

Non technical summary

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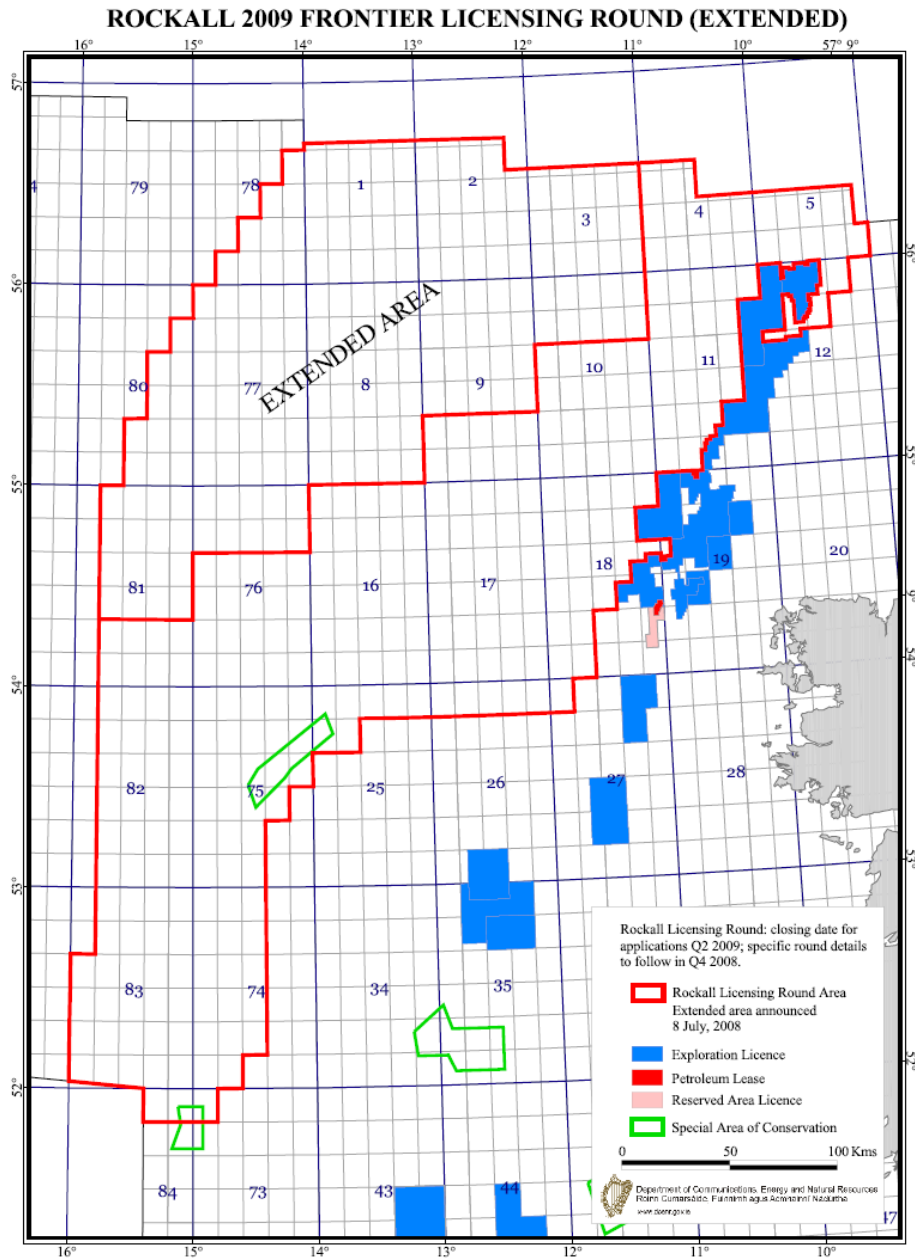
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Non-technical summary

Introduction

The Department of Communications, Energy and Natural Resources (DCENR) is carrying out a Strategic Environmental Assessment (SEA) on its proposed plan to issue Frontier Exploration Licences for the 2009 Licensing Round over the Rockall Basin. The acreage on offer in the current Frontier Licensing Round will cover unlicensed blocks in an area of approximately 117,100 km² as shown in the figure below. The area has been classified as Frontier acreage because of the challenging environment off Ireland's west and northwest coasts.

Location of Rockall Basin Frontier Exploration Licensing Round





This is the third in a series of offshore SEA conducted since 2006 on plans to issue exploration licences for the entire offshore area under Irish jurisdiction. As part of the SEA for the current proposed programme, the DCENR has commissioned this environmental report in order to highlight the potentially significant effects on the environment and to identify any mitigating measures.

The schedule for the IOSEA3 is aligned with that of the current licensing round, to ensure that the process leading up to production of the final environmental report, and the subsequent consultation, can provide a meaningful input into the decision-making process prior to license award. The final environmental report will be circulated during the consultation phase in November, during which expert bodies and the public will be able to provide feedback to the DCENR through various channels including specially arranged meetings. A post-consultation statement will incorporate the findings from the consultation period to support and inform the decision-making process for the Frontier Exploration licensing round.

Policy context

In Ireland there is now some urgency about the need to make further discoveries of indigenous gas. Ireland imports more than 80% of its gas requirement and to date the UK has been its primary source. In 2005 the UK became a net importer of gas as its own indigenous production does not meet its requirements. Until there is production from the Corrib Field the likely source for future Irish gas imports is Eastern Europe. This brings with it issues of security of supply, price stability/volatility and cost. On top of the purchase cost of the gas there is the transport cost over a significant distance. Government policy is to maintain the present licensing and fiscal terms and to continue to promote exploration in the Irish offshore.

Baseline data

Despite the low level of exploration activity in the past, the DCENR has continued to conduct and to sponsor environmental data gathering and analysis in the area. This work has been administered under the Petroleum Infrastructure Programme (PIP), a joint oil and gas industry-government partnership established in 1997. The Geological Survey of Ireland (GSI), with the Irish Marine Institute, has conducted a state-of-the-art survey of Ireland's seabed known as the Irish National Seabed Survey (INSS), now called INFOMAR, over seven years at a cost of €33m. Many data displays are available and there is ongoing interpretation of seabed characteristics and their marine sub-environments. The INFOMAR/INSS has also supported a variety of ancillary projects throughout the survey programme, ranging from physical oceanography to cetacean and seabird recording. In addition, several international research projects, such as the European-funded MESH (Mapping European Seabed Habitats) project and GEOMOUND, ECOMOUND and Atlantic Coral Ecosystem Study (ACES) projects studying seabed mounds, are also relevant to the IOSEA3.

Hence, there is a large catalogue of environmental baseline data and some analysis that has already been conducted. However, the DCENR recognises that the work is not exhaustive and some areas have been only lightly examined to date. At present, interpretation of the data gathered and publication of findings is incomplete and ongoing at the GSI, the Marine Institute, universities and other institutions in Ireland. This work will be invaluable in informing project-specific environmental assessments for any proposed exploration activities.

Scenarios for the Draft Plan

The scenarios being considered for the range in activity levels following licensing awards comprise the undertaking of 2D and 3D seismic data gathering from 2010 (it is unlikely that any seismic acquisition could be organized to commence in the remaining four months of 2009) to 2016 and exploratory drilling in the period 2011 to 2016. Although IOSEA3 is an assessment of exploration activities only, recognition of the possibility that a proportion of the exploration may ultimately result in development drilling taking place is also made. Since all previously held licences in the area have been relinquished some time ago, there are no activities arising out of previous licensing rounds which need to be considered. Exploration activities occurring in the neighbouring Slyne/Erris/Donegal and Porcupine basins are covered by IOSEA1 and IOSEA2, respectively.

The seismic survey effort estimated by the DCENR for the IOSEA3 area amounts to a likely maximum of 49,000 km of 2D (over the period 2010 to 2016) and 28,000 km² of 3D survey (over the period 2008 to 2014). This amounts to 2,893 days ship time over 7 years (including weather downtime and other delays), or approximately 413 ship-days per year on average.

Under the maximum drilling activity scenario for this new licensing round, a maximum of 25 wells may be drilled over the period 2010 to 2016 (0 to 15 exploration wells, 0 to 4 appraisal wells, 0 to 6 development wells). At the maximum anticipated rate over the period 2010 to 2016, with no pre-existing drilling activity, this would average out at between three and four wells per year.

Baseline environment

Information about the environment in the IOSEA3 area has been collated in order to characterise and assess the sensitivities of those features that might be affected by the proposed Draft Plan. The following section provides a brief summary of the baseline environment of the IOSEA3 area.

Physical and chemical environment

Lying approximately 125 to 500 km off the west coast of Ireland, the IOSEA3 area occupies the southern part of the Rockall Trough, with the Hebrides Terrace seamount lying on the northern boundary. The majority of the IOSEA3 area lies in water depths of more than 2,000 m on the lower slope and floor of the Rockall Trough, but it also includes the southeastern slopes of the Rockall Bank, the northern and western flanks of the Porcupine Bank and Porcupine Ridge, and parts of the adjacent slopes of the Irish Mainland Shelf, particularly the Malin Shelf in the northeast corner of the area. Overall, water depths in the IOSEA3 area range from approximately 200 m on upper slopes to over 3,000 m in the mouth of the Rockall Trough, with a small area as shallow as 130 m on the Malin Shelf in the northeast.

The seabed landscape in the IOSEA3 area has been shaped by glacial periods, when large volumes of material were eroded from the land and shelf and deposited at the shelf edge and over the continental slope. Glacial processes had a particularly strong influence on the development of the slope west and northwest of Donegal, as evidenced by the presence of the Donegal Fan, which is an extension of the Barra Fan system found in the Rockall Trough west of Scotland and continues southwest out onto the floor of the Rockall Trough. Iceberg scouring may have been important in the study area, as evidenced by the presence of extensive iceberg ploughmarks on the slopes throughout much of the region.

The present-day sediments are the result of reworking and redistribution by near-bottom currents and gravity-driven processes. Along the upper slope of the entire eastern margin of the Rockall Trough, sediment transport processes are dominated by strong currents flowing in a northeasterly direction, which are erosive and have remobilised sediments. Sediments are re-deposited by contour-hugging currents flowing to the southwest along the western margin of the Rockall Trough. Other important processes are associated with channel and canyon systems and submarine slope failures, resulting in down-slope sediment transport. Sampling data confirms the general pattern of predominantly fine sediments (silts/clays) in the deeper parts of the IOSEA3 area and of more mixed substrata including sands and gravelly sands on the slopes.

A number of seabed features have been discovered in the region, including sea mounts (underwater mountains), smaller mounds, pockmarks, channels and canyons, and iceberg ploughmarks, some of are of considerable scientific and conservation interest.

The oceanic regions west of Ireland have always been considered as an important area for the accumulation and propagation of warm and saline North Atlantic waters to the Arctic Ocean where they are transformed to cold, fresh deep water and contribute to the North Atlantic thermohaline overturning circulation. The upper layer of the NE Atlantic east of 18°W along the subpolar European continental margin (0 to 600 m) is dominated by Eastern North Atlantic Water (ENAW). ENAW is more saline than its western counterparts and is a substantial constituent of the upper layers of the West European Basin from Portugal to the Rockall Channel. In the surface layers, along the edge of the continental margin, there is a north flowing slope current called the Shelf Edge Current (SEC). The SEC carries a significant portion of warm, saline ENAW northwards, which makes it an important contributor to the heat and salt balance of the Arctic Ocean.

At intermediate depths (700 – 2,000 m), Mediterranean Water (MW) propagates west and northwards along the European continental margin from its source in the Gulf of Cadiz, as a distinct salinity



maximum and oxygen minimum layer. In the bottom layers, the water masses are made up of North Atlantic Deep Water (NADW) and Norwegian Sea Deep Water (NSDW).

Sea surface temperatures in the north of the IOSEA3 area range from a high of 14.2 °C in August to a low of 9.5 °C in February, and in the south of the study area from 15.4 °C in August to 10.0 °C in March. In the summer months, thermal stratification creates a thermocline at approximately 75 to 100 m with water temperature decreasing with depth. On the shelf bottom, temperature may be as much as 8 °C cooler than surface temperatures in summer months. The thermocline begins to break down in the autumn as surface temperatures cool and convection and wind induced mixing take place down to a depth of 500 to 750 m.

The climate of the northeast Atlantic region is strongly influenced by a large scale westerly air circulation which frequently contains low pressure systems. Storms and atmospheric depressions enter the IOSEA3 region from offshore with no sheltering landmass for protection. The deep water region west of Ireland has been described as having some of the harshest weather and sea conditions in the world. The predominant winds over the open waters west of Ireland are from the west and southwest. The dominant wave directions over the year are also from the west and southwest, whilst the maximum and minimum wave heights tend to occur in February and June/July respectively.

Ecology

Phytoplankton are planktonic organisms which derive energy from sunlight and form the basis of the marine food web, being responsible for most of the primary production in the sea. Due to their limited mobility, the distribution and abundance of phytoplankton is strongly influenced by hydrographic factors such as depth, tidal mixing, temperature stratification and advection. Phytoplankton in the study area includes the large diatoms and dinoflagellates as well as some smaller microflagellates. In the oceanic areas of the Rockall Trough, diatom species tend to be prevalent followed by dinoflagellates. Zooplankton are planktonic animals, the most common of which are the copepods, small crustaceans some of which graze on phytoplankton and which in turn form the main food source for higher trophic levels in the North Atlantic. Zooplankton includes a variety of animal forms including the eggs and larvae of many fish and seabed-dwelling (benthic) invertebrates.

Benthic communities are made up of a wide variety of invertebrate species that live either within the sediments on the sea floor (infauna) or on the seafloor and on rocks and boulders (epifauna). They feed on suspended organic material in the water (suspension feeders), on material settled on the seabed (deposit feeders), or by scavenging or preying on other animals. Benthic organisms provide a source of food for fish and other marine animals and often play an important role in the recycling of nutrients in the marine environment.

The epifauna of the continental shelf west of Ireland is generally thought to show a strong similarity to that of the northern North Sea, although with some species that distinguish it from North Sea communities. Characteristic species include tube dwelling polychaetes, molluscs and sea urchins. The infauna of the continental shelf tends to be dominated by species characteristic of the coarse sediments north and east of Shetland.

Upper slope communities (200 - 700 m)

From the shelf break at approximately 200 m down to approximately 700 m, the composition of the benthic fauna depends on whether coral banks are developed. The coral banks are composed mainly of the cold water reef building corals *Lophelia pertusa* and *Madrepora oculata*. Where they occur, these species can build large coral banks with a highly diverse and rich associated fauna and a biodiversity similar to that of tropical coral reefs. On the sparse sandy deposits where coral is not developed, the epifauna is rather sparse but prominent among it are sea urchins and sea cucumbers.

Mid slope communities (700 - 1,400 m)

At around the 700 m depth contour on the slope, the benthic fauna becomes richer. Among the most characteristic species of this zone is the sea urchin *Echinus acutus norvegicus* and the brittle star *Ophiecten gracilis*. Other species found at this level, such as the sea stars, solitary corals and pycnogonids (sea spiders) have also been recorded from shallower as well as deeper depths.

Lower slope communities (1,400 – 2,000 m)

From approximately 1,400 m, the sediment changes little down to the base of the slope at approximately 2,000 - 2,500 m, consisting of a mixture of the remains of planktonic organisms and

sediments transported by turbidity currents from elsewhere. The fauna is dominated by sea urchins and starfish.

Bottom communities (2,000 - 2,500 m)

The floor of the northern part of the Rockall Trough slopes gently from about 2,000 m in the north to about 3,000 m in the south and in general the epifauna is consistent within this range. Near the base of the continental slope, growths of the tree-like sea fan *Acanella arbuscula* are found which provide habitat for other organisms to feed in the current. Amongst the other species present, echinoderms characteristic of deeper areas predominate.

Irish waters support a wide variety of fish and shellfish species, including many commercially important species. However, the nature and dynamics of the fish species and communities of the deep-water area to the west of Ireland are as yet not fully understood. Demersal fish (species associated with the seabed) including many which are of commercial importance such as cod, haddock, whiting, sole, and plaice, are present over much of the shelf with hake, anglerfish and megrim often also associated with the shelf edge. The distributions of many of these species are dynamic with feeding, spawning or migratory movements between coastal waters, the shelf and upper parts of the continental slope. The waters of the IOSEA3 area are known to be spawning areas for blue whiting and mackerel in the spring and summer months.

Generally, gravelly sediments of the shelf are dominated by elasmobranchs (sharks and rays), gurnards, cod, large whiting and a few flatfish species with populations of scallops and queen scallops also present in such areas. Soft muddy sediments provide a habitat for burrowing crustacean, particularly the Dublin Bay prawn, *Nephrops*, which support important commercial fisheries. These areas have higher incidence of gadoids (cod family) and lower densities of plaice and dab than found in shallower sandy areas. Sandy or muddy sand sediments, which cover a large area of the shelf support fisheries for cod, whiting, haddock, anglerfish, hake and saithe.

Species found in deeper waters range from the morid cod, chimaeras, greater forkbeard, silvery pout, argentine, blue whiting and roundnose grenadier of upper slope areas, through orange roughy, black scabbardfish, siki, blue ling and squalid sharks of the mid slope, to various eel forms, Mediterranean grenadier, blue hake, Agassiz smoothhead, lizardfish, and blunt-snout smoothhead of the deepest areas.

Five species of marine turtle have been recorded in UK and Irish waters. Only one species however, the leatherback turtle is reported annually and is considered a regular and normal member of Irish marine fauna. Loggerhead turtles and Kemp's ridley turtles occur less frequently. Records of two other vagrant species, the hawksbill turtle and the green turtle are very rare.

The exposed and inaccessible west coast of Ireland provides a perfect breeding habitat for many seabird species. In addition to this, coastal and offshore Irish waters provide local breeding and non-breeding seabirds, along with migrants, with a rich source of nutrition, particularly near coastal upwelling and frontal systems (eg along the Irish Shelf front, north of the Porcupine Seabight). The majority of offshore seabirds recorded over the IOSEA3 area are petrels, shearwaters, skuas, gannets, gulls and auks. Most of these birds breed in colonies located on the southwest coast of Ireland while others overwinter in Irish waters. Other species, such as some species of shearwater and skua, are passage migrants that use the area as a migratory corridor. During the breeding season, generally between March and June, large numbers of seabirds congregate in coastal breeding colonies, a number of which have been designated as Special Protection Areas (SPAs) under the EU Birds Directive. Whilst raising young, seabirds tend to be constrained by colony location and exhibit a more inshore distribution.

Irish waters are some of the most important in Europe for a wide range of cetacean (whales, dolphins and porpoise) species. Twenty-four cetacean species have been recorded in Irish waters, the majority of which have been confirmed from actual sightings or acoustic recordings (as well as from strandings). Three species have been recorded solely as strandings, namely Gervais' beaked whale, pygmy sperm whale and True's beaked whale. There are a number of important factors which determine cetacean distribution and abundance along Ireland's Atlantic Margin. The availability and distribution of prey is one. Although the North Atlantic Ocean and its adjacent seas contain a myriad of species that may be exploited by cetaceans, the distribution of prey is not uniform in space or time and dynamic physical and oceanographic features prevail to maintain this complex environment. Seabed bathymetry is also an important factor. Areas of complex bathymetry are of importance to deep diving species, eg beaked whales, and may restrict these species to distinct areas of suitable



habitat. A number of canyons systems in the Rockall area are of particular importance as they show a high level of beaked whale activity. Species with quite specific habitat requirements are more vulnerable to disturbance from anthropogenic sources and added measures for their protection are required. A number of the larger baleen whales have been recorded from the IOSEA3 area, particularly along the continental shelf edge area, including fin and blue whales. Acoustic monitoring data have indicated a steady and regular passage of some species along the shelf edge, suggesting a potential migratory corridor for baleen whales.

The grey *Halichoerus grypus* and harbour *Phoca vitulina* seals are the two seal species native to Irish waters. Both species have established themselves in terrestrial colonies (or haul-outs) along all coastlines of Ireland, but both species in Ireland lie towards the southern end of their geographical range and their numbers are low in comparison to neighbouring UK populations. Neither species is likely to be found in large numbers in the offshore IOSEA3 area.

Conservation

Extensive areas of the west and northwest Irish coastline have been designated as being of international and national conservation importance. Four candidate Special Areas of Conservation (cSACs) have been designated off the west coast of Ireland. Two of these, the South West Porcupine Bank and the North West Porcupine Bank are located within the IOSEA3 area. Both sites within the IOSEA3 area have been designated due to the presence of biogenic reefs formed by the cold-water corals *L pertusa* and *M oculata*. As more information becomes available on the offshore environment to the west of Ireland it is possible that new conservation areas may be designated to include other qualifying features under national and international legislation.

The maritime archaeological heritage of the IOSEA3 area is restricted by water depth and limited historical use of the local environment. As such, the main archaeological interest is likely to come from historic wrecks and the majority of these lie in coastal areas.

Other users of the sea

The waters around Ireland make up some of the most productive fishing grounds in the world. Fisheries in and around the IOSEA3 area are important both nationally and internationally, with a wide range of fish and shellfish species targeted by demersal and pelagic fishing fleets. The main species caught are monkfish, megrim, hake, ling, mackerel, blue whiting and *Nephrops*. Deepwater fisheries have only developed over the last 30 years, targeting mainly orange roughy and roundnose grenadier on the continental slopes of the IOSEA3 area. Fishing effort, as gauged by numbers of vessel sightings in the area, declines with depth and also becomes more patchy with depth, suggesting that fishing is less intense in the deeper waters of the IOSEA3 area. Demersal landings by Irish vessels are greatest in shallow coastal and inshore waters, generally declining with increasing distance from shore and water depth. Pelagic catches show a similar pattern, being largest from coastal and shelf edge sea areas and lowest from the deepest reaches of the Rockall Trough, although pelagic landings as a whole are markedly higher than those for demersal species in the IOSEA3 area. Shellfish catches within the IOSEA3 licensing area are minimal by comparison.

Although shipping activity in the waters off the west coast of Ireland is less intense than that in the Irish Sea, Ireland's Atlantic Seaboard does support important shipping ports at Galway, Cork and along the Shannon Estuary. Major trade routes between Europe, America and Asia cross the Atlantic in the vicinity of Ireland's west coast. The majority of movements through the IOSEA3 licensing area are transatlantic sailings between North and South America and northern European ports based in Ireland, the UK and mainland Europe. The current level of shipping overall is estimated at 37,291 vessels per year in the IOSEA3 area and, on average, 25 vessels are likely to be within this area at any one time. Overall, vessel traffic levels are considerably lighter than those experienced in the Celtic Sea for example, or around the coasts of northwest Europe.

The Rockall Basin has seen little exploratory drilling with only 3 exploration wells drilled in the last ten years, all located in the northeastern part of the Rockall Basin. Of these, two have shown gas condensate while the other one was proven to be a dry hole.

Military Practice and Exercise Areas (PEXAs) are delineated areas used for aircraft and ship manoeuvres or as ranging and bombing practice. There is a submarine and fleet exercise area

overlapping the eastern half of the IOSEA3 area. In addition, there is a single munitions dump site located within the northeastern Rockall Trough.

Assessment of potential impacts

Stakeholders and consultees were identified and initial steps taken to identify key environmental issues. A notice under Section 11 of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004, SI no 435 on a plan to issue Frontier Exploration Licences for certain blocks within the Rockall Basin – Scoping Stage was issued to the three statutory environmental authorities: EPA, DoEHLG and DCENR. In addition, scoping advice was also sought from the Department of Transport (DoT) and the Department of Defence (DoD). As the IOSEA3 area is adjacent to territorial waters of the United Kingdom, consultation was also undertaken with the Northern Ireland Environment Agency (NIEA).

In addition to scoping with the statutory agencies, an Early Consultation Document was produced, outlining the scope of the SEA and a summary of the Draft Plan and known baseline environment. This document was sent to a wide group of stakeholders, identified from the previous SEA, to facilitate early input into the current SEA process.

The scoping process also included an Environmental Issues Identification (ENVID) exercise involving the IOSEA3 Steering Group and independent environmental specialists. The purpose of this was to identify where the interactions were likely to occur between the Draft Plan and the receiving environment, and to highlight where the main environmental concerns were likely to occur. The output of this exercise, together with scoping opinions received from the statutory environmental authorities and other stakeholders, determined which of the potential impacts arising from the Draft Plan should be assessed in detail.

Based on available data, the aspects identified as having a potentially major effect on the environment were the interactions between noise generation by seismic survey and drilling activities with marine mammals and protected sites in the area, impacts from both the physical presence of equipment and drilling discharge to protected sites, and the risk of accidental events (hydrocarbons releases in particular) from the proposed exploratory drilling. Certain interactions from these and other activities with the marine environment were also identified as having potentially moderate impacts, and these were also assessed in detail.

All of these concerns were taken through for further more detailed impact assessment, in which possible cumulative and transboundary effects were considered, and mitigative measures were proposed in order to minimise the impacts. The assessments took account of the range of possible scenarios and alternatives. The residual environmental impacts and key mitigation measures are described below.

Impacts from seismic survey activities

Seismic survey impacts - noise generation

Despite increasing concern over the effects on marine mammals of man-made sound in the oceans, we still have little direct information about what sound frequency-intensity combinations damage marine mammal ears, and at present there are insufficient data to accurately determine acoustic exposure guidelines for any marine mammal.

Although there are many documented, clearly discernible responses of marine mammals to anthropogenic sound, such responses are typically subtle, consisting of shorter surfacings, shorter dives, fewer blows per surfacing, longer intervals between blows, ceasing or increasing vocalisations, shortening or lengthening of vocalisations, and changing frequency or intensity of vocalisations. Some of those changes become statistically significant for a given exposure (on individual animals). However, it remains unknown when and how these changes translate into biologically significant effects, ie effects that have repercussions for the animal beyond the time of disturbance, effects on the animal's ability to engage in essential activities, and effects that have potential consequences at the population level.

Modelling indicates that baleen whales and fish may show some form of avoidance reaction from anywhere between a few km to tens of km from the seismic operations. However, field research has indicated that these zones of avoidance behaviour could be reduced or extended depending on local



conditions. Individual animals might leave or avoid this area, but may be expected to return soon after operations have ceased. There is very little information on the effects of seismic noise on seals but, on a conservative estimation, the avoidance behaviour might be considered similar to that of baleen whales. Of the odontocetes, it appears that the smaller species in particular, ie the dolphins and porpoises, show a degree of avoidance behaviour up to a distance of a few km, and which is generally short lived.

The degree of avoidance behaviour shown by the larger odontocetes species that might be present in the IOSEA3 area (such as beaked, killer, pilot and sperm whales) varies considerably amongst the observational studies from around the world, and therefore should be considered to be inconclusive at this stage. However, it has been implied that a few (high level) seismic operations have been responsible for beaked whale stranding events and, therefore, a precautionary approach is required.

In order to minimise any possible impacts on marine mammals, the use of the NPWS guidelines, should be mandatory, including the use of risk assessment in survey planning and the employment of MMOs to undertake visual monitoring during the survey and ensure that the survey is conducted in line with the NPWS guidelines. The use of slow, soft starts of the air guns would also alert marine mammals to the impending full seismic activity and give them time to vacate the immediate area. PAM devices could be used to monitor the area for cetaceans during the survey, particularly in areas or times of peak sensitivity (such as the canyons on the east side of the Rockall Basin; Section 5.2.6), and seismic operations delayed if marine mammals are detected.

The behavioural response shown by fish is to move away from the seismic survey sound sources temporarily. Research indicates that such movements are short lived and that the fish stocks will most likely return to the area after completion of the survey. Surveys should be planned to avoid known fish spawning areas and spawning times.

In conclusion, if the mitigation measures proposed here are adopted, the direct, short-term environmental impact of noise, from individual seismic surveys within in the IOSEA3 area, will be minimal. It should be noted however that the effects of multiple surveys taking place at the same time are not well understood and, where possible, the timing of each survey should be considered carefully in order to avoid surveys taking place simultaneously. For this reason it is recommended that simultaneous surveys should be separated by a distance of at least 100 km, so that marine mammals and fish have the chance to avoid these areas and migration routes are not impeded.

Seismic survey impacts - atmospheric emissions

A total of 2,893 days of seismic survey vessel effort may potentially occur over the period 2010 to 2016 in the IOSEA3 area. This equates to approximately 413 days of survey ship effort, per year, with atmospheric emissions of CO₂ estimated as 19,824 tonnes.

Assessing the impacts of these potential emissions at a local level is difficult due to the nature of the offshore environment. The impacts are generally mitigated circumstantially by the open and dispersive environment offshore. Shipping in general is built and operated to standards that preclude significant impacts to the health of their crews, whilst other environmental receptors (eg flora and fauna) tend to be sparsely distributed and/or transient in the local area. Impacts at this level are therefore both difficult to measure and to distinguish from background variation. On this basis, it is more profitable to consider emissions impacts at a regional or wider scale.

Emissions from shipping are excluded from the Kyoto protocol, and as such, no data have been specifically collated for shipping emissions to the atmosphere in Ireland on a national level. However, an estimation of annual CO₂ emissions from shipping in all waters surrounding EU countries, including Ireland, for up to 200 nautical miles offshore is 2.43×10^6 tonnes CO₂ for 2010. By comparison, the projected annual CO₂ emissions from one year of IOSEA3 seismic survey effort (ie 19,824 tonnes), is just 0.82% of this figure. In this context, the predicted atmospheric emissions from seismic survey activity in the IOSEA3 area between 2010 and 2016 can be considered to be minor, and therefore its resulting impacts are expected to be insignificant.

Seismic survey impacts - physical presence

Acquisition of 2D seismic data requires the towing of a single streamer of between 3 to 12 km in length at around 5 m depth. Surveys operate in a grid shape and therefore need turning area at the end of each line. 3D seismic surveys, however, tow a number of streamers in parallel and the length of streamers are shorter than for 2D seismic, around 4 to 6 km in length. In both cases whilst the

survey is being undertaken, the survey vessel has limited capability for taking avoiding action in respect of other shipping, and other shipping will therefore need to keep clear of the survey vessel.

Fishing vessels will be unable to fish in the vicinity of a seismic survey and will therefore lose access to grounds in the survey area for the duration of the survey. The total ship time for seismic survey for IOSEA3 is estimated at approximately 413 days per year over the period 2010 to 2016. This is assumed to be met by one to two vessels working during the summer months each year and when compared to the total area of 117,100 km² for the IOSEA3 area, seismic surveys are unlikely to exclude shipping or fishing activities from important areas for significant periods.

Fishing effort (demersal/pelagic/static gears) over the IOSEA3 area is 'very low' according to published information. The 2007 vessels sightings data from the Irish Naval Service also indicate a relatively low level of fishing activity in the IOSEA3 area, albeit with some discrete areas of higher fishing intensity. Fisheries landings data also suggest that much of the IOSEA3 area is not heavily utilised by the fishing industry.

The current level of shipping overall is estimated at 37,291 vessels per year in the IOSEA3 area, and on average 25 vessels are likely to be within this area at any one time. This is considerably lighter than the levels of shipping experienced in the English Channel and around the coasts of northwest Europe. This 'routine' shipping is also largely restricted to two or three corridors which diagonally bisect the licensing area. Overall the additional shipping resulting from seismic survey work under the Draft Plan is not significant, the use of the IOSEA3 area by other users such as fisheries and shipping is relatively low, and therefore the level of interaction between seismic survey work and other sea users is likely to be low.

Seismic survey impacts - accidental events

A kerosene spill from streamer failure is the most likely source of a hydrocarbon spill, but streamer construction is compartmentalised and the amounts of oil lost extremely small (several hundred litres or less). The quantities of oil spilled into the marine environment would be relatively low in all but a worst case scenario involving vessel collision. The relatively low volumes of oil involved in most streamer accidents and light nature of the oil involved means that it would be expected to evaporate and disperse within a few hours.

Overall, the main ecological concern will be seabirds, whilst the main socio-economic sensitivity will involve fisheries and fishing. Any seabirds on the water surface would be potentially at risk from any spilled oil, in addition to which oil spills can result in loss of fishing days, exclusion zones, and fishing bans on certain species for periods of time. Furthermore, hydrocarbon spills due to shipping accidents could occur inshore in shallow waters, in which case a greater range of physical, biological and socio-economic receptors may be directly impacted thus assuming a greater significance. The risk of a major accident, such as a collision with another vessel, causing the loss of the streamer oil reservoir and/or diesel fuel from the vessel is considered to be very low. Historical data suggest that small diesel spills and streamer oil spills of less than one tonne will represent the most likely oil spill scenario.

Impacts from drilling activities

Drilling impacts - noise generation

Low frequency noises from drilling wells, and all associated vessels, will add to the ambient noise in the area covered by this licensing round. Semi-submersible drilling rigs and drill ships generally produce sound levels at frequencies roughly similar as those generated by a large merchant vessel (Table 7.2), and as such, their impact is considered to be comparable.

The impact of such noise is difficult to assess due to uncertainties in how noise affects specific marine mammals, and how far the noise will be transmitted in the sea. However, it is estimated that the underwater noise produced could elicit response from individual cetaceans if they pass within 350 m to 3.5 km of a semi-submersible drilling rig or a drill ship respectively. Harbour porpoises might show a slightly increased avoidance distance, as they have shown to be quite sensitive to a wide range of human sounds at relatively low exposures. The limited data available for seals indicate avoidance behaviour to be limited to distances within a few hundred metres of the source at most.



The assessment of available information, taking into account the limited number of wells forecast as a result of the Draft Plan, together with the short duration of each drilling scenario (50 days), does not indicate any significant impacts from underwater noise generated during drilling operations. However it is felt that the effect of drilling noise on marine animals is still poorly understood and warrants further investigation in the context of this and other noise-producing exploratory activities. As further information is gathered on the effects of drilling noise, and the distribution of marine mammals in the IOSEA3 area, the potential interactions should be considered carefully in the context of reviews and new applications for drilling activities.

Drilling impacts - discharge of drill cuttings and disturbance to sea bed

Implementation of the Draft Plan combined with existing licensed activity may result in up to 25 wells in being drilled over the period 2010 to 2016. The impacts of activities such as anchoring, and the discharge of drilling wastes, will be primarily to the seabed rather than to the sea surface or water column. Impacts on the benthic communities from discharges of WBM and cement may occur in the immediate vicinity of each well, with likely recovery within months to years depending on the local hydrographic regime.

Overall, the discharges of cuttings and muds near the sea surface are expected to have a minor impact on both the water column and the seabed. The substantial water depths (>50 m) and the oceanographic conditions in the area enable good dispersion and dilution.

The discharges of drill cuttings, muds and cement from the top sections of the wells, which are deposited close to the seabed at the wellheads, are expected to have a moderate impact at each well site. However, the area affected will be very small, and any adverse effects on the benthic communities are expected to be limited to the immediate vicinity of the wellheads (generally within 50 m). The cuttings piles are expected to be dispersed completely over a timescale of one to ten years, and the overall impact is not likely to be significant.

The greatest potential for significant impact at the seabed arises from direct damage by placement and scouring of anchors and chains. If wells and anchors are sited using adequate site-specific data on benthic habitats and communities, these impacts can be minimised.

The potential impacts arising from drilling discharges and disturbance to the seabed from anchoring, whilst generally minor or moderate, assume a higher significance in the context of the offshore SACs within the IOSEA3 area. The risks of adversely affecting the integrity of the benthic ecological features for which these two SACs have been proposed remain potentially significant regardless of mitigation.

Drilling impacts - atmospheric emissions

A total of 25 wells will potentially be drilled between 2010 and 2016 in the IOSEA3 area. This equates to approximately three to four wells per year. Per well, the atmospheric emissions are estimated to have a global warming potential (GWP) of approximately 6,499 tonnes CO₂ equivalent, whilst the total from a maximum of four wells per year could result in a GWP of ~25,996 tonnes CO₂ equivalent. It is assumed that under the Draft Plan approximately 50% of all wells drilled will require testing, ie a maximum of two per year. This will result in the emission of approximately 14,737 tonnes CO₂ equivalent per well, or, when combined with the emissions expected from drilling one well, a total GWP of 21,235 tonnes.

Annual emissions of greenhouse gases in Ireland fell slightly in 2006 to 69.76 million tonnes CO₂ equivalent. The 6,499 tonnes CO₂ equivalent to be emitted by drilling one well represents just 0.009% of the total emissions in Ireland for that year, whilst including the well test in the total raises the proportion to just 0.03%.

Against this background, the predicted atmospheric emissions from exploration drilling activity in the IOSEA3 area between 2010 and 2016 can be considered to be minor, and any impacts are expected to be insignificant.

Drilling impacts - physical presence

The exploration wells are likely to be drilled by a semi-submersible drilling rig or drill ship, taking up to 50 days per well. For safety reasons a 500 m exclusion zone will surround each drilling rig whilst on site, patrolled by a safety standby vessel, leading to the temporary loss of fishing access, and will require all other forms of vessels such as merchant shipping and military vessels to avoid the area. If

a maximum of four wells per year is assumed, then there will be up to four areas closed by exclusion zones (each 0.79 km², totalling just over 3 km²) for up to 50 days within any one year.

Due to the requirement for a vessel to be on standby during drilling operations, a vessel will be present for the duration of drilling operations. Supply vessels and helicopters will ferry goods and personnel to and from the drilling rig, leading to a slight increase in vessel activity in the region. This would only take place over the 50 day drilling period. Supply vessels will most likely use ports at Galway, Foynes, Killybegs and Fenit to bunker and ship essential supplies. These ports are currently in use to supply the existing oil and gas activities west of Ireland. Moderate shipping intensity in the IOSEA3 area indicates that impacts upon other shipping operations in the region will be relatively low.

If the well is plugged and abandoned at the end of the drilling programme, the riser will be completely removed to below the seabed and will therefore pose no threat to ship anchors or over-trawling by fishing vessels. However if the well is suspended, the 500 m exclusion zone will remain in force. Overall, the appearance of one or two suspended wells per year in the IOSEA3 area between 2010 and 2016 is not likely to have any significant commercial impact on fisheries.

The total area potentially excluded to other sea users, predominantly commercial fishing, will be just over 3 km² for 50 days per year which is approximately 0.003% of the total area available for fishing activities within the licensing boundary. Redirection of fishing effort from one area to another nearby is unlikely to significantly affect fishing revenues in general. Profitability of fishing operations is more strongly influenced by factors such as fish prices, stock levels, quotas and fuel costs. Any effects to the fisheries are considered to be minor. The number of wells that may be drilled as a result of this Frontier licensing round are few, the duration of drilling is short and therefore the impact of the physical presence of the drilling rig and possible suspended wells is not considered to be significant.

Drilling impacts - accidental events

The risk of accidental hydrocarbon and/or chemical spillage to the sea is one of the main environmental concerns associated with oil industry developments. Spilled oil and chemicals at sea can have a number of environmental and economic impacts, the most conspicuous of which are on seabirds and marine mammals. The actual impacts depend on many factors, including the volume and type of oil spilled, and sea and weather conditions. During exploration and appraisal drilling, there is a risk of spillage of oil (fuel/crude), and spillage or leakage of chemicals. Evidence of both gas and oil prospects has been recorded from within the licensing area.

Due to the limited nature of available data from Irish operations, statistics obtained from the UK oil and gas sector have instead been used to demonstrate the likelihood of hydrocarbon spill occurrence during exploration and appraisal drilling in the IOSEA3 area. Historical data indicate that the probability of a large hydrocarbon spill from a mobile drilling unit (MODU) operating on the UKCS is very low. The most likely spills are small leaks (<1 tonne) arising from loading and bunkering oils between the drill rig or ship and supply vessels.

On the basis of accidental events statistics compiled for offshore exploration activity, the risk of a major crude oil spill or gas blowout during exploration, appraisal and development drilling is considered to be very low. Historical data suggest that small diesel spills from rigs and vessels of less than one tonne represent the most likely oil spill scenario. Impacts from diesel spills of this magnitude and frequency (one spill in every 4,404.8 MODU days) would be negligible.

Cumulative and transboundary impacts

Cumulative impacts occur as a result of a number of activities, discharges and emissions combining or overlapping, potentially creating a significant impact. Potential cumulative impacts could arise as a result of impacts resulting from seismic and exploration activities interacting or combining with those from other activities taking place in the IOSEA3 area. These may include, for example, seismic survey and exploratory drilling from the Draft Plan interacting with marine scientific research, commercial fishing, shipping and military activities. Some of the impacts assessed have the potential to combine with each other, and should therefore be considered together or cumulatively.

Transboundary impacts are those which could potentially have an impact on the environmental and resources beyond the boundary of UK waters. Of the likely impacts arising from seismic survey and drilling activity under the Draft Plan, the only ones potentially capable of extending across national boundaries into the territories of other EU nations are underwater noise from seismic survey, accidental hydrocarbon spills, and atmospheric emissions.



Cumulative and transboundary impacts - noise

Large marine mammals are regular visitors of the waters west of Ireland, as a result of upwelling currents bringing plentiful supplies of food. In addition, there is some evidence that the area is used as a migratory pathway by certain baleen whale species. Published information suggests that migratory pathways could be interrupted and feeding grounds disrupted if several seismic surveys occur at the same time. Simultaneously generated (loud) sound sources from different directions, such as those generated by multiple (seismic) vessels, have the potential to reduce the effectiveness of a marine mammal's directional hearing. This effect might be exacerbated by the complex bathymetric environment of the Rockall Basin, which might deflect and refract sound waves in multiple directions. However, studies both in northwestern Australia and along the Californian coast have indicated that baleen whales continue to migrate into areas of consistently high survey activity, and along coastlines subjected to decades of seismic activity.

The impact of such noise is difficult to assess due to uncertainties in how noise affects specific marine mammals, and how far the noise will be transmitted in the sea. However, it is estimated that the underwater noise produced could elicit response from individual cetaceans if they pass within 350 m to 3.5 km of a semi-submersible drilling rig or a drill ship respectively. Harbour porpoises might show a slightly increased avoidance distance, as they have shown to be quite sensitive to a wide range of human sounds at relatively low exposures. The limited data available for seals indicate avoidance behaviour to be limited to distances within a few hundred metres of the source at most. At certain times, multiple drilling operations are expected to take place simultaneously within the IOSEA3 area. It is however unlikely that the underwater sound generated by these operations will overlap in such a way as to cause a significant cumulative impact.

The northern edge of the IOSEA3 area is confluent with the Ireland/UK international boundary line, so potential does exist for noise from survey and drilling activities to travel into UK territory. Any transboundary impacts with regard to noise during seismic surveys and drilling activity will be limited in scale and of very short duration. However, in view of the likelihood that seismic surveys can interfere with each other and can give rise to environmental impacts, notification of seismic activity planned within 100 km of the Ireland/UK boundary will be given to the appropriate licensing authorities.

The NIEA expressed concerns as to the potential impacts of the IOSEA3 Draft Plan on the Ellet line, which is a chain of oceanographic monitoring stations extending from Scotland in the UK to Iceland via the Anton Dohrn seamount and the islet of Rockall. The Ellet line passes more than 100 km to the north of the IOSEA3 area at its closest point, and whilst noise from seismic surveys may be measurable at this distance, it will not have any impact on the oceanographic parameters being monitored. Therefore the impact from seismic survey noise in the IOSEA3 area on the Ellet line, and the long-term data that it yields for research into climate change for example, should be negligible.

Cumulative and transboundary impacts - discharge of drill cuttings and disturbance to sea bed

Drilling activity within the Rockall Basin area has been very low historically, with only 3 wells drilled to date. The extent of sea bed disturbance impacts potentially arising from the oil and gas industry amount to a very small proportion of the 117,000 km² IOSEA3 area. In addition, the temporary nature of anchoring impacts, and the very localised extent and low toxicity of discharged drilling wastes on the seabed, lead to good recovery potential in the dynamic benthic environment of the IOSEA3 area. However, the significance of any impact depends on the nature of the benthic environment at the sites concerned, and whether or not particularly sensitive or important habitats or species, seabed features or notable archaeological interests are present.

Other activities taking place within the IOSEA3 area which lead to physical disturbance of the sea bed include commercial fishing for demersal or benthic species, and telecommunications cable installation. There is currently no aggregate extraction or aquaculture taking place within the IOSEA3 area, and there is no dredging or spoil dumping within the area either.

With regard to fishing, there are no data quantifying the area of seabed trawled or dredged in the IOSEA3 area. However, due to the localised and discontinuous nature of seabed disturbance associated with drilling activities, the additive effect resulting from the Draft Plan would be relatively small.

Exploration drilling activity will be taking place in an environment that has long been used for a variety of economic activities, some of which disturb the seabed. As the potential impacts from drilling discharges and physical disturbance to the marine environment tend to be localised, of short duration

and with generally good recovery potential, the risks of cumulative impacts are considered to be low for this level of exploration and appraisal activity. For these reasons, transboundary impacts from drilling are also likely to be negligible.

Cumulative and transboundary impacts - atmospheric emissions

The estimated emissions of CO₂, NO_x and SO₂ from annual seismic survey effort in the IOSEA3 area would make up 0.82%, 0.66% and 0.06% respectively of the forecast emissions of these substances from all shipping in Irish waters for 2010.

The annual emissions resulting from the drilling of potentially up to four wells per year (including two with full well tests) would result in potential emissions of 55,467 tonnes CO₂ equivalent. Against the figure of 69.76 million tonnes CO₂ equivalent for Irish emissions for 2006, the annual emissions from the proposed annual drilling activity in the IOSEA3 area would be just 0.08% of total annual Irish emissions. Finally, The combined emissions on an annual basis from both seismic survey (22,242 tonnes) and drilling (55,467 tonnes) activities in the IOSEA3 area amount to 77,709 tonnes CO₂ equivalent. This equates to 0.11% of the total annual Irish emissions for 2006, which is considered to be insignificant.

With prevailing wind directions being from the west and southwest, most of the vessel emissions are likely to be deposited in Irish coastal waters or in Ireland. In terms of possible transboundary impacts, a small proportion of the emissions considered might end up in other European states including the UK. As outlined above, the combined incremental contribution from both seismic survey and drilling is just 0.11% of the total annual Irish emissions for 2006. In this context, the transboundary impacts of emissions arising from the Draft Plan are likely to be negligible.

Cumulative and transboundary impacts - physical presence

In terms of physical exclusion to other sea users, the combination of seismic survey and drilling activity is mutually exclusive; drilling at a location tends to follow on from a seismic survey. However, it may be useful to consider the total area affected by the proposed activities.

With regard to seismic survey, a 500 m exclusion zone applies around the vessel and streamers at any one time whilst on survey. Based on the available information, and taking the conservative (worst case) view that other sea users might realistically need to avoid not just the survey vessel itself but the whole survey area for the day, this could amount to an exclusion area amounting to 150 km² per day for a 2D survey and 90 km² per day for a 3D survey. Thus, the Draft Plan for the IOSEA3 area would amount to 240 km² per day being excluded to other sea users for 413 days per year over the period 2010 to 2016. This is equivalent to approximately 0.2% of the 117,000 km² offshore area covered by the Draft Plan per day.

In the case of drilling, up to 25 wells over 7 years (up to four per year) from all activities will be drilled, with an exclusion zone of 500 m radius around each. On this basis, the maximum level of drilling expected would cause a total exclusion area of less than 5 km² to be unavailable to other sea users in any one year on a temporary basis. This total is insignificant in relation to the 117,000 km² of offshore area being proposed for the Draft Plan, and is much smaller than the exclusion that may possibly result from seismic survey activity. Together with the 'worst case' rough estimate for seismic survey of 240 km² per day, the total cumulative impact of implementing the Draft Plan could be to exclude other sea users from up to approximately 245 km², or less than 0.5% of the IOSEA3 area.

Within the IOSEA3 area, the fishing industry may be of closest relevance to the oil and gas industry in comparing levels of exclusion to other sea users (and possibly also disturbance to the sea bed in combination with drilling discharges to the sea bed). However, the impacts of the physical presence on these various users in the IOSEA3 area do not change significantly when considered in combination.

There is little transboundary impact likely to arise from seismic vessel activity within the IOSEA3 area. It is possible that some of the seismic vessel activity in the IOSEA3 area will be based in ports in other European States. In addition, the proposed activity has the potential to interact with shipping travelling through the area to or from other European ports. The anticipated levels of seismic survey vessel activity are very low, and therefore any impact on other shipping will be insignificant. In addition, seismic surveys are subject to regulation and any potential impacts to other shipping would be mitigated through existing control and notification measures (including those for transboundary situations).



Cumulative and transboundary impacts -accidental events

The total draft plan and existing exploration activities forecast for the IOSEA3 area indicate a maximum of 25 exploration, appraisal and development wells will be drilled between 2010 and 2016. Based on the probabilities outlined for UK and Norwegian production, the incremental risk of a significant hydrocarbon spill is very low.

The cumulative level of hydrocarbons entering the marine environment from spills associated with exploration, appraisal and development drilling is likely to be negligible when considered against other natural and anthropogenic sources. While the impacts from oil spills will differ from those of hydrocarbon inputs from rivers, sewage and shipping for example, even large oil spills associated with tanker accidents do not appear to have had long term chronic impacts on marine ecosystems.

Transboundary impacts on the UK marine environment are considered to be the same or less than for Ireland. The island of Tiree off the coast of Scotland is the closest UK landfall some 130 km to the northeast of the IOSEA3 area, and the UK's Ellet line of oceanographic monitoring stations lies over 100 km to the north of the IOSEA3 area. Any oil spill likely to have impacts in UK waters will be reported by the Irish Coast Guard to the relevant UK authorities. The Irish Coast Guard has a close working relationship with the UK Maritime and Coast Guard Agency (MCA) and the two have a draft Service Level Agreement for co-operation on search and rescue and oil spill response in place. The Irish Coast Guard and the UK MCA also regularly conduct joint search and rescue and oil spill response exercises.

Cumulative and transboundary impacts from a shallow gas blowout would be reservoir specific. Atmospheric emissions could potentially have cumulative effects, although they would be dependent on the type and volume of gas released into the atmosphere. Similarly, transboundary impacts could possibly occur with the UK and other European States.

In conclusion, the degree of activity predicted to take place under the IOSEA3 Draft Plan, particularly when set against the oil and gas activity already taking place in Irish and UK offshore waters, is small. Additionally, there is an existing framework regulating offshore activities and for co-ordination of resources in the event of transboundary incidents. Finally, statistics for accidental events indicate that spills and releases from seismic survey and exploration drilling are minor and have control measures in place for clean-up and limiting impacts. Overall therefore, the risk of significant cumulative or transboundary impacts from accidental events is likely to be negligible.

Mitigation and monitoring

Mitigation - seismic survey: noise generation

Existing measures

Reducing the noise entering the marine environment is the main measure in minimising the impacts of seismic survey operations. Therefore, all seismic operations should use the lowest practicable power levels throughout the survey and only discharge pressure waves into the marine environment when necessary and after a suitable 'soft' start.

Operators are required to submit an Application for Approval to DCENR prior to conducting any Geophysical or Other Exploration Survey, Site Survey or Route Survey. Conditions that apply with any permit include the obligation to ensure that current best industry practices for the environment are applied with regard to impact mitigation and monitoring measures in relation to marine mammals. The NPWS has issued guidelines for this purpose entitled 'Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters Version 1.1' and it is a DCENR requirement that all operators incorporate these into seismic survey plans. The guideline requirements include:

- a qualified and experienced MMO to be on the seismic vessel;
- that seismic operations should use the lowest practicable power levels throughout the survey and only discharge pressure waves into the marine environment when necessary;
- if marine mammals are present, seismic operations must be delayed until the animals move out of range. The power in the air guns will be built up slowly over at least 20 minutes (but no longer than 40 minutes) to give marine mammals adequate time to hear the noise and leave the vicinity. This 'soft' start process should be adopted every time air guns are used, even if no marine mammals are seen, and if air guns have stopped and not restarted after 5 minutes.

In the event that there is a requirement for multiple surveys in the same area and at the same time, it is advised these are combined into consecutive surveys through planning and co-operation with other operators and with the regulator. If large commercial 2D and 3D surveys must be carried out simultaneously, consideration should be given to the location of surveys in relation to each other in order to maintain a 100 km separation, so that marine mammals can avoid these areas where necessary and migration routes are not impeded.

Potential additional measures

The timing and location of cetacean calving and potential migrations should be considered when planning seismic survey work, and if possible avoided. This will have to be assessed at a later stage, on a location-specific case-by-case basis as current knowledge of these sensitivities is very limited and is still developing.

In addition, the possible location, prevalence and timing of beaked whale feeding grounds in deep-water canyon systems within the IOSEA3 area requires consideration during survey planning. Because beaked whales are notoriously difficult to detect, visual monitoring should be augmented by passive acoustic monitoring (PAM) in these areas, and take into account the fact that beaked whales may only vocalise at depth. Again, mitigation measures will require re-evaluation as knowledge of these sensitivities develops, monitoring techniques improve and as location-specific proposals demand.

The NPWS guidelines are regularly reviewed, alongside other similar guidelines from other countries, as new data, technologies and approaches emerge in order to ensure their continuing status as embodying best practice. In addition, all means of assessing cetacean presence or absence in an area during seismic survey (eg passive acoustic monitoring and other acoustic systems) should be assessed continuously through research programmes and workshops.

The impact of noise generated by seismic surveys on other users of the sea is generally not considered to be a significant issue, and is regulated through the normal process of notifying the appropriate authorities and liaising with the respective industry organisations where necessary. However, carbonate mound and seamount sites in and around the Rockall Basin are areas of long-term marine research and therefore there is a need for the central co-ordination of seismic survey activity to take account of marine scientific research activity also.

Mitigation - seismic survey: atmospheric emissions

Existing measures

Regulations were introduced in 2007 to transpose EU Directive 2005/33/EC into Irish law. EU Directive 2005/33/EC which relates to the reduction of sulphur in liquid fuels and incorporates the requirements set out in Annex VI of MARPOL was transposed into Irish Law in May 2008 via the Sulphur Content of Heavy Fuel Oil, Gas Oil, and Marine Fuels Regulations 2008 (SI no 119 of 2008) .

Even though both the Directive and the Regulations do not cover the combustion of marine fuel in offshore areas, they do specify that all marine diesel sold in the EU, from 2010 onwards, shall be limited to a maximum sulphur content of 1.5% by mass. In addition, any vessel at berth or sailing on inland waterways may also only use marine diesel containing up to 1.5% sulphur. It can therefore reasonably be expected that most, if not all, survey vessels operating in the IOSEA3 area, from 2010 onwards, will 'automatically' operate on diesel with this lower sulphur content.

Another limit set under Annex VI of MARPOL is the amount of nitrogen oxide (NO_x) emissions from ship exhausts. Annex VI also prohibits deliberate emissions of ozone depleting substances, which include halons and chlorofluorocarbons (CFCs). New installations containing ozone-depleting substances are prohibited on all ships. However, new installations containing hydrochlorofluorocarbons (HCFCs) are permitted until 1 January 2020. Incineration onboard ship of certain products, such as contaminated packaging materials and polychlorinated biphenyls (PCBs) is also prohibited under the Annex.

Potential additional measures

None presented.



Mitigation - seismic survey: physical presence

Existing measures

The mitigation measures here relate to existing control measures and best practice.

The oil and gas industry operators are required to check in advance with the Maritime Safety Directorate, the MRCC of the Irish Coast Guard, and Sea Fisheries Protection Agency of the DCENR that the proposed survey will not be carried out in an area and at a time that would conflict with legitimate shipping and fishing operations, including both floating and stationary gear, with consequential disruption of both such activities. In addition, in the case of a survey planned in an area of intensive fishing, discussions with Sea Fisheries Control of the DCENR shall be initiated as early as possible, and, in any case, at least 45 days before the planned date in order that the implications can be fully considered. The Marine Safety Directorate publishes Marine Notices advertising such operations. Also marine navigation warnings are issued while the survey is taking place, for the duration of the survey.

According to the DCENR Rules and Procedures Manual, it is recommended best practice that a fisheries liaison officer, with a knowledge of fisheries local to the survey area, is onboard seismic vessels during survey work.

Potential additional measures

In the event that there is a requirement for multiple surveys in the same area and at the same time, especially if required by more than one user-group (eg the oil and gas and the research sectors), these should be combined through appropriate planning and co-operation between operators and regulator.

Mitigation - seismic survey: accidental events

Existing measures

The mitigation measures here relate to existing control measures and best practice. Selection of a survey contractor with demonstrable planned preventative maintenance procedures will lead to fewer emissions and equipment failures. In addition, training of staff at all levels in environmental awareness will encourage best practice.

A full risk assessment against accidental events should be performed as part of survey design. Procedural controls, stemming from industry-standard guidelines and best practice procedures, will limit the possibility of accidental events. Quality procedures, incorporating the tenet of continuous improvement, should apply and be considered at the contractor selection stage.

Mitigation – drilling: noise generation

Existing measures

Depending on the type of facility and their moorings, it is known that certain drilling facilities generate more underwater noise than others, with drill ships and semi-submersibles operating on DP being the noisiest. The selection of drilling facility can, therefore, be used to reduce the amount of sound entering the marine environment. However, it is understood that the choice of drilling rig is generally dictated by other factors. The only other practical way of minimising the amount of noise entering the marine environment is by reducing the drilling time where possible.

Consideration should be given to the timing of drilling periods in relation to seasonal environmental sensitivities. In addition, the well design and engineering process should minimise the duration of drilling.

Mitigation – drilling: discharge of drill cuttings and disturbance to sea bed

Impacts from drilling discharges are unlikely to be significant, but various mitigation measures are either required or can be taken by operators to further reduce impacts, as summarised below. The significance of impacts resulting from direct physical disturbance of the seabed depends on the

occurrence of key features of ecological or archaeological conservation importance in the immediate vicinity of operations.

Existing measures

All chemicals used are regulated under the OSPAR HOCNF scheme and approved by use of a PUDAC. Selection of all chemicals that may be used in drilling the proposed wells should be based upon both their technical specifications and their environmental performance, and the use of all chemicals minimised where practicable.

Actual mud and chemical usage must be monitored during drilling operations, and subsequently reported to the DCENR.

The discharge of cuttings contaminated with OBM or SBM to sea is prohibited. Cuttings shipped to shore for treatment and disposal will be dealt with under the local authority waste management plan.

Best practice should be followed to minimise the amount of excess cement deposited on the seabed.

Mud recovery systems should be used, thus minimising the amount of drill fluids eventually discharged.

Site surveys are undertaken with regard to geological hazards such as seabed stability, shallow gas and gas hydrates.

In addition to the Appropriate Assessment undertaken for IOSEA3, site-specific Appropriate Assessments may be required for operations in or adjacent to the coldwater coral SACs in conjunction with EAA.

Best practice should be followed in order to limit dragging of anchors and chains.

An environmental area assessment (EAA) is required with any application for drilling, and therefore is carried out prior to all exploration drilling activities. Any subsequent field development will be subject to full environmental impact assessment and reported in an EIS. The EAA, using available information and where necessary site-specific surveys, should describe the existing environmental conditions in sufficient detail to permit assessment of spatial and temporal changes in contamination of the sea bed, water column and biota resulting from subsequent exploration and production development activities.

Site-specific surveys as part of EAA should be carried out in advance of drilling in accordance with the OSPAR Guidelines for Monitoring the Environmental Impact of Offshore Oil and Gas Activities (Agreement 2004-11). These should describe the existing physical, chemical and biological conditions and where necessary archaeology. Archaeological impact assessment should follow the format detailed in the guidelines *Acquisition and interpretation of geophysical data for archaeological assessment during oil industry geophysical route and site surveys in water depths exceeding 50 m*. Any shipwrecks or objects of potential archaeological interest should be reported to the Director of the National Museum of Ireland within four days. If wreckage found is more than 100 years old, the Underwater Archaeology Unit and the Garda Síochána must also be notified within four days.

Potential additional measures

Consideration should be given to drilling slimhole wells (ie thinner than usual wellbore) where possible. These generate fewer cuttings, require less drilling fluid and chemicals, and are generally faster than a conventional drilling programme.

Consideration should be given to requesting that modelling of the dispersion of discharged drill cuttings be undertaken for sensitive locations. This would necessitate collection of tidal stream information at different depths through the water column, and validation of the predictions once drilling was complete.

As insufficient information is available on the precise occurrence and distribution of key habitats, megafaunal species and historic wreck sites, site-specific survey data will be required in order to assess the impacts resulting from direct disturbance during the installation and removal of drilling structures. This could be carried out as part of the site survey normally undertaken prior to all drilling activities. Careful consideration needs to be given to the design of such surveys, making use of non-destructive survey methods where appropriate.



Given there is very little information on the interaction of fishing gear and cutting piles, there is a need to be able to assess potential hazards of interaction with fishing gear, including the physical effects on fishing gear of impacting cuttings piles. Trawl warps and bridles have the ability to cut through the base of the cuttings pile and are then likely to cause the net or a trawl door to wedge firmly in the material on impact.

Mitigation – drilling: atmospheric emissions

Existing measures

The main sources of atmospheric emissions from drilling activity to address will be fuel use and from flaring during well clean-up and well testing.

In terms of fuel use, measures can be taken from an early stage to include fuel efficiency in the selection process for drilling rigs, support ships and helicopters, and to use low sulphur fuel for example. The Sulphur Content of Heavy Fuel Oil, Gas Oil, and Marine Fuels Regulations 2008 (SI no 119 of 2008) transposes EU Directive 2005/33/EC, which controls the sulphur content of marine fuels. As described in Section 7.3.5, these regulations limit the maximum level of sulphur in marine diesel sold within the EU to 1.5% from 2010 onwards.

With regard to well testing, emissions may also be influenced by careful selection of drilling rig and contractors and by the use of maximum efficiency 'green' burners (in the case of oil or condensate wells). The amount of flaring can also be minimised by appropriate design of the test programme. If appropriate, well testing systems that do without the need for flaring at all (eg closed chamber well tests) can be built into the test programme.

Mitigation – drilling: physical presence

Existing measures

At the time of submitting a well plan for approval, operators are obliged to inform fishermen by means of the established Irish Offshore Operators Association (IOOA) procedures. In addition, in the case of a well planned in an area of intensive fishing, discussions with the Sea Fisheries Control Division of the Department of Communications, Energy and Natural Resources must be initiated as early as possible, and in any case at least 90 days before planned commencement of drilling. Procedures are in place between IOOA members and the fishing industry to resolve possible disputes over damaged equipment.

In the event of a well being suspended, the need for over-trawlable protection should be considered for areas heavily used for demersal fishing activities. Such protection should meet guidelines used by the Norwegian and UK petrochemical industries. It should be noted that these standards and guidelines are based on trawl equipment and tests done pre-1996. With the changes in gear design (eg twin-rig gear with clump weights) and improvements in vessel equipment the oil and gas industries in UK and Norway have acknowledged the need to update these recommended practices. Consultation with the UK Fisheries and Offshore Oil Consultative Group is encouraged to take account of new recommendations that are forthcoming.

Mitigation – drilling: accidental events

Existing measures – oil releases

The following measures are already in place, either integral with good practice, or with regulatory systems, or both.

The crew of the drilling rig/ship should undergo environmental awareness and safety training. All equipment used on the rig/ship should have safety measures built in to minimise the risks of any oil spillage.

A two-barrier well control policy should be implemented at all times as a minimum. Primary well control (ie mud hydrostatic) and secondary well control (blow-out preventers or BOPs) should be maintained throughout the drilling of a well. A full risk assessment should be performed as part of the planning phase of the well.

As the highest risk of diesel spillage occurs during re-fuelling (bunkering) operations at sea, all bunkering should take place during suitable weather conditions, preferably in daylight hours, and a continuous watch should be posted during the operations. The bunkering hoses should be segmented and have pressure valves that, in the event of a drop in pressure within the line as a result of loss of diesel, will close, preventing the further release of diesel.

An OSCP is required under the Sea Pollution (Amendment) Act 1999, and this requirement is re-stated in the DCENR Rules and Procedures Manual (PAD, 2007). The OSCP is designed to assist the decision-making process during an oil spill, indicate what resources are required to combat the spill, minimise any further discharges and mitigate its effects. The OSCP must be submitted to the Irish Coastguard for approval.

Any oil spill must be reported immediately, however small. The level and manner of the required oil spill response will be overseen by the Irish Coast Guard, and determined by the volume and type of oil spilled, and the weather and sea conditions at the time.

Any oil spill likely to have impacts in UK waters will be reported by the Irish Coast Guard to the relevant UK authorities. The Irish Coast Guard has a close working relationship with the UK Maritime and Coast Guard Agency (MCA) and the two have a draft Service Level Agreement for co-operation on search and rescue and oil spill response in place. The Irish Coast Guard and the UK MCA also regularly conduct joint search and rescue and oil spill response exercises.

Existing measures – chemical releases

With regard to chemical use, the following measures are already in place, either integral with good practice, or with regulatory systems, or both.

Storage and transportation of chemicals on the drilling rig will be in line with industry-standard procedures and best practice, which have been designed to minimise the risk of loss of containment and impacts upon human health and the environment.

The approved OSCP will also address procedures in the event of chemical spillages.

All chemicals used are regulated under the OSPAR HOCNF scheme and approved by use of a Permit to Use and Discharge Added Chemicals (PUDAC). Selection of all chemicals that may be used in drilling the proposed wells should be based upon both their technical specifications and their environmental performance, and the use of all chemicals minimised where practicable.

Existing measures – gas releases

The following measures are already in place, either integral with good practice, or with regulatory systems, or both.

The potential for shallow gas should be identified and minimised by site survey prior to drilling.

The BOP is installed to prevent loss of well control incidents with gas wells once drilling has progressed beyond the riserless stage.

Gas detection systems are installed on mud shakers to give early indication of any potential for loss of well control incidents with gas wells.

Training in safety awareness and response procedures for drilling crews will ensure that the risk of a loss of well control incidents will be minimised, and be able to make the appropriate response should one occur.

Monitoring

The DoEHLG and EPA Guidelines for implementation of the SEA Directive describe the requirement to monitor the significant environmental effects of the implementation of the Final Adopted Plan. The primary purpose of monitoring is to cross check significant environmental effects which arise during the implementation stage against those predicted during the plan preparation stage. Monitoring should concentrate on the likely significant effects that have been identified in the environmental report and the mitigative measures that have been proposed. Monitoring should also ensure that the level of activities and subsequent impacts will be consistent with the scenarios developed within this



report. The types of monitoring can therefore be thought of at two levels; monitoring the activity levels, and monitoring the impacts of the activities.

Monitoring activity levels

The oil and gas exploration and appraisal activities resulting from implementation of the DCENR's Final Adopted Plan for the current Frontier Licensing Round will be monitored by the DCENR. This is to ensure the delivery of exploration commitments made by operators in the agreed work programmes at the time of licensing. An activity scenario has been developed by the DCENR for IOSEA3 as a basis for impact assessment. Actual activity levels over the area will therefore need to be compared with predicted levels, in order to monitor the basis for the conclusions in the Environmental Report.

A 6-monthly report is prepared by the DCENR for both Houses of the Oireachtas (Parliament), in line with other sectors, that summarises the activities of the oil and gas industry in Ireland, including a list of current licences, consents issued, wells drilled and surveys undertaken. This has been developed as the basis for the required monitoring of activity levels, and to confirm activity levels are in line with those predicted.

Monitoring the impacts of activities

As detailed in Article 10 of the SEA Directive, Member States shall monitor the significant environmental effects of the implementation of plans and programmes in order to identify at an early stage unforeseen adverse effects and to be able to undertake appropriate remedial action.

The licensing authority should ensure that an appropriate monitoring programme be devised for evaluating the environmental impacts and efficacy of mitigation measures relating to the key potential environmental issues that were identified as significant in Section 6, Table 6.4 of this report. This should be carried out in consultation with appropriate statutory bodies and specialists.

The licensing authority (DCENR) will ensure that appropriate best practice guidelines where required are developed and implemented in consultation with other statutory authorities and relevant specialists.

The current Rules and Procedures Manual for Offshore Petroleum Exploration and Appraisal Operations ('Rules and Procedures') are set out in accordance with the provisions of the Petroleum and Other Minerals Development Act, 1960 (no 7 of 1960), as applied by the Continental Shelf Act, 1968 (no 14 of 1968), as amended and pursuant to the Licensing Terms for Offshore Oil and Gas Exploration and Development, 1992 ('1992 Terms'). These are laid out in the *Rules and Procedures Manual for Offshore Petroleum Exploration and Appraisal Operations* (PAD, 2007a). DCENR approval is required before commencement of certain operations, and such DCENR approval may be dependent on prior satisfaction of the specific requirements of other responsible Departments, Agencies and Authorities.

A fuller outline of these procedures is given in Section 3, but provisions are in place for monitoring emissions and discharges, consent auditing, and for undertaking baseline studies and post-drilling impacts monitoring. Operators must report on compliance with legislation, progress made in achieving environmental goals and continual improvement in environmental performance.

Conclusions and recommendations

Data gaps

The following is a summary of the data gaps identified throughout this report.

- In the context of oil and gas related exploration activity, environmental data (physical, chemical and biological) collected as part of the impact assessment process for oil and gas industry activities, could be collated in a readily accessible database.
- Irish waters support a diverse fish and shellfish fauna, including many commercially important species, but relatively little synthesised information on the species present and their distribution has been made available. This applies in particular to deep water fish species for which the available information is dated and limited. With the further development of deep water fishing, and increasing numbers of deep water surveys, knowledge of the fish and shellfish species is starting to grow.
- Reliable overviews of commercial fish distributions and the fisheries that exploit them were not available to this SEA process. Though a number of surveys have been carried out, including

acoustic and groundfish surveys, there is currently insufficient coverage, or correlation between annual results to build up regional and temporal overviews of the area. Knowledge of the location and dynamics of the deep water fish and shellfish resource west of Ireland would not only improve impact assessment in relation to fish and fisheries *per se*, but would also facilitate understanding of the importance of the area to key predators such as marine mammals.

- In the context of climate change and with changes in sea temperature, the fish and shellfish spawning and nursery ground information in Coull *et al* (1998) is limited to traditional target species and is becoming dated. Fish larval surveys are taking place in Irish waters (Dransfeld *et al*, 2004) and the findings have been used where possible to update the information on fish spawning and nursery grounds in this report. Impact assessment of such fisheries sensitivities will not be possible without updated information on locally occurring species.
- Comparatively little is known about the numbers and distribution of marine mammals in the offshore environment, their use of the area and its resources, and their vulnerability to anthropogenic impacts of various types at different times of the year. Visual survey effort is currently limited offshore of the continental shelf break in autumn and winter due to poor weather conditions and reduced daylight hours. There is therefore a need for a strategic co-ordinated survey and monitoring programme based on good science. Irish scientists recently carried out a programme of acoustic monitoring to complement their broadscale visual surveys, and it would be useful if such work be continued over a wider area and throughout the year.
- The IWDG has highlighted the fact that a number of canyons on the southeast margin of the Rockall Trough are the only locations thus far surveyed in Irish waters which consistently show the presence of beaked whales year on year. The IWDG therefore recommends that a 12 month Passive Acoustic Monitoring (PAM) survey be undertaken, using an appropriate static device moored at a depth of at least 500m in the water column (as evidence suggests that some beaked whale species do not begin vocalising until they have reached such depths). This would assist in assessing the potential impacts of proposed seismic surveys on deep-diving species within these canyon systems. This recommendation relates to block numbers 16/27, 16/29, 17/22, 17/23, 17/24, 17/27, 17/28, 17/29 and 25/2.
- Existing MMO reports from seismic surveys have not been collated into the main body of knowledge on cetaceans. With suitable co-ordination and methods development, existing cetacean data gathering could be augmented by the MMO reports from seismic surveys. Approaches to acoustic disturbance mitigation measures in general (such as the benefits or otherwise of 'soft starts' and the utility of passive acoustic monitoring or other monitoring techniques) will benefit from ongoing research to evaluate the effectiveness of these measures.
- Very little is known about the existing levels of anthropogenic noise in the offshore area west of Ireland, and the significance of additional anthropogenic sound inputs on either fish or marine mammals.
- Further information on the timing and location of cetacean calving and migrations is needed. At present, SOSUS data have indicated the possibility of a winter migration to the south along the Rockall Basin for humpback whales in late winter or early spring, although there is no indication yet of any returning northward migration, and animals of the same species also appear to be present in the offshore area throughout the year. In addition, further information is needed on the possible location, prevalence and timing of beaked whale feeding grounds in deep-water canyon systems within the IOSEA3 area.
- Few data currently exist to identify foraging areas for seal species along the Irish Shelf, including the eastern edge of the IOSEA3 area. The first attempts to determine the offshore distribution of both common and grey seals in Irish waters, using tagging and satellite telemetry methods, began in 2006. A nationwide survey to assess the abundance and distribution of grey seals around Ireland's coasts has been carried out by NPWS and CMRC although the results are not yet available.
- Whilst much general information about the sea bed and benthos (including depth, topography and sea bed type) west of Ireland has been gathered in recent years, much analysis is still underway and is currently unavailable for environmental assessment.
- Comparatively little is known about the numbers and seasonal distribution of seabirds in the offshore environment, and their vulnerability to surface pollution at different times of the year. During the autumn and winter months, visual survey effort is limited to the continental shelf, but rarely extends into the deeper parts of the IOSEA3 area, due to poor weather conditions and reduced daylight hours.



- Block-specific data indicating seabird vulnerability to surface pollution is only currently available from JNCC Seabirds At Sea Team surveys from the 1990s, which only partially cover Irish waters. It is recommended that more recent CMRC seabird surveys looking at the offshore area west of Ireland should be used to update this information.

Overall recommendations

Overall recommendations - Data gaps and data management

- 1) The oil and gas regulators, including DCENR, should encourage the review of operational practices by industry and regulators alike on a regular basis, to facilitate the integration into decision-making of new scientific findings and technological advances that improve environmental performance and best practice as they come on stream.
- 2) The monitoring programmes and reporting resulting from implementation of this licensing programme should be consistent with OSPAR Agreement 2004-11 and designed to generate information and datasets that can support both strategic and site-specific approaches to environmental assessment. These datasets and information should be collated and held in an identified location, and be available to all interested parties.

Overall recommendations - Licensing and regulation

- 3) The Minister should, in certain circumstances, consider requesting the submission of a more detailed assessment up to and including an EIS. Criteria which might indicate or support this greater level of assessment could include:
 - distance from offshore European sites, coastline and international boundaries;
 - proximity to vulnerable concentrations of marine mammals or seabirds;
 - the presence of spawning, nursery and fishing grounds for commercially valuable fish and shellfish species;
 - proximity to features of ecological interest identified within Annexes to the Habitats Directive and OSPAR;
 - where proposed operations may significantly interfere with other sea users.
- 4) The communication and enforcement measures for exclusion zones around the sea bed infrastructure of the oil and gas industry (such as suspended wells and sub-sea field developments) should be reviewed and strengthened. The aim here is to improve mapping, information exchange, integration with fisheries monitoring procedures and interfaces with other marine users.
- 5) The existing regulatory framework and decision making process, as outlined in the Rules and Procedures documents of the DCENR should be updated with a view to greater clarity and transparency for the benefit of all stakeholders.

Overall recommendations - Seismic survey

- 6) The Steering Group recommends that seismic survey activities should not be permitted within the South West Porcupine Bank and the North West Porcupine Bank SACs. This is on the grounds that it cannot be precluded, on the basis of currently available scientific information, that such activities will not impinge on the integrity of these two sites.
- 7) Comparatively little is known about the numbers and distribution of marine mammals in the offshore environment, and their vulnerability to anthropogenic impacts. Visual survey effort is currently limited offshore of the continental shelf break in autumn and winter. There is therefore a need for a strategic co-ordinated survey and monitoring programme to expand current information and to develop seasonal maps of occurrence and sensitivity/vulnerability. It is recommended that proposals for a 12 month passive acoustic monitoring survey be considered, using moored static equipment to investigate the potential use made of the canyon systems on the eastern side of the Rockall Trough by beaked whales (relating to block numbers 16/27, 16/29, 17/22, 17/23, 17/24, 17/27, 17/28, 17/29 and 25/2).

- 8) The application for approval to conduct a seismic survey should include an assessment of the available information on all relevant ecological sensitivities, including for example fish, seabirds, mammals and other sea users including fisheries and shipping in the vicinity of the proposed survey. If necessary or appropriate, specific additional mitigation measures should be proposed.
- 9) Multiple surveys in the same area and at the same time should be combined into consecutive surveys through co-ordinated planning. The DCENR should work with operators to ensure that surveys are co-ordinated in this respect according to currently available best practice guidance from appropriate specialists.
- 10) If surveys must be carried out simultaneously, a separation distance of 100 km should be observed between survey vessels, so that marine mammals and fish have the chance to avoid these areas and migration routes are not impeded. This should be incorporated into the DCENR Rules and Procedures Manual for Offshore Petroleum Exploration and Appraisal Operations.
- 11) Notification of seismic survey activity planned within 100 km of each other or within 100 km of the Ireland/UK boundary should be exchanged between the appropriate licensing authorities. In considering applications for seismic surveys, the DCENR should also take account of similar activities being undertaken by the marine scientific research community.

Overall recommendations - Exploration drilling

- 12) The Steering Group recommends that drilling activities should not be permitted within the South West Porcupine Bank and the North West Porcupine Bank SACs. This is on the grounds that it cannot be precluded, on the basis of currently available scientific information, that such activities will not impinge on the integrity of these two sites.
- 13) Other carbonate mounds and habitats or species listed in Habitats Directive Annex I, II and IV and OSPAR Annex V in the Rockall Trough should be included for licensing at this stage, but treated as sensitive areas. Subject to recommendation 3) above being adopted, exploration drilling in these specific areas should be subject to EIS and regulated to avoid direct damage to such features and their biological communities. This will require appropriate site-specific survey.
- 14) In the event of a well being suspended, the competent authority will consider the need for the operator to install over-trawlable protection on a case by case basis. The nature and intensity of demersal fishing activities in the area, for example, should be taken into account in these considerations. The guidelines published by ICES (2005a) could be appropriate if such protection is being considered.
- 15) With regard to well testing, methods avoiding the need for flaring, such as closed chamber well testing systems, should be considered where possible.

Overall recommendations - Monitoring and reporting

- 16) The licensing authority should ensure that, where necessary, an appropriate monitoring programme be devised for evaluating the environmental impacts and efficacy of mitigation measures relating to the environmental issues that were identified as potentially significant in Section 6, Table 6.4 of this report. This should be carried out in consultation with appropriate statutory bodies and specialists.
- 17) The DCENR should continue to consult with relevant bodies in order to update the environmental monitoring framework and any gaps therein in light of this and other offshore SEAs.

Overall recommendations - Future oil and gas activity in the IOSEA3 area

- 18) In the event of Phases 1 and 2 of the current round being successful (ie that commercially viable hydrocarbon reserves are located) or by 2016, the competent authority should decide on the arrangements for follow-up SEA in the IOSEA3 area. This decision should be informed by up-to-date information (eg the DCENR activity level reports) and should potentially consider the full life-cycle of development from



exploration to decommissioning, with the aim of providing an integrated SEA framework for the individual EIAs that will be taking place.

Overall conclusions

The Draft Plan is to offer offshore blocks for hydrocarbon exploration in the current Frontier Exploration Licensing Round in the Rockall Trough. A strategic assessment has been carried out on the potential for environmental impacts, based on scenarios for the likely scale of activity, a literature search, a data gathering and acoustic impacts modelling exercise, and inputs from public consultation feedback combined with the expert judgement of the Steering Group, ERT and Aqua-Fact consultants and the Environmental Authorities. On the basis of the assessment conducted, certain constraints have been proposed. If these constraints, together with the mitigation, monitoring measures and recommendations are put into place, the Steering Group is of the opinion that the Draft Plan can be adopted and implemented without causing significant environmental impacts.