

ENVIRONMENTAL IMPACT ASSESSMENT

NON-TECHNICAL SUMMARY

FOR OFFSHORE DRILLING  
THE FALKLAND ISLANDS  
TO DESIRE PETROLEUM PLC



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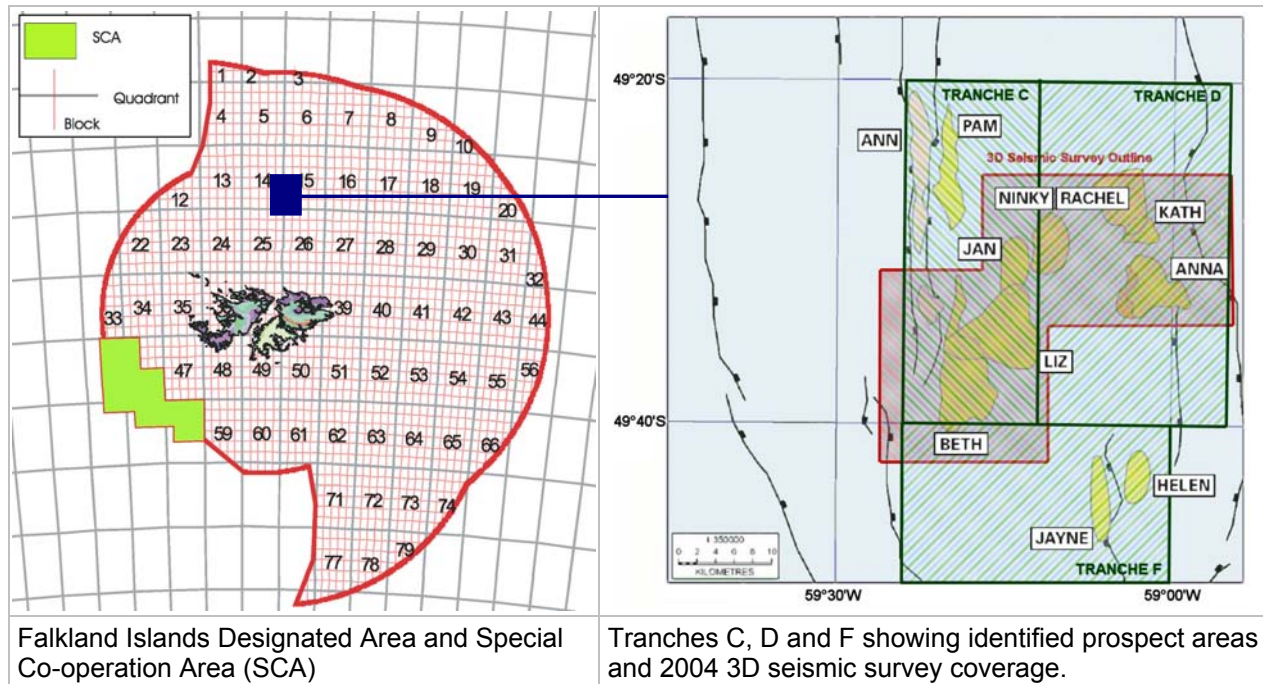
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# 1. INTRODUCTION

This non-technical summary provides an overview of the Environmental Impact Assessment (EIA) carried out on behalf of Desire Petroleum PLC (Desire), who are planning a three well drilling campaign in Tranches C and D of the North Falkland Basin.

Desire have been awarded Production Licences by the Falkland Islands Government (FIG) for exploration and production in Tranches C and D, which lie approximately 150km north of the Falkland Islands. The prime objective of the drilling programme is to evaluate the prospects identified by 3D seismic acquired in 2004. Of the prospects so far identified it is most likely that drilling will take place in three prospects out of Liz, Beth, Ninky or Ann (see below).



Six wells were drilled in the North Falkland Basin by a consortium of oil companies in 1998. The EIA for these operations identified a number of environmental information gaps. As a result further environmental studies were commissioned, including:

- Seabird, penguin and cetacean studies
- Current modelling and drill cuttings dispersion modelling
- Benthic surveys (before and after drilling)
- Metocean (meteorological and oceanographic) studies
- Oil spill modelling

These studies have greatly increased the level of environmental information available for this area. No additional environmental monitoring or sampling has therefore been commissioned for the current EIA, although both information gathering and stakeholder consultation has been carried out in the Falkland Islands. A large number of publications and websites have been used for the EIA and particular recognition is extended to Falklands Conservation, both for the commissioning of seabird and marine mammal surveys and for compiling the (draft) "Falkland Islands Environmental Baseline Survey 2004". Gratitude is also expressed to the FIG for making available extensive information on the relevant legal and environmental framework.

As the choice of drilling contractor and drilling unit has not been finalised, an addendum to this EIA will be produced prior to the start of operations in order to verify the assessment is both accurate and up-to-date. Any change to the operations likely to affect the findings of the EIA will lead to a reassessment of the relevant environmental impacts.

The scope of this EIA encompasses only the proposed drilling campaign. It does not extend to potential future oil and gas activities in the Falkland Islands.

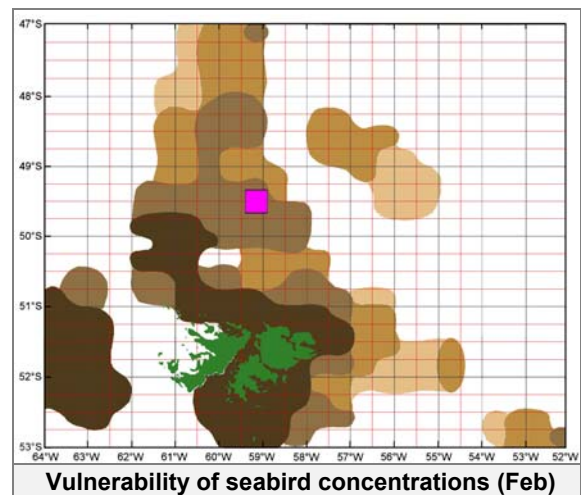
## 2. BASELINE ENVIRONMENT

The Falkland Islands are a United Kingdom Overseas Territory located on the edge of the Patagonian Shelf in the South Atlantic Ocean. There are two main islands, East and West Falkland, with a further 778 smaller islands forming a total land area in excess of 12,000 sq.km. There is a wide range of both flora and fauna present in the islands and the deep waters of the South Atlantic are rich in marine life, key to the survival of a wide variety of species. There are few trees, the natural vegetation being grassland with some species of heath and dwarf shrubs.

The main environmental sensitivities identified in Tranches C and D are the highly important seabird populations (including penguins), the presence of marine mammals and fisheries interests. In addition, the benthic (seafloor) habitat is considered to be sensitive to disturbance and relatively unstudied, although benthic surveys have previously been carried out in this area. Although not in the licence area, near-shore and coastal environments are also included within the EIA and are considered to be both extremely important and sensitive to pollution.

The Islands are considered to be highly significant for birdlife and over half the breeding birds on the Islands are largely dependent on the sea for food. There are five different species of breeding penguin in the Falkland Islands (rockhopper, Magellanic, gentoo, king and macaroni). The Islands are the most important world site for the endangered rockhopper penguin and are also home to 80% of the world's breeding population of black-browed albatross. Several rare and threatened species of petrel nest on offshore islands.

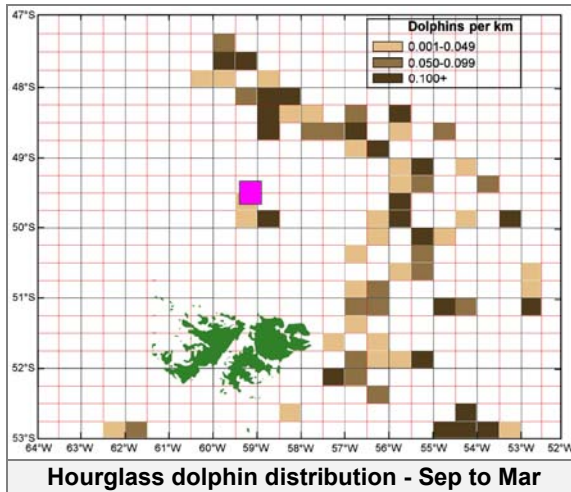
Extensive at-sea surveys commissioned by Falklands Conservation have built up a considerable level of knowledge regarding seabird distributions. In addition, a vulnerability atlas has been produced, highlighting the locations of seabird concentrations most vulnerable to the effects of surface pollution. The atlas has been adapted for Tranches C and D and an example is shown opposite, with the drilling area shown as a pink square and seabird vulnerability increasing from light to dark. In general, seabirds in coastal waters are most vulnerable to surface pollution and the deeper waters of Tranches C and D show lower vulnerability than the shallower waters to the south. The licence area shows higher vulnerability between January and March, although at no time of the year do Tranches C and D fall under the category of highest seabird vulnerability.



Both pinipeds (seals) and cetaceans (whales, porpoise and dolphins) are present in Falkland Island waters. The at-sea surveys conducted over three years from 1998 have added greatly to the level of knowledge regarding the presence of marine mammals in this area. Both Peale's dolphin and Commerson's dolphin are commonly seen from land and breed on the islands.

Over the three year at-sea survey 6,550 marine mammals were recorded, encompassing 17 different species. Of the species of cetacean likely to be present in Falkland Islands waters only hourglass dolphins were recorded within Tranches C or D. It is also possible that long-finned pilot whales and fin whales might be sighted in this area, depending on the time of year at which drilling takes place. Based on marine mammal distributions, the area for proposed drilling is not considered to be of particularly high sensitivity. As with seabird populations, the sensitivity of coastal areas is also examined within the EIA, particularly with regard to potential nearshore spills from loading and unloading operations.

Sea lions, fur seals and elephant seals breed on the islands. Breeding seals will generally rely on near-shore areas for food, although seal species may also be found in deeper waters particularly outside the breeding season. During the three year survey, only fur seals were recorded within Tranches C and D (between June and October).



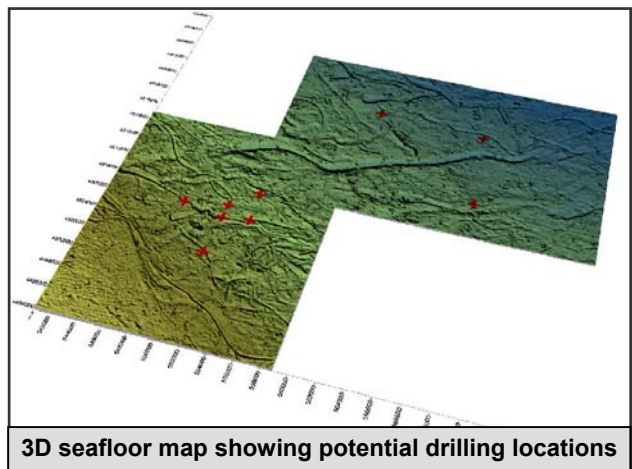
The fishing industry provides substantial income and for this reason knowledge of fish species is closely related to commercial factors. The Falkland Islands fishery is closely managed by the FIG Fisheries Department (FIFD) and is a good example of sustainable fisheries management.

Falklands Conservation Zones (FICZ and FOCZ) were introduced in 1987 and 1990 respectively to control fishing. The main fisheries resources are squid, although a finfish fishery also exists targeting predominantly hake, hoki, red cod and blue whiting. In addition to the commercial harvest, fish stocks are a major component of the diet of both seabirds and marine mammals. Due to the location and limited duration of drilling, the

impact on fisheries operations is expected to be low, however good communications with the FIFD are vital to ensure potential interference with other sea users is minimised.

Current patterns and seabed topography are important factors in the circulation of nutrients and marine productivity. The licence area lies near to the convergence zone of the Falklands currents, in the vicinity of an area of upwelling and high biological productivity. A year-long programme of meteorological and oceanographic (metocean) measurements was undertaken by Fugro to the north of the Falkland Islands from 1997. This looked at current and wave profiles, water column structure, meteorological conditions, salinity and temperature profiles. In addition, surveying was carried out by Gardline in 1998, both before and after drilling, in order to study the baseline seafloor environment and assess the seafloor impacts from drilling.

The general bathymetry of the North Falkland Basin indicates a gently sloping gradient with contours along a NW-SE direction. Seafloor surveys show a complex topography with numerous iceberg keel scars, depressions, troughs and furrows (see opposite). Although the benthic survey revealed a relatively uniform seafloor environment, with no significant pollution from previous drilling, additional knowledge of seafloor habitats would be useful, particularly to identify any unusual habitats. In order to increase understanding of the benthic environment detailed 3D maps, video footage and metocean data will be made available for further study.



Protected areas in the Falkland Islands can be designated as National Nature Reserves, National Parks and Ramsar sites. Although the FIG can designate marine reserves, as yet no marine National Nature Reserves have been created. A number of Important Bird Areas (IBAs) have also been defined, however this is a non-legal designation under the initiative of Birdlife International.

Socio-economic impacts of oil and gas exploration (both positive and negative) have been limited within the EIA at the request of the FIG to avoid overlaps with existing studies. Desire have initiated the drilling programme in an open and inclusive manner and ongoing liaison with the FIG, local people and stakeholders will help to ensure that potential impacts to shipping, fisheries, local businesses, tourism and socio-economic resources can be minimised.

### 3. DESCRIPTION OF OPERATIONS

Once a suitable drilling rig has been contracted, Desire plan to drill three wells, each around 3000m deep and each expected to take around 22 days to drill. The proposed drilling programme will be in water depths of 350 to 420m. It is intended to drill using a semi-submersible rig similar in type to the Borgny Dolphin (as used for the 1998 drilling campaign).

Drilling operations are being managed by Peak Well Management (Peak) on behalf of Desire. As the choice of drilling contractor and drilling unit have yet to be finalised, the EIA provides an operational description based on known details (well locations, depths, type of rig etc), established models (atmospheric emissions, sewerage discharge, volume of cuttings etc) and documented assumptions. Any subsequent alterations will be accounted for in the pre-operational addendum.

The rig will be towed from its previous commitments accompanied by a towing vessel and a large support/supply vessel. A semi-submersible drilling rig is buoyant and has to be secured in position using anchors. Detailed 3D seabed mapping has been carried out to provide an accurate 3D map of the seabed and subsurface (see previous figure). ROV (Remotely Operated Vehicle) surveys of the seafloor will also be used to assist deployment and avoid significant features or seabed obstacles.

Drilling will be undertaken using only water based muds, which are the least harmful type of drilling mud. As the well is drilled, steel casing is cemented into place in order to line the hole. This allows the drilling mud and drill cuttings (rock fragments) to be recirculated back to the rig where the mud is separated for reuse. Treated drill cuttings are then discharged to sea. Chemical additives are used to alter the properties of both the mud and cement and ensure safe operating conditions. Chemical additives are ranked by the UK Offshore Chemical Notification Scheme (OCNS) according to potential environmental impact. Only the lowest category (least harmful) chemicals will be used. Drilling in the Falkland Islands will follow the same requirements for chemical use and reporting as in the UK.

A blowout preventer (BOP) will be fixed in place and a fully documented pressure test carried out in accordance with safe operating practices. Between around 50 to 75 personnel will be present on the rig at different stages of the operation, with around a dozen shore based personnel (not including helicopter and well test personnel).

If well testing is carried out, formation fluids will be brought to the surface and tested, following which the hydrocarbons need to be flared (burnt off). Once drilling activity at each site has been completed, the wells will either be suspended or abandoned. These operations will be carried out in full accordance with UK Standards. A site (debris) survey will be undertaken prior to rig departure and once the well has been secured and equipment retrieved, the rig will be prepared for moving to the next drill location.

Two vessels capable of supply vessel and standby duties and equipped with oil spill response capability will be on hand throughout operations. In total these will be manned by 30 to 40 maritime personnel. It is expected that equipment, stores and chemicals necessary for the drilling programme will be transferred to the rig by supply vessel from Stanley. One vessel will be kept on standby with the rig, the other vessel will be available on rotation out of Stanley.

It is intended to service drilling operations from a supply base in Stanley established for the duration of the drilling programme. The Falkland Islands will also act as a transit point for the drill rig crew. Crew changes to and from the rig will take place using a dedicated helicopter.

The required helicopter services will be provided by a private contractor based at Mount Pleasant Airport (MPA), although it is likely that Stanley Airport will be used as the pick-up and drop-off point. It is expected that two scheduled flights per week will be sufficient, although additional flights will be supplied depending on operational issues. The same helicopter service will be used for emergency response duties if required.

## 4. ASSESSMENT OF IMPACTS

An assessment of the likely environmental impacts of drilling programme in Tranches C and D has been undertaken. Impacts have been assessed according to:

- Emissions to air
- Emissions to water
- Waste materials
- Physical presence
- Use of resources
- Socio-economic impacts

For each impact the **Scope** (area affected), **Persistence** (duration of impact), **Intensity** (the severity of the impact) and **Probability** (the likelihood of it occurring) have been assessed. Based on the assessment, the **Importance** (significance) of each impact is rated as low, medium or high. A summary of the impact assessment table for impacts of medium and high importance is shown on the following page.

The aspects of the operations that have been assessed as resulting in potential environmental impacts of high significance include the discharge of drill cuttings, the risk of offshore and near-shore hydrocarbon spills and the onshore disposal of waste material.

The quantity of drill cuttings likely to be discharged is estimated at approximately 1000m<sup>3</sup> (based on well modelling). Post-drill benthic sampling has shown the seafloor impacts of cuttings to be localised with minimal evidence of any contamination, however there will be localised seafloor smothering around the well site with a medium to long term persistence.

Despite the very low probability, the impact of hydrocarbon spills from both near-shore and offshore operations was assessed to be of high importance due to the local to regional scope, medium to long term effect and high intensity. Any release of liquid hydrocarbons has potential for direct, indirect and cumulative effects including physical oiling and toxicity impacts to wildlife, localised mortality to krill, eggs and larvae, habitat loss, impacts to fishing and tourism, political issues from transboundary movements and accumulation of oil in the food chain and sediments. Modelling has demonstrated that the risk of an offshore spill in Tranches C and D reaching the Falklands' shoreline is negligible. Principal risks to coastal wildlife therefore arise from small to medium sized spills in the nearshore environment. These risks can be minimised through operational controls, maintenance procedures and comprehensive spill response planning.

The onshore management of drilling waste is assessed to be of medium to high importance, due primarily to the lack of suitable facilities for waste treatment and disposal in the Falkland Islands. At present there is no appropriate in-country disposal route for hazardous waste, which will need to be transferred elsewhere for appropriate disposal. The exception is waste oil, for which there is a good local facility for recycling and reuse (for heating).

Aspects assessed as resulting in potential environmental impacts of medium significance include emissions to air from routine operations and potential well tests, the risk of chemical spills during drilling, waste management options such as incineration, shipment to the UK, storage and re-use, the physical presence of the rig leading to potential for interference with other sea users and seabed disturbance from anchoring.

The potential impacts of these operations will be mitigated in a number of ways, including:

- Maintaining a spirit of openness and ongoing consultation with the Falkland Islands Government (FIG), the public and key stakeholders.
- Applying International best practice and established UK standards to operations, particularly in offshore chemical use and emissions reporting.
- Using only water based drilling muds and low toxicity chemicals approved under the UK Offshore Chemical Notification Scheme.
- Implementing a high level of environmental management offshore and applying environmental procedures for potentially impacting operations (chemical storage, bunkering, waste handling, maintenance programmes, seafloor surveys etc).

- Monitoring and reporting consumption and emission figures in accordance with the UK Environmental Emissions Monitoring System (EEMS).
- Establishing and implementing a project specific Oil Spill Response Plan and carrying out training of key personnel in spill response. Employing Oil Spill Response Ltd in the UK to provide outside assistance in the case of a major spill.
- Implementing a detailed waste management plan to minimise the quantity of waste going to landfill, prevent unsuitable disposal of waste, maximise the re-use of materials and establish the Best Practicable Environmental Option (BPEO) for storage, treatment, transfer and disposal of waste materials.
- Collecting and sharing environmental data wherever possible, for example in offshore sightings, seabed surveys and metocean conditions.

### Summary of Impact Assessment Matrix showing impacts with medium to high significance

| Activity                       | Aspect                     | Impacts   |  |   |   |  | Description of potential impacts   |
|--------------------------------|----------------------------|---|--|---|---|--|--|
|                                |                            | Scope:<br>Local ●<br>Regional ●<br>Contin'tal ● | Persistence:<br>Short ●<br>Medium ●<br>Long ●<br>Perm'nt ● | Intensity:<br>Low ●<br>Medium ●<br>High ● | Probability:<br>Low ●<br>Medium ●<br>High ● | Importance:<br>Low ●<br>Medium ●<br>High ● |  |
| Rig mobilisation               | Rig engine emissions       | <del>LC</del>                                   | <del>ML</del>  | L   | H   | M  | Air pollution, emission of greenhouse gasses, ozone depleting substances, Volatile Organic Compounds (VOCs) and particulates |
| Drilling                       | Generator emissions        | <del>LC</del>                                   | <del>ML</del>  | L   | H   | M  |  |
| Vessel use                     | Engine emissions           | <del>LC</del>                                   | <del>ML</del>  | L   | H   | M  |  |
| Helicopter operations          | Engine emissions           | <del>LC</del>                                   | <del>ML</del>  | L   | H   | M  |  |
| Well testing                   | Flare emissions            | <del>LC</del>                                   | <del>ML</del>  | <del>M-H</del>                            | M   | M  |  |
| Top hole drilling              | Cuttings discharge         | L   | <del>ML</del>  | H   | H   | <del>M-H</del>                             | Localised smothering of the seabed. Localised turbidity.   |
| Drilling lower hole sections   | Cuttings discharge         | L   | <del>ML</del>  | H   | H   | <del>M-H</del>                             | Depletion of oxygen in surface sediments.  |
| Drilling/offshore bunkering    | Large fuel / oil spill     | <del>LC</del>                                   | L  | H   | L   | H  | Physical oiling and toxicity of wildlife, localised mortality to krill, eggs and larvae                                      |
| Drilling/offshore bunkering    | Small-med fuel/oil spill   | <del>LR</del>                                   | <del>ML</del>  | H   | L   | H  | Physical oiling and toxicity of wildlife, contamination of coastal habitats  |
| Near-shore loading / unloading | Small-med fuel / oil spill | L   | <del>ML</del>  | H   | L   | H  | Toxicity effects on marine biota.  |
| Drilling                       | Chemical spill             | L   | <del>S-M</del>   | H   | L   | M  | Air pollution  |
| Waste incineration             | Air emissions              | <del>LC</del>                                   | <del>ML</del>  | L   | H   | M  | Visual impact, soil and groundwater pollution  |
| Waste incineration             | Landfill of ash            | L   | <del>LP</del>  | L   | M   | M  | Contamination of soil and groundwater. Amenity impacts. Air emissions.   |
| Disposal on shore              | landfilling                | L   | <del>LP</del>  | M   | H   | H  | Impacts from long distance shipping of waste material  |
| Waste transfer to UK           | Trans-frontier shipment    | C   | M  | M   | M   | M  | Positive effect - reduced incineration / landfilling   |
| Waste Management               | Storage & reuse            | L   | <del>ML</del>  | M   | M   | M  | Exclusion of fisheries and shipping from drilling areas  |
| Rig presence                   | Interference               | L   | <del>ML</del>  | M   | M   | M  | Harm to marine biota. Damage to seafloor habitats  |
| Anchoring                      | Seabed disturbance         | L   | <del>ML</del>  | M   | H   | M  |  |

## 5. CONCLUSIONS

Sufficient baseline data now exists for this part of the North Falkland Basin to carry out a comprehensive environmental impact assessment of the proposed operations. Despite this, the area remains relatively unstudied and any additional environmental data that can be gathered during these operations would be extremely worthwhile.

The proposed drilling campaign will expand on the level of environmental knowledge to the north of the Falkland Islands by facilitating seabird and marine mammal recording, providing seabed ROV footage, 3D seabed surveys and offshore meteorological data.

Impacts assessed to be of high importance are the discharge of drill cuttings, the risk of offshore and near-shore spills and the onshore disposal of waste material. Mitigation measures will be implemented to minimise these impacts and it should be possible for operations to proceed without any significant long lasting impact to the marine or coastal environment of the Falkland Islands. A number of pro-active measures have already been instigated by Desire and Peak in planning these operations, which should be commended.

In order to minimise environmental impacts it is important to ensure operations follow established procedures, training of key personnel is carried out, joint oil spill response exercises are run and contingency plans are in place to deal swiftly with any potentially polluting incidents. The production of an operations-specific addendum to this EIA will further define the environmental management, operational controls and employee training necessary to minimise potential impacts to the environment.

Both Desire and Peak maintain management systems detailing health, safety and environmental procedures. In addition, the drilling contractors will have in place operational controls and management procedures detailing how specific operations should be carried out. The application of good management and tight controls will ensure that the drilling contractor operates in accordance with all applicable laws, standards and conditions while in Falkland Island waters. It is also intended to carry out training of all key personnel in oil spill response procedures prior to drilling.

A dedicated oil spill contingency plan (OSCP) has been developed in support of the proposed drilling campaign in the North Falkland Basin. The OSCP provides for a multi-tier response depending on the scale and type of spill involved. At the most extreme end of the scale (Tier 3), the OSCP relies on mobilising specialist aircraft and personnel from Oil Spill Response Limited (OSRL) in the UK to provide aerial dispersant spraying capability. The draft OSCP will be finalised when the drilling rig, vessels and relevant personnel have been established and all necessary details within the OSCP can be completed.

Finalising the drilling unit and crew is not expected to cause a significant change in the operational aspects identified in the EIA. Any operational adjustments likely to cause a significant change to the EIA will be incorporated within the addendum.

In conclusion, despite the high sensitivity and international importance of Falkland Islands' waters, there is obvious dedication to carrying out these operations to a high environmental standard. Given the current operational commitments and proposed mitigation measures, it is considered that the proposed operations can be undertaken without significant impacts to the Falkland Islands' environment.

