Department for Business, Energy & Industrial Strategy

OFFSHORE OIL & GAS LICENSING 30TH SEAWARD ROUND

Habitats Regulations Assessment

Draft Appropriate Assessment: West of Shetland

February 2018

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Contents

1 Introduction

1.1 Background and purpose

The plan/programme covering this and potential future seaward licensing rounds has been subject to a Strategic Environmental Assessment (OESEA3), completed in July 2016. The SEA Environmental Report includes detailed consideration of the status of the natural environment and potential effects of the range of activities which could follow licensing, including potential effects on conservation sites. The SEA Environmental Report was subject to an 8 week public consultation period, and a post-consultation report summarising the comments and factual responses was produced as an input to the decision to adopt the plan/programme. This decision has allowed the Oil & Gas Authority (OGA) to progress with further seaward oil and gas licensing rounds. As a result on 27th July 2016, the OGA invited applications for licences regarding 821 Blocks in a 30th Seaward Licensing Round covering underexplored frontier areas of the UKCS, and applications were received for licences covering 239 Blocks/part Blocks.

The *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) implement the requirements of Articles 6(3) and 6(4) of the Habitats Directive with respect to oil and gas activities in UK territorial waters and on the UK Continental Shelf. The *Conservation of Offshore Marine Habitats and Species Regulations 2017* cover other relevant activities in offshore waters (i.e. excluding territorial waters). Within territorial waters, the Habitats Directive is transposed into UK law via the *Conservation of Habitats and Species Regulations 2017* in England and Wales, the *Conservation (Natural Habitats, &c.) Regulations 1994* in Scotland (for non-reserved matters), and the *Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995* (as amended) in Northern Ireland.

As the petroleum licensing aspects of the plan/programme are not directly connected with or necessary for nature conservation management of European (Natura 2000[1]) sites, to comply with its obligations under the relevant regulations, the Department for Business, Energy and Industrial Strategy[2] (BEIS, formerly the Department of Energy and Climate Change) is undertaking a Habitats Regulations Assessment (HRA). To comply with obligations under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended), in winter 2017, the Secretary of State undertook a screening assessment to determine whether the award of any of the Blocks offered would be likely to have a significant effect on a relevant

[1] This includes Special Areas of Conservation (SAC) and Special Protection Areas (SPA), and potential sites for which there is adequate information on which to base an assessment.
[2] Note that while certain licensing and regulatory functions have been passed to the OGA (a government company wholly owned by the Secretary of State for BEIS) on 1 October 2016, environmental regulatory functions are retained by BEIS, and are administered by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

site, either individually or in combination[3] with other plans or projects (BEIS 2018). In doing so, the Department has applied the Habitats Directive test[4] (elucidated by the European Court of Justice in the case of Waddenzee (Case C-127/02)[5]) which is:

> *…any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects.*
>
> *…where a plan or project not directly connected with or necessary to the management of a site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light, inter alia, of the characteristics and specific environmental conditions of the site concerned by such a plan or project.*

1.2 Relevant Blocks

The screening assessment (including consultation with the statutory conservation agencies/bodies) formed the first stage of the HRA process. The assessment was undertaken in the period within which applications for Blocks were being accepted, and therefore considered all 821 Blocks offered. The screening identified 304 whole or part Blocks as requiring further assessment prior to decisions on whether to grant licences (BEIS 2018). Following the closing date for 30th Seaward Round applications, and the publication of the screening document, those Blocks identified as requiring further assessment were reconsidered against the list of actual applications. It was concluded that further assessment (Appropriate Assessment - AA) was required for 61 of the Blocks applied for. Because of the wide distribution of these Blocks around the UKCS, the AA in respect of each potential licence award, are contained in four regional reports as follows:

- Southern North Sea
- Central North Sea
- West of Shetland
- Irish Sea

[3] Note that "in-combination" and "cumulative" effects have similar meanings, but for the purposes of HRA, and in keeping with the wording of Article 6(3) of the Habitats Directive, "in-combination" is used to describe the potential for such effects throughout. More information on the definitions of "cumulative" and "in-combination" effects are available in MMO (2014) and Judd *et al.* (2015).

[4] See Article 6(3) of the Habitats Directive.

[5] Also see the Advocate General's Opinion in the recent 'Sweetman' case (Case C-258/11), which confirms those principles set out in the Waddenzee judgement.

1.2.1 West of Shetland Blocks

The west of Shetland Blocks applied for in the 30th Round and considered in this assessment are listed below in Table 1.1, and are shown in Figure 1.1.

Table 1.1: Blocks requiring further assessment

205/14	205/19	205/25	206/11d	206/16a	208/30

1.3 Relevant Natura 2000 sites

The screening identified the relevant Natura 2000 sites and related Blocks requiring further assessment west of Shetland (refer to Appendix B of BEIS 2018). Following a reconsideration of those Blocks and sites screened in against those Blocks applied for, two Natura 2000 sites in the wider west of Shetland area were identified as requiring further assessment in relation to the 6 Blocks (Table 1.2 and Figure 1.1).

Table 1.2: Relevant sites requiring further assessment

Relevant site Features	**Relevant Blocks applied for**	**Sources of potential effect**
SPAs		
Hermaness, Saxa Vord & Valla Field SPA Breeding diver and seabirds. Breeding seabird assemblage	208/30	Underwater noise: deep geological seismic survey, conductor piling, site survey and well evaluation
Seas off Foula pSPA Breeding great skua. Breeding and over-wintering seabird assemblages	205/19, 205/25, 206/11d, 206/16a	Physical disturbance and drilling: rig siting, drilling discharges, vessel presence and movement
	205/14, 205/19, 205/25, 206/11d, 206/16a	Underwater noise: deep geological seismic survey, conductor piling, site survey and well evaluation

1.4 Assessment overview

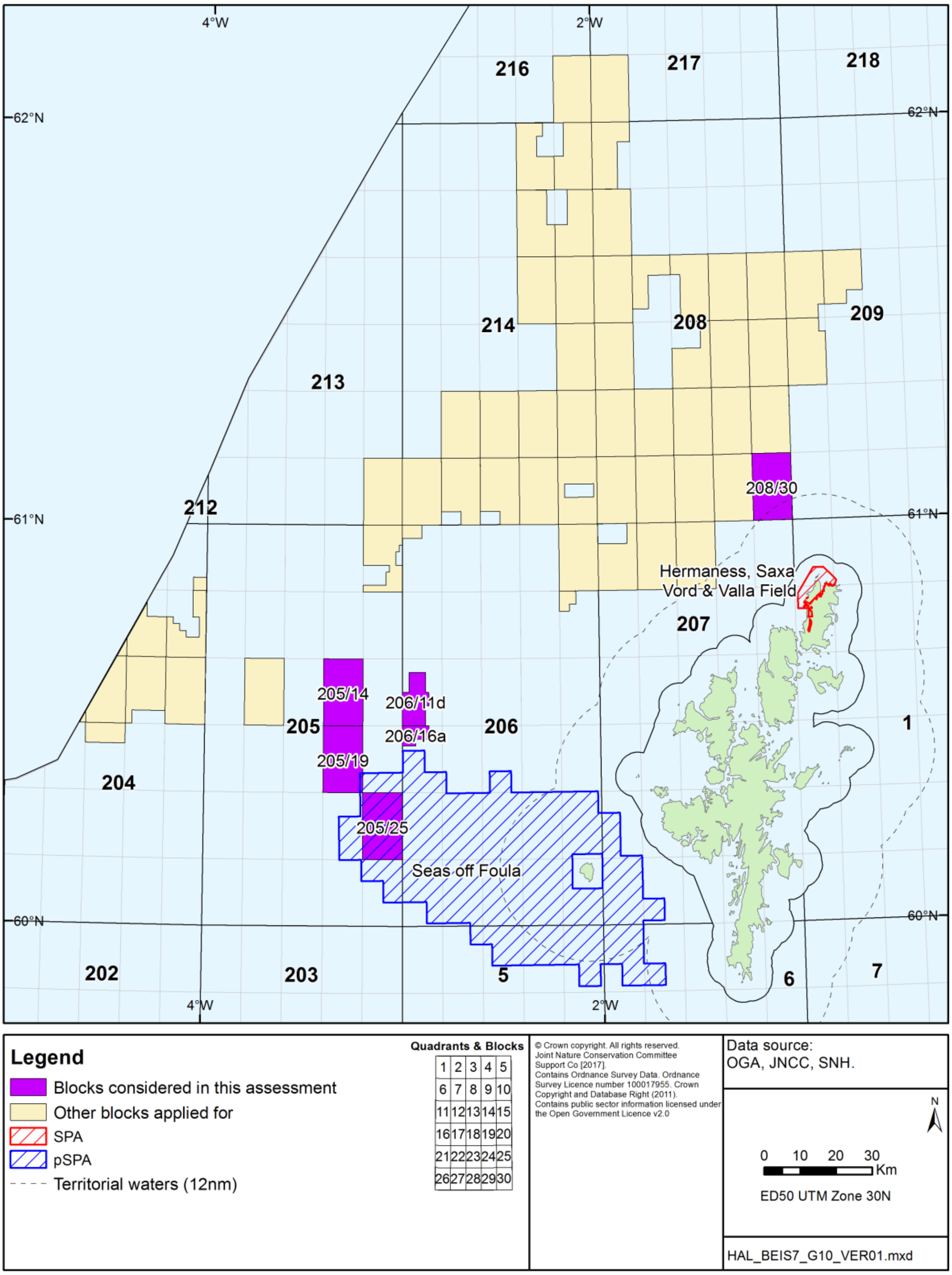
This document sets out the key assumptions and approach to the AA, the evidence base underpinning the assessment and the assessment of relevant Blocks and sites. The document is organised as follows:

- Overview of the licensing process and nature of the activities that could follow including assumptions used to underpin the AA process (Section 2)
- Description of the approach to ascertaining the absence or otherwise of adverse effects on the integrity of relevant European sites (Section 3)

- Evidence base on the environmental effects of offshore oil and gas activities to inform the AA reports (Section 4)
- The assessment of effects on the integrity of relevant sites, including in-combination with other plans or projects (Section 5)
- Overall conclusion (Section 6)

As part of this HRA process, this AA document is being subject to statutory consultation and will be amended as appropriate in light of comments received. The final AA documents will be available via the 30th Round Appropriate Assessment webpage of the gov.uk website.

Figure 1.1: Blocks and sites relevant to this Appropriate Assessment



2 Licensing and potential activities

2.1 Licensing

The exclusive rights to search and bore for petroleum in Great Britain, the territorial sea adjacent to the United Kingdom and on the UK continental shelf (UKCS) are vested in the Crown and the *Petroleum Act 1998* (as amended) gives the OGA the power to grant licences to explore for and exploit these resources. Offshore licensing for oil and gas exploration and production commenced in 1964 and progressed through a series of Seaward Licensing Rounds. A Seaward Production Licence grants exclusive rights to the holders "to search and bore for, and get, petroleum" in the area covered by the Licence but does not constitute any form of approval for activities to take place in the Blocks, nor does it confer any exemption from other legal or regulatory requirements. Offshore activities are subject to a range of statutory permitting and consenting requirements, including, where relevant, activity specific AA under Article 6(3) of the Habitats Directive (Directive 92/43/EC).

Several sub-types of Seaward Production Licence were available in previous rounds (Traditional, Frontier and Promote) which have been replaced by the single "Innovate" licence[6]. As per previous licensing structures, the Innovate licence is made up of three terms covering exploration (Initial Term), appraisal and field development planning (Second Term), and development and production (Third Term). The lengths of the first two terms are flexible, but have a maximum duration of 9 and 6 years respectively. The Third Term is granted for 18 years but may be extended if production continues beyond this period. The Innovate licence introduces three Phases to the Initial Term, covering:

- Phase A: geotechnical studies and geophysical data reprocessing (note that the acquisition of new seismic could take place in this phase for the purpose of defining a 3D survey as part of Phase B, but normally this phase will not involve activities in the field)
- Phase B: shooting of new seismic and other geophysical data
- Phase C: exploration and appraisal drilling

Applicants may propose the Phase combination in their submission to the OGA. Phase A and Phase B are optional and may not be appropriate in certain circumstances, but every application must propose a Phase C, except where the applicant does not think any exploration is needed (e.g. in the development of an existing discovery or field re-development) and proposes to go straight to development (i.e. 'straight to Second Term'). The duration of the Initial Term and the Phases within it are agreed between the OGA and the applicant.

[6] *The Petroleum and Offshore Gas Storage and Unloading Licensing (Amendment) Regulations 2017* amend the Model Clauses to be incorporated in Seaward Production Licences so as to implement the Innovate licences to be issued in the 30th Round.

Applicants may choose to spend up to 4 years on a single Phase in the Initial Term, but cannot take more than 9 years to progress to the Second Term. Failure to complete the work agreed in a Phase, or to commit to the next Phase means the licence ceases, unless the term has been extended by the OGA.

Financial viability is considered prior to licence award for applicants proposing to start at Phase A or B, but further technical and financial capacity for Phase C activities would need to be demonstrated before the licence could enter Phase C and drilling could commence. If the applicant proposes to start the licence at Phase C or go straight to the Second Term, the applicant must demonstrate that it has the technical competence to carry out the activities that would be permitted under the licence during that term, and the financial capacity to complete the Work Programme, before the licence is granted. It is noted that the safety and environmental capability and track record of all applicants are considered by the OGA (in consultation with the Offshore Safety Directive Regulator)[7] through written submissions before licences are awarded[8]. Where full details cannot be provided via the written submissions at the application stage, licensees must provide supplementary submissions that address any outstanding environmental and safety requirements before approvals for specific offshore activities such as drilling can be issued.

2.2 Activities that could follow licensing

As part of the licence application process, applicants provide the OGA with details of work programmes they propose in the Initial Term. These work programmes are considered along with a range of other factors by the OGA before arriving at a decision on whether to license the Blocks and to whom. Activities detailed in work programmes may include the purchase, reprocessing or shooting of 2D or 3D seismic data (Phases A and B) and the drilling of wells (Phase C). There are three levels of drilling commitment:

- A Firm Drilling Commitment is a commitment to the OGA to drill a well. Firm drilling commitments are preferred on the basis that, if there were no such commitment, the OGA could not be certain that potential licensees would make full use of their licences. However, the fact that a licensee has been awarded a licence on the basis of a “firm commitment” to undertake a specific activity should not be taken as meaning that the licensee will actually be able to carry out that activity. This will depend upon the outcome of relevant activity specific environmental assessments.

[7] The Offshore Safety Directive Regulator is the Competent Authority for the purposes of the Offshore Safety Directive comprising of the Department for Business, Energy and Industrial Strategy (BEIS) Offshore Petroleum Regulator for Gas Environment and Decommissioning (OPRED) and the Health and Safety Executive (HSE) working in partnership.
[8] Refer to OGA technical guidance and safety and environmental guidance on applications for the 30th Round at: https://www.ogauthority.co.uk/licensing-consents/licensing-rounds/

- A Contingent Drilling Commitment is also a commitment to the OGA to drill a well, but it includes specific provision for the OGA to waive the commitment in light of further technical information.

- A Drill or Drop (D/D) Drilling Commitment is a conditional commitment with the proviso that the licence is relinquished if a well is not drilled.

Note that Drill or Drop and Contingent work programmes (subject to further studies by the licensees) will probably result in a well being drilled in less than 50% of the cases.

The OGA general guidance[9] makes it clear that an award of a Production Licence does not automatically allow a licensee to carry out any offshore petroleum-related activities from then on (this includes those activities outlined in initial work programmes, particularly Phases B and C). Figure 2.2 provides an overview of the plan process associated with the 30th Seaward Licensing Round and the various environmental assessments including HRA. Offshore activities such as seismic survey or drilling are subject to relevant activity specific environmental assessments by BEIS (see Figures 2.3 and 2.4), and there are other regulatory provisions exercised by the Offshore Safety Directive Regulator and bodies such as the Health and Safety Executive. It is the licensee's responsibility to be aware of, and comply with, all regulatory controls and legal requirements.

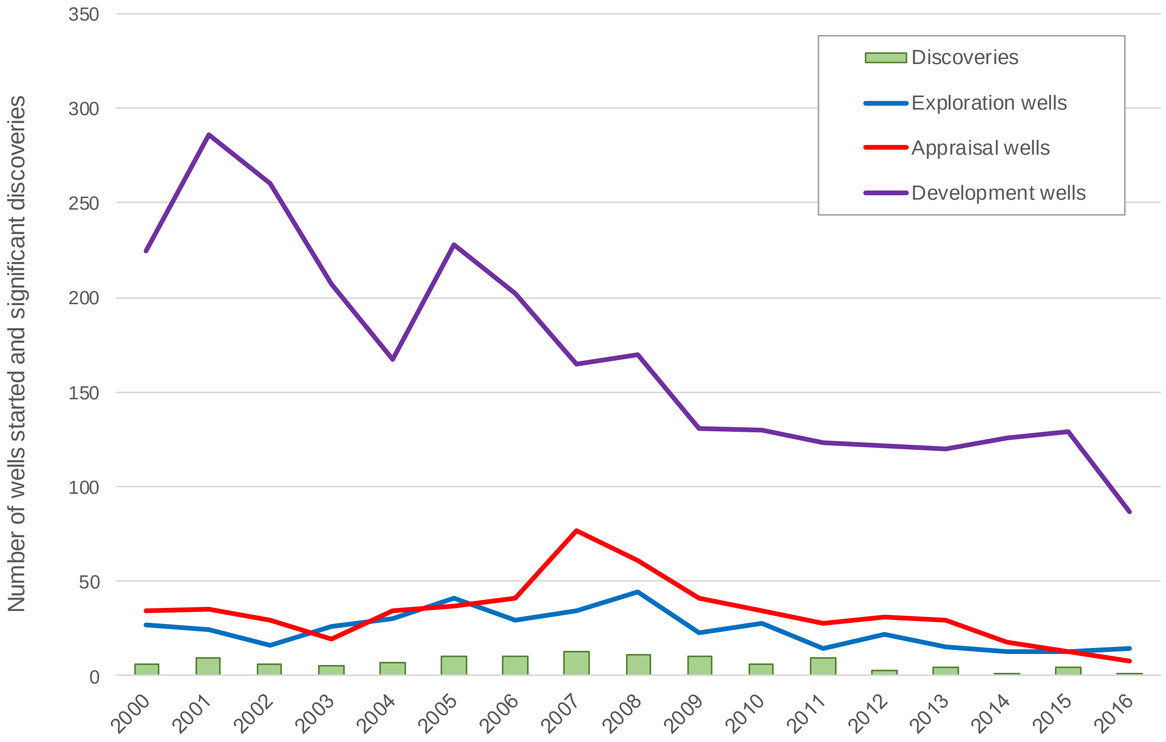
The proposed work programmes for the Initial Term are detailed in the licence applications. For some activities such as seismic survey, the potential impacts associated with noise could occur some distance from where the activity is being undertaken and the scale of activity is not necessarily proportional to the size or number of Blocks in an area. In the case of direct physical disturbance, the Blocks being applied for are relevant.

2.2.1 Likely scale of activity

On past experience the activity that actually takes place is less than that included in the work programme at the licence application stage. A proportion of Blocks awarded may be relinquished without any offshore activities occurring. Activity after the Initial Term is much harder to predict, as this depends on the results of the initial phase, which is, by definition, exploratory. Typically less than half the wells drilled reveal hydrocarbons, and of that, less than half will have a potential to progress to development. For example, OGA analysis of exploration well failures from the Moray Firth & Central North Sea between 2003 and 2013 indicated an overall technical success rate of 40% with respect to 150 exploration wells and side-tracks (Mathieu 2015). Depending on the expected size of finds, there may be further drilling to appraise the hydrocarbons (appraisal wells). For context, Figure 2.1 highlights the total number of exploration and appraisal wells started on the UKCS each year since 2000 as well as the number of significant discoveries made (associated with exploration activities).

[9] https://www.ogauthority.co.uk/media/3951/general-guidance.pdf

Figure 2.1: UKCS Exploration, appraisal & development wells, and significant discoveries since 2000



Note: "significant" generally refers to the flow rates that were achieved (or would have been reached) in well tests (15 mmcfgd or 1000 BOPD) and does not indicate commercial potential of the discovery. Source: OGA Drilling Activity (October 2017), Significant Offshore Discoveries (April 2017)

Discoveries that progress to development may require further drilling, installation of infrastructure such as wellheads, pipelines and possibly fixed platform production facilities, although recent developments are mostly tiebacks to existing production facilities rather than stand alone developments. For example, of the 48 current projects identified by the OGA's Project Pathfinder (as of 4th August 2017)[10], 18 are planned as subsea tie-backs to existing infrastructure, 4 involve new stand-alone production platforms and 10 are likely to be developed via Floating Production, Storage and Offloading facilities (FPSO). The final form of development for many of the remaining projects is not decided, with some undergoing re-evaluation of development options but some are likely to be subsea tie-backs. Figure 2.1 indicates that the number of development wells has declined over time and this pattern is likely to continue. The nature and scale of potential environmental impacts from the drilling of development wells are similar to those of exploration and appraisal wells and thus the evidence base described in Section 4 is applicable to the potential effects of development well drilling within any of the 30th Round Blocks.

[10] https://itportal.ogauthority.co.uk/eng/fox/path/PATH_REPORTS/pdf

2.2.2 30th Round activities considered by the HRA

The nature, extent and timescale of development, if any, which may ultimately result from the licensing of 30th Round Blocks is uncertain, and therefore it is regarded that at this stage a meaningful assessment of development level activity (e.g. pipelay, placement of jackets, subsea templates or floating installations etc) cannot be made. Once project plans are in place, subsequent permitting processes relating to exploration, development and decommissioning, would require assessment (including HRA) as appropriate, allowing the opportunity for further mitigation measures to be identified as necessary, and for permits to be refused if necessary. In this way the opinion of the Advocate General in ECJ (European Court of Justice) case C-6/04, on the effects on Natura sites, "*must be assessed at every relevant stage of the procedure to the extent possible on the basis of the precision of the plan. This assessment is to be updated with increasing specificity in subsequent stages of the procedure"* is addressed. Therefore only activities as part of the work programmes associated with the Initial Term and its associated Phases A-C will be considered in this AA (see Table 2.2).

Potential accidental events, including spills, are not considered in the AA as they are not part of the work plan. Measures to prevent accidental events, response plans and potential impacts in the receiving environment would be considered as part of the environmental impact assessment (EIA) process for specific projects that could follow licensing when the location, nature and timing of the proposed activities are available to inform a meaningful assessment of such risks.

The approach used in this assessment has been to take the proposed activity for the Block as being the maximum of any application for that Block, and to assume that all activity takes place. The estimates of work commitments for the relevant Blocks derived from the applications received by the OGA are shown in Table 2.1.

Table 2.1: Indicative work programmes relevant to Blocks considered in this assessment

Relevant Blocks	Obtain[11] and/or reprocess 2D or 3D seismic data	Shoot 3D seismic	Drill or drop well
205/14	✓	-	✓
205/19	✓	-	✓
205/25	-	✓	✓
206/11d	✓	-	✓
206/16a	✓	-	✓
208/30	-	✓	✓

Completion of the work programmes is likely to involve one or more of the activities summarised in Table 2.2. A series of assumptions has been developed on the nature and scale of activities to be assessed based on the evidence base for potential effects presented in

[11] To obtain seismic data means purchasing or otherwise getting the use of existing data and does not involve shooting new seismic.

Section 4 as well as reviews of exemplar Environmental Statements of relevant activities. Subsequent development activity is contingent on successful exploration and appraisal and may or may not result in the eventual installation of infrastructure. Where relevant, such future activities will themselves be subject to activity specific screening procedures and tests under the Habitats Directive.

Table 2.2: Potential activities and assessment assumptions

Potential activity	Description	Assumptions used for assessment
Initial Term Phase B: Geophysical survey		
Deep geological seismic (3D) survey	3D seismic involves a survey vessel towing multiple airgun arrays and streamers (up to 12 km long), containing several hydrophones along its length. The reflections from the subsurface strata provide an image in two dimensions (horizontal and vertical). Closely spaced 3D lines (typically between 25 and 50m apart) can be achieved by a single sail line. Repeated parallel lines are typically run at intervals of several kilometres (minimum *ca.* 0.5km) and a second set of lines at right angles to the first to form a grid pattern. This allows imaging and interpretation of geological structures and identification of potential hydrocarbon reservoirs. Typical airgun arrays for deep geological surveys involve 12-48 airguns and have a total array volume of 3000-8000 in^3	Assuming a survey vessel sailing speed of 4.5 knots and 500 line km of seismic shot per Block, this activity would take at least 2.5 days to complete. Total survey duration could vary between 3 and 11 days depending on its location and time of year (e.g. assuming shooting is undertaken only in daylight hours and suitable sea state is available).
Initial Term Phase C: Drilling and well evaluation		
Rig tow out & de-mobilisation	Mobile rigs are towed to and from the well site typically by 2-3 anchor handling vessels.	The physical presence of a rig and related tugs during tow in/out is both short (a number of days depending on initial location of rig) and transient.
Rig placement/ anchoring	Semi-submersible rigs are used in deeper waters (normally >120m). Mooring is achieved using either anchors (deployed and recovered by anchor handler vessels) or dynamic positioning (DP) to manoeuvre into and stay in position over the well location. Eight to 12 anchors attached to the rig by cable or chain are deployed radially from the rig; part of the anchoring hold is provided by a proportion of the cables or chains lying on the seabed (catenary).	Semi-submersible rig anchors (if used) may extend out to a radius of 1.5km. It is assumed that the seabed footprint of these is in the order of $0.06km^2$.
Marine discharges	Typically around 1,000 tonnes of cuttings (primarily rock chippings) result from drilling an exploration well. Water-based mud cuttings are typically discharged at, or relatively close to sea surface during "closed drilling" (i.e. when steel casing in the well bore and a riser to the rig are in place), whereas surface hole cuttings are normally discharged at seabed during "open-hole" drilling. Use of oil based mud systems, for example in highly deviated sections or in drilling water reactive shales, would require onshore disposal or treatment offshore to the required standards prior to discharge.	The footprint of cuttings and other marine discharges, or the distance from source within which smothering or other effects may be considered is generally a few hundred metres. For the assessment it is assumed that effects may occur within 500m of the well location covering an area in the order of $0.8km^2$.

Potential activity	Description	Assumptions used for assessment
Conductor piling	Well surface holes are usually drilled "open-hole" with the conductor subsequently inserted and cemented in place to provide a stable hole through which the lower well sections are drilled. Where the nature of the seabed sediment and shallow geological formations are such that they would not be stable open-hole (i.e. risking collapse), the conductor may be driven into the sediments. In North Sea exploration wells, the diameter of the conductor pipe is usually 26" or 30" (<1m), which is considerably smaller than the monopiles used for offshore wind farm foundations (>3.5m diameter), and therefore require less hammer energy and generate noise of a considerably lower amplitude. For example, hammer energies to set conductor pipes are in the order of 90-270kJ (see: Matthews 2014, Intermoor website), compared to energies of up to 3,000kJ in the installation of piles at some southern North Sea offshore wind farm sites. Direct measurements of underwater sound generated during conductor piling are limited. Jiang *et al.* (2015) monitored conductor piling operations at a jack-up rig in the central North Sea in 48m water depth and found peak sound pressure levels (L_{pk}) not to exceed 156dB re 1 µPa at 750m (the closest measurement to source) and declining with distance. Peak frequency was around 200Hz, dropping off rapidly above 1kHz; hammering was undertaken at a stable power level of 85 ±5 kJ but the pile diameter was not specified (Jiang *et al.* 2015).	The need to pile conductors is well-specific and is not routine. It is anticipated that a conductor piling event would last between 4-6 hours.
Rig/vessel presence and movement	On site, the rig is supported by supply and standby vessels, and helicopters are used for personnel transfer.	Supply vessels typically make 2-3 supply trips per week between rig and shore. Helicopter trips to transfer personnel to and from the rig are typically made several times a week. A review of relevant exploratory drilling Environmental Statements suggests that the rig could be on location for up to 10 weeks.
Rig site survey	Rig site surveys are undertaken to identify seabed and subsurface hazards to drilling, such as wrecks and the presence of shallow gas. The surveys use a range of techniques, including multibeam and side scan sonar, sub-bottom profiler, magnetometer and high-resolution seismic involving a much smaller source (mini-gun or four airgun cluster of 160in^3) and a much shorter hydrophone streamer. Arrays used on site surveys and some VSP operations (see below) typically produce frequencies predominantly up to around 250Hz, with a peak source level of around 235dB re 1µPa @ 1m (Stone 2015). The rig site survey vessel may also be used to characterise seabed habitats, biota and background contamination.	Rig site survey typically covers 2-3km^2. Survey durations are usually of the order of four or five days.
Well	Sometimes conducted to assist with well	Vertical Seismic Profiling (VSP) surveys are

Potential activity	Description	Assumptions used for assessment
evaluation (e.g. Vertical Seismic Profiling)	evaluation by linking rock strata encountered in drilling to seismic survey data. A seismic source (airgun array, typically with a source size of ~500 in^3 and a maximum of 1,200 in^3, Stone 2015) is deployed from the rig, and measurements are made using a series of geophones deployed inside the wellbore.	static and of short duration (one or two days at most).

2.3 Existing regulatory requirements and controls

The AA assumes that the high level controls described below are applied as standard to activities since they are legislative requirements. These are distinct from further mitigation measures which may be identified and employed to avoid likely significant effects on relevant sites (see Section 5.1.3).

2.3.1 Physical disturbance and drilling

There is a mandatory requirement to have sufficient recent and relevant data to characterise the seabed in areas where activities are due to take place (e.g. rig anchor placement)[12]. If required, survey reports must be made available to the relevant statutory bodies on submission of a relevant permit application or Environmental Statement, and the identification of any potential sensitive habitats by such survey (including those under Annex I of the Habitats Directive) may influence BEIS's decision on a project level consent.

Discharges from offshore oil and gas facilities have been subject to increasingly stringent regulatory controls over recent decades (see review in DECC 2016, and related Appendices 2 and 3). As a result, oil and other contaminant concentrations in the major streams (drilling wastes and produced water) have been substantially reduced or eliminated (e.g. the discharge of oil based muds and contaminated cuttings is effectively banned), with discharges of chemicals and oil exceeding permit conditions or any unplanned release, potentially constituting a breach of the permit conditions and an offence. Drilling chemical use and discharge is subject to strict regulatory control through permitting, monitoring and reporting (e.g. the mandatory Environmental Emissions Monitoring System (EEMS) and annual environmental performance reports). The use and discharge of chemicals must be risk assessed as part of the permitting process (e.g. Drilling Operations Application) under the *Offshore Chemicals Regulations 2002* (as amended), and the discharge of chemicals which would be expected to have a significant negative impact would not be permitted.

At the project level, discharges would be considered in detail in project-specific environmental impact assessments, (where necessary through HRAs) and chemical risk assessments under existing permitting procedures.

[12] See BEIS (2017). Guidance notes on the *Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999* (as amended).

2.3.2 Underwater noise

Controls are in place to cover all significant noise-generating activities on the UKCS, including geophysical surveying. Seismic surveys (including VSP and high-resolution site surveys), sub-bottom profile surveys and shallow drilling activities require an application for consent under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) and cannot proceed without consent. These applications are supported by an EIA, which includes a noise assessment. Applications are made through BEIS's Portal Environmental Tracking System using a standalone Master Application Template (MAT) and Geological Survey Subsidiary Application Template (SAT). Regarding noise thresholds to be used as part of any assessment, applicants are encouraged to seek the advice of relevant SNCB(s) (JNCC 2017) in addition to referring to European Protected Species (EPS) guidance (JNCC 2010). Applicants should be aware of recent research development in the field of marine mammal acoustics and the publication in the US of a new set of criteria for injury (NMFS 2016, referred to as NOAA thresholds).

BEIS consults the relevant statutory consultees on the application for advice and a decision on whether to grant consent is only made after careful consideration of their comments. Statutory consultees may request additional information or risk assessment, specific additional conditions to be attached to consent (such as specify timing or other specific mitigation measures), or advise against consent.

It is a condition of consents issued under Regulation 4 of the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) for oil and gas related seismic and sub-bottom profile surveys that the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC 2017) are followed. Where appropriate, EPS disturbance licences may also be required under the *Conservation of Offshore Marine Habitats and Species Regulations 2017*[13]. JNCC (2017) reaffirms that adherence to the guidelines constitutes best practice and will, in most cases, reduce the risk of deliberate injury to marine mammals to negligible levels. Applicants are expected to make every effort to design a survey that minimises sound generated and consequent likely impacts, and to implement best practice measures described in the guidelines.

In addition, potential disturbance of certain species may be avoided by the seasonal timing of offshore activities. Periods of seasonal concern for individual Blocks on offer have been highlighted (see Section 2 of OGA's Other Regulatory Issues[14] which accompanied the 30th Round offer) which licensees should take account of. These include periods of concern for drilling, with respect to seabird sensitivity to oil spills, and periods of concern for seismic survey, with respect to fish spawning. The latter covers a range of species which are important prey species for mobile qualifying features of European sites, for example sandeel, herring and young gadoids as key prey species of many seabirds and marine mammals. Licensees should

[13] Disturbance of European Protected Species (EPS) (i.e. those listed in Annex IV) is a separate consideration under Article 12 of the Habitats Directive, and is not considered in this assessment.
[14] https://www.ogauthority.co.uk/media/4004/other_regulatory_issues.docx

also be aware that it may influence BEIS's decision whether or not to approve particular activities.

Figure 2.2: Stages of plan level environmental assessment

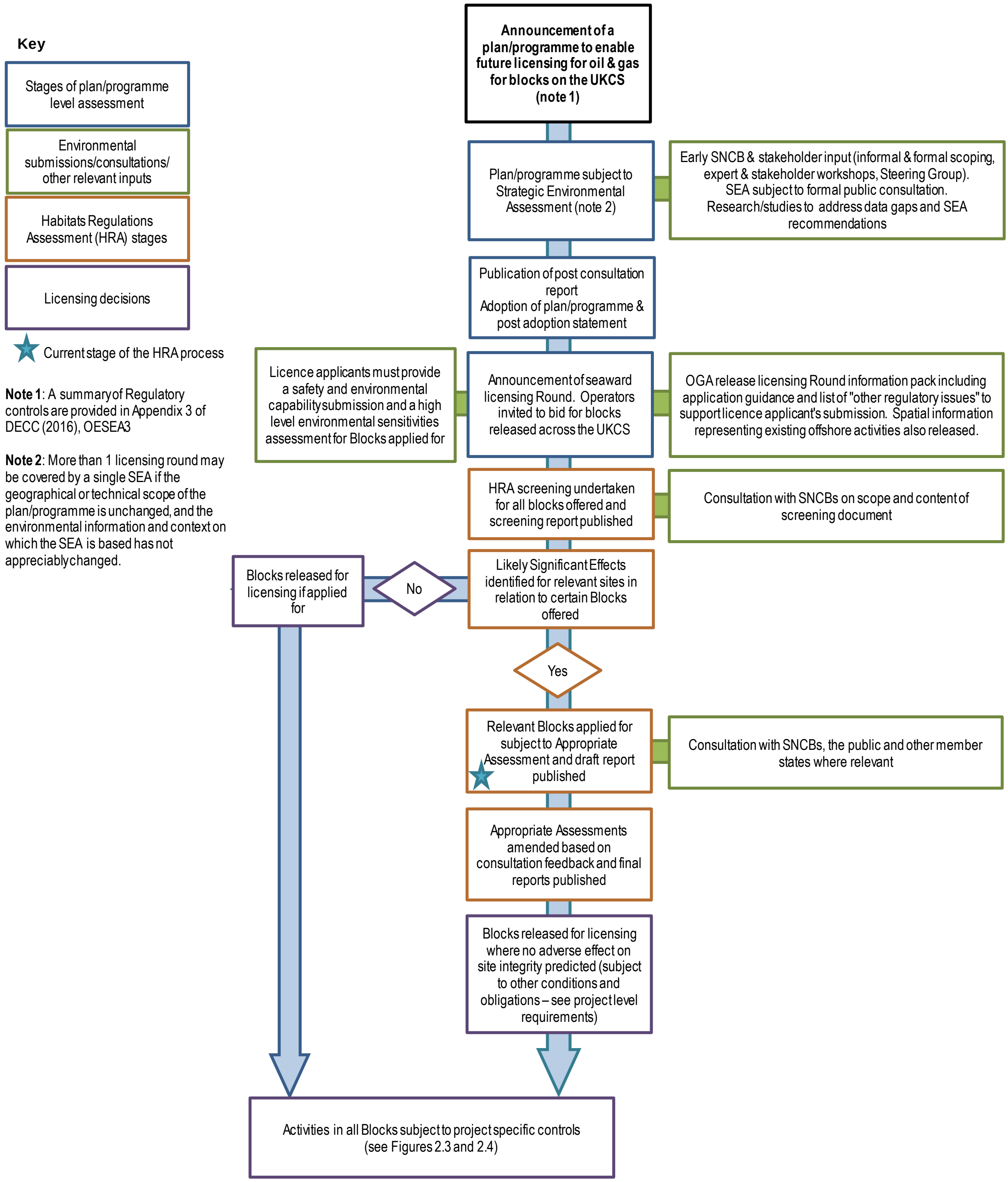
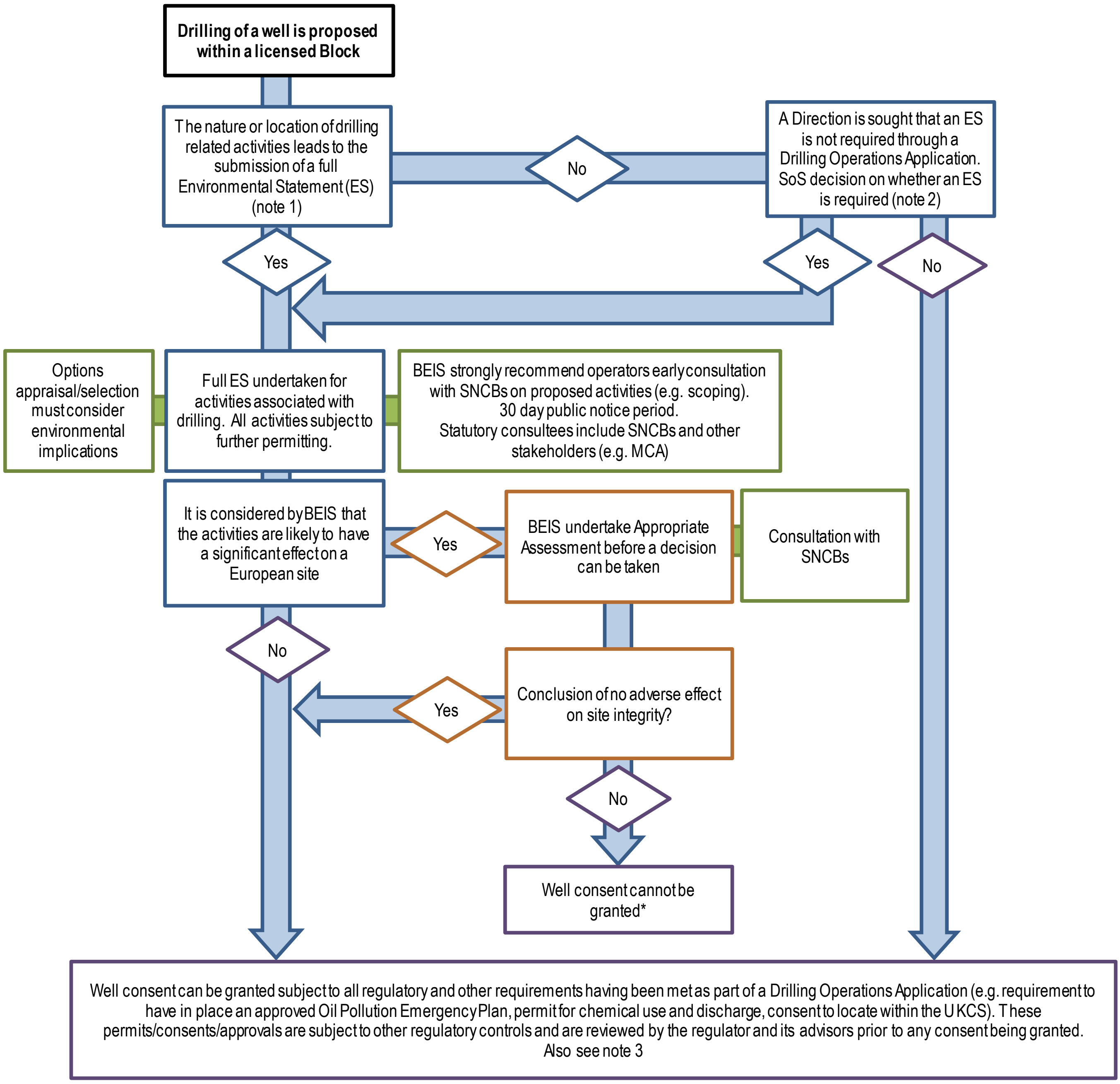


Figure 2.3: High level overview of exploration drilling environmental requirements



Key

- Stages of project permitting
- Environmental submissions/consultations/ other relevant inputs
- Habitats Regulations Assessment (HRA) stages
- Permitting/Consenting decisions

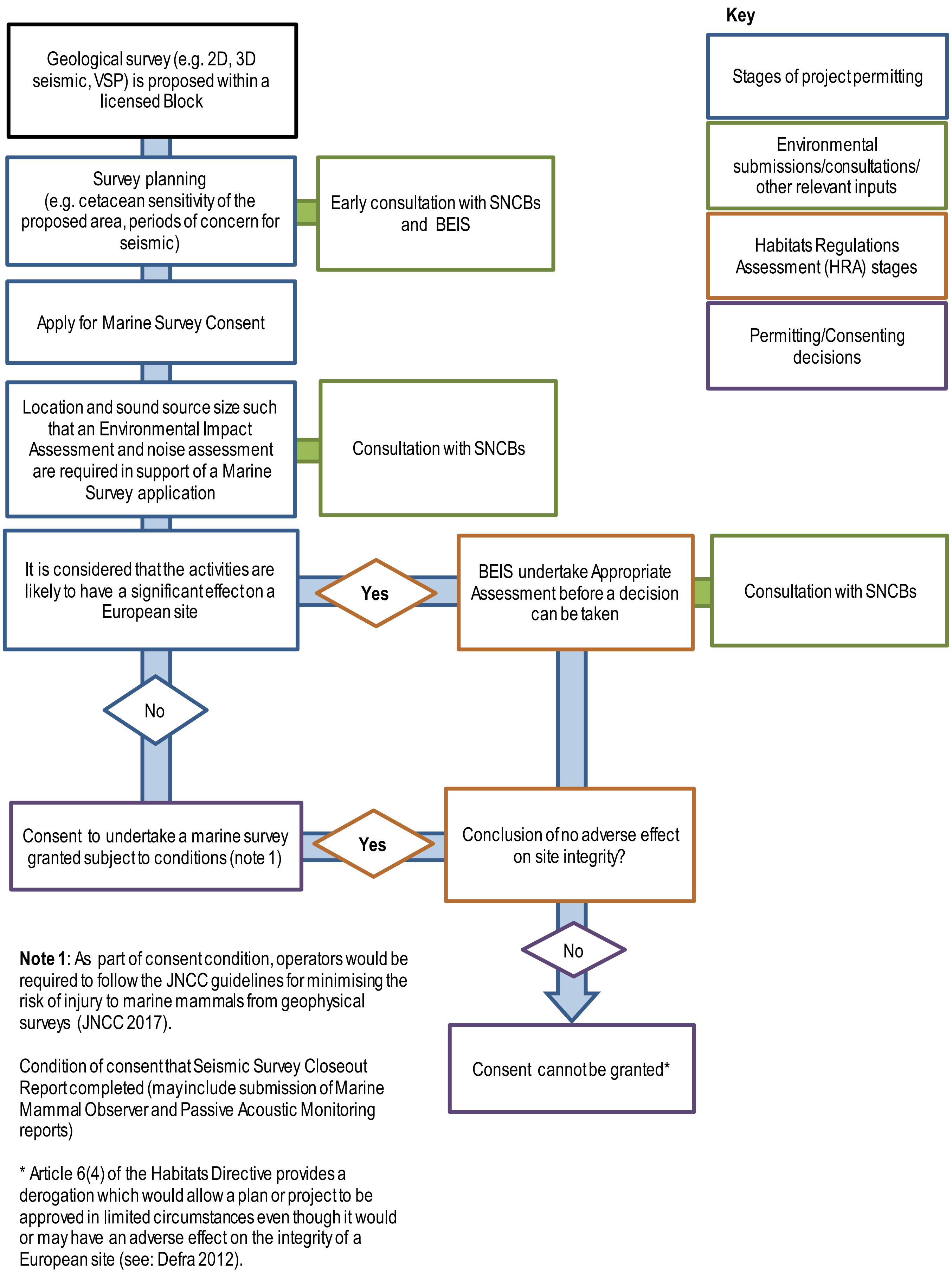
Note 1: See BEIS (2017). The Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999 (as amended) – A Guide. The Offshore Petroleum Regulator for Environment and Decommissioning, 80pp.

Note 2: Early consultation between BEIS and operators is typical to mitigate against Environmental Statement (ES) requirements being identified following the request for a direction

Note 3: In cases where an ES was initially identified as not required, or where an ES has been approved, the requirement to undertake AA may still apply (e.g. due to changes in the nature of the project or the designation of additional European sites)

* Article 6(4) of the Habitats Directive provides a derogation which would allow a plan or project to be approved in limited circumstances even though it would or may have an adverse effect on the integrity of a European site (see: Defra 2012).

Figure 2.4: High level overview of seismic survey environmental requirements



3 Appropriate assessment process

3.1 Process

In carrying out this AA so as to determine whether it is possible to agree to the grant of licences in accordance with Regulation 5(1) of *The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended), BEIS has:

- Considered, on the basis of the precautionary principle, whether it could be concluded that the integrity of relevant European Sites would not be affected. This impact prediction involved a consideration of the in-combination effects.
- Examined, in relation to elements of the plan where it was not possible to conclude that the integrity of relevant sites would not be affected, whether appropriate mitigation measures could be designed which negated or minimised any potential adverse effects identified.
- Subject to consultation on this document, drawn conclusions on whether or not it can agree to the grant of relevant licences.

In considering the above, BEIS used the clarification of the tests set out in the Habitats Directive in line with the ruling of the ECJ in the *Waddenzee* case (Case C-127/02), so that:

- Prior to the grant of any licence all activities which may be carried out following the grant of such a licence, and which by themselves or in combination with other activities can affect the site's conservation objectives, are identified in the light of the best scientific knowledge in the field.
- A licence can only be granted if BEIS has made certain that the activities to be carried out under such a licence will not adversely affect the integrity of that site (i.e. cause deterioration to a qualifying habitat or habitat of qualifying species, and/or undermine the conservation objectives of any given site). That is the case where no reasonable scientific doubt remains as to the absence of such effects.

3.2 Site integrity

The integrity of a site is defined by government policy, in the Commission's guidance and clarified by the courts (Cairngorms judicial review case[15]) as being: *'…the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat,*

[15] World Wild Life Fund & Others, Re application for judicial review of decisions relating to the protection of European Sites at Cairngorm Mountain, by Aviemore and proposals for construction of a funicular railway thereon.

complex of habitats and/or the levels of populations of the species for which it was classified/[designated].' This is consistent with the definitions of favourable conservation status in Article 1 of the Directive (JNCC 2002). As clarified by the European Commission (2000), the integrity of a site relates to the site's conservation objectives. These objectives are assigned at the time of designation to ensure that the site continues, in the long-term, to make an appropriate contribution to achieving favourable conservation status for the qualifying interest features. An adverse effect would be something that impacts the site features, either directly or indirectly, and results in disruption or harm to the ecological structure and functioning of the site and/or affects the ability of the site to meet its conservation objectives. For example, it is possible that a plan or project will adversely affect the integrity of a site only in a visual sense or only with respect to habitat types or species other than those listed in Annex I or Annex II. In such cases, the effects do not amount to an adverse effect for purposes of Article 6(3) of the Habitats Directive, provided that the coherence of the network is not affected. The AA must therefore conclude whether the proposed activity adversely affects the integrity of the site, in the light of its conservation objectives.

3.3 Assessment of effects on site integrity

The assessment has been undertaken in accordance with the European Commission Guidance (EC 2000) and with reference to other guidance, reports and policy, including the Habitats Regulations Guidance Notes (English Nature 1997, Defra 2012, SEERAD 2000), SNH (2015), the National Planning Policy Framework (DCLG 2012), the Marine Policy Statement (HM Government 2011), English Nature report, No. 704 (Hoskin & Tyldesley 2006) and Natural England report NECR205 (Chapman & Tyldesley 2016).

The assessment of effects on site integrity is documented in Section 5. It has been informed by an evidence base on the environmental effects of oil and gas activities on the UKCS and elsewhere (Section 4), and has utilised a number of assumptions on the nature and scale of potential activities that could follow licensing (Table 2.2), along with the characteristics and specific environmental conditions of the relevant sites (see Section 5). Activities which may be carried out following the grant of a licence, and which by themselves or in combination with other activities can affect the conservation objectives of relevant sites are discussed under the following broad headings:

- Physical disturbance and drilling effects (Section 5.1)
- Underwater noise effects (Section 5.2)
- In-combination effects (Section 5.3)

4 Evidence base for assessment

4.1 Introduction

The AAs are informed by an evidence base on the environmental effects of oil and gas activities derived from the scientific literature, relevant Strategic Environmental Assessments (e.g. DECC 2009, 2011 and 2016) and other literature. Recent operator Environmental Statements for offshore exploration and appraisal activities on the UKCS have also been reviewed, providing for example a more specific indication of the range of spatial footprints associated with relevant drilling activities to inform the further consideration of those sites where physical disturbance and drilling effects may be considered likely.

In recent years, significant work has been undertaken in the area of sensitivity assessments and activity/pressure matrices (e.g. Tillin *et al*. 2010, Tillin & Tyler-Walters 2014). Defra (2015) includes an evidence base for the latest pressures-activity matrix produced by JNCC (2013). These are intended to be representative of the types of pressures that act on marine species and habitats from a defined set of activities, based on benchmarks of these pressures where the magnitude, extent or duration is qualified or quantified in some way. This approach underpins the Scottish Government's FEAST (Feature Activity Sensitivity Tool[16]) database that facilitates the identification of potential management requirements for Nature Conservation Marine Protected Areas (MPAs). This database was used to inform the draft advice[17] for the Seas off Foula pSPA given the importance of sandeels (a feature of MPAs) as a qualifying feature of the pSPA. Whilst these matrices are informative and note relevant pressures associated with hydrocarbon exploration, resultant effects are not inevitable consequences of activity since often they can be mitigated through timing, siting or technology (or a combination of these). The Department expects that these options would be evaluated by the licensees and documented in the environmental assessments required as part of the activity specific consenting regime.

The following sections provide the evidence informing the assessment of effects provided in Section 5. To focus the presentation of relevant information, the sections take account of the environments in which those Blocks and relevant Natura 2000 sites to be subject to further assessment are located (Figure 1.1).

4.2 Physical disturbance and drilling effects

The pathways by which exploration activities may have physical disturbance and drilling effects on Natura 2000 sites include:

16 http://www.marine.scotland.gov.uk/FEAST/Index.aspx
17 http://jncc.defra.gov.uk/pdf/SAS_Conservation_Objectives_and_Reg_18_Foula.pdf

- Physical damage to benthic habitats caused by semi-submersible drilling rig anchor placement, dragging and contact of anchor cables and chains with the (see Section 4.2.1)

- Physical loss of benthic habitats through the discharge of surface hole cuttings around the well and placement of wellhead assembly (see Section 4.2.2)

- Smothering by settlement of drill cuttings on seabed following discharge near sea surface (see Section 4.2.2)

- Displacement of sensitive receptors by visual/acoustic disturbance from the presence and movement of vessels and aircraft (see Section 4.2.3)

4.2.1 Physical damage to benthic habitats

The response of benthic macrofauna to physical disturbance has been well characterised in peer-reviewed literature, with increases in abundance of small opportunistic fauna and decreases in larger more specialised fauna (Eagle & Rees 1973, Newell *et al.* 1998, van Dalfsen *et al.* 2000, Dernie *et al*. 2003).

Habitat recovery from temporary disturbance (caused by anchor scarring, anchor mounds) will depend primarily on re-mobilisation of sediments by current shear (as reviewed by Newell *et al*. 1998, Foden *et al.* 2009). Subsequent benthic population recovery takes place through a combination of migration, re-distribution (and larval settlement). On the basis that seabed disturbance is qualitatively similar to the effects of wave action from severe storms, it is likely that in most of the shallower parts of the UKCS, sand and gravel habitat recovery from anchor scarring, anchor mounds and cable scrape is likely to be relatively rapid (1-5 years) (van Dalfsen *et al.* 2000, Newell & Woodcock 2013).

In the west of Shetland area, semi-submersible drilling rigs are likely to be used due to water depths (>120m), and therefore there is the potential for seabed disturbance resulting from anchor deployment. It was indicated in Environmental Statements (ESs) for developments in Blocks 206/8 (BP 2010) and 214/30 (Total 2014) that the area of seabed affected by the use of semi-submersible rigs, both using eight anchors, was 0.032km^2 and 0.11km^2 respectively, with the latter anchoring in comparatively deeper water (*ca*. 435m compared with *ca*. 140m), and therefore having a wider anchor spread and more anchor chain in contact with the seabed (catenary contact). The above ESs note that anchoring scars could persist in the short to medium term, with scars in Block 206/8 expected to recover within 5 years due to relatively strong seabed currents (0.6m/s). Water depths across the Blocks being considered in this AA are broadly comparable to these (150-500m depth), and a semi-submersible rig would typically be used to drill exploration wells. The extent of seabed disturbance is likely to be in the range described above (see Table 2.2).

4.2.2 Physical loss of benthic habitats and smothering

The surface hole sections of exploration wells are typically drilled riserless, producing a localised (and transient) pile of surface-hole cuttings around the surface conductor. These cuttings are derived from shallow geological formations and a proportion will therefore be similar to surficial sediments in composition and characteristics. The persistence of cuttings discharged at the seabed is largely determined by the potential for it to be redistributed by tidal and other currents.

After installation of the surface casing (which will result in a small quantity of excess cement returns being deposited on the seabed), the blowout preventer (BOP) is positioned on the wellhead housing. These operations (and associated activities such as ROV operations) may result in physical disturbance of the immediate vicinity (a few metres) of the wellhead. When an exploration well is abandoned, the conductor and casing are plugged with cement and cut below the mudline (seabed sediment surface) using a mechanical cutting tool deployed from the rig and the wellhead assembly is removed. The seabed "footprint" of the well is therefore removed although post-well sediments may vary in the immediate vicinity of the well compared to the surrounding seabed (see for example, Jones *et al*. (2012)).

In contrast to historic oil based mud discharges[18], effects on seabed fauna of the discharge of cuttings drilled with water based muds (WBM) and of the excess and spent mud itself are usually subtle or undetectable, although the presence of drilling material at the seabed is often detectable chemically close to the drilling location (<500m) (e.g. Cranmer 1988, Neff *et al.* 1989, Hyland *et al.* 1994, Daan & Mulder 1996, Currie & Isaacs 2005, OSPAR 2009, Bakke *et al*. 2013, DeBlois *et al*. 2014). Considerable data has been gathered from the North Sea and other production areas, indicating that localised physical effects are the dominant mechanism of ecological disturbance where water-based mud and cuttings are discharged. Dispersion modelling of a WBM cuttings discharge of 3,160 tonnes of mud and cuttings from a well in Block 214/30a (water depth *ca.* 435m) predicted deposition in a 560m by 120m (0.85km^2) area. The thickest deposit of cuttings (203mm) was present at the discharge point, falling quickly to 5mm within *ca*. 50m of the well and then to 1mm or less over the remainder of the 0.85km^2 area. The model showed that the majority of the WBM (the finer particles) remained suspended in the water column and did not settle in the vicinity (Total 2014). Jones *et al*. (2006, 2012) compared pre- and post-drilling ROV surveys of an exploration well in Block 206/1a in *ca*. 600m water depth and documented physical smothering effects within 100m of the well. Outside the area of smothering, fine sediment was visible on the seafloor up to at least 250m from the well. After 3 years, there was significant removal of cuttings particularly in the areas with relatively low initial deposition (Jones *et al.* 2012). The area impacted by complete cuttings cover had reduced from 90m to 40m from the drilling location, and faunal density within 100m of the well had increased considerably and was no longer significantly different from conditions further away.

OSPAR (2009) concluded that the discharge of drill cuttings and water-based fluids may cause some smothering in the near vicinity of the well location. The impacts from such discharges are localised and transient, but may be of concern in areas with sensitive benthic fauna, for example corals and sponges. Field experiments on the effects of water-based drill cuttings on

[18] OSPAR Decision 2000/3 on the Use of Organic-Phase Drilling Fluids (OPF) and the Discharge of OPF-Contaminated Cuttings came into effect in January 2001 and effectively eliminated the discharge of cuttings contaminated with oil based fluids (OBF) greater than 1% by weight on dry cuttings.

benthos by Trannum *et al.* (2011) found after 6 months only minor differences in faunal composition between the controls and those treated with drill cuttings. This corresponds with the results of field studies where complete recovery was recorded within 1-2 years after deposition of water-based drill cuttings (Daan & Mulder 1996, Currie & Isaacs 2005).

Finer particles may be dispersed over greater distances than coarser particles although exposure to WBM cuttings in suspension will in most cases be short-term (Bakke *et al.* 2013). Although chemically inert, suspended barite has been shown under laboratory conditions to potentially have a detrimental effect on suspension feeding bivalves. Standard grade barite, the most commonly used weighting agent in WBMs, was found to alter the filtration rates of four bivalve species (*Modiolus modiolus, Dosinia exoleta, Venerupis senegalensis* and *Chlamys varia*) and to damage the gill structure when exposed to 0.5mm, 1.0mm and 2.0mm daily depth equivalent doses (Strachan 2010, Strachan & Kingston 2012). All three barite treatments altered the filtration rates leading to 100% mortality. The horse mussel (*M. modiolus*) was the most tolerant to standard barite with the scallop (*C. varia*) the least tolerant. Fine barite, at a 2mm daily depth equivalent, also altered the filtration rates of all species, but only affected the mortality of *V. senegalensis*, with 60% survival at 28 days. The bulk of WBM constituents (by weight and volume) are on the OSPAR list of substances used and discharged offshore which are considered to Pose Little or No Risk to the Environment (PLONOR). Barite and bentonite are the materials typically used in the greatest quantities in WBMs and are of negligible toxicity. Field studies undertaken by Strachan (2010) showed that the presence of standard grade barite was not acutely toxic to seabed fauna but did alter benthic community structure. When the suspended barite levels used in laboratory studies are translated to field conditions (i.e. distances from the point of discharge) it is clear that any effects will be very local to a particular installation (in the case of oil and gas facilities, well within 500m).

Relevant information on the recovery of benthic habitats to smothering mainly comes from studies of dredge disposal areas (see Newell *at al*. 1998). Recovery following disposal occurs through a mixture of vertical migration of buried fauna, together with sideways migration into the area from the edges, and settlement of new larvae from the plankton. The community recolonising a disturbed area is likely to differ from that which existed prior to construction. Opportunistic species will tend to dominate initially and on occasion, introduced and invasive species may then exploit the disturbed site (Bulleri & Chapman 2010). Harvey *et al.* (1998) suggest that it may take more than two years for a community to return to a closer resemblance of its original state (although if long lived species were present this could be much longer). Shallow water (<20m) habitats in wave or current exposed regimes, with unconsolidated fine grained sediments have a high rate of natural disturbance and the characteristic benthic species are adapted to this. Species tend to be short lived and rapid reproducers and it is generally accepted that they recover from disturbance within months. By contrast a stable sand and gravel habitat in deeper water is believed to take years to recover (see Newell *et al.* 1998, Foden *et al*. 2009).

4.2.3 Presence and movement of vessels

Blocks may support important numbers of seabirds at certain times of the year including overwintering birds and those foraging from coastal SPAs. Therefore, the presence and/or movement of vessels and aircraft from and within Blocks during exploration and appraisal activities could temporarily disturb foraging seabirds from relevant SPA sites. The anticipated level of airborne noise from helicopter traffic associated with Block activity is likely to be insignificant in the context of existing helicopter, military and civilian aircraft activity levels. Given the mature nature of the regions within which 30th Round Blocks are being offered, helicopter traffic is also likely to use established routes. In view of the seasonal nature of the sensitivity, where relevant it is more appropriate to consider this in project level assessment (e.g. EIA and HRA where necessary), when the location and timing of activities are known.

Physical disturbance of seaduck and other waterbird flocks by vessel and aircraft traffic associated with hydrocarbon exploration and appraisal is possible, particularly in SPAs established for shy species (e.g. common scoter). Such disturbance can result in repeated disruption of bird feeding, loafing and roosting. For example, large flocks of common scoter were observed being put to flight at a distance of 2km from a 35m vessel, though smaller flocks were less sensitive and put to flight at a distance of 1km (Kaiser 2002, also see Schwemmer *et al.* 2011). Larger vessels would be expected to have an even greater disturbance distance (Kaiser *et al.* 2006). With respect to the disturbance and subsequent displacement of seabirds in relation to offshore wind farm (OWF) developments, the Joint SNCB interim displacement advice[19] recommends for most species a standard displacement buffer of 2km with the exception of the species groups of more sensitive divers and sea ducks for which a 4km displacement buffer has been recommended. Whilst displacement effects for divers have been detected at greater distances (e.g. 5-7km, Webb 2016), this relates to the construction and operation of offshore wind farms which have a much larger spatial and temporal footprint than oil and gas exploration activities.

4.3 Underwater noise

The sources, measurement, propagation, ecological effects and potential mitigation of noise associated with hydrocarbon exploration and production have been extensively reviewed, assessed and updated in each of the successive offshore energy SEAs (see DECC 2009, 2011, 2016).

4.3.1 Noise sources and propagation

Of those oil and gas activities that generate underwater sound, deep geological seismic survey (2D and 3D) is of primary concern due to the high amplitude, low frequency and impulsive nature of the sound generated over a relatively wide area. Typical 2D and 3D seismic surveys consist of a vessel towing a large airgun array, made up of sub-arrays or single strings of multiple airguns, along with towed hydrophone streamers. Total energy source volumes vary between surveys, most commonly between 1,000 and 8,000 inches^3, with typical broadband source levels of 248-259 dB re 1μPa (OGP 2011). Most of the energy produced by airguns is low frequency: below 200Hz and typically peaking around 100Hz; source levels at higher

[19] http://jncc.defra.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf

frequencies are low relative to that at the peak frequency but are still loud in absolute terms and relative to background levels. As detailed in Section 2.2.1 some work programmes relating to the Blocks applied for in the 30th Round include the intention to conduct a 3D seismic survey.

In addition to seismic surveys, relevant sources of impulsive sound are restricted to the smaller volume air-guns and sub-bottom profilers used in site surveys and well evaluation (i.e. Vertical Seismic Profiling, VSP), and also from occasional pile-driving of conductors during drilling. Compared to deep geological survey, these smaller volume sources tend to generate sound of lower amplitude, are typically complete within several hours on a single day, are conducted from either a fixed point (VSP) or cover a small area (site surveys) and, in the case of some sub-bottom profilers, operate at a higher frequency than air guns[20]. Consequently, the overall magnitude and area of risk from sound effects is considerably smaller than in the case of deep geological seismic surveys.

Drilling operations and support vessel traffic are sources of continuous noise (non-impulsive), of a comparable amplitude, dominated by low frequencies and of a lower amplitude than deep geological seismic survey. Sound pressure levels of between 120dB re 1µPa in the frequency range 2-1,400Hz (Todd & White 2012) are probably typical of drilling from a jack-up rig, with slightly higher source levels likely from semi-submersible rigs due to greater rig surface area contact with the water column. In general, support and supply vessels (50-100m) are expected to have broadband source levels in the range 165-180dB re 1µPa@1m, with the majority of energy below 1kHz (OSPAR 2009). Additionally, the use of thrusters for dynamic positioning has been reported to result in increased sound generation (>10dB) when compared to the same vessel in transit (Rutenko & Ushchipovskii 2015).

For all sources, there is now a reasonable body of evidence to quantify sound levels associated with these activities and to understand the likely propagation of these sounds within the marine environment, even in more complex coastal locations (DECC 2016).

4.3.2 Potential ecological effects

Potential effects of anthropogenic noise on receptor organisms range widely, from masking of biological communication and small behavioural reactions, to chronic disturbance, physiological injury and mortality. While generally the severity of effects tends to increase with increasing exposure to noise, it is important to draw a distinction between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance. In addition to direct effects, indirect effects may also occur, for example via effects on prey species, complicating the overall assessment of significant effects. Marine mammals, and in particular the harbour porpoise, are regarded as the most sensitive to acoustic disturbance and

[20] It should be noted that airgun (including VSP) and sub-bottom profiling site surveys undertaken in relation to licences issued under the *Petroleum Act 1998* require consent under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended), but side-scan sonar and multibeam echosounder surveys only require to be notified to the Regulator (JNCC 2017).

are typically the focus of impact assessments; however, high amplitude impulsive noise also potentially presents a risk to fish and diving birds.

There are no sites with marine mammal or fish qualifying features screened in for the West of Shetland region, and the Blocks applied for are not within areas of particular high use by seals associated with sites in Shetland and Orkney (Jones *et al*. 2015, Jones & Russell 2016). Consequently, the following discussion focuses on potential effects of underwater noise on diving birds and, as their prey species, fish.

Diving birds

Direct effects from seismic exploration noise on diving birds could occur through physical damage, or through disturbance of normal behaviour, although evidence for such effects is very limited. Deeper-diving species which spend longer periods of time underwater (e.g. auks) may be most at risk of exposure to high-intensity noise from seismic survey and consequent injury or disturbance, but all species which routinely submerge in pursuit of prey and benthic feeding opportunities (i.e. excluding shallow plunge feeders) may be exposed to anthropogenic noise. A full list of relevant species occurring in the UK is provided in Box 4.1; of these, five species are qualifying features of sites in West of Shetland region which this AA addresses: red-throated diver, gannet, guillemot, puffin and shag.

Very high amplitude low frequency underwater noise may result in acute trauma to diving seabirds, with two studies reporting mortality of diving birds in very close (i.e. tens of metres) proximity to underwater explosions (Stemp 1985, Danil & St Leger 2011). However, mortality of seabirds has not been observed during extensive seismic operations in the North Sea and elsewhere. While seabird responses to approaching vessels are highly variable, flushing disturbance would be expected to displace most diving seabirds from close proximity to seismic airgun arrays, particularly among species more sensitive to visual disturbance such as scoter, divers and cormorant (Garthe & Hüppop 2004).

The reported in-air hearing sensitivity for a range of diving duck species, red-throated diver and gannet have been tested for tone bursts between frequencies of 0.5-5.7kHz; results revealed a common region of greatest sensitivity from 1-3kHz, with a sharp reduction in sensitivity >4kHz (Crowell e*t al.* 2015). Testing on one of these species underwater (the long-tailed duck), showed reliable responses to high intensity stimuli (> 117 dB re 1µPa) from 0.5-2.9kHz (Crowell 2014). One recent study of underwater hearing in the cormorant suggested a hearing threshold of 70-75 dB re 1µPa rms for tones at tested frequencies of 1-4kHz (Hansen *et al*. 2017). The authors argue that this underwater hearing sensitivity, which is broadly comparable to that of seals and small odontocetes at 1-4kHz, is suggestive of the use of auditory cues for foraging and/or orientation and that cormorant, and possibly other species which perform long dives, are sensitive to underwater sound. One study showed that the use of acoustic pingers mounted on the corkline of a gillnet in a salmon fishery, emitting regular impulses of sound at *ca*. 2kHz, was associated with a significant reduction in entanglements of guillemot, but not rhinoceros auklet (Melvin *et al*. 1999).

A study investigated seabird abundance in Hudson Strait (Atlantic seaboard of Canada) during seismic surveys over three years (Stemp 1985). Comparing periods of shooting and nonshooting, no significant difference was observed in abundance of fulmar, kittiwake and thick-billed murre (Brünnich's guillemot). McCauley (1994) inferred from vocalisation ranges that the threshold of perception for low frequency seismic in some species (e.g. penguins, considered as a possible proxy for auk species) would be high, hence only in close proximity to the source might individuals be adversely affected. More recently, Pichegru *et al*. (2017) used telemetry data from breeding African penguins to document a shift in foraging distribution concurrent with a 2D seismic survey off South Africa. Pre/post shooting, areas of highest use (indicated by the 50% kernel density distribution) bordered the closest boundary of the seismic survey; during shooting, their distribution shifted away from the survey area, with areas of higher use at least 15km distant to the closest survey line. However, insufficient information was provided on the spatio-temporal distribution of seismic shooting or penguin distribution to determine an accurate displacement distance. It was reported that penguins quickly reverted to normal foraging behaviour after cessation of seismic activities, suggesting a relatively short-term influence of seismic activity on these birds' behaviour and/or that of their prey (Pichegru *et al*. 2017).

These data are limited, and further studies across a variety of diving species are required. However, the observed regions of greatest hearing sensitivity for cormorants in water and other diving birds in air are above those low frequencies (i.e. <500Hz) which dominate and propagate most widely from seismic survey. While there is some evidence of noise-induced changes in the distribution and behaviour of diving birds in response to impulsive underwater noise, these have been temporary and may be a direct disturbance or reflect a change in fish distribution during that period (possibly as a result of seismic activities).

Box 4.1: Migratory and/or Annex I diving bird species occurring in the UK considered potentially vulnerable to underwater noise effects

Divers and grebes	**Diving ducks**
Great northern diver *Gavia immer*	Pochard *Aythya ferina*
Red-throated diver *Gavia stellata*	Tufted duck *Aythya fuligula*
Black-throated diver *Gavia arctica*	Scaup *Aythya marila*
Little grebe *Tachybaptus ruficollis*	Eider *Somateria mollissima*
Great crested grebe *Podiceps cristatus*	Long-tailed duck *Clangula hyemalis*
Slavonian grebe *Podiceps auritus*	Common scoter *Melanitta nigra*
Seabirds	Velvet scoter *Melanitta fusca*
Manx shearwater *Puffinus puffinus*	Goldeneye *Bucephala clangula*
Gannet *Morus bassanus*	Red-breasted merganser *Mergus serrator*
Cormorant *Phalacrocorax carbo carbo*	Goosander *Mergus merganser*
Shag *Phalacrocorax aristotelis*	
Guillemot *Uria aalge*	
Razorbill *Alca torda*	
Puffin *Fratercula arctica*	

Note: Includes species which are known to engage in pursuit diving or benthic feeding in marine, coastal and estuarine waters at least during part of the year. Species in ***bold*** *are those of relevance to the sites and Blocks considered within this AA.*

Fish

Many species of fish are highly sensitive to sound and vibration and broadly applicable sound exposure criteria have recently been published (Popper *et al.* 2014). Studies investigating fish mortality and organ damage from noise generated during seismic surveys are very limited and results are highly variable, from no effect to long-term auditory damage (reviewed in Popper *et al.* 2014). Behavioural responses to high amplitude noise (such as increased swimming speed and startle responses) have been widely reported (see DECC 2009), but are highly variable in nature and their biological significance is difficult to determine. Behavioural responses and effects on fishing success ("catchability") have been reported following seismic surveys (Pearson *et al.* 1992, Skalski *et al.* 1992, Engås *et al.* 1996, Wardle *et al*. 2001). Following a review of relevant studies, MMS (2004) consider that the "consensus is that seismic airgun shooting can result in reduced trawl and longline catch of several species when the animals receive levels as low as 160dB". These reduced catches are temporary in nature and likely reflect temporary displacement and/or altered feeding behaviour. No associations of lower-intensity, continuous drilling noise and fishing success have been demonstrated, and large numbers of fish are typically observed around producing installations in the North Sea (e.g. Løkkeborg *et al*. 2002, Fujii 2015) and elsewhere (e.g. Stanley & Wilson 1991).

A key prey species of many seabirds, including those qualifying features of the Seas off Foula pSPA, is the sandeel. Studies on the hearing abilities of sandeels and their responses to noise are very limited. Hassel *et al.* (2004) observed startle responses from caged sandeels in response to seismic survey noise in the North Sea; no sandeels took refuge in the sand during seismic shooting, and no increased mortality was observed in comparison with controls. A study of the auditory thresholds of the closely-related Japanese sandeel (*Ammodytes personatus)* reported an ability to detect low frequency tone bursts at ≤500Hz, although their sensitivity was less than that of other fish species (Suga 2005). The sandeel's lack of a swim bladder is considered to be responsible for their observed low sensitivity to underwater noise.

5 Assessment

The screening process (BEIS 2018) identified a number of sites where there was the potential for likely significant underwater noise, physical disturbance and/or drilling effects associated with proposed activities that could follow licensing of Blocks offered in the 30th Round. A number of these Blocks have been applied for (see Section 1.2) and the further assessment of licensing of these Blocks on relevant Natura 2000 sites is given below. This assessment has been informed by the evidence base on the environmental effects of oil and gas activities (Sections 4.2 and 4.3), and the assumed nature and scale of potential activities (Table 2.2).

5.1 Assessment of physical disturbance and drilling effects

5.1.1 Blocks and sites to be assessed

The relevant Blocks and sites are shown in Figure 5.1 Water depths over the Seas off Foula pSPA range between 50m and 150m; shallow areas with less than 50m depth occur only around Foula and 10km north of it, while depths of more than 150m are only reached in the northwest[21]. Water depths across the relevant Blocks range between 150-500m. The medium and shallow parts of the area are therefore within a depth range which is favoured by sandeel (30-80m, Wright *et al*. 2000). The combined effect of currents and waves creates moderate-energy seabed environment in the west, and a high-energy seabed in the east of the site. The site comprises a mosaic of subtidal coarse sediments and moderate-energy circalittoral rock, with some sand and muddy sand habitats in the northwest (McBreen *et al*. 2011).

Different studies suggest that the site fully (Ellis *et al.* 2012), or at least in its southern extent (Coull *et al*. 1998), overlaps with low intensity spawning and nursery grounds of sandeels. Sandeels form an important part of the diet of great skua (Furness & Hislop 1981, Votier *et al*. 2007). Additionally, the Shetland-Orkney thermal front overlaps with the site, suggesting that this feature might create relatively predictable foraging habitat for seabirds and other marine predators (Begg & Reid 1997) and be an important driver of the regular aggregations of seabirds in the area.

The island of Foula provides habitat for more than 190,000 seabirds; the land mass and immediately surrounding waters have been protected as the Foula SPA[22] since 1995, with the Seas off Foula pSPA extending this protection to cover 3,412km^2 of waters surrounding the island[23]. These waters provide foraging habitat for several species of seabird in both breeding and non-breeding seasons. Analyses of European Seabirds at Sea (ESAS)[24] data found that some 1,500 great skuas regularly use Seas off Foula during the breeding season,

[21] http://jncc.defra.gov.uk/pdf/SAS_Departmental_Brief_Foula.pdf
[22] http://jncc.defra.gov.uk/pdf/SPA/UK9002061.pdf
[23] Consultation on the proposed SPA closed in January 2017.
[24] http://www.seabirds.net/esas.html

corresponding to approximately 4% of the estimated biogeographic population and satisfying criteria for designation as a SPA (JNCC 2016). Analyses of movement data from great skua (n=12) tagged at Foula (Thaxter *et al*. 2011, Wade *et al*. 2014) provided further evidence of the importance of this area to foraging birds during the breeding season. ESAS data also indicated a qualifying seabird assemblage during the breeding season (listed species include fulmar, Arctic skua, guillemot and puffin) and non-breeding season (listed species include great skua, fulmar, guillemot). All species are distributed throughout the entire extent of the proposed site, albeit in variable densities (JNCC 2016). While the highest predicted densities of great skua (>1 bird per km^2) are closer to the island of Foula, densities of 0.5-1 birds per km^2 are predicted throughout the site and some immediately adjacent waters). Puffin predicted densities are lowest in the northwest of the site and increase to the southeast, with the highest densities just south of Foula. Guillemot densities are lowest in the north of the site and its southeast extent; highest values occur predominately southwest of Foula. Densities of fulmar are low across most of the site, with higher values in the west and southeast, while the highest densities of Arctic skua are towards Shetland and an area 20km northeast of Foula.

Counts of breeding pairs of great skua at Foula between 1986 and 2000 remained between *ca*. 2,100-2,500, with a lower number of 1,657 breeding pairs reported in 2007; no more recent counts are available. Numbers of great skuas among four other Shetland colonies (Hermaness, Noss, Mousa and Fair Isle) in 2013 showed an increase of 27% over 2007 counts, and the latest assessed condition of breeding great skua at Foula SPA is listed as "Favourable Recovered" (SNH 2018); however, the data for sites across Scotland illustrate a complicated picture with no clear trend (JNCC website[25]). Among the other seabird species listed within the assemblages for the Seas off Foula pSPA, all have experienced declines among colonies in Shetland and indeed most Scottish colonies since the last census in 1998-2002 (JNCC website[26]).

5.1.2 Implications for site integrity of relevant sites

The site conservation objectives and other relevant information relating to site selection and advice on operations has been considered against indicative Block work programmes (see Section 2.2.1) to determine whether they could adversely affect site integrity, i.e. impacts the site features, either directly or indirectly, and result in disruption or harm to the ecological structure and functioning of the site and/or affects the ability of the site to meet its conservation objectives. The results are given in Table 5.1 below. In terms of mitigation, all mandatory requirements (as given in Section 2.3.1), are assumed to be in place as a standard for all activities assessed here.

[25] http://jncc.defra.gov.uk/page-2879
[26] http://jncc.defra.gov.uk/page-3201

Figure 5.1: Sites and Blocks to be subject to further assessment for physical disturbance and drilling effects

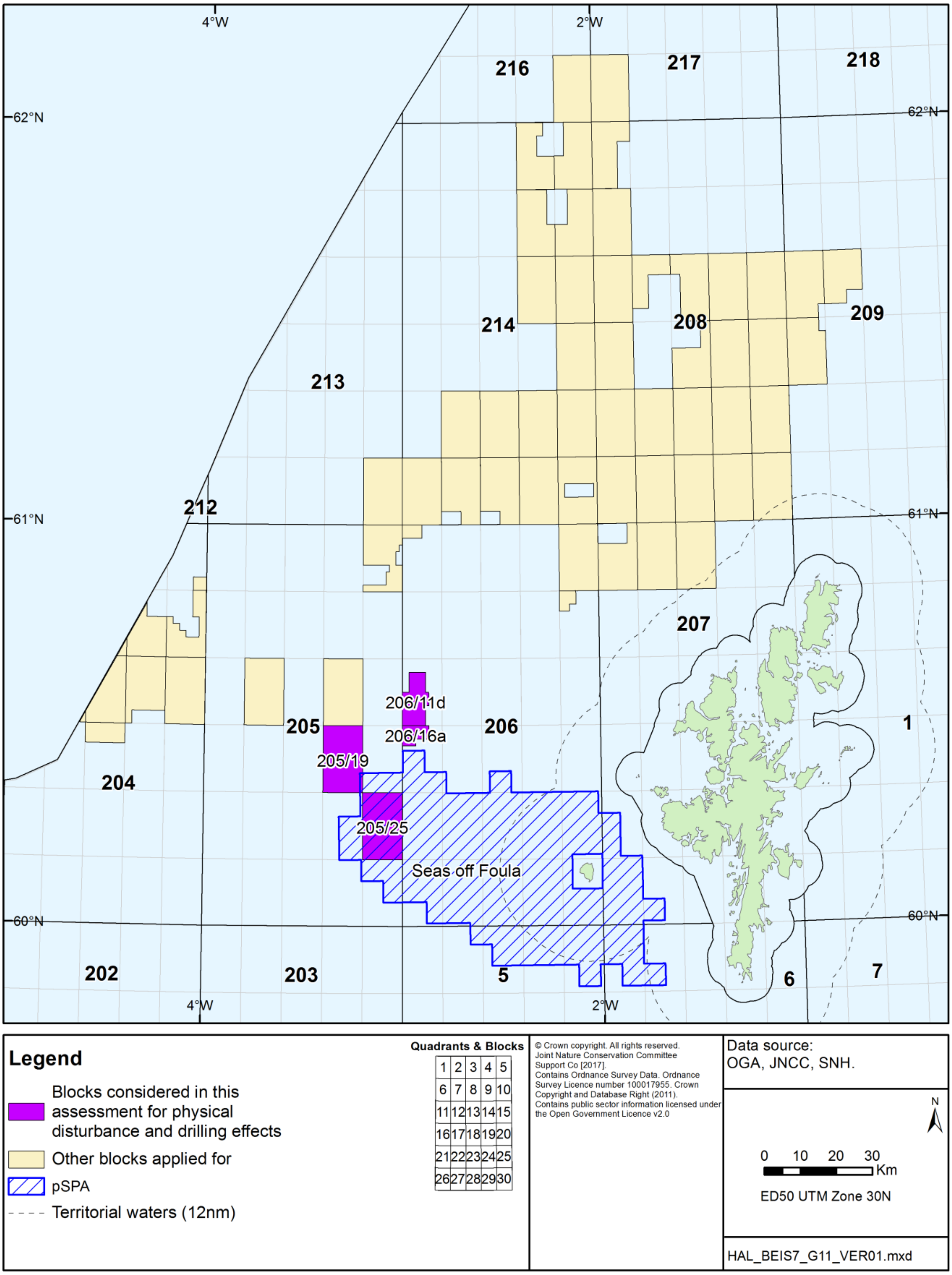


Table 5.1: Consideration of potential physical disturbance and drilling effects and relevant site conservation objectives

Seas of Foula pSPA
Site information
Area (ha): 341,215 **Relevant qualifying features:** Breeding great skua. Breeding and overwintering seabird assemblages. **Draft conservation objectives:** To avoid significant deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long term and makes an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species. This contribution would be achieved through delivering the following objectives for each of the sites qualifying features: • Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term; • Maintain the habitats and food resources of the qualifying features in favourable condition.
Relevant Blocks for physical disturbance and drilling effects
205/19, 205/25, 206/11d, 206/16a
Assessment of effects on site integrity
Rig siting Blocks 206/11d and 206/16a are 7km and 1.5km respectively from the site boundary and given the assumed distance from a semi-submersible rig within which effects may occur (1.5km, see Table 2.2), rig installation will not cause significant deterioration of the habitats of the qualifying species. Block 205/19 has significant areas outside the site boundaries in which rig siting would be possible, and therefore interaction with the habitats of the qualifying species could be avoided. Block 205/25 is fully within the site and whilst the assumed area within which effects may occur is quite large (7.1km^2, given 1.5km radius), the actual seabed footprint of physical damage associated with semi-submersible rig anchoring is small (*ca*. 0.06km^2, see Table 2.2), relative to the overall site area (covering <0.002%). Recovery from physical damage of the scale associated with rig anchoring is expected to be rapid given the moderate to high energy seabed environment. The small scale and temporary nature of the potential physical damage will not have a significant effect on the extent and quality of the supporting habitats in the longer term[27] and therefore there will be no adverse effect on site integrity. **Drilling discharges** It is assumed that effects relating to drilling discharges occur within 500m of the well location (Table 2.2). Therefore with respect to Blocks 206/11d and 206/16a, drilling discharges will not cause significant deterioration of the habitats of the qualifying species. With respect to Block 205/19, as mentioned above there are significant areas outside the site in which drilling discharges would not impact the site. For Block 205/25 which is fully within the site, the maximum spatial footprint within which smothering by drilling discharges may occur (0.8km^2) is small (representing 0.02% of the total site area) and given the dynamic nature of the site, redistribution of drilling discharges and recovery from smothering would be rapid. The small scale and temporary nature of potential smothering, and mandatory mitigation requirements with respect to drilling chemical use and discharge (Section 2.3.1), will ensure that the extent and quality of the supporting habitats are not impacted in the longer term and therefore there will be no adverse effect on site integrity. **Rig/vessel presence and movement** Of the qualifying features, guillemot are moderately sensitive to disturbance by ship and helicopter traffic with the other features being of low sensitivity (Garthe & Hüppop 2004). Block 205/25 is the only Block where there is the potential for a rig to be present within the site and this coincides with an area of low guillemot density (<3 birds/km^2)[28]. All of the relevant Blocks are currently exposed to very low shipping densities[29]. Given the low to moderate sensitivity of the qualifying features, the temporary nature of drilling activities and limited number of associated supply vessel and helicopter trips (Table 2.2) are unlikely to represent a significant disturbance. The

[27] http://jncc.defra.gov.uk/pdf/SAS_Conservation_Objectives_and_Reg_18_Foula.pdf
[28] http://jncc.defra.gov.uk/pdf/SAS_Departmental_Brief_Foula.pdf
[29] https://www.ogauthority.co.uk/media/1419/29r_shipping_density_table.pdf

activities are not likely to impact the qualifying features' distribution and use of the site such that their ability to survive and/or breed is compromised in the longer term[30]. Therefore there will be no adverse effect on site integrity.

In-combination effects

No intra-plan in-combination effects are likely with respect to the spatial footprints associated with rig siting and drilling discharges given that Block 205/25 is the only one within the site. There is the potential for in-combination effects associated with the presence and movement of supply vessels to rigs within each of the Blocks. However, given the existing very low shipping densities, the low to moderate sensitivity of the qualifying features and the limited and temporary supply vessel traffic, intra-plan effects are not considered likely for the four Blocks. Section 5.3 provides a consideration of potential Block activities in-combination with other relevant plans and projects.

5.1.3 Further mitigation measures

Further mitigation measures are available which are identified through the EIA process and operator's environmental management and the BEIS permitting processes. These considerations are informed by project specific plans and the nature of the sensitivities identified from detailed seabed information collected in advance of field activities taking place. Site surveys are required to be undertaken before drilling rig placement (for safety and environmental reasons) and the results of such surveys (survey reports) allow for the identification of further mitigation including the re-siting of activities (e.g. wellhead or anchor positions) to ensure sensitive seabed surface or subsurface features (such as shallow gas accumulations) are avoided. Such survey reports are used to underpin operator environmental submissions (e.g. EIAs) and where requested, survey reports are made available to nature conservation bodies during the consultation phases of these assessments[31].

In all instances, consent for project-level activities will not be granted unless the operator can demonstrate that the proposed exploration activities will not have an adverse effect on the integrity of relevant sites. The information provided by operators in their applications must be detailed enough for BEIS (and its advisors) to make a decision on whether the activities could lead to a likely significant effect.

5.1.4 Conclusions

Likely significant effects identified with regards to physical damage to the seabed, drilling discharges and other effects (see Section 5.1.2) when considered along with project level mitigation (Section 5.1.3) and relevant activity permitting (see Sections 2.3.1 and 5.1.3), will not have an adverse effect on the integrity of the Natura 2000 sites considered in this assessment. There is a legal framework through the implementation of the EIA Regulations and the Habitats Directive, to ensure that there are no adverse effects on the integrity of Natura 2000 sites. These would be applied at the project level, at which point there will be sufficient definition to make an assessment of likely significant effects, and for applicants to propose project specific mitigation measures.

Taking into account the information presented above, it is concluded that activities arising from the licensing of Blocks 205/19, 205/25, 206/11d and 206/16a, in so far as they may generate

[30] http://jncc.defra.gov.uk/pdf/SAS_Conservation_Objectives_and_Reg_18_Foula.pdf

[31] Whether within or outside an SAC, rig site survey typically includes a consideration of the presence of, amongst other sensitivities, Annex I habitats.

physical disturbance and drilling effects, will not cause an adverse effect on the integrity of the Seas off Foula pSPA. Consent for activities will not be granted unless the operator can demonstrate that the proposed activities which may include the drilling of a number of wells and any related activity including the placement of a drilling rig, will not have an adverse effect on the integrity of relevant sites.

5.2 Assessment of underwater noise effects

5.2.1 Blocks and sites to be assessed

The relevant Blocks and sites are shown in Figure 5.2. Hermaness, Saxa Vord and Valla Field SPA lies at the northern tip of Unst, Shetland, the most northerly part of the UK. The site includes sea cliffs of 100-200m height which, along with the adjacent stacks, heathland and grassland, provide important nesting habitat for a number of breeding seabird species, including the diving species of red-throated diver, gannet, guillemot and shag. The boundaries of the SPA extend 2-4km offshore from the Unst coast where seabed falls away fairly steeply; the majority of the marine areas of the site are 50-100m water depth. The seabirds feed within and outside the SPA in nearby waters, as well as more distantly elsewhere in the North Atlantic. Red-throated divers primarily forage within inshore waters during the breeding season and shag remain in coastal waters throughout the year; breeding gannet, guillemot and puffins will forage near the coast and also further offshore, up to 100km or more from nesting sites (Thaxter *et al*. 2012). In their latest assessed conditions, guillemot, puffin and red-throated diver were assessed as “unfavourable declining”, shag as “unfavourable no change”, and gannet as “favourable maintained” (SNH 2018). The breeding seabird assemblage as a whole was assessed as “unfavourable declining”. Reasons for the declines are the subject of ongoing investigation, although early indications suggest a lack of preferred prey species (adult sandeels) due, at least in part, to climate change, to be a main contributing factor (Miles *et al*. 2015, Daunt *et al*. 2017, RSPB 2018).

A description of the Seas off Foula pSPA and its qualifying features, which is also assessed for physical and drilling effects, is provided in Section 5.1.1.

5.2.2 Implications for site integrity of relevant sites

The site conservation objectives and other relevant information relating to site selection and advice on operations has been considered against indicative Block work programmes (see Section 2.2.1) to determine whether they could adversely affect site integrity, i.e. impacts the site features, either directly or indirectly, and result in disruption or harm to the ecological structure and functioning of the site and/or affects the ability of the site to meet its conservation objectives. The results are given in Table 5.2 below. In terms of mitigation, all mandatory requirements (as given in Section 2.3.2), are assumed to be in place as a standard for all activities assessed here.

Figure 5.2: Sites and Blocks to be subject to further assessment for underwater noise effects

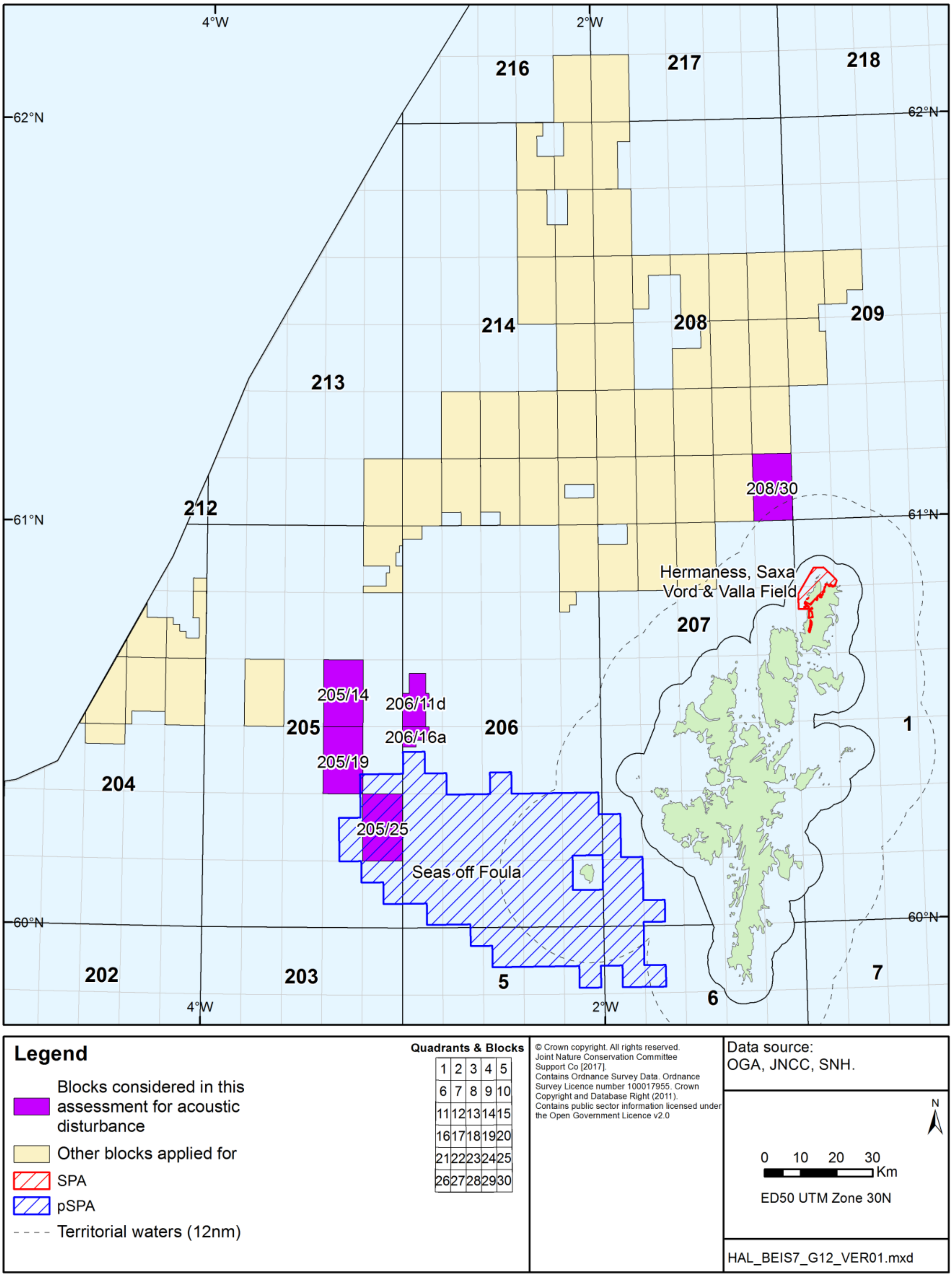


Table 5.2: Consideration of potential underwater noise effects and relevant site conservation objectives

Hermaness, Saxa Vord and Valla Field SPA
Site information
Area (ha): 1,037.7 **Relevant qualifying features (diving species listed only):** Breeding (including guillemot and puffin), and overwintering (including guillemot) seabird aggregations. **Conservation objectives:** To avoid significant deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long term and makes an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species. This contribution would be achieved through delivering the following objectives for each of the sites qualifying features: • Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term; • Maintain the habitats and food resources of the qualifying features in favourable condition.
Relevant Blocks for underwater noise effects
208/30
Assessment of effects on site integrity
2D and 3D seismic survey Block 208/30 lies a minimum of 14km from the closest boundary of the site, with the majority of the Block being >15km distant. Consequently, those qualifying species which are largely restricted to nearshore waters during the breeding season – red-throated diver and shag – are not anticipated to be in the vicinity of Block 208/30 and therefore exposure to seismic survey noise. Gannet, puffin and guillemot breeding at Hermaness, Saxa Vord and Valla Field SPA forage outside the boundaries of the site, with reported foraging ranges of 100+km, and some individuals can be expected to forage within Block 208/30 and surrounding waters. While they have the potential to come into close proximity to seismic survey activities, the evidence (albeit limited) of low hearing sensitivity and a lack of reported injury or disturbance effects, combined with the likely avoidance of the physical presence of survey vessel(s) and airguns, suggests that the risk of significant mortality, injury or disturbance is very low. As detailed in Section 4.3.2, there is very little information on the potential impact of underwater noise on diving birds, including that produced by deep geological survey. Mortality of seabirds has not been observed during extensive seismic operations in the North Sea and elsewhere, and flushing disturbance associated with the physical presence of the survey vessel would be expected to displace most diving seabirds from close proximity to seismic airgun arrays where sound pressure may be at sufficient levels to cause physical injury. Negative indirect effects of seismic survey activities on qualifying features may arise through effects on prey species, primarily sandeels and other small fish, if these prey are subject to injury or disturbance which reduce their availability to qualifying seabirds. While there is evidence that a reduction in fish catches can be associated with seismic survey activity, these are temporary in nature, and the disturbance of sensitive spawning periods will be considered through the activity consenting process. As such, any underwater noise effects on fish associated with licensing Block 208/30 are not anticipated to result in significant effects on the food resources of the qualifying seabird features. Considering the above, it is concluded that underwater noise effects from 2D or 3D seismic survey associated with the licensing of Block 208/30, will not represent an adverse effect on the integrity of the site. **Other activities** Considering the limited potential for effects of 2D/3D seismic survey on diving birds identified above, and the lower amplitude, shorter duration and smaller geographic footprint associated with other impulsive noise such as VSP, rig site survey and conductor piling, these activities will not result in an adverse effect on site integrity. Similarly, no effects on diving birds are anticipated from continuous underwater noise from drilling and vessel movements due to the lower amplitude and non-impulsive nature of the sound resulting in no potential for acute trauma and no evidence of significant disturbance.

In-combination effects No intra-plan in-combination underwater noise effects are likely given that Block 208/30 is the only Block applied for of relevance to the site. Section 5.3 provides a consideration of potential Block activities in-combination with other relevant plans and projects.
Seas off Foula pSPA
Site information
Area (ha): 341,215 **Relevant qualifying features:** See Table 5.1 above. **Conservation objectives:** See Table 5.1 above.
Relevant Blocks for underwater noise effects
205/14, 205/19, 205/25, 206/11d, 206/16a
Assessment of effects on site integrity
2D and 3D seismic survey The relevant Blocks lie within or adjacent to the northwest corner of the Seas off Foula pSPA; Block 205/25 is completely within the site boundary, covering some 200km^2 (6%) of the site, while a small proportion (*ca*. 5km^2, 0.1% of the site) of Block 205/19 overlaps the site. Of the relevant Blocks, one (205/25) has an application to shoot new 3D seismic. Puffin and guillemot forage within Block 205/25 and surrounding waters, and therefore have the potential to come into close proximity to seismic survey activities. However, the evidence (albeit limited) of low hearing sensitivity and a lack of reported injury or disturbance effects, combined with the likely avoidance of the physical presence of survey vessel(s) and airguns, suggests that the risk of significant mortality, injury or disturbance is very low. Furthermore, areas further south and east within the site, closer to Foula, appear to be of greater importance to these species. Negative indirect effects of seismic survey activities on qualifying features may arise through effects on prey species, primarily sandeels and other small fish, if these prey are subject to injury or disturbance which reduce their availability to qualifying seabirds. While there is evidence that a reduction in fish catches can be associated with seismic survey activity, these are temporary in nature, and the disturbance of sensitive spawning periods will be considered through the activity consenting process. As such, any underwater noise effects on fish associated with licensing Block 205/25 are not anticipated to result in significant effects on the food resources of the qualifying seabird features. Considering the above, it is concluded that underwater noise effects from 2D or 3D seismic survey associated with the licensing of Block 208/30, will not represent an adverse effect on the integrity of the site. **Other activities** Considering the limited potential for effects of 2D/3D seismic survey on diving birds identified above, and the lower amplitude, shorter duration and smaller geographic footprint associated with other impulsive noise such as VSP, rig site survey and conductor piling, these activities will not result in an adverse effect on site integrity. Similarly, no effects on diving birds are anticipated from continuous underwater noise from drilling and vessel movements due to the lower amplitude and non-impulsive nature of the sound resulting in no potential for acute trauma and no evidence of significant disturbance. **In-combination effects** Intra-plan in-combination underwater noise effects are considered highly unlikely given the low potential for effects identified above and that the Block-site overlap is largely restricted to a single Block. Section 5.3 provides a consideration of potential Block activities in-combination with other relevant plans and projects.

5.2.3 Further mitigation measures

The assessment concluded that no further mitigation measures were required beyond existing regulatory controls (see Section 2.3.2) in order to avoid adverse effects on the integrity of the relevant sites. BEIS require operators to provide sufficient information in the EIA on the potential impact of proposed activities on relevant sites and their qualifying features as well as proposed further mitigation measures in their applications for a Geological Survey consent. The information provided by operators must be detailed enough for BEIS to make a decision on whether the activities could lead to a likely significant effect, and whether the activities should therefore be subject to the requirement for HRA. Depending on the nature and scale of the proposed activities (e.g. area of survey, source size, timing and proposed mitigation measures) and whether likely effects are identified for these, BEIS may undertake further HRA to assess the potential for adverse effects on the integrity of sites at the activity specific level. As part of consent condition, operators would be required to follow the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys.

Consent for project-level activities will not be granted unless the operator can demonstrate that the proposed activities, which may include small-scale geophysical rig site survey, VSP and drilling (which may incorporate conductor piling), will not have an adverse effect on the integrity of relevant sites.

5.2.4 Conclusion

The risks of injury and disturbance to relevant qualifying features is limited both by the nature of the indicative work programmes for the Blocks applied for and controls currently in place; therefore, it is concluded that activities arising from the licensing of those Blocks listed in Table 5.2, in so far as they may generate underwater noise effects, will not cause an adverse effect on the integrity of the relevant sites identified. Consent for project specific activities will not be granted unless the operator can demonstrate that the proposed activities will not have an adverse effect on the integrity of relevant sites. These activities may be subject to activity level EIA and, where appropriate, HRA.

5.3 In-combination effects

5.3.1 Introduction

Potential incremental, cumulative, synergistic and secondary effects from a range of operations, discharges and emissions (including noise) were considered in the latest Offshore Energy SEA (DECC 2016; see also OSPAR 2000, 2010[32]). There are a number of potential interactions between activities that may follow licensing and those existing or planned activities in the west of Shetland area, for instance in relation to fishing, shipping, renewable energy and other oil and gas exploration and production activity. These activities are subject to strategic level and individual permitting or consenting mechanisms, or are otherwise managed at a national or international level. Marine planning in Scotland is set out in the Scottish National Marine Plan, adopted in March 2015.

5.3.2 Sources of potential effect

Projects for which potential interactions with operations that could arise from the licensing of 30th Round Blocks 205/14, 205/19, 205/25, 206/11d, 206/16a and 208/30 have been identified. Interactions were identified on the basis of the nature and location of existing or proposed activities and spatial datasets in a Geographic Information System (GIS).

5.3.3 Physical disturbance and drilling

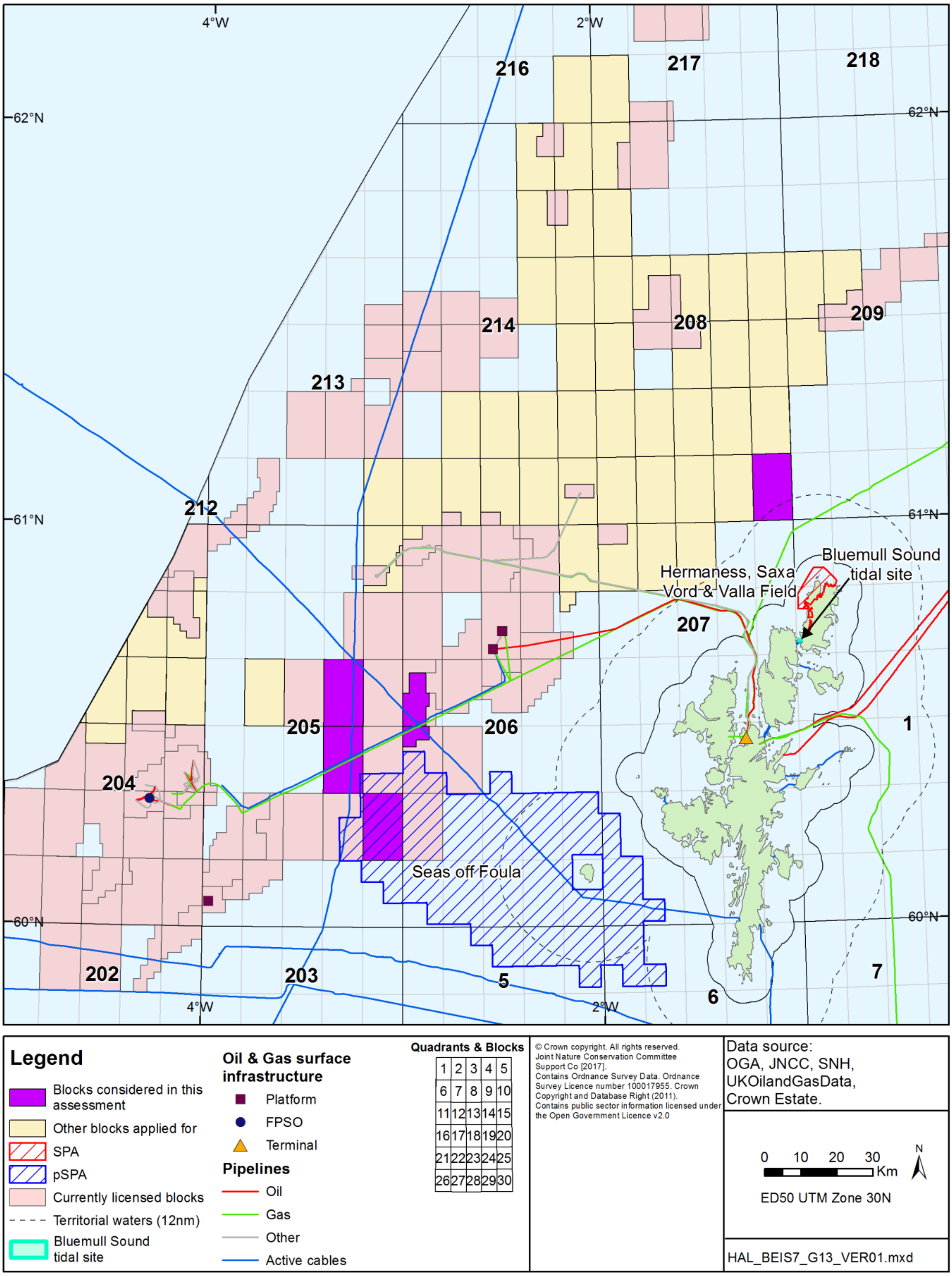
Potential sources of physical disturbance to the seabed, and damage to biotopes, associated with oil and gas activities that could result from licensing were described in Section 4.2 and Section 5.1 and include the siting of semi-submersible drilling rigs and drilling discharges.

Existing or proposed oil & gas projects

Existing oil and gas infrastructure in the west of Shetland area is limited both in density and footprint (Figure 5.3). There are a number of existing pipeline/telecommunication cable crossings within the relevant Blocks but these are outside of the Seas off Foula pSPA boundaries and site survey would inform rig placement so as to avoid such areas. A review of field development projects (as of January 2018) published by OGA's Project Pathfinder[33] indicates developments are present in Block 206/8 (Clair Ridge, under construction), 204/20 (Schiehallion redevelopment, under construction) and 205/21 (Lancaster Field, under construction), though these are distant from the Blocks and sites relevant to this assessment. Additionally, a number of nearby blocks (within 10km of the Seas off Foula pSPA) have been licensed since the 27th Round, including Blocks 205/20, 205/24, 206/16, 206/17 and 206/21 following HRA[34], though no wells have been drilled to date.

[32] Note that an intermediate assessment was published by OSPAR in 2017: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/
[33] https://itportal.ogauthority.co.uk/eng/fox/path/PATH_REPORTS/pdf
[34] https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process#appropriate-assessment

Figure 5.3: Other projects relevant to this AA



Given the small and temporary seabed footprint associated with drilling activities which may follow the licensing of 30th Round Blocks and those standard and additional mitigation measures set out already in Section 2.3 and 5.1.3, significant in-combination effects associated with those limited other oil and gas projects discussed are not expected.

With respect to drilling discharges, previous discharges of WBM cuttings in the UKCS have been shown to disperse rapidly and to have minimal ecological effects (See Section 4.2). Dispersion of further discharges of mud and cuttings could lead to localised accumulation in areas where reduced current allows the particles to accumulate on the seabed. However, in view of the scale of the proposed activity, extent of the region, the water depths and currents, this is considered unlikely to be detectable and to have negligible cumulative ecological effect (DECC 2016). Similarly, the potential for in-combination effects relating to chemical usage and discharge from exploratory drilling is limited by the existing legislative and permitting controls that are in place, which the UK Marine Strategy[35] has identified as making an ongoing contribution to managing discharges.

Fisheries

Fishing, and particularly bottom trawling has historically contributed to seabed disturbance over extensive areas, and was identified as an ongoing problem in the UK initial assessment for MSFD[36]. It was also noted that depending on the nature of future measures (e.g. in relation to MPA management in the wider environment and within MPAs), such effects are likely to be reduced and therefore some improvement in benthic habitats could be expected. The management of fisheries in relation to Article 6 of the Habitats Directive is fundamentally different to other activities such as offshore energy development, and a revised approach to the management of commercial fisheries in European sites[37] has sought to implement steps to ensure that they are managed in accordance with Article 6.

In Scotland, fisheries management is coordinated by Marine Scotland (note that any measure which may influence vessels of other member states can only be adopted after consultation with the Commission, other Member States and the Regional Advisory Councils) and for offshore sites beyond 12nm from the coast, measures are required to be proposed by the European Commission in accordance with the CFP[38].

There is fishing activity within the Seas off Foula pSPA, with both mobile and static gear types. This includes some level of trawling, traps, nets and lines fishing types, to which the features may be sensitive[39]. Of these, longline fishing is considered most likely to affect the qualifying

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35 https://www.gov.uk/government/publications/marine-strategy-part-three-uk-programme-of-measures
36 https://www.gov.uk/government/publications/marine-strategy-part-one-uk-initial-assessment-and-good-environmental-status
37 https://www.gov.uk/government/publications/revised-approach-to-the-management-of-commercial-fisheries-in-european-marine-sites-overarching-policy-and-delivery and see http://www.gov.scot/Topics/marine/marine-environment/mpanetwork/SACmanagement
38 See: http://ec.europa.eu/environment/nature/natura2000/marine/docs/fish_measures.pdf and also refer to Regulation (EU) No. 1380/2013 on the Common Fisheries Policy.
39 http://jncc.defra.gov.uk/pdf/SAS_Conservation_Objectives_and_Reg_18_Foula.pdf

features[40]. In the period from 2009 to 2013, fishing effort with longline gears was concentrated in the western part of the pSPA, reflecting the distribution of the target species (hake) which generally occurs in relatively deep water. Evidence suggests northern fulmar is susceptible to bycatch in longline fisheries (ICES 2013). Sandeels which are listed as a prey resource in the Conservation Objectives are also sensitive to fishing (although little sandeel fishing currently occurs), in addition to other activities which may cause changes to the seabed such as abrasion and sedimentation[41].

In view of the scale and nature of the exploration activities which could follow the licensing of the relevant Blocks and the mitigation which is available to avoid effects (see Sections 2.3.1 and 5.1.3), significant in-combination effects with respect to physical disturbance are not considered likely.

5.3.4 Physical presence

Physical presence of offshore infrastructure and support activities may potentially cause behavioural responses in fish, birds and marine mammals (see Section 5.6 of BEIS 2018). Previous SEAs have considered the majority of behavioural responses resulting from interactions with offshore oil and gas infrastructure (whether positive or negative) to be insignificant; in part because the number of surface facilities is relatively small (of the order of a few hundred) and because the majority are at a substantial distance offshore. With respect to the west of Shetland area, the potential for large numbers of individual surface or submerged structures associated with renewable energy developments is currently limited; the Shetland tidal array[42] in Bluemull Sound which will consist of six 100kW turbines (three of which are currently deployed) lies approximately 8.5km from the marine part of the Hermaness, Saxa Vord and Valla Field SPA (see Figure 5.3). With respect to the Seas off Foula pSPA, the closest renewable energy project is the proposed 10MW tidal array at Lashy Sound on Orkney which is 75km to the south and currently at a pre-application stage[43]. The presence of rotating turbine blades and considerations of their location and spatial distribution (e.g. in relation to coastal breeding or wintering locations for waterbirds), are an important consideration for such projects. Video monitoring of the three turbines in Bluemull Sound (over 4,000 hours of footage) has not recorded marine wildlife colliding with the blades[44]. Given the limited nature of renewable energy development and the location of the Blocks, it is not regarded that the temporary addition of drilling rigs and associated shipping will lead to adverse effects on the integrity of relevant sites considered in this AA.

Shipping densities over the relevant Blocks are very low. Additional vessels associated with drilling and site survey will represent a small increment to existing traffic, for example typical supply visits to rigs while drilling may be in the order of 2 to 3 per week.

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[40] http://jncc.defra.gov.uk/pdf/SAS_Management_Options_paper_Foula.pdf
[41] http://jncc.defra.gov.uk/pdf/SAS_Conservation_Objectives_and_Reg_18_Foula.pdf
[42] https://www.novainnovation.com/tidal-array
[43] http://www.gov.scot/Topics/marine/Licensing/marine/scoping/LashySound
[44] http://www.gov.scot/Resource/0053/00530133.pdf

5.3.5 Underwater noise

Evidence suggests the primary concern for underwater noise impacts on diving birds is that of acute trauma due to close proximity to very high amplitude impulsive noise sources (see Section 4.3). Therefore, the potential for in-combination effects with activities which may follow the licensing of 30th Round Blocks are limited to those known to generate high-amplitude impulsive noise (see DECC 2016).

There are no relevant offshore wind energy projects (either planned or under construction) in the west of Shetland area which could introduce high amplitude underwater noise through pile driving of foundations. The closest project (*ca.* 180km to the south) is the small Dounreay Trì Floating Wind Demonstration Project, *ca*. 6km off Dounreay, Caithness consented in March 2017[45], where embedment anchors rather than piles will be used to anchor the floating foundation.

There are military practice areas (airforce danger areas) to the south of the Seas off Foula pSPA, around the Orkney Islands. Qualifying features of the site may occasionally be present in these military practise areas and therefore have the potential to be exposed to associated noise; however, given the distance from the site, their numbers are likely to represent a small proportion of those using the site. Furthermore, it is suggested that the level of military activity in the area is limited[46].

There is the potential for seismic surveys to take place in adjacent Blocks which are yet to be fully explored or which have been developed (not covered by the plan being assessed). The timing, location and scale of any such surveys are unknown and a meaningful assessment of these cannot be made at this time, but they will be subject to activity specific permitting, including HRA where appropriate.

In addition to those activities which may follow licensing of the west of Shetland Blocks, there are a variety of other existing (e.g. oil and gas production, fishing, shipping, military exercise areas) noise-producing activities in overlapping or adjacent areas. Despite this, BEIS is not aware of any projects or activities which are likely to cause cumulative and in-combination effects that, when taken in-combination with the likely number and scale of activities likely to result from Block licensing (Section 2.2), would adversely affect the integrity of the relevant sites. This is due to the presence of effective regulatory mechanisms (Section 5.2 and also Appendix 3 of DECC 2016) which ensure that operators, BEIS and other relevant consenting authorities take such considerations into account during activity permitting. These mechanisms generally allow for public participation in the process, and this has been strengthened by recent Regulations[47] amending the offshore EIA regime which came into force in May 2017. These reflect Directive 2014/52/EU (amending the EIA Directive) which provides for closer co-ordination between the EIA and Habitats Directives, with a revised Article 3

[45] http://www.gov.scot/Topics/marine/Licensing/marine/scoping/DTFWDP/decision-letter
[46] http://jncc.defra.gov.uk/pdf/SAS_Management_Options_paper_Foula.pdf
[47] *The Offshore Petroleum Production and Pipe-lines (Environmental Impact Assessment and other Miscellaneous Provisions) (Amendment) Regulations 2017*

indicating that biodiversity within EIA should be described and assessed “with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC”.

5.3.6 Conclusions

Available evidence (see e.g. UKBenthos database and OSPAR 2010) for the west of Shetland area indicates that past oil and gas activity and discharges has not lead to adverse impacts on the integrity of European sites in the area. Any activities relating to the work programmes, and any subsequent development that may occur if site appraisal is successful, will be judged on its own merits and in the context of wider development in the North Sea (i.e. any potential incremental effects). The current controls on terrestrial and marine industrial activities, including oil and gas operations that could follow licensing, can be expected to prevent significant in-combination effects affecting relevant European Sites.

BEIS will assess the potential for in-combination effects whilst considering project specific EIAs and, where appropriate, through HRAs. This process will ensure that mitigation measures are put in place to ensure that activities, if consented, will not result in adverse effects on integrity of European Sites. Therefore, it is concluded that the in-combination effects from activities arising from the licensing of Blocks 205/14, 205/19, 205/25, 206/11d, 206/16a and 208/30 with those from existing and planned activities in the west of Shetland area will not adversely affect the integrity of relevant European Sites.

6 Overall conclusion

Taking account of the evidence and assessment presented above, it has been determined that the licensing through the 30th Licensing Round of the 6 Blocks considered in this AA will not have a significant adverse effect on the integrity of the relevant sites (identified in Section 1.3), and BEIS have no objection to the OGA awarding seaward licences (subject to meeting application requirements) covering Blocks 205/14, 205/19, 205/25, 206/11d, 206/16a and 208/30. This is because there is certainty, within the meaning of the ECJ Judgment in the Waddenzee case, that implementation of the plan will not adversely affect the integrity of relevant European Sites (as described in Section 5), taking account of the mitigation measures that can be imposed through existing permitting mechanisms on the planning and conduct of activities (as described in Section 5.1 and 5.2).

These mitigation measures are incorporated in respect of habitat and species interest features through the range of legislation and guidance (see https://www.gov.uk/guidance/oil-and-gas-offshore-environmental-legislation) which apply to activities which could follow licensing. Where necessary, project-specific HRA based on detailed project proposals would be undertaken by BEIS to ensure that permits/ consents are only granted where the proposed activity will not result in adverse effects on integrity of relevant sites.

Even where a site/interest feature has been screened out, or where a conclusion of no adverse effect on integrity has been reached at plan level, it is likely that a project level HRA will be necessary if, for example, new relevant sites have been designated after the plan level assessment; new information emerges about the nature and sensitivities of interest features within sites, new information emerges about effects including in-combination effects; or if plan level assumptions have changed at the project level.

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