Hornsea Project Three
Offshore Wind Farm

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Appendix 4 to Deadline 10 submission - Applicant's response to Spirit Energy Matters Not Agreed at deadline 9

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Hornsea 3
Offshore Wind Farm

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Front cover picture: Kite surfer near a UK offshore wind farm © Ørsted Hornsea Project Three (UK) Ltd., 2019.

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Applicants response to Spirit Energy Impact on Matters Not Agreed

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1.	**ALARP**	
1.1	Matter not agreed: Spirit Energy submit that the Applicant is required to demonstrate that the risk to personnel supporting Spirit Energy's operations will remain ALARP.	
1.2	A small increase in risk to personnel will arise as a result of - (a) Personnel spending more time on NUI's than they would have done had windfarm array not been present (b) Greater risk of vessel allision as a result of the presence of the windfarm (c) Greater risk of vessel allision as a result of windfarm construction traffic – especially larger vessels.	(a) The Applicant maintains that the Environmental Statement (ES) has considered the effect on helicopter operations in regard to EN-1 part 5.4, EN-3 part 2.6, and CAP 764 and it is the Applicant's case that these policies do not impose an "additional test" on the Applicant to undertake an "ALARP assessment" as asserted by Spirit Energy (see the Applicant's response to ExA Q2.5.13 at Deadline 4; REP4-012). The reference to "as low as reasonably practicable" in EN-3 should be attributed its ordinary meaning, and not interpreted so as to require the Applicant to perform an ALARP assessment within the meaning of the HSE Regulations. Nonetheless, Section 8.11, Volume 2, Chapter 8: Aviation, Military and Communication of the ES (APP-113) presents an assessment of whether the project results in a change to the ability to carry out operations safely, and has taken consideration of EN-3, paragraphs 2.6.183 and 2.6.184, in that no unacceptable risk has been introduced by Hornsea Three, thereby ensuring risk is reduced to as low as reasonably practicable. The Applicant considers that the restriction in access to the Spirt Energy operated platforms as a result of Hornsea Three is not significantly more than the restriction that the platforms experience anyway in regard to weather (an annual average increase of 3.5%; REP9-053. The Applicant does not consider therefore that there is a significantly higher percentage of time that personnel will remain on the platforms as a result of Hornsea Three. In addition, the Applicant considers that the application of shift patterns to the analysis of the J6A data as applied by Spirit Energy (see REP9-053) which has resulted in the Applicant having a slightly higher value than the Applicant in regard to restricted access to the NUI's of 5 % is not applicable in this

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		case. In such a case where a person may potentially be left over night on a NUI and Spirit Energy consider this a safety risk, then a helicopter will be made available outside of the regular shift pattern to collect that person, which has not been accounted for in their calculations. The Applicant also maintains that remaining on a platform cannot be a safety issue but is a comfort issue as the platform has a safe place of refuge which must comply with HSE regulations (in particular PFEER Regulation 13). (b) Fishing and recreational vessels are expected to navigate internally within the wind farm, as discussed in the NRA. Passing vessels currently transit the propose site in low numbers, mainly in an east-west direction. These vessels are expected to be displaced by the wind farm based on experience of existing wind farms and consultation, where no traffic survey and no consultee feedback indicated vessels would navigate inside the layout. This is in-line with MCA guidance (MGN 372), which recommends it to be prudent to avoid the area if sea room is available, which it is. East-west vessels are expected to route both north and south around the Hornsea Three array, increasing their current passing distance to the NUIs. North-south vessels are less frequent and expected to use the channel designed between the Hornsea One/Two and Hornsea Three arrays since it is the most efficient route, This will result in the low number of vessels passing at a greater distance on average from the NUIs. Any vessels on a projected course to pass within 500 metres of the NUIs will be able to be monitored and (if they reach 20 minutes) sound an alarm in the J6A control room. Currently the number of alarms is low and mainly from fishing vessels. The alarms from commercial vessels are expected to reduce due to the displacement effect of the wind farm. c) The wind farm will introduce new vessel traffic in the area, with the busiest period

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		being during the temporary construction phase. However, this will mostly be remote from the NUIs, i.e., inside the wind farm to the west. Strict procedures will be in place to control the movements of such vessels which will mitigate the risk of a powered or drifting incident. The highest risk will be to the wind farm structures (metres away), rather than remote oil & gas platforms (kilometres away), therefore, it is in the Applicant's interests to safely control these vessels. Wind farm vessels will be carefully selected, vetted, audited, monitored, and required to follow strict operating procedures including allowable weather limits (REP7-010). This is particularly the case for large units such as jackup barges where weather windows (with contingency) will be required for their operation inside the wind farm.
1.3	Increased non-availability of flights (see 2 below) increases the risk of personnel spending longer on NUI's. Absent an ALARP assessment undertaken by the Applicant, *Spirit Energy calculate that ALARP would be achieved if no turbines are placed within 6nm of the NUIs.*	The Applicant maintains that the restrictions on access to the NUIs is not significant (discussed further in response to comment 2.2 below) and is an operational effect not a safety issue. The Applicant maintains that under the current EIA regulations and national planning policy ENI-1 and EN-3 for aviation assessments, there is no requirement for the Applicant to carry out an additional ALARP assessment on a Safety Case operated by Spirit Energy. An ALARP assessment is an economic consideration (consideration of ALARP as defined by HSE (2018) involving weighing a risk against the resource, time and money needed to control it). Therefore, it is not a judgement that the Applicant is able to make on a document owned by Spirit Energy. The Applicant has requested but not seen the safety case of either the Chiswick or Grove platform. The Applicant has therefore no knowledge of how ALARP is defined for either platform. What the Applicant does know is that what is evident in the public domain is that there are alterations that could be made to the platforms which would increase the safety of these platforms (i.e. the requirement for Touchdown and Positioning Marking circle and Heliport; identification lighting to be fitted at the

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		Chiswick platform; and automatic fire fighting facilities to be fitted at both NUI's). Spirit Energy have also, through the examination phase, referred to the platforms as aging structures requiring greater maintenance. It is impossible therefore to guess at how ALARP is set by Spirit Energy. What the Applicant does know is there is no increase in safety risk arising as a result of Hornsea Three due to flights to and from the NUIs as quite simply (and in Spirit Energy's own submission) if it is not safe to do so, the pilot will not fly. Therefore, whether there is a 1.5 nm or a 6 nm separation distance does not affect the safety risk to the platforms, it affects the operational ability to access the platforms. Moreover the 2.8 nm separation distance (offered by the Applicant) to the Chiswick platform provides far greater flexibility to Spirit Energy and results in only a 3.5 % restriction in flights, which the Applicant maintains is not a significant increase in flights which are restricted due to weather anyway, i.e. 8.6 % of the time (see REP9-051, with update provided at Appendix 3 to the Applicant's response to Deadline 10).

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1.4	Spirit Energy are of the view that allision risk will be increased by some ships electing to pass to the east of the array under some weather conditions. The risk to personnel on the NUI's may be mitigated by early warning from radar / AIS, a matter on which Spirit Energy and the Applicant are now agreed but it is likely that there would still be an increased risk. *Spirit Energy believe that provision of a 2nm corridor between the array and its permanent platforms would further mitigate this risk to maintain current ALARP levels.*	Based on the NRA, this is not expected as north-south traffic is limited and there are alternative routes available in normal and bad weather such as inshore (typically used in bad weather) or via the channel designed for north-south traffic to the west of Hornsea Three (designed in consultation with the MCA and Trinity House, and suitable for use in all weathers). Therefore, any such routeing would be an infrequent event and, in any case, vessels would be outside the wind farm and able to be monitored by the J6A REWS (both on radar and AIS). Based on this, there is no justification for a channel to the east of the wind farm due to the lack of any current or future route. It is further noted that it is illegal for a Master of a third-party vessel to deliberately pass within 500 metres of an oil & gas installation on the UKCS, potentially facing two years imprisonment. Therefore, an occasional vessel routeing east of the wind farm will no doubt be aware of the NUIs (installed for over 10 years) and plan to pass at a safe distance.
1.5 Impact upon Spirit Energy: Should the ExA decide that risk to personnel is not required to remain at current ALARP levels, each of the platform safety cases will need to be revised with a full quantitative re-analysis of risks. The cost of this would be of order £500k per platform and the costs of any additional mitigation measures are unknown.		
Hornsea Three Response The Applicant maintains that Spirit Energy are the Duty Holder of the safety cases for their NUI's and therefore they are responsible for the maintenance of the safety cases. The safety cases are live documents and it is the responsibility of the operator to update them every time there is a change to operations which may result in a change in safety risk. Spirit Energy are required therefore to update their safety cases regularly and, in any case, every 4 years. Therefore, to the extent that the safety case needed to be reviewed as a result of Hornsea Three, this could be undertaken as part of the regular review, without significant additional burden. The Applicant has requested but never seen the safety case, or how the restriction on flights is integrated into that safety case. In the event there is a component of the safety case that would require updating as a direct result from restriction to flights resulting from Hornsea Three, the Applicant would require a 3rd party verification process to be able to consider any compensation mechanism.		

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2.	**Impact of array proximity on operations (aviation)**	
2.1	Matter not agreed: Space requirements around each of Chiswick and Grove platforms and subsea wells C6, C7, G5 and Kew	
2.2	Following extensive consultation, including discussion with helicopter operators, a set of minimum distances for take-off and landings under different conditions have been calculated (Spirit Energy Deadline 7 Submission, Appendix 4). The basis of the calculations is agreed between the Applicant and Spirit Energy. These distances have yet to be accepted by helicopter operators who have already indicated that they may add some safety margins. Simulator flights are being arranged with the helicopter operators to facilitate their making a full assessment.	The Applicant has identified a restriction in the ability to conduct straight in Airborne Radar approaches (ARA), including the ability to carry out a Missed Approach Procedure or One Engine Inoperative (OEI) in certain weather conditions, to the Spirit Energy operated assets, the Chiswick and Grove platforms. The Applicant identified a small, but not significant increase in the number of days that flights would be restricted to the Chiswick and Grove platforms at 1.5 nm to the Chiswick platform, and 2.4 nm to the Grove platform as stated in the Environmental statement and validated through the Examination (see REP9-051, with update provided at Appendix 3 to the Applicant's response to Deadline 10). The Applicant however sought to address the issues presented by Spirit Energy and in the spirit of co-existence, provided an offer to Spirit Energy of a 2.8 nm exclusion zone around the Chiswick platform to enable a greater degree of flexibility for both approaches and take offs from the platform. The Applicant advises that this is **not a minimum separation distance** as stated by Spirit Energy but an agreed separation distance (REP9-053) subject to validation to provide additional comfort to Spirit Energy. The Applicant also asserts that as the result of any validation no greater separation distance will be required for the same availability of flights. The Applicant advises that a separation distance of 2.4 nm provides sufficient space to undertake a Circling ARA which provides a greater degree of flexibility to approach both the Chiswick platform and Grove platform. Regarding take-offs, the Applicant has calculated a required distance of 1.81 nm for the worst-case scenario with a headwind of only 10 knots, taking-off at a mass of 6400 kg and an engine failure occurring on rotation from the helideck. The Applicant considers this a highly unlikely scenario (which

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		has not occurred in the North Sea) as the helicopter operators are required to demonstrate, through a combination of engine reliability data and usage monitoring, that the probability of an engine failure during the short Exposure Time is $<5x10^{-8}$. It should be noted that the worst-case scenario requires an exact and very specific combination of wind direction and speed. If the wind drops below 10 knots a take off can be made in any direction, and if the wind speed increases from 10 knots the distance required to reach MSA would be decreased. Take offs are required to be VMC however the addition of a 1nm IMC buffer, providing a separation distance of 2.8 nm ensures that take offs with a full suite of passengers could be flown in all directions and into IMC. The Applicant therefore advises this is an unlikely event which is informing the maximum separation distance required. Considering this separation distance, the Applicant and Spirit Energy have been able to bring the number of days potentially restricted by Hornsea Three to within a 1.5 % difference (see REP9-053). The remaining difference is considered to be due to disagreement in regard to the criteria used to define icing conditions and disagreement in the application of shift patterns to the data (see REP9-053). Following consultation with helicopter operators the Applicant and Spirit Energy have been able to able to agree on the basis of the calculations. Fundamental differences have been aligned which include: • Agreement has been reached on the regulations underpinning the assessments. The regulations that should be used to underpin the assessments have been agreed to be EASA as used by the Applicant and not IOGP as previously used by Spirit Energy; • Agreement has been reached on the availability of alternative flights to the platforms, that can be flown within the regulations, namely an en route descent, a shuttle flight and a circling ARA; • Agreement has been reached on the use of a common data set for assessing the percentage of days restricted, agreed to be the J6A met data provided by Spirit

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		Energy; and • Agreement has been reached on the IMC conditions which require an airborne radar flight to be flown. The Applicant submitted a set of footprints (available approach and take off distances; REP7-056) which were agreed by Spirit Energy (REP7-093) and provided to the helicopter operators for their review. Spirit Energy whilst agreeing to the footprints presented by the Applicant (REP7-056) caveated their position requiring validation by helicopter operators and a simulation trial to be flown to evaluate pilot workload and environmental factors such as turbulence (REP9-053). The Applicant agrees with Spirit Energy that the footprints should be validated by the helicopter operators and the Applicant has sought to do so and has responded to the feedback received. Feedback from the helicopter operators has been sought through the organisation of a meeting with CHC and a helicopter operators' workshop and feedback has been requested on the footprints provided (REP7-093). The Applicant has responded to the points raised by one operator, and is not aware of any other responses that have been made on the footprints as alleged by Spirit Energy. The deadline for receiving responses was provided to the helicopter operators at 25 March 2019. In regard to take offs two issues were raised by the helicopter operators in regard to weight and air speed. CHC asked for the requirement for a 7000 kg take-off weight for the AW139 to be considered but subsequently agreed that 7000 kg is not a realistic take-off mass as it does not provide out-of-ground effect hover performance, which would be a reduction in safety compared to the current performance available. The Applicant considers therefore that the weight used in the footprint presented by the Applicant (and agreed with by Spirit Energy in the slides presented at the ISH8; REP7-093) of 6400 kg is a realistic worst case for the Chiswick platform. For the AW139, operations at 6400 kg are only required for a take-off into immediate IMC on a westerly

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		direction. Using met data from the J6A platform provided by Spirit Energy, westerly wind conditions with a cloud base below 600 ft occur for less than 6% of the time. When the cloud base is 600 ft or higher, an earlier turn in VMC can be made and so operations at up to 6800 kg are available. Therefore, even if Spirit Energy consider a greater weight is required at take-off, this would result in a weight restriction for a certain take off direction in IMC for a limited period of time, it would not require a greater separation distance from the turbines. In regard to the second comment from CHC, a wind speed below 10 knots (and therefore of 0 knots as requested by CHC) would enable take off to be in any direction resulting in the removal of any restriction and not requiring take-off to be towards the wind farm. In regard to the Circling ARA, the Applicant and Spirit Energy agree with the footprint available for a circling ARA of 2.42 nm but there is disagreement in regard to Spirit Energy's assertion that if there is any chance of becoming IMC, an additional 1 nm would need to be added (i.e. a footprint of 3.42 nm). The Applicant advises that during a circling approach the helicopter will be operating under VFR in order to conduct a circle and so the 1 nm IFR avoidance criteria is not required. Visual reference is required with the landing site at all times. If the pilot is not able to maintain VFR at the MAP a go around will be conducted. Feedback from the helicopter operators was sought on this footprint and the only comment was received from CHC which noted that descents at night and in Degraded Visual Environment (DVE) will require a 2 nm set up. This comment relates to getting visual at the MAP (as for the circling approach) and then the ability to conduct a stabilised visual approach. The Applicant considers the requirement to set up a 2 nm final from any direction, is met for a VFR approach in DVE as sufficient space is available (at 2.8 nm), even though does not consider that this type of approach is applicable to a circling approach. The standard ARA circling approach, with a visual reference at less than 2 nm, will remain applicable which is available as confirmed by the helicopter operators and within EASA regulations.

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		In regard to the validation of pilot workload by a simulator the Applicant disagrees with this approach. The diagrams of approach distance requirements (or footprints) provided by the Applicant are based on standard regulatory requirements and the Applicant does not therefore understand the need to fly these in a simulator as they are standard profiles flown every day by the helicopter operators. They do not require any change to procedure or modifications to the operators' operations manuals. As such, the standard regulatory requirements used by the Applicant have already gone through robust and extensive validation tests conducted over time by the aviation industry. For the simulator trial under discussion for Hornsea Three, it is not expected that any increase in workload will occur as the helicopter will be flown using the autopilot upper modes, as per industry guidelines. The flight profiles proposed for the trial are no different to those currently flown and so again no increase in workload should occur. Secondly, the performance model in the simulator should use the same source data as the Flight Manual performance graphs which have been used by the Applicant and Spirit Energy (Submitted by the Applicant at REP7-056) to calculate the take-off distance required. Therefore, as the same source data will have been used the trial results should replicate the calculations agreed by the Applicant and Spirit Energy. If a simulator is used to test pilot workload it requires careful planning as detailed in Applicant's submission clarifications at Deadline 9 (REP9-030) and a number of suitably qualified pilots employed on the trial if it is to provide meaningful results. Despite the Applicant's reservations in regard to the use of a simulator the Applicant has advised that they are willing to work with Spirit Energy on a simulator trial, if this is what they see as essential for their validation process, on the condition that it is set up using a robust methodology and it occurs when sufficient time is available for both parties to plan the trial, when more simulator time is made available and all the operators' test pilots are available. Whilst Spirit Energy have been able to secure a simulator and advise in this submission that they are progressing with a simulator trial, they know that the Applicant's advisors

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		are not available at this short notice to provide sufficient input into the planning or the trial itself. Furthermore, it is the Applicant's understanding that only 4 hours of simulator time has been made available and only one of the operators' test pilots is available for the short notice trial. Therefore, it is unlikely that any trial conducted in such a manner and without the input from the Applicant's expert advisor, will not be fit for purpose. The Applicant reiterates that in any case if the simulator trial is done correctly it will not present any new information outside of what is already known and has been agreed between both parties. In regard to validation of environmental factors such as turbulence, the Applicant advises that this cannot be realistically modelled in a simulator. As the Applicant has advised (see position statement on Turbulence; REP7-042) what is required by the industry to verify that –turbulence is not an issue, is real time measurements of turbulence on large wind farm arrays such as Hornsea Three. The Applicant notes that a 1 nm IMC buffer has, in any case, been provided for the worst case take of in the provision of a 2.8 nm separation distance to Chiswick platform.
2.3	The Applicant and Spirit Energy have independently undertaken analyses of the same met- ocean dataset and have arrived at broadly similar results that show that the impact upon Spirit Energy's operations is critically dependent upon the distance of the array from Spirit Energy's facilities. Using the minimum distances (i.e. those calculated but now subject to validation in simulator trials and acceptance by helicopter operators), the impact may be summarised below[1]. The table shows, that with no windfarm, flights are possible 97% of the time. With the windfarm in proximity, the proportion of days upon which flights can be conducted is reduced. The fourth column expresses this reduction as a percentage of flights that would otherwise have been available were there no windfarm. In the fifth column, this percentage is	The Applicant agrees that the analysis undertaken of the J6A data by both the Applicant and Spirit Energy have been able to arrive at broadly similar results in regard to the effect of Hornsea Three at a distance of 2.8 nm from Chiswick Platform (see REP9-053). However, the Applicant does not agree with the values presented by Spirit Energy for the level of restrictions at closer distances than 2.8 nm and particularly at a distance of 1.5 nm from the Chiswick platform. The Applicant maintains that the ES is robust and that the level of restricted flights presented in the ES have been validated against the J6A data and the Applicants met ocean data (see REP9-051, with updated version at Appendix 3 to the Applicant's response to Deadline 10). The Applicant maintains that the assumptions and available flights put forward in the ES have been validated by the helicopter operators (REP7-010) and it is Spirit Energy that have had fundamentally to align with the Applicant's position as laid out in the paragraph above.

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	converted into the number of days per year (that would otherwise have been available) on which it would not be possible to fly a crew to a NUI and back at the end of their working shift. The sixth column shows the average delay (in days) in being able to fly personnel to a NUI for a working shift. The final column calculates the estimated loss of production revenue arising from delays to flights required to restore production following unplanned shutdowns. The calculation takes into account that in 2017 (regarded as a representative year) there were 66 such unplanned visits to Chiswick. Assuming that the percentage given in the fourth column of these flights would be delayed and using the average delay (based on the met-ocean data) before flights can be resumed (shown in the sixth column), the overall delay is calculated. This is then multiplied by the daily production revenue (taken from Woodmac who are independent industry analysts) to arrive at the lost revenue.	The Applicant therefore continues to maintain that the results of the assessments presented in the ES are valid and correct and that there is not a significant effect on flights to either the Chiswick or Grove platforms as a result of Hornsea Three. The Applicant however sought to address the issues presented by Spirit Energy and in the spirit of co-existence, provided an offer to Spirit Energy of a 2.8 nm exclusion zone around the Chiswick platform to enable a greater degree of flexibility for both approaches and take offs from the platform (see above). Spirit Energy have only offered "minor modifications" since the Deadline 7 submission have been made as to why the calculations following further discussion between the Applicant and Spirit energy on 20th March", as to why the values presented in the table of the percentage of restricted flights have changed so much from the numbers presented at Deadline 7 (see REP7-093). As can be seen in the Spirit Energy Deadline 7 submission, the percentage restriction at 1.5 nm is stated to be 66% which at Deadline 9 (REP9-077) has been increased to 80%. The percentage restriction at 2.5 nm as seen at D7 is 9 % and has been increased to 35% (REP9-077). The restriction at 2.8 nm which was discussed with Spirit Energy on 20 March and presented in the joint position statement (REP9-053) has however been reduced to a figure understood by the Applicant (but still with a margin of error) from 9 % to 5%. The discrepancy in percentages for distances less than 2.8nm do not align with the J6A data that has been analysed based on the agreed weather minima (REP9-053) and the agreed availability of flights (CHC meeting and meeting workshop notes; REP7-049). In any respect, as the Applicant has provided Spirit Energy with a 2.8 nm buffer around the Chiswick platform, the values less than 2.8nm become irrelevant for this platform and a value of less than 2.4 nm becomes irrelevant for the Grove platform. Further discussion in regard to the Grove platform is provided in section 5.1. The Applicant maintains that the values are irrelevant for the distances to the subsea wells as the wells do not require the same access as an above sea platform for the reasons outlined below.

Distance to windfarm (nm)	No windfarm	With Windfarm	% of available flights lost	Lost flights due to H3 (days)	Average time (days) until Flights can be resumed	Lost Revenue based on lost time to restore (£million)
3.5	97%	92%	5%	16	1	0.6

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3.3	97%	92%	5%	16	1	0.6
3.1	97%	92%	5%	16	1	0.6
2.9	97%	92%	5%	16	1	0.6
2.8	**97%**	**92%**	**5%**	**16**	**1**	**0.6**
2.7	97%	74%	23%	78	1	4.5
2.5	97%	63%	35%	119	2	8.0
2.3	97%	47%	51%	172	2	16.9
2.1	97%	35%	63%	214	3	28.5
1.9	97%	35%	63%	214	3	28.5
1.7	97%	23%	76%	257	5	54.4
1.5	**97%**	**19%**	**80%**	**271**	**6**	**67.4**
1	**97%**	**11%**	**89%**	**300**	**10**	**124.8**

In regard to the calculations presented by Spirit Energy, the Applicant does not understand how Spirit Energy have calculated that a 5 % restriction on flights equates to a 0.6 £million loss in revenue. In the first instance the value provided of a 1-day average delay caused by any restricted flights is simply not correct. Spirit Energy have assessed the ability to access flights using 12-hour shift patterns which the Applicant does not agree with (see REP9-053). In the instance of an unplanned event requiring a call out significant enough to stop production if not attended to, surely it is quite apparent that a flight would wait for weather conditions to improve and then to proceed at any time in the day and indeed even in the night, now that availability has been established at the Chiswick and Grove platforms.

The Applicant understands that 66 unplanned visits may have been made to the Chiswick in one operational year as reported by Spirit Energy, but is mindful of how many of these were actually significant enough that if delayed by one day would result in a loss of production, considering that the platforms experience an 8.6 % weather restriction in any case (see REP9-051, with update provided at Appendix 3 to the Applicant's response to Deadline 10). The Applicant notes that no value has been provided for the Grove platform.

The Applicant also questions the validity of the numbers presented in the final column as it appears that Spirit Energy have assigned the same percentage loss in revenue in regard to restricted access to an above-sea installation (the Chiswick platform for example) which is designed to be readily accessed, as to a subsea installation (G5 well for example) which, by the simple fact it is subsea, is not designed to be readily accessed.

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2.5	It can be seen that, setting aside consideration of ALARP (see 1 above), there is a rapid change in impact as the distance exceeds the minimum distance required for take-off (calculated to be 2.81nm). In this table, the losses resulting from the array being no less than 2.8nm from any installation to which helicopters need to fly may be considered to be reasonable in the spirit of coexistence. Conversely, the level of disruption (e.g. >25% of flights being unavailable) with less separation between any vessel or installation that requires helicopter access would not be reasonable and at a distance of 1.5nm as originally proposed by the Applicant, losing 80% of flights would be quite unmanageable. It should be noted that should the helicopter operators add any additional safety margin to the minimum distances calculated then a corresponding increase would be required in separation between installations and the windfarm array in order to achieve successful coexistence.	As explained in the Applicant's response at section 2.4 above, the values provided at a separation distance of less than 2.8 nm by Spirit Energy do not align with the J6A data and the assumptions agreed to be used by the parties. It is noted that no explanation as to why this has changed from their last submission at Deadline 7 (REP7-093). As the Applicant has provided Spirit Energy with a 2.8 nm buffer around the Chiswick platform, the values less than 2.8 nm become irrelevant in any case for this platform, and the values less than 2.4 nm become irrelevant for the Grove platform. The Applicant maintains that the values provided for access restrictions to the Spirit Energy operated sub-sea wells are incorrect and that there is available access to all these wells in accordance with the weather minima as agreed between the Applicant and Spirit Energy (REP9-053) and as explained in 4.3 below in regard to C6 and C7 and in 6.2 below in regard to the Grove well head. The values of economic loss are also not applicable to the subsea wells as the wells do not require the same access as an above-sea platform explained in section 4.3 below in regard to C6 and C7 and in 6.2 below in regard to the Grove wellhead.

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	During construction, decommissioning and whilst drilling or performing well interventions (at the NUIs or at subsea well locations), the vessels used require to be accessible by helicopter as there is generally a need for frequent changes in personnel (as different skills and specialisms are required).	All rigs and vessels may at some time require crew changes or personnel changes, dependant on the type of rig or vessel and operation being performed. Rigs and vessels are able to operate in close proximity to other obstructions, including oil and gas platforms and wind farm arrays, and flights are accommodated to cater for the environment for each specific scenario. In certain cases, flights may be VMC restricted or daylight restricted, or they may be restricted for certain take off and approaches. These are all standard operational conditions which the North Sea helicopter operators are familiar with. There are also other alternative means of access now increasingly being used in the North Sea which involve walk2work vessels. The Applicant is able to assess access to fixed installations such as the Chiswick and Grove platforms. The Applicant has been advised by the helicopter operators that it is typical to fly to one fixed installation and then shuttle to another vessel or rig if access is restricted. In this instance it is considered that a rig or vessel operation within a 10 nm radius of either the Chiswick or Grove platform can be accessed from these platforms via a routine shuttle in most weather minima (see REP9-051). In addition, the Applicant also advises that the SAR helicopters operate to a wider weather window than the CAT helicopters, enabling a wider flexibility in emergency provision.
Impact upon Spirit Energy: If the array were permitted to be *at less than the distances helicopter operators determine is required to execute the majority of take-off and landing manoeuvres* (assumed in this analysis to be 2.8 nm but some operators have already signalled a need for greater space) from offshore installations and vessels, Spirit Energy would effectively be unable to rely upon helicopter support for its operations. As illustrated in the table above, this is likely to make production from the existing NUIs unviable. As frequent movement of equipment and personnel is required during drilling, construction and decommissioning activities (e.g. the current drilling activity at Chiswick is serviced by two flights per day to the rig – typically between 50 – 100 personnel will man a drilling rig) essential operations at the subsea installations would also not be viable		

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Hornsea Three Position The Applicant considers the position put forward by Spirit Energy unhelpful, in that the Applicant has provided a separation distance of 2.8 nm from the Chiswick platform and so it is not the case that there will be less than 2.8 nm provided at this installation. The Applicant has also provided a 2.8 nm protected area at the Grove platform for the reasons provided in response to comment 5.1 below. The Applicant does not consider the necessity to provide 2.8nm at the existing wells for the reasons outlined in response to comment 2.2 above and does not consider the necessity to provide 2.8 nm at the aspirational wells for the reasons provided in response to comment 4.3 below.		
3.	**Impact of array proximity on operations (shipping)**	
3.1	Matter not agreed: Space requirements for 3rd party and Spirit Energy vessels around each of Chiswick and Grove platforms and subsea wells C6, C7, G5 and Kew.	
3.2	Masters of third party vessels may, under certain wind conditions, elect to pass to the east of the array. Evidence to the contrary presented by the Applicant has been shown to be the direct result of input assumptions. In order to ensure safe passage for such vessels and minimise allision risk, a 2nm wide PIANC compliant corridor can be created by the eastern edge of the array being no less than 2nm to the west of a line through the Chiswick and Grove platforms. This would require only a small reduction in the array area to the south of Chiswick but would provide very significant operational and safety benefits by allowing vessels to pass on a constant heading and at a safe distance from Spirit Energy's installations rather than having to divert around Chiswick.	See Response to Q1.4. Input assumptions were supported by evidence, i.e., experience of traffic surveys and the results of Government research projects analysing vessel traffic around wind farms (before and after construction) as well as consultation with regular ship operators in the area. An occasional vessel may plan a passage to the east of the wind farm in particular weather conditions but they will also plan the passage to keep a safe distance from oil & gas assets, which is a legal requirement. There is no justification for a shipping channel given the low numbers of ships and the alternative (and more efficient) routes that are available, including adverse weather routes.

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3.3	For vessels servicing Spirit Energy's platforms and subsea infrastructure, having at least 2nm to the array would also ensure adequate sea room to place anchors and/or adopt appropriate stand-off positions	A statutory safety zone of 500 metres is already provided for oil & gas surface, and in some cases subsea, installations on the UKCS. Beyond that distance other sea users are free to operate. Whilst we appreciate it is preferable to have unlimited sea room for two miles around the installation, experience has shown it is possible to safely carry out the marine operations referred to within a wind farm, as well as in proximity to a wind farm, with appropriate procedures and controls in place. There is vast industry experience in these types of operations. Anatec have reviewed AIS recordings of large vessel operations, such as *Stanislav Yudin* Heavy Lift Vessel (used in decommissioning) and rig moves (for workovers, etc.), and found they can take place in restricted sea room such as in proximity to other oil platforms and within or near wind farms. A relevant example of close proximity between offshore wind and oil & gas operations is at the Walney Extension Offshore Wind Farm where Spirit Energy have three wells (an exploration, appraisal and development well) inside the Walney extension array area. The nearest turbine to these wells is at a distance of 0.86 nm from the exploration well and 1.3 nm from the development and appraisal wells. Periodic intervention is required (typically every few years) but there have no reported issues and in fact the two Operators have a good relationship and coordinate activities when necessary.

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	3.4 Impact upon Spirit Energy: If there were no corridor, a significant number of false alarms from the AIS and radar early warning system would be expected as third party vessels approach Chiswick on a heading towards the platform before making a diversion to the east to circumnavigate it. Such repeated false alarms would lead to considerable disruption to personnel working on the facility, interfering with and extending the time taken to undertake essential work (including restoring production) with a consequent loss of production revenue and increase in costs. The increased time personnel would spend on the installation would also increase risk to personnel as set out in section 1 above. Spirit Energy's experience in the East Irish Sea was that, following construction of the Walney Extension windfarm, there were frequent alarms warning of potential vessel allision which were highly disruptive. In that case the vessels heading for the platform were regular ferries and it has been possible to modify the early warning system to only raise an alarm for vessels heading for one of the platforms when these are either unknown vessels or known vessels that deviate from their expected courses. In the case of Hornsea Project Three, most vessels passing to the east of the windfarm would be unknown third party vessels so such a solution would not mitigate the impact. 3.5 In addition to false alarms, the actual risk of allision is considered by Spirit Energy to increase. Vessel data recently gathered shows that assumptions on vessel routing made by the Applicant in their risk assessment are incorrect and, whilst the volume of traffic may not be great, the consequences of such allision would be significant in terms of potential loss of life and major damage. 3.6 If there were not 2nm searoom around each installation, vessels working at or on Spirit Energy infrastructure would face restrictions, particularly in terms of appropriate weather windo ws in which they could carry out operations. This would significantly add to the cost of these already expensive operations. The kind of vessels utilised typically cost in the range of $50,000-$200,000 per day to lease and there are additional costs for personnel and support vessels.	

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Hornsea Three Response and Position The number of vessels expected to re-route to the east of the wind farm is very low as more efficient, alternative routes are available in normal and bad weather. Any vessel that does pass to the east is unlikely to follow a course which would generate an alarm at the NUIs as the alarm settings used by Spirit are (projected) Closest Point of Approach less than 500 metres and Time to CPA of 20 minutes. Given these NUIs have been in place, and marked on charts for over 10 years, it is highly unlikely a Master would plan such a close passage. It is illegal for Masters to enter within 500m of a platform, with potential sanctions including two years' imprisonment. Overall, due to the shielding effect of the wind farm, the rate of alarms is expected to reduce. This differs from the situation in the East Irish Sea where the number of alarms **was predicted** to rise because the wind farm was anticipated to displace shipping towards an oil & gas facility, unlike Hornsea Three. In the Irish Sea case the TCPA alarm setting was much longer at 45 minutes which also made alarms more likely as vessels were still a considerable distance away from the platform. In the event of an alarm the J6A control room have procedures to immediately call the vessel and confirm it intends to pass safely. Trials are planned to verify the system is still working as anticipated post-construction. Preliminary discussions have also taken place between the Applicant and Spirit Energy with regard to data sharing and cooperation / coordination protocols that will benefit both parties.		
4.	**C6 and C7**	
4.1	Matter not agreed: The proposed C6 and C7 subsea wells are integral to maximising economic recovery from the Chiswick Field and each of these wells need to be afforded the same space as for a NUI	

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4.2	Documents submitted by Spirit Energy at this Deadline 9 (Appendices 1 and 2) confirm that these wells have been under consideration, and discussed with the regulator OGA, since (in the case of C6) 2014 and (in the case of C7) 2015. Both wells have met the strict criteria to be categorised as Contingent Resource as defined by the Society of Petroleum Engineers' Petroleum Resource Management System. The nature of contingent resource is that some further work is required before considering the resource as proven reserves. In the case of these wells, this would be analysis of the production from the C5 well and then (for C7) from the C6 well. Spirit Energy accepts that it would be reasonable for the protections discussed in sections 2 and 3 above to be contingent upon Spirit Energy meeting milestones in the more detailed planning and execution of these wells.	Spirit Energy have informed the Applicant, subsequent to the submission of the Environmental Statement, of potential subsea exploration wells west of Chiswick platform and located within the Hornsea Three array area. The Applicant notes that these wells have not met the criteria to be categorised as a contingent resource and therefore at this stage are not confirmed and not proven. Despite the information submitted at DL9, which cannot be independently verified or examined, there remains considerable uncertainty about the prospects of these wellheads. The evidence submitted by Spirit Energy demonstrates that uncertainty will continue for a while yet. However, the Applicant has, despite the non-confirmed status of these wells and in the spirit of coexistence, made an offer to Spirit Energy of a buffer around the proposed C6 and C7 wells of 1nm as outlined below. This is far beyond what the Applicant is required to do in terms of planning, EIA, O&G legislation and guidance.
4.3	Spirit Energy acknowledges that the Applicant has proposed some accommodation for these wells in their latest proposed protective provisions but, as outlined in sections 2 and 3 above, the proposed 1nm zone around these wells is inadequate for both vessels and helicopter access to any rig or vessel working on the well (which as a minimum will be required during drilling, during any subsequent workovers which may typically occur approximately every three years of the well's life, and during decommissioning). Accordingly, the Applicant's proposed protective provisions would not be effective.	The Applicant has made an offer of a 1 nm buffer around the C6 and C7 wells which will enable the Applicant to be able to design the final layout with certainty and would provide Spirit Energy with access for their drilling activities via vessel and via helicopter with restricted access in certain weather conditions. It should be noted that this 1 nm buffer is only required in a westerly direction as the wells will have unrestricted access in an easterly direction due to their location at the eastern edge of the Hornsea Three array area. In addition, with the provision of a 2.8 nm buffer being provided around the Chiswick platform, the separation distance around the wells is in fact a shape far greater than 1 nm in all but the most westerly direction. The Applicant considers that if the need for C6 and C7 is material, then the drilling of these well programmes should be brought forward. The Applicant considers it reasonable that an accelerated programme is proposed by Spirit Energy and that this accords with MER policy and the principles of coexistence. The wells would then be able to be drilled with no restrictions imposed by the presence of Hornsea Three. Once the wells have been drilled, access can then be maintained to these wells by vessel

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		and by restricted helicopter approaches. Spirit Energy have advised in their own submission that they access subsea wells by vessel, this then should be the operational preference for access to these wells. Likewise, when the wells are decommissioned, they can be plugged and abandoned from a rig or vessel, and that if helicopter access is required it can be scheduled when weather restrictions due to the proximity of Hornsea Three are least likely to occur. The Applicants proposed protective provision provides enough access for the rigs and vessels operating over the wells as discussed in response to comment 2.2, 3.2, 3.3 and 3.4 above. Spirit Energy's requirement for the same access as for the Chiswick and Grove platforms does not align when they also state that these wells will only be visited once every three years. Nor can the calculations of revenue lost for restricted access presented by Spirit Energy be the same for a platform as a subsea well. A platform may require unplanned maintenance visits several times a year, a subsea well does not. The assertion made that the buffer of 1 nm being offered around the C6 and C7 wells will restrict access by 89% is incorrect. Spirit Energy have agreed the criteria for VMC conditions (REP9-053) which from the agreed J6A data set can be flown for up to 77 % of the time (the day annual average; see REP9-051, with update provided at Appendix 3 to the Applicant's response to Deadline 10 and that shuttle flights can be flown from the Chiswick platform (as agreed by the helicopter operators) for a further 10 % of the time, allowing unrestricted access by helicopter to the wells for up to 87% of the time. In addition, Spirit Energy has not adequately considered alternative means of access to the wells such as the use walk2work vessels. Walk2work vessels are increasingly being used in the industry for programmes such as well work overs. It is noted that Spirit Energy already use walk2work vessels within their operational portfolio. The Applicant maintains therefore that the 1 nm buffer being provided by the Applicant to the C6 and C7 wells will not have a significant restriction on the ability to conduct planned maintenance visits to these wells every three years and that no greater distance is required.

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		The Applicant also advises that the Kew subsea well at a distance of 3nm from the Hornsea Three array is not significantly restricted by the presence of Hornsea Three for the matters in regard to it being a subsea well (as discussed above) and in regard to the proximity being greater than 2.8 nm as discussed in response to comment 2.2 above.
4.4	**Impact upon Spirit Energy**: Were C6 and C7 not given the space required for vessel and helicopter access, Hornsea Project Three is likely to prevent the maximisation of economic recovery from Chiswick with the Chiswick field being decommisioned earlier than its true economic end of life.	
Hornsea Three Response and Position The Applicant suggests that the drilling of the C6 and C7 wells should be accelerated to ahead of the construction of Hornsea Three such that restrictions on access to the drilling rig/vessel can be minimised. The Applicant maintains that if this is not possible the 1 nm buffer provides enough room to conduct the drilling programme however there will be restrictions on helicopter access to the vessels/rigs in certain weather conditions. The Applicant maintains that the 1 nm buffer being provided by the Applicant to the C6 and C7 wells will not have a significant restriction on the ability to conduct planned maintenance visits to these wells and therefore will not result in a significant restriction to economic recovery from the Chiswick field.		
5.	**Grove**	
5.1	Matter not agreed: Timescale for cessation of production and decommissioning of Grove	
5.2	Although the Grove field is nearer to the end of its economic life than Chiswick, there remain opportunities for life extension, including at least one additional well to be drilled from the platform and a planned workover of G5 (requiring a rig over the subsea well location) and Spirit Energy would not be permitted by the OGA (from whom consent to permanently cease production has to be obtained) to cease production until it has demonstrated that such opportunities have been exhausted. Accordingly, Spirit Energy is unable to commit to any date for the removal of the Grove facilities (the NUI and subsea well G5). Never-the-less, in the spirit of coexistence Spirit Energy believes that by maintaining good communication between Spirit Energy and the	The Applicant submits that the information it has relied upon in regard to the Grove platform and its future decommissioning programme both during the pre-application phase and during examination has all been provided by Spirit Energy. The Applicant submits that at no point in the pre-application phase or during examination, has Spirit Energy made any submission in regard to plans for life extension or indeed for an additional well to be drilled at Grove, until their submission at Deadline 9 (REP9-077). The Applicant understands from all the consultation to date that the focus of the proximity discussions have been in regard to the Chiswick platform due to the well programmes planned at this field. The restriction on the Grove platform is less than that on the Chiswick as it is further from the Hornsea Three array area (at a distance of 2.4 nm; see APP-071). During the meeting

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	Applicant and by each party exercising such flexibility as they have at their disposal (e.g. in the case of the Applicant, a phased development of Hornsea Project Three and, in the case of Spirit Energy, piecemeal decommissioning – particularly of the subsea G5 well rather than waiting to undertake this more efficiently as part of a decommissioning campaign), there should be scope to allow the space around Grove to transition from use in oil and gas exploitation to use in offshore electricity generation without too much inconvenience to either party. It should be noted that as the Grove NUI is 2.4nm from the eastern edge of the array area, there would be limited impact on the array layout of the space requirements set out in section 2 above.	with CHC the Applicant and Spirit Energy were advised that circling ARA could be flown and it was noted that CHC said these flights were manageable at the Grove platform. The footprint provided by the Applicant of the worst case take off with engine failure of 1.81 nm is possible at the Grove. All take offs are required to be flown in VMC however in the event there is the potential for IMC after take off, a weight restriction may be required (very broadly approximating to two passengers), if the wind was exactly 10 knots and a westerly take off was required. The assertion by Spirit Energy that an additional proximity to be placed around the Grove platform would have limited impact on the Hornsea Three array area is misinformed as detailed in the Applicants response to Rule 17 (REP9-013), as alterations to the leading edge of a wind farm has not only power generation and economic implications, but carries significant consent risk. The Applicant has assessed the restricted flights due to Hornsea Three using the J6A data to the Chiswick and Grove platforms as 3.5%, and Spirit Energy has assessed this value to be 5%. Due to the coarseness of the data the Applicant has considered a restriction in access due to all easterly wind directions and assumed the answer to be the same for both platforms. This is actually not the case as due to the Grove platform being at a greater separation distance from Hornsea Three than the Chiswick platform, a smaller segment of airspace is restricted and so more flights will be available. However considering the value of 3.5% the Applicant asserts that this is not a significant reduction in flights, to a platform that has weather restrictions in any case, and that is coming to the end of its operational life. The Applicant has also provided for a protected area around the Grove platform to a distance of 2.8 nm which will which trigger a requirement for a proximity agreement to be entered before construction takes place within this area which will minimise the potential for any issues to arise between both parties in regard to access to the Grove platform. In terms of shipping, the Grove NUI is considered sufficiently distant from the wind farm as to be at minimal risk of allision from wind farm vessels, due to the arguments put forward previously (strict management of wind farm vessels, allowable weather limits, low drift

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		speeds, potential to anchor, etc. In terms of passing vessels, these are expected to be re-routed away from Grove such that the average passing distance increases and the net allision risk reduces. Finally, for oil & gas vessels including rigs and decommissioning, there is sufficient separation distance from Grove to the wind farm for work to be safely and efficiently carried out.
5.3	Impact upon Spirit Energy: Were the Grove NUI and G5 not each given the space required for vessel and helicopter access, Hornsea Project Three is likely to prevent the maximisation of economic recovery from the Grove field with it being decommisioned earlier than its true economic end of life.	
Hornsea Three Position The Applicant has demonstrated in the Environmental Statement that the restriction on access to the Grove platforms is less than that to the Chiswick platform. CHC have confirmed that additional flexibility of conducting an ARA can also be provided for at the Grove platform. The ability to take off with engine failure is possible in all directions at the Grove platform. If there is the potential for IMC conditions to arise at take off it is possible to weight restrict take off in a limited westerly direction. The Applicant therefore maintains that access restrictions to the Grove platform are not significant (less than 3.5%) and will not therefore result in in the potential for a significant restriction in economic recovery from this field. The Applicant does not consider that scheduled maintenance to the G5 on a three yearly basis will be restricted by the presence of Hornsea Three for the reasons outlined in section 6.1 and therefore does not consider the potential for a significant restriction in economic recovery to arise. The distances from the wind farm are considered to be adequate for marine operations involving rigs / vessels.		
6.	**G5**	
6.1	Matter not agreed: The Grove G5 subsea well needs to be afforded the same space as a NUI and subsea wells C6 and C7.	
6.2	As set out in sections 2, 3, and 4 above, in order to permit both vessels and helicopter access to any rig or vessel working on the well (which as a minimum will be required during drilling, during any subsequent	The Grove subsea well head is at a distance of 1.5 nm from Hornsea Three and so any access restrictions to a rig or vessel positioned over the Grove subsea well head are therefore comparable to the Chiswick platform.

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	workovers which may typically occur approximately every three years of the well's life, and during decommissioning) the same space will be required as for a NUI.	The Applicant understands the nature of subsea facilities being facilities that do not require regular access, or if they did, a surface installation would be built. Any time access is required, the appropriate rig or vessel must first be moved to over the location, requiring advanced planning to achieve and as advised by Spirt Energy is only required once every three years. The Applicant therefore rejects Spirit Energy's requirement that a well head requires similar access to an above sea installation. VMC, En Route and shuttle flights remain available to the G5 well head which, considering the J6A data provided by Spirit Energy will be for 87 % of the time (day annual average; see REP9-051, with update provided at Appendix 3 to the Applicant's response to Deadline 10). In addition, Spirit Energy must consider alternative means of access to this well, just as they do in other parts of their operations, such as the use of walk2work vessels (discussed above). The Applicant also notes that Spirit Energy have subsea facilities which are proximate to and even within existing wind farms, with a Spirit Energy operated well, located at a distance of 0.86 nm from a turbine in Walney extension for example. The Applicant therefore considers that access to the G5 well head at a separation distance of 1.5 nm is not significantly restricted. Oil and gas vessels are used to working in close proximity to offshore structures. Therefore, marine issues are considered to be manageable by following appropriate industry procedures (e.g., weather limits) and experienced personnel.