SEPA Guidance

Regulation of Offshore Oil and Gas Waste

This guidance outlines the main types of waste arising from off shore oil and gas activities. It summarises the key risks to consider from waste arising during both routine operations and decommissioning. It details the current regulatory framework and which environmental authorisation is needed for different activities.

Contents

Note that whilst this guidance focusses on decommissioning, the requirements also apply to routine waste arising from offshore oil and gas activities.

Background

There are over 600 offshore oil and gas installations in the North Sea, 470 of which are in UK waters. These include sub-sea equipment fixed to the ocean floor as well as platforms ranging from the smaller structures in the Southern North Sea (similar in size to Big Ben) to enormous concrete or steel structures as big as the Eiffel Tower but much heavier in the Northern North Sea.

Offshore there are also more than 10,000km of pipelines, circa 5,000 wells and accumulations of drill cuttings. Associated with these operations there are also a small number of onshore terminals and pipelines.

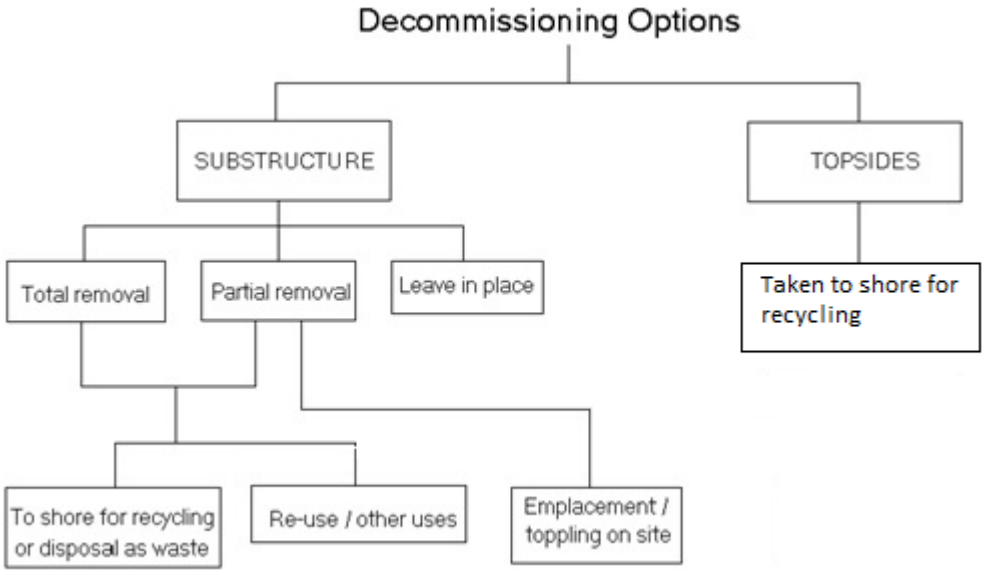
During the lifetime of a field or installation, equipment will be replaced when it fails, is replaced or becomes obsolete. Such equipment is often brought to shore for recycling or disposal, usually in small amounts. Once the operator has decided that an installation or even an entire field is no longer economically viable, they will make a decision to cease production and begin the decommissioning process. Each decommissioning project gives rise to large amounts of a wide range of waste. Both the routine and decommissioning wastes must be handled correctly to minimise impacts on the environment.

Decommissioning is split into decommissioning of the sub-sea structure, i.e. below the water, and decommissioning of the topside which is above the water. Generally all topsides are removed to shore.

There are three types of decommissioning activity for the topsides:

1- complete topsides can be removed from the legs in a single lift. This is called 'large' piece removal,
2- individual modules such as accommodation blocks or heli-decks can be removed in 'medium' piece removal and
3- the rig's own crane dismantles the structure off-shore dropping the pieces onto a barge to be taken ashore, called 'small' piece removal.

There are various decommissioning options for the sub-sea infrastructure depending on the nature of the construction and complexities there may be in removal. Operators must agree their programme of decommissioning work with the Offshore Petroleum Regulator for Decommissioning and Environment (OPRED) in advance of work commencing. If the operator proposes to leave any part of the structure in place, they must consult, via OPRED, with other OSPAR contracting parties. (Note the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) requires removal of all installations such as wellheads and Christmas trees (see appendix 2). A case may be made to decommission in situ pipelines and related stabilisation items.)



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The Decommissioning Process

(See Appendix 3)

The typical decommissioning process starts during late life activity when the operator decides to cease production. They will prepare a decommissioning programme (DP) which is approved by OPRED. The DP will outline the following:

- what is being decommissioned- e.g. a field with several platforms and pipelines, a single platform or a floating structure, along with associated infrastructure such as manifolds and umbilicals. It will include an inventory of the amount and type of materials present, and therefore the amount of waste expected. This may be based on original plans, databases of weights and/or records of modifications that have been made over the years. Surveys are made where it is safe to do so.
- Decommissioning options and a comparative assessment: this will set out the options for decommissioning the infrastructure, and an options appraisal comparing the different options of the pipelines and related stabilisation items. It will also identify proposals to leave certain items in place due to difficulties in removing them e.g. footings of large steel jackets and concrete installations
- Removal and disposal options - this may be combination of offshore and onshore activities to decommission, dismantle, remove, recycle or treat components and materials from offshore facilities.

- The proposed decommissioning procedure and timeline
- An environmental impact assessment that presents the operator's assessment of the potential environmental impacts of the proposed programmes of work. It gives an overview of effects over the course of the proposed decommissioning programme, taking into consideration the project and site-specific mitigation measures. Finally, it estimates the possible cumulative effects both of the operations offshore and in combination with other potential concurrent operations in the area.

As part of the consultation process on each decommissioning programme, OPRED consults with government departments, agencies and non-government agencies, including SEPA and the Health and Safety Executive. SEPA will comment on the waste aspects of the programme including management of radioactive waste, transfrontier shipment of waste and Duty of Care obligations. The operator is also required to carry out a public and statutory consultation.

Once the DP is approved, removal of the installation will begin, with the materials being brought on-shore for reuse, recycling, recovery or disposal.

Five Key Principles for Management and Reporting of Decommissioning Waste

SEPA has worked with Government Departments and industry bodies to develop key principles for the management and reporting of offshore waste to ensure it is done properly. These are summarised as follows:

• **Early Engagement**: operators should speak to the appropriate regulator (as outlined below) as early in the decommissioning process as they can, preferably when identifying options and collecting data in phase 2 of the process (see appendix 3). To avoid delays in gaining approval of the plan, operators should discuss technical issues when developing the DP ensuring they gather and submit all relevant information.

• **Waste Framework Directive (2008/98) alignment**: the Directive regards waste as a valuable resource which can provide raw materials for sustainable growth in a low carbon economy. It aims to move away from a linear model of consumption and disposal towards a cyclical model which optimises material productivity.

The Directive has at its core a waste hierarchy, setting out a priority order of how waste should be managed. With regard to the objective of conserving resources and reducing the environmental and societal costs of primary extraction, priority is given to prevention of waste and its potential harmful effects, the reuse of materials and then to the recovery and recycling of waste. Disposal is the least desirable option.

In Scotland, a waste producer has a legal duty, under the Environmental Protection Act 1990, to take all reasonable steps to apply the waste hierarchy. They must therefore apply the hierarchy, as a priority to the management of their waste. This goes hand in hand with the duty to promote 'high quality recycling' that applies in Scotland. This is the promotion of closed loop recycling where supply chains, from producer onwards, work together to maximise the delivery of high quality material capable of meeting the standards required by those that reprocess materials in high quality outcomes. To do this, there must be effective source segregation, with minimal contamination, into different waste streams for onward recycling or recovery. The Waste Hierarchy Guidance (available from the Scottish Government's web site) provides details of the priority outcomes for a range of common waste streams.

• **Duty of Care**: Waste producers, e.g. site/decommissioning operators and their contractors, must keep waste securely to make sure it doesn't escape or that unauthorised people don't gain access to it. They must only pass it on to someone authorised to receive it, e.g. a registered waste carrier, and they must complete a waste transfer note that includes a full description of the waste.

Waste producers must remember that their liability does not end when they pass on their waste to a carrier or treatment facility. If they pass it to an unlicensed carrier or it is later taken to an unlicensed or incorrectly licensed site, they may have committed an offence. Where activities are contracted, and potentially sub-contracted, liability for compliance with the Duty of Care obligations can remain with the original waste producer.

Anybody who collects and transports waste must be registered to carry waste and must take it to someone authorised to receive it. Waste treatment facilities must have the appropriate environmental authorisation for the waste they accept on site. They must manage it safely under the conditions of the authorisation.

Note that from SEPA's regulatory perspective the duty of care requirements only legally apply once the waste is onshore. However, it is best practice to ensure that appropriate paperwork accompanies the waste when it leaves the installation to ensure that when it is passed to a waste carrier or treatment facility on shore they are then in a position to comply with their Duty of Care obligations.

Scottish Government has issued statutory guidance on the Duty of Care requirements that is available at http://www.gov.scot/resource/0040/00404095.pdf.

• **Improve waste inventory reporting**: the Duty of Care requires an accurate description of waste when it is transferred to another person. This includes volumes/tonnages but also importantly any hazardous materials that may be present. Accurate assessment and categorising of waste makes it easier to ensure that it goes to a site authorised to handle that material. The HSE and environmental regulators need a detailed inventory and it will aid compliance with regulatory requirements. Appendix 4 contains an example of an inventory.

• **Active waste management planning**: this follows on from the creation of the waste inventory and charts the movement of all the waste arising as part of the decommissioning project from arrival onshore to final destination for recycling or recovery. It should be managed by a competent person and regularly reviewed as the decommissioning programme progresses. The active waste management plan will highlight early in the process where any waste (including topsides, modules, fluids, etc.) is to be exported and this should be discussed with SEPA. Revised OPRED guidance requires the maintenance of an Active Waste Management Plan.

Waste Types- Characterisation and assessment

Offshore oil and gas waste covers a wide range of types and size of equipment and may contain a large number of component parts and materials. Due to the nature of the process, some of the waste present may be hazardous, e.g. if it contains hazardous chemicals or hydrocarbons and coatings such as lead based paint and asbestos. Failure to assess and characterise the waste may result in misclassification and it could potentially end up in a site not authorised or equipped to deal with it. If the installation or equipment contains hazardous waste, the entire structure is classed as hazardous and must be handled accordingly.

In order to comply with legal requirements when the waste arrives on-shore, it is best practice for the producer of the waste to carry out an assessment to determine the characteristics of the waste and whether it is hazardous or not using the Guidance on the Classification and Assessment of Waste Technical Guidance WM3. Further guidance on classification of waste is available on the SEPA website: https://www.sepa.org.uk/regulations/waste/special-waste/.

Whether the waste is hazardous or not will affect the site that it can go to for storage and treatment. If it is hazardous waste it will need to be consigned in accordance with the Special Waste Regulations 1996 from the point at which it lands on shore. Once landed in Scotland anyone handling the waste must comply with duty of Care obligations including ensuring that the waste is only transferred to an authorised carrier or to an authorised treatment or disposal site. Guidance is available on consigning hazardous waste in Scotland.

Regulators and Responsibilities in Decommissioning

The decommissioning of offshore oil and gas installations and pipelines on the United Kingdom Continental Shelf (UKCS) is controlled through the Petroleum Act 1998. There are numerous regulators involved in the decommissioning process, depending on what activity is taking place and where.

OPRED = Offshore Petroleum Regulator for Environment and Decommissioning

The legislation, regulation and guidance for the Decommissioning Programme process is the responsibility of the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED). It oversees the approval of decommissioning programmes from concept selection, programme approval through to execution, the close out report and post decommissioning monitoring. They are also the competent authority on offshore oil and gas decommissioning in the UKCS for OSPAR (international regulations) purposes. OPRED is part of the Department for Business, Energy and Industrial Strategy (BEIS). In addition, OPRED issues the environmental consents or permits required for decommissioning activities under the relevant Environmental regulations as well as consulting on decommissioning programmes in regard to the impact on the environment.

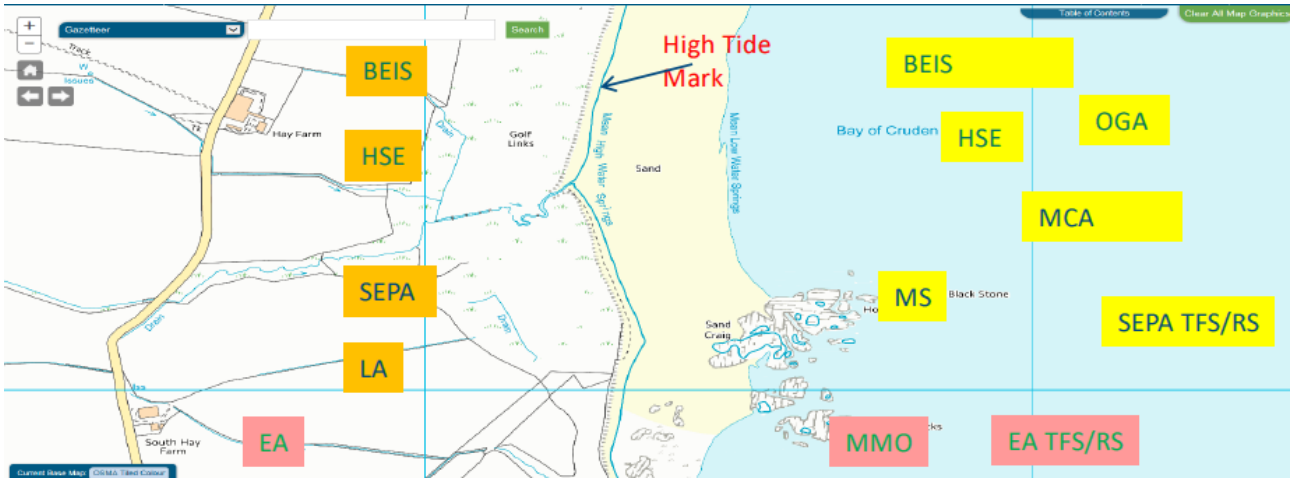
HSE= Health and Safety Executive. OPRED works in partnership with the HSE as the Offshore Safety Directive Regulator (OSDR) responsible for implementing the EU directive 2013/30/EU on safety of offshore oil and gas operations. The HSE is a consultee in the Decommissioning Programme process and Operators must consult the HSE at an early stage in the development of decommissioning scope and option assessment. The HSE are also involved with the safety aspects of dismantling structures onshore.

OGA= Oil and Gas Authority was created by The Energy Act 2016. Its principal statutory objective is to maximise the economic recovery of the UK's oil and gas resources. The OGA is also responsible for regulation in relation to the decommissioning of wells.

MCA= Maritime and Coastguard Agency. The aim of the MCA is to develop, promote and enforce high standards of marine safety and to minimise the risk of pollution of the marine environment from ships. It is responsible for implementing the Government's strategy for marine safety and the prevention of pollution from ships. The MCA is a consultee to any application for the placing of offshore installations and other works in tidal waters, advising specifically on matters of navigational safety.

MS= Marine Scotland is responsible for the integrated management of Scotland's seas for prosperity and environmental sustainability, working closely with its key delivery partners and others. Anyone wishing to undertake activities involving the deposits of substances or articles at sea in waters adjacent to Scotland is advised to check with Marine Scotland. Marine Scotland will confirm if a licence is required or if the activities are exempt under the Deposits in the Sea (Exemptions) Order 1985 (as amended). Marine Scotland also conducts an extensive marine environment monitoring programme in waters adjacent to Scotland. The MMO (Marine Management Organisation) is the equivalent body for England.

(Trade Bodies- there are two main trade bodies representing the oil and gas sector: Oil and Gas UK, which speaks for the whole sector from exploration to decommissioning, and Decom North Sea which is specific to decommissioning.)



Note that waste controls only extend to mean low water mark

SEPA's Role in Decommissioning Activities

SEPA is the environmental regulator for activities that take place in Scotland or for waste that is exported from the Scottish area of the UKCS. SEPA is a consultee for the Decommissioning Plan within the Decommissioning Programme (DP) and comments on the proposals for management of the waste. This is managed through our consultations process. SEPA is actively involved in assessing decommissioning plans, particularly the hazardous waste inventory and the active waste management plan, to ensure that waste brought onshore in Scotland goes to sites appropriately authorised to accept it. We also comment on the close out report that is submitted once the decommissioning programme is complete.

Regulatory Regimes and their application to offshore oil and gas waste

Radioactive waste

When hydrocarbons are extracted, naturally occurring radioactive material (NORM) is transported to the surface and can be deposited on surfaces of processing components or can contaminate sands and sludges accumulating in vessels on the installation.

Under The Radioactive Substances Act 1993 (RSA93), SEPA is responsible for the regulation of the keeping and use of radioactive material and the accumulation and disposal of radioactive waste. RSA93 requires persons accumulating and disposing of radioactive waste to hold an appropriate authorisation. Limitations and conditions are included in schedules attached to the authorisation. Installations holding an appropriate authorisation may routinely clean NORM-contaminated components offshore and discharge any waste to the marine environment (under an RSA93 authorisation issued by SEPA), or send it onshore to a Waste Permitted Person (WPP) with an appropriate authorised disposal route (e.g. landfill, incineration). Operators may also send NORM-contaminated equipment onshore to an authorised descaling facility, where any NORM waste generated from the cleaning process is disposed of by transferring it to a WPP, again with an appropriate authorised disposal route in place. When it comes to decommissioning, the installation is taken to an onshore authorised facility where any NORM-contaminated equipment will be cleaned and any NORM waste will be removed and disposed of to a WPP.

The production and processing of oil and gas is likely to generate radioactive waste. Most installations undergoing decommissioning will already have an authorisation allowing the accumulation and disposal of radioactive waste. However, operators should consider whether they will need to apply for any additional disposal routes. This may be to allow the transfer of radioactive waste to a WPP if the existing authorisation

only allows disposal to the marine environment, or to allow the transfer of radioactive waste if the decommissioning will take place in another country.

If a site accepts radioactive waste it must have the appropriate permit to do so, in addition to any other permit to handle non-radioactive waste.

Some radioactive wastes are not regulated under RSA 1993. These are radioactive wastes exempted under the Radioactive Substances Exemption (Scotland) Order 2011 (EO11). Examples of exempt wastes that may arise from offshore decommissioning include smoke detectors, certain types of emergency lighting containing gaseous tritium, certain sealed sources containing tritium, and luminised articles (radium painted dials). Other waste may be exempt due to low concentrations of radioactivity.

NORM waste may be exempt from RSA93 where the activity is less than 10 Bq/g. For further information refer to "Exemption Guidance - Guidance for NORM industrial activities on how to comply with the radioactive substances exemption regime", available on SEPA's website Any waste that is exempt under EO11 is considered to be controlled or Directive waste and is therefore subject to regulation by SEPA under the conventional waste management regime or the Pollution Prevention and Control (Scotland) Regulations 2012 (PPC). This means that an operator of a decommissioning facility wishing to manage exempt and non-exempt radioactive waste may require two environmental permits from SEPA.

Besides NORM waste, decommissioning an installation may generate waste sealed radioactive sources. SEPA expects the removal of all sealed radioactive sources kept and used on the installation and held under a RSA93 registration (e.g. in gauges for measuring levels, densities or flow) before the installation moves from its authorised location. The sources should be returned to the supplier or disposed of to an authorised facility.

Some installations have sealed radioactive sources in their footings. Where the operator has received permission to leave the footings in place, SEPA would expect removal of the sources where practicable. If, following a review of options and risk assessments, the operator does not consider it practicable to remove the sources, SEPA would consider this to be a disposal to the marine environment. The operator must apply to cancel the RSA93 registration and apply for permission to leave these sources in situ. This application should cover the options and risk assessments and include a radiological dose assessment detailing any consequences there may be from leaving the sources in situ. If SEPA grants the application, we will issue a Letter of Authorisation.

Moving radioactive waste.

UK Government Policy is that the import and export of radioactive waste, including NORM waste, may only be consented by SEPA in light of an assessment of all practicable options, and should not be allowed except for the recovery of re-usable materials or for treatment that will make its subsequent storage and disposal more manageable. The presumption is that if the installation goes overseas for decommissioning any sealed sources are removed before it moves from the registered location and all radioactive waste will be returned to the country of origin to a timescale agreed by the competent authorities in the countries of destination and origin.

The Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008 does not cover waste containing NORM. Instead, the import or export of NORM waste falls under the conventional waste shipment controls outlined below. Authorisation under RSA93 is also required.

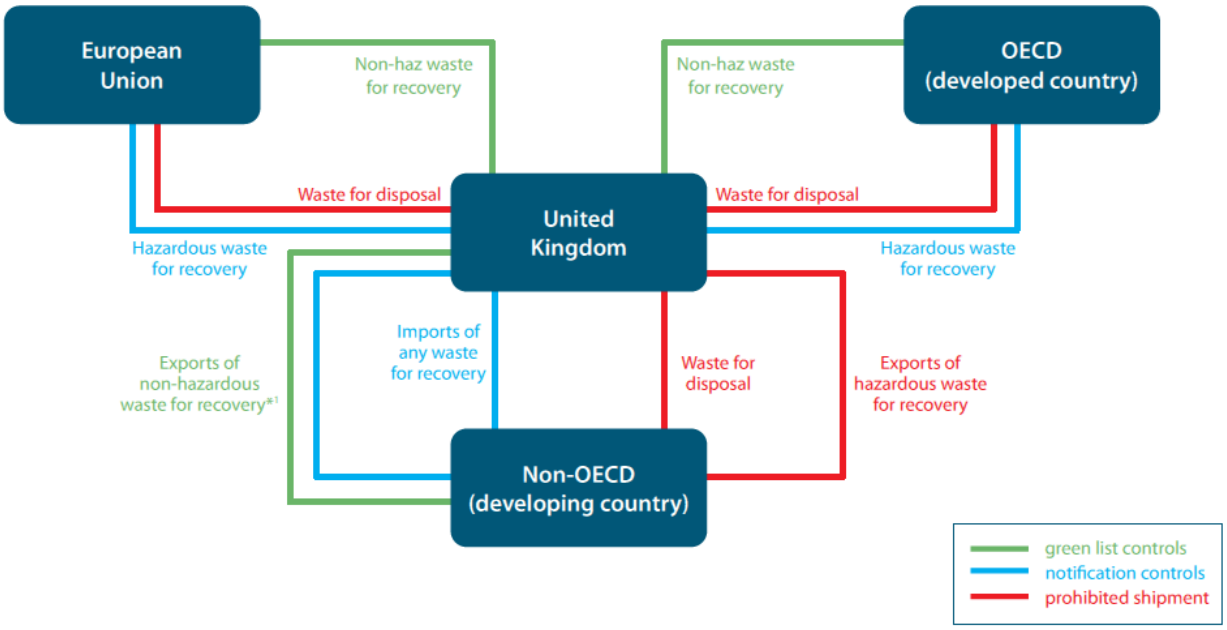
Guidance is available on the shipment of waste containing NORM:

https://www.sepa.org.uk/media/219776/guidance-on-the-shipment-of-wastes-which-contain-norm.pdf.

Transfrontier Shipment of Waste

The export of waste from the UK is subject to a range of regulatory controls depending on the nature of the waste, the purpose of export (recovery or disposal) and the destination:

The export of waste for disposal is banned, even within Europe. Incineration is allowed where the site can demonstrate that it operates above a set efficiency threshold and the incineration is considered a recovery activity.



Green list controls apply to the export of certain non-hazardous wastes for recovery. These are generally clean, segregated recyclable materials such as metals, plastics, paper and glass. Prior to shipment you must complete, sign and submit to SEPA an Annex VII form. A copy of this form must also accompany the waste.

Notification controls apply to the export of hazardous waste for recovery. Note that whole vessels and structures are likely to be classed as hazardous waste and will require prior approval. Prior to export of the waste, the exporter must submit an application for notification to export.

The application must contain:

- a completed notification form accompanied by the relevant fee;
- evidence of a financial guarantee to cover the expense of the worst case scenario – usually taken as the waste being returned to the UK and requiring disposal – is in place;
- evidence of a written contract for the recovery of the waste, including specific terms, with the business that will be receiving and recovering the waste;
- evidence of insurance against liability for damage to third parties;
- evidence that all necessary permissions from the competent authorities in all countries concerned have been obtained before the waste is moved.

Fees are applicable to each application, relative to how many shipments are covered by the notification.

Further information is available on the SEPA website: https://www.sepa.org.uk/regulations/waste/transfrontier-shipment-of-waste/.

Waste Treatment Activities

SEPA supports re-use but operators must be aware that some types of preparation for re-use activities fall under waste controls, e.g. the cleaning of pipes or umbilicals prior to reuse is a waste activity and must have the appropriate environmental authorisation. SEPA has produced guidance that clarifies when waste legislation applies. Where items are to be exported from the UK there is less certainty that the items will actually be reused. Because of this uncertainty, SEPA will assume that these items are waste unless it is demonstrated otherwise.

Where offshore items cannot be directly re-used without further processing, or re-use is not certain, they are classed as waste and will often be sent to shore for recycling or disposal. Any treatment or disposal activity must be carried out at an appropriately authorised facility. The type of authorisation needed will depend on the activity carried out.

Where treatment or disposal of the waste does not fall under RSA93 controls then the treatment or disposal will be subject to either –

- A Waste Management Licence (WML)

- A Pollution Prevention and Control (PPC) Permit, or

- An Exemption from waste management licence (WMX)

The waste management licensing regime applies to waste treatment activities carried out anywhere on land which includes land covered by waters where the land is above the low water mark of ordinary spring tides (MLWS).

The PPC regime applies onshore and up to 12 nautical miles (approx. 14 land miles) from the baseline, i.e. it will apply to prescribed activities carried out on area that would normally be under water, including activities at quayside or in a wet berth.

Marine Scotland (MS) licences apply to activities carried out in the Scottish marine area, i.e. from the territorial limit of the sea to Mean High Water Spring including estuaries, river and channels that are tidal. If the activity has a MS licence then a WML is not required. MS licence deposits in the sea or on or under the seabed. However there are exemptions from the requirement to hold a MS licence including the dismantling of ships that are waste where

(a) it involves disposal of its own non-hazardous waste at place of production or recovery of waste,

(b) the type and quantity of waste etc. is consistent with the "relevant objectives" in Article 13 of WFD and

(c) they are registered with the Scottish Ministers.

SEPA, with other regulatory bodies, is clarifying the responsibility for regulation of activities such as the dismantling of ships or vessels carried out in wet berths, i.e. adjacent to the quayside.

Pollution Prevention and Control (Scotland) Regulations 2012 (PPCR)

The PPCR implement the Industrial Emissions Directive (2010/75/EU) and apply to many industrial activities including the disposal and recovery of hazardous and non-hazardous waste. There are thresholds applicable to many of the activities.

The PPCR contains a list of activities that require a PPC permit. This includes the following activities:

1- Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving specified activities including physico-chemical treatment. Note that SEPA's interpretation of this is it means a physical **and** a chemical process such as adsorption, distillation, chemical precipitation, chemical oxidation, evaporation, chemical reduction, ion exchange process and stripping. SEPA does not class manual dismantling of offshore equipment or installations using cutting tools and heavy equipment as a physico-chemical process. (The Environment Agency has adopted a different interpretation and operators should seek their advice if waste is to be landed/treated in England.)

2- Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving specified activities such as pre-treatment prior to incineration and physico-chemical treatment. Note that this means a physical and a chemical process such as those listed in the above paragraph.

3- Temporary storage of hazardous waste (excluding storage on the site the waste was generated) in an installation with a capacity exceeding 50 tonnes where the waste is going to incineration, landfill or another prescribed waste treatment activity.

Decommissioning of oil and gas equipment may involve activities other than those listed above. Operators should check the regulations and confirm with their local SEPA office as to whether their activities will require a PPC permit. SEPA will only issue a PPC permit to sites carrying on a listed activity.

A PPC permit will not be required if the only activities carried on include flushing of pipes and tanks with collection but no treatment of the liquid or manual cutting, shearing, etc. of metal. These 'physical' treatments are controlled under the Waste Management Licensing regime.

Waste Management Licensing

Any waste activities that do not fall under PPCR and take place above MLWS will be regulated under the waste management licensing regime and will require a waste management licence (WML). The majority of decommissioning activities will fall under this regime. This will include the recovery of non-hazardous waste at any capacity and physical treatment processes such as hot and cold manual cutting and shearing (including the use of acetylene torches).

On-shore depollution activities including washing, purging or flushing equipment or emptying tanks will require a WML where there is no other treatment of the removed liquids. Treatment may also require the removal of marine growth for treatment or disposal off-site.

Exempt Activities

Waste management activities are regulated by SEPA under the Environmental Protection Act 1990 and the Waste Management Licensing (Scotland) Regulations 2011 (WMLR). Schedule 1 of the WMLR contains a list of activities that can be exempted from the requirement to hold a WML, known as 'exempt activities'. Paragraph 45 of this schedule allows the sorting, grading, baling, shearing or cutting of scrap metal, the dismantling of depolluted motor vehicles and the sorting of lead acid batteries with a view to the recovery of the waste.

The waste metals that can be treated and stored under a Paragraph 45 exemption are ferrous and non-ferrous metals within categories 16 01 17 and 16 01 18 of the EWC i.e. those arising from end of life vehicles (ELVs). Additionally, the paragraph 45 exemption allows the storage and treatment of depolluted motor vehicles. **The paragraph 45 exemption does not allow the handling of any waste containing or coated with hazardous substances.**

Regulatory Position Statement WST-PS-041 sets out circumstances in which SEPA will not take enforcement action when ferrous and non-ferrous metals, depolluted offshore oil and gas equipment and lead acid batteries arising from offshore oil and gas activities are accepted, stored and treated at a scrap metal facility which is not covered by a waste management licence. The metals, equipment, etc. must not be contaminated with hazardous coatings or paints, asbestos or marine growth. Due to the potential for contamination, it is unlikely that exempt sites will be able to accept many decommissioning waste streams.

In order to take advantage of the Regulatory Position the site must comply with the requirements in paragraph 45 including the provision of an impermeable surface with sealed drainage for all areas where the storage and treatment takes place. This is a surface constructed using a material such as sealed concrete which does not allow the permeation of liquids. Gravel and concrete block paving are not impermeable surfaces since they allow liquids to pass through. SEPA does not believe that a design in which there is a permeable layer of gravel or block paving above the impermeable layer is compliant. The performance of that sub-surface layer could not be easily monitored and there is the possibility that spills could sit for extended periods of time below the surface with no method of clean up available.

Floating Production Storage and Offloading Vessels (FPSOs)

A Floating Production, Storage and Offloading (FPSO) unit is a floating vessel used by the offshore oil and gas industry. It has equipment for separation and treatment of crude oil, water and gases, arriving on board from sub-sea oil wells via flexible pipelines and for the storage of oil. FPSOs can be a conversion of an oil tanker or can be a vessel built specially for the application. (There are also Floating Production Units and Floating Storage Units.)

FPSOs are classed as ships and therefore their treatment at end of life is tightly controlled. Note that for RSA93 purposes an FPSO is classed as an installation and not a ship when it is connected to subsea infrastructure. Once it moves from the Authorised Premises it is considered a ship.

Articles 13 and 14 of the EU Ship Recycling Regulation established requirements for ship recycling facilities that recycle ships within its scope. This means that ships sailing under the flag of a member state that exceed 500 gross tonnes will only be able to be recycled at a facility if it is included on the European List of facilities established under the EU Ship Recycling Regulation. The UK Ship Recycling Facility Regulations provide for facilities located in England, Scotland or Wales to be authorised in accordance with the EU Regulation so that they may be added to the European List.

DEFRA, the Environment Agencies and the Health and Safety Executive have developed guidance on the requirements of UK regulations.

The guidance document developed between DEFRA, HSE and the Environment Agencies sets out what built structures will be acceptable at Ship recycling facilities. They include:

1. Dry Dock – this method generally allows for greatest control of accidental spillage and provides land access around the whole ship.

2. Floating Dry Dock (or Flat Top Barge) – submersible structures where the ship is positioned over the submerged dry dock and water pumped out until the ship is clear of water. The structure may be susceptible to damage during dismantling operations, so would need to be managed constantly.

3. Slipway – this is a sloping concrete hard standing where the ship will be hauled up to above the high water mark for dismantling. Procedures must be in place to ensure the ship remains in a stable condition during disassembly and that any contamination is contained.

4. Wet Berth – within a wet berth the ship is moored on the quayside whilst being dismantled. This option can be used to remove the internal components of the hull, but care must taken with the ship's stability. Management procedures must be in place to address this. Once internal items are removed, the vessel must be removed from the water to strip the hull. This can lead to further control and stability problems.

Grounding a vessel on a beach or a river bank is not an environmentally suitable option. This will not be authorised in the UK.

Regulation of FPSO Dismantling

The site must be authorised in accordance with the EU Regulations and on the EU list of approved sites. Where the activity includes the physico-chemical treatment of waste (including processing of hydrocarbons, sludges and chemicals) a PPC Part A permit will be required. Otherwise a WML will be required where the activity takes place on land i.e. above mean low water springs.

The presence of other hazardous materials such as asbestos is also highly likely.

Treatment of Subsea mattresses

Concrete mattresses provide an engineering solution for the oil and gas industry. Uses include protection of subsea pipelines from dropped objects, scour protection and providing added weight to aid stabilisation. The mattresses are made of individual concrete blocks linked together with polypropylene rope.

There are many thousands of concrete mattresses deployed on the seabed on the UKCS. Mattresses may have been made with concrete containing chromium VI and III and since they are used in very harsh environments there are concerns over additional contamination by salt, heavy metals and hydrocarbons. These compounds may leach out once the mattresses return to shore. All waste mattresses should be classified using Guidance on the Classification and Assessment of Waste Technical Guidance (WM3).

Under current regulations all mattresses installed must be removed at the end of field life unless it can be adequately proven that a recovery operation cannot be completed safely and efficiently. Approval to leave in-situ is granted by OPRED only if the owner can demonstrate this is the best option via the comparative assessment.

SEPA is currently working with industry to develop guidance on testing and recycling of waste mattresses based on suitability for use.

Options include bringing the waste mattresses onshore for preparation for reuse in future offshore applications including offshore wind farms, use in erosion prevention schemes or industrial applications but only where they are suitable for that use and preparation for reuse is carried out at a suitably licensed facility. Where they are not suitable for reuse they must be treated or disposed of in a suitably authorised facility.

Crushing and screening of waste mattresses to produce aggregates may be an option after confirming they are suitable for this purpose. This is a PPC Part B activity. Companies wishing to crush and screen waste mattresses must have a PPC Part B permit in place for control of emissions to air. This may be done by appropriately permitted mobile plant. Operators must also register a paragraph 24 WML exempt activity and meet its requirements.

Note that a PPC Part B activity or a paragraph 24 WML exempt activity cannot be carried out on hazardous waste.

The output from the crushing and screening process will still be regarded as a waste and must be used lawfully, i.e. as part of a WML exempt activity, e.g. paragraph 19, or under a WML. Where the aggregate meets the requirements of SEPA's guidance on recycled aggregates from inert wastes it will cease to be waste and waste management controls will not be required for further use.

Appendix 1- Quick guide to regulatory controls

If I want to…	I will need this…
Bring on-shore whole structures, e.g topsides or modules, and carry out dismantling	An RSA authorisation if the structure contains radioactive material, a waste management licence, or a relevant Pollution Prevention & Control Permit (dependent on the nature of the material and the specific activities to be undertaken – see below)
Depollute structures or equipment on-shore, e.g. draining/ flushing pipework for collection and off-site treatment	An RSA authorisation if the structure contains radioactive material and a waste management licence once RSA no longer applies.
Treat collected fluids that are hazardous using physico-chemical treatment, e.g. distillation of oily sludges, where the capacity exceeds 10 tonnes per day.	A pollution prevention and control permit (section 5.3)
Store more than 50 tonnes of hazardous waste for subsequent section 5.3 treatment off-site	A pollution prevention and control permit (section 5.6)
Size reduce depolluted, uncontaminated offshore equipment	Register an exempt activity under paragraph 45 of WMLR (limits apply)
Dismantle floating structures, e.g. FPSO, on shore (where they fly an EU flag and exceed 500 gross tonnes)	An RSA authorisation if the structure contains radioactive material and either a WML or PPC Permit Listing on the EU register
Accept, accumulate, treat and dispose of NORM or NORM-contaminated items for onward disposal to a waste permitted person (WPP).	RSA authorisation to accept, accumulate and dispose of NORM (unless exempt when WML will apply)
Export hazardous waste (including topsides, modules and equipment) for recovery outwith the UK (note that export for disposal is banned).	Prior written consent from SEPA.
Bring mattresses onshore for recycling into use as aggregate	A PPC Part B authorisation for crushing/screening and an exempt activity registration for crushing (paragraph 24) and another for subsequent use of resulting aggregate if “end of waste” status is not achieved.

Appendix 2- Typical decommissioning wastes and methods of removal and treatment

Topside – All parts and structures above sea level.

(Brent Delta platform)

In the case of the Brent Delta platform, this arrived whole from a single lift operation and contained accommodation and amenity blocks as well as oil production equipment.

Means of removal

Small Piece- Small parts of the platform are size reduced offshore and taken onshore for further treatment.

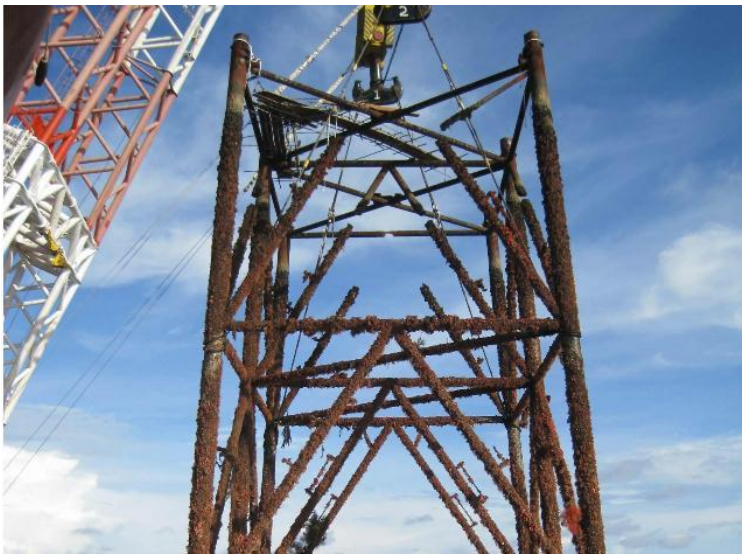
Modules (large piece)- it is becoming common place for entire 'modules' to be taken onshore by barge by reverse modular decommissioning i.e. by complete Heli Deck Module, Main Deck Module, Cellar Deck Module, Accommodation Deck Module etc. Some treatment may be done offshore such as flushing of tanks and removal of radioactive sources or the entire unit may be brought on-shore to be decommissioned. The potential for residual contamination, asbestos (lagging, paints, panels etc.) lead paints etc. results in the classification of the entire module as hazardous.

Single Lift – The entire platform is sheared from the jacket legs and taken onshore as a single item to be decommissioned. The jacket is removed separately.

Jacket –This is the steel tubular frame that supports the topside platform and connects it to the seabed. There is a small part above sea-level however the majority is below sea-level. The jacket legs are drilled into the seabed to a depth of up to 100m and acts as a protective cage for all piping going between the seabed and the rig. The jacket is susceptible to contamination from discharged drill cuttings, NORM, marine growth etc. Sealed radioactive sources may also be present in the jacket legs.

Typical jacket

Typical marine growth contamination found on jackets



Jacket undergoing decommissioning

Topside metals – (Gangways, platforms, masts, derrick, modules etc.). Asbestos, heavy metals, PCB contamination, lead paint, greases, hydrocarbon and other contamination may be present in substantial quantities depending on level of depollution carried out offshore.

Topside metal module being decommissioned

Topside metal being size reduced

Drilling fluids/muds/cuttings – Complex and changeable in nature. Each company produces fluid mixes as required for each individual operation, and the composition may change throughout the process of that operation. Typically includes polymers, hydrocarbons (if oil based), heavy metals, oxygen scavengers, inhibitors, de-scalers, lubricants and other additives. Used fluids/muds will contain contaminants/pollutants found within the hydrocarbon product and drill cuttings. This may include NORM. All component parts of this process are exposed to the fluid and there may be the potential for the accumulation of sludge/scale within associated tubulars and component parts.

Drilling fluids/muds/cuttings- operational system – consists of storage tanks, a series of fluid/mud pumps that circulate the fluids around the well, bulk fluid/mud component storage, degassers that remove gas from the drilling fluids, shale shaker that is used to sieve out the larger drill cuttings from the drilling fluid as it is returned from the well, desander & desilter remove the finer drill cuttings prior to the drilling fluid being recirculated through the process. The potential for the accumulation of pollutants, in particular fluids/muds/cuttings within this system is high (that may be NORM contaminated), as well as the residual contaminants present within the system component parts (hydraulic oils, chemicals etc.).

Muds tank

Part of operational system

Produced/process water – Is returned to the platform from the well as a liquid containing the mixed hydrocarbon factions (unseparated) contaminants/pollutants contained within the drilling fluids. Typically produced water will contain organic compounds, dissolved salts, trace metals (higher than background oceanic levels for sodium, potassium, chloride, magnesium and sulphates), suspensions, added corrosion inhibitors, de-scalers, biocides, dispersants, emulsion breaker, and many other substances that are components of the formation water or used during drilling/production operations. Produced waters will always contain petroleum hydrocarbons. Once processed produced/process water has additives placed into it, it can be used as injection water.

Produced/process water treatment system – This system removes the hydrocarbon oil/gas fractions from the aqueous solution they are contained in (process/produced water) that is returned from the well. Separated water from all sources is sent to a Produced Water Treatment Plant for recovery of oil and treatment of water. The produced water is pumped through a system of high and low pressure production separators, valves, skimmers, filters, gas flotation and dehydrators. The potential for the accumulation of pollutants (that may be NORM contaminated), in particular hydrocarbons within this system is high, as well as the residual contaminants present within the system component parts.

Modular operational produced/processed water treatment system

Storage Tank contents – Chemical soup of additives, hydrocarbons etc. dependent on use.

Ancillaries – Will include (but not limited to) various winches, generators, cranes, air-conditioning units, heating systems, fire alarm systems etc. as modules, pieces are returned may not be depolluted.

Subsea structures/items - originate from below sea-level

Typical subsea structures

Risers

Marine riser/drilling riser- A marine riser is a larger drilling riser that connects a semi-submersible or drilling ship to the sea floor. The drilling pipe is within the riser and concentric pipes create a circulating system for the drilling fluids/muds to be taken to the rock face within the drill pipe and returned to the rig within the space between the pipe and riser. This allows drilling fluids/muds, hydrocarbons and other contaminants (see drilling fluids/muds above) to accumulate within the casing and internal ribbing of the riser.

Production Riser – is a permanent pipe used to flow oil/gas to the surface from the seabed. It may be a single pipe, concentric pipe or a bundle of multiple flowlines. Usually put in in place for the lifetime of the production platform. The riser is susceptible to build-up of hydrocarbons within the pipe and other contaminants found in processed/production water (see above). The pipe is pre-treated with numerous chemical compounds.

Unused production risers

All risers are inter-connected by hydraulic connectors and flexible joints, which contain large quantities of hydraulic oil and other liquid. The well head is connected to a riser by a riser tensioner, which consists of a sheaved hydraulic cylinder, containing hydraulic oil.

Riser connector

Riser tensioner

Blow Out Preventer - In the drilling phase a '*blow out protector*' is located either or at both the seafloor or on the rig. This is a large (up to 30 tonnes plus) failsafe device designed to 'closeout' the drilling/marine riser in the event of an incident by shearing the drilling pipe. This item contains large volumes of hydraulic oil and other fluids. In production this is replaced by the subsea isolation valve.

Blow out protector

Subsea isolation valve being deployed

Jumper Spools- Connect satellite wells to the manifold or to other subsea structures such as riser bases. They can be either ridged or flexible. The spool may be contaminated with external marine growth, drill cutting contamination etc. Internally they may have the same pollutants present as shown for umbilical/risers/pipes dependent on the use of the spool.

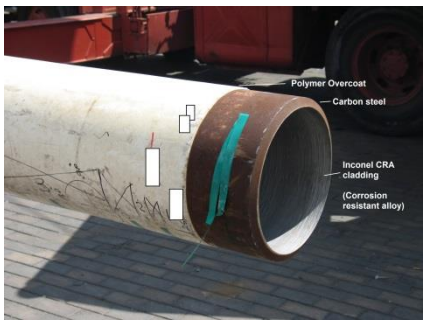
Jumper spool being deployed

Drilling pipes - exposed continuously whilst in use to drilling fluids/muds/cuttings/cements etc. (see above). These will be contaminated by the accumulation of contaminants.

New drilling pipes

Used drilling pipe showing contamination

Pipe/flow lines – Accumulation of hydrocarbons and other fractions that may include NORM on wall of the pipe/flow lines. Pipe/flow lines are chemically treated prior to use. Highly susceptible to contamination by marine growth, however the type of growth is influenced by water depth.



New pipe | Used pipe hydrocarbon pollution | Used pipe hydrocarbon scale

Water injection/boosting systems- A system of pumps and structures, interconnected by a series of flowlines/pipes that takes treated/processed water from the platform back to the well for pressurisation. This will be polluted by the additives placed into the water or the naturally occurring pollutants found in the process water (see above).

Subsea Manifold - located on a subsea template which acts as a base for the manifold and subsea christmas trees. The manifold is a system of headers, branch pipes and valves used to control and distribute produced fluids (hydrocarbons, processed water etc.) and to distribute injected fluids(injected chemicals, injected gas, control fluids, hydraulics etc.) from the platform to the well and other subsea structures through pipe/flowlines and umbilicals. The manifold is susceptible to contamination by the accumulation/poor depollution of any substances that are an integral part of the system (control fluids, hydraulics etc.) or to any substance that has passed through it (hydrocarbons, injected chemicals, additives, processed water, NORM and external marine growth etc.). The pig loop module collects pigged hydrocarbons that have been removed from pipes as part of the maintenance process.

New template | Manifold on template with protective cover

Christmas tree –a series of valves to control the flow of gas or oil out of a production well, or the injection of gas or processed/produced water into a non-production well. A tree also allows the injection of production/control/maintenance fluids to a well or other associated subsea structures. The christmas tree is susceptible to contamination by the accumulation/poor depollution of any substances that are an integral part of the system (control fluids, hydraulics etc.) or to any substance that has passed through it (hydrocarbons, injected chemicals, additives, processed water, NORM and external marine growth etc.).

Unused Christmas trees | Newer Christmas trees look like this

Umbilicals –an assembly of cables, hoses and pipes within a flexible or semi-ridged pipe. These take hydraulics to subsea systems, production chemicals to christmas trees and well-heads, deliver gas for uplift etc. They also contain maintenance chemicals and additives, as required. The umbilical may be connected to an umbilical termination assembly, which allows multi subsea control structures to be connected to a single system. Steel flying leads from this assembly provide electrical/hydraulic/chemical connections from the umbilical termination assembly to individual trees/control pods/structures. New, unused umbilicals contain storage fluids (that are special waste) that may include de-scaler, biocides, MEG, methanol, inhibitors, buffering fluids etc. Umbilicals may be taken back onshore with all fluids in place or partially flushed. Subsea umbilical lines may reach over 50km in length. They can be dynamic or static.

Umbilical attached to umbilical termination assembly

Steel flying lead

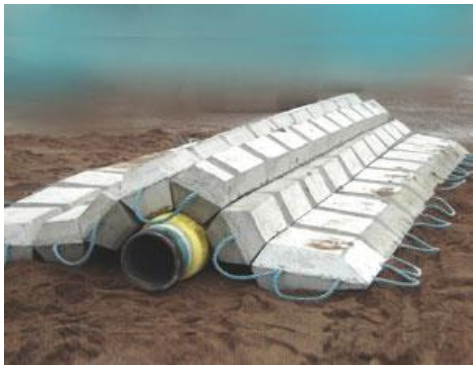
Umbilical construction

Subsea Mattresses

Oil & Gas UK estimates that between 35,000 and 40,000 concrete mattresses have been deployed on or around oil and gas subsea infrastructure since operations began in the North Sea. Concrete mattresses provide a recognised engineering solution for several of the challenges faced in subsea pipeline construction, umbilical deployment and seabed and soil protection/stabilisation.

Typically, concrete mattresses may be used to provide:

- Protection from dropped objects
- Added weight and stabilisation
- Protection from Trawl Boards
- Scour prevention
- Crossover support and separation for pipelines and umbilicals
- Supports or foundations for other subsea activities



Flexible mats are constructed using concrete blocks and polypropylene rope. These are the most widely used type of mattress in the North Sea. They retain their structural integrity and are usually easily recoverable.

Fronded mattresses are less widely used. They were designed to self-bury and are generally more difficult to remove from the seabed.

Mattresses may also contain grout or bitumen. Again, these mattresses are difficult to remove from the seabed and present additional hazards when recovered back to land.

Concrete mattresses were not designed to be recovered but under current regulations all mattresses installed must be removed at the end of field life unless it can be adequately proven that a recovery operation cannot be completed safely and efficiently. OPRED will grant approval to leave in-situ only if the operator can demonstrate this is the best option via the comparative assessment.

There can be several hundred mattresses arising through a decommissioning project. However it is estimated that only 5% of mattresses that were originally deployed have been removed from the sea bed.

Contamination may be present in the form of marine growth fouling, drill cuttings

A report was prepared on behalf of Zero Waste Scotland examining the use of subsea mattresses and potential for removal and reuse/recycling:

http://decomnorthsea.com/uploads/pdfs/projects/DNS-Mattress-Solutions_JEE-Report_June-2015.pdf. Note that this document does not refer in detail to waste management controls but any preparation for reuse must be carried out by a suitably authorised facility and the mattresses must be assessed for suitability prior to treatment, e.g. salt and heavy metal content and the presence of marine growth may affect treatment and reuse options.

Marine Growth

Various marine organisms start to grow on platform legs and other subsea structures after they have been in the sea for only a few months, and the quantity is much larger after 30–40 years in the sea. Mussels, barnacles, benthic algae and sea cucumbers quickly colonise installations, followed by soft corals and after some years colony-forming stony corals. The species that colonise a particular installation will depend on a number of factors such as water temperature, currents, water depth, distance from land, latitude and the season in which the structure was installed.

Marine fouling may be removed from the installation while it is still offshore if this is technically possible and agreed with MS.

Marine growth on manifold protection support leg

Much of the material dries out/decomposes quickly, but calcareous shells and skeletons of organisms such as mussels and stony corals may be brought onshore to the decommissioning facility. During transport to shore, which can take several days, some of the organisms with a very high water content (for example sea cucumbers and soft corals) dislodge, die off or mummify. Organisms that are adapted to survive out of the water, such as mussels, may survive especially in humid cooler conditions.

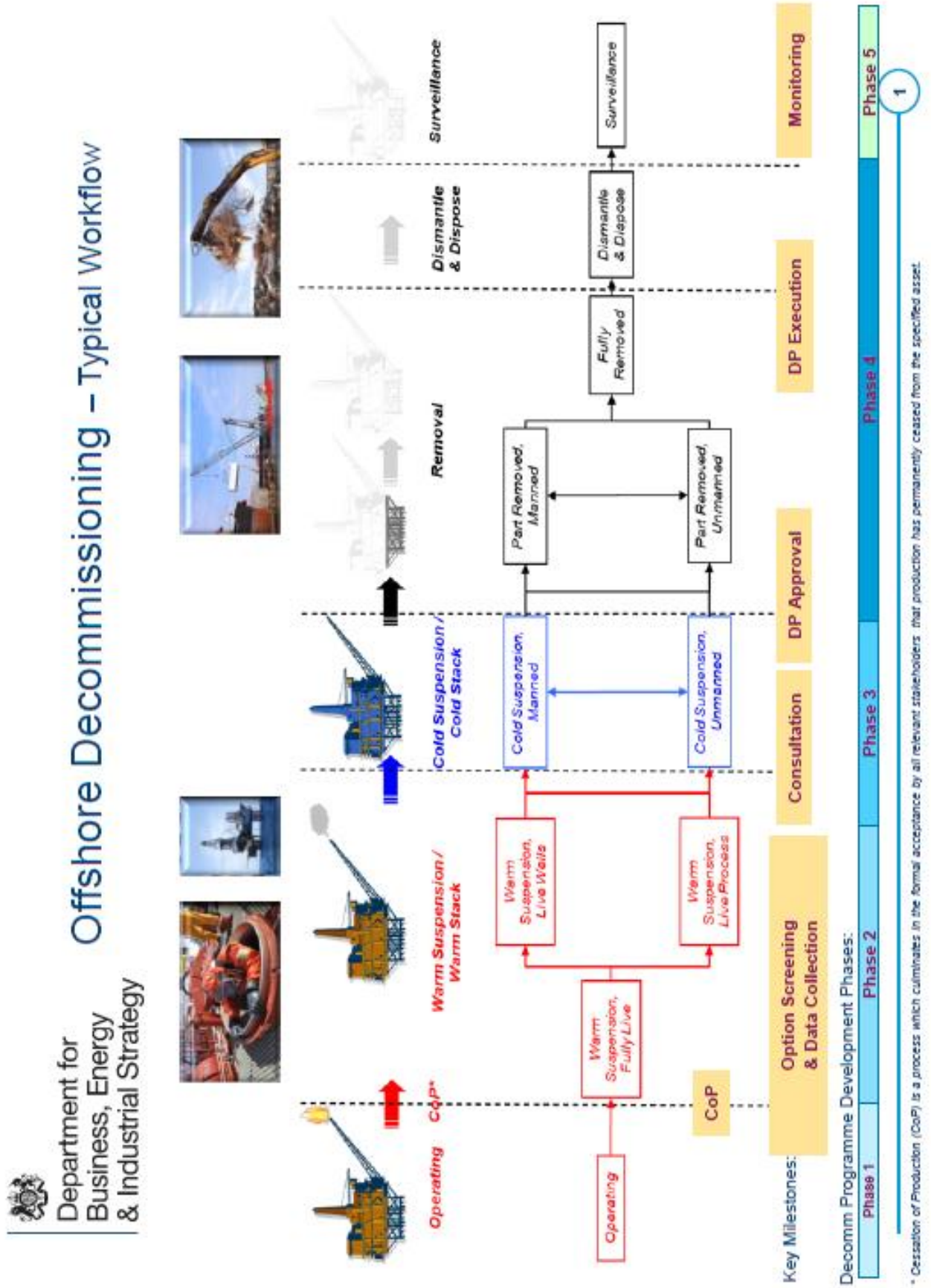
Marine growth must be managed when brought on shore as part of the decommissioning project and care must be taken to control odour and prevent access from vermin, including birds.

More information on the management of marine growth during decommissioning is available here.

Appendix 3- Typical Decommissioning Workflow

CoP= cease of production

DP= decommissioning programme



Appendix 4- Draft Waste Inventory

Material	Quantity (Tonnes)	EWC	Location
ABS			
Ac 228			
Alloy Steel			
Aluminium			
Aluminium Bronze			
Americium			
Anodes (total)			
Asbestos Blue			
Asbestos White/Brown			
Asbestos Total			
Batteries: by type			
Biocides by type (inc TBT)			
Brass			
Bronze			
Buna			
Bronze			
Butyl Rubber			
Carbon Steel			
Cement Powder			
Cement Mattresses			
Ceramics (all types)			
CFC/HCFC			
Chartex/fire protection			
Chloro-paraffins			
Chromium			
Copper			
Copper nickel alloys			
Cork			
Cotton			
Diesel			
Drill Cutting Residues			
EPDM			
Ethylene/Polypropylene			
Fire Extinguishers			
Fire Foam			
Flame Retardants – Brominated etc			
Fluorescent Tubes			
Formica			
Glass			
Glycol			
GRP			
Graphite/Charcoal			
Gun Metal			
Heli-fuel			
Hydrocarbons			
Inconel/Nimoics (nickel alloys)			

Insulation			
Iron (cast)			
Lead			
Marine Growth est. quantities soft/hard			
Mercury			
Methanol			
NORM Scale			
Neoprene			
Ni-Resist			
Nylon			
Organotins			
Paint –by type containing- e.g. Isocyanates, Polyurethane, Lead, Asbestos, Bitumen etc.			
Pb-210/226/228			
PCB			
PTFE			
Plastics			
PVC			
Radium (Ra-226)			
Radium (Ra-228)			
Residual HC			
Rubber			
Sewage			
Smoke Detectors			
Stainless Steel			
Satellite			
Tin			
Titanium			
Wood			
Zinc			
Approximate Total Weight			