Decommissioning and disposal of Statfjord A

Proposed impact assessment programme
28 March 2011

COS-110392 Photo Harald Pettersen / Statoil

centrica energy

ConocoPhillips

ExxonMobil

Statoil

Preface

The present proposed Impact Assessment Programme (IAP)[1] is developed in accordance with the requirements given by the Petroleum's Activities Act for decommissioning and disposal of redundant offshore installations and deals with the Statfjord A installation and the Statfjord field in the North Sea.

The installation is owned by the licensees to production licence 037; Statoil (operator), ConocoPhillips Skandinavia AS, ExxonMobil Exploration and Production Norway AS, ConocoPhillips (UK) Limited and Centrica Resources Limited. Statfjord A has produced oil since 1979 and has over the last years been an integral part of Statfjord Late Life with increasing focus on gas production. The production at Statfjord A is currently declining and in accordance with current plans final production shut down is expected in 2016.

In the Impact Assessment relevant disposal alternatives for Statfjord A will be addressed including options for topsides, concrete substructure, associated field internal pipelines and drill cutting residues around the installation. If no re-use opportunity is found feasible for the entire installation or parts of it current regulations require that the installation will have to be removed from the site. There is however the possibility to apply for exemption for the concrete substructure if removal is not found technically feasible or acceptable from a safety point of view.

For the relevant disposal alternatives the Impact Assessment will present documentation on possible impacts on natural resources, the environment, third parties and the society in general.

The present proposed Impact Assessment Programme is hereby made available for public consultation. Comments should be directed to Statoil with a copy to the Norwegian Ministry of Petroleum and Energy (MPE). In agreement with MPE the consultation period is set to 12 weeks.

In accordance with the Treaty between Norway and the UK on cross-boundary petroleum co-operation, and in agreement with the MPE the decommissioning plan process will follow Norwegian regulations. Formally contact with British authorities in the process will be coordinated by the MPE.

Forus, 28 March 2011

[1] In an international EIA context the IAP is often referred to as "Scoping document"

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Summary

The present proposed Impact Assessment Programme (IAP) represents the formal start of the planning process for decommissioning of Statfjord A with consecutive disposal of the installation and associated infrastructure. The objective of this proposed IAP is to inform about the licensees plans for decommissioning and disposal, what is being proposed for assessment (alternative disposal options and technical issues), to ensure proper stakeholder involvement in the planning process and to ensure that all relevant issues and aspects have been addressed as part of the Impact assessment (IA).

Statfjord A has produced oil and gas since 1979. The production at the field has during the last years changed from primarily oil production to a larger degree of gas production. The Statfjord field is now in its late life production and Statfjord A represents the first major redundancy for an installation at the field. The loading platform SPM C is taken out of use and is planned for removal in 2012. In accordance with the existing long term plans Statfjord A will cease hydrocarbon processing in 3Q 2014 at the earliest however with a likely production through 2016. As the production is coming to an end in the near future the Norwegian regulations require the development of a decommissioning program of which the Impact Assessment constitutes an integral part.

The current plans further stipulate cessation of production for the Statfjord field in 2020 by decommissioning of Statfjord B and C. The licensee is exploring possibilities for continuing the production beyond this point in time.

The Statfjord A substructure contains oil storage cells and is made of concrete with a total concrete weight of more than 200.000 tonnes. The topside facility is also large weighing more than 40.000 tonnes including modules and equipment. The topside facility is mainly made by steel however it also includes various types of materials and substances contained within structural items and equipment. Potential hazardous materials and substances will be mapped as part of the decommissioning planning to ensure a proper execution of decommissioning and disposal from a HSE perspective. The oil storage cells will be emptied of oil prior to shut down of the installation.

Statfjord A substructure was not designed for removal. However technical feasibility studies will be performed to further explore possibilities for removal within acceptable safety limits. If the concrete substructure cannot reasonably be removed it will have to be left in situ following completion of appropriate decommissioning activities. This requires a formal derogation within the OSPAR countries. The topside facility will be removed and different technical methods for removal will be studied. The Impact Assessment will address comparative impacts on the environment and society from removal of the entire installation as a whole or the topside facility only. Drill cuttings piles at the seabed at Statfjord A will be sampled and characterised and various disposal options will be addressed and evaluated jointly with options for disposal of the concrete substructure.

The petroleum resources at Statfjord are partly located in Norway and partly on United Kingdom territory. The field installations are however all located on the Norwegian Continental Shelf. In accordance with the Treaty between Norway and the UK on cross-boundary petroleum co-operation, and in agreement with the MPE the decommissioning plan process will follow the Norwegian regulative regime. UK authorities will be consulted and kept involved through dialogue with the MPE.

The present proposed Impact Assessment Programme gives a more in depth description of relevant disposal options and technical aspects suggested for comparative assessment in the Impact Assessment process. In accordance with current plans the Impact Assessment document will be issued for public consultation by turn of the year 2012/2013.

1 Introduction

1.1 Objectives

The Impact Assessment (IA) is an integral part of the planning for offshore decommissioning in Norway. The IA and the Disposal Plan give the overall Decommissioning Plan.

The objectives of the IA are:

- To ensure that relevant aspects related to natural resources, the environment and society are included in the planning process equally with technical, economic and safety related aspects.
- To address questions and issues relevant to both internal and external decision processes and to ensure that the public are properly informed about the project.
- To facilitate for an open and transparent process including giving the various stakeholders the opportunity to express their opinions and feed input on the project scope and execution.

The objective of the proposed Impact Assessment Programme (IAP) is to give authorities and stakeholders the opportunity to influence the scope for the impact assessment. The IAP will define what is to be assessed in the IA and as such forms the basis for the impact assessment work being executed by the licensees /ref. 1/.

The IAP describes the plan for decommissioning and disposal, and areas of concern related to natural resources, the environment, fisheries and the society in general. This description is based on current knowledge and the need for further studies and documentation is being discussed.

1.2 Regulatory framework and authority processes

International agreements such as the OSPAR Convention (Decision 98/3) and the IMO guidelines (1989) give the basic framework for disposal of redundant offshore installations. The contents of these agreements are further incorporated in Norwegian and UK regulations and practice.

OSPAR 98/3 requires that all offshore installations shall be removed when redundant. There are exceptions however which will require a derogation process among the OSPAR countries. The exceptions include among other installations with steel based substructures with a weight above 10.000 tonnes in air or with concrete based substructures. The IMO guidelines shall ensure free sail over for maritime vessels and require a 55m water column above possible offshore installations disposed of at sea.

The petroleum resources at Statfjord are partly located in Norway and partly on United Kingdom territory. The field installations are however all located on the Norwegian Continental Shelf. In accordance with the Treaty between Norway and the UK on a common utilisation of petroleum resources, and in agreement with the MPE the decommissioning plan process will follow the Norwegian regulative regime. UK authorities will be consulted and kept involved through dialogue with the MPE.

The Petroleum Activities Act section 4-2 sets the requirement for Impact Assessment for offshore oil and gas activities on the Norwegian Continental Shelf. The Act with its associated regulations imposes a duty on the licensees to assess potential impacts of an activity on the environment, natural resources and the society. Relevant measures to reduce discharges or negative impacts shall be addressed as an integral part of the assessment. This requirement is relevant to both field developments and for field decommissioning and disposal.

The Petroleum Activities Regulation and the Guidelines for PDO/PIO from the Ministry of Petroleum and Energy (MPE) further specify recommended process for assessment and decisions, relevant to decommissioning. This process is further described below:

1. The licensees issue a proposed Impact Assessment Programme (IAP)
2. The IAP is issued for stakeholder consultation, normally 12 weeks duration
3. The licensees evaluate received comments
4. The Ministry of Petroleum and Energy approves the IAP based on the issued proposal and the comments received from stakeholders and the licensees' evaluation. The IAP will form the basis for the impact assessment work which will actually be undertaken.
5. Execution of the impact assessment work and issue the IA report for consultation
6. Stakeholder consultation on the IA report, normally 12 weeks duration
7. Submission of the Decommissioning Plan
8. Parliament/Governmental decision process on the Decommissioning Plan

A specific process will be initiated by Norwegian authorities in case a recommendation is given for getting exception from the OSPAR Decision 98/3 requirements. This derogation process will be managed by Norwegian authorities and will be supported by a consultation paper to the OSPAR countries. The consultation paper will be written in accordance with predefined criteria. A final decision on the Decommissioning Plan will be made by Norwegian authorities (normally the Parliament) following the OSPAR derogation.

A schematic illustration of the process for IA and Decommissioning Plan to final decision is presented below:

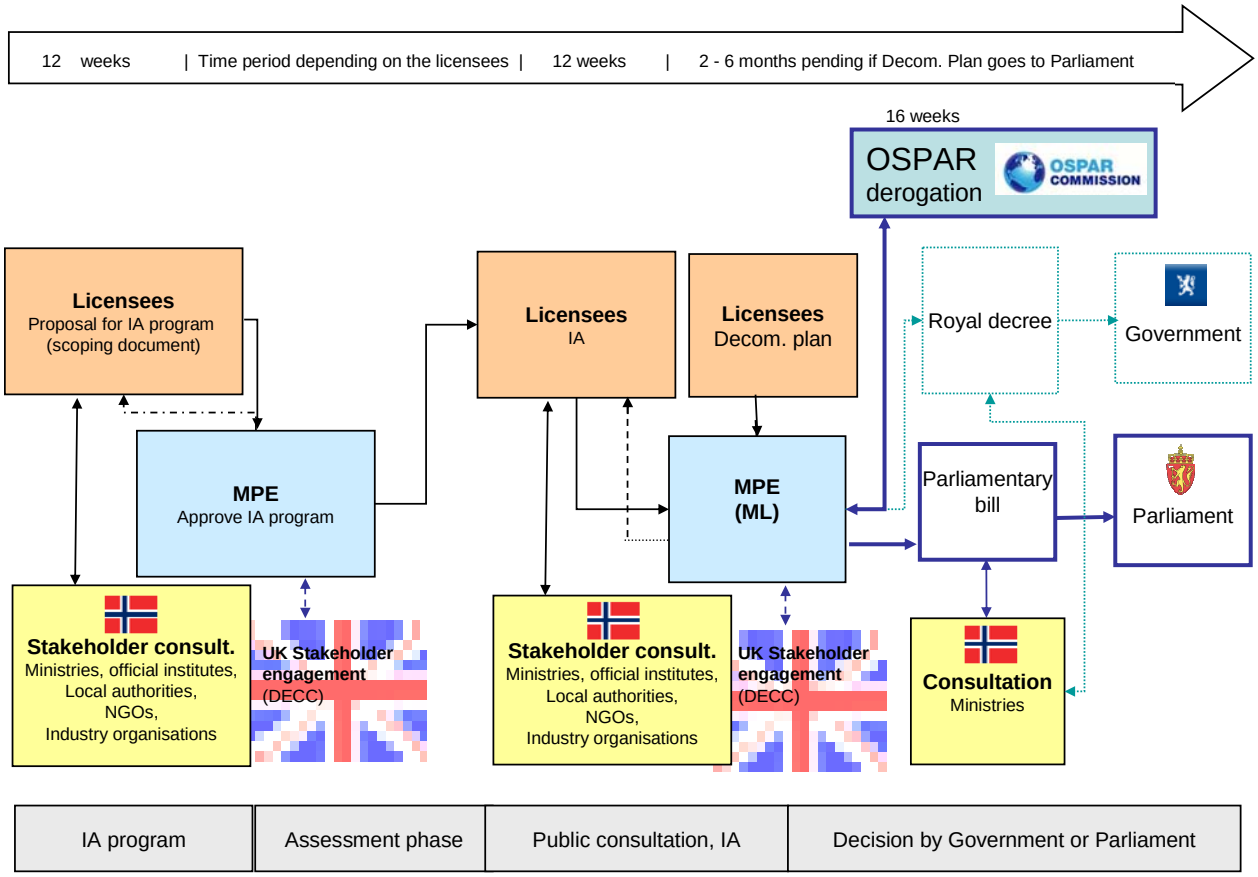


Figure 1. Impact Assessment process for Statfjord A (Norwegian process)

1.3 Schedule

In accordance with Norwegian regulatory requirements the Decommissioning Plan shall be submitted within 2 to 5 years before production is terminated or the installation becomes redundant. There will always be some uncertainty on the actual time for final production cessation and for Statfjord A there are uncertainties related to reservoir/production issues and external conditions such as oil price. In accordance with current plans the final cease of production will be in 2016. Hence the process planning for decommissioning has been initiated. The first step of the work towards a Decommissioning plan is to develop the Impact Assessment process through the development of a proposed IAP (current document). In accordance with the agreement with the Snorre license Statfjord A shall process hydrocarbons from Snorre A at least to 31 August 2014. A possible termination of this agreement shall be announced within minimum one year. The schedule for this IAP is made to meet the earliest possible time for production cessation at Statfjord A. The further schedule associated with the planning process for the Decommissioning Plan through formal approval is presented in detail in Table 1.

Table 1. Schedule for Decommissioning Plan and authority processes.

Activity	Tentative schedule
Stakeholder consultation IAP	March – June 2011 (12 weeks)
Approving IAP	July – August 2011
IA	2011 – 2012
Stakeholder consultation IA	4Q 2012 – 1Q 2013 (12 weeks)
Submit Decommissioning Plan	April 2013
Possible OSPAR derogation process	2Q 2013
Parliamentary approval	4Q 2013 / 1Q 2014

A further schedule for decommissioning and disposal for the relevant disposal alternatives is presented in Chapter 2.

2 Plans for decommissioning and disposal

2.1 Licensees

The Norwegian part of Statfjord is located in Production Licence 037 granted in 1973.

The Statfjord field was discovered by Mobil in 1974 and January 1st 1987 Statoil took over the operatorship.

The licensees for the Production Licence and their relative share are listed in table 2 below.

Table 2. Licensees and relative shares.

Licensees	Share (per cent)
Statoil Petroleum AS	44.33
ExxonMobil Exploration & Production Norway AS	21.36
ConocoPhillips Scandinavia AS	10.32
Centrica Resources Ltd	9.68
Centrica Resources Norge	9.43
ConocoPhillips (U.K.) Limited	4.84

The field is jointly controlled by Norway and the UK in accordance with the ”Statfjord treaty” managing mutual issues related to exploitation and transport of petroleum, requirements for documentation and authority approval of plans and agreements between the two countries’ authorities. The Norwegian part of the resources is 85.47 per cent while 14.53 per cent of the original resources were in the UK sector.

The Norwegian part of the field is located in offshore blocks 33/9 and 33/12 in Production Licence 037 and the British part of the field is located in UK block 211/25 in the licences 104 and 293.

2.2 Description of field and installations

2.2.1 The Statfjord field

The Statfjord field is located in the northern part of the North Sea about 220 kilometres northwest of Bergen (on line with the mouth of the Sognefjord) and between Norway and Shetlands, Figure 2.

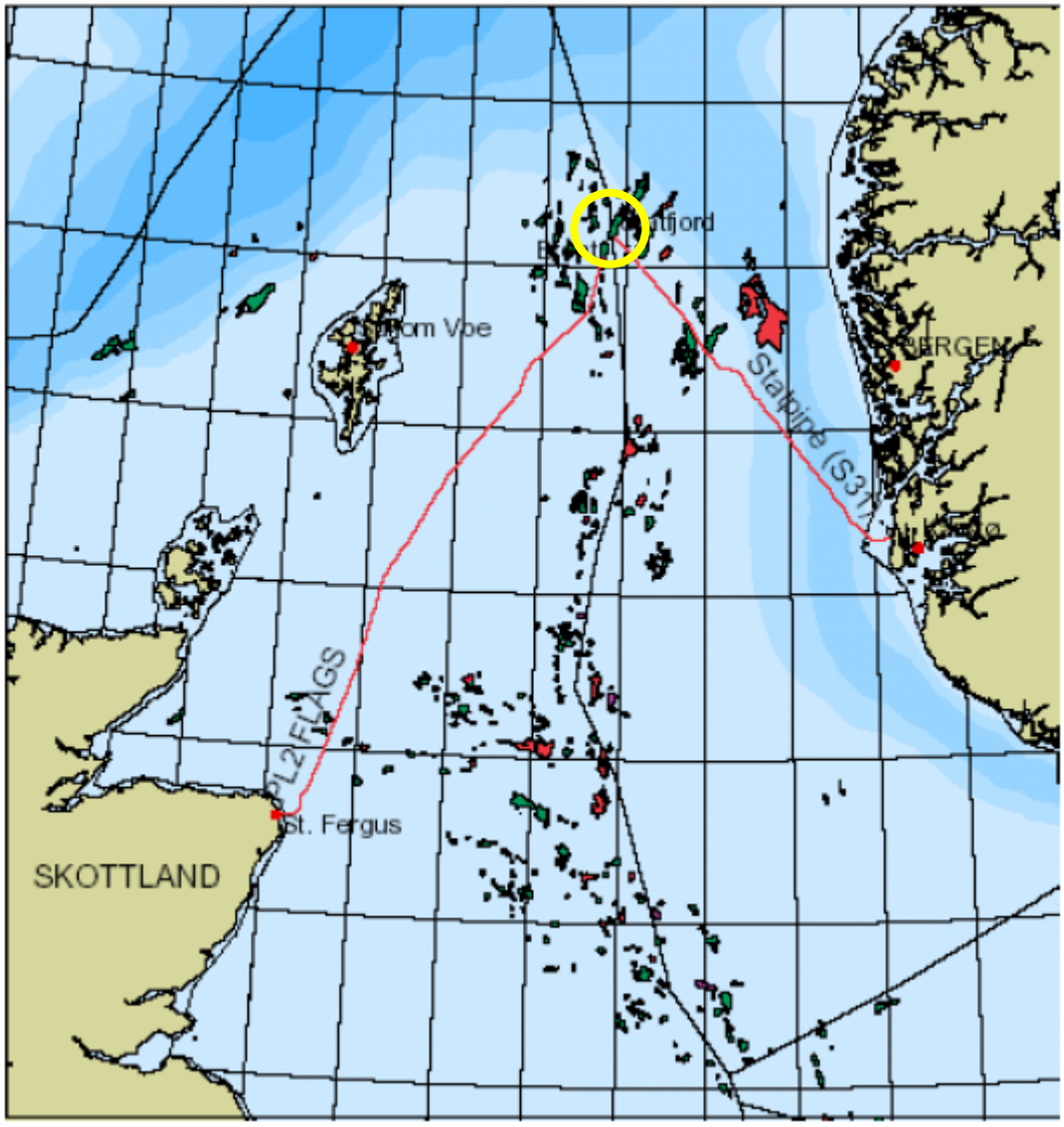


Figure 2. Geographic location of theStatfjord field in the North sea (yellow circle)

The Statfjord field is among the oldest and the largest oil field in the North Sea. The field is developed by three large concrete installations for production of oil and gas, Statfjord A (SFA), Statfjord B (SFB) and Statfjord C (SFC), figure 3. Statfjord A was installed at the field in May 1977 and oil production started November 24th 1979. Statfjord B came on stream 5th November 1982 and Statfjord C 26th June 1985. The installations are integrated platforms with functions for drilling, processing, oil storage and living quarter. Oil is loaded to shuttle tankers via loading buoys and transported to terminals in northwest Europe. The oil loads are split among the licensees in accordance with their interest share. Gas export from Statfjord started in 1985. The Norwegian share of the gas was exported via Statpipe to Kårstø and further to the Continent. The British share of the gas production is exported via spur line and the FLAGS system to St Fergus in Scotland. As part of the Statfjord late life project it was decided that all gas from Statfjord shall be exported to the UK. A new export pipeline was installed, the Tampen Link, and this connects the Statfjord B pipeline system with FLAGS. Hence since October 2007 the Norwegian share of the gas production has

been exported via Tampen Link and FLAGS equally to that of the British gas production. Today all gas export from Statfjord goes to the UK.

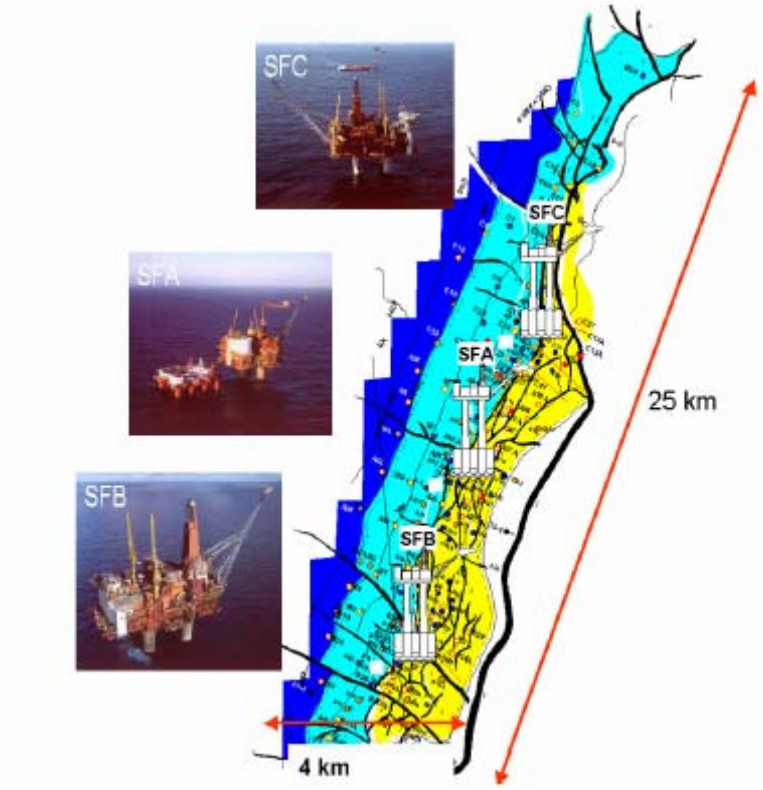


Figure 3. The Stafjord installations and their location.

2.2.2 Statfjord A

The following key figures apply to Statfjord A:

- Topsides dry weight: 41.535 tonnes
- The superstructure contains topsides support frame, integrated topsides modules, modules, drilling facilities, flare stack and living quarters.
- Bed capacity for 206 persons (299 with use of Pullman beds / sharing of cabins)
- The concrete substructure is made by 87 000 m^3 of concrete, equally to 200.100 tonnes.
- The concrete substructure consists of 19 cylindrical cells of which 16 are being used for oil storage. The storage cells have a capacity of 206.000 standard m^3 oil, i.e. 1.3 million barrels.
- About 43.800 m^3 solid ballast (sand in 15 cells, ilmenite in one) is sealed under a tight concrete floor at the tank cell bottom
- Water depth is 149m

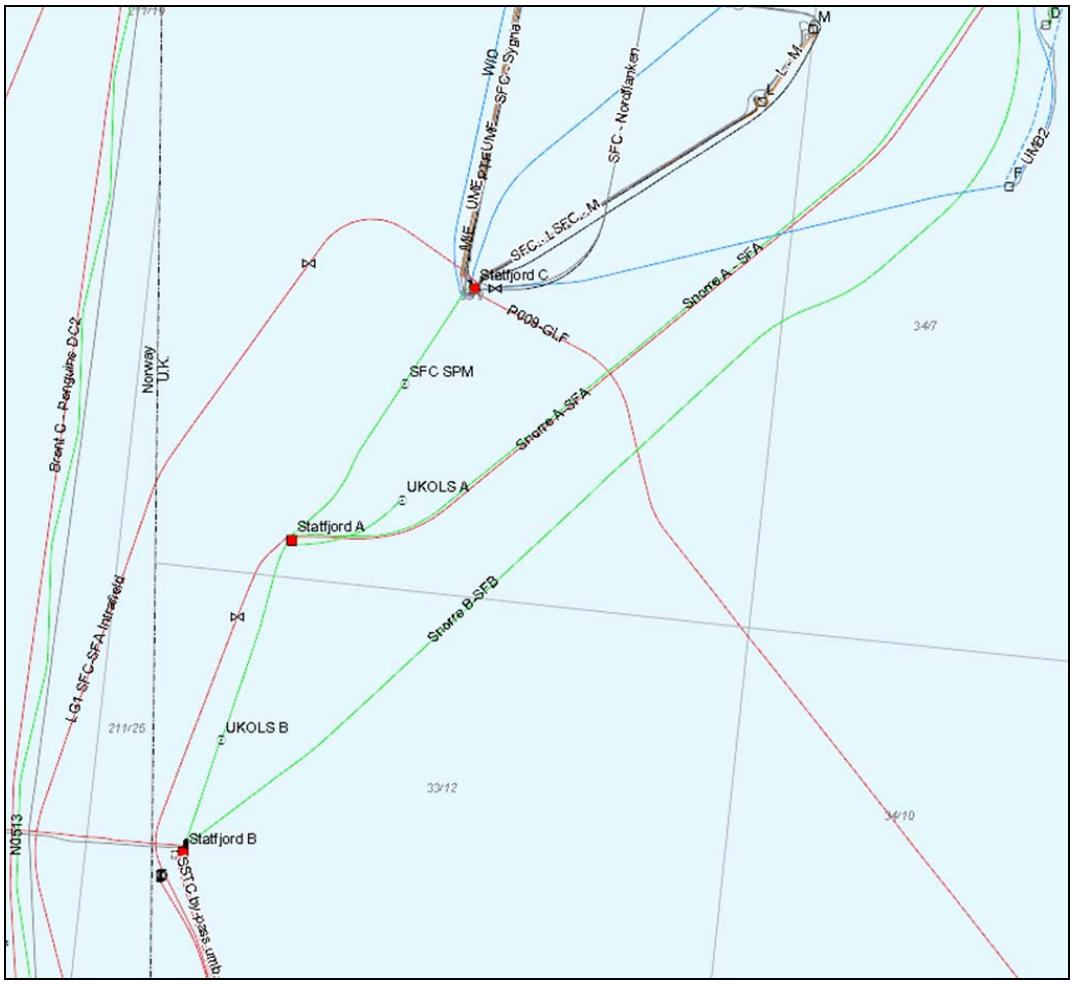
2.2.3 Oil loading systems

The Statfjord field has currently two systems in operation for oil loading to shuttle tankers of which one is associated with Statfjord A. In addition there is a redundant system, SPM C, planned for removal in 2012.

2.2.4 Pipelines

The Statfjord field has an integral system of pipelines linking the installations together for oil export (see Figure 4). The following pipelines are linked to external fields and systems:

- Subsea satellite fields tied back to Statfjord C
- Snorre A is connected to Statfjord A
- Pipeline for export of oil from Snorre B to Statfjord B
- Gas export pipeline between Gullfaks and Statfjord C (redundant)
- Gas export from Statfjord B to the UK
- Connection from Statfjord B to Statpipe.



Figur 4. Overview of pipelines at the Statfjord field.

2.2.5 Drill cuttings piles

The drill cuttings pile at Statfjord A is not fully defined, mapping and characterisation will be performed as part of the Decommissioning Plan work. This work will be based on the OLF guidelines for characterisation of drill cuttings piles /ref. 4/.

Based on previous video inspection DNV and IRIS (2001) /ref. 5/ have estimated that about 45 per cent of the generated drill cuttings still remain in the cuttings pile. This estimate is quite old and has high uncertainty. Based on this estimate the cuttings pile has a volume just above 6 000 m^3. Since it may be difficult to identify the limit of distribution of the cuttings pile to the surrounding/underlying sediments a somewhat higher volume should be assumed for possible treatment as drill cuttings pile material. This assumption is supported by recent work on actual cuttings piles removal at Ekofisk I. OSPAR criteria are established for acceptance level of oil leakage from drill cuttings piles over time and in total. A previous evaluation for the Statfjord A drill cuttings pile concludes that the criteria are being met /ref. 11/. Calculations of oil leakage from the Statfjord A cuttings pile will be performed based on physical and chemical characterisation of the pile, by calculations and applying the proper modelling tool, and compared with the OSPAR criteria to verify the previous evaluation.

2.3 Production history and further production

Based on the decision for the Statfjord Late Life project (SFLL) in 2005 the production strategy for Statfjord was changed from oil production with associated gas to gas production with associated oil. This is a consequence of a declining oil production and a potential for a greater value creation focusing on gas production in the final phase of the field life. To date more than 65 per cent of present oil has been produced. Within a few years the recovery rate is expected to increase to 66 per cent. This represents an oil production at totally 663.5 million Sm^3.

Injection of gas and water to sustain the reservoir pressure has been an important part of the production strategy. Together with a comprehensive drilling programme targeting remaining oil pockets the injection has contributed to a recovery rate far higher than expected at the time of the field development.

By termination of the injection and continuation of the production the reservoir pressure will decline and large volume of previously injected gas will be produced together with gas from non-producible oil reserves. The injection was terminated fall 2008 and in the Brent reservoir the pressure has dropped to below bubble point. Still it takes some time before the gas is released and produced by the wells. The decline in reservoir pressure has been somewhat slower than planned primarily due to fewer wells being drilled than predicted in the Statfjord Late Life PDO.

The recovery rate will, as a consequence of the Statfjord Late Life project, increase from 54 to 68 per cent. The production from Statfjord A is rapidly declining and the Statfjord licensees have hence decided to initiate the decommissioning planning. With the current production profiles and processing of oil from Snorre A the working assumption for the cessation project is an earliest production shut down in 3Q 2014. Optimization work continues to ensure production through 2016. The production at Statfjord B and C will

remain for further drainage of the reservoir. With the current production profiles Statfjord B and C are expected to produce economically through 2020.

Following the decommissioning of Statfjord A some infrastructure impacts will arise:

- Today Statfjord A processes the production from Snorre A. Hence Snorre A will find an alternative solution for oil processing. Two pipelines from Snorre A to Statfjord A will have to be terminated (see illustration in Figure 4).
- Oil from Statfjord C is today loaded via Statfjord A to OLS (Oil Loading System) A or B. The pipelines must be re-arranged to enable for direct piping of the oil from Statfjord C to one or both of the OLS's.

2.4 Alternative Disposal Options

In accordance with the requirements of the Petroleum Activities Act for offshore installation decommissioning and disposal the licensees shall consider opportunities for further use of the installation within petroleum activities, other re-use or removal. Further use and re-use will be temporary solutions with removal or end disposal in place following particular criteria as the ultimate solution in accordance with international agreements.

2.4.1 Further use within the petroleum industry

In accordance with agreement between the Snorre and Statfjord licences Statfjord A will process hydrocarbons from Snorre A till at least 31.08.2014. A termination of this agreement has to be initiated at least a year in advance. When the agreement is terminated, Statfjord A may be closed down and continued operation on the Statfjord field will be on Statfjord B and C platforms. The optimum time for production cease on Statfjord will be evaluated yearly. As of today there does not exist any plans for production on Statfjord A beyond 2016. Snorre A oil is presently partly being processed at Statfjord A, and an alternative solution at Gullfaks A is being developed. This solution will be implemented before Statfjord A is closed down. The agreement on Snorre oil processing at Statfjord A is valid through 2016.

Statfjord A is being maintained and upgraded as needed to ensure a safe production throughout the field life. Age and technical condition predict that removal and re-use of the installation at another location is not however a likely solution. Reuse of Statfjord A within the petroleum industry is hence not considered relevant, neither in situ nor at a different location. Any reuse at another location is not suggested for further assessment.

2.4.2 In situ re-use options

As a part of the initial Decommissioning Plan process the Statfjord licensees have considered alternative use of the installation. A relevant reuse opportunity considered is:

- Reception platform and transformer HUB for power from shore to the Tampen areas. This scenario is only likely to be feasible if adopted in conjunction with new developments/installations in the area.

The age and technical condition of the installation at the end of its life however require large resources to convert the installation for another purpose of use. The possibility for use as host for example for production of renewable energy is hence not considered realistic and such re-use is not proposed for further assessment.

2.4.3 Topsides disposal

As re-use is not considered a realistic option the Statfjord A topsides will have to be removed to shore for dismantling. The topsides are generally made from steel materials which will be recyclable. Equipment with potential for re-use will be advertised for sale. Hazardous waste will be identified, managed and disposed of in accordance with the relevant regulations.

The Statfjord A topsides is a large and complex structure with a high density of equipment. It is partly built as an integrated topsides facility and partly module based. Hence it is challenging to identify an optimal method for removal of the topsides. Currently there is no crane vessel capable of lifting the entire topsides facility and in accordance with current technology it will have to be dismantled in situ into smaller parts which may be lifted off module by module.

2.4.4 Complete or partly in place disposal of the concrete substructure

In accordance with OSPAR Decision 98/3 any redundant offshore installation shall be entirely removed. It is however possible to seek exception to this requirement for concrete substructures if removal is not technically feasible or represents too high safety risk. Possible alternatives are to remove the topsides while the concrete substructure is disposed of in place either entirely or partly by cutting it down to ensure a minimum depth below the surface of 55m. An illustrative example is presented in Figure 5. As part of the Impact assessment work technical feasibility and potential impacts of the following disposal options will be assessed:

- Leaving concrete substructure (GBS) as is.
- Cut the concrete substructure down to minimum -55m and leave the remaining part as is.

If leaving the concrete substructure in place, external and internal steel items will be considered removed. Further the oil storage cells will be cleaned as much as reasonable practicable. For the leave as is option navigational lights will be mounted on the shafts above sea surface level.

Figure 5. Illustrations of options for leaving the concrete substructure in situ, entirely with navigation lights (left) and cut down to the storage cells. Examples from Frigg cessation plan where the illustration to the left represents the approved solution for Frigg. Source: Total E&P Norge AS.

For an in situ disposal solution it is considered likely that the substructure construction will remain for centuries before it is deteriorated by weather actions.

2.4.5 Concrete substructure removal to shore / onshore deconstruction

Statfjord A was designed and constructed before regulations requiring complete removal of offshore installations were established. Having been in operation offshore for more than 30 years it is anticipated that removal will be at least technically challenging, and probably not feasible. Technical feasibility studies will be undertaken to further study the possibility for removal, and possible impacts on environment and society will be addressed for a possible removal and onshore deconstruction solution.

Prior to removal of the concrete substructure deballastation is necessary in order to make the construction float. Statfjord A was towed offshore and installed at the field with parts of the topsides facility in place (cf. picture below, figure 6). It is not possible to refloat the installation with the entire topsides facility in place as it is today. Major parts of the topsides will have to be removed prior to a possible refloat and removal of the substructure.

Figure 5. From towing of Statfjord A prior to installation.

2.4.6 Drill Cuttings Pile Disposal Options

OSPAR has through recommendation 2006/5 determined that drill cuttings at the seabed can be left in place if specific criteria, as defined by OSPAR, are met. These criteria are related to a combination of contaminated area and leakage rate of oil per year. A previous evaluation for the Statfjord A drill cuttings pile concludes that the criteria are being met /ref. 11/. As the knowledge basis is limited new characterisation studies will be executed to verify previous evaluation.

If the OSPAR criteria are not being met alternative disposal options will be explored. For the drill cuttings pile material there is different possible disposal solutions and such disposal alternative have previously been addressed through a joint industry project with UKOOA (Oil & Gas UK) and OLF /ref. 5/. There is however limited experience from actual execution of such disposal work and a case-by-case assessment is necessary to find the best solution.

The disposal solution for drill cuttings material will largely depend on the disposal solution for the concrete substructure. The following alternative options are proposed for assessment in the IA:

- Leave as is (if OSPAR criteria are met)
- Leave in place with measures implemented to enhance degradation and limit possible leaching of pollutants
- Removal with different end solutions:
    - Onshore treatment
    - Injection into a well
    - Relocation at the field

2.4.7 Field internal pipelines and cables

Field internal pipelines and cables will only to a minor degree be affected by decommissioning Statfjord A. The oil export lines from Statfjord B and C are presently going via Statfjord A and will have to be re-routed. The lines to Snorre A will be redundant when Statfjord A is shut down and will be addressed as part of the Decommissioning Plan. The following disposal solutions are relevant for redundant pipelines and cables:

- Clean and leave in situ
- Burial/trenching
- Rock dumping
- Removal

For pipelines going to Statfjord A the most likely scenario is to leave the pipelines temporary and consider these as part of the overall Statfjord Decommissioning Plan. Possible free spans and pipeline ends which may create obstacles to fisheries will be mitigated.

Following finalisation of the disposal activities the seabed will be cleared for possible debris. Verification will be performed by means of trawl test and/or visual/acoustic methods.

2.5 Schedule for the decommissioning work

At Statfjord more than 100 well targets in 40 wells have been drilled. An early plug and abandonment campaign is planned for in 2011 including wells that are not planned for further production. The main plug and abandonment campaign is planned for 2013/14 and will continue through 2016. Following production shut down the remaining wells will be plugged and abandoned.

In accordance with the agreement with the Snorre Licence for processing Snorre A oil the earliest notification for shut down can be given by 31.8.2013 with a subsequent shut down by 31.8.2014. The production cessation time for Statfjord A will be evaluated annually to identify the overall best timing. Today there is no plan for production at Statfjord A beyond 2016.

Cleaning of process equipment, vessels, tanks, piping etc. will be initiated along with the decommissioning activities.

Cleaning of the oil storage cells will be considered started while the installation is still in operation.

Execution of the actual removal and disposal work will be initiated following the parliamentary approval of the Decommissioning Plan based on thorough method statement developments and commercial tendering processes. Schedule for removal activities is likely in the period 2018 – 2021.

2.6 Interim phase Options – Potential impacts

One alternative is to consider decommissioning of Statfjord A integrated with the other installations at the Stafjord field. Coordinated removal activities may open for synergetic effects with economic benefits. It is however important to ensure that a postponed removal will not affect the removal feasibility and safety level during execution. The demand for extended maintenance will hence be assessed. In the IA possible impacts of an interim phase will be addressed and documented.

2.7 HSE

The project shall ensure a high HSE standard during planning and execution. This will be based on the Statoil zero damage philosophy:

- Zero damage to people and the environment
- Zero accidents or losses
- No violation to safetey regulations which can impose loss or damage

The zero philosophy shall form the basis for identifying, planning and execution of all activities. The project shall ensure an execution with the highest HSE standards by active engagement in the organisation and follow up of contractors.

To ensure that the project objectives are met and the HSE risks are reduced to an acceptable level the following strategy is defined:

- Early identification and follow up of identified risks and possible hazards in all activities.
- Ensure compliance with all laws, regulations and requirements
- Ensure adequate HSE competence in the project
- Ensure adequate competence among operative personnel
- Risk based and tight follow up of contractors
- Actively seek experience transfer from other projects
- Follow up HSE activities and monitoring plans
- Ensure adequate planning of all removal activities
- Stop work when changes occur to identify and follow up risks
- Mange waste in accordance with the waste hierarchy

The project shall develop a project specific HSE program which will describe HSE objectives, KPIs, principles and strategies. The executive contractor shall develop his own specific HSE plans in accordance with the Statoil HSE program. An HSE activity and monitoring plan will further be developed to follow up the contractor and ensure compliance with the project objectives.

3 Natural resources, environmental impacts and mitigation measures

3.1 Natural resources and environmental conditions in the area

A description of natural resources and environmental conditions within a relevant area of influence for decommissioning related activities at Statfjord A is given in the Regional Impact Assessment (RKU) for the North Sea and associated background studies /ref. 7/. The current RKU for the North Sea was “approved” in 2007 and its technical documents are generally proposed as key basis documentation for environmental impact assessments for decommissioning of Statfjord A. In the case of new knowledge on distribution of natural resources or changes in environmental conditions such information will be applied.

Activities associated with decommissioning have generally impacts on a local scale. Planned discharges to sea will normally be modest and the risk associated with unplanned spills of oil and chemicals is low (limited volumes involved). For activities taking place offshore fish spawning areas, occurrence of sea mammals and seabirds are considered of most relevance. As the activities mainly will take place within the 500m safety zone the relevance of potential vulnerable seabed habitats or benthic fauna in the region will be limited. Natural resources distributed along the coast are not considered of relevance to the actual risk potential.

For assessment of disposal options and associated activities also the current environmental condition at the field is of importance. Environmental status at the Statfjord field is monitored regularly as part of the region specific regular environmental monitoring for Region IV. The last monitoring campaign was carried out in 2008 /ref. 8/. Mainly due to drilling related discharges some decades ago the seabed in the vicinity to the installations are contaminated with oil (THC) and some heavy metals.

Considerable parts of the Statfjord A installation will be taken to shore as part of the decommissioning work. Impacts on natural resources and environmental conditions in the local areas around the onshore demolition facility will to a large extent be specific to that locality. The actual demolition facility will not be decided upon before the Decommissioning Plan has been approved, and following detailed method statement reviews and tendering processes. Hence impacts from the onshore demolition activities is proposed based on knowledge about Statfjord A and its contents with general assessments for relevant onshore demolition facilities (cf. for example in accordance with the aspects addressed by KLIF report (2010) on the onshore demolition industry /ref. 3/). As part of this assessment work relevant information from literature and available data bases on local environmental conditions and natural resources will be consulted and used as basis for the assessment. The magnitude of area being contaminated is limited however and the reduction trend is significant since the 1990s.

3.2 Cultural heritage

Projects to document and archive relevant information for major redundant offshore fields have been undertaken for Ekofisk I and Frigg. Similarly in 2008 a project was initiated, Cultural Heritage Statfjord, in

cooperation between the Norwegian Oil Museum, The National Archive, National Library, Directorate for Cultural Heritage and Statoil.

Digital data bases are used to archive drawings, photos, film, publications, interviews and other material for archiving. The main objective is to document and not necessarily to collect items to use in general museum exhibition. Cultural Heritage Statfjord will get a dedicated web page. The Norwegian Oil Museum will manage the development and publishing of articles and information. The work is planned completed by end 2012.

The web page will present the development in Statfjord through its field life including its significance to people and the society. Main issues will be the field, the installations, daily working life offshore and historical events. From the web page it should be possible to dive deeper into the relevant technical documentation that has been collected.

3.3 Issues for assessment

The IA will follow the principles for structure, contents, issues for assessment and assessment methodology as given by the OLF handbook in IA for redundant offshore installations /ref. 2/. The issues for assessment will be related to the different disposal options which will be addressed and for Statfjord A specific conditions.

As relevant disposal options include solutions with disposal of the concrete substructure in place it will be essential that the IA addresses issues of relevance both in a short and long term perspective.

The following environmental aspects will be assessed:

- Energy
- Emissions to air (NO_X, CO_2, SO_X)
- Planned and unplanned discharges to sea, water or ground
- Physical impacts / impacts on habitats
- Drill cuttings pile material at the seabed
- Aesthetic impacts (noise, odour, visual impacts)
- Waste management and resource utilisation
- Littering

AS the Statfjord A installation is a relatively old installation with an integrated topsides facility it will be challenging to identify and map all substances and materials of potential hazard to human health and the environment. This is a very important task where great effort will be dedicated to thorough investigations in both the planning phase and later prior to the actual removal campaigns. Useful experiences are made from execution of the Ekofisk and Frigg projects and such knowledge will be drawn upon. In the IA an overview of possible hazardous materials will be given with a description of how these substances will be managed during decommissioning and disposal. Further the IA will describe expected end use for key material streams and associated impacts.

Another key challenge is to empty and clean the oil storage cells being an integral part of the concrete substructure. A specific study will be performed as to consider technical feasibility for removal of oily residues and further cleaning. Attempt for sampling of accumulated cell residues will be made.

The most appropriate disposal option for drill cutting pile material will be related to disposal option for the concrete substructure. Different options will be addressed and experiences from the previous UKOOA/OLF JIP for drill cuttings piles will form an important basis for the assessment.

3.4 Predicted environmental impacts

3.4.1 Energy and emissions to air

Activities related to decommissioning and disposal of offshore installations is energy demanding. A number of vessels will be applied and with a considerable duration. In the IA estimates for energy consumption and associated emissions to air will be provided. Based on experiences likely more than 90 per cent of the energy consumption will be associated with the offshore activities, hence these will be prioritised in the estimation.

3.4.2 Discharges to sea and physical impacts

Possible discharges to sea and possible physical impacts / impacts on local habitats will be assessed related to vessel operations and leave in place options. Discharge of chemical residues and slightly oil contaminated water may be relevant related to decommissioning and cleaning activities (including pipelines) and will require prior permit from KLIF. From the actual removal activities no planned discharged to sea are expected hence no negative environmental impacts are anticipated. Risk related to unplanned discharges will be assessed related to type of spill, volumes and relevant type of events. Impacts on the environment will be assessed and presented in the IA. Possible mitigation measures will be proposed as found appropriate.

3.4.3 Waste management and resource utilisation

Following removal and demolition the platform materials will be recycled to as much as possible. Relevant aspects related to waste management and resources utilisation will be presented in the IA and estimates will also be produced on energy consumption and emissions to air associated with material processing and recycling. Based on experiences from removal of installations from Ekofisk and Frigg it is expected that the materials and waste management will be executed professionally, with a high degree of recycling and minimal of waste for disposal. This will be further assessed in the IA.

3.4.4 Littering

Following completion of the removal campaigns the seabed will be cleared for debris. Hence the littering potential is very limited. It will however be further assessed related to a possible disposal in situ of the concrete substructure.

3.4.5 Drill cuttings

Knowledge on the size and characteristics of the Statfjord A drill cuttings pile is limited. The trend for environmental monitoring at the field indicated however a significant decline in the level of oil contamination in seabed sediments (cf. figure 6). In the IA the environmental impacts for different drill cuttings pile disposal options will be assessed.

3.4.6 Impacts in the vicinity of the onshore dismantling facility

As mentioned above the potential impacts on environment and local community in the vicinity of an onshore demolition facility are highly dependent on the actual facility and its surrounding environmental conditions. All activities related to transport and demolition of all parts of the Statfjord A installation at whatever onshore facility is used shall comply with all relevant regulations and concessions, ensuring that possible negative impacts on environmental and local community shall be at a minimum. Relevant issues will be assessed and documented in the IA.

4 Impacts on society

Impacts on society from removal and end disposal will be assessed with primary focus on safety of navigation and fishing activities, in addition to local community issues related to onshore demolition facility.

4.1 Risk for ship collision and associated impacts

Specific studies will be undertaken as to quantify risk related to ship collision in respect of possible in situ disposal of the concrete substructure. Further, quantification of risk will be undertaken for ship collision in the execution of removal phase. The results will be compared with the present situation as a reference.

4.2 Impacts on fisheries

Impacts on fishing activities will be assessed for the different disposal options and will cover the execution phase as well as the long term perspective for possible disposal in situ options.

The assessments should further take into consideration also other installations in the area as to consider possible synergetic effects.

4.3 Impacts on local community and employment

Estimates will be made on the project costs related to goods and services needs on a national scale, and associated employment effects. In the contrary to development projects a decommissioning project only the planning and execution period is of relevance (no production phase). As part of the studies the magnitude of total employment effects will be estimated mainly based on experiences from previous projects and studies.

Depending on the location for onshore demolition and materials and waste management such activities may generate significant effects locally and regionally with respect to employment and local trade and industry. Since the facility for onshore demolition is not decided before a tendering process is completed – and following the parliamentary approval process, such issues can however be assessed on a generic level only.

5 The proposed scope for assessment

Different disposal options and technical areas for further studying and assessment have being addressed in the previous sections. Below a summary of the planned studies are presented.

5.1 Technical feasibility studies – disposal options

Technical feasibility studies will be performed for several disposal options, among others the following:

- Reuse options
- Removal of topsides and concrete substructure (GBS) including inshore/onshore demolition and final disposal
- Removal of topsides
- Cutting GBS –to ensure a minimum clearance of 55m
- Leaving in situ the GBS
- Cutting or leaving in place the pipelines
- Characterisation of drill cuttings and evaluation against the OSPAR criteria. If the criteria are not met solutions including removal, relocation or leaving in place the drill cuttings pile will be assessed
- Tank cell cleaning

5.2 Status and condition, surveying and measurements

5.2.1 Technical conditions description

Statfjord A is a relatively old installation which requires vast resources for maintenance. As long as the installation is in operation, keeping it in an acceptable technical and safety level is highly prioritised. In 2007 the life time for Statfjord A was approved for a period till 2027. So even if it is being an ageing installation, with associated wear and tear, its technical conditions are good.

Technical conditions may impact on the disposal option assessment process, hence the key results from the technical conditions review will be presented in the IA.

5.2.2 Materials inventory

The IA will present an overview of the main constituents of the installations including amounts and volumes of the various materials present.

For the different types of materials and substances an estimate of degree of re-use, recycling and waste disposal will be presented. Relevant disposal solutions will be assessed to ensure a sound end disposal.

5.2.3 Mapping and management of possible hazardous substances

Some substances at the installation may be hazardous to human health and/or the environment. Hence identification and mapping of substances possibly being hazardous to the environment or human health will be undertaken as part of an offshore surveying campaign. This will enable for a sound hazardous waste and HSE management from planning through end disposal. All decks on the topsides will as far as

reasonably practicable be investigated[2] to identify and quantify possible hazardous substances. The study will include among other:

- Oil and chemicals
- Scale; low radioactive scale or heavy metals in scale (mercury, lead)
- Batteries
- PCB
- Asbestos
- Other components with possibly hazardous contents (e.g. paint which could emit isocyantes when heated, ftalates, TBT, heavy metals, etc.)

The results of the study will be presented in the IA with a description of expected waste management and waste disposal solutions.

The drill cuttings pile at the seabed will be studied in line with the OLF guidelines for drill cuttings pile characterisation. This includes topography mapping, volume estimation and sampling for chemical and biological analyses. The results will be evaluated against the OSPAR criteria for leaving drill cuttings in place (cf. recommendation 2006/5).

Oil in the storage tank cells will be pumped out as part of the decommissioning and cleaning operations. There is no easy access to the tank cells and sampling of bottom sludge etc. after the oil removal will be challenging. Possibilities for such will be studied based on also experiences from other operators. Risk assessments will be undertaken and possible solutions explored for possible retrieval and end disposal of possible bottom sludge in the storage cells.

5.3 Environmental impact assessment studies

For the relevant disposal options environmental impacts will be assessed in line with the aspects listed in section 3.3, “Issues for assessment”. Energy and emissions to air will be quantified while for most other aspects qualitative assessments will be made. Possible planned discharges to sea will also be quantified if relevant

Environmental impacts will be addressed both in the short and long term perspective, and including execution phase and end disposal.

5.4 Society effect studies

Specific studies will be undertaken to assess impacts of the different disposal options with respect to safety of navigation (ships) and fisheries. As for the environmental impacts assessment both short term and long term perspective will be assessed.

[2] Since the platform is in operation some systems will not be available for control and sampling. These systems will be note and be further investigation in the future after production shut down, before removal.

Base don cost estimates for the different disposal options the national share of goods and services deliverables will be calculated and associated employment effects modelled.

6 Proposed Table of Contents for the IA

Below is presented a tentative Table of contents for the IA. When preparing the actual IA document it is likely however that some minor editorial changes can be made. The main headings are however proposed to remain as presented below:

Summary

1. Introduction
   - Licensees and installation description
   - IA objectives and scope
   - Regulations and requirements
2. Plans for decommissioning and disposal of the installation and associated pipelines
   - Alternative options assessed
   - Recommended disposal option
   - Schedule of execution
   - End disposal
3. Summary of comments received to the proposed IAP
4. IA methods description
5. Baseline description
   - Natural resources and environmental conditions
   - Industrial/third party activities in the area
   - Relevant onshore demolition locations– brief description of local conditions and activities
6. Environmental Impacts and Mitigation Measures
   - Impacts in the execution period (removal and demolition)
   - Impacts of end disposal
7. Impacts on society and Mitigation Measures
   - Impacts in the execution period (removal and demolition)
   - Impacts of end disposal
8. Impacts summary
9. Suggestions for mitigation measures and further plans for follow-up

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Abbreviations and definitions

CO2	Carbon dioxide
DECC	(UK) Department of Energy and Climate Change
DNV	Det norske Veritas
Flags	Pipeline system in UK sector
Ftalates	Ftalates; chemical substances used for plastic softening. May damage reproduction abilities.
GBS	Gravity Based Structure
HSE	Health, safety and Environment
IA	Impact Assessment
IAP	Impact Assessment Program
IMO	International Maritime Organization
IRIS	International Research Institute of Stavanger
Isocyanates	Gases with potential for being hazardous to health. May be released from heating/burning of polyuretane and various plastic components.
KLIF	Norwegian Directorate of Climate and Pollution Control
KPI	Key performance indikator
ML	Ministry of Labour (Norway)
MPE	Ministry of Petroleum and Energy (Norway)
NOX	Nitrogen oxides
OLF	Norwegian Oil Industry Association
OLS	Oil loading system
OSPAR	Oslo – Paris convention
PCB	Poly chlorinated biphenyls
PDI	Plan for development and Installation
PDO	Plan for development and Operation
RKU	Regional IA
SFA	Statfjord A
SFB	Statfjord B
SFC	Statfjord C
SFLL	Statfjord Late Life
SOX	Sulphur dioxides
SPM	Single Point Mooring (loading buoy)
TBT	Tributyltin
THC	Total hydrocarbon (oil)
UK	United Kingdom
UKOOA	United Kingdom Oil Operators Association (Oil&Gas UK)