

Section 9

Cumulative and transboundary impacts from implementing the Draft Plan

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9.1 Introduction

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 IOSEA2 area. These may include, for example, seismic survey and exploratory drilling that pre-dates the Draft Plan, marine scientific research, commercial fishing, shipping and military activities. Some of the impacts assessed in Sections 7 and 8 have the potential to combine with each other, and should therefore be considered together or cumulatively in this section.

9.2 Noise

This section assesses the cumulative impacts of anthropogenic sound in the IOSEA2 area. Both seismic surveys and offshore drilling operations contribute to manmade sound in the marine environment, although the sound levels generated by former are inherently more significant than the latter. Other sources of sound in the IOSEA2 area include those of military vessels, super tankers and research vessels which, at times, all emit relative high levels of sound into the water column.

9.2.1 Cumulative impacts from seismic surveys

Tables 4.3 and 4.4 summarise the predicted seismic survey effort in the IOSEA2 area, for the period 2008 to 2014. The table shows that, between 2008 and 2008 levels of seismic survey activity are high, with an estimated total of 300 ship days per year during this period. This decreases to 144 days between 2011 and 2013 and to 57 days in 2014. The practical operational timing of seismic survey is weather dependent and, therefore, can effectively only take place during the summer months when the weather is most likely to be suitable. As a consequence, seismic surveys may overlap, particularly during the years where the predicted survey effort is greater than 3 months per year, which will be the case for most of the time.

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. Gordon *et al* (1998) 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 Porcupine 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 (McCauley, 1994).

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 appropriate planning and co-operation. If surveys must be carried out simultaneously, a minimum separation distance of 100 km should be observed between survey vessels, in order to create a corridor between the two surveys through which marine mammals and fish can avoid, or safely leave, these areas and migration routes are not impeded.

The short-term effect to whales subjected to multiple seismic surveys may be to move away from the sound source. Longer-term exposure, however, may cause habituation to such noises (Richardson *et al*, 1995).

9.2.2 Cumulative impacts from drilling operations

Table 9.2 shows the predicted maximum drilling activity in the IOSEA2 area for the period 2008 to 2014, expressed the amount of exploration, appraisal and development wells to be drilled and associated drilling time (assuming an average drilling time of 50 days per well).



Table 9.1 Maximum estimated drilling effort in the IOSEA2 area

Drilling activity	2008	2009	2010	2011	2012	2013	2014	Total
Number of wells	2	5	5	7	8	8	8	43
Drilling time (days)	100	250	250	350	400	400	400	2,150

The table shows that drilling activity will increase over the years, levelling out at 400 days per year. This indicates that multiple drilling operations will have to take place simultaneously, in order to accommodate the maximum level of drilling activity.

The sound levels and frequencies generated by a semi-submersible drilling rig or drill ship are in many ways comparable with those generated by a large merchant vessel. Sound transmission calculations estimate that a small proportion of any baleen whale in the area may respond to the drilling noise by avoiding the drill site up to a radius of 1 km. At certain times, multiple drilling operations are expected to take place simultaneously within the IOSEA2 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.

9.2.3 Cumulative impacts of seismic and drilling activities

It is likely that, at certain times, seismic survey and drilling operations will take place simultaneously within the IOSEA2 area. Baleen whales, beaked whales and seals are thought to be the most sensitive marine mammals to the low frequency sound and are predicted to show avoidance reactions from 2 to 20 km from a seismic sound source and within 1 km of a drilling source. Fish avoidance reactions to seismic survey might be expected within 11.5 km of the source, though evidence of fish avoidance at greater distances has been reported.

Both seismic survey and drilling activity are temporary and of short duration. It is unlikely, therefore, that there will be any significant cumulative impacts resulting from the interaction of these two sound sources. However, it must be stressed that the long-term implications of such noise sources, or their cumulative and synergistic interactions, are unknown.

9.2.4 Cumulative impact of seismic and drilling activities with other users of the sea

Other users of the IOSEA2 area may include merchant shipping, fishing, marine scientific research, and naval vessels. Table 7.2 in Section 7 shows some indicative sound levels of various users of the sea. This table shows that, in general, sound levels of all these users are attenuated to below levels expected to cause any effects on marine mammal or fish behaviour within 1 km from the source (with the exception of seismic surveys).

With a 500 m exclusion zone in place around each drilling rig, the interaction of underwater drilling noise with those noises generated by other users of the sea is unlikely to cause a significant cumulative effect, due to the transitory and temporary nature of the various other activities. In addition, any other vessel in the vicinity, with the exception of those vessels servicing the rig itself, will be passing, and any cumulative effect will be of short duration.

Due to the high sound levels generated by seismic surveys, underwater sounds are more likely to interact with other users of the sea at some level. However, any interaction with passing vessels is expected to be of short duration, and no significant cumulative impacts are expected to arise as a result of such encounters.

Transboundary impacts

The nearest transboundary line is that between Ireland and the UK and lies over 160 km from the IOSEA area. Any sound generated by seismic surveys or exploration/appraisal drilling operations is expected to attenuate to below natural background levels before it reaches the transboundary line. Therefore no transboundary impacts are expected to occur from any exploration and/or appraisal operations in the IOSEA2 area.

9.2.5 Conclusion

The long term, synergistic and cumulative impacts of sound sources in water are poorly understood. As a result, the introduction of additional low frequency noise into the marine environment from seismic surveys in the IOSEA2 area should be considered to have the potential to create a cumulative effect. However, the relatively short duration of the activities and relatively small radius of predicted

effect suggests that seismic surveys and drilling operations are expected to have a limited temporal and spatial impact on the marine mammal and fish populations when appropriate mitigation measures are in place.

9.3 Discharge of drill cuttings and disturbance to sea bed

Drilling activity within the IOSEA2 area has been low historically, with some 30 wells drilled to date. As discussed in Section 8.3.2 the extent of sea bed disturbance impacts potentially arising from the oil and gas industry amount to a very small proportion of the 63,500 km² IOSEA2 area. In addition, the temporary nature of anchoring impacts, and the very localised extent and low toxicity of discharged drilling wastes on the sea bed, lead to good recovery potential in the dynamic benthic environment of the IOSEA2 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, sea bed features or notable archaeological interests are present.

Other activities taking place within the IOSEA2 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 IOSEA2 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 IOSEA2 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.

9.4 Atmospheric emissions

9.4.1 Cumulative impacts of emissions from seismic survey

The annual emissions resulting from seismic survey activity in the IOSEA2 area would result in potential emissions of 10,609 tonnes CO₂ equivalent for 197 survey ship effort days per year. Emissions of CO₂, NO_x and SO₂ from shipping in and around Ireland have been estimated in Entec (2005) and are summarised in Table 7.6. These show that the assumed annual seismic survey effort in the IOSEA2 area would make up 0.39%, 0.31% and 0.03% respectively of the total forecast shipping emissions for 2010. In this context, the predicted atmospheric emissions from seismic survey activity in the IOSEA2 area between 2008 and 2014 can be considered to be minor, and therefore its resulting impacts are expected to be insignificant.

9.4.2 Cumulative impacts of emissions from drilling activity

The annual emissions resulting from the drilling of a potential six wells per year (including three with full well tests) would result in potential emissions of 82,204 tonnes CO₂ equivalent. Against the figure of 68.4 million tonnes CO₂ equivalent for Irish emissions for 2004, the annual emissions from the proposed annual drilling activity in the IOSEA2 area would be just 0.12% of total annual Irish emissions, which is considered to be insignificant.

9.4.3 Cumulative impacts of combined emissions from seismic and drilling activity

The combined emissions on an annual basis from both seismic survey (10,609 tonnes) and drilling (82,204 tonnes) activities in the IOSEA2 area amount to 92,813 tonnes CO₂ equivalent. This equates to 0.14% of the total annual Irish emissions for 2004 (EPA, 2006a).

9.4.4 Transboundary impacts drilling

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 in Section 9.4.3, the combined annual emissions anticipated from both seismic survey and drilling amount to 92,813 tonnes CO₂ equivalent. This equates to 0.14% of the total annual Irish emissions of 68.4 million tonnes CO₂ equivalent for 2004 (EPA, 2006a).

Shipping emissions in the UK over the last ten years have fluctuated between approximately 1.5 to 2.0 million tonnes carbon dioxide equivalents (DEFRA, 2006). Set against this, and against the almost 200 million tonnes of carbon dioxide arising from European-flagged ships in 2000, the annual and total emissions estimated to result from the proposed seismic survey are low by comparison. There is also a much higher level of exploration activity generally underway in the UK, and the impact of any emissions crossing over from exploration activity in the IOSEA2 area will be minor compared to these. For comparison, the total GWP of emissions from UK exploration activity in one year amounted to approximately 551,437 tonnes CO₂ equivalent (EEMS, 2004), although it should be noted that the UK Environmental Emissions Monitoring System (EEMS) only covers drilling rig fuel use and well testing, and excludes data on support vessels and helicopters. Within this framework the increases in atmospheric emissions resulting from the proposed seismic and drilling activity can only be viewed as negligible.

9.5 Physical presence

9.5.5 Cumulative effects of physical presence of seismic and drilling activities

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 information in Section 4, 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 IOSEA2 area would amount to 240 km² per day being excluded to other sea users for 197 days per year over the period 2008 to 2014. This is equivalent to less than 0.5% of the 63,500 km² offshore area covered by the Draft Plan per day.

In the case of drilling, up to 43 wells over 7 years (just over six 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 63,500 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 along with pre-existing activities could be to exclude other sea users from up to approximately 245 km², or less than 0.5% of the IOSEA2 area.

Within the IOSEA2 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 of these various users in the IOSEA2 area do not change significantly when considered in combination.

9.5.6 Transboundary impacts

There is little transboundary impact likely to arise from seismic vessel activity within the IOSEA2 area. However, the proposed activity may have the potential to interact with shipping travelling through the area to or from other European ports. In addition, it is possible that some of the seismic vessel activity in the IOSEA2 area will be based in ports in other European States.

9.6 Accidental events

9.6.1 Cumulative and transboundary impacts

The total draft plan and existing exploration activities forecast for the IOSEA2 area indicate a maximum of 43 exploration, appraisal and development wells will be drilled between 2008 and 2014. 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 nearest transboundary line is over 160 km east of the IOSEA2 area. Land's End in Cornwall is the closest UK landfall some 380 km to the south east of the IOSEA2 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 is currently finalising a Service Level Agreement for co-operation on search and rescue and oil spill response. Recently the Irish Coast Guard and the UK MCA concluded a joint search and rescue and oil spill response exercise off the Donegal coast.

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.