From:	Victoria Lane (Brodies Solicitors)
To:	Hornsea Project Three
Cc:	Karen Hamilton (Brodies Solicitors)
Subject:	Spirit Energy ISH 1 Submission - Appendix T - V, X, Z - ZC - ZO [BRO-D.FID4510105]
Date:	14 December 2018 23:31:54
Attachments:	image013.png image014.png image015.png image016.png image017.png image018.png SE_ISH_1 - Appendix U - Marine Accident Investigation Branch, Report on the Investigation of the collision between Sage Sky and Stema Barge II (March 2018)_44074550_1.PDF SE_ISH_1 - Appendix ZC - Statutory Declaration_ Chiswick, Grove and J6-A Safety Cases_44089237_1.PDF SE_ISH_1 - Appendix ZB - Spirit Energy Proposed Protective Provisions_44088791_1.PDF SE_ISH_1 - Appendix ZA - Spirit Energy Written Representation (7 November 2018)_44074471_1.PDF SE_ISH_1 - Appendix Z - CAA, Operational Manual Extracts - Appendix 1 to the AviateQ International Limited Report (October 2018)_44074406_1.PDF SE_ISH_1 - Appendix X - Marine 4 - Letter OGUK Oil and Gas Regulator 19_09_2018_43600425_1_44074181_1.PDF SE_ISH_1 - Appendix V - Advice-note-9.-Rochdale-envelope-web - July 2018_44074184_1.PDF SE_ISH_1 - Appendix T - Markham ST-1 Decommissioning Programme, 31 January 2018_44074620_1.PDF

CONFIDENTIAL MESSAGE - INTENDED RECIPIENT ONLY

Please find attached Appendix T - V, X, Z - ZC – ZO

Kind regards

Victoria Lane
Senior Solicitor
Edinburgh, UK
www.brodies.com

Direct Line +44(0) 131 656 0127

APPENDIX ZA

WRITTEN REPRESENTATION (7 NOVEMBER 2018)

FULL WRITTEN REPRESENTATION ON BEHALF OF SPIRIT ENERGY NORTH SEA LIMITED, SPIRIT ENERGY RESOURCES LIMITED AND SPIRIT ENERGY NEDERLAND B.V.

1 Introduction

1.1 '*Spirit Energy*' is the trading name used by Spirit Energy Limited and its subsidiaries which collectively as a group conduct European oil and gas operations.

1.2 Spirit Energy ("Spirit") is headquartered in the UK and collectively operates and/or holds interests in 27 producing fields and more than 70 exploration licences across the UK, Norway, the Netherlands and Denmark.

1.3 Spirit Energy North Sea Limited (UK Company Number: 04594558), Spirit Energy Resources Limited (UK Company Number: 02855151) and Spirit Energy Nederland B.V. (Company Number: 34081068) are each entities operating under the 'Spirit Energy' trading name. Each of these entities own and operate assets located in the Southern North Sea (on both sides of the UK/Netherlands median line) including platforms, pipelines, seabed infrastructure and licensed blocks. Spirit has interests that lie within or near to the site ("the Development Site") which is the subject of Orsted's application ("the Application") for a development consent order ("DCO") for the Hornsea Project Three Offshore Wind Farm ("the Project").

1.4 This is the full written representation prepared jointly on behalf of Spirit Energy North Sea Limited, Spirit Energy Resources Limited and Spirit Energy Nederland B.V. as objectors in relation to the examination of the Project given the common issues relevant to each. References to "Spirit" throughout the remainder of this document are a reference to any or all of the objectors as the context requires.

1.5 In summary, while Spirit does not object to the principle of the Application –

1.5.1 The Application is likely to impact adversely on Spirit's ability to carry out operations in and around its existing assets in a safe, efficient and cost-effective manner, with specific reference to

1.5.1.1 shipping and marine activity, and

1.5.1.2 aviation activity.

1.6 The Application also has the potential to prejudice future exploration and exploitation of oil and gas resources from Spirit's current licences compromising Spirit's ability to play its part in maximising the economic recovery of UKCS hydrocarbon resources which is its obligation under the terms of its licences from the Oil and Gas Authority ("OGA").

1.7 Accordingly, the Application does not accord with relevant national policy in that it does not –

1.7.1 provide for the appropriate co-existence of Spirit's oil and gas operations (current and future) with the Project;

1.7.2 seek to minimise negative impacts and reduce risks to as low as reasonably practicable in respect of Spirit's operations and assets, or

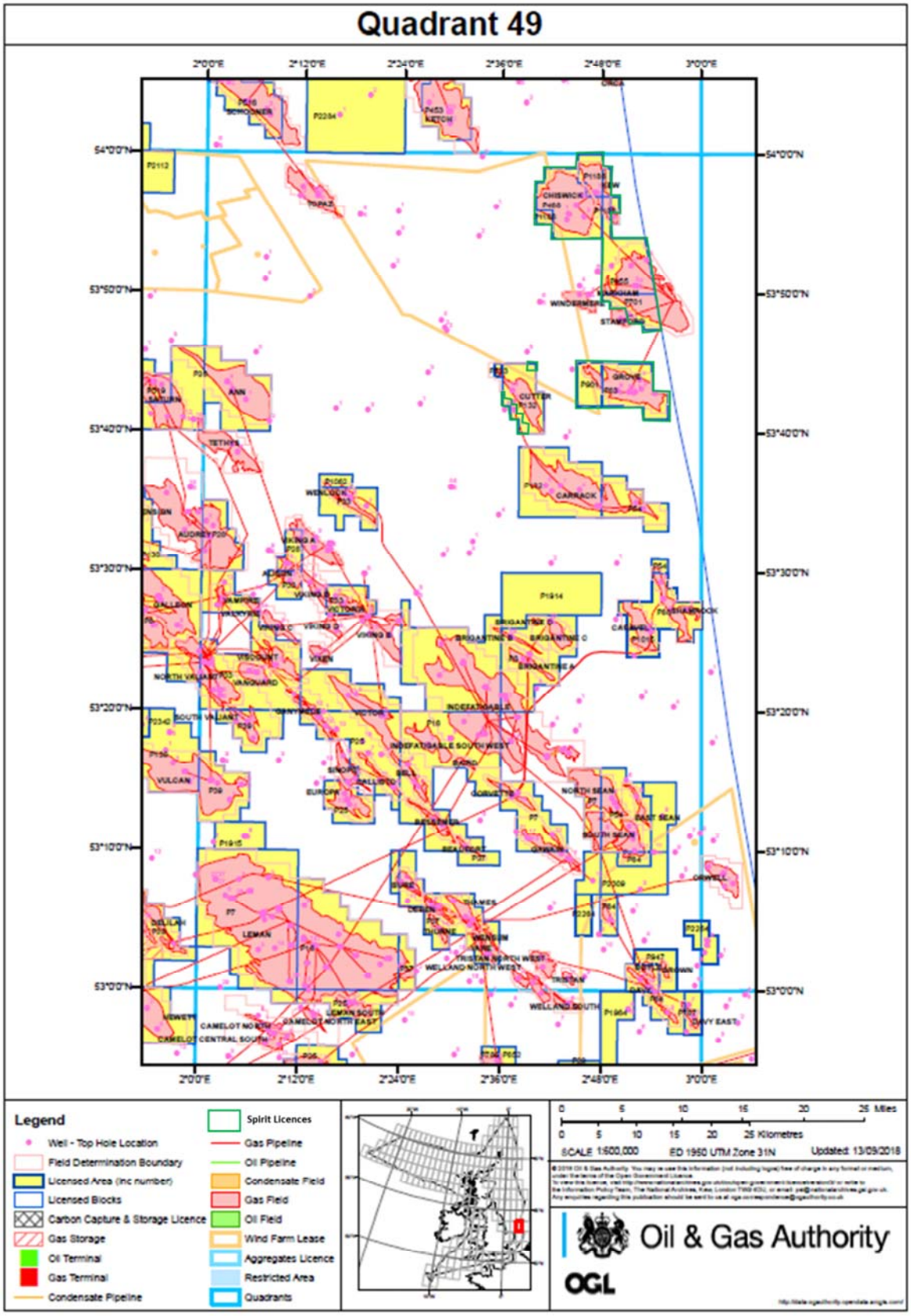
1.7.3 avoid or minimise disruption, economic loss or adverse effects on safety in so far as Spirit's interest are concerned.

1.8 Furthermore the Application is not consistent with the MER Strategy as hereinafter defined and may prejudice Spirit's ability to perform its obligations thereunder.

1.9 Therefore protective provisions should be incorporated within the DCO if granted as proposed within the annex to this document.

2 Spirit's Assets

Figure 1: Oil & Gas Licences, Fields and Infrastructure (OGA 2018) Annotated to show Spirit Licences in Close Proximity to Hornsea Project Three



2.1 The Project will impact Spirit's interests in the Greater Markham area (See Figure 1), which comprise a group of producing fields straddling the UK/Dutch border exporting gas to the Netherlands. The producing fields are economically important to Spirit and its partners, to the UK Government and to the Dutch Government. Combined, the Greater Markham Area fields produced 23 billion cubic feet of gas net to Spirit in 2017.

2.2 A description of the key physical assets and infrastructure ("the Affected Assets") is as follows:

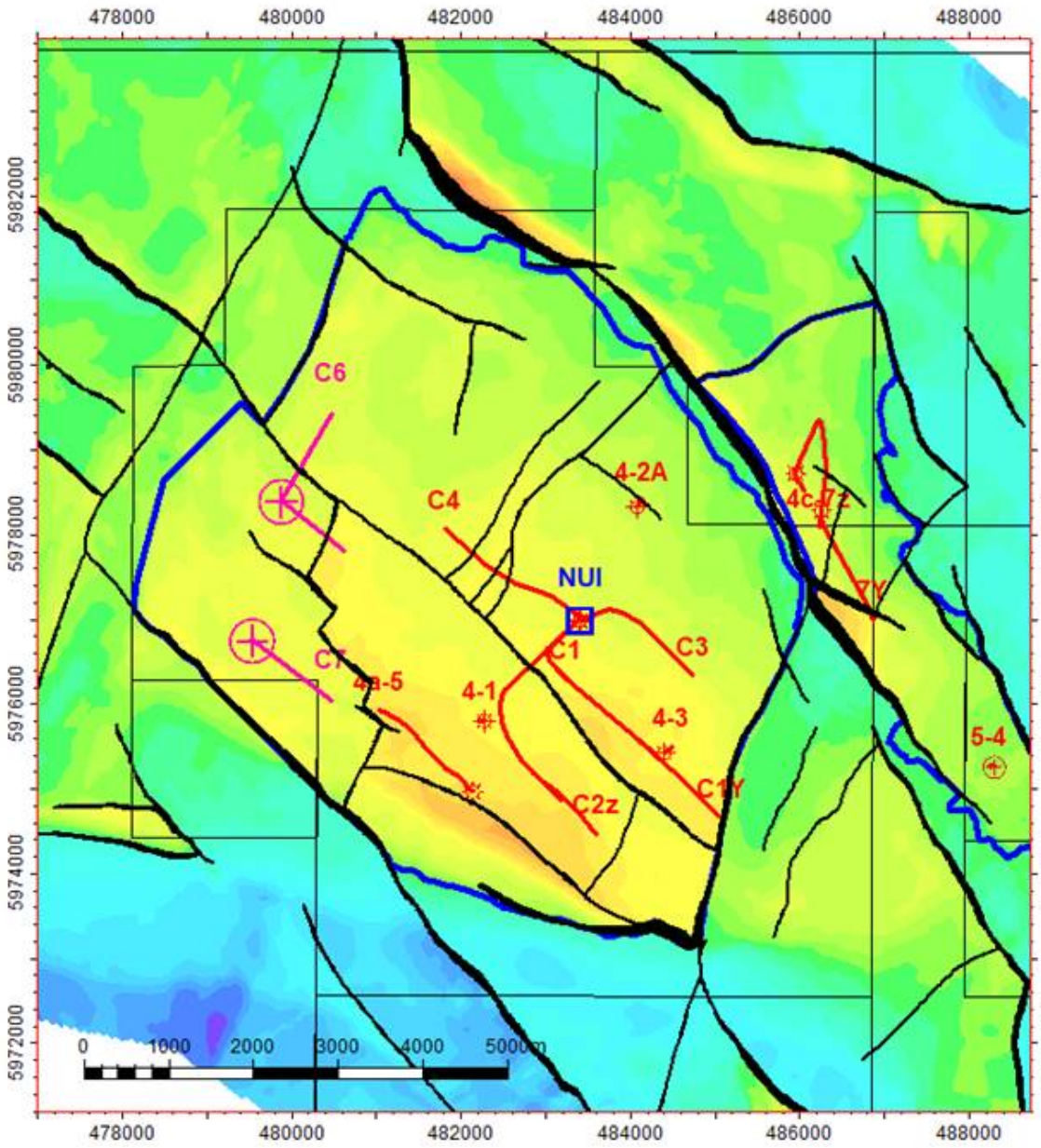
2.2.1 **Chiswick**

The gas platform for the Chiswick field is located 1.45nm or 2.7km to the east of the Development Site and in British waters. A normally unmanned platform, it was never-the-less visited by workers on over 120 days in 2017. This platform also enables production from the Kew field via a subsea pipeline from the Kew sub-sea well-head, which is located 1.7nm or 3.1km to the Northeast of the Chiswick platform. Spirit recently announced a major programme of investment in the Chiswick field (Refer to Spirit Energy's press release "SPIRIT ENERGY TO DRILL NEW WELL AT KEY NORTH SEA FIELD" dated 29th January 2018) and as part of this has had a drilling rig stationed over the Chiswick platform since April 2018. This rig re-entered an existing well (performing a well workover) in order to enhance production and is now drilling a new well which is expected to be followed by the drilling of a further well or conducting a workover.

Gas from the Chiswick platform flows 18km through a sub-sea pipeline to the Markham J6A platform, in Dutch waters to the southeast.

The Chiswick Field extends into the Development Site as do the associated licences P.468 and P.1186. Spirit Energy North Sea Limited has well developed plans to drill two further wells from subsea locations each within the part of the Chiswick Field lying within the Development Site. Due to technical issues it would not be viable to drill these wells from the Chiswick platform and for each of these wells a drilling rig would need to be located (at separate locations) within the Development Site each approximately 2nm or 3.7km to the west of the Chiswick platform. (The currently proposed drilling locations are shown by the two crosses within circles in Figure 1.)

Figure 1: Planned Future Well Locations in Licence P.



2.2.2 **Grove**

The gas platform for the Grove field is located 2.4nm or 4.4km to the east of the Development Site and in British waters. A normally unmanned platform, it was visited by workers on over 60 days in 2017. This platform also enables production from the Grove field via a subsea pipeline from the Grove G5 well-head, which is located approx. 1.1nm or 2km to the west of the Grove platform (i.e. 1.5nm or 2.8km from the eastern edge of the Development Site).

Gas from the Grove platform flows 13km through a subsea pipeline to the Markham J6A platform, in Dutch waters to the northeast.

2.2.3 **Markham**

2.2.3.1 J6-A

The J6-A platform is located over the Markham field in the Dutch sector of the Southern North Sea. It provides wells producing from the Markham field and gas processing facilities for all production from Markham and its surrounding satellite fields. Gas from the satellite fields described above (Chiswick & Grove) flows via subsea pipeline to the J6A production hub in the Netherlands. The Markham field is more mature than the above satellite fields and serves as the processing hub for the greater Markham area fields. Thus, although J6-A is further from the Development Site than the fields and facilities above, the symbiotic relationship between all of these fields in the greater Markham area means that its future is also impacted by the Project.

2.2.3.2 ST-1

The ST-1 platform in the UK sector of the Southern North Sea provides six wells producing from the Markham field. Gas flows 5.6km via subsea pipeline to the J6A installation to the east. At the end of January 2018, Spirit Energy submitted a Decommissioning Programme (accessible at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693560/Markham_ST-1.pdf) which outlines the proposed method of decommissioning the ST-1 platform. It is expected that a heavy lift crane barge, will be brought to ST-1 later in 2019 to remove the ST-1 platform. Whilst this work will occur prior to construction activity on the Project, the detailed planning for this work is informative in considering the potential issues that may arise in the removal of similar structures (such as the normally unmanned platforms at Chiswick and Grove) which will not be removed until after the construction of the Project.

The distances of these assets to the nearest part of the Project are tabulated in the following table.

Physical Asset	**Distance from Hornsea Three (km)**	**Distance from Hornsea Three (nm)**
Chiswick Platform	2.7	1.5
Kew sub-sea well	5.6	3.0

Grove Platform	4.4	2.4
Grove G5 subsea well	2.8	1.5
Markham J6-A Platform	12.8	6.9
Markham ST-1 Platform	8.3	4.5

2.3 A summary of the key details of each of the Affected Assets including their location and current status is set out in the following table.

Asset	Location	Status
Markham J6A platform	Platforms near the array area (6.9nm)	Producing
Markham ST1 platform	Block 49/10d (near array area, 4.46nm)	Decommissioning
Chiswick, Chiswick NUI	Field within array area, NUI quite near to array area (1.45nm)	Producing
Grove, Grove NUI	Field within array area, NUI quite near to array area (2.43nm)	Producing
Kew, subsea tie-back	Field and subsea infrastructure near to array area (3.58nm)	Producing

2.4 A summary of the key details of each of the Licence Interests is set out in the following table.

Asset	**Location**	**Status**
Block 49/4a – Licence P.468	Coincident with array area	Producing
Block 49/9a – Licence P.132	Coincident with array area	Producing
Block 49/4b – Licence P.1186	Coincident with array area	Producing
Block 49/4c – Licence P.1186	Near array area	Producing
Block 49/5a – Licence P.455	Near array area	Producing
Block 49/5b – Licence P.1186	Near array area	Producing
Block 49/5c – Licence P.1186	Near array area	Producing

Block 49/9c – Licence P.901	Coincident with array area	Producing
Block 49/10a – Licence P.83	Near array area	Producing

2.5 A map illustrating the Affected Assets, Licences and the Development Site is provided at Figure 2.

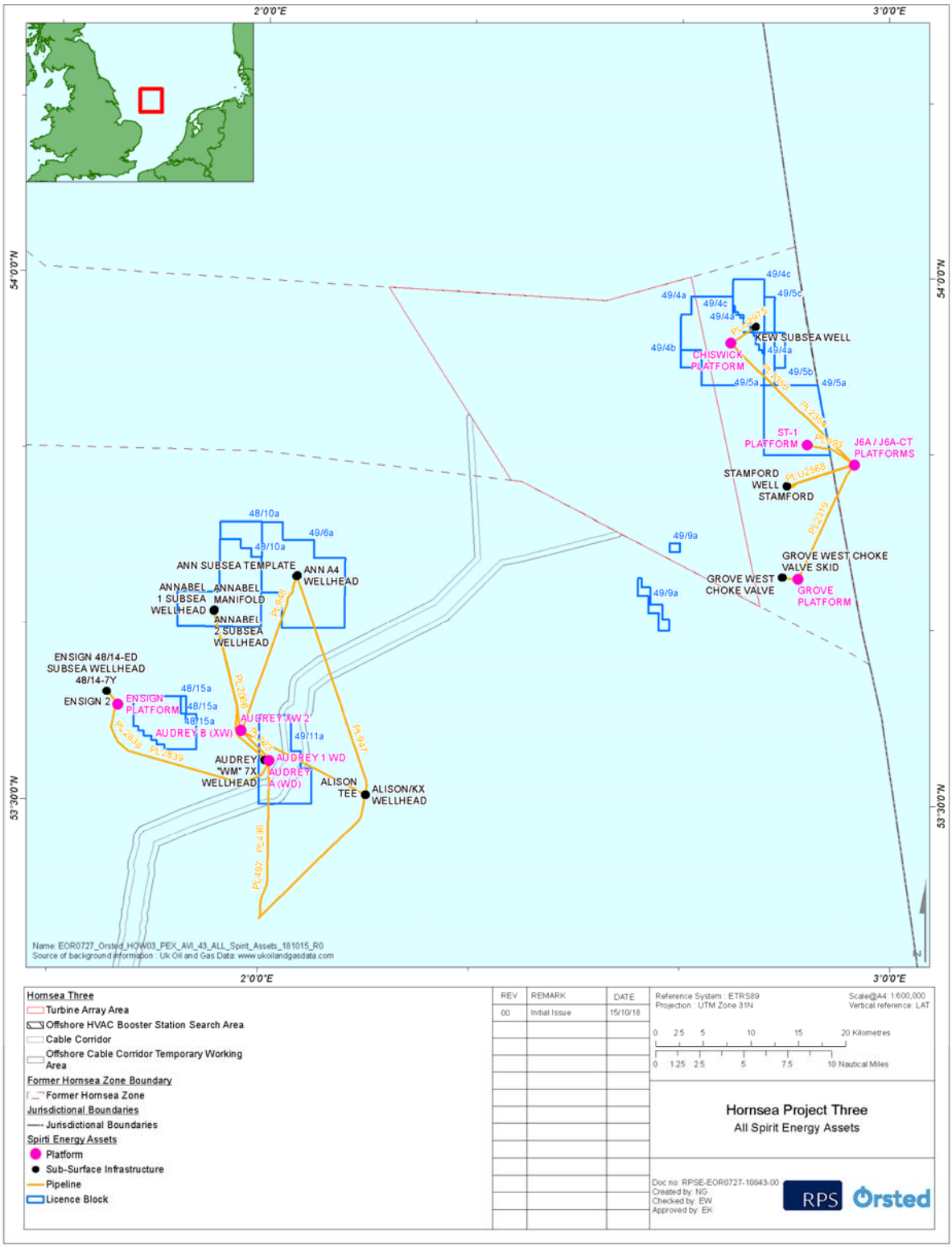

2°0'0"E
3°0'0"E
54°0'0"N
53°30'0"N
49/4c
49/4a
49/5c
49/4b
CHISWICK PLATFORM
KEW SUBSEA WELL
49/5b
49/5a
ST-1 PLATFORM
J6A / J6A-CT PLATFORMS
STAMFORD WELL STAMFORD
PL2319
GROVE WEST CHOKE VALVE SKID
GROVE WEST CHOKE VALVE
GROVE PLATFORM
49/9a
48/10a
49/6a
49/10a
ANN SUBSEA TEMPLATE
ANN A4 WELLHEAD
ANNABEL 1 SUBSEA WELLHEAD
ANNABEL MANIFOLD
ANNABEL 2 SUBSEA WELLHEAD
PL948
ENSIGN 48/14-ED SUBSEA WELLHEAD 48/14-7Y
ENSIGN 2
ENSIGN PLATFORM
48/15a
AUDREY B (XW)
AUDREY 1XW 2
49/11a
AUDREY "WM" 7XI WELLHEAD
AUDREY 1 WD
AUDREY A (WD)
ALISON TEE
ALISON/KX WELLHEAD
PL947
PL2838
PL2839
PL496
PL497
Name: EOR0727_Orsted_HOW03_PEX_AVI_43_ALL_Spirit_Assets_181015_R0
Source of background information : Uk Oil and Gas Data: www.ukoilandgasdata.com
Hornsea Three
Turbine Array Area
Offshore HVAC Booster Station Search Area
Cable Corridor
Offshore Cable Corridor Temporary Working Area
Former Hornsea Zone Boundary
Former Hornsea Zone
Jurisdictional Boundaries
Jurisdictional Boundaries
Spirti Energy Assets
Platform
Sub-Surface Infrastructure
Pipeline
Licence Block
REV
REMARK
DATE
00
Initial Issue
15/10/18
Reference System : ETRS89
Projection : UTM Zone 31N
Scale@A4: 1:600,000
Vertical reference: LAT
0 2.5 5 10 15 20 Kilometres
0 1.25 2.5 5 7.5 10 Nautical Miles
Hornsea Project Three
All Spirit Energy Assets
Doc no: RPSE-EOR0727-10843-00
Created by: NG
Checked by: EW
Approved by: EK
RPS
Ørsted

Figure 2

3 Legislative and policy context

3.1 We generally agree with the statement of legislation and policy set out in chapter 2 of the Environmental Statement. However, the following section is of particular relevance to consideration of the Application in light of Spirit's interests and operations in the area.

3.2 The oil and gas sector is highly regulated. The impacts of the Project on Spirit's existing and future operations will require to be managed by Spirit in the context of that regulatory framework. Accordingly the implications of that regulatory framework are relevant to the determination of the Application. As discussed in section 5 below, the EIA undertaken by the Applicant does not fully capture the impacts of the Project in relation to Spirit's interests. Moreover, the health and safety (H&S) regulatory regime under which Spirit operates requires it to assess the risks arising from the Project in a different manner and respond to those risks accordingly. For this reason, it is relevant for the examining authority to consider the potential impacts of the Project as viewed within that H&S context and the consequent implications for Spirit.

3.3 Safety

3.4 In terms of the Health and Safety at Work etc. Act 1974 and other offshore safety regulations (such as the Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015, the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 and the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995) Spirit has a duty to ensure that all risks associated with its offshore oil and gas operations are reduced to a level as low as reasonably practicable (ALARP).

3.5 The Application has the potential to increase or modify the risk profile in which the Affected Assets currently operate. The proximity of existing platforms, wells, pipelines and other subsea infrastructure to the proposed turbines, related support vessels and equipment (including anchors and other subsea cabling etc.) and how this proximity affects the risk profile of Spirit's operations, will require to be considered in relation to the current internal and external emergency response arrangements and risk assessments (both operational and major hazard assessments). Where the risk profile is altered revision of Spirit's affected safety cases (as required under the Offshore Installations (Offshore Safety Directive) (Safety Case etc) Regulations 2015) and/or Corporate Major Accident Prevention Policies and related procedures and assessments is likely to be required. Different risks to Spirit's operations, for example, the construction phase of the Project and operation of the windfarm, are likely to result in the risks having to be re-evaluated by Spirit to reflect any changes and a subsequent update and/or revisal the safety case. Where material change is required, these changes must be submitted to the competent authority for approval. Revisions which have or may have a significant impact on safety are likely to require submission to the competent authority for approval.

3.6 Under section 21 of the Petroleum Act 1987 and related legislation, a safety zone of at least 500m is required from the outer periphery of certain infrastructure such as mobile offshore drilling units, fixed installations, floating storage and offloading vessels.

3.7 It is also common practice in the oil and gas industry to agree (under the terms of crossing and proximity agreements) a similar zone of up to 250m either side of existing pipelines to reduce the risk of causing damage to pipelines.

3.8 Continuing importance of oil and gas sector

3.9 Overarching National Policy Statement for Energy (EN-1) notes that natural gas will continue to play an important part in the UK's fuel mix for many years to come. Further infrastructure, beyond that which exists or is under construction at present, will be needed in future in order to reduce supply or price risk to consumers (Section 3.8). It further provides that the UK needs to ensure that it has safe and secure supplies of oil products it requires (para. 3.9.3).

3.10 Co-existence

3.11 National Policy Statement for Renewable Energy Infrastructure (EN-3) provides as follows –

3.12 Where a proposed offshore wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the Secretary of State. Much of this infrastructure is important to other offshore industries as is its contribution to the UK economy. In such circumstances the Secretary of State should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable (Para 2.6.183).

3.13 As such, the Secretary of State should be satisfied that the site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. The Secretary of State should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered (Para 2.6.184).

3.14 Where a proposed development is likely to affect the future viability or safety of an existing or approved/licensed offshore infrastructure or activity, the Secretary of State should give these adverse effects substantial weight in its decision-making (Para 2.6.185).

3.15 Maximising economic recovery of UK petroleum

3.16 Section 9A of the Petroleum Act 1998, requires the Oil and Gas Authority to produce a strategy for achieving the principal objective of maximising economic recovery of United Kingdom petroleum (the “MER Strategy”).

3.17 Spirit is bound by the MER Strategy Central Obligation which obliges it, to take the steps necessary to secure that the maximum value of economically recoverable petroleum is recovered from the strata beneath relevant UK waters.

3.18 The MER Strategy sets out a number of Supporting Obligations intended to clarify how the Central Obligation applies in certain circumstances.

3.19 In relation to oil and gas exploration, Spirit, as a licensee, must "plan, fund and undertake exploration activities, including seismic and drilling activity… optimal for maximising the value of economically recoverable petroleum". Spirit's ability to conduct future exploration activity may be prejudiced by the Project, where Spirit cannot yet generate firm plans (such as drilling locations) resulting in potential hydrocarbon resources being unexplored.

3.20 In relation to development, Spirit are required to "plan, commission and construct infrastructure in a way that meets the optimum configuration for maximising the value of economically recoverable petroleum". Infrastructure related to the Project could prevent Spirit from meeting this obligation. (See discussion of Spirit's plans to drill two further wells at Chiswick at 2.2.1).

3.21 Spirit are required in the programme of the foregoing obligations to reduce the full lifecycle costs of the recovery of petroleum as far as possible. The cost implications resulting from the infrastructure related to the Project may prevent Spirit from meeting this obligation.

3.22 <u>The "oil and gas clause"</u>

3.23 In terms of section 3 of the Petroleum Act 1998, the government (via the Oil and Gas Authority) may grant licences that confer exclusive rights to "search and bore for and get" petroleum.

3.24 However the management and use of the seabed within a 200 nautical mile limit is administered by the Crown Estate, which leases areas of the seabed to offshore operators for their activities.

3.25 Potential conflict between offshore renewables and oil and gas activities is generally governed in such leases by the "oil and gas clause" which permits the Crown Estate to determine a lease or agreement for lease, in whole or in part, following a request from the Secretary of State, for the purposes of allowing an oil or gas development to proceed.

3.26 Guidance issued by DECC in 2014 states that:

3.27 Where it emerges that the plans of an oil or gas developer and those of an offshore renewables developer may be in conflict, the Secretary of State expects the parties to make every reasonable effort to reach a commercial agreement at the earliest stage.

3.28 Furthermore, the Guidance makes it clear that where the parties are unable to reach such an agreement, the Secretary of State, in considering applications, should take into account any matters which he or she deems to be relevant, including, but not limited to, the Government's energy policies and the Government's wider objectives, investor confidence and maximising the economic recovery of the UKCS' indigenous oil and gas resources.

3.29 The oil and gas clause should therefore be relied upon only as a matter of last resort. Moreover its use has the potential to give rise to a substantial liability in compensation payable by the oil and gas operator who benefits therefrom.

4 Proximity

4.1 Fundamentally, if the Applicant is permitted to place turbines up to the eastern boundary of the Development Site, the proximity of the Project to Spirit's Affected Assets and licensed blocks is almost certain to reduce Spirit's ability to carry out its operations in a safe, efficient and cost effective manner[1] due to impacts on shipping and navigation (the impacts on vessels required to deliver supplies and undertake work in support of Spirit's operations and risks from third party vessels) and aviation (the impacts on helicopters required to transport people and some materials to and from platforms and vessels servicing Spirit's operations). These matters, including proposed protective provisions will be considered in more detail in Sections 5, 6 and 8 below.

4.2 The location of infrastructure related to the Project may also inhibit future exploration, development and decommissioning activities under licences currently held by Spirit. Spirit's concerns and proposed protective provisions in relation to current licences are discussed in the annex to this document.

4.3 Revenues to the Markham owners (payments are made based on volumes produced in return for transportation and processing services received) from Chiswick, Kew and Grove contribute to the economic viability of maintaining the Markham facilities in the Netherlands which provide an entry point into one of the key Dutch offshore gas gathering systems (WGT).

4.4 Spirit has experience of operating in close proximity to off-shore turbines, with vessels and helicopters making regular visits to 12 installations (associated with fields which include Morecambe North, Morecambe South, Bains and Rhyl) located close to the Eastern edge of the Walney Offshore Wind Farms, in the Irish Sea off the coast of Cumbria (refer to figure 3).

4.5 The Walney Offshore Wind Farms are operated by Orsted or a related company.

4.6 By way of comparison:

4.6.1 In the Irish Sea, Spirit's closest asset (the DPPA Platform) is located 4.3nm or 8km from the Walney Extension turbine array. A platform that Spirit maintains is located 3.2nm or 6km from the edge of the Walney Extension wind farm.

4.6.2 For the Project, Spirit's closest asset (the Chiswick platform) would be located 1.5nm or 2.8km from the turbine array.

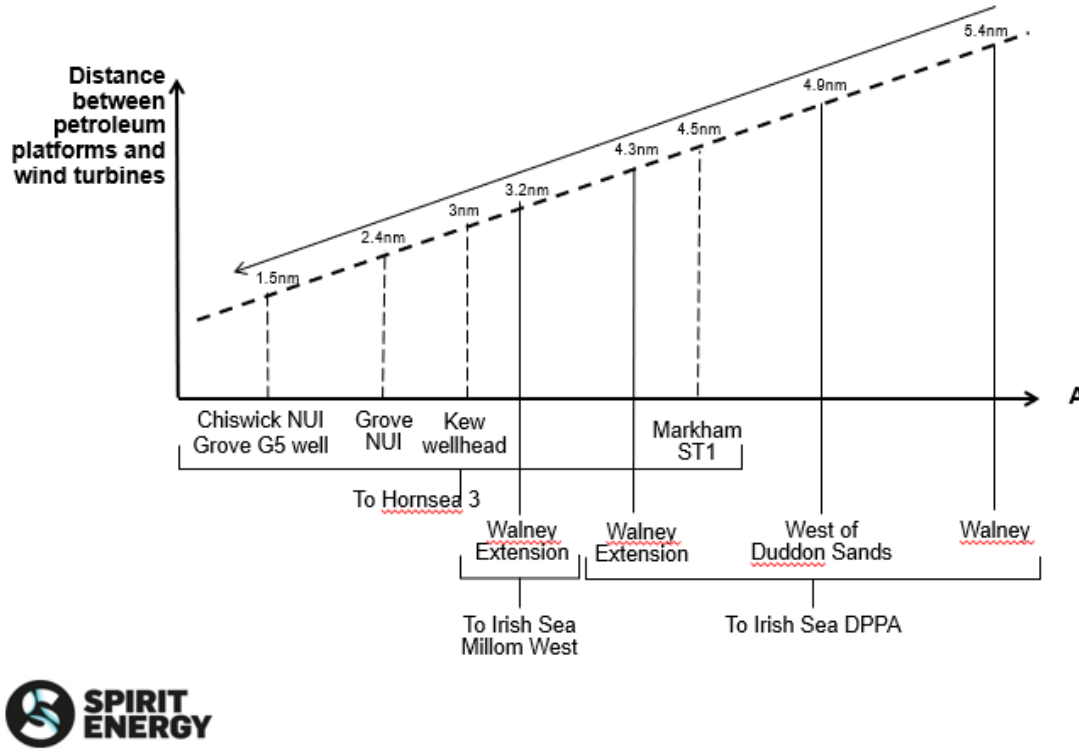
4.6.3 The total height of turbines installed at Walney Extension are 165m whereas the proposed turbines for the Project may be 325m.

[1] Vessel and helicopter visits may be planned (e.g. in order to change crews or carry out pre-planned work) or may be unplanned (i.e. arranged at short notice in order to respond to a problem). Disruptions to the former may extend periods of planned reductions in production whilst delays to the latter may result in increased down-time. The costs of running offshore installations (incurred whether or not they are producing) are such that high up-time is required in order to be commercially viable.

4.6.4 The windfarms (Walney, Walney Extension, West of Duddon Sands and Ormond) in the vicinity of the East Irish Sea assets that Spirit operates or maintains occupy an area approximately 1/8th of the combined area of Hornsea Project One, Hornsea Project Two and the Project, so the impact in terms of displacement of fishing and vessels, though significant in the East Irish Sea, is much less than is likely to arise from the cumulative effect of the Project.

4.6.5 Figure 3 shows a graphical comparison of the distances between wind farms and assets in the East Irish Sea and the Hornsea area.

Figure 2: Comparison of distances between wind farms and assets that Spirit operates or maintains



4.7 Protective measures have assisted Spirit's operations in co-existing with other windfarm developments. These have ranged from establishing buffer zones around subsea wells to allow for future drilling, cable and pipeline corridors to enable access for maintenance and decommissioning of cables and pipelines, and exclusion zones where there is a requirement to consult before entering into such areas.

4.8 In relation to the Walney Offshore Wind Farms, Spirit has encountered the following difficulties[2]:

4.8.1 A ferry service adopted a new routing to avoid the wind farm resulting in it heading directly towards one of Spirit's platforms resulting in regular collision warning alarms;

[2] Subsequent work has resolved or identified a path to resolving most of these issues but they are illustrative of the potential impacts that could arise from the Project.

4.8.2 The windfarm generated radar reflections interpreted by the radar early warning system predictive (REWS) as approaching vessels (false positives);

4.8.3 The REWS, when attempting to interpret large numbers of reflections from within the array area, required more computing power than was available causing it to run too slowly;

4.8.4 The REWS was unable to detect vessels approaching the platform from within the wind farm array area; and

4.8.5 Fishing activity was displaced closer to Spirit's infrastructure.

4.9 In relation to the Project and other windfarm projects, Spirit has sought to be co-operative and pragmatic in its discussions with the Applicant and relevant windfarm operator respectively with a view to reaching mutually acceptable solutions to allow both types of offshore developments to co-exist.

4.10 Protective provisions are sought in this instance by way of an amendment to the DCO, if granted, to facilitate the co-existence of the Project with Spirit's operations. These are set out in full in the annex to this document together with a reasoned justification.

5 Shipping and Navigation

5.1 Spirit commissioned a technical review of the Application and Environmental Statement in so far as it relates to shipping and navigation impacts relevant to Spirit. This review carried out by DNV Noble Denton marine services identified hazards which had not been assessed or had not been adequately assessed in order to inform consideration and determination of the Application. The conclusions of the review are contained within the report entitled Hornsea 3 Windfarm, Review of Marine Hazards, Spirit Energy dated 6 November 2018 (Report 1).

5.2 The findings of Report 1 can be summarised as:

5.2.1 The Development Site eastern boundary is much closer to Spirit's assets in the Markham area than previously experienced by Spirit elsewhere. The hazards associated with this aspect of the proposed wind farm are:

5.2.1.1 Interference with supply vessel operations to installations in the vicinity due to the requirement to divert round windfarm infrastructure.

5.2.1.2 Displacement of third party passing traffic towards Spirit's assets, increasing the traffic density and hence risk of collision with installations with severe or catastrophic consequences. This displacement will increase the major accident hazard risks in the Markham area, especially near Grove.

5.2.1.3 Displacement of fishing vessel operations towards Spirit's assets with potentially severe consequences.

5.2.1.4 If the Development Site eastern boundary has a significant number of turbines i.e. a 'packed boundary', this could reduce the ability of Spirit to manage the risks associated with approaching vessels, especially errant or NUC vessels, due to the lack of visibility.

5.2.1.5 Considerable reduction of drift and hence reaction times to vessels going NUC close to the eastern limit of the proposed wind farm (either inside or out with the array area) before potential impact with Spirit's assets. The increase in traffic, including construction traffic and fishing vessels due to the proposed wind farm will also increase the likelihood of such events. Due to the presence of cables within the array, such vessels will not be able to anchor there.

5.2.1.6 The ability to safely manoeuvre jack up rigs onto, and off, locations (e.g. Grove, Grove West and Chiswick) close to the eastern limit of the proposed wind farm may be compromised.

5.2.1.7 The effects of the Project on the operation of construction vessels, diving vessels, pipe lay and walk to work vessels at Spirit's assets have not been adequately assessed and may be compromised.

5.2.1.8 The use of helicopters by these specialist vessels may be compromised by the proximity of turbines and helicopter traffic associated with the proposed wind farm.

5.2.1.9 The noise associated with piling operations during construction, on diver operations at Spirit's assets, has not been adequately assessed.

5.2.1.10 Compromising the ability to deploy spread moored vessels, including heavy lift vessels, at Spirit's assets.

5.2.2 In addition, the following generic hazards were identified:

5.2.2.1 The potential for future marine operations within the array area such as drilling, pipelay and installation of surface and subsea assets will be severely compromised. From a marine perspective, the potential to conduct seismic surveys and indeed a range of other surveys (benthic, ROV etc) within the array area and cable corridor will be severely restricted by the presence of the proposed wind farm.

5.2.2.2 The decommissioning of old pipelines in the vicinity of the cable corridor may be compromised

5.2.2.3 A reduction in the effectiveness of the J6A installation Automatic Identification System ("AIS") / Automatic Radar Plotting Aid ("ARPA"), or of an Emergency Response and Rescue Vessel ("ERRV"), to monitor and manage 'errant vessels' approaching installations. Note, Marine Guidance Note 543 indicates that vessels can pass through Offshore Renewable Energy Installations ("OREIs"), and the presence of the array will degrade the ability to detect such vessels. In Section 4.1.6 of the note, the OGA outlines the HSE requirement for the Duty Holder to have a system in place to manage this issue.

The assumption that commercial vessels will not navigate within the array area is based on an ideal world scenario and the hazards associated with third party vessels passing through the array area should not be 'scoped out'.

5.2.3 During the construction and decommissioning phases of the Project, the following additional hazards have been identified:

5.2.3.1 Current borne sediments in suspension to be carried to Spirit assets with the potential to interfere with cooling water intakes and diver visibility.

5.2.3.2 Jack-up spud can placement causing seabed disturbance that could interfere with future operations.

5.2.3.3 Dumping of spoil from dredgers to cause similar disruption to 5.2.3.2 above, or seabed disturbances which could interfere with future operations.

5.2.3.4 Noise from piling operations to interfere with essential diver IRM interventions.

5.2.3.5 Emergency response procedures may be compromised by the proposed wind farm.

5.3 Key differences between Report 1 and the Applicant's ES are:

5.3.1 While the ES necessarily has a wide scope, Report 1 is focused more specifically on the Affected Assets and considers the likely impacts of the Project in the context of the regulatory regime applicable to oil and gas, particularly health and safety, to which Spirit is subject.

5.3.2 The ES relies on a standard EIA methodology. Report 1 approaches risk from an operational perspective which focusses on the probability of an unintended

consequence occurring and which take greater cognisance of the potential for catastrophic outcomes. Both are relevant to the determination of the Application. .

5.3.3 The Applicant has assumed that east-west vessel traffic displaced by the combined effect of Hornsea Project One, Hornsea Project Two and the Project will mainly pass to the north of the Project. No real justification is provided for this and Report 1 does not regard this as being a reasonable assumption].

5.3.4 The Applicant has assumed that vessels will not route through the windfarm array area DNV considers that this is not a reasonable assumption. As the presence of windfarms in the Southern North Sea increases vessels are likely to elect to transit through the Project array area rather than take longer routes.

5.3.5 The Applicant has assumed that as the large specialist vessels which serve both the offshore oil and gas and the offshore renewables industries are used to working with restricted sea room the Project will not materially restrict such operations. This is a generalisation which is made without adequate support. DNV, having examined a number of recent and planned large vessel mobilisations and referenced appropriate guidelines, considers that such operations would be severely restricted by the Project. Even where such operations would be possible with the limited sea room available increased risks would be involved.

5.4 If the DCO is granted, the number of vessels (transiting and operating) in the vicinity of the Affected Assets and licensed blocks will increase. Relevant categories of vessel include: (1) vessels supporting Spirit's platforms and operations; (2) vessels involved in the construction and operation of the Project; and (3) third party vessels displaced as a result of the Project. This increased traffic will increase the potential for collisions with platforms and is likely to result in false alarms resulting in possible production shutdowns and (if manned) evacuation of personnel.

5.5 The numbers of vessels visiting each of Spirit's platforms is dependent upon work that is going on.

5.5.1 Routinely a platform supply vessel (PSV) will sail to Markham J6-A twice every month where it will spend a day before moving to each of Grove and Chiswick for around ½ day at each.

5.5.2 In addition, further unplanned visits may be required. During 2017, 19 such unplanned vessel visits occurred across Chiswick and Grove.

5.5.3 Specialist vessels such as crane barges or drilling rigs are required from time to time. These vessels will typically spend considerable lengths of time close to a platform or subsea drilling location. Whilst positioning they will be attended by tugs and anchor handlers. Throughout the time that they are on station an emergency response and recovery vessel (ERRV) will be required to be close by. During the current drilling campaign, the Nobel Hans Duel drilling rig has been stationed at Chiswick since April

2018 and is currently expected to remain there until April 2019. During this time, in addition to the Nobel Hans Deul, there has been an ERRV permanently in attendance.

5.5.4 Vessels in category (1) broadly fall into two broad groups: (a) offshore support vessels such as platform supply vessels (PSVs) which routinely operate within the 500m exclusion zones of offshore facilities bringing supplies, equipment and removing waste; and (b) larger specialist vessels such as drilling rigs, crane barges and accommodation facilities which may be stationed adjacent to platforms or over subsea wells/infrastructure in order to drill, re-enter or abandon wells, undertake construction or decommissioning activity and provide accommodation for personnel undertaking significant construction, maintenance or decommissioning campaigns. As described in Report 1, these vessels also need to take up stations at stand by positions some distance prior to their final approach. Similar groupings apply to vessels in category (2).

5.5.5 Vessels in group (a) above will maintain their position through dynamic positioning whilst vessels in group (b) above will either maintain their position through dynamic positioning or by means of anchors. Dynamic positioning is achieved by a number of thrusters operating continuously to compensate for any movement of the vessel. In the event that the vessel loses power or one or more thrusters fail[3] or if the sea state or weather conditions are sufficiently strong to overcome the vessel power, the vessel may drift. Where anchors are used, the vessel will often not have its own propulsion and will rely on tugs when relocating. In the event that one or more anchors fail (or the lines to one or more of the tugs are disconnected), the vessel is likely to drift.

5.5.6 Due to the potential for these vessels to drift (referred to as being not under command (NUC)), it is usually necessary to maintain a clear path in the direction of drift (which will depend upon met-ocean conditions) to a drift off point. The distance to the drift-off point will again depend upon met-ocean conditions and the time it is reasonable to expect to regain command (e.g. by connecting a line to a tug, or undertaking maintenance to regain power). The time required (which will depend on the type of vessel and the availability of other vessels to assist) could by way of illustration be of order 30 mins even when one or more tugs are in attendance. A clear path to the drift off position is particularly important when a vessel is being moved or temporarily stationed.

5.5.7 Prior to entering a controlled 500m zone or in some cases when commencing operations at another location, a vessel will remain at a stand by position until entry checks have been performed and it has been authorised to enter the 500m zone or proceed to its operational location. If there a situation (such as a mechanical failure, changing weather conditions or an operational change of plan) with the vessel still

[3] Note: there are a variety of different classifications of dynamically positioned vessel with varying degrees of inherent redundancy to make them more resilient to some systems failing. Recommendations are provided in [ref to GOMO].

under command, the vessel would retreat to the stand by position which would be at a safe distance and usually a drift off position.

5.5.8 Sea room is a term used to describe the unfettered space needed to safely operate which has to include space for manoeuvring, space for anchors (which may typically extend 0.684nm or 1.245km (refer to figure 4-2 in Report 1), clear pathways to stand by and drift off positions and space for additional associated vessels (e.g. tugs and/or anchor handlers) to also operate safely. As the sea room required is dependent upon the met-ocean conditions it may be that operations can still be performed under some conditions but not under others. The more limited the conditions for safe operation, the more time may be spent "waiting on weather". Vessels of this nature are exceedingly expensive to operate (potentially several million GBP (£) per day) and have to be booked well in advance of operations so it is necessary to minimise any "waiting on weather".

5.6 Spirit considers that a lack of sea room will be one of the main impacts of the Project for:

5.6.1 vessels (in group (1)) operating in support of Spirit's oil & gas activities in the Greater Markham area placing restrictions on the use of larger vessels such as drilling rigs, crane barges and accommodation vessels; and

5.6.2 vessels (in group (2)) supporting construction or maintenance along the eastern boundary of the Project, significantly increasing the risk of collision with Spirit's assets.

5.7 In respect of vessels in category (2), it should be noted that stand by and operating positions may place these vessels in a drift on position for Spirit's assets (i.e. a position from which, were it to drift not under command a vessel would enter the asset's 500m zone and potentially collide with the asset before its drift could be averted, or stated another way, the path to its drift off position would enter the 500m zone and may lead to the asset itself).

5.8 In respect of vessels in category (3), Spirit does not agree with the assumptions made by the Applicant from which it concluded that any impact would be minor. Spirit believes that, even if the density of traffic is not much higher than currently (an assertion that is poorly supported and therefore disputed), the presence of the Project will force those vessels that do pass to the east of the Project into close proximity with Spirit's assets. Spirit also believes that as shipping crews becomes more familiar with an increased number of windfarms in the Southern North Sea, vessels will elect to pass through the array area posing a danger to Spirit assets on exit (if travelling eastwards) from the Project area. Spirit believes that in order to mitigate these increased risks, the current ARPA and AIS warning systems will need to be upgraded to a predictive radar early warning system (REWS). Further work is however required to verify the effectiveness of such a REWS in operating in close proximity to turbines of the size and density proposed by the Applicant.

5.9 In light of Report 1 and the other matters discussed in this section, Spirit considers the key impacts in relation to shipping and navigation on Affected Assets and, to the extent applicable, Licences to be:

5.9.1 An inability (or an ability much more heavily constrained than currently by met-ocean conditions resulting in delays) to carry out work essential to Spirit's oil and gas operations. Failure to carry out, or delays in, such work may result in loss of production[4] and/or increased costs (both with a resultant economic impact).

5.9.2 Loss of production (with consequent economic impact) arising from:

5.9.2.1 Emergency production shutdowns due to vessels on collision course with platforms;

5.9.2.2 Breakdowns caused as a result of emergency shutdowns[5] and waiting for repairs.

5.9.3 An unacceptable risk of collision with platforms by:

5.9.3.1 Vessels working near the eastern boundary of the Project that become not under command and drift towards a platform;

5.9.3.2 Third party vessels circumnavigating or passing through the Project array area.

5.9.4 Increased routine costs of operating and maintaining facilities due to longer vessel journeys in order to circumnavigate the Project.

5.9.5 Significant cost and effort in additional updates to installation Safety Cases to account for changes resulting from the proximity of the Project[6]. Where material change is required, those changes must be submitted to the Competent Authority for approval. It should be noted that in order to include the impact of the Project in a Safety Case, the active cooperation of the Applicant is likely to be required in order to properly characterise risks and proceduralise mitigating measures.

[4] Note that safety will never be compromised. Production loss and increased costs will always be incurred rather than accepting increased safety risks.

[5] Like many process systems, offshore oil and gas facilities are designed for continuous operation. Shutting down production quickly as in an emergency shutdown places demands on equipment that frequently results in equipment failures. By analogy, repeatedly performing an emergency stop in a car will place far greater demands on for example the breaking system than would occur under normal operation and may result in failure of components that would still have lasted for a long time in normal driving conditions.

[6] A Safety Case is a substantial document that identifies any Major Accident Hazards (MAH) affecting the facility and operations and for each such MAH identifies mitigation measures in order to reduce the risk to ALARP. The Safety Case also includes the overall Safety Management System including all policies and procedures governing work.

5.9.6 Restrictions and potential delays leading to increased costs and potential loss of production (with associated economic impacts) to Spirit's ability to undertake diving operations during windfarm construction when piling activities are likely. Whilst it is acknowledged that conflicts between piling and diving will generally be able to be averted by careful collaboration between Spirit and the Applicant in planning work, any unplanned work in response to emergencies or failures of subsea equipment/infrastructure will result in one or both parties suffering delays in accomplishing their respective workscopes.

5.10 Protective provisions are sought to deal with these matters by way of an amendment to the DCO, if granted, to facilitate the co-existence of the Project with Spirit's operations. These are set out in full in the annex to this document together with a reasoned justification.

6 Aviation

6.1 Spirit commissioned a technical report "Proposed Hornsea Three Offshore Wind Farm" dated October 2018 (Report 2) to assess the aviation impacts on the Affected Assets.

6.2 The findings of Report 2 can be summarised as:

6.2.1 a minimum distance of 7.5 nautical miles is required to safely execute an airborne radar approach from a minimum safe altitude over the windfarm of 2100 feet into the Spirit facilities.

6.2.2 a minimum distance of 5.0 nautical miles upwind is required in order to reach a minimum safe altitude over the windfarm of 2100 feet following either:

6.2.2.1 executing a single engine missed approach; or

6.2.2.2 on departure from one of the elevated helidecks with an engine failure shortly after committing to take-off.

6.3 These findings differ from those of the Applicant as:

6.3.1 The Applicant did not consider the need to be able to execute a missed approach or take-off with one engine inoperable. It is standard safe practice in flying two engined helicopters to always have the ability to follow through a manoeuvre even should one engine fail.

6.3.2 The Applicant took the view that as the prevailing winds are from the west, there would very rarely be a requirement to make an approach from the east (i.e. over the windfarm). The average wind direction changes from month to month and on any given day can be from any direction and can change significantly through the course of the day. As the Chiswick and Grove platforms are normally unmanned installations the accommodation they provide is intended as a temporary safe refuge and is not

equipped for regular use should it not be possible to collect personnel at the end of their day's shift on the platform. Spirit's safety cases for these installations are predicated on personnel who are left on the platform normally being collected by helicopter at the end of their shift. It is therefore assumed that there will be few limitations to flights. Spirit therefore consider that flights should not be constrained by wind direction.

6.4 The approach adopted by AviateQ differed from that of the Applicant. The Applicant conducted a desktop exercise (with the differences noted in 6.3 above) and applied certain statistics to deduce that flights would not be possible on less than 1% of days. AviateQ used typical meteorological conditions and conducted flights in a flight simulator captained by a very experienced training pilot to determine that in most cases it was not possible to execute an airborne radar approach under instrument flying rules with a missed approach within standard offshore helicopter practices and the capabilities of two different aircraft used by Spirit.

6.5 Spirit relies on helicopter access to its platforms and infrastructure for both routine operational matters and emergency evacuations (although it should be noted that emergency response is beyond the scope of the ES and different criteria may apply - for example when search and rescue helicopters are involved).

Origin/Destination	2018		2018		2018	
Humberside	August		September		October 1st-22nd	
	AM	PM	AM	PM	AM	PM
Chiswick	0	0	0	0	0	0
Grove	0	0	0	0	0	0
J6A	0	0	0	0	0	0
Norwich	August		September		October 1st-22nd	
	AM	PM	AM	PM	AM	PM
Chiswick	19	4	16	6	17	5
Grove	0	0	0	0	0	0
J6A	0	0	1	0	0	0
Den Helder	August		September		October 1st-22nd	
	AM	PM	AM	PM	AM	PM
Chiswick	11	12	9	4	12	8
Grove	14	13	11	11	8	8
J6A	21	23	20	18	17	14
Totals	**65**	**52**	**57**	**39**	**54**	**35**
	302					

Table 1: Number of Helicopter Landings

6.6 Table 1 indicates the number of helicopter landings made from 1 August 2018 to 22 October 2018 to each of the Affected Assets and the onshore point of departure. Whilst this level of activity is somewhat higher than normal due to current drilling operations, it illustrates a more intense period

of activity, In a normal month there are around 70 return flights from Den Helder to J6-A and about 10 infield round-trip flights from J6-A to Chiswick and a similar number to Grove.

6.7 Spirit's key concerns in relation to aviation in so far as impacting the Affected Assets and, to the extent applicable, Licences are therefore as follows:

6.7.1 The proximity of the Project to Chiswick and Grove platforms and the height of the proposed turbines will prevent an ascent with one engine inoperable under the most common meteorological conditions to the minimum safe altitude before entering the windfarm. It would therefore not be possible to land helicopters at these platforms under these normal conditions whilst operating in accordance with offshore helicopter standards. Were consent to be granted for the proposals as set out in the Application, it would become impracticable for Spirit to rely upon helicopters to transport personnel to and from these platforms. These visits are required in order to carry out essential maintenance work to ensure continuing safe production. Alternative methods of accessing the platform such as the use of "walk to work" vessels would require capital modifications to the platforms and result in increases in annual operating expenditure associated with chartering such vessels. The response times in the event of unplanned production shutdowns would be longer than were it possible to fly personnel to the platform and as a result there would be reductions in annual production. The combination of reduced production revenues, higher operating costs (therefore lower margins) and the need for capital investments could render the remaining production uneconomic and lead to an early cessation of production. Such an outcome would be contrary to MERUK.

6.7.2 The proximity of the Project to Chiswick and Grove platforms and the height of the proposed turbines will prevent almost all airborne radar approaches (over an arc of 160^{o}) from the east when the wind has a westerly component. A significant increase in the number of occasions when flights would not be possible (relative to current) would be likely. This would manifest itself through increased losses of production due to delays in carrying out preventative or corrective work.

6.7.3 Due to the increased potential with altitude for icing, during many of the winter months it will not be possible to fly over the windfarm and instead it will need to be circumnavigated at lower altitude. Accordingly, it is proposed to re-route the main HMR 2 route, adding 10.6 nm or 19.6km to each round trip from Norwich to Chiswick. This increase in distance will require the helicopters to carry more fuel and thus less payload. Flights from Norwich to Chiswick are mainly conducted in support of vessels such as drilling rigs rather than the platform. Such flights are already severely payload constrained and so it is anticipated that during such campaigns additional flights will be needed with consequent increases in operating costs. The additional flight distances also add to the risks to which personnel are exposed. Although helicopters are a very safe mode of travel, they never-the-less constitute one of the most risky aspects of

working offshore and accordingly Spirit seeks to reduce rather than increase such risks.

6.7.4 Even if the Applicant agreed to move the eastern boundary of the Project to be 5nm from Chiswick and Grove (parallel to the currently proposed boundary) (thus averting the situation outlined in 6.7.1), then instrumented helicopter approaches would not be possible when the wind was from an easterly direction over an arc of around 100^{o}. Whilst not as severe as the situation described in 6.7.2, production losses due to delays in carrying out work would still be likely. Further work examining meteorological statistics would be required to better determine the overall impact.

6.7.5 The Applicant acknowledges that due to the significant number of flights utilised by windfarm developers, available airspace may be affected. Spirit is of the view that, whilst it is highly likely that there would be times when flight congestion introduces delays or route modifications, overall the impact of such issues will be manageable and of a much lower order of magnitude than the above effects.

6.7.6 The above concerns have been expressed for convenience in terms of the impacts upon production operations at Chiswick and Grove.

6.7.6.1 Markham J6-A is not significantly affected as it is beyond the 5nm and although less than 7.5nm, there would only be a narrow arc of wind directions of about 40o when an instrumented approach would not be possible.

6.7.6.2 As noted in Section 5, vessels such as drilling rigs with their own helidecks could be operating at any location within Spirit's licenced acreage and the same distance restrictions of 5nm and 7.5nm would apply to flights from these locations. In the case of drilling rigs in particular, this will limit the viable locations from which future drilling can be undertaken thus limiting Spirit's ability to maximise economic recovery of hydrocarbons.

6.8 Protective provisions are sought to deal with these matters by way of an amendment to the DCO, if granted, to facilitate the co-existence of the Project with Spirit's operations. These are set out in full in the annex to this document together with a reasoned justification.

7 Licence Activities

7.1 The Applicant has made an incorrect assumption that licences are not developed in their later terms. Whilst one operator may relinquish a licence, the acreage may be re-licensed by the Oil & Gas Authority. Without appropriate protective measures within the DCO, the proposal is likely to have the effect of impeding future exploration and production, whether by Spirit or a third party and/or sterilising UK hydrocarbon resource.

8 Protective Provisions

8.1 Spirit is continuing to engage with the Applicant with the aim of coming to a commercial agreement to regulate relations in so far as their respective interests are concerned and to facilitate cooperation. A successful conclusion to those negotiations may allow Spirit to withdraw elements of its objection to the Application.

8.2 However, without any such agreement, and as matters currently stand, the proposed protective provisions sought by Spirit are considered necessary and reasonable to –

8.2.1 Avoid undue adverse impact on Spirit's existing and future operations

8.2.2 Maintain an acceptable level of safety in line with the ALARP principle

8.2.3 Facilitate appropriate co-existence of Spirit's operations with the Project.

8.3 The incorporation of the standard oil and gas clause within the Crown Estate's proposed lease to Orsted will not avoid the need for these measures for the reasons set out at section 3.

8.4 The reasoned justification for the protective provisions followed by the provisions themselves are set out in the annex to this document.

07 November 2018