Hartley Anderson Limited

Marine Environmental Science and Consultancy

Risk Assessment for Annex IV species

Celtic Interconnector Foreshore Licence Application

Report to
Department of Housing, Local Government
and Heritage

May 2022

TABLE OF CONTENTS

SECTION 1 - INTRODUCTION 2
1.1 Background 2
1.2 Relevant consultation responses 2
1.3 Legislative context 25
SECTION 2 - DESCRIPTION OF PROPOSED WORKS 26
2.1 Site Location and Project Overview 26
2.2 Project Elements on Foreshore in Ireland 28
2.3 Interconnector Operation 41
2.4 Decommissioning 42
SECTION 3 - RELEVANT ANNEX IV SPECIES 44
3.1 Cetacean species 44
3.2 Other Annex IV species 48
SECTION 4 - RISK ASSESSMENT 50
4.1 Potential impacts associated with proposed works 50
4.2 Mitigation measures 55
4.3 Conclusion of the Risk Assessment for Annex IV Species 56
BIBLIOGRAPHY 57

SECTION 1 - INTRODUCTION

1.1 Background

Arup with Hartley Anderson Limited[1] have been commissioned by the Department of Housing, Local Government and Heritage (DHLGH) to conduct a risk assessment for Annex IV species[2] of an application by EirGrid plc to cover the pre-lay installation works, cable installation works, operation, and periodic maintenance of a submarine electricity interconnector between France and Ireland (Reference number: FS006916). This infrastructure passes through Irish Territorial Waters, the Irish Exclusive Economic Zone (EEZ), the UK EEZ, French EEZ and French Territorial Waters.

The Celtic Interconnector will enable the exchange of electricity between Ireland and France. It will be the first direct energy link between the two countries, running from the south coast of Ireland to the north-west coast of France. Since 2011, EirGrid, the state-owned independent Transmission System Operator has been working with its French counterpart Réseau de Transport d'Electricité (RTE) to find the best way to develop the interconnector to benefit electricity customers and markets in Ireland, France and the EU. EirGrid and RTE are working together to deliver the Celtic Interconnector, which, if it receives consent, is due to be completed in 2026.

A planning application, as a strategic infrastructure project, required for the onshore elements of the proposed development, from the inner limit of the Foreshore to the connection point with the transmission grid, has been submitted to An Bord Pleanála (Reference number: PL04.302725).

1.2 Relevant consultation responses

The licence application was open for public consultation between 11th October 2021 to 6th December 2021, and a second consultation was undertaken from 29th March 2022 to 27th April 2022. Responses from the prescribed bodies and the public relevant to this Risk Assessment for Annex IV species are provided in Table 1.1.

[1] Hartley Anderson Ltd has prepared over thirty Habitats Regulations Assessments and Appropriate Assessments in UK and Irish waters on behalf of Regulators prior to their licensing or activity consenting. Hartley Anderson Ltd has an in depth understanding of the Irish and adjacent waters Natura 2000 conservation sites, their features, conservation objectives and relevant management measures together with pressures, scales of impact and efficacy of mitigation measures.

[2] Article 12 of the Habitats Directive addresses the protection of species listed in Annex IV(a). The article applies throughout the natural range of the species within the EU and aims to address their direct threats, rather than those of their habitats.

Table 1.1: Summary of relevant observations made by Prescribed Bodies and Applicant's Response

Statutory Body	Applicant's Response
Second consultation (29 March – 27 April 2022)	
No relevant observations.	
Initial consultation (11 October – 6 December 2021)	
Marine Institute A foreshore application has been submitted for the Celtic Interconnector Project development by EirGrid Plc. The project will create an electrical interconnection between Ireland and France to allow the exchange of electricity between the two countries. The link will have the capacity to carry up to 700 MW of electrical energy between the two systems. The main elements of the overall Celtic Interconnector project are (foreshore relevant components italicised): *- A High Voltage Direct Current (HVDC) submarine cable of approximately 500 km in length laid between the coast in Brittany France, and the Cork coast in Ireland. The submarine cable will be either buried beneath the seabed or laid on the seabed and covered for protection;* *-A landfall location in Ireland and France, where the HVDC submarine circuit will come onshore and terminate at a Transition Joint Bay (TJB);* *-A HVDC underground cable (UGC) in both countries between the landfall location and a converter station compound;* -A converter station in both countries to convert the electricity from HVDC to High Voltage Alternating Current (HVAC) and vice versa; -A HVAC UGC in both countries between the converter station compound and the connection point to the National Grid; -A connection to the National grid; and, *-A fibre optic link, with associated power supply, will also be laid along the route for operational control, communication and telemetry purposes.* As it relates to the foreshore, the development comprises the installation of two high-voltage direct current (HVDC) subsea cables and a fibre optic link with associated power supply to be buried within pre-installed Steel/High Density Polyethylene (HDPE) conduits beneath Claycastle Beach, south of Youghal, Co. Cork and car park at	EirGrid thanks the Marine Institute for taking the time to provide a response to Foreshore Licence application FS006916 for the Celtic Interconnector. We acknowledge the request that mitigation measures as outlined within Section 3.6 of Volume 6B of the application documentation (Appropriate Assessment Screening Report and Natura Impact Statement) form conditions in any Foreshore Licence issued, and are happy to support this request.

Statutory Body	Applicant's Response
Claycastle Beach. The HVDC cables extend across the HWM and enter the two underground concrete chambers of a Transition Joint Bay (TJB); this chamber is where the subsea cables will connect with the onshore cables. An Environmental Impact Assessment Report and Natura Impact Statement (NIS), among other documentation, were prepared and submitted with the application. These documents consider all aspect of the overall project including the foreshore considerations. The closest licenced aquaculture site (T05/491A) is in Ballymacoda Bay and is approximately 4.2km to the (foreshore aspects) of the proposed development. The closest Shellfish Grow water area is Ballymacoda Bay (4.1km). On the basis of the information provided in the EIAR, and the relatively short duration of the proposed works (10 weeks), the development is unlikely to impact on any licenced aquaculture activities. A detailed fishery interaction report was also prepared for the Irish Territorial waters (EIAR Chapter 19). Three main categories of fishing gear fished within the waters adjacent to the proposed cable route: • Static gear (pots, lines and gill nets); • Demersal (bottom) trawl gear; and • Pelagic (mid-Water) trawl gear. Potential interactions between fishing activities and the cable infrastructure are likely to occur and mitigation measures are identified to minimise the likely negative effect of these interactions. These measures include, among others, active communication at all stages of the development and the appointment of a fisheries liaison officer. In addition, it is anticipated that smooth over-trawlable rock berms and concrete mattressing will be installed where adequate cable burial has not been possible. These measures are considered sufficient to mitigate any negative interactions with demersal fishing activities. The Marine Institute is satisfied that the mitigation measures to be adopted in order to protect commercial fisheries interests are sufficient. The NIS identifies the likely interactions between the proposed project and the conservation features of all Natura 2000 sites in the vicinity and ex-situ features (bird and mammal species). The document provides detailed description of the proposed development and the likely interactions with conservation features. During screening	

Statutory Body	Applicant's Response
assessment, likely significant effects were identified for a number of conservation interests (for the project alone and in-combination with other plans or projects) and were carried forward for full assessment. Those features carried forward for full assessment were considered in more detail and likely significant effects were either dismissed or, with certain mitigation measures, conclude that the development is unlikely to impact on the integrity of the conservation sites and ex-situ features identified. It would be important that these mitigation measures (Section 3.61 (Celtic Interconnector - Volume 6B. Appropriate Assessment Screening Report and Natura Impact Statement June 2021)) are enacted in full and that they form conditions in any foreshore licence to issue.	
Underwater and Archaeology Unit/ National Parks and Wildlife Service Underwater Archaeology Having reviewed the archaeological documentation submitted for the above Foreshore Application the Department makes the following observations/recommendations. Please note that our previous observations/recommendations in relation to the SID application by Eirgrid for the development of portion of an electricity transmission connector for the Celtic Interconnector Project, Co Cork remain unchanged (see below). The observations/recommendations below are additional to those previously made by this Department and are specific to the works proposed below the High Water Mark at the Irish landfall at Claycastle Beach. Previous investigations and archaeological (Licence Nos. 18E0322; 18R0118; 19E0278) and geotechnical surveys for this project have identified submerged intertidal and subtidal peat deposits extending seaward from the coastline at Claycastle Beach. The peats have produced Neolithic and Iron Age radiocarbon dates and there are antiquarian accounts of flints and Bronze Age metal objects, including a gold dress-fastener, having been discovered here during previous exposures. The EIAR points out that though no archaeological material was identified associated with the peat deposits during the investigations to date 'there is a potential that such could survive given the characteristics of the palaeo-landscape' (EIAR Vol. 3C part p. 413). Evidence of Ireland's drowned landscapes and settlements presently comprises around 50 sites spread across the entire island (Westley and Woodman, 2020, Ireland: Submerged Prehistoric Sites and Landscapes). Radiocarbon dates from these intertidal and subtidal deposits give ages from as early as 13,500 cal BP right up to 5000 cal BP.	EirGrid thanks the Underwater Archaeology Unit for taking the time to provide a response to Foreshore Licence application FS006916 for the Celtic Interconnector. With regards to the specific comments raised, the EIAR mitigations were set out as in-principle proposals, and consequently the additional detail provided by the UAU provides welcome detail on which to base a more detailed project design for an Underwater Archaeological Impact Assessment (UAIA) and, where appropriate, further mitigation proposals. It is confirmed that the project design will be prepared by an appropriately qualified licence-eligible marine archaeologist. This investigative scope will be agreed with the UAU to ensure compliance with the relevant requirements of any necessary licencing, and that the proposed investigative works are appropriate to the aims and scope of the project and can be safely delivered.

Statutory Body	Applicant's Response
In the main they are intertidal find spots or small collections of flint artefacts and only eleven are subtidal, comprising of find spots of stray finds or reworked assemblages of lithic material which have been found either by dredging or by divers. The only subtidal site in Ireland to have been subjected to systematic archaeological investigation is Eleven Ballyboes, Co. Donegal, where a large collection of early Mesolithic flints have been recovered from a submerged peat deposit. As the peat deposits overlie what is considered to be a Late Pleistocene glacial till and the date of their initial formation in the Early Neolithic is reliant on a single radiocarbon determination, it is possible that some of the deposit is considerably older in age than the Neolithic and perhaps of Late Glacial or Early Holocene date (Cotswold Archaeology p. 43). This hypothesis is supported by the Relative Seal Level (RSL) curves, which indicate that in the extreme south and south-west of Ireland RSL rose from a lowstand of c. −50 to − 90 m and did not reach modern sea level until the Late Holocene. Early and Late Mesolithic human occupation of SW Ireland is well attested archaeologically and Mesolithic dates have been obtained on submerged forest deposits at Ballycotton Bay, 12km to the south-west of Claycastle Beach. Submerged Neolithic megalithic tombs present on the south-west coast at Cork Harbour and Ringarogy Island also attest to sea level rise along this coastline. The development works associated with the Claycastle Beach landfall thus provide an important and rare opportunity to archaeologically investigate a relatively large, apparently stratified, and intact submerged intertidal and subtidal landscape represented by peat and forest remains, in a coastal zone that was potentially occupied during Ireland's earliest colonisation and settlement. Excavations associated with the cable landfall infrastructure as well as temporary construction compounds could potentially uncover previously unidentified archaeology, in particular associated with these submarine forest and peat deposits. The EIAR recommends as mitigation that a suitably qualified and experienced Project Environmental Specialist be retained to develop a strategy in relation to the investigation and sampling of the submerged landscape along the cable route, in accordance with TII Environmental Sampling Guidelines (EIAR Vol. 3C part p. 437). The EIAR also recommends that targeted test excavations are undertaken to assess the character of the peat deposits (EIAR Vol. 3C part p. 431). Test excavations are also proposed at the landfall area of Claycastle Beach as part of an advance works programme and it is also recommended that exposed peat deposits (15m buffer) and the site of metal object (CH3001) are fenced off and a buffer zone	

Statutory Body	Applicant's Response
instituted. Archaeological monitoring of construction works is also proposed. Whilst we concur with these mitigation measures, we also recommend, given the potential archaeological significance of the intertidal and subtidal peat deposits which will be impacted upon by the development, that they are subjected to a detailed and comprehensive evaluation, as follows, over and above the test-excavations recommended in the EIAR. <u>Underwater Archaeological Impact Assessment (UAIA)</u> An Underwater Archaeological Impact Assessment (UAIA) shall be undertaken to address any potential impact to the Underwater Cultural Heritage. • A licence-eligible, suitably qualified, underwater archaeologist shall be engaged to carry out the Underwater Archaeological Impact Assessment (UAIA). • The archaeologist should also be suitably experienced, with a track record in dealing with marine and offshore developments, resultant report submission, etc. • This evaluation should be conducted by a multidisciplinary team of specialists to determine the archaeological, including artefact-bearing, potential of the submerged forest deposits and the nature, date and extent of any such archaeological materials that may exist. • The evaluation shall include detailed topographical mapping of the peat horizon, a systematic wade and dive survey and careful manual excavation and palaeoenvironmental sampling of a substantial section of the deposit (to be agreed with this Department via a method statement), aimed at retrieving and plotting the locations of worked stone tools and other archaeological materials, should they be identified. • The UAIA shall include a hand-held metal detection survey, undertaken by a suitably licenced and experienced detectorist. A Dive Licence (section 3 1987 Act) and Detection Device consent (section 2 1987 Act) will be required for these works. • A detailed method statement shall accompany their licence applications to the National Monuments Service for consideration (both for a Dive Survey Licence to cover the UAIA and a Detection Device Consent to cover the geophysical survey assessment for archaeological purposes and metal detector for the foreshore survey). The licences shall be issued as required under the National Monuments Acts 1930-2004. • The archaeologist shall be compliant with all licensing requirements, including	

Statutory Body	Applicant's Response
being up to date with report submissions. • A preliminary report shall be issued to the Department within four weeks of the end of the excavation works and this report shall summarise the results. The UAIA Report is to contain a detailed Impact Assessment to address all identified cultural heritage and shall also make recommendations for mitigation measures to avoid all impacts to the archaeology. If potential or identified sites, features or artefacts cannot be avoided to allow for preservation in situ, then the UAIA Report Recommendations shall put forward an archaeological mitigation strategy to address this, including preservation by record (archaeological testing and/or full archaeological excavation). • Once all surveys and follow up interpretations (including radiocarbon dating and palaeoenvionmental analysis) have been completed, the full information is to be compiled into a UAIA report and submitted to the Underwater Archaeology Unit, National Monuments Service for review and further comment. The applicant shall be prepared to be advised by the Department in this regard. • For wrecks and other sites identified, or the potential location of same, the results to be reviewed by the applicants and the archaeologists and appropriate exclusions placed around them to ensure they are avoided by any works, including SI works. Once the UAU or the National Monuments Service has had the opportunity to review the UAIA Report, further recommendations may issue. It should be borne in mind that should significant archaeological remains be identified, further archaeological mitigation may be required. These may include refusal of planning permission, relocation and/or redesign (in whole or in part) of the development to allow for preservation in situ, further excavation ('preservation by record') and/or monitoring. The Department of Housing, Local Government and Heritage will advise the applicant with regard to these matters. Nature Conservation The proposed development of an electrical cable at Claycastle Beach, Youghal has been evaluated by a Natura Impact Statement (NIS) and other documents. The conclusion of the Natura Impact Statement document is that the proposed works are unlikely to pose a significant likely risk to nature conservation interests in the vicinity. This is supported by the available evidence. The Department concur with this conclusion in and request that mitigation outlined in Section 3.6 of the NIS document is implemented in full.	

Statutory Body	Applicant's Response
Sea-Fisheries Policy Management Division, Department of Agriculture Food and the Marine These comments from the Department of Agriculture, Food and the Marine relate to commercial fisheries. This document has been prepared with scientific input from the Marine Institute and BIM. Commercial sea fishing is a long standing, pre-existing and traditional activity in the marine environment. The evaluation and consideration of potential impacts on any commercial sea fishing activities needs to be given consideration as part of any planning/proposal process and during the development process itself. It is imperative that engagement should be sought with the fishing industry and other relevant stakeholders at as early a stage as possible, and at every stage of any planning/proposal process and during the process itself, to discuss any changes that may affect them to afford a chance for their input. Fishers' interests, access to fishing grounds, and livelihoods must be fully recognised and taken into account. For instance, Volume 3D2's material assets should also include fisheries. The concerns of this Department are set under the following key points: 1. Herring stocks around Ireland are regarded as depleted and interference with spawning grounds for these stocks during the time proposed is strongly discouraged. 2. Volume 7 does not adequately address concerns that the selected route passes close to known herring spawning grounds. The proposed timing of construction overlaps with the herring spawning season and this season should be avoided and construction carried out in the period April to mid-August. 3. While meetings were held with two local Fisherman's Associations, the Department would also recommend liaising with national representative organisations whose members operate in the area. 4. Importance of avoiding to the greatest extent possible the Labadie *Nephrops* (Dublin Bay Prawns) ground. 5. Possible interaction of fishing gear with the cable and consideration of mitigation measures. 6. Concerns with regarding the use of AIS (Automatic Identification System) data. ***1. Celtic Sea Herring stocks are depleted*** Herring are a vitally important part of the marine ecosystem, being prey for marine	EirGrid thanks the Sea-Fisheries Policy and Management Division, Department of Agriculture, Food and the Marine for taking the time to provide a detailed response to Foreshore Licence application FS006916 for the Celtic Interconnector. **Point 1 and 2** We acknowledge that herring are a vitally important part of the ecosystem and a valuable fishery species. Also, that the Celtic Sea Herring (CSH) stock has fallen to its lowest ever observed biomass (Figure 2 in your consultation response), is sensitive (ecologically and economically) and activities that have the potential to disturb the life-cycle of these fish must be avoided. Also, that spawning is known to occur between late August / September and March and with the first phase of the installation sequence being completed in the winter months there is a seasonal overlap for the herring spawning period. With reference to (Figures 3 and 4 in your consultation response), the route option that has been assessed within the EIAR is the option that lands at Youghal (Claycastle Beach). On this basis it is evident that direct disturbance and impact to all herring spawning grounds have been avoided. The footprint of the cable corridor through the nearshore environment is considered to be localised. Within the EIAR it was also identified that benthic habitat along the cable corridor from Claycastle Beach and within Youghal Bay did not identify optimal herring spawning habitat or features / significant substrate that may provide habitat for herring spawning. Whilst fish may occasionally spawn on features within the intertidal zone these eggs may become desiccated or predated during low water periods and are not considered to contribute to recruitment.

Statutory Body	Applicant's Response
mammals, birds and many predatory fish. They are also a valuable fishery species, with Irish landings worth up to €13m in 2012 (Fig. 1). Celtic Sea Herring (CSH) is one of three such herring stocks that occurs in Irish waters. The CSH stock encompasses the south east, south and south west of the country. It has been a key fishery for over a century and Ireland holds the vast majority of the yearly allowable catch for this stock. In recent years, however, the size of the CSH stock has fallen to its lowest ever observed biomass (Fig. 2). Due to the extreme sensitivity of CSH, both from an ecological and economic point of view, activities that have the potential to disturb the life-cycle of these fish must be avoided. (Main source: Marine Institute Stockbook 2021). Unusually for a marine fish, herring eggs are deposited on the bottom of the seafloor in discrete gravel beds or flat stone and the herring are completely reliant on these spawning beds for reproduction. However, the locations of the discrete gravel beds can move over time (e.g. due to water movement) so nearby spawning beds are grouped into "spawning grounds", which may contain one or more spawning beds. Spawning grounds are further grouped into spawning areas. The spawning areas, grounds and beds for herring in the Celtic Sea are well known and are located close to the coast (Fig. 3). (Main sources: O'Sullivan et al., 2013; Breslin, 1998). CSH consist of a mixture of autumn- and winter-spawners, and spawning occurs between late September and March. Spawning either side of this period, in late August and spring, has occasionally been reported by fishermen but appears restricted to very exceptional events. (Main source: Molloy 2006). ***2. Interactions with herring spawning grounds*** Volume 7 does not adequately address concerns that the selected route passes close to known herring spawning grounds. <u>The proposed timing of construction overlaps with the herring spawning season and this season should be avoided, and construction carried out in the period April to mid-August.</u> The impact of cable installation on herring spawning grounds is addressed in volume 3D2, pages 218 and 219, which concludes that the impact is Negligible and Not Significant; mainly because the proposed cable route from Claycastle Beach, Youghal follows a channel that avoids outcropping rocks with surface sediments predominantly formed of sandy mud, with patches of sand, and because cable installation occurs over relatively short time periods and is a singular event that will occur outside of the main	

Statutory Body	Applicant's Response
herring spawning period. In contrast to this, Volume 7a states that: The installation sequence (foreshore/nearshore) would be completed in the winter months, i.e. October 2024 to April 2025. This does overlap with the spawning period for herring. Volume 7a – Part 7 also states that: Fishing / Aquaculture considerations: "The Celtic Interconnector project: Does not cross through any known spawning or nursery habitat." This contradicted by a statement in Vol-3D2-technical-chapters: "This data indicates that the proposed marine cable route passes within or close to the spawning grounds of nine principal fish species including cod, haddock, hake, herring, lemon sole, ling, megrim, mackerel, pollock, sprat and whiting" It should be noted that the proposed route is very close to a known spawning ground. In terms of spawning grounds, this cable should only directly affect species that spawn on the seabed; species that spawn in the water column (broadcast spawners) are unlikely to be significantly affected. The main species of commercial interest that spawn on the seabed are herring, skates and rays and squid. Detailed maps of spawning grounds exist for herring but not for other species that spawn on the seabed. Figure 4 shows the locations of herring spawning grounds off the Irish south-east coast in relation to the proposed cable route options. It is clear that the easterly route options are likely to interfere with the group of spawning grounds off Dunmore East. The westerly route options come close to the Ballycotton and Youghal grounds and may interfere with these grounds. The spawning activity around Ballycotton and Youghal occurs mainly in November and October respectively. It is important to note here that some species of skates are critically endangered and also given that the main Herring stocks around Ireland are regarded as depleted, interference with spawning grounds for these stocks during this time is strongly discouraged. Herring spawning grounds are vulnerable to anthropogenic damage (damage caused by human activity) such as dredging, sand and gravel extraction, dumping of dredge spoil and waste from fish cages. The International Council for the Exploration of the Seas ICES has consistently stated that: "*Activities that have a negative impact on the spawning habitat of herring, such as the dumping of dredge spoil, the extraction of marine aggregates (e.g. gravel and sand), and the erection of structures such as wind turbines in the vicinity of spawning grounds are a cause for concern" and advises that:*	

Statutory Body	Applicant's Response
"Activities that have a negative impact on the spawning of herring should not occur unless the effects of these activities have been assessed and shown not to be detrimental to the productivity of the stock1". Smothering of gravel spawning beds via sediment plumes and noise during works would also cause disruption to herring spawning behaviour. Due to the sensitivity of Celtic Sea Herring, **disturbance to spawning must be avoided**; mitigation is not an option. Due to a planned route bisecting a known spawning ground, works should be restricted to non-spawning time, i.e. April to mid-August. The geospatial coordinates of known spawning gravel beds must be adequately buffered to allow for minor mapping inaccuracies and substrate movements. Similarly, a further buffer zone should be added to avoid any resulting sediment plume from reaching the spawning beds. This may require an analysis of water movement in the area and restricting works to times with favourable conditions. Spot testing for gravel along the chosen route through the spawning ground is also advised. ***3. Suggest meetings with Irish producer organisations*** In volume 2B and other mentions elsewhere, we note meetings were held with both Youghal and Ballycotton Fisherman's Associations. The Department would also recommend liaising with national representative organisations whose members operate in the area. We would recommend also contacting the local fishing producer organisations including, but not limited to: the Irish South & East Fish Producers Organisation (ISEFPO@gmail.com), the National Inshore Fisheries Forum (denise.maloney@bim.ie), the local Regional Inshore Fisheries Forums (SWRIFF@inshoreforums.ie and SERIFF@inshoreforums.ie) and the Irish South & West Fish Producers Organisation (Carmel@IrishSouthAndWest.ie) It is likely that members of the different organisations will have previous experience in dealing with subsea cables and pipelines and will understand what this will mean to their operation. Mention elsewhere is made to a fisheries liaison officer tasked on the project, which is encouraging. The fisheries liaison officer should be a key link with the stakeholders in the Celtic Sea fisheries and will need to keep them well informed on key developments, e.g. restrictions because of cable laying and rock armour deployments. Discussions with the various fishery representative groups would also help clarify how fishers have	**Point 3** We agree with the recommendation to liaise with the national representative organisations and their members who operate in the area i.e. the local fishing producer organisations, as the project continues to progress. The following organisations shall be added to the list of proposed contacts for any future engagement on the project: Irish South & East Fish Producers Organisation. National Inshore Fisheries Forum. Regional Inshore Fisheries Forums. Irish South & West Fish Producers Organisation. We also agree that the FLO should be a key link with the stakeholders in the Celtic Sea fisheries and will need to keep them well informed on key developments e.g. restrictions because of cable laying and rock armour deployments. Also, the FLO is key for implementing the measures to offset the effects to fisheries.

Statutory Body	Applicant's Response
managed cable related risks in the past, considering the number of subsea cables and pipelines there are in the Celtic Sea. ***4. Overlap with the Labadie Nephrops ground*** It is important to avoid, to the greatest extent possible, the Labadie *Nephrops* (Dublin Bay Prawns) ground and where this is not possible that there is prior engagement with fishing industry to ensure the minimum of disruption. Volume 3D2 contains a section on commercial fisheries. The following appears on page 368: "The proposed cable route avoids the principal *Nephrops* (Dublin Bay Prawn) fisheries located to the east and south west of the cable route.". This statement is somewhat misleading as the cable does cross the north-eastern part of the Labadie *Nephrops* grounds, an area with a significant amount of Nephrops directed fisheries. (figs 5 and 6). This is not acknowledged in the documentation. The basis for identifying the selected route as the preferred option is not well documented and, from a fisheries point of view, not supported by VMS data (Vessel Monitoring Systems) which automatically collect positional data from fishing vessels. When combined with the reports as outlined in the Introduction (page 337), the survey of fishing vessels is a little limited (Apr – Sept 2014 and May –Oct 2015 for AIS, and 2009 for VMS) and may not reflect current fishing operations in the Celtic Sea given that the most recent data is almost six years old. The limitations of the survey could mean that some fishing operations have not been identified. For example, demersal (whitefish) seine net fishing does not appear to be a significant fishing operation in this report but does feature in the areas near the proposed routes in Figure 19.3 (page 347). The fishing industry representative organisations will be best placed to comment on how the survey data compares to current fishing operations and potential associated changes to fisheries management. The appointment of the fisheries liaison officer is key for implementing the measures to offset the effects to fisheries. The fisheries liaison officer needs to make sure that they can contact and keep all relevant stakeholders in the Celtic Sea fishery informed. ***5. Interactions between gear and the seabed*** The Department wishes to highlight concern about possible interaction of fishing gear with the cable and urges consideration of mitigation measures to be discussed with	**Point 4** For overlap with the Labadie Nephrops grounds (Figure 6 in your consultation response), these are located beyond the limits of the Foreshore Licence application FS006916. It is however noted that these grounds will not be avoided completely, in the waters beyond the 12nm, and only a very small percentage of the entire grounds will be intersected. It is also agreed that prior engagement with the fishing industry will be carried out to ensure the minimum disruption. For the survey of fishing vessels, it is noted that this assessment was carried out using best available information (project specific reports from Wood, NetWork Services and Anatec Limited to EirGrid & RTE), liaison work undertaken by the proposed FLO, review of a list of peer-reviewed and grey literature and was supported further by a data request to the Sea Fisheries Protection Authority. The date range for the available project specific reports is also noted from 2013 to 2019. The applicant acknowledges continuing developments in the marine environment and are committed to ongoing stakeholder engagement and information gathering. For demersal (whitefish) seine net fishing, Section 19.7 (Page 351) of the EIAR sets out the principal target species for the commercial fisheries in the Celtic Sea and provides a focus on demersal fish and those that are captured via seine vessels (notably whiting Merlangius merlangus and Atlantic mackerel Scomber scombrus). Also, with reference to Figures 5 and 6 in your consultation response, it is noted that international fishing activity for Danish Seine and Scottish Seine (Figure 5) is primarily located out with the limits of the Foreshore Licence application FS006916 (beyond 12nm), and the majority of the route (within 12nm) does not intersect any of the main demersal (whitefish) fishing grounds.

Statutory Body	Applicant's Response
fishing industry representatives. We note on page 150 of Volume 5: "*Fishing vessels, and trawlers in particular, are likely to change their fishing areas due to rock placement work in certain sectors. There will be a greater risk of nets getting caught in these areas. However, the external protection is designed in such a way as to allow trawl nets to pass over them. It will be up to the examining authorities to decide whether fishing can take place around the subsea construction site.*" Otter and beam trawl fishing gear will be able to pass over most obstacles but demersal (whitefish) seine nets (especially those without large disc ground gear) and dredges are unlikely to be able to pass over rock placements or exposed cable. Additionally, rock placements will be a potential entanglement for static nets and traps. The information regarding gear penetration in volume 3D2 Appendices omits specifics on dredging (e.g., scallop gear). Scallop dredges will penetrate the substrate by up to 50 mm; some information on scallop dredges is included in Volume 3D (pages 346) and highlights that they should not be an issue unless the cable is uncovered or not buried deep enough. While the cable remains buried it is unlikely to restrict fishing activity for most gears. However, in areas where rock armour is used to cover the cable there will likely be some restrictions to those gears that are typically towed over clean (free of obstruction) ground, i.e. dredges and seines. Again, while the cable remains buried it is unlikely to restrict fishing activity for most gears. However, in areas where rock armour is used to cover the cable there will likely be some restrictions to those gears that are typically towed over clean (free of obstruction) ground, i.e. dredges and seines. The fisheries liaison officer and meetings with the industry representatives will be a key link with the stakeholders in the Celtic Sea fishery and the need to keep them well informed on the location of any obstructions. ***6. Concerns over use of AIS data (Automatic Identification System data)*** Volume 3D2 Appendices: pg 412: Fishing analysis: Investigates the presence of vessels in the area. This section describes a detailed analysis of AIS data (Automatic Identification System data or vessel traffic data) but it is not particularly informative. Although all vessels of 15 metres and over are obliged to carry AIS, the coverage of the	For the fishing industry representative organisations providing comments on how the survey data compares to the current fishing operations and potential associated changes to fisheries management, the applicant again acknowledges continuing developments in the marine environment and are committed to ongoing stakeholder engagement and information gathering. It is also recognised that the FLO will be key for implementing measures to offset the effects to fisheries and that the FLO will make contact and keep all relevant stakeholders in the Celtic Sea fishery informed. **Point 5** For interactions between gear and the seabed, concerns about possible interaction of fishing gear with the cable (notably rock placements/berms/concrete mattressing, exposed cable and entanglement of passing demersal (whitefish) seine nets, dredges, static nets, traps and scallop gear with 50mm substrate penetration) is recognised, and we will discuss the mitigation measures with fishing industry representatives (where applicable). Exposed cable is not likely to restrict fishing activity providing the target burial depth is met, the seabed is restored to its original profile and it remains following installation and during operations. For rock placements/berms/concrete mattressing, Section 8.4.3 (Page 91) of the EIAR identifies that these are not anticipated within the first 18km of the cable from the landfall at Claycastle Beach. This covers the majority of the seabed area within the limits of the Foreshore Licence application FS006916 and for the remaining 3km in the Irish territorial waters (within 12nm) the water depth is over 60m BCD. It is noted that entanglement does not apply to all activities (i.e. deploying static nets, traps and use of scallop gear with 50mm substrate penetration, which has been identified as a receptor

Statutory Body	Applicant's Response
AIS data is highly variable in space because only data that is received by a base station or a satellite is recorded. In general, the coverage close to shore is quite good (close to 100%) but further offshore the coverage can be as low as 10%. This can lead to significant bias in the results. The analysis was carried out along a study transect. The results are then extrapolated to the various route options by identifying general regions of high activity. The two main areas of fishing activity that were identified are 1) the area close to the Irish shore and 2) south of the Scilly Isles (p425 of the pdf). These findings are not fully supported by the VMS data (Figure 5). The high levels of activity near the Irish coast could be an artefact of higher AIS coverage, compared to further offshore areas. Figure 5 does not indicate that this is an area of particularly high activity. Figure 5 does confirm that there is beam trawl activity in the other main area of activity (south of the Scilly Isles) but when the total activity of all bottom contacting gears is considered (top-left map in Figure 5) this does not appear to be an area of particularly high activity and not necessarily a reason to choose route 2 over route 1 (which passes closer to the Scilly Isles but avoids the Labadie grounds). In summary, the basis for identifying areas of fishing activity is not particularly sound. Having said that, the proposed preferred option (route 2) does avoid the Smalls grounds, which has by far the most activity in the area. **A collection of figures included within the Sea-Fisheries Policy and Management Division's response are included below:**	beyond 12nm within the Irish EEZ) and / or during the operational phase of the Project (i.e. beyond any temporary fishing vessel exclusion periods during installation). Section 19.11 (Page 364 and 365) of the EIAR identifies that seabed obstructions created by installation of the marine cables, that are considered to pose a risk to the fishing industry will be made safe for towed fishing gear. Also, that where seabed obstruction such as rock berms and concrete mattressing will be installed (where cable burial has not been possible), they will be designed to have a smooth over-trawlable profile so that they do not present an obstruction to fishing activity (i.e. ensuring operational safety and minimising risk of gear snagging). The locations of any rock placement/berm/concrete mattress will also be communicated to fishermen via Notice to Mariners. **<u>Point 6</u>** For concerns over use of AIS data, it is noted that this assessment was carried out using best available information (Anatec Limited to EirGrid & RTE) with the AIS coupled with VMS data for commercial fishing vessels and qualitative information on recreational vessels/small fishing craft from local harbours (where available). Consultation also took place with the Ballycotton and Youghal Fisherman's Associations in 2017 and 2018, and further consultation with the national representative organisations and their members who operate in the area (i.e. the local fishing producer organisations) will be undertaken as part of the process of communicating detailed proposals for construction activity, when these are available. With reference to the comparison that is being made between the main areas of fishing activity, 1) the area close to the Irish shore, and 2) south of the Scilly Isles (Fig 7.15 and 7.16 of the Vol 3D2 Appendices), and the findings of the ICES VMS data (Fig 5 in your

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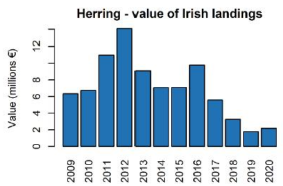


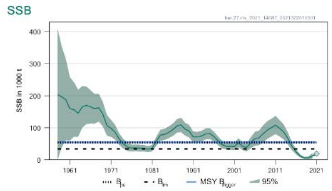
Figure 1. Yearly value of Irish herring landings (all stocks)


Figure 2. Stock biomass of Celtic Sea Herring. Horizontal lines depict management targets and limits.


Figure 3. Herring spawning grounds and areas around Ireland (O'Sullivan et al 2013).
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consultation response) these datasets are not directly comparable. The former is illustrating a total of 12 months fishing crossing frequency and fishing crossing results by gear type (below 6 knots and varied gear types e.g. including pelagic) in the period April to September 2014 and May to October 2015. It also has a different purpose and is attempting to identify risk from fishing vessels. The latter is illustrating international fishing activity in a different period (2013-18), is specific to mobile bottom fishing only and is attempting to reduce fishing disturbance on the seafloor habitats that affect fisheries landings and value.

As an additional observation the 'All mobile bottom gears' part of Figure 5 in your consultation response does actually show a main area of fishing activity close to the Irish shore. The 'Bottom trawl - Demersal fish' and 'Beam trawl - Demersal Fish' parts of Figure 5 in your consultation response also show areas of fishing activity to the south of the Scilly Isles. Both of these overlap with sections of high annual fishing crossing frequency and high annual fishing crossing results by gear type (Figures 7.15 and 7.16 of the Vol 3D2 Appendices).

Also, it is possible that the sections to the south of the Scilly Isles (Figures 7.15 and 7.16 of the Vol 3D2 Appendices) is showing high annual fishing crossing frequency and high annual fishing crossing results by gear type (beam trawlers in particular), as the model is picking up on these beam trawlers as they slowly (<6 knots) navigate and traverse in and out of the mid to northern waters of the English Channel entrance. It is also possible that they are not actively fishing within the dataset and time period that was examined and this caveat is identified in the Anatec work (Vol 3D2 Appendices).
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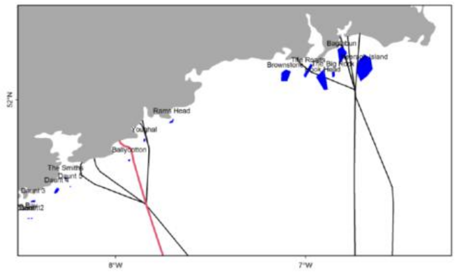
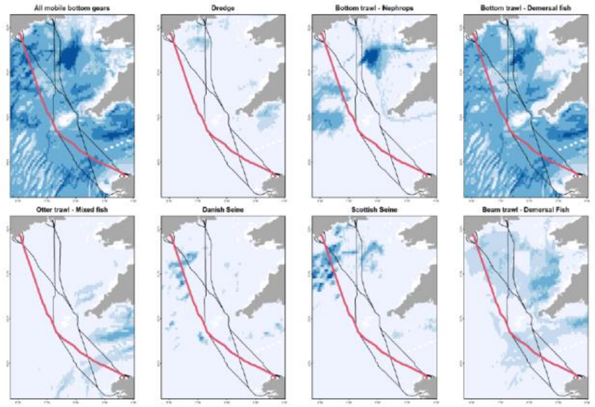
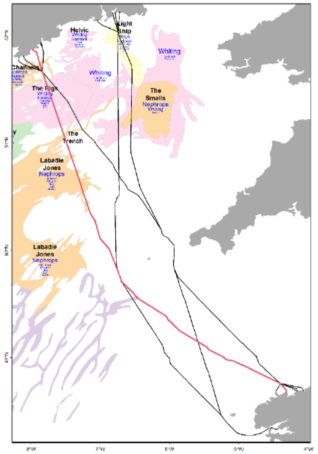
 *Figure 4. Location of herring spawning grounds[3] and the various cable route options. The preferred route 2 is highlighted in red. This is the only option shown in volume 7B.*  *Figure 5. International fishing activity in the period 2013-18[4] and the various cable route options. The preferred route 2 is highlighted in red. This is the only option shown in volume 7B.* [3] O'Sullivan, D., O'Keeffe, E., Berry, A., Tully, O., and Clarke, M. (2013) An Inventory of Irish Herring Spawning Grounds. Irish Fisheries Bulletin No. 42: Marine Institute [4] ICES. 2021. ICES advice to the EU on how management scenarios to reduce mobile bottom fishing disturbance on seafloor habitats affect fisheries landing and value.: ICES data product release, https://doi.org/10.17895/ices.data.8192	

Statutory Body	Applicant's Response
 *Figure 6. Main demersal (whitefish) fishing grounds of interest to Irish vessels[5] and the various cable route options. The preferred route 2 is highlighted in red. This is the only option shown in volume 7B.* Sources: Breslin J.J. (1998) The location and extent of the main Herring (*Clupea harengus*) spawning grounds around the Irish coast. Masters Thesis: University College Dublin ICES. 2003. Report of the Working Group on Fish Ecology (WGFE), 3–7 March 2003, ICES Headquarters, Copenhagen, Denmark. ICES CM 2003/G:04. 113 pp. http://www.ices.dk/sites/pub/CM%20Doccuments/2003/G/G0403.PDF ICES. 2015. Second Interim Report of the Working Group on Maritime Systems (WGMARS), 2–5 December 2014, ICES HQ, Copenhagen, Denmark. ICES CM 2014/SSGSUE:08. 35 pp. https://doi.org/10.17895/ices.pub.5430. Marine Institute Stockbook 2021. In press, previous versions available at https://oar.marine.ie/ Molloy, J., 2006. The Herring Fisheries of Ireland (1990 – 2005), Biology, Research, Development and Assessment. O'Sullivan, D., O'Keefe, E., Berry, A., Tully, O., and Clarke, M. 2013. An Inventory of Irish Herring Spawning Grounds. Irish Fisheries Bulletin. 42: 2013. 38 pp. [5] Gerritsen, H.D. and Kelly, E. (2019). Atlas of Commercial Fisheries around Ireland, third edition. Marine Institute, Ireland.	

Statutory Body	Applicant's Response
Marine Advisor Environment, Department of Housing, Local Government and Heritage Your email of the 17th of November 2021 refers to this licence application for the construction and operation of a subsea electrical interconnector cable from the Irish EEZ to landfall at Claycastle, Co. Cork. There are ten Natura 2000 sites within the zone of influence of this project. This SPA is one of the few sites in the country which regularly supports more than 20,000 wildfowl and is therefore one of the most important. These sites hold nationally and internationally important populations of a variety of bird species, they are important for a variety of fish species including Salmon and Twaite Shad and breeding sea birds. **Assessment Process** The Minister for Housing, Local Government and Heritage, is responsible for carrying out environmental screening and any environmental assessments determined as being required following screening, in accordance with the requirements set out in Directive 92/43/EEC (Habitats Directive), Directive 2009/147/EC (Birds Directive) and Directive 2011/92/EU, as amended by Directive 2014/52/EU (EIA Directive), in respect of applications under the The Foreshore Act 1933, as amended. Outside of the Directives, the Minister is also required to consider environmental issues in respect of applications under the Foreshore Act 1933, as amended. **Habitats Directive** The Appropriate Assessment process (AA) is an assessment of the potential for adverse or negative effects of a plan or project, in combination with other plans or projects, on the conservation objectives of a European Site (Natura 2000 site). The focus of AA is targeted specifically on Natura 2000 sites and their conservation objectives. Article 6(3) and 6(4) of the Habitats Directive place strict legal obligations on Member States to regulate the conditions under which development that has the potential to impact on European Sites can be proceed. It requires that an Appropriate Assessment be carried out of plans or projects, not directly connected with or necessary to the management of a site as a European Site, but which are likely to have a significant effect thereon, either individually or in combination with other plans or projects. An AA Screening assessment is carried out to determine whether a plan or project is likely to have a significant effect on a European Site.	EirGrid thanks the Marine Advisor of the Department of Housing, Local Government and Heritage for taking the time to provide a response to Foreshore Licence application FS006916 for the Celtic Interconnector. We welcome the Advisor's conclusion that in principle they have no objections to the application, noting the recommendation that the Foreshore Unit engage a suitably-qualified Independent Environmental Consultant to undertake independent assessment of the application.

Statutory Body	Applicant's Response
• Article 6.3 states that: "*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."* • Article 6.4 states: *"if, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.* *Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."* In giving effect to the above as a matter of Irish law, the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011, as amended) (**Birds and Natural Habitats Regulations**) provide as follows: Regulation 42(1) of the Birds and Natural Habitats Regulations states that: *"A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the*	

Statutory Body	Applicant's Response
European site". Regulation 42(2) provides that: "*A public authority shall carry out screening for Appropriate Assessment under paragraph (1) before consenting for a plan or project is given, or a decision to undertake or adopt a plan or project is taken".* The Birds and Natural Habitats Regulations further provide as follows at Regulation 42 (6) and 42 (7):- *6. The public authority shall determine that an Appropriate Assessment of a plan or project is required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.* *7. The public authority shall determine that an Appropriate Assessment of a plan or project is not required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.* Furthermore, under section 42A (13) of S.I. No. 293 of 2021 an Appropriate Assessment, including the specified public consultation, must be carried out before the public authority makes a decision to undertake or adopt the proposed plan or project. **Risk Assessment for Annex IV Species** Outside of designated Natura 2000 sites, the waters around Ireland's coast are a suitable habitat for a number of species listed under Annex IV of the Habitats Directive (92/43/EEC). Article 12 of the Habitats Directive affords strict protection to those species listed in Annex IV of the Directive wherever they occur. Where necessary a Risk Assessment for adverse effects of the proposed works on Annex IV species must be undertaken and a report produced. This assessment is separate to that undertaken under Article 6.3. The purpose of the Risk Assessment is to examine the possibility that the proposed project either individually or in combination with other plans and projects,	

Statutory Body	Applicant's Response
may result in the deliberate disturbance or destruction of any of the species listed in Annex IV which may be present in the works area. The Risk Assessment should take into account the status (e.g. as indicated in the latest Article 17 reporting for Ireland, NPWS 2019) and sensitivities of relevant Annex IV species to potential impacts associated with the proposed project. The **Risk Assessment for Annex IV Species** should be precise, with definite findings, mitigation and conclusions removing all reasonable scientific doubt as to the effects of the proposed project on any Annex IV species. **EIA Directive** In Ireland, in accordance with Directive 2011/92/EU, as amended by Directive 2014/52/EU (hereafter, the EIA Directive), projects that are likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location must be subject to an EIA. Article 4 of the EIA Directive requires that projects listed under Annex I must always have an EIA while projects listed under Annex II shall be subject to an EIA if (i) determined on a case-by-case basis or (ii) they exceed certain thresholds set by each Member State. Thresholds have been set for Annex II projects in Irish legislation. Projects which do not meet the threshold may still require an EIA if the project is likely to have significant effects on the environment. Annex I and Annex II projects have been transposed into Section 5 (Parts 1 and 2) of the Planning and Development Regulations 2001, as amended. Section 13A(1)(b)(i) of The Foreshore Act 1933, as amended, requires that an EIA be carried out for all developments of a class specified in Part 1 or Part 2 of Schedule 5 of the Planning and Development Regulations where the development exceeds the relevant quantity, area or other limit specified in that Part, or where no quantity, area or other limit is specified. Section 13A(1)(b)(ii) of the Foreshore Act states that an EIA shall be carried out when a development is of a class specified in Part 2 of Schedule 5, but does not exceed the relevant threshold (i.e. sub-threshold) and the Minister determines that the proposed development would be likely to have significant effects on the environment. Therefore, it is necessary to examine such projects on a case-by case basis. In the case of Annex II projects that are determined on a case-by-case basis, or sub-threshold, an EIA screening is required to determine if the project will have	

Statutory Body	Applicant's Response
significant effects on the environment. Under Article 4(4) the developer (applicant) is required to submit information on the characteristics of the project and its likely significant effects on the environment. The developer may also provide a description of any features of the project and/or measures envisaged to avoid or prevent what might otherwise have been significant adverse effects on the environment. Subsequently, in accordance with Article 4(5), the Minister is required to make a determination, which shall be made public, that: 1. Where it is decided that an EIA is required, states the main reasons for requiring such assessment with reference to the relevant criteria listed in Annex III (Schedule 7 of the Planning & Development Regulations 2001) of the EIA Directive; or 2. Where it is decided that an EIA is not required, states the main reasons for not requiring such assessment with reference to the relevant criteria listed in Annex III of the EIA Directive, and, where proposed by the developer, states any features of the project and/or measures envisaged to avoid or prevent what might otherwise have been significant adverse effects on the environment. The proposed project is not of a type/class that is included in Annex I and II of the EIA Directive (Schedule 5 to the Planning & Development Regulations). However an EIA Pre-Screening process is a requirement to demonstrate this analysis. Accordingly, **please find attached an EIA Pre-Screening** for the proposed project. **Non-statutory Environmental Report** Where projects do not fall under a class that require an EIA or an EIA Screening and in-keeping with good governance, a Non-statutory Environmental Report assessing the environmental effects of the proposed works on the receiving environment is required. This report will document the current state of the environment in the vicinity of the proposed activity in order to quantify the effects, if any on the environment, and if applicable to highlight how mitigation will be implemented to minimise impacts on the environment. The EPA Guidelines on the Information to Be Contained in Environmental Impact Assessment Reports (2017) indicates the relevant topics to be covered in this report. **Independent Environmental Consultants (IEC)** Owing to the scale and complexity of the environmental assessment required, and	

Statutory Body	Applicant's Response
taking account of the available resources within the Department, I recommend that Foreshore Section of DHLGH engage a suitable qualified IEC. The IEC must conduct an independent assessment of the information provided by the Applicant, having regard to the Habitats Directive, the Birds Directive, the Birds and Natural Habitats Regulations, the EIA Directive, Non-statutory Environmental Reports and relevant jurisprudence of the EU and Irish courts. The IEC shall ensure that The Minister has all the environmental assessments required to allow them to make decisions on applications under The Foreshore Act 1933, as amended in accordance with the requirements set out in Directive 92/43/EEC (Ha**bitats Directive**), Directive 2009/147/EC (**Birds Directive**) and Directive 2011/92/EU, as amended by Directive 2014/52/EU (**EIA Directive**). **Conclusion/Recommendation** In principle I have no objections to this application. As outlined above, I recommend that Foreshore Section of DHLGH engage a suitable qualified IEC. On completion of the Public and Prescribed Bodies Consultation and the work of the IEC, I will furnish my AA Screening Determination and Environmental Report. If the Minister adopts and approves these reports and a determination is made that a Stage 2 Appropriate Assessment is required a public consultation will be held on the AA. The Final Environmental Report with Determinations (if an EIAR Reasoned Conclusions should be address here) which may include any case specific conditions identified through the environmental assessments will follow having regard to the information obtained during public participation.	

1.3 Legislative context

The *Foreshore Act 1933* (as amended), requires that a lease or licence must be obtained from the Minister for Housing, Local Government and Heritage for the carrying out of works or placing structures or material on, or for the occupation of or removal of material from, State-owned foreshore.

The 1992 EU Habitats Directive (Council Directive 92/43/EC) and Birds Directive (2009/147/EC) are transposed into Irish law by Part XAB of the *Planning and Development Act 2000* (as amended) and the *European Communities (Birds and Natural Habitats) Regulations 2011* (as amended).

In addition to the requirement to consider potential effects of a plan or project on European Sites under Article 6(3) of the Habitats Directive, the Directive requires consideration of the potential effects on species listed under Annex IV of the Directive (termed Annex IV species). Under Article 12, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas.

SECTION 2 - DESCRIPTION OF PROPOSED WORKS

2.1 Site Location and Project Overview

As noted in Section 1.1 above, the Celtic Interconnector is a proposed subsea link to allow the exchange of electricity between Ireland and France. The interconnector will link the Irish high voltage electricity transmission system, at the existing Knockraha substation in Cork in Ireland, with the French high voltage electricity transmission system at an existing substation in La Martyre in Brittany, France.

Both Irish and French electricity transmission grids operate using high voltage alternating current (HVAC). The interconnector will transmit electricity using high voltage direct current. Consequently, a converter station will be required close to each grid connection point to convert HVDC to HVAC and vice versa. Direct current (DC) will be used for the interconnector as it enables large amounts of electricity to be efficiently transported underground or subsea over long distances.

The elements of the project are outlined below and illustrated in Figure 2.1.

Onshore in Ireland:

- Connection to the Knockraha high voltage electricity transmission system substation
- 11km underground HVAC circuit from Knockraha substation to the converter station in Ballydam, Co. Cork
- Ballyadam converter station, on a brownfield site
- 32km underground HVDC circuit from Ballyadam converter station to the landfall transition joint bay (TJB), at which the subsea cable will be connected to the onshore cable, at Claycastle Beach, 2km south of Youghal in East Cork.
- HVDC circuit from the TJB to the landfall,

These onshore elements will require planning permission from An Bord Pleanála as strategic infrastructure development.

On the Irish Foreshore:

- Circuit landfall at Claycastle, Co. Cork (Figure 2.2).
- 35km subsea HVDC circuit to the outer limit of the Irish Foreshore (Figure 2.3).

This part of the interconnector will require a consent under the Foreshore Act, 1933, as amended, and is the subject of this application.

In the Irish EEZ:

- 116km subsea HVDC circuit.

In United Kingdom EEZ:

- 211km subsea HVDC circuit.

In French EEZ:

- 87km subsea HVDC circuit.

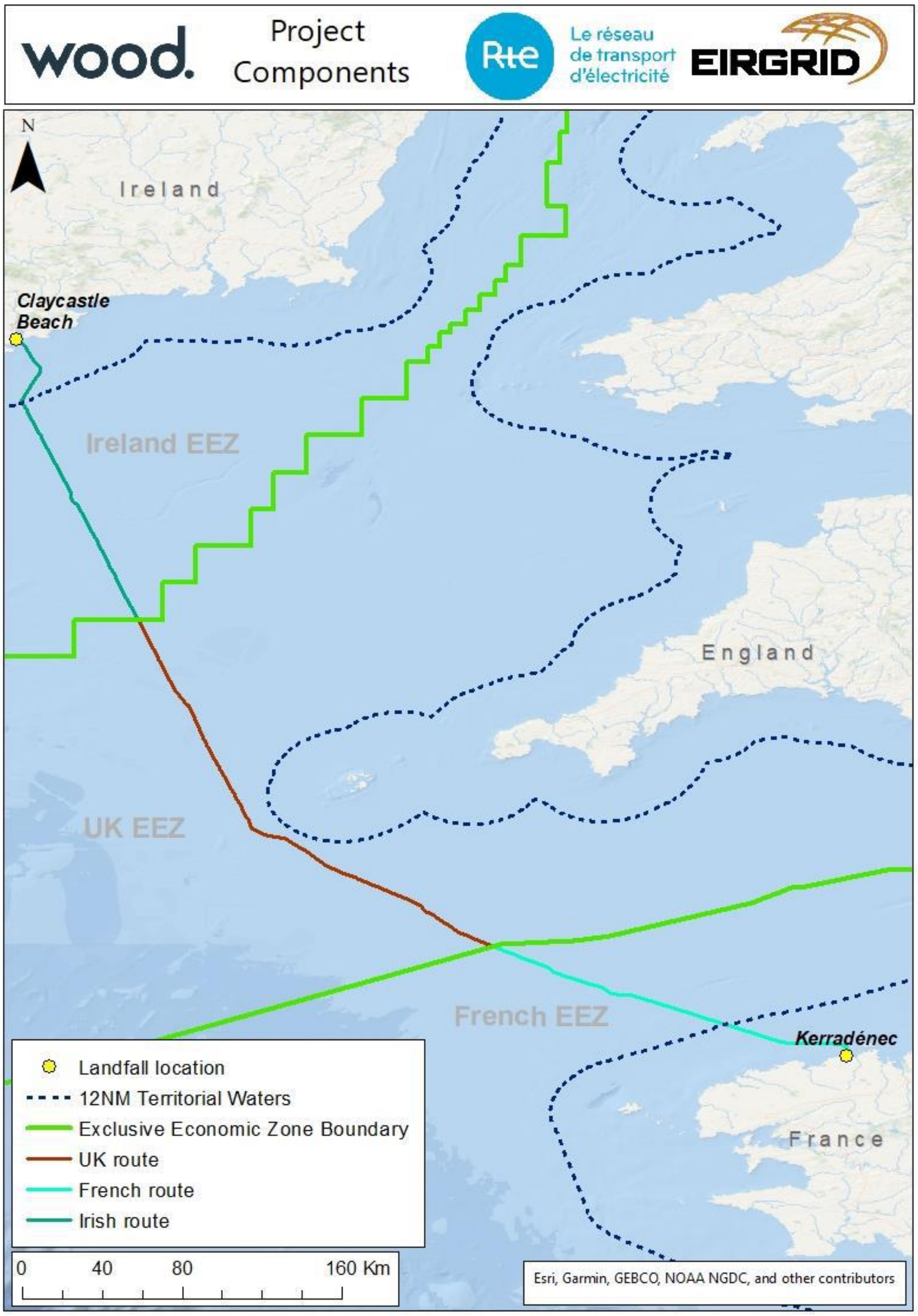
In French territorial waters:

- 48km subsea HVDC circuit
- Landfall at Kerradénec in Cléder, Brittany

Onshore in France:

- TJB at Kerradénec
- 35km underground HVDC circuit connecting the landfall at Kerradénec in Cléder, to the converter station at La Martyre
- Converter station at La Martyre
- Underground HVAC circuit (a couple hundred metres) from the converter station to the existing high voltage transmission grid substation at La Martyre.

Figure 2.1: The Celtic Interconnector



Source: Volume 3D1 Ireland Offshore: Environmental Impact Assessment Report

A fibre optic cable, with an associated power supply, will be installed for the full length of the interconnector. The purpose of the fibre optic link will be to remotely monitor the operation of the interconnector and enable communication and operational control between the converter stations. The fibre optic link between the two converter stations will have a dedicated power supply. This will require optical repeaters to be installed alongside the fibre optic link at intervals of approximately 100km. The fibre optic cable, with the associated power supply, will be laid with the submarine HVDC circuit. For the onshore segments the fibre optic cable, with the associated power supply, will be laid underground in a dedicated duct beside the HVDC circuit.

Subject to obtaining the necessary consents, the construction of the interconnector is proposed to commence in 2023 and the interconnector will enter into service in late 2026 – early 2027. The project schedule is as follows:

- Laying of subsea cable: three periods of two quarters in 2024, 2025 and 2026
- Laying of the onshore underground circuit in France and Ireland: 2023-2025
- Construction of converter stations in France and Ireland: 2023-2025

2.2 Project Elements on Foreshore in Ireland

The elements of the proposed interconnector on the Irish foreshore are the landfall at Claycastle Beach, near Youghal in East Cork, and the subsea HVDC circuit within Irish territorial waters. The sections below provide a description of these elements, and the construction works associated with them.

The Foreshore Licence Application Area covers a total area of 1,757.14ha, consisting of the landfall (3.64ha, Figure 2.2), and the cable corridor within territorial waters (1,753.5ha, Figure 2.3).

2.2.1 Description of Submarine Cables

2.2.1.1 Cable Configuration

The HVDC submarine cable package from the TJB at Claycastle to the TJB at Kerradénec will comprise two electrical cables and a fibre optic cable with associated power supply. The diameter of each HVDC cable will be between 100-200mm and the fibre optic cable will be circa 20mm.

The estimated length of the submarine route on the Irish foreshore is 35km, from Claycastle Beach to the outer edge of the territorial seas.

2.2.1.2 Submarine Cable Components

The submarine cable will comprise several elements including a central metallic conductor made of copper or aluminium that is surrounded by insulation. A lead alloy sheath will be located outside of the insulation layer. This will be surrounded by armouring that will be made of galvanised steel wires. This will all be contained in an external protection layer.

The operational life of each cable is expected to be approximately 40 years.

Figure 2.2: Foreshore Licence Application Area A nearshore and intertidal area

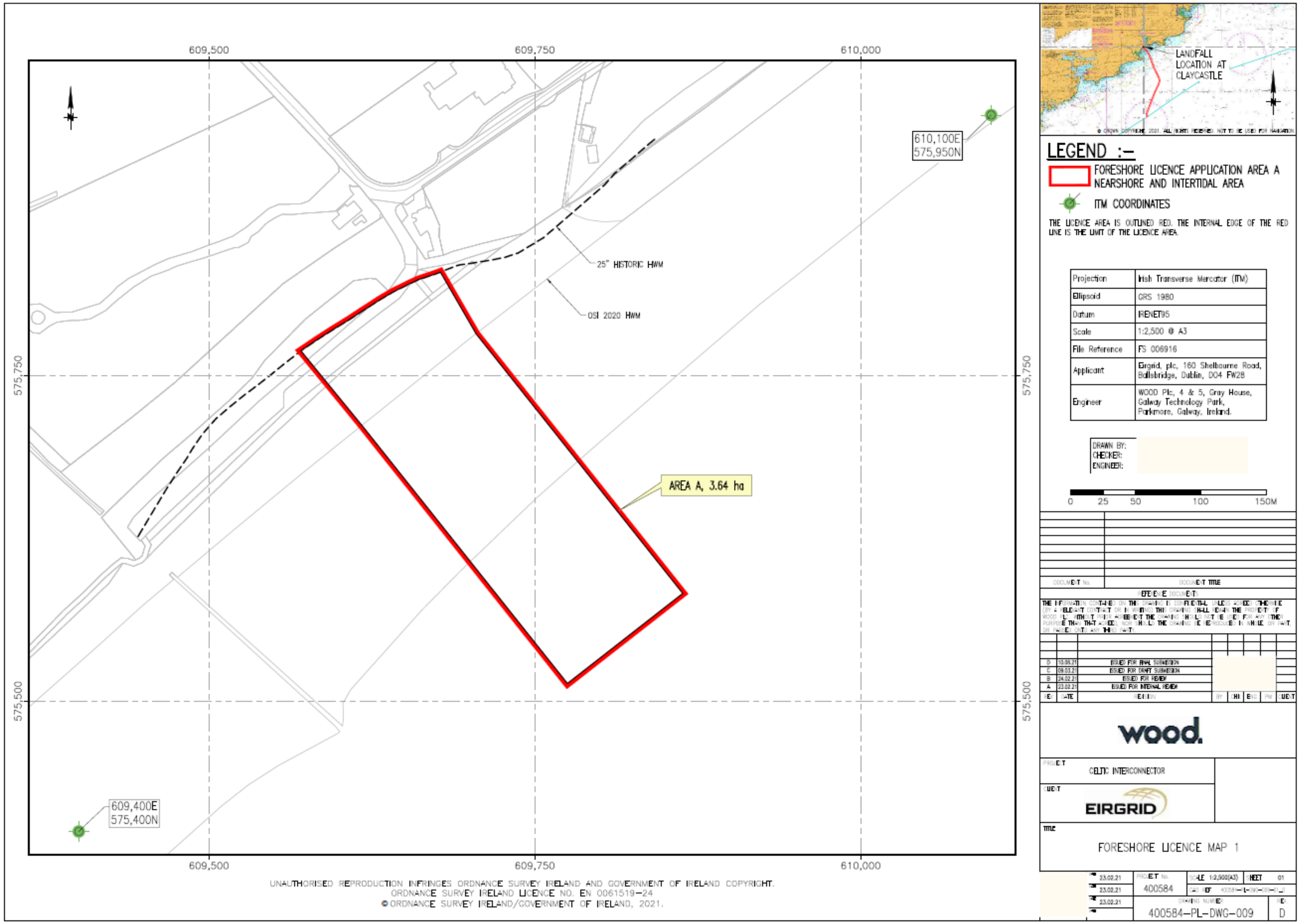
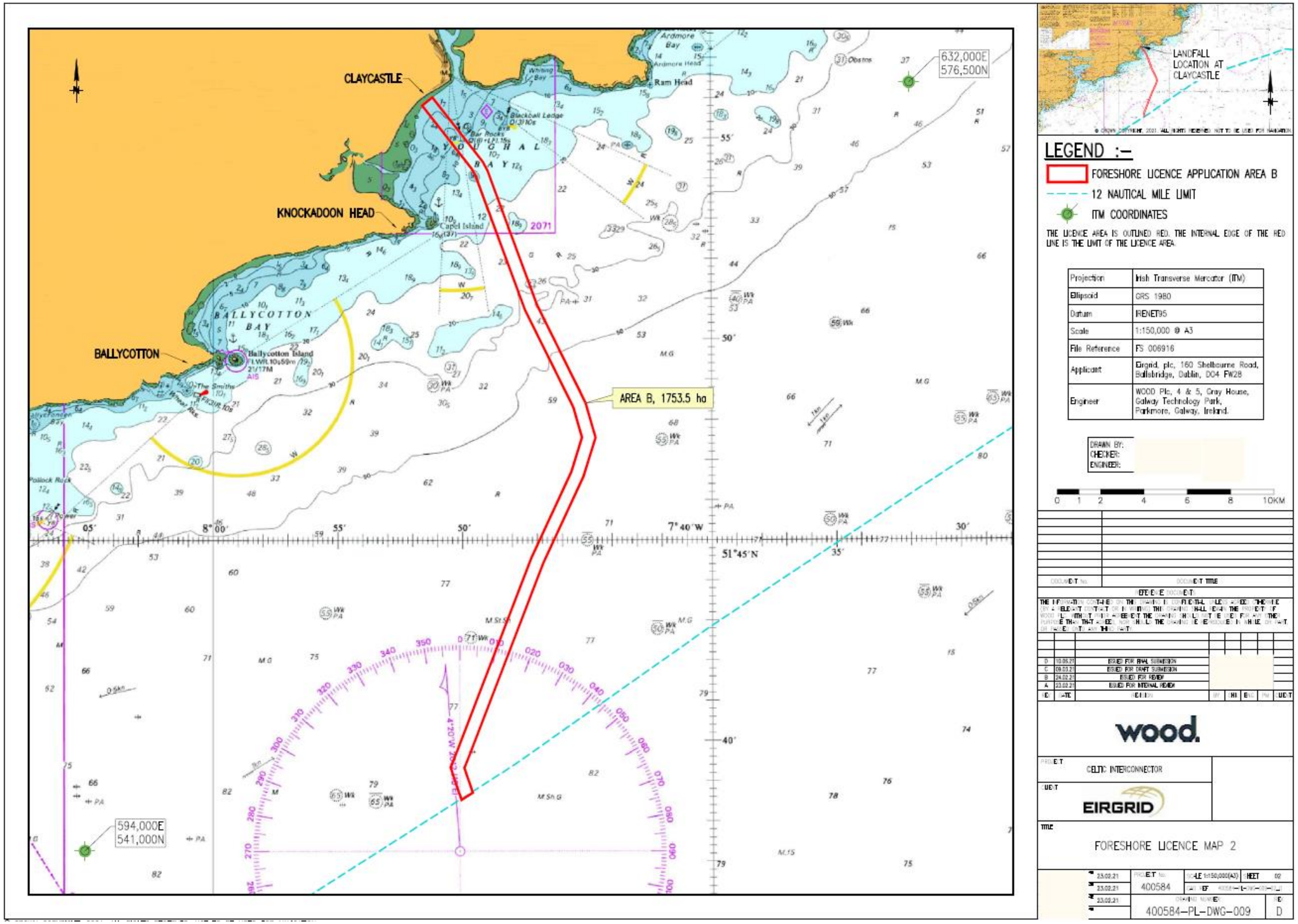


Figure 2.3: Foreshore Licence Application Area B 12 nautical mile limit



2.2.1.3 Submarine Cable Protection

When the cables are being laid at sea, where feasible, they will be buried in the seabed for protection. Several surveys were conducted to determine the preferred cable route. During these surveys, indicative targets for cable burial depth were determined for each region along the route. In instances where the cables cannot be buried or are not expected to reach the target depth of lowering, additional protection measures may be provided. Protection may also be provided in areas where the cable risk profile requires it due to the potential risk of damage due to anchor penetration or by fishing gear, or where existing cables are in the vicinity of the proposed cable. The methods of additional protection proposed are rock placement and concrete mattresses. Refer to Section 2.2.3.6 for detailed information on cable protection measures.

Rock placement as a means of primary cable protection is not envisaged to be necessary along the cable route in Irish territorial waters. The level of secondary rock protection will be minimised, and the installation contractor will endeavour to achieve the required level of protection through burial. The length of rock protection required in Irish territorial waters is expected to be up to 3km, requiring up to 10 tonnes of rock.

2.2.2 Construction Aspects at the Landfall

Two HVDC subsea cables and a fibre optic link with associated power supply will be buried within pre-installed Steel / High Density Polyethylene (HDPE) conduits beneath the beach and car park at Claycastle Beach. The HVDC cables extend across the HWM and enter the two underground concrete chambers of a Transition Joint Bay (TJB); this is where the subsea cables will connect with the onshore cables. In addition, a communications chamber will house the joint between the submarine communications / fibre optic link and the terrestrial communications / fibre optic link. The TJB, the onshore cable and fibre optic link are elements of a separate application to An Bord Pleanála for Approval of proposed Strategic Infrastructure Development (SID).

In order to minimise potential disruption to the beach area and to ensure that the main construction activities occur outside the bathing season, it is proposed to construct the landfall in two phases. Phase One involves the pre-installation of the conduits while Phase Two involves the pull-in and burial of the cables.

Two options are proposed for the construction of both phases. The option to be used will be decided by the construction contractor. The options are:

- Option 1 (Figure 2.4): Install the conduits from the TJB across the car park and below the beach extending 150m into the intertidal zone. This will minimise disruption to the beach during the summer months but increase the overall construction effort as it will require the construction of a temporary causeway to facilitate access for laying of the conduits. This option will also necessitate the construction of a cofferdam to prevent seawater ingress during construction.

- Option 2 (Figure 2.5): Install the conduits from TJB across the car park and extending a short distance below the top of the beach. This will reduce the construction effort as there will be no need for a causeway and the extent of the cofferdam piling would be less thus reducing associated noise and traffic. However, this option will require a short duration (approximately seven days) exclusion period with no access by the public to that portion of the beach and the car park during cable installation.

In each phase, three cable conduits will be installed, one each for the two HVDC cables and the fibre optic link with integrated power supply. There may also be a requirement for the installation of a spare conduit(s). The conduits will be constructed of carbon steel and designed with a specific gravity of approximately 1.4 to 1.6 to ensure they will not float. The proposed conduit will have an internal diameter of 300mm. Alternative conduit material such as HDPE may be used. The HDPE would be buoyant when flooded and will require the installation of concrete collars to provide ballast so that it will not float. The burial depth to the top of the conduits will vary from 3m onshore to 1.8m at the offshore end of the conduit.

The three conduits will be installed at a 5m spacing and will extend from the TJB, which will be located in the grassed area adjacent to the beach car park, to approximately 150m into the intertidal zone in Option 1 and to a short distance below the top of the beach in Option 2.

In Option 1 the conduit offshore entry point will be located in the intertidal zone, approximately 50m shoreside of Lowest Astronomical Tide (LAT). The advantages of locating the conduit offshore entry point above LAT is that it will allow land-based installation equipment to be used. This will remove the requirement for an extended cofferdam / causeway at the landfall and the use of pre-lay dredging vessels/equipment beyond the LAT.

2.2.2.1 Phase One Installation

The first phase for both Options 1 and 2 involves the installation of conduits in a trench excavated across the beach and car park to the area of the TJB. In the beach, the trench will be excavated using land-based equipment such as long-reach excavators. Both options will proceed as follows:

Option 1
A temporary 14m wide sheet pile cofferdam and a temporary 8m wide causeway will be constructed to install the cables and prevent ingress of sediments (see Figure 2.4). The steel sheet-piles will be installed using a piling rig with a hydraulic vibratory hammer. The piling rig will typically work from the top of the beach outward, using the formed temporary causeway adjacent to the cofferdam for access. The cofferdam will be approximately 130m long and formed with two lines of sheet piles parallel to the centreline of the conduits. The cofferdam will also be closed off by sheet piles at its offshore end. The temporary causeway will also be enclosed by sheet piles on the three sides facing the beach to mitigate against the ingress of seawater and sediments particularly at high tides. The causeway will need to be of sufficient width to allow heavy land-based equipment to manoeuvre during trench excavation and conduit installation. The temporary causeway will require an estimated 6000m^3 of aggregate material. The temporary causeway will be constructed, used and removed during the 10-week period of Phase one.

The trench will be excavated using long-reach excavators from the causeway. The trench depth will taper from 3m at the TJB to 1.8m in the intertidal areas. The spoil material from the trench, estimated to be 4000m^3, will be stored in the temporary construction compound at the back of the beach. The spoil will be re-used to restore the beach, car park and grassed area to their previous condition following conduit installation. Stored spoil will be covered to prevent exposure to the elements.

Figure 2.4: Phase One landfall construction for Option 1

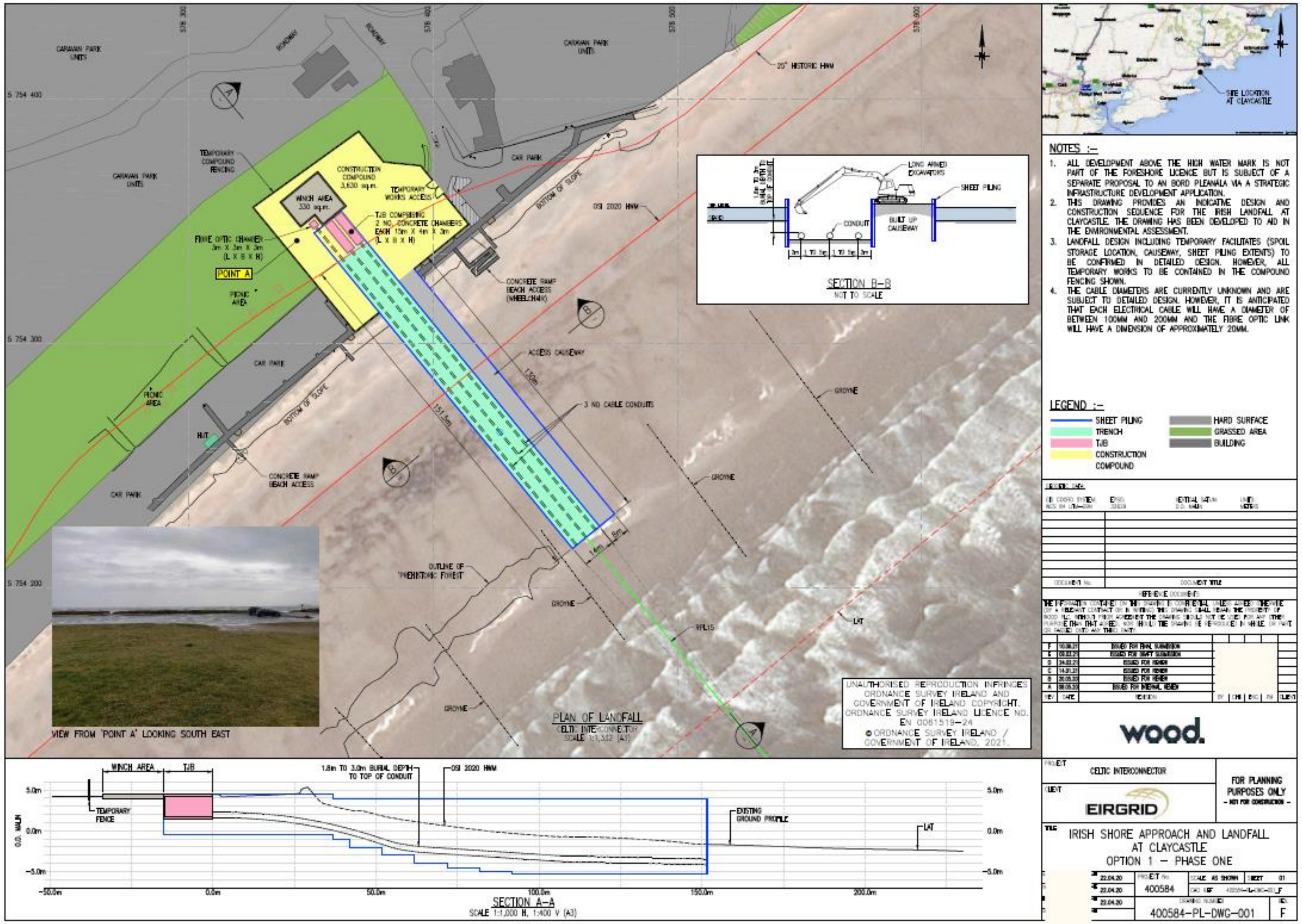
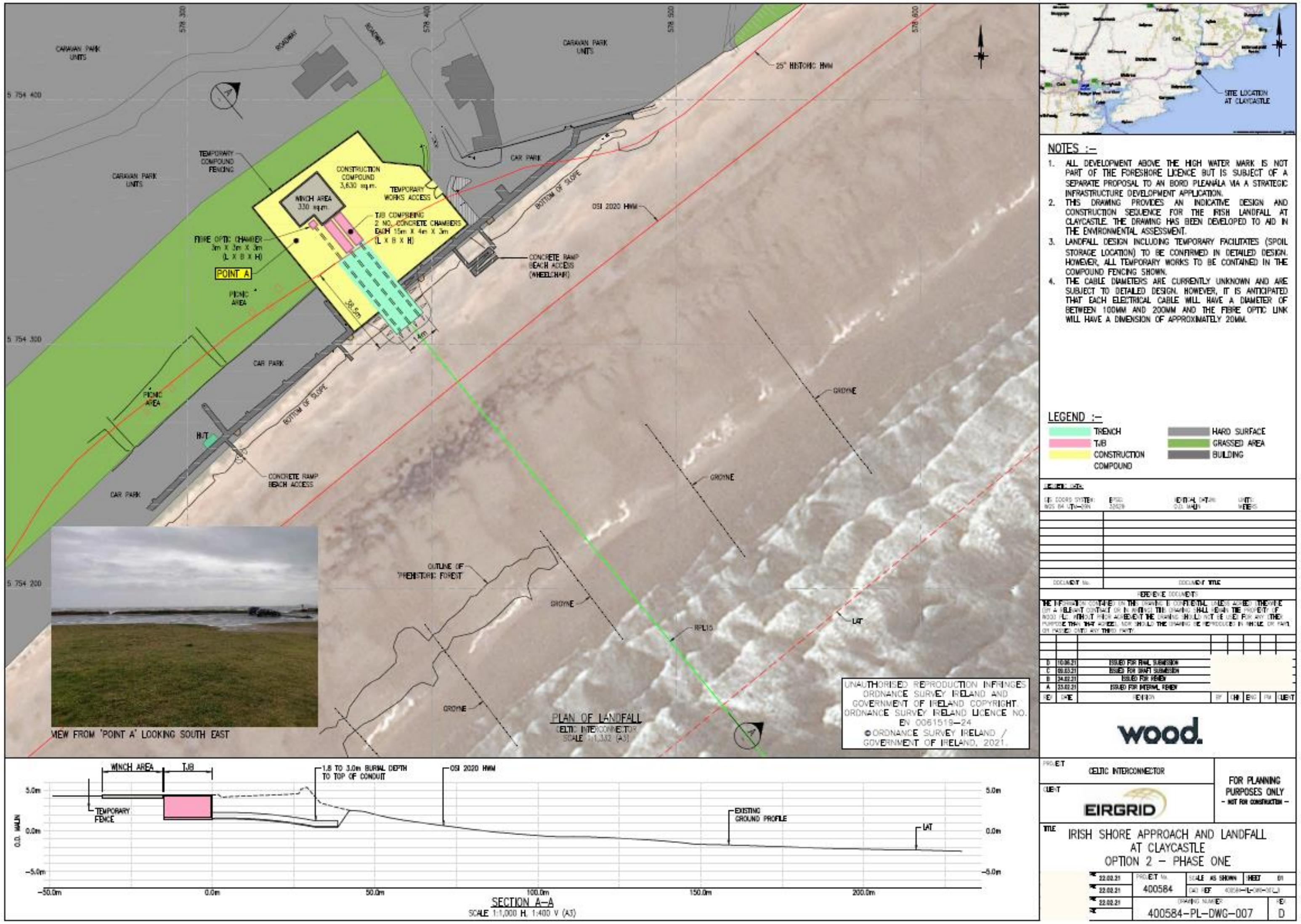


Figure 2.5: Phase One landfall construction for Option 2



Upon completion of the trench, the conduits will be transported from a staging area in the construction compound and laid out adjacent to the trench on support structures. The conduit segments, expected to be 3m to 5m in length, will be welded together to form a pipe string and transferred shoreward using lifting equipment. The supports will be removed, and a messenger wire will be inserted the conduits. The trench will be backfilled to retore the beach to its prior condition. Following this, the cofferdam and causeway will be removed, and the car park will be reinstated.

For Phase 2, a temporary winch platform measuring approximately 20m x 20m will be constructed on the shore side of the TJB. The winch will be used to pull the HVDC and fibre optic cables ashore from the offshore lay vessel through the conduits into the TJB. The winch platform will be a hard standing, typically of compacted aggregate. This platform will be constructed during Phase one.

The estimated duration for Option 1 for Phase one is anticipated to be 10 weeks, as follows:

- Mobilisation/Site Preparation – 1 week
- Landfall Civil Works – 4 weeks
- Conduit Stringing and Installation – 3 weeks
- Backfilling and Site Reinstatement – 2 weeks

Option 2

Construction of a causeway will not be required for Option 2 and the cofferdam will extend an estimated 5m into the intertidal area. A 14m wide cofferdam will be constructed to allow for the same 5m spacing of conduits. Long-reach excavators will be used for trench excavation to the same burial depth.

As with Option 1, upon completion of the trench, conduit will be welded together to form a pipe string. The pipe string will then be transferred to the shore. The supports will be removed, and messenger wires installed. The trench will be backfilled, and the beach re-instate to its prior condition.

The estimated duration for Option 2 for Phase one is 6 weeks as follows:

- Mobilisation/Site Preparation – 1 week
- Landfall Civil Works – 2 weeks
- Conduit Stringing and Installation – 2 weeks
- Backfilling and Site Reinstatement – 1 week

Land take of approximately 3,360m^2 will be required along the beach, the car park, and the grassed area for the Phase one. This area will be used for installation of the onshore trench, the TJB and the winch platform.

Land take of approximately 2,860m^2 will also be required into the intertidal zone for installation of the sheet pile cofferdam and temporary causeway for Option 1. The land take in the intertidal zone for Option 2 would be approximately 200m^2.

2.2.2.2 Phase Two Installation

The second phase of the installation sequence involves the pull-in of the offshore cables through the conduits, using a cable winch on the shoreside of the TJB. The locations of the receiver pits will vary between options. However, all other activities are similar. Option 2 will require an exclusion corridor of approximately 50m along the beach for 2-3 days per cable. However, the car park will remain fully accessible. There will be a localised temporary diversion for pedestrians on the beach around the exclusion zone. The installation of the three cables will not occur simultaneously and may require three separate timeslots.

A receiver pit is required to retrieve the pre-installed messenger wire from the seaward end of the conduit and to provide a smooth transition from the seabed down to the conduits during cable pull-in. In each instance, the receiver pit will be a tapered trench (approximately 10m long) at the seaward end of the conduit extending towards the LAT to taper towards the seabed. The receiver pit will be excavated using land-based equipment at low tide to minimise sediment dispersal within the water column. The excavation of these pits is expected to be undertaken to coincide directly with each cable pull-in operation. Each receiver pit will be backfilled prior to the excavation of the next pit.

A cable winch will be positioned on the platform erected in Phase one, in the grassed area on the landward side of the car park. The submarine cables will be transported on a cable lay vessel which will be stationed offshore. Floats will be attached to each cable which will be floated to shore, pulled by the cable winch, using the guidance of the messenger cable. The buoyancy aids will be removed, and the cable winch will pull the cable to the TJB.

Once the cables are secured in the TJB, the offshore cable lay and burial process will commence with a plough / jet setter transferred to the beach to bury the cable from the receiver pit towards the open sea. Following the successful connection of all three cables, the beach will be restored to its previous condition.

The estimated duration for each cable pull-in phase will be two weeks as follows:

- Mobilisation / Site Preparation / Winch Setup – 1 week
- Cable Pull (total) – 3 days
- Cable Jointing Activities / Site Reinstatement – 1 week

In Phase two, a land take of approximately 1,750m^2 (in addition to the construction compound) is required in the section of grass on the landward side of the car park. This area will be used for the winch, its retaining system (back anchorage) and all associated equipment. Carpark access will not be restricted in this phase.

For Option 1, limited land take is also required in the intertidal zone around the seaward end of each conduit. This is required to retrieve the pre-installed messenger wire to be used in the pull-in. In Option 2, an exclusion corridor of approximately 50m will extend from the receiving pit near the top of the beach to the water line during cable installation. Access to the car park will not be restricted and provision will be made for pedestrian access to the southern part of the beach.

2.2.3 Construction of Submarine Cable in Foreshore

The landfall at Claycastle Beach is formed by a long gently sloping sandy beach. The intertidal region is approximately 200m long with a gradient of approximately 4 degrees. Beyond the intertidal zone the seabed profile is relatively flat with gentle gradients leading to an uninterrupted smooth progression to the 10m water depth at approximately Kilometre Point (KP) 2.9.

The distance from the landfall site at KP 0 to the edge of the 12nm limit is approximately 35km (see Figure 2.3). The offshore route follows a sediment channel in a band of bedrock to provide ease of burial to the required target depths. The cables will be buried beneath the seabed to varying depths between 0.8m and 2.5m depending on the risks posed to the cable by fishing and shipping, seabed conditions and seabed mobility along the route. Following installation, there will be no restrictions on fishing or other activities over the cable.

A pre-lay survey will be undertaken in Irish territorial waters and the Irish EEZ prior to construction. The survey is expected to take 28 days.

Standard cable burial tools comprising either a plough or a mechanical trenching tool will be used for offshore cable installation. In the 35km stretch, challenging strata consisting of underlying chalk has been identified. Where a plough or a mechanical trenching tool is not appropriate along these stretches, a specialist rock cutting tool may be utilised for trenching. These techniques are described below in Section 2.2.3.5.

The following subsections describe the cable installation on the foreshore. It is anticipated that these steps will be required for the full length of the proposed subsea route.

The installation of the submarine cable will typically be as follows:

- Contractor survey, route engineering and finalisation
- Unexploded ordnance (UXO) intervention campaign (if required)
- Boulder clearance
- Sand wave pre-sweeping (not required in Irish territorial waters or Irish EEZ)
- Pre-lay grapnel runs
- Construction of infrastructure crossings
- Pre-lay route survey
- Cable lay
- Post-lay survey
- Cable burial
- Installation of external / secondary protection, and
- Post-burial survey.

2.2.3.1 Survey, Route Engineering and Finalisation

The installation contractor will survey and finalise the route within the 500m wide route corridor which is referred to in the application form and indicated by a red line boundary in Figure 2.3. The contractor will carry out route engineering to optimise conditions for the specific installation tools / techniques to be used. This will include identifying the areas for boulder clearance, sand wave pre-sweeping and deployment of the different burial tools.

The applicant's screening does not provide details of the survey equipment that will be used for the subsea survey of the pipeline route pre- and post-cable installation. Table 2.1 provides an example of side scan sonar, multibeam echosounder and sub-bottom profiler equipment that could be used and details of potential noise source levels.

Table 2.1: Source level and frequency of survey equipment which could be used

Equipment type	Purpose	Frequency range	Maximum Source Pressure Level (dB re 1 µPa @ 1m)
Multibeam Echo Sounder (MBES)	Determines depth and nature of the seabed by transmitting sound pulses (active sonar). Transmits broad acoustic pulse.	400-700 kHz (depending on selected option)	225-231
Side Scan Sonar (SSS)	Determines depth and nature of the seabed by transmitting sound pulses	100 & 500 kHz	235

Equipment type	Purpose	Frequency range	Maximum Source Pressure Level (dB re 1 μPa @ 1m)
	(active sonar).		
Sub-bottom Profiler e.g. Innomar SES-2000 Quattro Parametric[3]	Uses reflection seismology to give a 2D image of the sub-seabed geology	Primary: 85-115kHz Secondary: 2-20kHz	235-245

2.2.3.2 Unexploded Ordnance Clearance

A full UXO survey will be undertaken prior to cable installation. It is not anticipated that UXO clearance will be necessary in Irish waters. Pre-installation surveys of the cable route will determine the presence of any UXO. In the unlikely event that UXO are found, they will be either avoided, removed, or detonated in situ under licence (informed by relevant environmental assessments) held by the contractor.

2.2.3.3 Seabed clearance

Boulder Clearance
There are boulders, in varying concentrations, in certain areas of the cable route. These areas will be avoided in the detailed route engineering and design, if feasible. However, unavoidable boulders are a common challenge and boulder clearance is generally undertaken in three ways:

- The boulders may be pre-cleared using a purpose-built plough, or individually using a grab in advance of cable lay and burial operations.
- The boulders may be dealt with on an as-encountered basis. The options here would be limited to a grab or (if possible) micro-routeing of the cable.
- The concentration of boulders may make clearance impractical, and the decision may be taken to use secondary protection only (e.g., rock placement).

Sand wave pre-sweeping
It is not anticipated that sand wave sweeping will be necessary in Irish waters as sand waves have not been identified in the route surveys.

2.2.3.4 Seabed Preparation

Pre-lay grapnel runs
Pre-lay grapnel runs will be required along the cable route on the seabed to ensure debris (e.g., redundant cables, fishing gear, or discarded ropes) is cleared in advance of cable lay. The cable footprint on the seabed is anticipated to be approximately 5m wide. However, this may increase to approximately 15m during seabed preparation and cable installation works due to the size of the equipment deployed for these activities.

Construction of infrastructure crossings
Rock placement or concrete mattresses/sleepers will be used where the cables cross third-party infrastructure such as other cables or pipelines. Concrete mattresses are prefabricated and consist of a number of concrete block sections connected by polypropylene rope.

[3] https://www.nautilusoceanica.com/images/datasheets/innomar/Innomar-ses2000-quattro.pdf

There are six operational cables in the Irish EEZ that the interconnector will cross and two decommissioned cables. Each cable crossing will require a specific crossing design to be agreed with the asset owner. Where cables cross, if possible, the interconnector will be buried to avoid damage to either cable. In instances where existing cables are currently buried at the target depth, the interconnector will be laid without burial, or on pre-laid concrete mattresses or rock to achieve adequate separation between the cables. In either case, cable protection in the form of rock mattresses or a rock berm will be installed to protect both cables.

For decommissioned cables on the proposed route, a separate procedure will be undertaken. The cables will be cut a minimum of 50m on either side of the crossing point and the ends secured by dead-weights or buried. In each instance, coordinates and details of the ends or weights will be recorded.

2.2.3.5 Installation techniques

It is anticipated that the submarine cable will be installed in a bundled configuration, with the fibre optic link also installed in the bundle. Bundling the cables ensures the installation footprint is minimised (reducing boulder sweeping and potential rock placement volumes). The submarine cable will be transported on the cable laying vessels in a carousel. To lay the cable, it is fed via the laying arm at the stern of the vessel to its position on the sea floor. The cable laying vessels can simultaneously lay and bury the cables. The burial technique will vary depending on the geology of the seabed as indicated in the pre-lay route survey.

The cable lay vessel, with a crew of about 90, will arrive off Claycastle Beach with all the equipment required to install the cable. It will be necessary to transfer the plough from the cable lay vessel to shore to the seaward end of the landfall. It is envisaged that the plough will be transferred on a shallow draught barge at high water and lifted by an on-board crane and placed in the receiving pit. Alternatively, it may be off-loaded in Cork Port and transported by road, as an abnormal load.

Standard cable lay techniques are as follows:

Plough
Ploughs may be of displacement and non-displacement varieties. Displacement ploughs are used to dig trenches in the sediment in advance of cable installation. A back-filling pass may be employed post lay to close the trench back over the cable. A non-displacement plough works by passing the cable through the plough share to a level below the seabed with minimum disturbance and leaving an effectively closed trench in its wake.

Jetter
Jetting tools work by injecting high-pressure water into the seabed material to fluidise it and allow the cable to sink into it. They work by fluidising the seabed and are therefore generally used in soft seabed material such as clay and silts. They perform less well in sands and gravels, and particularly cobbles. Water jetting may be employed as a standalone method or form part of a hybrid solution.

Mechanical Trencher
The tool most commonly used for the sediment type that covers the most of the route is the mechanical or hybrid trenching machine. These tools are controlled remotely and run on tracked wheels along the seabed, burying the cable beneath the body of the machine.

The cable installation is expected to be undertaken using standard burial tools such as a plough or a mechanical trenching tool. Approximately 33km of the marine route in the Irish

EEZ, from KP 57.5 to KP 90.7, has more challenging strata, consisting of underlying chalk. Sections of this route may pose a challenge to cable burial using standard burial tools and may require the use of specialist rock cutting tools for trenching.

2.2.3.6 Cable Burial and Protection

Following cable installation, a post lay survey will be conducted to determine the extent of protection needed. The primary means of protection for the cables in Irish waters will be burial. Rock placement as a means of primary cable protection is expected to be minimal. As indicated in Section 2.2.1.3, the extent of rock protection in Irish territorial waters is expected to be between 0km and 3km.

Some secondary rock protection may be required where the target depth of lay is not fully achieved through burial. The secondary protection is most likely to be rock placement. However, a number of other options may be considered, including concrete mattresses. These options, however, are only economic over short distances and are considered a more localised solution, for example at infrastructure crossings. The rock will be sourced from quarries with the necessary consents.

Following the installation of cable protection throughout the proposed route, post-burial surveys will be undertaken to determine the overall protection of the interconnector.

2.2.3.7 Offshore Construction Vessel Traffic

The offshore works will involve several vessels for a variety of activities. Prior to cable installation, a survey vessel, carrying a crew of approximately 15, will be deployed for surveys. Seabed preparation will be undertaken prior to cable laying by a vessel with a crew of 30 to 40. A cable lay vessel, with a crew of circa 90, will follow seabed preparation for cable lay and burial in Irish territorial waters and EEZ. Finally, a rock placement vessel, if required, will follow cable installation.

All vessels may require access to Cork Harbour, particularly in adverse weather conditions.

2.2.3.8 Duration and Timing of Offshore Construction Works

The timeframes allocated to each offshore construction element is summarised below:

- The first activity will be the pre-lay survey, which is expected to last 28 days in Irish waters. It can be undertaken well in advance of the main installation activity.
- The preparatory works shall be carried out in advance of cable lay for approximately 30 days in Irish territorial waters and EEZ.
- The overall schedule for cable lay and burial in Irish territorial waters and EEZ excluding weather or mechanical damage stand by is 60 days.
- A rock placement vessel, if required, will follow cable installation. It will be required in Irish TW and EEZ for between 0 days and approximately 16 days.
- The durations of the works provided are indicative only and based on 24/7 operations.
- Safety requirements for the installation operations / procedures and weather condition may ultimately dictate the final programme.

2.2.4 Construction Environment Management Plan

A copy of the Outline Construction Environmental Management Plan (OCEMP) accompanies the application. This will form the basis for the Construction Environmental Management Plan (CEMP). All conditions of the consents will be included in the CEMP.

The CEMP will be prepared and implemented during the construction phase in consultation with the Planning Authorities and the Department of Housing, Local Government and Heritage. The CEMP will remain a 'live' document which will be reviewed regularly and revised as necessary to ensure that the measures implemented are effective.

Daily inspections will be undertaken by the contractor's environmental manager (CEM) which will include monitoring conformance with the CEMP. Daily assessment forms will be completed by the CEM during the daily checks. Checks on equipment will be undertaken to reduce the risk of incidents occurring such as oil leaks. As a minimum, unless otherwise agreed with the Department or other relevant stakeholders, the following equipment will be inspected:

- Waste storage facilities
- Sediment management
- Oil separators
- Chemical storage facilities
- Storage vessels and equipment including tanks, pumps, gauges, pipework and hoses
- Secondary containment i.e., bunds and secondary skins for oil tanks
- Spill response materials
- Equipment with potential to leak oils and other liquids (i.e. compressors and transformers)

2.3 Interconnector Operation

2.3.1 Operational Overview

Upon completion, the proposed interconnector will be operated and monitored by EirGrid in Ireland and Réseau de Transport d'Électricité in France. It is envisaged that the interconnector will be managed remotely in a similar fashion to existing interconnector from Ireland to the UK. The converter stations in Ireland and France will also be operated remotely.

Once operational, it is anticipated that the onshore and submarine cables will require minimal maintenance. For offshore components requiring maintenance, the cable may need to be cut at relevant places, lifted to the surface for repair, and replaced in or on the seabed. Operational maintenance activities will require similar vessels and machinery to that used for the installation works.

2.3.2 Electromagnetic Field

The cables will give rise to a permanent electromagnetic field (EMF) being generated along their length. EMFs surround any object that is generating, transmitting or using electricity, including appliances, wiring, office equipment, batteries and any other electrical devices. Electric and magnetic fields are common in modern life. In many cases, domestic electrical appliances and tools generate much higher magnetic and electric fields, near a sensitive receptor, than transmission lines at standard separation distances.

Independent and authoritative international panels of scientific experts have reviewed studies on possible human health effects from EMFs. These have concluded, based on the weight of the evidence available, that the power frequency electric and magnetic fields encountered in normal living and working conditions do not cause adverse health effects in humans when properly designed and constructed. These form the basis for guidelines published by the International Council on Non-Ionising Radiation Protection (ICNIRP) for EMF. EirGrid and ESB Networks have had strict regard to the ICNIRP guidelines in the design and operation of the transmission system.

The Celtic Interconnector Project has been assessed. It has been determined that ICNIRP guidelines will not be exceeded, and that the strength of the electric and magnetic fields generated during operation will have no significant effects. This is largely due to the direct current utilised for the most of the interconnector. Direct current cables have no frequency and, consequently, produce no electric fields.

Electric fields are normally fully contained within the insulation surrounding the cable whilst magnetic fields propagate outside the cable. The methods of cable burial and protection outlined above will further minimise the magnetic field in the vicinity of the cable.

It is noted that the Marine Adviser Environment Screening Stage Report[4] (11 March 2022) indicated that the NIS must include the latest scientific information on the effects of EMF on mammals (and migratory fish). Relevant information is provided below, primarily from a review of the topic to inform the recent UK Offshore Energy Strategic Environmental Assessment 4 Environmental Report (BEIS 2022[5]).

BEIS (2022) indicates that the interaction between anthropogenic EMF and marine mammals is not well understood, with the assessment of the impacts to marine mammals largely undetermined and with very little recent current research in this area. In Table 2.7, the applicant indicates that whilst there remains the potential for marine mammals to detect EMF emissions within the immediate locale of the cable, to date there has been no evidence to indicate that the sensitivity and/or magnitude of these impacts are sufficient to significantly impact marine mammal resources and no sensitivity thresholds for marine mammals in the environment have been proposed by regulators. Given the risks to marine mammals from EMFs associated with submarine power cables are not considered to constitute a major impact (Taormina *et al*. 2020, BEIS 2022), and the distance of relevant sites which support designated marine mammal qualifying interests from the cable (at least 70km), likely significant effects on marine mammals from EMF are not expected, as concluded by the AA Screening (Hartley Anderson 2022).

2.4 Decommissioning

The Celtic Interconnector is considered strategic infrastructure of national and European importance. Consequently, it is not expected to be decommissioned. The operational life of the submarine cables and other equipment is expected to be 40 years, and it is assumed that they will be replaced with new cables and equipment at that time.

If replaced, the submarine cables will either be left in place or removed and recycled in line with the waste management practices in place at the time of replacement. The same procedure will be implemented for onshore HVAC and HVDC cables. Equipment for the onshore converter station will be removed for recycling or disposal as required by the waste management practices at the time.

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[4] https://assets.gov.ie/218976/5f1af6ce-f06c-47de-828b-2e6f214fa40e.pdf

[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1061670/OESEA4_Environmental_Report.pdf

It is envisaged that activities associated with replacing the cable components will be similar to those associated with the construction phases outlined in Section 2.2 above.

SECTION 3 - RELEVANT ANNEX IV SPECIES

Under Article 12 of the Habitats Directive, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas. Those Annex IV species (cetaceans and marine turtles) that could potentially occur along the proposed cable route in Irish waters are described below.

3.1 Cetacean species

There are several key data resources on the species composition and relative abundance of the marine mammal fauna in the Celtic Sea. The annual Celtic Sea Herring Acoustic Surveys (CSHAS) cover waters off the south coast of Ireland, typically over a three week period each October and extends from 2-3km off the coast to over 100km offshore (e.g. O'Donnell *et al*. 2017, 2020). Dedicated marine mammal observers (MMOs) recorded sightings when light and environmental conditions permitted; combined data from 11 years of surveys from 2008-2018 are provided in Table 3.1. Data from the Irish Whale and Dolphin Group's (IWDG) casual database and other sources over the period 2005-2011 were synthesised by Wall *et al.* (2013), which includes an assessment of the seasonal occurrence of the most commonly sighted species; the IWDG casual sightings data are not effort corrected, and are biased towards busier and more accessible coastal waters, and areas subject to research (e.g. Ryan *et al*. 2010, Whooley *et al.* 2011); but provide useful information on the composition and relative abundance of cetacean species of the area.

The harbour porpoise (*Phocoena phocoena*), common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*) are the most common toothed cetaceans off the south coast of Ireland (Table 3.1), where they are sighted year-round. Risso's dolphin (*Grampus griseus*) are occasionally seen in this region, primarily in summer, while a small number of killer whale (*Orcinus orca*) sightings have occurred close to the coast. Minke (*Balaenoptera acutorostrata*) and fin (*Balaenoptera physalus*) whales are the most commonly sighted baleen whales in summer and late summer-autumn, respectively. Minke whale are also frequently observed during late summer to autumn, albeit in apparently lower abundance. Small numbers of humpback whales also occur in this area, with sightings peaking from late summer through to January.

Table 3.1: Cetacean sightings recorded during the annual Celtic Sea Herring Acoustic Surveys

Species	**Celtic Sea Herring Acoustic Surveys (CSHASs) 2008-2020**	
	Number of years observed (of a maximum of 13)	**Total number of sightings (individuals)**
Toothed cetaceans		
Common dolphin	12	1,230 (15,877)
Harbour porpoise	11	48 (263)*
Bottlenose dolphin	6	8 (40)
Risso's dolphin	4	6 (14)
Killer whale	1	1 (3)
Pilot whale	0	0 (0)
Unidentified dolphin	n/a	*81 (674)*
Baleen whales		
Fin whale	13	139 (237)

Species	Celtic Sea Herring Acoustic Surveys (CSHASs) 2008-2020	
	Number of years observed (of a maximum of 13)	Total number of sightings (individuals)
Minke whale	12	83 (94)
Humpback whale	7	19 (26)
Unidentified whale	*11*	75 (95)
Total	***n/a***	***1,690 (17,323)***

*Notes: See main text for a description of the two data sources. * Total harbour porpoise sightings in the CSHASs were heavily influenced by data from the 2016 cruise report where 22 sightings, representing 191 individuals, were reported in the Celtic Deep; excluding 2016 data yields a total of 19 harbour porpoise sightings totalling 57 individuals.*
Source: Nolan et al. (2014), O'Donnell et al. (2008, 2011, 2012, 2013, 2015, 2016, 2017, 2018, 2019, 2020) Saunders et al. (2009, 2010)

Two strata surveyed for marine mammals as part of the ObSERVE programme are relevant to the proposed works. These are Stratum 4 (offshore areas of the Celtic Sea) and Stratum 8, which was only surveyed in summer and winter 2016, and covered 9,506km^2 of coastal waters off the south and south-west coasts. Cetacean sightings and abundance estimates in these two strata are summarised in Table 3.2.

For Stratum 4 (offshore), the abundance of bottlenose, common and unidentified dolphins was considerably higher in winter. The opposite was observed for harbour porpoise, which were by far the most abundant species recorded in Stratum 4 in summer. In Stratum 8 (coastal), both harbour porpoise and all species of dolphin showed higher abundance in summer. Minke whale abundance was estimated to be similar across two summer and one winter surveys, although the number of sightings was low. Within Stratum 8, minke whales were not seen in the winter survey, but observed 20 times in summer, with sightings clustered off the south-west coast.

Predicted distribution maps suggested the presence of higher densities of harbour porpoise in summer, bottlenose dolphin in winter, and common dolphin in winter (relative to other surveyed areas for each species). Predicted densities of minke whale are higher in summer than winter, with waters off the south-west coast appearing to be of higher importance.

Table 3.2: Cetacean sighting numbers and abundance estimates for waters south of Ireland from the ObSERVE aerial surveys in 2015 and 2016

Species & season	Stratum 4 (offshore)		Stratum 8 (coastal)	
	N groups (mean group size)	Abundance; density (CV)	N groups (mean group size)	Abundance; density (CV)
Harbour porpoise				
Summer 2015	41 (1.2)	14,190; 0.227 (27.4)	-	-
Winter 2015-16	11 (1.3)	3,752; 0.060 (41.3)	-	-
Summer 2016	42 (1.3)	14,196; 0.227 (37.2)	8 (1.6)	1,977; 0.208 (62.6)
Winter 2016-17	0 (na)	na	3 (1)	568; 0.060 (73.2)
Bottlenose dolphin[1]				
Summer 2015	7 (6)	3,885; 0.062 (64.3)	-	-

Species & season	Stratum 4 (offshore)		Stratum 8 (coastal)	
	N groups (mean group size)	Abundance; density (CV)	N groups (mean group size)	Abundance; density (CV)
Winter 2015-16	26 (2.9)	6,217; 0.098 (28.4)	-	-
Summer 2016	17 (4)	5,549; 0.088 (47.7)	39 (7.2)	11,266; 1.161 (59.9)
Winter 2016-17	91 (7.8)	58,647; 0.929 (22.3)	17 (3.8)	3,322; 0.342 (47.6)
Common dolphin and common/striped dolphin[2]				
Summer 2015	3 (4.5)	2,554; 0.041 (73.8)	-	-
Winter 2015-16	45 (8.9)	40,027; 0.639 (51.5)	-	-
Summer 2016	0	na	5 (5.2)	1,319; 0.139 (45.5)
Winter 2016-17	0	na	2 (4.0)	779; 0.082 (76.0)
Risso's dolphin[1, 3]				
Summer 2015	0	na	-	-
Winter 2015-16	1 (1)	40; 0.001 (101.6)	-	-
Summer 2016	2 (10)	809; 0.013 (94.8)	3 (7.7)	549; 0.057 (50.9)
Winter 2016-17	0	na	0	na
Unidentified dolphin[1]				
Summer 2015	19 (4.9)	4,814; 0.076 (43.9)	-	-
Winter 2015-16	92	27,348; 0.433 (39.0)	-	-
Summer 2016	27 (3.3)	4,982; 0.079 (37.2)	57 (6.2)	10,047 (45.0); 1.035
Winter 2016-17	107 (7.1)	38,413; 0.608 (20.9)	28 (3.5)	4,142 (41.4); 0.427
Minke whale				
Summer 2015	4 (1.0)	836 (66.6); 0.013	-	-
Winter 2015-16	4 (1.0)	751 (64.8); 0.012	-	-
Summer 2016	4 (1.0)	761 (63.3); 0.012	20 (1.0)	2,242 (66.1); 0.236
Winter 2016-17	0	na	0	na
Fin whale[1, 3]				
Summer 2015	0	na	-	-
Winter 2015-16	0	na	-	-
Summer 2016	0	na	0	na
Winter 2016-17	0	na	1 (2.0)	33 (98.4); 0.003

Notes. [1] Abundance estimates for these species are uncorrected for detection probability and are therefore likely to be underestimates. [2.] Includes a small number of sightings where the two species could not be differentiated; as Strata 4 and 8 are restricted to shelf waters and striped dolphins favour deeper waters, the values presented here can be assumed to be almost exclusively common dolphins. [3.] The abundance estimates for Risso's dolphin and fin whale are based on very few sightings, are highly uncertain and should be interpreted with caution. Abundance estimates are rounded to the nearest whole number; CV rounded to 2 decimal places. Source: Rogan et al. (2018).

3.1.1 Harbour porpoise

The harbour porpoise is the most abundant and widespread species occurring around the Irish coast, commonly seen in shallow coastal waters in the summer, although surveys suggest highest densities along the south coast occur in autumn (Marine Institute 2013). They move further offshore in the spring; although the details of this migration are uncertain, it may be linked to calving (DCENR 2015). Harbour porpoise are generally less often encountered in the Celtic Sea than in the Irish Sea, although it may be that this is a result of lower survey effort and higher sea states off the south coast (Wall *et al*. 2013). In the CSHAS data (Table 3.1), harbour porpoise were the second most frequently sighted toothed cetacean, seen both close to shore and in offshore waters. A comparison of the results of the broad-scale SCANS and SCANS-II surveys (SCANS-II 2008) indicate there has been a general shift to the southwest and an increase in the harbour porpoise population in the region over the period between the surveys.

3.1.2 Common dolphin

The common dolphin is Ireland's most common dolphin species and it is most abundant off the south and southwest coasts, where they are often seen in very large groups. They tend to move east over the winter, with sightings off County Cork at their greatest between September and January (Berrow *et al*. 2010). Common dolphins were, by a large margin, the most frequently observed and numerous species during the recent CSHAS (Table 3.1). Common dolphins typically move further offshore in the summer and are seen in large groups, moving to inshore waters in autumn, probably linked to the presence of large numbers of schooling pelagic fish (Marine Institute 2013).

3.1.3 Bottlenose dolphin

Bottlenose dolphins are present in the Celtic Sea and there is a small semi-resident population present at Cork Harbour, where six individuals have been repeatedly sighted (Ryan *et al*. 2010), with larger numbers visiting the area during the summer. The species is more commonly seen off the west coasts of the country, with sightings peaking in summer (Berrow *et al*. 2010). Photo-identification data from groups of bottlenose dolphins at several locations around the coast of Ireland have revealed movement of animals between sites separated by 130-650km over durations of 26-760 days, providing evidence that many individuals should be considered highly mobile and transient (O'Brien *et al*. 2009).

3.1.4 Other dolphins

Risso's dolphin are occasionally observed in the wider area, most commonly in the summer months and within a few kilometres of the coast (Wall *et al*. 2013). One Risso's dolphin was recorded outside Cork Harbour during the 2014 CSHAS (Nolan *et al.* 2014), while none were seen off the south coast of Ireland in 2016-2020. A small number of killer whales have been recorded off the south coast, primarily during summer (Wall *et al*. 2013). Records of other toothed cetacean species off the south coast (e.g. white-beaked dolphin *Lagenorhynchus albirostris* and long-finned pilot whale *Globicephala melas*) are very rare.

3.1.5 Baleen whales

Baleen whales are sighted along the south coast of Ireland primarily from late summer through autumn. Minke whales are observed in most months of the year, but are most frequently seen from April to November (Berrow *et al*. 2010). The larger fin and humpback whales are regularly observed in small numbers both close to the coast and further offshore, primarily in autumn and winter when these waters are a known foraging ground (Marine

Institute 2013). Fin whales sightings peak in November (Berrow *et al*. 2010, Whooley *et al*. 2011), and they were the most frequently sighted and most numerous baleen whale in the CSHAS data (Table 3.1). Photo-identification data were collected from whale-watching vessels over 79 trips from 2003-2008, which resulted in the identification of 62 individual fin whales, of which 11 were sighted across multiple years (Whooley *et al*. 2011). Ryan *et al*. (2016) analysed several hundred humpback whale sightings from the IWDG casual database collected from 1999-2013, revealing an annual easterly movement along the southern coast over the autumn.

During a geophysical survey of Ballycotton Bay and Youghal Bay, East Cork in October-November 2017, a total effort of just under 136 hours of marine mammal surveys was undertaken, recording 18 sightings of an estimated 92 individual animals, comprising four species: harbour porpoise, common dolphin, Atlantic white-sided dolphin and grey seal.

3.2 Other Annex IV species

3.2.1 Marine turtles

There are seven species of marine turtle, of which five species have been recorded in the seas around Ireland and the UK: leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), Kemp's ridley turtle (*Lepidochelys kempii*), green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*). The leatherback turtle is the largest of the marine turtles and is the only species of turtle to have developed adaptions to cold water (Goff & Stenson 1988).

A significant majority of turtle sightings recorded in Irish waters are of the leatherback turtle (King & Berrow 2009), which migrates into the waters of the Celtic and Irish Seas in response to the distribution of the gelatinous zooplankton which make up their favoured diet (Doyle *et al.* 2008, Fossette *et al.* 2010). Tagging studies show that they migrate across the Atlantic from the eastern American coast and the Caribbean (Hays *et al*. 2004, Doyle *et al*. 2008). Sightings in the wider region are concentrated off the south and west of Ireland, the southwest of England and the west coast of Wales but also in the Irish Sea. Most sightings occur in the summer, peaking in August (Penrose & Gander 2016, Botterell *et al*. 2020). The decadal trend of records in the UK and Ireland for leatherback turtles generally increased, peaking in the 1990s from which it has since decreased. Data from the National Biodiversity Data Centre[6] reflects these patterns with the predominance of sightings in the south and west of Ireland. Aerial surveys for the ObSERVE project from 2015-2016 recorded a handful of leatherback turtle sightings at the southern limits of Irish offshore waters in summer; none were observed in the area of the proposed works (Rogan *et al*. 2018).

3.2.2 Otter

Section 8.5.3.3 of the applicant's Volume 3C2 EIAR[7] covering onshore aspects of the proposed works indicated that otter signs were recorded during aquatic surveys of watercourses affected by the proposed onshore development. A regular otter sprainting site was recorded on the Glenathonocash River beneath the bridge. No signs of otter were recorded on the Elfordstown Stream and the Dungourney River. However, it was noted that for both watercourses, suitability was high. No signs of otter were recorded on the

[6] https://maps.biodiversityireland.ie/Species/128443
[7] https://www.celticinterconnectorforeshorelicence.ie/planning-and-environmental-documents/Volume-3C2_Technical-Chapters-for-Ireland-Onshore-EIAR_Celtic-Interconnector_June-2021.pdf

Owenacurra River or at Lough Aderry, however, otter are well known to make use of the areas (Triturus pers obs., NBDC data) and suitability was noted as high.

Freshwater and coastal habitats are used, but otters utilising the marine environment require access to freshwater habitats to drink and bathe (Reid *et al*. 2013). There are a number of NBDC records of otters from surrounding coastal areas relevant to the cable landfall location[8]. Otter is a qualifying interest of the Blackwater River (Cork/ Waterford) SAC and River Barrow and River Nore SAC which are 1.4 and 6.5km respectively from the proposed works. The River Blackwater is an important habitat for the otter in southern Ireland, with evidence of presence throughout the entire catchment ranging from the sea to small feeder streams in the uplands, and including all the major tributaries (Smiddy 2016).

[8] https://maps.biodiversityireland.ie/Map/Terrestrial/Species/119290

SECTION 4 - RISK ASSESSMENT

4.1 Potential impacts associated with proposed works

4.1.1 Habitat loss/degradation from physical disturbance of the seabed

Section 10.5.2 of Volume 3D2 EIAR – Technical chapters indicate that compared to other offshore activities such as bottom trawling, ship anchoring or large-scale dredging, seabed disturbance resulting from subsea cable activities is considered temporary and has a relatively limited extent (Carter *et al.* 2009, OSPAR 2012), with the seabed usually returning to its original state (BERR 2008). The disturbance itself is restricted to a narrow strip of seabed, normally limited to an area 2-3m either side of the cable (Bald *et al.* 2014, Carter *et al.* 2009), or in the order of 10m width if the cable has been ploughed into the seabed (OSPAR 2009). These distances are similar to those given in Section 2.2.3.4 where the seabed footprint for the Celtic Interconnector cable is indicated to be about 5m wide or potentially some 15m during seabed preparation and cable installation works.

Dispersion of disturbed sediments is dictated by the local hydrodynamic regime, particularly near-bottom current speeds (BERR 2008). Coarser sediments such as sand and gravel settle relatively close to the origin of disturbance, while finer sediments such as clay and silt can remain in suspension for a longer period creating a larger impact footprint. However, a greater dispersion also results in a smaller level of deposition at a given point. The majority of sediment deposition occurs within tens of metres of the cable route (OSPAR 2009).

The disturbance to the seabed will be temporary and is not expected to result in a marked change in prey availability in the locality either during construction (even allowing for the temporary suspension of sediments) or operation.

During landfall installation works at Claycastle Beach, a trench will be cut, removing approximately 4,000m^3 of beach sediment. This spoil shall be stored within the compound on the hard standing, to allow the site to be restored to its previous condition following installation of the conduits. The spoil shall be adequately covered in order to prevent exposure to the elements. This, combined with use of the cofferdam, will help to prevent disturbed sediment entering the marine environment. Even if sediment is resuspended during beach works, intertidal habitats such as sand and mudflats tend to display a low sensitivity to and high recoverability from temporary sediment displacement likely to occur from trenching. The recovery of these habitats is dependent on the hydrodynamics of the surrounding area, although sandy sediments (such as those found at Claycastle Beach) are likely to recover in less than a year (Tillin & Budd 2016).

There is the potential that otter could use the beach area for foraging although this does not represent a preferred habitat which tend to be characterised by better quality semi-natural river channel with good riparian cover and lower levels of encroachment and or associated disturbance (Macklin *et al*. 2019). Given the extensive habitats available to otter in the area (Smiddy 2016), the temporary unavailability of a relatively small area of beach area for a 10 week period is unlikely to represent a significant impact.

4.1.2 Disturbance due to noise and vibration and movement created during survey, construction and operation

The inclusion of ObSERVE data on the distribution of marine mammals within the project's zone of influence is noted (Section 2.2.2 of the applicant's AA Screening and NIS).

The applicant indicated that underwater noise and disturbance effects on marine mammals in the subtidal zone were possible during the installation, operation and decommissioning phases as a result of subsea survey and use of monitoring equipment and vessel operation (potentially causing behavioural responses, masking, auditory injury and non-auditory injury). Section 3.4.2 of the applicant's AA Screening and NIS references the noise assessment in Volume 4 Environmental Report for UK Offshore – Chapter 18: Noise and Vibration, which provides a summary of the noise sources associated with the proposed works (Table 18.1). Of these, the subsea survey and monitoring equipment represent the largest potential sound source. Table 2.1 of this report provides examples of side scan sonar and/or multibeam echosounder equipment that could be used and this has been updated from that presented in the AA Screening (Hartley Anderson 2022) to reflect the potential use of a sub bottom profiler (as indicated in Table 18.1). The SBP example in Table 2.1 has a source size larger than that provided in Table 18.1 to cover the potential use of a larger (parametric) source size (up to 245dB re 1μPa @1m (peak)), as specific examples of equipment were not provided by the applicant.

The emitted sound fields from sources such as SBPs, side-scan sonar and echosounders are of much lower amplitude and extent compared to seismic surveys using airguns due to their lower source levels, higher central operating frequencies and greater directionality (narrower beam widths) (e.g. Boebel *et al.* 2005, Genesis 2011). However, very few empirical field data are available to quantify these expectations. The most relevant work to date is part of the study funded by the US BOEM: following the calibrated measurements of Crocker & Fratantonio (2016), measurements were made in shallow (≤ 100m depth) open-water environments to investigate the propagation of sound from various high-resolution geophysical survey (HRGS) sources (Halvorsen & Heaney 2018). Problems were encountered during the open-water testing resulting in a lack of calibration in the reported sound source levels (Labak 2019). The accompanying advice note (Labak 2019) emphasises that these uncalibrated data should not be used to provide source level measurements, and consequently the reported isopleths (summarising sound propagation) should not replace project-specific sound source verifications. A further project to calibrate these measures and provide an expanded assessment of propagation commenced in 2019.

Despite these caveats, it is worth noting some general patterns observed in Halvorsen & Heaney (2018). In all test environments, broadband received levels from all SBP chirper, echosounder and side-scan sonar devices tested were rapidly attenuated with distance from source, with particularly pronounced fall-off for directional sources when the receiver was outside of the source's main beam. The greatest propagation was generally observed at the deepest test site (100m water depth) from sources generating low frequencies (<10kHz); by contrast, at 100m water depth, some of the highest frequency sources (>50kHz) experienced such attenuation that they were only weakly detectable or undetected by recording equipment. In all open-water test environments, broadband received levels did not exceed 160dB re 1μPa (rms)[9] beyond 200m from any chirper SBP, echosounder or side-scan sonar device tested. While recognising that these results require refining, preliminary evidence suggests that these electromechanical HRGS sources generate a very limited sound field in the marine environment, and of a much lower magnitude than those generated by seismic airgun sources.

Neither of the BOEM studies tested a parametric SBP, and that this potential source has the highest indicative source level of those listed in Table 2.1. The mechanism by which these

[9] The 160dB re 1μPa (rms) isopleth represents the acoustic exposure criterion for behavioural disruption from impulsive noise as described by NMFS (2016), although this criterion is not universally adopted in policy or guidance elsewhere (such as the UK).

devices generate the low-frequency signal of interest (secondary) requires initial emission of a high amplitude signal (primary). However, the high frequency of this initial signal and its associated narrow beam width (~2 degrees) will limit its horizontal propagation; in the absence of empirical measurements, a similar pattern to that observed by Halvorsen & Heaney (2018) for chirper SBPs and echosounders can be reasonably assumed for a parametric SBP of this specification.

Marine mammals, for which sound is fundamental across a wide range of critical natural functions, show high sensitivity to underwater sound. Generally, the severity of effects tends to increase with increasing exposure to noise with both sound intensity and duration of exposure being important. A distinction can be drawn between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance. With respect to injury, risk from an activity can be assessed using threshold criteria of sound levels, with the criteria presented in Southall *et al.* (2019). Auditory capabilities, and in particular the range of frequencies over which sensitivity is greatest, varies between species and criteria are assigned to functional hearing groups with accompanying injury criteria. Table 4.1 provides details of relevant marine mammals listed by functional hearing group, their estimated hearing range and recommended injury criteria, defined as the sound level at which a permanent threshold shift (PTS; permanent hearing damage) is estimated to occur.

Table 4.1: Marine mammal auditory injury criteria to impulsive and non-impulsive noise by functional hearing group

Functional hearing group (species relevant to the proposed development area)	**Estimated hearing range** (region of greatest sensitivity) [frequency of peak sensitivity]	**Proposed injury (PTS onset) threshold criteria**	
		Impulsive noise (dB re 1µPa, peak, unweighted)	**Non-impulsive noise** $L_{E,24h}$ (dB re 1 µPa²·s)
Low frequency cetaceans Minke whale (*Balaenoptera acutorostrata*), fin whale (*Balaenoptera physalus*), humpback whale *(Megaptera novaeangliae)*	0.2 kHz to 19 kHz	219	199
High-frequency cetaceans Bottlenose dolphin (*Tursiops truncatus*), common dolphin *(Delphinus delphis),* Risso's dolphin *(Grampus griseus)*	150 Hz to 160 kHz (8.8 kHz to 110 kHz) [58 kHz]	230	198
Very high frequency cetaceans Harbour porpoise (*Phocoena phocoena)*	275Hz to 160kHz (12kHz to 140kHz) [105kHz]	202	173

Source: Southall et al. (2019). Notes: The region of greatest sensitivity represents parameters f1 and f2, which are the bounds of the flat, central portion of the frequency-weighting curve region; the frequency of peak sensitivity represents parameter f0. $L_{E,24h}$ *= cumulative sound exposure level over 24 hours, weighted according to functional hearing group.*

Of the species likely to occur in the area, the harbour porpoise has the lowest threshold criteria for the onset of PTS at 202dB re 1µPa for impulsive noise (as produced by the survey). Given the source characteristics and evidence of propagation presented above, the potential sources in the planned survey will not result in received sound levels exceeding this threshold or those of the other Annex IV species beyond more than a few metres from the source. It is noted that the sub-bottom profiler has a frequency range overlap with all of the functional groups and a source level higher than the criteria for the onset of PTS. However, the parametric SBP (Innomar SES-2000) is characterised by a narrower beam width (~2.5°) than other sources, resulting in a very small area beneath this source being ensonified to the extent that injury to a marine mammal may occur. Therefore, given the very small radius (a few metres) within which injury may potentially occur and the relatively low numbers of cetacean species likely to be present during the temporary surveys, the risk of injury is considered to be negligible, particularly with the implementation of mitigation measures (Section 4.2.1) and significant effects are not considered to be likely. Sources of non-impulsive noise including vessel movements may achieve sound pressure levels of *ca*. 180dB re 1µPa; however, received levels within the general vicinity of cable-lay operations (i.e. hundreds of metres to a few kilometres) are likely to be of the order of 120-160dB re 1µPa.

The predominantly low frequency sound produced by large vessels (<200Hz) will likely be detectable by Annex IV cetacean species, particularly the low frequency whales. However, the source level is very unlikely to be above the PTS threshold except within a very short distance of the vessel. As indicated above, of the species likely to occur in the area, the harbour porpoise (very high-frequency hearing group) has the lowest threshold criteria for the onset of PTS from non-impulsive sounds. However, the primarily low frequency nature of the vessel noise is likely below the hearing range of porpoises.

Available information on potential effects of underwater sound on marine turtles is very limited (Nelms *et al*. 2016). The hearing range of cheloniid species has been estimated at between 50-2,000Hz, with highest sensitivity below 400Hz (Popper *et al*. 2014). For leatherback turtles, measurements made on hatchlings suggested a similar low frequency sensitivity, with sound detection ranging between 50 and 1,200Hz when in water and between 50 and 1,600Hz in air (Dow Piniak *et al*. 2012). Underwater noise generated by the survey and pipelay vessel may be detectable by leatherback turtles, although their low density and limited seasonal presence in the area dictates that very few individuals are likely to be exposed to noise levels beyond that of the background for the region.

Any otters in the area will have very limited exposure to underwater noise given they are predominantly terrestrial/freshwater animals which may utilise shallow coastal waters to forage. The potential for significant effects is considered extremely unlikely.

Reported responses of marine mammals to the presence and movement of vessels include avoidance, interrupted foraging behaviour, changes in swimming speed, direction and surfacing patterns, and alteration of the intensity and frequency of calls (review in Erbe *et al*. 2019). Chronic exposure has also been linked to an increase in stress-related hormones (Rolland *et al.* 2012). Harbour porpoises, white-sided dolphins and minke whales have been shown to respond to survey vessels by moving away from them, while white-beaked dolphins have shown attraction (Palka & Hammond 2001). A study on captive harbour porpoises in a semi-natural net-pen complex in a Danish canal, recorded their behaviour while simultaneously measuring underwater noise of vessels passing the enclosure; reaction to noise was defined to occur when a highly stereotyped 'porpoising' behaviour was observed. Porpoising occurred in response to almost 30% of vessel passages; the most likely behavioural trigger were medium- to high- frequency components (0.25–63kHz octave bands) of vessel noise, while low- frequency components of vessel noise and additional pulses from echo-sounders could not explain the results (Dyndo *et al*. 2015). A tagging study of a small number of free-ranging porpoises in Danish coastal waters estimated that porpoises encountered vessel noise 17-89% of the time (from evaluation of the wideband sound and movement tag recordings). Occasional high-noise levels (coinciding with a fast ferry) were associated with vigorous fluking, bottom diving, interrupted foraging and even cessation of echolocation, leading to significantly fewer prey capture attempts at received levels greater than 96dB re 1 mPa (16 kHz third-octave, Wisniewska *et al.* 2018).

More evidence is available on bottlenose dolphins, especially for coastal populations. Shore-based monitoring of the effects of boat activity on the behaviour of bottlenose dolphins off the US South Carolina coast, indicated that slow moving, large vessels, like ships or ferries, appeared to cause little to no obvious response in bottlenose dolphin groups (Mattson *et al*. 2005). Pirotta *et al*. (2015) used passive acoustic techniques to quantify how boat disturbance affected bottlenose dolphin foraging activity in the inner Moray Firth. The presence of moving motorised boats appeared to affect bottlenose dolphin buzzing activity (foraging vocalisations), with boat passages corresponding to a reduction by almost half in the probability of recording a buzz. The boat effect was limited to the time where a boat was physically present in the sampled area and visual observations indicated that the effect increased for increasing numbers of boats in the area. Dolphins appeared to temporarily interrupt their activity when disturbed, staying in the area and quickly resuming foraging as the boat moved away.

As indicated in Section 3.2.2, otters may be present in the general area but the landfall location does not represent their preferred habitat. Given the limited temporal and spatial impact of the proposed cable installation works in coastal waters and on the beach, significant disturbance to otter populations is unlikely.

4.1.3 Collision risk associated with increased vessel movements

Collision with vessels is not considered to present a risk to Annex IV species due to the slow progress of the vessels laying the cable (20 to 300m per hour dependent on substrate). At this speed the risk of collision with any marine mammal (or marine turtle) is highly unlikely.

4.1.4 Accidental loss of pollutants and dispersal of existing pollutants within sediments during cable laying and burial activity

During all works at sea and in the intertidal zone, there is the potential for loss of chemicals, fuels, or other pollutants as a result of accidental spills from installation vessels and other associated heavy plant. This can result in both direct toxic effects on individuals in the water column and on the seabed, and subsequent effects on other species in the food-web, including predator species such as marine mammals.

To minimize risks of pollution incidents international good practice will be followed (see Section 4.2.2), for example adherence to the International Convention for the Prevention of Pollution from Ships (the MARPOL Convention), the main convention covering pollution prevention in the marine environment, including from operational or accidental causes. The risk of the loss of pollutants from the vessels installing or maintaining the cable is therefore low.

The installation phase has the potential to release / remobilise contaminants held within the sediment when the seabed is disturbed (BERR 2008). The location and type of sediment will determine whether contaminants are likely to be held in the benthic environment. Contaminants such as oil and heavy and trace metals are most likely found near the coastline, generally attached to fine sediments, although certain chemicals can persist in coarser sediments (BERR 2008). Contaminant release is only a concern in heavily contaminated locations, such as major ports, oil and gas developments, historical industrial areas, and waste disposal or natural sinks, and is of less importance when considering offshore areas (OSPAR 2009).

Sediment samples collected as part of the cable route surveys in 2015 and 2018 indicate that neither Claycastle Beach nor the seabed along the cable route in Irish waters is contaminated. Furthermore, bioavailable metals and hydrocarbons are generally associated with fine sediments (i.e. <63µm) and higher total organic carbon (TOC) content. As the surficial sediments along the interconnector cable route are predominantly sands with low associated TOC values, the risk of resuspension and subsequent desorption of contaminants is lower than in very muddy sediments.

4.2 Mitigation measures

Mitigation measures to minimise any potential impact of the cable installation, both offshore and in the intertidal zone have been included within the design and installation methods described for the project. These include:

4.2.1 Disturbance due to noise and vibration

Offshore

- Operations in the Irish marine environment to be undertaken in line with the 'Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters' (DAHG 2014). This guidance recommends the use of marine mammal observers (MMOs) for pre-start monitoring, ramp up procedure, breaks (>30 mins) in sound output and reporting;
- DAHG (2014) guidance outlines operational requirements concerning MMOs. These requirements require MMOs to be familiar with the Irish regulatory procedures, be provided with full details of all licence/consent conditions, be dedicated to and engaged solely in monitoring development activities and conducting survey effort for marine mammals in accordance with the guidance. The use of a crew member or team member with other responsibilities is not considered to be satisfactory. A sufficient number of MMO personnel must be assigned to ensure that the role is performed effectively and to avoid observer fatigue. General conditions for effective visual monitoring by MMOs are: (1) during daylight hours; (2) in good visibility extending 1km or more beyond the limits of the assigned Monitored Zone (1,000m for piling and 500m for geophysical acoustic surveys, not seismic); and (3) sea conditions WMO Sea State 4 (Beaufort Force 4) or less. Efficacy in the visual detection of marine mammal species improves considerably below Sea State 3 (Beaufort Force 3);
- Unless otherwise agreed with the NPWS and/or the Foreshore Unit, MMOs must be located on an appropriate elevated platform from which the entire Monitored Zone (1,000m for piling and 500m for geophysical acoustic surveys, not seismic) can be effectively covered without any obstruction of view. For geophysical acoustic surveys and other moving platforms from which sound-producing activity is taking place, MMOs must be located on the source vessel;
- DAHG (2014) guidance also recommends that, in some cases involving the persistent significant risk of injury to marine mammals in Ireland, the supplementary use of passive acoustic monitoring (PAM) may be recommended, or required, as part of the licence/consent conditions, in order to optimise marine mammal detection around the site of a plan or project. It is also indicated that PAM has/should not be regarded as the primary or sole monitoring approach for risk management purpose. It was identified that for PAM be effective, animals are required to vocalise and their detection depends on the range capability of the technology. It should also be recognised that this was related to the method/technology that was available back in 2014;

Landfall

- Use of noise-attenuation fencing, solid hoarding or other acoustic barriers to reduce in-air noise propagation and to conceal human activity. The barrier material shall have a mass per unit area exceeding 7kg/m^2 in accordance with the recommendations of BS 5228 Part 1:2009+A1:2014 Part B.4;
- Use of piling types and techniques that limit underwater noise propagation: namely vibratory sheet piling installation and piling at low tide;
- Use of ramp up/soft start procedures for piling and geo acoustic survey techniques to prevent Annex IV species from being startled;
- The sheet piling required for construction of the cofferdam, will be completed following best practice to minimise noise impacts. Full details will be provided in a Construction Code of Practice document to be adopted by the project but may include measures such as restricting timing and duration of piling activities or the use of aural screening to minimise the extent of noise;

4.2.2 Accidental loss of pollutants

- Project-related vessels will adhere to international obligations and best practice regarding pollution control, including under the MARPOL convention;
- All works will be completed following standard operating measures to minimise risk of pollution, as outlined within the CEMP and other project documentation. See Section 2.2.4 of this document for relevant measures within the Outline Construction Environmental Management Plan (OCEMP)

4.3 Conclusion of the Risk Assessment for Annex IV Species

The risk assessment of the potential impacts on Annex IV species from activities associated with the proposed cable installation works concludes that with the implementation of the DAHG (2014) mitigation measures:

- It is very unlikely that there will be negative residual impacts from the proposed cable installation activities (including geophysical survey) on Annex IV species in the area.
- It is very unlikely that any Annex IV species will be injured or killed as a result of the proposed works.
- Annex IV species using the area are likely to be tolerant of vessel noise and any animals which might be displaced from the vicinity of the construction vessels can be expected to quickly re-establish use of the area following cessation of the works.

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