

REPORT

Annex IV Risk Assessment

Wicklow Export Cable Corridor Foreshore Licence
Application

Client: Wicklow Sea Wind Limited

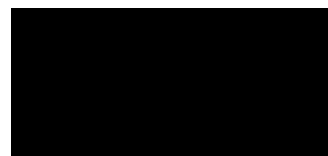
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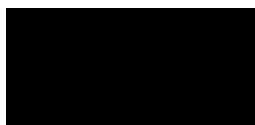
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1 Introduction

This report includes information to inform a Risk Assessment (RA) for Annex IV species under the Habitats Directive (92/43/EEC) in support of the Wicklow Export Cable Corridor Foreshore Licence Application.

Annex IV species that may be present in the export cable corridor cable Area of Search (herein the 'cable AoS'), given the location and distance offshore, are restricted to cetaceans (whales, dolphins and porpoises), and leatherback turtle. These are all European Protected Species (EPS) protected under Annex IV of the Habitats Directive (92/43/EEC) and as such, an EPS Stage 1 RA has been undertaken.

A full description of the proposed site investigation surveys is outlined in the Schedule of Works (Royal HaskoningDHV, 2022a – document reference: UB1019-RHD-ZZ-XX-RP-Z-0011), and a summary of the geophysical surveys (which have the potential to emit underwater noise at a level that could cause disturbance to Annex IV species) is provided below in **Section 2**.

1.1 Determining the need for a Marine EPS Licence

Under Article 12 of the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992), as transposed by Regulation 51 of the EC (Birds and Natural Habitats) Regulations 2011, as amended, any person who, in respect of an Annex IV species:

- (a) *Deliberately captures or kills any specimen of these species in the wild,*
- (b) *Deliberately disturbs these species particularly during the period of breeding, rearing, hibernation, and migration,*
- (c) *Deliberately takes or destroys the eggs from the wild*
- (d) *Damages or destroys a breeding site or resting site of such an animal, or*
- (e) *keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive, is guilty of an offence.*

The purpose of the Annex IV RA presented in this report is to determine whether, when considering appropriate measures as presented in **Section 2.4**, there is still potential for the marine survey activities to cause deliberate harm, or inadvertently cause disturbance to cetaceans or other protected species, as provided under Regulation 51. The need for an Annex IV Licence will be determined based on findings from the Annex IV RA. Any potential risk of disturbance will be related to the wider population of each Annex IV species, and in relation to the Favourable Conservation Status (FCS) of each.

2 Stage 1 Risk Assessment

2.1 Underwater Sound Sources

Multibeam echosounder (MBES) is a recommended technique used to assess the bathymetry of the seabed prior to deploying the Cone Penetration Test (CPT) tool and other geotechnical tests. The MBES will obtain high resolution bathymetry data to map the seafloor and the seafloor features across the full cable AoS. The system will emit a sound source of 200 and 400 kHz, with a source Sound Pressure Level (SPL) of 210dB re 1 μ Pa peak.

Sub-Bottom Profiling (SBP) is a method for obtaining high-resolution characterisation of sediments and rock under bodies of water. A high frequency single channel SBP will be deployed to collect data on all geophysical survey lines. The primary objectives of this survey are:

- To identify the geological structures in the upper 50m of the seabed substratum; and
- To identify geo-hazards, especially buried boulders, peat layers close to the seabed and very shallow gas.

The SBP will emit a sound source of between 0.2 and 20 kHz (for the pinger), 5 kHz with an amplitude of 222dB (for the boomer).

Side Scan Sonar (SSS) is a method used to detect potential seabed obstructions and identify additional seabed features prior to deploy the CPT. A simultaneous dual frequency SSS will be used.

The SSS system can operate at greater than 600 kHz using the Edgetech 4125 900 kHz or equivalent, with a source level of 215 – 226dB re 1 μ Pa @ 1m.

Table 1 Summary of potential noise sources during the geophysical surveys

Equipment	Underwater noise emissions
MBES	Between 200 and 400 kHz, with a source SPL of 210dB re 1 μ Pa peak
SBP	Between 0.2 and 20 kHz (for the pinger), 5 kHz with an amplitude of 222dB (for the boomer)
SSS	Greater than 600 kHz using the Edgetech 4125 900 kHz or equivalent, with a source level of 215 – 226 dB re 1 μ Pa @ 1m

2.2 Extent of Injury and / or Disturbance Areas

As outlined in Section 8.4 of Supporting Information for Screening for Appropriate Assessment (SISAA): Wicklow Foreshore Licence Application (Royal HaskoningDHV, 2022b - document reference UB1019-RHD-ZZ-XX-RP-Z-0009), underwater noise can cause both physiological (e.g. lethal, physical injury and auditory injury (Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS)) and behavioural (e.g. disturbance and masking of communication) effects on marine mammals (e.g. Bailey *et al.*, 2010; Madsen *et al.*, 2006; Thomsen *et al.*, 2006, Thompson *et al.*, 2010). For Annex IV species, both injury and disturbance are required to be assessed.

In order to determine the potential for injury and disturbance effects on Annex IV species, it is important to relate the potential noise of the activity to the known thresholds of effect for different species, and to determine the range at which both injurious (e.g. PTS) and behavioural (e.g. disturbance) effects may occur over in relation to the source location.

Underwater noise modelling has not been undertaken in order to determine what those potential effect ranges may be, rather a desk-based review of reported effect ranges for these activities has been undertaken (**Table 2**), and the worst-case and most relevant effect range will be taken forward for the assessment. The most recent marine mammal underwater noise effect thresholds are those from National Marine Fisheries Service (NMFS) (2018) and Southall *et al.* (2019), and therefore the effect ranges taken forward for assessment should utilise these thresholds (wherever possible) to ensure the most recent scientific advice and knowledge is taken into account.

Table 2 summarises the results of the desk-based review, with the ranges to be taken forward and reflects the equipment that will be used, as described in the Schedule of Works (Royal HaskoningDHV, 2022a - document reference: UB1019-RHD-ZZ-XX-RP-Z-0011).

For harbour porpoise, the potential PTS onset range is 23m and the potential disturbance range is 3.77km. This is based on modelling that was undertaken by BEIS (2020) for the Southern North Sea SAC Review of Consents for a sub bottom profiler and uses the NMFS (2018) thresholds for harbour porpoise. Wieting (2019) included a review of known PTS onset ranges for a geophysical survey (specifically SBP) for all marine mammal species, also under the NMFS (2018) thresholds. This found that the PTS threshold was not breached for dolphin species, and with a PTS onset range of less than 1m for whale species, however, as a worst-case the PTS onset range of 5m, as reported in Neart na Gaoithe Offshore Wind Farm (2019) has been used on a precautionary basis. PTS onset has not been assessed for dolphin species, as the threshold is not breached in any of the modelled ranges included in the review.

For the potential for disturbance for dolphin and whale species, no reported effect ranges were found through the desk-based review under the NMFS (2018) thresholds, and therefore a conservative approach has been taken as the disturbance effect range of 1.5km is used, as this is the largest reported disturbance range, other than for harbour porpoise, and has been used in other underwater noise assessments (e.g. Neart na Gaoithe Offshore Wind Farm (2019)).

Table 2 Desk-based review of reported geophysical effect ranges for Annex IV species

Equipment	Species	Potential effect	Threshold (and source)	Reported range of effect	Reference
Sub bottom profiler	Harbour porpoise	PTS onset	155 SEL _{cum} dB re 1 µPa (NMFS, 2018)	23m	BEIS (2020)
		Behavioural	140 SPL _{RMS} dB re 1 µPa unweighted; NMFS, 2018	3.77km	
Sub bottom profiler (220 dB re 1 µPa @ 1m peak)	Harbour porpoise	PTS	Not reported	32m	Shell (2017) cited in Neart na Gaoithe Offshore Wind (2019)
	Dolphin species	PTS	Not reported	0m	
	Whale species	PTS	Not reported	5m	
	Cetaceans	Disturbance	Not reported	1.5km	
Sub bottom profiler (215 SPL _{peak} dB)	Dolphin species	PTS	230 dB _{peak} / 185 dB SEL _{cum} (NMFS, 2018)	0m	Wieting (2019)
	Whale species	PTS	219 dB _{peak} , 183 dB SEL _{cum}	<1m	
	Harbour porpoise	PTS	202 dB _{peak} / 155 dB SEL _{cum} (NMFS, 2018)	<3m	

The maximum predicted effect ranges for the risk of PTS onset or potential disturbance during the geophysical surveys at the cable AoS are presented in **Table 3**.

Table 3 Potential effect ranges and areas used in the Annex IV RA

Potential effect	Species	Maximum reported range of potential effect	Maximum predicted area of potential effect (km ²)* ¹
Risk of PTS onset	Harbour porpoise	23m	0.0017km ²
	Dolphin species	-	-
	Whale species	5m	0.00008km ²
Disturbance	Harbour porpoise	3.77km	44.65km ²
	Dolphin species	1.5km	7.07km ²
	Whale species	1.5km	7.07km ²

2.3 Likelihood of Exposure

2.3.1 Presence of Annex IV Species

Extensive aerial surveys of Ireland's offshore waters (ObSERVE surveys; Rogan *et al.*, 2018) were conducted in the summer and winter of 2015 and 2016, with additional surveys conducted in inshore/coastal areas in the summer and winter of 2016 (Rogan *et al.*, 2018). The study area covered waters overlying and beyond Ireland's continental shelf and was divided into five survey strata in 2015, with three smaller inshore strata added in 2016. The cable AoS is located within Stratum 5. Within Stratum 5, harbour porpoise *Phocoena phocoena*, minke whale *Balenoptera acutorostrata* have been recorded. One sighting each of bottlenose dolphin *Tursiops truncatus* and one Risso's dolphin *Grampus griseus* were also recorded in Stratum 5, and although considered rare in the area have been included in the assessment for completeness.

Five species of marine turtle have been recorded in the Celtic and Irish Seas, with the majority of sightings being of the leatherback turtle *Dermochelys coriacea*, and this species is considered to be resident in these waters (DECC, 2016). They are generally spotted off the south and south west coasts of Ireland during the summer months, however they have also been recorded off the coast of Wicklow (Botterell *et al.*, 2020).

Therefore, harbour porpoise, bottlenose dolphin, Risso's dolphin, minke whale and leatherback turtle will be assessed for the potential impact from the proposed geophysical surveys.

The following RA assesses the potential for PTS onset (injury) and disturbance to Annex IV species as listed above, based on the density in the cable AoS, the areas of effect, and the wider reference populations.

2.3.2 Potential for Underwater Noise Effects

2.3.2.1 Harbour Porpoise

The FCS of harbour porpoise is *Favourable*, with an overall population trend of *Stable* (NPWS, 2019). The assessments use the worst-case density estimate of harbour porpoise in the cable AoS of 1.046 individuals per km² (Rogan *et al.*, 2018), in order to determine the number of harbour porpoise potentially at risk of PTS onset or disturbance, based on the potential area of effect outlined in **Table 3**. The assessment uses the wider Celtic and Irish (CIS) Sea Management Unit (MU) reference population of 62,517 harbour porpoise (Inter-Agency Marine Mammal Working Group (IAMMWG), 2021).

¹ based on the area of a circle, using the impact range as the radius

The assessment indicates that, without any mitigation, less than one individual (0.002 harbour porpoise) may be at risk of PTS onset, (0.000003% or less of the CIS MU reference population), and up to 47 individuals (0.075% of the reference population) could be temporarily disturbed during geophysical surveys (**Table 4**).

Table 4 Estimated No. of Harbour Porpoise Potentially Effected during Geophysical Surveys

Potential effect	Maximum reported range (and area) of potential effect	Maximum number of individuals	Percent of reference population
Risk of PTS onset	23m (0.0017km ²)	0.002 harbour porpoise	0.000003% of CIS MU
Disturbance	3.77km (44.65km ²)	46.7 harbour porpoise	0.075% of CIS MU

2.3.2.2 Bottlenose Dolphin

The FCS of bottlenose dolphin is *Favourable*, with an overall population trend of *Stable* (NPWS, 2019). Using the worst-case density estimate of bottlenose dolphin in the cable AoS of 0.036 individuals per km² (Rogan *et al.*, 2018), the number of bottlenose dolphin potentially at risk of disturbance has been calculated. This has been put into context of the wider population estimate in the Irish Sea (IS) MU of 293 individuals (IAMMWG, 2021).

The assessment indicates that, without any mitigation, less than one individual (0.09% of the IS MU reference population) could be temporarily disturbed during geophysical surveys (**Table 5**).

Table 5 Estimated No. of Bottlenose Dolphin Potentially Effected during Geophysical Surveys

Potential effect	Reported range (and area) of effect	Maximum number of individuals	Percent of reference population
Disturbance	1.5km (7.07km ²)	0.25 bottlenose dolphin	0.09% of the IS MU

2.3.2.3 Risso's Dolphin

The FCS of Risso's dolphin is *Favourable*, with an overall population trend of *Stable* (NPWS, 2019). The assessments use the worst-case density estimate of Risso's dolphin in the cable AoS of 0.0032 individuals per km² (Rogan *et al.*, 2018), in order to determine the number of individuals potentially at risk of disturbance, based on the potential area of effect outlined in **Table 3**. The assessment uses the wider CGNS MU reference population of 12,262 Risso's dolphin (IAMMWG, 2021).

The assessment indicates that, without any mitigation, less than one individual (0.0002% of the reference population) could be temporarily disturbed during geophysical surveys (**Table 6**).

Table 6 Estimated No. of Risso's Dolphin Potentially Effected during Geophysical Surveys

Potential effect	Reported range (and area) of effect	Maximum number of individuals	Percent of reference population
Disturbance	1.5km (7.07km ²)	0.02 Risso's dolphin	0.0002 of the CGNS MU

2.3.2.4 Minke whale

The FCS of minke whale is *Favourable*, with an overall population trend of *Stable* (NPWS, 2019). Using the worst-case density estimate of minke whale in the cable AoS of 0.014 individuals per km² (Rogan *et al.*, 2018), the number of individuals potentially at risk of PTS onset and disturbance has been calculated. This has been put into context of the wider population estimate in the CGNS MU (of 20,118 individuals) (IAMMWG, 2021).

The assessment indicates that, without any mitigation, less than one individual (0.000000005% of the CGNS MU reference population) may be at risk of PTS onset, and less than one minke whale could be temporarily disturbed during geophysical surveys (**Table 7**).

Table 7 Estimated No. of Minke Whale Potentially Effected during Geophysical Surveys

Potential effect	Reported range (and area) of effect	Maximum number of individuals	Percent of reference population
Risk of PTS onset	5m (0.00008km ²)	0.000001 minke whale	0.000000005% of CGNS MU
Disturbance	1.5km (7.07km ²)	0.1 minke whale	0.0005% of CGNS MU

2.3.2.5 Leatherback Turtle

The FCS of leatherback turtle is *Unknown* (NPWS, 2019). Information on the hearing abilities and sensitivities of marine turtles is limited, however, initial auditory hearing studies have found that turtle species hear in the range of 100 Hz to 2,000 Hz (e.g. Ridgway *et al.*, 1969). Martin *et al.* (2012) measured underwater hearing abilities in loggerhead turtles *Caretta caretta* and found a behavioural sensitivity threshold of between 100 and 400 Hz, at about 100 dB re 1 µPa.

For the proposed surveys of the cable AoS, the sound source of the SBP boomer will be above 5 kHz, outside of the estimated marine turtle hearing range, however as the SBP pinger will operate between 0.2 and 20 kHz this will be within turtle hearing range. The sound source for both SSS and MBES will be outside of marine turtle hearing ranges due to the high operating frequency.

While there is a small likelihood of geophysical survey sound sources being within marine turtle hearing ranges, (with only SBP operating frequency overlapping), and that it is unlikely that there would be any marine turtle in close proximity of the survey itself no further assessment has been conducted. However, the good practice measures outlined below will reduce the potential for there being marine turtles present within the monitoring zone prior to surveys commencing and it is not expected that there would be any significant risk to leatherback turtles from the proposed surveys.

2.4 Good practice

The measures outlined below are applicable to all MBES, single beam, SSS and SBP (e.g. pinger or chirp system) surveys within bays, inlets or estuaries and within 1,500m of the entrance of enclosed bays / inlets / estuaries, or as requested by the Regulator (Department of Arts, Heritage and the Gaeltacht (DAHG, 2014). While the cable AoS is not within enclosed bays, inlets or estuaries (or within 1.5km of any such area), the measures as described for geophysical surveys would be applied as good practice, and to reduce the potential for risk to Annex IV species. These measures will also apply for all species, including marine turtles, as well as marine mammals.

2.4.1 Multibeam, single beam, side-scan sonar & sub-bottom profiler surveys

Wicklow Sea Wind Limited will consider opportunities to coordinate with other developers undertaking geophysical surveys during similar timeframes to minimise any in combination effects.

A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and marine turtles and to log all relevant events using standardised data forms.

Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g. specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, acoustic surveying using the above equipment shall not commence

if marine mammals or marine turtles are detected within a 500m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

2.4.1.1 Pre-Start Monitoring

Sound-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where the MMO determines that effective visual monitoring is not possible, the sound-producing activities shall be postponed until effective visual monitoring is possible.

An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.

The MMO will conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals or marine turtles detected within the Monitored Zone by the MMO.

This prescribed Pre-Start Monitoring shall subsequently be followed by a Ramp-Up Procedure which should include continued monitoring by the MMO.

2.4.1.2 Ramp-Up Procedure

In commencing an acoustic survey operation using the above equipment, the following ramp-up procedure (i.e. "soft-start") must be used, including during any testing of acoustic sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1 μ Pa @1m:

- a) Where it is possible according to the operational parameters of the equipment concerned, the device's acoustic energy output shall commence from a lower energy start-up (i.e. a peak sound pressure level not exceeding 170 dB re: 1 μ Pa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20 minutes; and
- b) This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period.

Where the acoustic output measures outlined in steps (a) and (b) are not possible according to the operational parameters of any such equipment, the device shall be switched "on" and "off" in a consistent sequential manner over a period of 20 minutes prior to commencement of the full necessary output.

In all cases where a ramp-up procedure is employed the delay between the end of ramp-up and the necessary full output must be minimised to prevent unnecessary high-level sound introduction into the environment.

Once the ramp-up procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals or marine turtles occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.

2.4.1.3 Break in sound output

If there is a break in sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all pre-start monitoring and a subsequent ramp-up procedure (where appropriate following pre-start monitoring) must be undertaken.

For higher output survey operations which have the potential to produce injurious levels of underwater sound as informed by the associated RA, there is likely to be a regulatory requirement to adopt a shorter

5-10 minute break limit after which period all pre-start monitoring and a subsequent ramp-up procedure (where appropriate following pre-start monitoring) shall recommence as for start-up.

2.4.1.4 Reporting

Full reporting on MMO operations must be provided to the Minister, as Licensor, and to the NPWS where required.

2.5 Residual Likelihood of Exposure

The good practice measures as outlined above would aim to ensure that there are no marine mammals or marine turtles present within 500m prior to the commencement of surveys. The Monitoring Zone of 500m is larger than all PTS onset ranges, as provided in **Table 3**, and therefore there would no Annex IV species within the potential range of injury.

2.6 Consideration of Cumulative Impacts

A full screening of all plans and projects that could be undertaken at the same time has been included in Section 7 of SISAA: Wicklow Foreshore Licence Application (Royal HaskoningDHV, 2022b - document reference UB1019-RHD-ZZ-XX-RP-Z-0009). Of those identified for dredging, in connection with Arklow Bank Wind Park Phase 1 and Dublin Port, activities are not at a noise level that would cause disturbance to Annex IV species.

A number of other projects undertaking site investigation works were identified. The following assessments include a cumulative assessment for the Annex IV species (**Table 8**), assuming that up to two other site investigation surveys (in addition to the surveys at Wicklow) could be undertaken at any one time (including for Codling Bank² and Leinster³). Given the availability of vessels and the timing of projects this is considered precautionary. The assessments assume that same impact ranges and density estimates as has been used to quantify the risks at Wicklow and assess the total cumulative impacts against the wider population estimate. The assessment has been undertaken for disturbance effects only, as all geophysical surveys would be required to follow good practice to protect Annex IV species against injury (PTS onset).

Table 8 Estimated No. of Cetaceans Potentially Effected during Geophysical Surveys

Annex IV species	Cumulative Project Scenario	Potential effect	Maximum reported range (and area) of potential effect of each survey	Total area for three geophysical surveys	Maximum number of individuals for cumulative scenario	Percent of reference population
Harbour porpoise	Up to three geophysical surveys (Wicklow plus two others)	Disturbance	3.77km (44.65km ²)	134km ²	117 harbour porpoise	0.18% of CIS MU
Bottlenose dolphin	Up to three geophysical surveys (Wicklow plus two others)	Disturbance	1.5km (7.07km ²)	21.2km ²	3.5 bottlenose dolphin	1.2% of the IS MU
Risso's dolphin	Up to three geophysical surveys	Disturbance	1.5km (7.07km ²)	21.2km ²	0.3 Risso's dolphin	0.002% of the CGNS MU

² <https://www.gov.ie/en/foreshore-notice/31ca6-fs007045-codling-wind-park-ltd/?referrer=http://www.gov.ie/en/publication/4a6b4-fs007045-codling-wind-park-ltd/#>

³ Based on the assessment for the foreshore survey licence area

Annex IV species	Cumulative Project Scenario	Potential effect	Maximum reported range (and area) of potential effect of each survey	Total area for three geophysical surveys	Maximum number of individuals for cumulative scenario	Percent of reference population
	(Wicklow plus two others)					
Minke whale	Up to three geophysical surveys (Wicklow plus two others)	Disturbance	1.5km (7.07km ²)	21.2km ²	1.2 minke whale	0.006% of CGNS MU

2.7 Summary

Given the short term and temporary impacts of the survey to cetaceans, it is considered that there is no potential for a significant impact on the wider populations of harbour porpoise, bottlenose dolphin, Risso's dolphin, minke whale, or leatherback turtle, with a negligible risk of injury or disturbance to any species of cetacean.

With good practice for the survey and positioning equipment, potential effects from the proposed survey work are unlikely to result in the harassment, disturbance, injury or killing of an Annex IV species.

In relation to the potential for disturbance to Annex IV species, the percentage of the reference population of each species which has the potential to be disturbed by use of the geophysical survey equipment, is considered to be negligible (1.2% or less for all cetacean species which occur in the area, including for cumulative effects) and therefore not detrimental to the maintenance of the population of the species concerned at a FCS. Any disturbance is likely to be localised and short-term, and with good practice measures is considered to be negligible.

3 Conclusions

While the geophysical surveys associated with the site investigation works present a temporary disturbance to a localised marine environment, this work is an important addition to Ireland's growing contributions to the renewable energy sector.

It is possible that a small number of Annex IV species may experience some level of disturbance for the short period they may encounter noise emissions from the geophysical survey operations. Given the short term and temporary impacts of the survey to receptors, it is considered that there is no potential for a significant impact on the wider populations of harbour porpoise, bottlenose dolphin, Risso's dolphin, leatherback turtle, and minke whale, with a negligible risk of injury or disturbance to any species of cetacean.

There is potential for cumulative impacts from other projects should they be undertaken at the same time, although there is significant uncertainty when and where these may arise. Based on current and likely future activities and the predicted level of impact, along with the good practice measures that will be in place, the level of cumulative disturbance is predicted to be relatively small. However, the impacts arising from disturbance from each activity will be temporary and there will be no impact on the FCS of any Annex IV species.

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