**Marine Mammals**: to mitigate any potential impacts on marine mammals such as seals, porpoises, dolphins and whales, the well-established Joint Nature Conservation Committee (JNCC) guidelines for minimising the impact of seismic survey will be followed. This includes 'soft-start' procedures to limit the impact whereby the power of the seismic source is gradually increased during start-up. PA Resources will employ a qualified marine mammal observer (MMO) on board the survey vessel to ensure that no marine mammal is within 500m of the vessel during the soft-start procedure and are therefore neither disturbed nor injured. This ensures that no marine mammal is within 500m of the vessel during the soft-start procedure. Whilst not a legal requirement, PA Resources intends to run a 'passive acoustic monitoring' device to detect echo-sounding mammals during the survey. This system will support the visual observations made by the MMO. The MMO will have the authority to halt the survey if any marine mammal is seen within 500m. A log of all observations by the MMO will be kept and provided to the University of Aberdeen and the JNCC.

During the survey the University of Aberdeen will undertake the second phase of its research project to assess the impact of seismic activities on marine mammals. The researchers will observe and record the behaviour of marine mammals at various distances from the survey. The results of this careful scientific study have the scope to be of wide benefit to the oil industry and marine scientists in understanding the impact of its seismic activities.

**Protected Sites and Species**: The Moray Firth is an area of significant national and international conservation value, supporting a large number of protected areas and species. The proposed survey area lies 500m to the east of the Moray Firth SAC and as mentioned above whales, dolphins and porpoises are likely to frequent the area, all of which are designated as European Protected Species. The mitigation measures identified to ensure clean seas and to minimise the impact of underwater noise on marine mammals are pertinent to protected sites and species.

The EIA concluded that, with the mitigation measures in place, the impact of subsea noise from the 2D seismic survey will cause temporary disturbance to marine mammals. This disturbance has been assessed as of medium significance in the EIA. All other proposed activities are of low impact.

PA Resources has recently applied to DECC for consent to undertake the survey and to Scottish Natural Heritage for a licence to temporarily disturb European Protected Species.

## Stakeholder Liaison

PA Resources is committed to minimising environmental impacts and actively engaging with representatives from relevant organisations and the local community in the Moray Firth. We will liaise with all appropriate bodies and any individual is invited to contact us.

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*PA Resources is a member of the Moray Firth Partnership.*


# Moray Firth Seismic Exploration Programme 2010

PA RESOURCES

## Introduction

A seismic survey to assist in oil and gas exploration is required in part of the Inner Moray Firth to meet commitments made to the Government by PA Resources.

The Inner Moray Firth is an environmentally sensitive area and PA Resources is committed to undertaking any activity with the utmost care for and respect of that environment.

It is important that the seismic sound waves do not impact the rich wildlife, especially the protected bottlenose dolphin population.

The survey is to be acquired over a small area, for a short duration and with sound sources considerably smaller than typical marine seismic surveys to limit the generation of underwater noise.

Comprehensive environmental impact studies have been undertaken and well-established mitigation measures will be put in place.

This leaflet introduces PA Resources and provides facts on the survey and environmental assessment and protection.

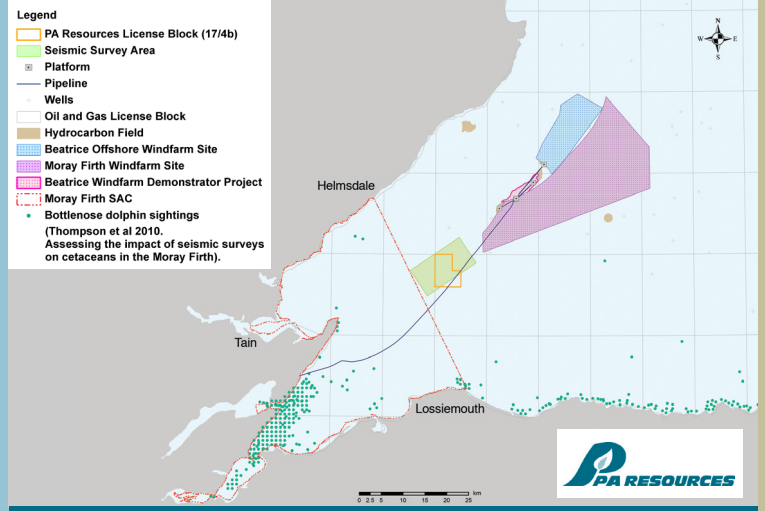
## Background

PA Resources was founded in 1994 to acquire and develop oil and gas reserves and explore for new reserves. The group, which is listed on the Swedish Stock Exchange, owns 27 licences of which 20 are exploration licences. The group's assets are located in the UK, Tunisia, Denmark, Netherlands, Equatorial Guinea, the Republic of Congo and Greenland.

PA Resources UK Limited is the licence holder of UKCS Block 17/4b which is located in the Inner Moray Firth adjacent to the Moray Firth Special Area of Conservation (SAC).The company was awarded the licence by the UK Department of Energy and Climate Change (DECC) in the 23rd oil and gas licence round in 2005.

Seismic exploration surveys are used to pinpoint possible reserves of oil and gas through a better understanding of the subsurface rock layers in which the hydrocarbons are located. Seismic acquisition is an essential part of oil and gas exploration and there are no alternative ways to gather this information.

As part of the licence agreement, PA Resources is to survey approximately 500km of seismic data in 63 discrete lines mostly in a north-north-west to south-south-east orientation. The survey will focus on imaging a small target within the block but the vessel will be required to run lines into adjacent Blocks 17/3, 11/28 and 11/29 to define the full extent of the potential sub-surface reservoir. PA Resources operates an environmental management system certified to ISO 14001:2004 which will ensure that all operations are carefully and responsibly managed.




## The Moray Firth

PA Resources recognises that any activity related to oil and gas exploration and production in the environmentally sensitive Moray Firth is of concern to many people and organisations. The company is committed to conducting all its activities in the area with the utmost priority to and respect for that environment. PA Resources will at all times conduct our operations in an open and transparent manner and we welcome communication with all interested stakeholders.

## The Seismic Survey

The planned 2D seismic survey is short in duration and covers a relatively small geographical area of 104km2. It is proposed to be carried out in September 2010 and will take approximately 10-15 days to complete, subject to weather conditions, and fishing and shipping traffic. The survey will be undertaken on behalf of PA Resources by a company which specialises in offshore seismic exploration surveys, using a seismic vessel. High energy sound waves will be generated by an array of airguns which will be towed behind the vessel, beneath the sea surface, together with a single streamer cable containing sound receivers. These listening devices will record the returned sound waves as they reflect from the underground rock structures. This process will create a sub-surface image of the rocks and reservoir that will be used to produce accurate geological maps. These maps will then be used to precisely target any future exploration programme in the area. The airguns to be used are small by industry standards, which will limit the magnitude of the seismic noise produced.

## The Seismic Vessel

A multi-purpose survey vessel fitted with a full suite of geophysical equipment will be used. It is capable of high-resolution seismic acquisition and environmental surveys. Typical operating speeds for vessels acquiring seismic data is 4 to 4.5 knots. The seismic vessel will be supported by a guard vessel which will protect the source array and streamer and ensure that the survey area is operationally clear of other vessels or marine life.

## Environmental Assessment and Protection

Activities associated with the exploration of oil and gas are governed by a collection of strict international, European, UK and Scottish laws, policies and frameworks. In compliance with the first phase of the exploration commitments within its licence agreement, PA Resources has undertaken an extensive Environmental Impact Assessment (EIA). This is a broad desktop exercise that has taken some months to complete and which is designed to both identify the potential effects of the survey and propose mitigation measures to prevent, reduce and offset any such effects.

The EIA has analysed possible impacts upon:

- The physical environment including air, water and seabed conditions
- The biological environment including fish, seabirds, marine mammals and protected sites and species
- The human environment including shipping and navigation, fishing and archaeology
- The environment of the combined effects of more than one oil and gas activity at a time and that of oil and gas activity together with other marine users

As part of a sophisticated study in 2009, the University of Aberdeen undertook a passive acoustic baseline study in the Inner Moray Firth using listening devices to establish, in particular, the distribution of bottlenose dolphins. This study showed that although harbour porpoises and minke whales are seen in and around the seismic survey area, bottlenose dolphins do not seem to frequent the deeper waters of the planned survey area. In addition, PA Resources commissioned a specific study to model how the noise levels arising from the planned seismic survey would be experienced by marine mammals at various distances from the survey area.

As part of the EIA, PA Resources has incorporated well established protection measures into its environmental plan for the Moray Firth seismic programme including:

**Timing**: the survey is scheduled for early autumn to avoid the most sensitive periods for fish spawning, seabirds and marine mammals.

**Clean Seas**: an accidental spill is highly unlikely to occur but an approved shipboard oil pollution emergency plan (SOPEP) is in place which would minimise the potential impact on the physical and biological environment.