

Volume 6: Summary Chapters

Chapter 36

Mitigation, Monitoring and Likely Significant Residual Effects

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36. Mitigation and Monitoring Measures and Likely Significant Residual Effects

36.1 Introduction

This chapter of the EIAR includes all of the mitigation and monitoring measures identified in the EIAR and also provides a summary of the likely significant residual effects of the proposed development.

The mitigation and monitoring measures listed herein (Sections 36.2 to 36.27) are those contained in the EIAR topic-specific chapters (Chapters 10 to 35) included in Volumes 3 through 5 of the EIAR.

As noted in Section 2.9 of Volume 2, Chapter 2: EIA and Methodology for the Preparation of an EIAR, embedded mitigation measures are those that are identified and adopted as part of the evolution of the proposed development's design and operation of the project. Such measures are considered in the significance of effect assessment (i.e. they are assumed to form part of the design of the proposed development **prior** to any assessment). Embedded measures also include industry best practice that would be incorporated into most offshore wind farm developments. Embedded mitigation measures contained in the EIAR topic specific chapters are replicated in the relevant sections (Sections 36.2 to 36.27) below under the sub-heading of "embedded mitigation measures".

As also noted in Section 2.9 of Volume 2, Chapter 2: EIA and Methodology for the Preparation of an EIAR, additional mitigation measures are those that are identified **during** the impact assessment process specifically to reduce or eliminate any predicted significant adverse effects. Additional mitigation measures contained in the EIAR topic specific chapters are replicated in the relevant sections (Sections 36.2 to 36.27) below under the heading of "mitigation and monitoring measures".

The assessment of residual effects includes incorporation of mitigation measures. The residual effects i.e. those effects that are predicted to remain after all mitigation measures have been implemented – are detailed in the Residual Effects sections of each of the relevant topic chapters. Section 36.28 of this chapter summarises those predicted residual effects which are defined as **likely significant effects** (as defined in Volume 2, Chapter 2: EIA and Methodology for the Preparation of an EIAR).

36.2 Marine Geology, Oceanography and Physical Processes Mitigation and Monitoring Measures

36.2.1 Embedded Mitigation Measures

The design development process for the proposed development offshore has included a reduction in the overall array area which has a potential beneficial reduction to impacts on marine processes receptors.

36.2.2 Mitigation and Monitoring Measures

Throughout the development stage, the design of the proposed development has evolved such that no additional mitigation or monitoring measures are considered necessary during the construction, operation and decommissioning phases additional to standard asset monitoring already planned for over the operational period, as outlined in Volume 2, Chapter 6: Description of the Proposed Development Offshore

36.3 Marine Water and Sediment Quality Mitigation and Monitoring Measures

36.3.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.1 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Table 36.1 Embedded mitigation measures of relevance to Marine Water and Sediment Quality

Measure	Mitigation detail
Construction	
Cable design	<p>HDD of cables will be undertaken in the intertidal zone, thus avoiding direct sediment disturbance in the intertidal zone and minimising increases in suspended sediment.</p> <p>Export and inter-array cables will be buried where practically possible to avoid the requirement for protection measures.</p> <p>The design development process for the proposed offshore development has included a reduction in the overall array area, which has a potential beneficial reduction to impacts on marine physical processes receptors (see the Physical Processes chapter)</p>
Cable specification and installation measures	Development of a detailed Cable Burial Risk Assessment (CBRA) to enable informed judgements regarding burial depth to maximise the chance of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary.
Pollution prevention design measures	<p>Marine pollution contingency measures will be implemented as part of Volume 8, Appendix 6.1: Offshore Environmental Management Plan (EMP; hereafter the Offshore EMP) to manage the risk of accidental spillages from construction equipment or collision incidents. This will include a chemical risk review with information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance.</p> <p>Typical measures will include:</p> <p>storage of all chemicals in secure designated areas with impermeable bunding (generally to 110% of the volume); and</p> <p>double skinning of pipes and tanks containing hazardous materials.</p> <p>This measure would reduce the likelihood of potentially harmful pollutants to be released into the marine environment and ensure that potential for contaminant release is strictly controlled.</p>
Pollution prevention management and best practice measures	<p>The Offshore EMP includes Marine Pollution Contingency elements and incorporates procedures to cover accidental spills, potential contaminant release and include key emergency contact details (e.g. Marine Survey Office (MSO), Commissioners for Irish Lights (CIL) and Irish Coast Guard (IRCG) and the proposed development site co-ordinator). Guidance for Pollution Prevention 5 (GPP5): Works and maintenance in or near water has been used to inform the development of the Offshore EMP.</p> <p>Measures to ensure safe passage of vessels and avoid collision are also captured within Appendix 17.2: Vessel Management Plan (VMP).</p>
Disposal of waste management	The Developer commits to the disposal of sewage and other waste in a manner which complies with all regulatory requirements, including but not limited to the International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL) requirements.
Operation	
Scour protection and cable protection measures	Development of a Scour Protection and Cable Protection strategy which sets out the details of the protection where there is the potential for scour to develop around wind farm infrastructure, including turbine and substation/ platform foundations and cables. This will be included within the Offshore EMP once the site condition information is available following the detailed site investigation surveys.
Scour protection of other infrastructure	In areas where there is potential for scour pits to develop around the foundations of structure, there is potential for release of sediment and concurrent sediment-bound contaminants into the water column. Therefore, in areas where there is potential for scour pits to occur scour protection will be implemented removing the potential for scour development.
Decommissioning	
Removal of infrastructure	Infrastructure above seabed level will be removed and foundations cut to approximately 1 to 2m below seabed level and it is anticipated that cables, cable protection and scour protection will remain in-situ' and there will be secure burial of export cables in the intertidal area. These measures will reduce the potential for seabed disturbance and thus increased suspended sediment concentrations and the release of sediment-bound contaminants. This will be managed as part of the decommissioning strategy within the Offshore EMP.
Assessment of impacts and best practice environmental management	Prior to decommissioning a study of the potential environmental impacts to benthic ecology receptors from the proposed decommissioning activities will be undertaken, considering the baseline environment at the pre-decommissioning stage. All mitigation measures to be captured will be captured within the Rehabilitation Schedule and decommissioning strategy within the Offshore EMP. Any licences or authorisations that might be required will be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR, as required.

36.3.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to marine water and sediment quality listed in Table 36.2 and not considered again here. No additional mitigation or monitoring measures are considered necessary for the construction, operation and decommissioning phases specific to the potential impacts on marine water and sediment quality.

36.4 Benthic Subtidal and Intertidal Ecology Mitigation and Monitoring Measures

36.4.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.2 have been identified through the design and consultation process and are assumed to be incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual impact stage.

Table 36.2 Embedded mitigation measures relating to benthic subtidal and intertidal ecology

Type of mitigation measure	Description of Mitigation measure
Construction	
Cable installation measures/Cable Burial Risk Assessment	<p>Cable installation measures will minimise adverse impacts to potentially sensitive receptors. It will also set out appropriate cable burial depth in accordance with industry good practice, reducing the risk of cable exposure and based on a cable burial risk assessment.</p> <p>Cables will be buried to a sufficient depth to ensure that they are not exposed by sandwave movements.</p> <p>Where target cable burial depth cannot be achieved during the cable installation process (for any of inter-array, interconnector or export cables), cable armouring will be implemented (e.g. mattresses, or rock placement etc). The suitability of installing rock or mattresses for cable protection will be investigated, based on (inter alia) the seabed current data at the location of interest and a risk assessment of the potential for cable damage to occur. Cable installation measures are captured in the Offshore Environmental Management Plan (EMP)</p>
Cable burial	Cable installation will follow the burial hierarchy, where practicable two attempts will be made to bury cables before cable protection is used.
Landfall	The installation of the offshore export cables at landfall will be undertaken by Horizontal Directional Drilling (HDD) beneath the intertidal zone which will prevent any direct disturbance to intertidal receptors. The HDD exit pits will be located within the Export Cable Corridor (ECC) seaward of the Low Water Mark (LWM) at a point where cable installation vessels can operate.
Project Design	Presence of sensitive habitats will be identified through a review of the latest available benthic datasets and pre-construction surveys. Proposed development infrastructure will avoid protected habitats wherever reasonably practicable to an extent not resulting in a hazard for marine traffic and Search & Rescue capability.
Offshore Environmental Management Plan (EMP)	<p>An offshore EMP will be developed and will include details of:</p> <p>Marine pollution contingency measures to address the risks, methods and procedures to deal with any spills and collision incidents of the authorised project in relation to all activities carried out below the High Water Mark (HWM);</p> <p>A chemical risk review to include information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance;</p> <p>Marine biosecurity measures detailing how the risk of introduction and spread of invasive non-native species will be minimised;</p> <p>Waste management and disposal arrangements;</p> <p>A vessel management plan, to determine vessel routing to and from construction sites and ports, to include a code of conduct for vessel operators; and</p> <p>The appointment and responsibilities of a company fisheries liaison officer.</p>
Pre-construction profile survey	Where necessary, before works commence and following reinstatement, a topographical survey of the nearshore subtidal area will be carried out to identify and map the contours of the subtidal HDD exit pit to ensure a profile similar in nature to the profile recorded during the pre-construction survey is reinstated, as far as practicable.

Type of mitigation measure	Description of Mitigation measure
Operation	
EMF and cable protection	Where practicable cables will be buried to reduce the impacts of EMF on sensitive receptors and minimise the requirement for additional cable protection.
Decommissioning	
Assessment of impacts and best practice environmental management	Prior to decommissioning a study of the potential environmental impacts to benthic ecology receptors from the proposed decommissioning activities will be undertaken, considering the baseline environment at the pre-decommissioning stage. All mitigation measures to be captured will be captured within the Rehabilitation Schedule and decommissioning strategy within the Offshore EMP. Any licences or authorisations that might be required will be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR, as required.

36.4.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to benthic subtidal and intertidal ecology are listed in Table 36.2 and not considered again here. No additional mitigation or monitoring measures are considered necessary for the construction, operation and decommissioning phases specific to the potential impacts on subtidal and intertidal benthic ecology.

36.5 Fish and Shellfish Ecology Mitigation and Monitoring Measures

36.5.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.3 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Table 36.3 Embedded mitigation measures relating to fish and shellfish ecology

Measure	Mitigation detail
Construction	
Marine Pollution Contingency Procedure (MPCP)	<p>Marine pollution prevention and contingency measures will be implemented as part of Volume 8, Appendix 6.1: Offshore Environmental Management Plan (EMP; hereafter the Offshore EMP) to manage the risk of accidental pollution from offshore operations relating to the proposed development (Appendix 2A and 2B in Offshore EMP). The MPCP will include the following control measures and procedures:</p> <p>A chemical risk review with information regarding how and when chemicals (including vessel fuels) are to be used, stored and transported in accordance with recognised best practice guidance and national and international regulations and commitments.</p> <p>Navigational safety measures (e.g., guard vessels, safety buoys, lighting of active working zones) to reduce the likelihood of collision events; and</p> <p>Emergency response methods and procedures to deal with any spills and collision incidents.</p> <p>Implementation of these measures would reduce the likelihood of potentially harmful pollutants to be released into the marine environment, thereby reducing the likelihood of pollution impacts on sensitive fish and shellfish receptors.</p>
Offshore Waste Management Procedure	<p>An Offshore Waste Management Procedure setting out waste management and disposal procedures will be implemented as part of the Offshore EMP (Appendix 6 in Offshore EMP). The Waste Management Procedure will include the following measures:</p> <p>Application of the waste hierarchy (prevention, re-use, recycle, recovery, and disposal) to minimise the amount of waste produced, and reduce, as far as possible, the amount of waste that is disposed of in landfill;</p> <p>Waste disposal procedures, ensuring all waste that cannot be reused, recycled or recovered will be kept onboard vessels and safely disposed of onshore in a suitable licensed waste facility; and</p> <p>Code of conduct for vessel operators with respect to the discharge of wastewater and handling and storing of hazardous materials.</p>

Measure	Mitigation detail
	Implementation of these measures will reduce the likelihood of potentially harmful pollutants to be released into the marine environment, thereby reducing the likelihood of pollution impacts on potentially sensitive migratory fish species.
Environmental Vessel Management Plan (EVMP)	An EVMP will be implemented to minimise the risk of collision, injury and disturbance to marine wildlife during construction activities, which will include a code of conduct for vessel operators when encountering marine species (Volume 9, Appendix 14.5). In addition, vessel movements to and from construction sites and ports will, where feasible, follow existing routes. While the measures are targeted towards marine mammals and birds at sea, they would equally reduce the risk of injury and disturbance to marine turtles and larger mobile receptors, such as basking sharks.
Soft-start procedures during pile driving	During the piling of foundations, each piling event will commence with a soft-start at low hammer energy, followed by gradual ramp-up to the maximum hammer energy required (Section 8.3.4.1 in the Volume 2, Chapter 8: Construction Strategy Offshore of the EIAR). This would allow sensitive fish and shellfish receptors to vacate the area before sound energy levels reach levels where lethal or sublethal effects may occur.
UXO Management Measures	The clearance of Unexploded ordinance (UXO) will follow a mitigation hierarchy, with micro-siting of subsea infrastructure around UXO where practicable. Where avoidance is not possible, relocating the UXO to a safe place and leaving in situ will be considered. Where clearance of UXO is required (i.e. avoidance or relocation is not practicable), removal of the UXO from the site or low order clearance at the UXO location will be adopted where feasible. However, removal of the UXO or low order deflagration of the UXO are not always possible and are dependent upon the individual situations surrounding each UXO. Therefore, a high order detonation of the UXO may be required. A case-by-case risk assessment will be undertaken following dedicated geophysical and ROV surveys during the construction phase (Volume 9, Appendix 14.4: Marine Mammal Mitigation Protocol (MMMP), and Offshore EMP).
Noise Abatement System (NAS) during high order UXO clearance	Where auditory injury impact ranges for marine mammals from the use of high order detonations are greater than what can be mitigated using Marine Mammal Observers (MMO), Passive Acoustic Monitoring (PAM) and Acoustic Deterrent Devices (ADD) (e.g., > 7.5 km; e.g. 120kg UXO charge weight plus donor weight), noise abatement will be used to reduce the noise propagated through the water column during detonations (MMMP). This would reduce the impact of UXO clearance noise on sensitive fish and shellfish species.
UXO detonation strategy	If UXO detonations are required for clearance, detonations will not occur within the same 24-hour window as piling operations. Where there may be clusters of UXO requiring detonation, these UXO will not be detonated at the same time (Offshore EMP).
Pre-construction profile survey	Where necessary, before works commence and following reinstatement, a topographical survey of the nearshore subtidal area will be carried out to identify and map the contours of the subtidal HDD exit pit to ensure a profile similar in nature to the profile recorded during the pre-construction survey is reinstated, as far as practicable.
Operation	
Cable burial and cable protection measures	Export and inter-array cables will be buried where practicable to ensure they are not exposed by sediment movements (EIAR Volume 2, Chapter 8: Section 8.3.10 in the Construction Strategy Offshore). Where cables cannot be buried, additional cable protection measures such as rock placement or matting will be applied to achieve adequate cable protection. Up to 20% of cable length is expected to need protection either during initial installation, or throughout the operational phase of the proposed development (EIAR Volume 2, Chapter 8). Cable burial or cable protection increases the distance between the cables and electro- and magneto-sensitive receptors, thereby reducing the received EMF (from attenuation of the EMF).
Marine Pollution Contingency Procedure (MPCP), Offshore Waste Management Procedure, EVMP	Marine pollution and waste management control measures and vessel operating procedures will be implemented throughout the operational phase of the proposed development, following the same measures and procedures that were implemented during the construction phase.
Decommissioning	
Assessment of impacts and best practice environmental management	Prior to decommissioning a study of the potential environmental impacts to fish and shellfish receptors from the proposed decommissioning activities will be undertaken, considering the baseline environment at the pre-decommissioning stage. All mitigation measures to be captured will be captured within Rehabilitation Schedule and decommissioning strategy within the Offshore EMP. Any licences or authorisations that might be required will be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR, as required.

36.5.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the project design) and that are relevant for fish and shellfish receptors are listed in Table 36.3. No additional mitigation or monitoring measures are considered necessary for the construction, operation and decommissioning phases specific to the potential impacts on fish and shellfish ecology.

36.6 Marine Mammal Ecology Mitigation and Monitoring Measures

36.6.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.4 have been identified through the design and consultation process and are assumed to be incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual impact stage.

A Marine Mammal Mitigation Protocol (EIAR Volume 9, Appendix 14.4; hereafter the MMMP) and Offshore Environmental Management Plan (EMP) (Volume 8, Appendix 6.1; hereafter the Offshore EMP) have been prepared and will be implemented for all phases of the proposed development.

Table 36.4 Embedded mitigation measures relating to marine mammal ecology

Measure	Mitigation detail
Construction	
Marine Pollution Contingency Procedure (MPCP)	<p>An offshore Environment Management Plan (EMP) is provided in Volume 8 Appendix 6.1 of the EIAR and will be implemented to cover the construction, operational and decommissioning phase of the proposed development. The Offshore EMP includes a MPCP to cover accidental spills, potential contaminant release and include key emergency contact details. Key measures in the MPCP include:</p> <ul style="list-style-type: none">Compliance with MARPOL;Spill kits on board all vessels;Fuel and chemical storage according to relevant storage regulations;Handling of waste in accordance with relevant waste regulations; andVessel refuelling to take place in port. <p>The measures included in the MPCP would reduce the likelihood of potentially harmful pollutants to be released into the marine environment which may then impact on marine mammal receptors. Further information is provided in Appendix 6.1.</p>
Collision avoidance	<p>The Department of Communications, Marine and Natural Resources released a Marine Notice (No 15 of 2005) for the correct procedures when encountering whales and dolphins in Irish coastal waters (DCMNR 2005). Alongside this Marine Notice, the Irish Whale and Dolphin Group provided a Code of Conduct for all watercraft encountering whales and dolphins (IWDG 2005). These guidelines were drafted specifically for the interactions between small vessels and marine mammals (e.g. whale watching passenger vessels), however the key principals will be followed by all project vessels where practicable to minimise the risk of vessel collisions with marine mammals and disturbance to marine mammals from vessels. These measures are captured within Volume 9, Appendix 14.5 Environmental Vessel Management Plan (EVMP). Other key measures to mitigate collision risk, as described in the EVMP include:</p> <ul style="list-style-type: none">When an animal(s) is first sighted, vessels should maintain a steady course (speed and direction) to allow marine mammals to predict the vessel's path;Where practicable, when an animal(s) is in close proximity (for example 100 – 200 m), vessel speed should be gradually reduced and maintained below 7 knots (in accordance with DCMNR, 2005). The exception to this is when behaviour such as bow riding is experienced, where speed should be maintained on a steady course;If animals are moving in a consistent direction, maintain a parallel course;Do not cut off individuals by moving across their path;Avoid deliberately approaching marine mammals when sighted;Avoid abrupt changes to course or speed should marine mammals approach the vessel, be on course to cross the path of a vessel or bow-ride;Transit vessels should maintain a minimum distance of 150m or more from the coast, particularly when near to known seal haul-out sites during sensitive periods (i.e. moulting and breeding seasons). Vessels should remain in the vicinity of seals for no more than 15 minutes; andFurther information is provided in Volume 8, Appendix 6.1 of the EIA.

Measure	Mitigation detail
Pile driving parameters and soft start procedures	In order to reduce the risk of Permanent Threshold Shift (PTS) and disturbance to marine mammals during piling activities the maximum hammer energy to be used during pile driving (5,500kJ for monopile, 3,000kJ for multi leg pin-piles). Inclusion of soft-start and ramp up procedures for pile driving have also been incorporated into the design and no simultaneous piling events will occur. This requirement is captured within the MMMP.
Operation	
Marine Pollution Contingency Procedure (MPCP)	<p>The Offshore EMP includes a MPCP to cover accidental spills, potential contaminant release and include key emergency contact details.</p> <p>Key measures in the MPCP include:</p> <p>Compliance with MARPOL;</p> <p>Spill kits on board all vessels;</p> <p>Fuel and chemical storage according to relevant storage regulations;</p> <p>Handling of waste in accordance with relevant waste regulations; and</p> <p>Vessel refuelling to take place in port.</p> <p>The MPCP would reduce the likelihood of potentially harmful pollutants to be released into the marine environment which may then impact on marine mammal receptors.</p>
Collision avoidance	The Department of Communications, Marine and Natural Resources released a Marine Notice (No 15 of 2005) for the correct procedures when encountering whales and dolphins in Irish coastal waters (DCMNR 2005). Alongside this Marine Notice, the Irish Whale and Dolphin Group provided a Code of Conduct for all watercraft encountering whales and dolphins (IWDG 2005). These guidelines were drafted specifically for the interactions between small vessels and marine mammals (e.g. whale watching passenger vessels), however the key principals will be followed by all proposed development vessels where practicable to minimise the risk of vessel collisions with marine mammals and disturbance to marine mammals from vessels. These measures are captured within Appendix 14.5 EVMP. Other key measures from the EVMP are the same as those listed in the construction collision avoidance mitigations section of this table.
Decommissioning	
Collision avoidance	The Department of Communications, Marine and Natural Resources released a Marine Notice (No 15 of 2005) for the correct procedures when encountering whales and dolphins in Irish coastal waters (DCMNR 2005). Alongside this Marine Notice, the Irish Whale and Dolphin Group provided a Code of Conduct for all watercraft encountering whales and dolphins (IWDG 2005). These guidelines were drafted specifically for the interactions between small vessels and marine mammals (e.g. whale watching passenger vessels), however the key principals will be followed by all Project vessels where practicable to minimise the risk of vessel collisions with marine mammals and disturbance to marine mammals from vessels. These measures are captured within the EVMP. Other key measures from the EVMP are the same as those listed in the construction collision avoidance mitigations section of this table.
Assessment of impacts and best practice environmental management	Prior to decommissioning a study of the potential environmental impacts to marine mammal receptors from the proposed decommissioning activities will be undertaken, considering the baseline environment at the pre-decommissioning stage. All mitigation measures to be delivered will be captured within the Rehabilitation Schedule and Offshore EMP. Any licences or authorisations that might be required will be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR, as required.

36.6.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to marine mammal ecology are listed in Table 36.4 and not considered again here. Table 36.5 below identifies additional mitigation measures that are not embedded into the proposed development design.

Table 36.5 Mitigation relating to marine mammal ecology

Measure	Mitigation detail
Construction	
Geophysical survey monitoring	<p>Geophysical survey equipment sources with a greater than negligible magnitude of impact will be covered by ‘Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters’ (DAHG 2014), which outlines measures to reduce the potential impacts (PTS and disturbance) to negligible levels. Only the Sub-Bottom Profiler (SBP) is predicted to overlap with the estimated hearing range of relevant marine mammal species. Measures proposed are:</p> <p>A mitigation zone (an area within which mitigation must be applied to prevent instantaneous injury) of 500m radial distance from the SBP source; and</p> <p>A qualified and experienced marine mammal observer (MMO) will be appointed to monitor for marine mammals and to log all relevant events using standardised data forms in accordance with licensing and regulatory requirements; and</p> <p>Survey equipment with a source Sound Pressure Level (SPL) above 170 dB re 1µPa shall commence from a lower energy start-up and increase gradually over a period of 40 minutes.</p> <p>The start of the acoustic equipment will be delayed if marine mammals are detected within the mitigation zone during the pre-watch, allowing the animals time to move away from the acoustic source. The start of the source will be delayed for at least 30 minutes following the last sighting within the mitigation zone; and</p> <p>For any breaks in operation of the equipment of 10 minutes the Marine Mammal Observer/Passive Acoustic Monitoring (MMO/PAM) operator will undertake dedicated monitoring to check no marine mammals are present within the mitigation zone prior to the source restarting; and</p> <p>For line changes taking longer than 40 minutes, the source will be stopped, then a pre-watch of 30 minutes followed by a soft-start will be required to resume operations.</p> <p>These measures and further detail on these measures are included in the MMMP (Appendix 14.4).</p>
Pre-construction further noise modelling	<p>Post consent during the pre-construction phase, there will be further noise modelling undertaken with finalised piling and design parameters to confirm impacts on marine mammals, this will be documented within the MMMP (Appendix 14.4).</p>
<p>Piling mitigation, including:</p> <p>Marine Mammal Observers (MMO)</p> <p>Passive Acoustic Monitoring (PAM) (if required)</p> <p>Acoustic Deterrent Devices (ADD) (if required)</p> <p>At-source noise reduction (if required)</p>	<p>The implementation of a MMMP (see Appendix 14.4) includes measures to ensure the risk of PTS to marine mammals is imperceptible and will be in line with the latest relevant available guidance such as the guidance to manage the risk to marine mammals from man-made sound sources in Irish waters (NPWS 2014).</p> <p>Mitigation measures outlined in the MMMP include those that are considered to be ‘industry standard’ and are supported by the NPWS (2014) guidance including:</p> <p>A mitigation zone. The mitigation zone will be defined as the maximum potential PTS onset impact range. Noise modelling will be updated, if required, prior to construction once the final design details are known. The DAHG (2014) guidance recommends a mitigation zone of 1,000m for piling which is greater than the current largest impact range for instantaneous PTS onset modelled for the proposed development (i.e. 810 m). Whilst the SELcum PTS onset ranges are currently larger than this, ADDs are effective at displacing marine mammals at larger ranges and as such can provide cover for impact ranges greater than the advised 1,000m mitigation zone. Additionally, were noise abatement systems to be implemented for the proposed development, the impact ranges would be expected to be reduced compared to those considered in this version of the MMMP.</p> <p>A qualified and experienced marine mammal observer (MMO) will be appointed to monitor for marine mammals and to log all relevant events using standardised data form.</p> <p>PAM (if required to supplement to visual observations). PAM will be used as a form of mitigation under hours of darkness and/or low visibility when an MMO cannot visually observe.</p> <p>In addition, additional mitigation measures that will be implemented to reduce the risk of PTS to negligible levels include the use of ADDs to deter marine mammals from the immediate vicinity of the pile.</p> <p>Pre-piling deployment of ADDs (if required) Use of ADDs within this protocol follows the JNCC (2010) guidance in the absence of information within DAHG (2014) guidance, as well as best practice followed on recent OWFs in Scottish and English waters.</p>

Measure	Mitigation detail
	In the event that impact ranges predicted by the underwater noise modelling to be undertaken based on the final design for the proposed development post-consent are larger than distances capable of passive mitigation (MMOs and PAM) and ADDs, Noise Abatement Systems (NAS) may be used to minimise the risk of injury. NAS will be used if required to reduce the effect to negligible levels. The MMMP with selected mitigation measures will be updated post consent once a piling contractor is in place and final detailed installation methods are known.
UXO clearance mitigation measures, including: MMO ADD (if required) At-source noise reduction (if required)	<p>The implementation of a MMMP (Appendix 14.4) with specific measures should Unexploded ordinance (UXO) clearance be required, to ensure the risk of PTS to marine mammals is imperceptible (not significant levels). The list of measures and procedures, can be modified in accordance with advice received from the regulator and their specialist UXO advisors as appropriate prior to UXO clearance activities commencing. Measures will include:</p> <p>If detonation is deemed necessary, a mitigation zone of 1,000m from the detonation location will be established, within which it will be ensured, through visual observations (trained and experienced MMOs).</p> <p>Where a UXO disposal method has a risk of PTS impact range that may exceed the 1,000m mitigation zone there is a residual risk of auditory injury to marine mammals at a greater range than can be mitigated by monitoring of the 1,000m mitigation zone alone. Therefore, an ADD will be operated for a pre-determined length of time, concurrent to the pre-detonation search, to deter marine mammals to a greater distance prior to any detonation.</p> <p>Where auditory injury impact ranges from the use of high order detonations are greater than what can be mitigated using MMO/PAM watch and ADD (e.g. >7.5km; e.g. 120kg + donor impact ranges), noise abatement will be used. MMO/PAM pre-watch and ADD use will still be required if noise abatement is used.</p> <p>It is recommended for the MMO to continue monitoring the mitigation zone during the detonation procedure and undertake a post-detonation search for at least 15 minutes after the final detonation.</p>
Operation	
Nil	No mitigation measures are anticipated to be required specifically during the operational phase.
Decommissioning	
Nil	No additional mitigation measures are anticipated to be required specifically during the decommissioning phase. All relevant embedded mitigation measures will still apply.

36.7 Offshore Ornithology Mitigation and Monitoring Measures

36.7.1 Embedded Mitigation Measures

- The following embedded mitigation measures in Table 36.6 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Table 36.6 Embedded mitigation measures relating to offshore and intertidal ornithological receptors

Measure	Mitigation detail
Refinement and reduction in the offshore development area	<p>Refinements in the offshore development area (as outlined in the Alternatives Chapter (Volume 2 Chapter 5 of EIAR)) were undertaken to avoid key areas for birds (e.g., avoidance of density hotspots that may indicate key foraging areas where possible, alongside avoidance of breeding colonies and migration corridors where possible). Reducing the extend of the offshore development area also increases distance from Rockabill Island and Lambay Island which leads to a considerable reduction in interaction with bird species that inhabit these SPA colonies.</p> <p>There has been a considerable reduction in the size of the array area from the original Maritime Area Consent (MAC) boundary. This process considered hotpots of auks, the most abundant species within the survey area, using species heatmaps from raw observations and a modelled approach using MRSea (MRSea Modelling Report). The results of this modelling clearly show high densities of guillemots and razorbills in proximity to Lambay Island during the breeding season. During this time the densities of birds within the array area are comparatively low. Outside of the breeding season there are no clear hotspots throughout the survey area (MAC boundary plus 4km buffer).</p>

	This process was undertaken for the proposed development, with the array area of the proposed development being reduced by more than 60% from the MAC boundary of 195.9km ² to the refined array area of 88.5km ² .
Increase in air draft	<p>The design has increased the wind turbine generator (WTG) air draft, which reduces the collision risk to key vulnerable ornithological receptors by reducing the rotor swept area that is at collision risk height.</p> <p>All turbines in Project Option 1 will have minimum air draft of 40m LAT. Turbines in Project Option 2 will have a minimum air draft of 40m Lowest Astronomical Tide (LAT) except where they are in the aviation restriction zone where the air draft will be 35m LAT.</p> <p>The number of birds at collision risk height at 40m is considerably reduced compared to 22m. For example, the number of common tern flying at collision risk height is reduced by 90.6% between 22m and 40m. Likewise, kittiwake have a reduction of birds at collision risk height of 82.2% between 22m and 40m, and gulls show a reduction of roughly 65%.</p>
Lighting design	Lighting design will avoid lighting levels that exceed those required to comply with navigational safety, aviation, emergency procedures and general activity to reduce the risk of WTG and Offshore Station Platform (OSP) lighting attracting birds during periods of bad weather or at night. This measure will be provided as part of the Lighting and Marking Plan (LMP) (Volume 9 Appendix 17.3 of EIAR).
Standard pollution and waste management	Each WTG will be equipped with sensors to enable early detection of fluids and leaks. Spill kits will also be located on each WTG to contain any fluids in the unlikely event of pollutant release. Pollution and waste management is considered within Volume 8, Appendix 6.1: Offshore Environmental Management Plan (EMP; hereafter the Offshore EMP).
Assessment of impacts and best practice environmental management	Prior to decommissioning a study of the potential environmental impacts to fish and shellfish receptors from the proposed decommissioning activities would be undertaken, considering the baseline environment at the pre-decommissioning stage. All mitigation measures to be captured would be captured within the Rehabilitation Schedule. Any licences or authorisations that might be required would be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR, as required.

36.7.2 Mitigation and Monitoring Measures

36.7.2.1 Mitigation

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to offshore ornithology are listed in Table 36.6 and not considered again here. Table 36.7 below identifies additional mitigation measures that are not embedded into the proposed development design.

Table 36.7 Mitigation relating to offshore and intertidal ornithology

Mitigation measure	Description
Construction	
Vessels to avoid birds	Where practicable vessels accessing the offshore development area during construction are to seek to avoid 'rafts' of birds and feeding aggregates to minimise disturbance and displacement. This measure is provided as part of the EVMP.
Use of established navigation routes	Vessel movements will follow, where practicable, existing navigation routes enroute to the array area and offshore export cable, where the densities of divers and seaducks are typically relatively low due to regular vessel presence compared to the wider inshore area. This measure is provided as part of the EVMP.
Avoidance of rafting birds during vessel transit	Avoidance of rafting birds during transiting and within the offshore development area, with particular consideration within the North-west Irish Sea candidate Special Protection Area (cSPA). Vessels will seek to avoid rafting birds and where practicable avoid disturbance to areas with consistently high diver density. This measure is provided as part of the EVMP.
Avoidance of over-revving of engines	Vessels will seek to avoid unnecessary running of engines and idling engines while anchored, in order to minimise noise disturbance. Vessels will shut down engines or maintain low engine power as soon as possible. This measure is provided as part of the EVMP.
Briefing of vessel crew	Vessel crew will be briefed on the purpose and implications of the vessel management practices outlined in the EVMP.

Mitigation measure	Description
Operation	
Vessels to avoid birds	Where practicable vessels accessing the offshore development area during operation are to seek to avoid ‘rafts’ of birds and feeding aggregates to minimise disturbance and displacement. This measure is provided as part of the EVMP.
Use of existing navigation routes	Vessel movements will follow, where practicable, existing navigation routes enroute to the array area and offshore export cable, where the densities of divers and seabirds are typically relatively low due to regular vessel presence compared to the wider inshore area. This measure is provided as part of the EVMP.
Avoidance of rafting birds during vessel transit	Avoidance of rafting birds during transiting and within the offshore development area, with particular consideration within the North-west Irish Sea cSPA. Vessels will seek to avoid rafting birds and where practicable seek to avoid disturbance to areas with consistently high diver density. This measure is provided as part of the EVMP.
Avoidance of over-revving of engines	Vessels will seek to avoid unnecessary running of engines and idling engines while anchored, in order to minimise noise disturbance. Vessels will shut down engines or maintain low engine power as soon as possible. This measure is provided as part of the EVMP.
Briefing of vessel crew	Vessel crew will be briefed on the purpose and implications of the vessel management practices outlined in the EVMP.
Reduction of vessel activity in sensitive months	During the operational phase the proposed development will reduce vessel activity in the ECC during the most sensitive months for coastal divers (November to March 1st inclusive), where practicable. This measure is provided as part of the EVMP.
Decommissioning	
Vessels to seek to avoid birds	Where practicable vessels accessing the offshore development area during decommissioning are to seek to avoid ‘rafts’ of birds and feeding aggregates to minimise disturbance and displacement. This measure is provided as part of the EVMP.
Use of existing navigation routes	Vessel movements will follow, where practicable, existing navigation routes enroute to the array area and offshore export cable, where the densities of divers and seabirds are typically relatively low due to regular vessel presence compared to the wider inshore area. This measure is provided as part of the EVMP.
Avoidance of rafting birds during vessel transit	Avoidance of rafting birds during transiting and within the offshore development area, with particular consideration within the North-west Irish Sea cSPA. Vessels will seek to avoid rafting birds and where practicable seek to avoid disturbance to areas with consistently high diver density. This measure is provided as part of the EVMP.
Avoidance of over-revving of engines	Vessels will seek to avoid unnecessary running of engines and idling engines while anchored, in order to minimise noise disturbance. Vessels will shut down engines or maintain low engine power as soon as possible. This measure is provided as part of the EVMP.
Briefing of vessel crew	Vessel crew will be briefed on the purpose and implications of the vessel management practices outlined in the EVMP.

36.7.2.2 Monitoring

The proposed development is committed to participating in the ‘East Coast Monitoring Group’ (ECMG), to discuss and agree potential strategic monitoring initiatives in relation to offshore ornithology. The need for strategic monitoring, and the level of participation by individual projects, will be determined by the conclusions of the EIAR process, in consultation with statutory and technical stakeholders, and with a focus on validation and evidence gathering.

If further monitoring is required for the proposed development on a project alone basis, then this will be determined through consultation with relevant stakeholders.

36.8 Commercial Fisheries Mitigation and Monitoring Measures

36.8.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.8 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Where additional mitigation is identified as being required to reduce the significance of the likely effect in EIA terms, this is presented in Chapter 16: Commercial Fisheries.

Table 36.8 Embedded mitigation relevant to commercial fisheries

Embedded mitigation	Justification
Construction	
Fisheries liaison	<p>The Developer is committed to ongoing liaison with fishers throughout all stages of the project, including:</p> <p>Continuation of the appointment of a company FLO to continue to maintain effective communications between the project and fishers, in compliance with the Seafood/ORE Engagement in Ireland guidance (Seafood/ORE Working Group, 2023);</p> <p>Appropriate liaison with relevant fishing interests to ensure that they are fully informed of development planning and any offshore activities and works;</p> <p>Timely issue of notifications including Notice to Mariners (NtMs), Kingfisher Bulletin notifications and other navigational warnings to the fishing community to provide advance warning of project activities and associated advisory safe passing distances; and</p> <p>Development of a Fisheries Management and Mitigation Strategy (FMMS) (Volume 9, Appendix 16.2) setting out in detail the approach to fisheries liaison and means of delivering co-existence and disruption payments.</p>
Agreement of lighting and marking with Commissioners of Irish Lights during construction.	Implementation of a buoyed construction area around the site (assumed to be 12 construction buoys during the appropriate phases, in consultation with Commissioners of Irish Lights.
Dropped objects	<p>The approach for dealing with dropped objects, including reporting and recovery of dropped objects where they pose a potential hazard to other marine users, is included in the offshore environmental management plan (Offshore EMP).</p> <p>Measures to prevent dropped objects include:</p> <p>Good housekeeping practices, with all wastes correctly stored;</p> <p>Storage of hazardous chemicals as per material safety data sheet (MSDS);</p> <p>Lift planning for over-the-side lifting (including appropriate crane rigging and load ratings, crane operator and rigger training and competency requirements) all lifting equipment will be tested and certified;</p> <p>A ship-to-ship transfer permit will be in place;</p> <p>All deck items will be securely stowed;</p> <p>Transfers of objects will use specialist equipment and consider environmental conditions;</p> <p>Ongoing personnel awareness and training, and dropped object prevention programs (e.g., lanyards on hardhats, hand tools);</p> <p>Safe working procedures to prevent dropped objects;</p> <p>Procedures will be put in place to ensure that the location of any lost material is recorded and that significant objects are recovered – including ROV and boat recovery where practicable;</p> <p>Ongoing personnel awareness and training, and dropped object prevention programs; and</p> <p>Waste Management Plan.</p>
Cable Burial Risk Assessment (CBRA)	CBRA undertaken pre-construction following detailed site investigation surveys including consideration of under keel clearance and appropriate cable protection applied based upon the outcomes. To include consideration of requirements for monitoring of the protection.
Guard vessels	Use of temporary guard vessel during construction phase will be employed if deemed necessary during detailed design stage and following consultation with the relevant

Embedded mitigation	Justification
	statutory authorities, e.g. to protect unlit structures and/or unprotected cable prior to burial.
Advisory safety zones	<p>During construction the proposed development will deploy advisory safety zones around individual structures undergoing installation. Due to a lack of Irish guidance, it is proposed to establish zones based on the relevant UK guidance, UK guidance MGN 654 (Maritime and Coastguard Agency, 2021).</p> <p>Advisory safety zones of up to 500m in radius around individual structures undergoing installation will be established. Advisory safety zones of 50m will be sought for incomplete structures where construction activity may be temporarily paused (and therefore the 500m safety zone has lapsed) such as installed foundations or where construction works are completed but the WTGs have not yet been commissioned.</p>
Advisory safe passing distances	<p>Use of advisory safe passing distances including surrounding vessels that are undertaking sensitive construction, installation, or maintenance works.</p> <p>These vessels are likely to display Restricted in Ability to Manoeuvre (RAM) status.</p>
Operation	
Fisheries liaison	<p>The Developer is committed to ongoing liaison with fishers throughout all stages of the project, including:</p> <p>Continuation of the appointment of a company Fisheries Liaison Officer (FLO) to continue to maintain effective communications between the project and fishers, in compliance with the Seafood/ORE Engagement in Ireland guidance (Seafood/ORE Working Group, 2023);</p> <p>Appropriate liaison with relevant fishing interests to ensure that they are fully informed of development planning and any offshore activities and works;</p> <p>Timely issue of notifications including Notice to Mariners (NtMs), Kingfisher Bulletin notifications and other navigational warnings to the fishing community to provide advance warning of project activities and associated advisory safe passing distances; and</p> <p>Development of a FMMS (Appendix 16.2) setting out in detail the approach to fisheries liaison and means of delivering co-existence and disruption payments.</p>
Snagging	In the instance that snagging does occur, the Developer will work to the protocols laid out within the guidance produced by the UK FLOWW group and 'Recommendations for Fisheries Liaison: Best Practice' guidance for offshore renewable developers, in particular Section 11: Dealing with claims for loss or damage of gear as confirmed in the FMMS (Appendix 16.2).
Agreement of lighting and marking with Commissioners of Irish Lights during the operational phase.	<p>The Developer is committed to marking and lighting the project in accordance with relevant industry guidance and as advised by relevant stakeholders including in accordance with IALA Recommendation O-139 (IALA, 2013) and Irish Lights requirements. In particular, the use of marine lighting to mark selected peripheral structures.</p> <p>The Developer will also ensure all structures associated with the proposed development are adequately marked on nautical and electronic charts.</p>
Advisory safety zones	During the operational phase, the proposed development will deploy advisory safety zones around any WTG or OSP to protect technicians, crew and vessels on-site during any maintenance works. Safety zones are not a statutory requirement in Ireland meaning they are advisory only, however following UK guidance MGN 654 (Maritime and Coastguard Agency, 2021) the safety zones will be 50m during the operational phase.
Advisory safe passing distances	The proposed development will recommend that advisory clearance distances of up to 500m in radius are observed around cable installation vessels and cable repair vessels during the operational phase.
Decommissioning	
Fisheries liaison	<p>The Developer is committed to ongoing liaison with fishers throughout all stages of the project, including:</p> <p>Continuation of the appointment of a company FLO to continue to maintain effective communications between the project and fishers, in compliance with the Seafood/ORE Engagement in Ireland guidance (Seafood/ORE Working Group, 2023);</p> <p>Appropriate liaison with relevant fishing interests to ensure that they are fully informed of development planning and any offshore activities and works;</p>

Embedded mitigation	Justification
	<p>Timely issue of notifications including Notice to Mariners (NtMs), Kingfisher Bulletin notifications and other navigational warnings to the fishing community to provide advance warning of project activities and associated advisory safe passing distances; and</p> <p>Development of a FMMS (Appendix 16.2) setting out in detail the approach to fisheries liaison and means of delivering co-existence and disruption payments.</p>
Agreement of lighting and marking with Commissioners of Irish Lights during decommissioning.	Implementation of a buoyed decommissioning area around the site (assumed to be 12 decommissioning buoys during the appropriate phases, in consultation with Commissioners of Irish Lights.
Advisory safety zones	<p>During decommissioning the proposed development will deploy advisory safety zones around individual structures undergoing installation. Due to a lack of Irish guidance, it is proposed to establish zones based on the relevant UK guidance, UK guidance MGN 654 (Maritime and Coastguard Agency, 2021).</p> <p>Advisory safety zones of up to 500m in radius around individual structures undergoing installation will be established.</p>
Advisory safe passing distances	<p>Use of advisory safe passing distances including surrounding vessels that are undertaking sensitive decommissioning works.</p> <p>These vessels are likely to display Restricted in Ability to Manoeuvre (RAM) status.</p>
Decommissioning strategy	<p>A decommissioning strategy will be developed to cover the decommissioning phase and included as part of the Offshore EMP. The decommissioning strategy is anticipated to cover the removal of all structures above the seabed; cutting of piled foundations at approximately 1m to 2m below the seabed, with remaining sections fully buried; decision to leave or remove scour protection and buried assets; and secure burial of export cables in the intertidal area.</p> <p>As the decommissioning phase will be a similar process to the construction phase but in reverse (i.e., increased project vessels on-site, partially deconstructed structures) the embedded mitigation measure and post-effect mitigation measures will be similar to those for the construction phase.</p>

36.8.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (i.e., embedded into the proposed development design) and that are relevant to commercial fisheries are listed in Table 36.8 and not considered again here. Key mitigation measures relate to the implementation of a Sustainable Fisheries Community (SFC) and Fisheries Management and Mitigation Strategy (FMMS).

Table 36.9 below identifies additional mitigation measures that are not embedded into the proposed development design.

Table 36.9: Mitigation relating to commercial fisheries

Measure	Mitigation description
Construction	
Volume 9, Appendix 16.2: Fisheries Management and Mitigation Strategy (FMMS)	<p>This chapter has concluded significant impacts requiring additional mitigation for Irish demersal otter trawlers targeting Nephrops (<i>Nephrops norvegicus</i>) within the array area during the construction phase of the proposed development. Under the NMPP, where significant impacts are identified, a FMMS should be prepared (Fisheries Policy 2). This is provided as Volume 9 Appendix 16.2.</p> <p>The mitigation measures provided within the FMMS have been developed in consultation with the industry and will continue to be delivered through the FMMS as it remains a live document. The FMMS includes the following key principles and measures relevant to construction:</p> <ul style="list-style-type: none"> The proposed development will provide a Fisheries Liaison Strategy <p>The implementation of appropriate communication and information transfer strategies is of key importance to assist in minimising interference and facilitating effective co-existence with the fishing industry.</p> <p>The principles of liaison are that:</p> <ul style="list-style-type: none"> The Developer will undertake regular and routine communications via NtM to provide reasonable time (accounting for adverse weather etc.) to enable operational fishing business decisions to be made;

Measure	Mitigation description
	<ul style="list-style-type: none"> – Continued engagement, constructive two-way communication and proactive dialogue between the fishers, their representatives and other fisheries stakeholders and the Developer is desired and is advantageous to all parties; and – All maritime operations that may have an effect on the commercial fishing sector will be made on a factual and accurate basis, in order to prevent unnecessary escalation of issues. <ul style="list-style-type: none"> • The proposed development will follow the Seafood / Offshore Renewable Energy (ORE) Working Group Summary guidance (Seafood/ORE Working Group, 2023) <p>The FMMS provides a schedule for liaison and information dissemination. Notice and information will aim to be provided not less than 14 days prior for individual construction vessels mobilisations (where feasible) and weekly construction status updates will be provided.</p> <ul style="list-style-type: none"> • The Developer will minimise the size and duration of advisory safety zones during surveys and other works where safe and practicable to do so. • The Developer will provide local fisheries stakeholders with procedures for registering disruption payment claims for loss of/damage to fishing gear in association with surveys and construction activities of the proposed development. • Vessels undertaking operations in relation to the proposed development will be working to appropriate safety management systems to ensure safe work practices. • Vessels undertaking operations in relation to the proposed development will only undertake activities prescribed in their line of work. • Vessels involved in the construction, operation and maintenance and decommissioning of the proposed development, including guard vessels and survey vessels, will be provided with the relevant lines of communication (as outlined within the FMMS) to minimise interaction with fishing vessels undertaking their normal activities. • The proposed development will provide a Co-existence Strategy <p>The Developer regards coexistence as the continuation of both the proposed development and fishing industry activities at the same time within and around the array area and along the ECC.</p> <p>Specifically, these commitments relate to:</p> <ul style="list-style-type: none"> – Proposed development design, i.e. the location and coordination of all wind farm layout infrastructure and cable burial and protection; – The offshore development area represents only 36% of the full MAC boundary area and was reduced as a commitment by the Developer to ensure optimal seabed usage where possible, whilst ensuring the key other marine users are impacted as minimally as possible; – Design of the array area that maximised corridors between turbines for navigation and orientated the turbines in a NNW - SSE direction to facilitate the direction of trawling in this area; – Appropriate notification of survey and construction activities to other marine users and the retention of a FLO and OFLO; – Appropriate lighting and marking of the proposed development and construction vessels; – Appropriate charting of the proposed development and notification of any hazards; and – The adoption of advisory safety zones and a process for marine coordination of all vessel activity. – Code of good practice for all vessels sets out measures for safe navigation, communication, vessel scheduling and reporting of any disruption. – Procedures in relation to gear fastening or loss; set out protocols for securing gear, reporting losses, retrieving lost gear and communicating any entanglement hazards. <ul style="list-style-type: none"> • In addition to the commitments above, vessels undertaking operations in relation to the proposed development will be required to follow the mitigation and management measures provided in other documents and management plans committed to by the proposed development. These are referenced within the FMMS and include: <ul style="list-style-type: none"> – The Lighting and Marking Plan (Volume 9, Appendix 17.3); sets out the types, placement and intensity of lights, identification systems and protocols to ensure visibility and safety. – The Vessel Management Plan (VMP) (Volume 9, Appendix 17.2); sets out navigational safety measures for the proposed development, including use of advisory safety zones and guard vessels (as appropriate) – The Offshore Environmental Management Plan (EMP) (Volume 8, Appendix 6.1); includes a Dropped object procedure which sets out measures for risk assessment, reporting and retrieval protocols for dropped objects.

Measure	Mitigation description
Sustainable Fisheries Community (SFC) (Appendix B within the FMMS Appendix 16.2)	<ul style="list-style-type: none"> The proposed development will develop and deliver a Sustainable Fisheries Community (SFC) <p>The SFC is a mechanism to deliver long-term proactive fisheries impact mitigation through collaboration and mutual cooperation between the local fishing community and the Developer. It is a live document and will be updated to reflect the current fishing and construction schedule ahead of the construction commencing.</p> <p>The key aim is to establish a SFC focused on the protection and enhancement of a locally sustainable fisheries and marine environment in the waters around the proposed development. This ambition includes the following delivered throughout the lifetime of the proposed development:</p> <ul style="list-style-type: none"> – Collaboration between the Developer and local fishing community. – Provide a definition of what is considered the local fishing community. – Deliver a proactive fisheries impact mitigation process. – Create a mechanism to deliver benefits, both to and from, the local fishing ports. – Work collaboratively to deliver enhancements to the local marine environment. – To, in a broad context, enhance the sustainability of the local fishing community. – Establish ways of collaboratively adding value to local seafood produce. <p>The SFC will focus on the commercial fishing industry in the long term through such measures such as enhancing stocks, improvements to fishing vessels, improvements that enhance the profit margins of sustainable fishing activities, and the development of new fisheries or other activities. Where construction related impacts occur, and where there are claims to be considered, the developer will require a significant level of supporting evidence for any such claims. It is for this reason that the Developer has gathered extensive fishing activity information, so as to ensure that this lengthy process can be expedited, for known fishers in the area. The Developer will develop a fair, transparent and evidence based disturbance payment scheme for those fishers that can evidence disruption.</p> <p>Further information of the SFC is provided in the FMMS Volume 9 (Appendix 16.2).</p>
Operation	
FMMS	<p>This chapter has concluded significant impacts requiring additional mitigation for Irish demersal otter trawlers targeting Nephrops (<i>Nephrops norvegicus</i>) within the array area during operation. Under the NMPF, where significant impacts are identified, a FMMS should be prepared (Fisheries Policy 2). This is provided as Volume 9 Appendix 16.2.</p> <p>The mitigation measures provided within the FMMS have been developed in consultation with the industry and will continue to be delivered through the FMMS as it remains a live document. The key principles and mitigation details are presented earlier in this table and the measures that are relevant to operation are:</p> <ul style="list-style-type: none"> • The Developer will provide a Fisheries Liaison Strategy • The Developer will follow the Seafood / Offshore Renewable Energy (ORE) Working Group Summary guidance (Seafood/ORE Working Group, 2023) • The proposed development will minimise the size and duration of advisory safety zones during operation and maintenance and other activities where safe and practicable to do so. • Vessels undertaking operations in relation to the proposed development will be working to appropriate safety management systems to ensure safe work practices. • Vessels undertaking operations in relation to the proposed development will only undertake activities prescribed in their line of work. • Vessels involved in the operation and maintenance of the proposed development, including guard vessels and survey vessels, will be provided with the relevant lines of communication (as outlined within the FMMS) to minimise interaction with fishing vessels undertaking their normal activities. • The proposed development will provide a Co-existence Strategy • In addition to the commitments above, vessels undertaking operations in relation to the proposed development will be required to follow the mitigation and management measures provided in other documents and management plans committed to by the proposed development. These are referenced within the FMMS and include the VMP, LMP and Offshore EMP.
SFC	<ul style="list-style-type: none"> The proposed development will develop and deliver a Sustainable Fisheries Community (SFC) <p>The SFC is a mechanism to deliver long-term proactive fisheries impact mitigation through collaboration and mutual cooperation between the local fishing community and the Developer. It is a live document and will be updated to reflect the current fishing ahead of the operation commencing.</p> <p>The key aim is to establish a SFC focused on the protection and enhancement of a locally sustainable fisheries and marine environment in the waters around the proposed development.</p>

Measure	Mitigation description
	<p>This ambition includes the following delivered throughout the lifetime of the proposed development, including the operational phase:</p> <ul style="list-style-type: none"> • Collaboration between the Developer and local fishing community. • Provide a definition of what is considered the local fishing community. • Create a mechanism to deliver benefits, both to and from, the local fishing ports. • Work collaboratively to deliver enhancements to the local marine environment. • To, in a broad context, enhance the sustainability of the local fishing community. • Establish ways of collaboratively adding value to local seafood produce. <p>The engagement with the local fisheries around the SFC will commence ahead of construction. Whilst consideration of the potential deliverables of the SFC has already commenced, the full and final detail of the long term aspects to help create a sustainable fisheries in the area will be developed over time. Delivering these broad ranging benefits to the local fishing community as relevant to the proposed development will continue into the operational phase.</p>
Decommissioning	
FMMS	<p>This chapter has concluded significant impacts requiring additional mitigation for Irish demersal otter trawlers targeting Nephrops (<i>Nephrops norvegicus</i>) within the array area during decommissioning. Under the NMPF, where significant impacts are identified, a FMMS should be prepared (Fisheries Policy 2). This is provided as Volume 9 Appendix 16.2.</p> <p>The mitigation measures provided within the FMMS have been developed in consultation with the industry and will continue to be delivered through the FMMS as it remains a live document. The key principles and mitigation details are presented earlier in this table and the measures that are relevant to decommissioning are:</p> <ul style="list-style-type: none"> • The proposed development will provide a Fisheries Liaison Strategy • The proposed development will follow the Seafood / Offshore Renewable Energy (ORE) Working Group Summary guidance (Seafood/ORE Working Group, 2023) • The proposed development will minimise the size and duration of advisory safety zones during surveys and other works where safe and practicable to do so. • Vessels undertaking operations in relation to the proposed development will be working to appropriate safety management systems to ensure safe work practices. • Vessels undertaking operations in relation to the proposed development will only undertake activities prescribed in their line of work. • Vessels involved in the construction, operation and maintenance and decommissioning of the proposed development, including guard vessels and survey vessels, will be provided with the relevant lines of communication (as outlined within the FMMS) to minimise interaction with fishing vessels undertaking their normal activities. • The proposed development will provide a Co-existence Strategy • In addition to the commitments above, vessels undertaking operations in relation to the proposed development will be required to follow the mitigation and management measures provided in other documents and management plans committed to by the proposed development. These are referenced within the FMMS and include the VMP, LMP and Offshore EMP. <p>The FMMS is a live document and will be updated to reflect current (at the time of decommissioning) fishing practices and liaisons to reflect best practice at that point in time.</p>
SFC	<ul style="list-style-type: none"> • The proposed development will develop and deliver a Sustainable Fisheries Community (SFC) <p>The SFC is a mechanism to deliver long-term proactive fisheries impact mitigation through collaboration and mutual cooperation between the local fishing community and NISA. It is a live document and will be updated to reflect the current fishing ahead of decommissioning commencing, to provide a mechanism for dealing with this transitional phase for the fisheries.</p> <p>The key aim is to establish a SFC focused on the protection and enhancement of a locally sustainable fisheries and marine environment in the waters around the proposed development.</p>

36.9 Shipping and Navigation Mitigation and Monitoring Measures

36.9.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.10 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Table 36.10 Embedded mitigation measures relating to Shipping and Navigation

Measure	Mitigation detail
Construction	
Advisory safe passing distances	Advisory safe passing distances may be deployed around ongoing work being undertaken by a construction or maintenance vessel with notice of these promulgated through Notices to Mariners and Marine Notices (where deemed appropriate).
Buoyed construction area	A buoyed construction area around the array will be implemented during the appropriate phases in agreement with Irish Lights and as outlined in Appendix 17.3: Lighting and Marking Plan (LMP).
Cable protection	Cable protection (burial or external protection) will be implemented and monitored, as determined by a cable burial risk assessment post consent.
Compliance with relevant regulator guidance	The proposed development will be compliant with the relevant regulator guidance noting that the draft version published by DoT is generally aligned with UK Marine Guidance Note (MGN) 654.
Guard vessel(s)	Where appropriate, guard vessels will be used to ensure adherence with advisory passing distances.
Liaison with IRCG in relation to SAR resources	The Developer will liaise with the IRCG in relation to SAR resources to ensure the Emergency Response Cooperation Plan (ERCoP) is in place post consent.
Lighting and marking	Lighting and marking of the array in agreement with Irish Lights and in line with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) G1162. A separate LMP is provided in Appendix 17.3.
Marine coordination for proposed development vessels	Marine coordination will be implemented to manage proposed development vessels. A separate Vessel Management Plan (VMP) is provided in Appendix 17.2.
Marking on nautical charts	There will be appropriate marking of all offshore infrastructure associated with the offshore development area on UKHO Admiralty charts.
Proposed development compliance with international marine regulations	All proposed development vessels will comply with international marine regulations as adopted by the Flag State including International Regulations for Preventing Collisions at Sea (COLREGs) and International Convention for the Safety of Life at Sea (SOLAS). A separate VMP is provided in Appendix 17.2.
Promulgation of information	Information relating to the proposed development will be circulated via Notices to Mariners and other appropriate media including via the project Fisheries Liaison Officer (FLO) and Marine Notices (where deemed appropriate).
Structure Exclusion Zone	An area within the array area within which no surface piercing structure will be located inclusive of blade overfly. This area will ensure that a minimum 3nm gap between the Rockabill islands and the array is maintained.
Operation	
Advisory safe passing distances	Advisory safe passing distances may be deployed around ongoing work being undertaken by a maintenance vessel with notice of these promulgated through Notices to Mariners and Marine Notices (where deemed appropriate).
Cable protection	Cable protection (burial or external protection) will be implemented and monitored, as determined by a cable burial risk assessment post consent.
Compliance with relevant regulator guidance	The proposed development will be compliant with the relevant regulator guidance noting that the draft version published by DoT is generally aligned with UK Marine Guidance Note (MGN) 654.
Guard vessel(s)	Where appropriate, guard vessels will be used to ensure adherence with advisory passing distances.
Lighting and marking	Lighting and marking of the array in agreement with Irish Lights and in line with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) G1162. A separate LMP is provided in Appendix 17.3.
Marine coordination for proposed development vessels	Marine coordination will be implemented to manage proposed development vessels during operation. A separate Vessel Management Plan (VMP) is provided in Appendix 17.2.
Marking on nautical charts	There will be appropriate marking of all offshore infrastructure associated with the offshore development area on UKHO Admiralty charts.

Measure	Mitigation detail
Minimum blade clearance	There will be a minimum blade clearance of more than 22 m above highest Astronomical Tide (HAT) in line with industry good practice and MGN 654. The lowest minimum blade clearance associated with the proposed development is 35m above LAT associated with selected WTGs for Project Option 2.
Proposed development vessel compliance with international marine regulations	All proposed development vessels will comply with international marine regulations as adopted by the Flag State including COLREGs and SOLAS.
Promulgation of information	Information relating to the proposed development will be circulated via Notices to Mariners and other appropriate media including via the FLO and Marine Notices (where deemed appropriate).
Structure Exclusion Zone	An area within the array area within which no surface piercing structure will be located inclusive of blade overfly. This area will ensure that a minimum 3nm gap between the Rockabill islands and the array is maintained. See Figure 17.8 of Volume 7A of EIAR.
WTG design and layouts	Consideration will be given to navigational safety and SAR with respect to WTG and layout design (with respect to the 500m LoD), including acceptable levels of SCADA systems.
Decommissioning	
Advisory safe passing distances	Advisory safe passing distances may be deployed around ongoing work being undertaken by a decommissioning vessel with notice of these promulgated through Notices to Mariners and Marine Notices (where deemed appropriate).
Buoyed decommissioning area	A buoyed construction decommissioning area around the array area will be implemented during the appropriate phases in agreement with Irish Lights as outlined in the LMP in Appendix 17.3.
Compliance with relevant regulator guidance	The proposed development will be compliant with the relevant regulator guidance noting that the draft guidance published by the DoT is generally aligned with UK Marine Guidance Note (MGN) 654.
Guard vessel(s)	Where appropriate, guard vessels will be used to ensure adherence with advisory passing distances.
Liaison with Irish Coastguard (IRCG) in relation to SAR resources	The Developer will liaise with the IRCG in relation to Search and Rescue (SAR) resources to ensure the ERCoP is in place post consent.
Marine coordination for proposed development vessels	Marine coordination will be implemented to manage proposed development vessels. A separate VMP is provided in Appendix 17.2.
Proposed development vessel compliance with international marine regulations	All proposed development vessels will comply with international marine regulations as adopted by the Flag State including COLREGs and SOLAS.
Promulgation of information	Information relating to the proposed development will be circulated via Notices to Mariners and other appropriate media including via the project FLO and Marine Notices (where deemed appropriate).

36.9.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to shipping and navigation are listed in Table 36.10 and not considered again here. No additional mitigation and monitoring measures specific to shipping and navigation were identified in this assessment.

36.10 Offshore Archaeology and Cultural Heritage Mitigation and Monitoring Measures

36.10.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.11 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Table 36.11 Embedded Mitigation relating to offshore archaeology and cultural heritage

Measure	Mitigation detail
Construction	
HDD Installation	Use of HDD to entirely avoid any direct impact from cable corridor preparation and laying within the intertidal zone will decrease the magnitude of impact on these receptors to negligible.

36.10.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to offshore archaeology and cultural heritage are listed in Table 36.11 and not considered again here. Table 36.12 below identifies additional mitigation measures that are not embedded into the proposed development design. These measures will be set out in the EIAR Schedule of Environmental Commitments (see Volume 8, Appendix 6.1: Offshore Environmental Management Plan (EMP); hereafter the Offshore EMP).

Table 36.12 Mitigation relating to offshore archaeology and cultural heritage.

Measure	Mitigation description
Construction	
Archaeological review of geophysical and geotechnical datasets	<p>Additional geophysical and geotechnical surveys will be undertaken prior to construction. In order to identify known and potential / currently unknown archaeological receptors, in line with EPA guidelines (EPA 2022) to facilitate avoidance of impacts (for example, in areas of currently partial geophysical survey coverage such as the array) the archaeological review of the additional geophysical and geotechnical datasets will be undertaken for the footprint of direct and indirect impacts prior to construction, and supporting operation & maintenance and decommissioning stages of the proposed development. The final locations of infrastructure within the 500m Limit of Deviation won't be confirmed until detailed site investigation and detailed design have been undertaken.</p> <p>The archaeological review of these additional survey data will enhance the design of the final positions of seabed infrastructure (e.g. WTGs, OSP, inter-array cabling) to facilitate avoidance of known and potential archaeological receptors.</p> <p>This mitigation applies to direct and indirect physical disturbance of archaeological receptors.</p>
Archaeological Exclusion Zones (AEZs)	<p>The main mitigation for the protection of known archaeological receptors is avoidance, in line with EPA guidelines (EPA 2022). The implementation and monitoring of Archaeological Exclusion Zones (AEZs) achieves this for the identified high value offshore archaeology and cultural heritage receptors.</p> <p>This mitigation applies to direct and indirect physical disturbance of archaeological receptors.</p>
Protocols for Archaeological Discoveries (PAD)	<p>A PAD is a system for reporting and investigating unexpected archaeological discoveries encountered during the different phases of the proposed development, with a Retained Archaeologist providing guidance and advising industry staff on the implementation of the PAD. A PAD also makes provision for the implementation of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice, and, if necessary, for archaeological inspection and recording of important features prior to further activities in the vicinity. The PAD provides a mechanism to comply with legislation, including notification to the NMS.</p> <p>This mitigation applies to direct and indirect physical disturbance of archaeological receptors. The PAD is captured within the Offshore EMP.</p>
Operation	
AEZs	<p>The main mitigation for the protection of known archaeological receptors is avoidance, in line with EPA guidelines (EPA 2022). The implementation and monitoring of Archaeological Exclusion Zones (AEZs) achieves this for the identified high value offshore archaeology and cultural heritage receptors.</p> <p>This mitigation applies to direct and indirect physical disturbance of archaeological receptors.</p>
PAD	<p>A PAD is a system for reporting and investigating unexpected archaeological discoveries encountered during the different phases of the proposed development, with a Retained Archaeologist providing guidance and advising industry staff on the implementation of the PAD.</p>

Measure	Mitigation description
	<p>A PAD also makes provision for the implementation of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice, and, if necessary, for archaeological inspection and recording of important features prior to further activities in the vicinity. The PAD provides a mechanism to comply with legislation, including notification to the NMS.</p> <p>This mitigation applies to direct and indirect physical disturbance of archaeological receptors. The PAD is captured within the Offshore EMP.</p>
Decommissioning	
AEZs	<p>The main mitigation for the protection of known archaeological receptors is avoidance, in line with EPA guidelines (EPA 2022). The implementation and monitoring of Archaeological Exclusion Zones (AEZs) achieves this for the identified high value offshore archaeology and cultural heritage receptors.</p> <p>This mitigation applies to the direct disturbance of archaeological receptors.</p>
PAD	<p>A PAD is a system for reporting and investigating unexpected archaeological discoveries encountered during the different phases of the proposed development, with a Retained Archaeologist providing guidance and advising industry staff on the implementation of the PAD. A PAD also makes provision for the implementation of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice, and, if necessary, for archaeological inspection and recording of important features prior to further activities in the vicinity. The PAD provides a mechanism to comply with legislation, including notification to the NMS.</p> <p>This mitigation applies to the direct disturbance of archaeological receptors.</p>

36.10.3 Archaeological Exclusion Zones

AEZs will be implemented for these receptors within the offshore development area or where an AEZ around a receptor outside the offshore development area would encroach on the offshore development area. These are as follows:

- for all receptors assigned a high value which may be impacted, an AEZ of 100m buffer is required: defined around the extent of the feature if mapped, or otherwise a central location or the reported position as appropriate and
- for all receptors assigned a high value discrimination rating but which have no potential for impact due to being outside the offshore development area no AEZ is required

Table 36.13 AEZs within the offshore development area

Site ID	Description	UTM30N Easting	UTM30N Northing	Recommended AEZ buffer
WA7000	High value, potential for impact	289332	5946816	100m
WA7001	High value, potential for impact	289796	5946725	100m
WA7002	High value, potential for impact	297073	5949027	100m
WA7003	High value, no potential for impact	297403	5947223	None: outside the ECC boundary by c.450m
WA7004	High value, no potential for impact	297387	5947239	None: outside the ECC boundary by c.450m
WA7005	High value, no potential for impact	298783	5947415	None: outside the ECC boundary by c.450m
WA7006	High value, potential for impact	299034	5948785	100m
WA7007	High value, potential for impact	302666	5951085	100m
WA7008	High value, potential for impact	303126	5951304	100m

Site ID	Description	UTM30N Easting	UTM30N Northing	Recommended AEZ buffer
WA7009	High value, potential for impact	311154	5944559	100m
WA7010	High value, potential for impact	299052	5948791	None, covered by AEZ for WA7006
WA7011	High value, potential for impact	299029	5948771	None, covered by AEZ for WA7006
WA7012	High value, potential for impact	302665	5951077	None, covered by AEZ for WA7007
WA7013	High value, potential for impact	303061	5951326	100m

36.11 Aviation and Radar Mitigation and Monitoring Measures

36.11.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.14 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Table 36.14 Embedded mitigation measures relating to aviation and radar

Measure	Mitigation description
Construction	
Compliance with IAA lighting and marking requirements	The offshore infrastructure would be designed and constructed in accordance with the requirements of the IAA and the Commissioners of Irish Lights (CIL) in terms of the notification, charting, marking and lighting of obstacles in order to protect air and marine navigation. Refer to Section 19.4.5.1. for further details and Volume 9, Appendix 17.3: Lighting and Marking Plan.
Compliance with IAA requirements for the promulgation of obstacle locations	At least three months before the erection of offshore infrastructure, the required obstacle parameters will be supplied to the IAA and the CIL. Refer to Section 19.4.5.2 of Chapter 19 of EIAR for further details.
WTG design parameters within aviation restricted zone	Project Option 2 WTGs within the 3nm buffer areas of Dublin Airport's ATCSMAC sectors 1 and 2 will have a reduced air draft and corresponding reduced tip height of 311m above LAT. This is to ensure that the minimum required obstacle clearances of sectors 1 and 2 are not infringed.
Compliance with relevant regulator guidance (MGN 654 requirements)	The proposed development will be compliant with the relevant regulator guidance noting that the draft version published by DoT is generally aligned with UK Marine Guidance Note (MGN) 654. Refer to Volume 3, Chapter 17: Shipping and Navigation for further details.
Consultation with the DoD Adherence to DoD issued NOTAMs and NtMs, and DoT issued Marine Notices	Prior to installation of the offshore export cable, engagement will be undertaken with the DoD and the following of NOTAMs, NtMs and Marine Notices relating to Gormanston Danger Area EID1 will ensure that installation schedules do not conflict with IAC firing range activities.
Operation	
Compliance with IAA lighting and marking requirements	The offshore infrastructure would continue to be lit during operation in accordance with the requirements of the IAA and the CIL in terms of the notification, charting, marking and lighting of obstacles in order to protect air and marine navigation. Refer to Section 19.4.5.1. for further details and Appendix 17.3.
Compliance with IAA requirements for the promulgation of obstacle locations	Within three months of construction completion, updated obstacle information will be supplied to the IAA and the CIL. Refer to Section 19.4.5.2 for further details.
WTG design parameters within aviation restricted zone	Project Option 2 WTGs within the 3nm buffer areas of Dublin Airport's ATCSMAC sectors 1 and 2 will have a reduced air draft and corresponding reduced tip height of 311m above LAT.

Measure	Mitigation description
Compliance with MGN 654 requirements	The fixed layouts for Project Option 1 and Project Option 2 comply with MGN 654 requirements with regards to SAR emergency access to the array area.
Decommissioning	
Compliance with IAA lighting and marking requirements	The offshore infrastructure would continue to be lit through the decommissioning phase in accordance with the requirements of the IAA and the CIL in terms of the notification, charting, marking and lighting of obstacles in order to protect air and marine navigation. Refer to Section 19.4.5.1. for further details and Appendix 17.3.
Compliance with IAA requirements for the promulgation of obstacle locations	Updated relevant information will be supplied to the IAA and the CIL, as detailed in Section 19.4.5.2.
WTG design parameters within aviation restricted zone	Project Option 2 WTGs within the 3nm buffer areas of Dublin Airport's ATCSMAC sectors 1 and 2 will have a reduced air draft and corresponding reduced tip height of 311m above LAT.
Compliance with MGN 654 requirements	The fixed layouts for Project Option 1 and Project Option 2 comply with MGN 654 requirements with regards to SAR emergency access to the array area.
Assessment of impacts and best practice environmental management	Prior to decommissioning a study of the potential impacts to aviation and radar receptors from the proposed decommissioning activities would be undertaken, considering the baseline environment at the pre-decommissioning stage. All mitigation measures to be captured would be captured within the decommissioning strategy within the Offshore EMP. Any licences or authorisations that might be required would be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR, as required.

36.11.1.1 Lighting and Marking Requirements

The proposed development would create an obstacle environment which will be mitigated by compliance with appropriate international and national requirements for the permanent marking and lighting of obstacles. ASAM No. 018 (IAA, 2015) states that for offshore wind farms within 32nm (59km) of Air Navigation Services Radar, the marking, lighting and radar enhancing requirements will require to be assessed on an individual basis. The offshore development area is within 16nm (30km) of Dublin 2 PSR/SSR.

Notwithstanding the requirement for assessment on an individual basis, the guidance within ASAM No.018 (IAA, 2015) states the following lighting requirements to protect air navigation:

“Yellow lights will be fixed to all machines and shall be located appropriately at a point(s) on the structure above the Highest Astronomical Tide but below the lowest point of the arc of the structure's rotor blades. Such lights will be visible through 360° in azimuth and will have vertical divergence of 5° above and below the horizontal, 5 nautical miles visibility and a minimum of 99% availability.

Structures chosen as suitable for representing the periphery of wind farms are termed Significant Peripheral Structures. Such structures will be spaced along the periphery of wind farms at intervals of no more than 3 nautical miles, where practicable. Such structures will be lighted with flashing lights of distinctive navigational characteristic fitted above the Highest Astronomical Tide but below the lowest point of the arc of the structure's rotor blades. Such lights will be visible through 360° in azimuth and have a vertical divergence of 5° above and below the horizontal, 10 nautical miles visibility and a minimum of 99% availability.”

“All Significant Peripheral Structures, of height $\geq 90\text{m}$, to the highest point of the structure including the top of blade spin where appropriate, above Mean Sea Level; will be fitted with high intensity warning lighting meeting the following requirements:

- the lighting must be mounted on the highest point practicable of the fixed structure
- be in accordance with the International Civil Aviation Organisation (ICAO) Annex 14 standards, on a H24 basis, for High Intensity Type A lighting
 - colour white with a flash rate of 40~60fpm
 - have an effective intensity, with background luminance above 500cd/m^2 , of $200,000\text{cd} \pm 25\%$

- have an effective intensity, with background luminance 50~500cd/m², of 20,000cd ± 25%
- have an effective intensity, with background luminance below 50cd/m², of at least 2,000cd
- light fittings will be fully cut off so that practically no light will be emitted below the horizontal, or as otherwise agreed with the IAA
- all lights across the farm should flash in synchronisation and reductions in light intensity should occur simultaneously, if practicable and
- be visible through 360° in azimuth
- any light which fails shall be repaired or replaced as soon as is reasonably practicable. An alerting system for light failure will be put in place, such as remote monitoring or other suitable method agreeable to the IAA”

The document states the following marking requirements to protect air navigation safety:

- “High-visibility yellow from high water mark to the specified level of the marine navigation protection lights or
- double yellow bands as specified and
- fog signals may be required to be fitted on Significant Peripheral Structures in wind farm developments”

The document also states that:

- “Significant Peripheral Structures must be fitted with Radar Reflectors”

The proposed development will be designed and constructed in compliance with the requirements of the IAA and the CIL in terms of marking and lighting in order to protect air and marine navigation. A Lighting and Marking Plan is included in Appendix 17.3.

36.11.1.2 Promulgation of Obstacle Locations

The proposed development would create an obstacle environment which will be mitigated by compliance with appropriate international and national requirements for the promulgation of obstacle locations on charts and in aeronautical documentation.

In accordance with IAA ASAM No.018 (IAA, 2015), information required for promulgation of offshore wind farms that are within 32nm (59km) of Air Navigation Services Radar must be assessed by the IAA on an individual basis.

However, the guidance within the document states the following information is required by IAA prior to the erection of structures:

“At least three months in advance of the erection of wind machines or associated structures, the following information shall be supplied to the Irish Aviation Authority for promulgation in a manner considered appropriate by the Authority:

- positional data representing the Estimated Position of each machine or structure to be erected. The geodetic datum to which all obstructions shall be referred is the World Geodetic System of 1984 (WGS-84). Co-ordinates should be provided in degrees, minutes, seconds and decimals of a second, as appropriate
- the estimated maximum elevation of each structure in feet and metres
- proposed lighting details for each structure
- proposed marking details for each structure
- whether it is proposed that a Radar Enhancer / Transponder / Reflector or Radar AIS be fitted
- minimum and maximum spacing between structures

- planned earliest date of erection and
- Any other information considered relevant for air navigation”

Information required after the erection of structures is as follows:

“Within three months of the completion of the development of a wind farm or part of a wind farm, updated information, as per above, shall be supplied to the Irish Aviation Authority. The positional data will be derived by survey in accordance with the IAA Guidance Material for Obstruction Surveys (ASAM No.023), which is available on IAA web site.

The developer will thereafter be required to provide updated relevant information on any subsequent alterations to the wind farm.

This information shall also be supplied to the Commissioners of Irish Lights.”

The proposed development will comply with the requirements for the promulgation of offshore wind farms in accordance with IAA ASAM No.018.

36.11.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to aviation and radar are listed in Table 36.14 and not considered again here. Effects during construction, operation and decommissioning are not considered to be significant, therefore no further mitigation or monitoring measures are considered necessary.

36.12 Infrastructure and Other Users Mitigation and Monitoring Measures

36.12.1 Embedded Mitigation Measures

The following embedded mitigation measures in Table 36.15 have been identified through the design and consultation process and are incorporated as part of the proposed development. The embedded mitigation measures will not be considered again at the residual effect stage.

Embedded mitigation measures that are required to manage the impacts to marine water and sediment quality, fish and shellfish, commercial fisheries, shipping and navigation, and aviation and radar may also be indirectly beneficial to the receptors identified within this chapter however they are not repeated here in full. Only those that are key to managing impacts to infrastructure and other users are captured in Table 36.15.

Table 36.15 Embedded mitigation measures relating to Infrastructure and Other Users

Measure	Mitigation detail
Construction	
Pre-construction surveys	Pre-construction surveys will be carried out that involve geophysical and magnetometer surveys used to identify existing assets. This may include out of service cables located in a different area to their chartered location due to outdated location techniques, which will reduce the risk of direct impacts or damage to subsea cables and pipelines during construction.
Structure Exclusion Zone	As part of managing potential impacts to shipping and navigation, the proposed development has incorporated a Structure Exclusion Zone, into the design. This is an area within the array which excludes all surface infrastructure (inclusive of blade overfly) and enables a 3nm separation between surface infrastructure and the Rockabill islands to be maintained. This gap between the array area and the Rockabill islands is referred to as the Rockabill gap and provides sea room to facilitate the safe passage of vessels. Additionally, it is anticipated that potential other users of the Rockabill gap will be able to safely navigate in the presence of other activities.
Advisory safety zones	Advisory safety zones of up to 500m around infrastructure under construction will be communicated during construction. Where appropriate, guard vessels and/or guard buoys will also be used to ensure adherence to advisory safety zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction. An advisory safety zone of 50m will be implemented for incomplete structures at which construction activity may be temporarily paused.
Advanced vessel warnings	Details of the proposed development will be promulgated in advance of construction, via Notice to Mariners (NtM) to ensure mariners are aware of the planned works.

Measure	Mitigation detail
	This information will include associated advisory safety zones and advisory passing distances.
Updated nautical charts	The provision of relevant data and information will be provided to the relevant authorities/charting bodies for the updating of nautical and electronic charts.
Consultation with the DoD Adherence to DoD NtMs and/or Marine Notices	Prior to installation of the export cable, engagement will be undertaken with the DoD and the following of, NtMs (and/or Marine Notices) relating to Gormanston Danger Area EID1 will ensure that installation schedules do not conflict with Irish Air Corps (IAC) firing range activities.
Cable burial and cable protection measures	<p>Exposed and/or inappropriately managed cables may potentially impact on vessels looking to anchor within proximity to the offshore development area.</p> <p>Export and inter-array cables will be buried where practicable to ensure they are not exposed by sediment movements (Section 8.3.10 in the Offshore Construction Strategy). Where cables cannot be buried, additional cable protection measures such as rock placement or mattressing will be applied to achieve adequate cable protection. Up to 20% of cable length is expected to need protection either during initial installation, or throughout the operational phase of the proposed development (see the Offshore Construction Strategy).</p> <p>Cable specification and installation measures are determined within the offshore Environmental Management Plan (EMP) and include a detailed Cable Burial Risk Assessment (CBRA) to enable informed judgements regarding burial depth to increase the likelihood of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary. This sets out appropriate cable burial depth in accordance with industry good practice, reducing the risk of cable exposure.</p> <p>A cable burial risk assessment (CBRA) will be developed that will set out the appropriate installation methods to be used during the construction phase. During construction, sections of export cable might be left exposed whilst awaiting a suitable method of installation. A temporary exclusion zone may therefore be required until the cable can be buried.</p>
Vessel route management	<p>Indicative transit corridors (vessel routing to and from construction sites and ports) will be define in advance of the construction phase, in consultation with the Marine Survey Office (MSO). A vessel management plan (VMP) will be implemented and will include a code of conduct for vessel operators. These measures will reduce the risk of disturbance and displacement of with infrastructure and other users.</p> <p>The VMP is provided in Appendix 17.2 and will be updated through the phases of the proposed development.</p>
Marine pollution contingency measures – chemical risk review	Marine pollution contingency measures will be implemented as part of the offshore EMP to manage the risk of accidental spillages from construction equipment or collision incidents. This includes a chemical risk review with information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance. This measure will reduce the likelihood of potentially harmful pollutants to be released into the marine environment which may then impact on fish and shellfish receptors.
Operation	
Structure Exclusion Zone	The proposed development design has incorporated a Structure Exclusion Zone, an area within the array which excludes all surface infrastructure (inclusive of blade overfly) and enables a 3nm separation between surface infrastructure and the Rockabill islands to be maintained. This gap between the array area and the Rockabill islands is referred to as the Rockabill gap and provides sea room to facilitate the safe passage of vessels. Additionally, it is anticipated that potential other users of the Rockabill gap will be able to safely navigate in the presence of other activities.
Advanced vessel warnings	<p>Details of the proposed development will be promulgated in advance of any work that is not routine during operation via NtM to ensure mariners are aware of the planned works.</p> <p>This information will include associated advisory safety zones and advisory passing distances.</p>
Advisory safety zones	<p>Advisory safety zones of up to 500m around the relevant infrastructure will be communicated during substantial maintenance activities (such as major component replacement). Where appropriate, guard vessels and/or guard buoys will also be used to ensure adherence with advisory safety zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such risks may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards.</p> <p>An advisory safety zone of 50m will be implemented for incomplete structures at which construction activity may be temporarily paused.</p>
Updated nautical charts	The provision of relevant data and information will be provided to the relevant authorities/charting bodies as/if required for the updating of nautical and electronic charts.

Measure	Mitigation detail
Consultation with the DoD Adherence to DoD issued NtMs and/or Marine Notices	Prior to management or repair of the offshore export cable, engagement will be undertaken with the DoD and the following of NtMs (and/or Marine Notices) relating to Gormanston Danger Area EID1 will ensure that installation schedules do not conflict with IAC firing range activities.
Decommissioning	
Structure Exclusion Zone	The proposed development incorporated a Structure Exclusion Zone, an area within the array which excludes all surface infrastructure (inclusive of blade overfly) and enables a 3nm separation between surface infrastructure and the Rockabill islands to be maintained. This gap between the array area and the Rockabill islands is referred to as the Rockabill gap and provides sea room to facilitate the safe passage of vessels. Additionally, it is anticipated that potential other users of the Rockabill gap will be able to safely navigate in the presence of other activities.
Advanced vessel warnings	Details of the proposed development will be promulgated in advance of decommissioning via NtM to ensure mariners are aware of the planned works. This information will include associated advisory safety zones and advisory passing distances.
Advisory safety zones	Advisory safety zones of up to 500m around the relevant infrastructure will be communicated during decommissioning. Where appropriate, guard vessels and/or guard buoys will also be used to ensure adherence with advisory safety zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during decommissioning. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards. An advisory safety zone of 50m will be implemented for incomplete structures at which construction activity may be temporarily paused.
Updated nautical charts	The provision of relevant data and information will be provided to the relevant authorities/charting bodies for the updating of nautical and electronic charts.
Consultation with the DoD Adherence to DoD issued NtMs and/or Marine Notices	Prior to decommissioning of the offshore export cable, engagement will be undertaken with the DoD and the following of NtMs (and/or Marine Notices) relating to Gormanston Danger Area EID1 will ensure that installation schedules do not conflict with IAC firing range activities.
Assessment of impacts and best practice environmental management	Prior to decommissioning a study of the potential environmental impacts to infrastructure and other users from the proposed decommissioning activities should be undertaken, taking into account the baseline environment at the pre-decommissioning stage. All mitigation measures to be captured would be captured within the decommissioning strategy within the Offshore EMP. Any licences or authorisations that might be required would be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR, as required.

36.12.2 Mitigation and Monitoring Measures

Mitigation measures that were identified and adopted as part of the evolution of the proposed development design (embedded into the proposed development design) and that are relevant to I&OU are listed in Table 20.9 and not considered again here. No additional mitigation and monitoring measures specific to infrastructure and other users were identified in this assessment.

36.13 Land and Soils (includes soils, geology and hydrogeology) Mitigation and Monitoring Measures

36.13.1 Construction Phase

The mitigation strategy outlined in this section will be implemented during the construction phase of the proposed development. The strategy will be incorporated into the overall Onshore Construction Environment Management Plan (CEMP), which is included in Appendix 9.1 of the EIAR. The Onshore CEMP will be updated by the contractor prior to the commencement of construction.

36.13.1.1 General

Best construction management practice (daily site clean-ups, use of disposal bins, etc.) will be carried out at working areas during construction, and the proper use, storage and disposal of all substances and their containers will help prevent soil contamination.

For all activities involving the use of potential pollutants or hazardous materials, there will be a requirement to ensure that the material such as concrete, fuels, lubricants and hydraulic fluids will be carefully handled and stored to avoid spillages or leaks. Potential pollutants will also be adequately secured against vandalism and will be provided with proper containment according to codes of best practice. Any spillages or leaks will be immediately contained, and contaminated soil removed from site and disposed of in a licensed waste facility.

Potential soil and water pollution will be minimised by the implementation of best construction practices. Such practices will include adequate bunding for oil containers, wheel washers and dust suppression on site roads, and regular plant maintenance.

Best construction management practices, as outlined in the Construction Industry Research and Information Association (CIRIA) Control of Water Pollution from Construction Sites – Guidance for consultants and contractors (Masters-Williams et al. 2001) will be reflected in the CEMP.

An Emergency Response Plan has been prepared and included in the CEMP and will be further developed by the appointed contractor prior to the commencement of works and regularly updated, identifying the actions to be taken in the event of a pollution incident. The Emergency Response Plan will address the following:

- Secure oil and chemical storage in over-ground bunded areas, limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas
- All refuelling to take place in bunded enclosures and a minimum of 50m from any watercourse, or coastline. The only exception to this would be plant of limited mobility such as HDD rigs: for refuelling of these items, a small mobile fuel bowser will be used for refuelling, drip trays and plant nappies would be utilised to mitigate any potential spill of fuel during refuelling, and additional supervision employed
- Emergency spill kits will be retained at sensitive locations, with portable kits provided to plant and equipment operators
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified
- Silt traps will be employed and maintained in appropriate locations
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities
- Excavation and earthworks will be suspended for review as required during and immediately following periods of heavy rainfall to minimise sediment generation and soil damage

36.13.1.2 Mitigation of potential effects

Loss or damage of topsoil and subsoil

All earthworks will be undertaken in accordance with TII Specification for Road Works (SPW) Series 600 Earthworks and project specific earthworks specifications ensuring that all excavated material and imported material is classified using the same methodology so as to allow maximum opportunity for the reuse of materials on site.

Excavated topsoil will be stockpiled using appropriate methods to minimise the effects of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff.

In order to reduce the compaction and erosion of topsoil outside the areas of direct construction, haul routes will be along predetermined routes within the proposed development and deliveries will be along predetermined routes outside the proposed development.

Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to its original condition.

Where practical, compaction through trafficking of any soil or subsoil which is not part of the works and intended to remain in-situ within the proposed development will be avoided.

The contractor will ensure that any excavated topsoil, subsoil or rock is assessed for re-use within the proposed development ensuring the appropriate handling, processing and segregation of the material. Where practical the removal of excavated material from the proposed development will be avoided. Any surplus suitable excavated material that is not required in the proposed development, will be reused on other projects where possible. The reuse of this material as a by-product on other construction sites would be subject to Article 27 notification to the EPA. This material would have to be shown to be suitable for such use and subject to appropriate control and testing according to earthworks specifications. Alternatively the surplus excavated material will be recovered at suitable authorised waste facilities.

Effects on the surrounding ground

Monitoring of ground settlement, horizontal movement will be implemented during construction activities where required to ensure that the construction does not exceed the design limitations.

Foundation type and method of construction and cable installation methodology have been selected to control ground settlement. The foundation types are described within Section 9.5 of the Onshore Construction chapter.

Excavation of Potentially Contaminated Land

Excavations in made ground will be monitored by an appropriately qualified person to ensure that any localised areas of contamination encountered are identified, segregated and disposed of appropriately and to ensure soils are consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations. Any identified localised areas of contamination will be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure that the contaminated material does not cross-contaminate clean soils elsewhere throughout the site.

Samples of ground suspected of contamination will be tested for contamination during the detailed investigation and material excavated from these areas will be disposed of to a suitably licensed or permitted site in accordance with the current Irish waste management legislation.

Any dewatering in areas of contaminated ground will be designed to minimise the mobilisation of contaminants into the surrounding environment. Where dewatering in such areas is unavoidable the water will be adequately treated prior to discharge.

Pollution of soil and groundwater

Good construction management practices will be employed to minimise the risk of transmission of hazardous materials as well as pollution of adjacent watercourses and groundwater.

Measures to be implemented to minimise the risk of spills and contamination of soils and waters will include:

- Employing only competent and experienced workforce, and site-specific training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures
- Ensure that all areas where liquids (including fuel) are stored, or cleaning is carried out, are in designated impermeable areas that are isolated from the surrounding area and within a secondary containment system, e.g., by a roll-over bund, raised kerb, ramps or stepped access

- The location of any fuel storage facilities will be considered in the design of all construction compounds and will be fully bunded. These are to be designed in accordance with relevant and current guidelines and codes of best practice at the time of construction
- All concrete mixing and batching activities will be located in designated areas away from watercourses and drains
- Potential pollutants will be adequately secured against vandalism in containers in a dedicated secured area
- Provision of proper containment of potential pollutants according to relevant and current codes of practice and legal requirements
- Thorough control during the entire construction stage to ensure that any spillage is identified at early stage and subsequently effectively contained and managed
- Spill kits to be provided and to be kept close to the HDD and temporary construction compounds. Staff to be trained on how to use spill kits correctly

Landfall site, grid facility and onshore cable route

- Any groundwater or rainwater that collects in the HDD drilling pit or in a trench, or other excavation, will be pumped away onto adjacent land, not directly into waterways.
- Bentonite (or similar HDD drilling head lubrication material), which comprises 95% water and 5% bentonite clay which is a non-toxic, natural substance, will be used on site. It will be within a closed system, with drilling fluid recirculated, the drill cuttings recovered, and drilling fluid reused. Residual amounts of bentonite will be left in situ following the drilling process posing a negligible risk due to the inert nature of bentonite.
- In order to minimise the likely migration of drilling fluids through the subsurface to waterbodies the following measures will be employed:
- Exit and entry points for the HDD will be enclosed by silt barriers (e.g. straw or silt fence) to prevent any runoff into surface water bodies.
- If pressure drops during drilling or if there is a lack of returns the drilling will stop immediately to allow an assessment of a potential leakage of drilling fluid into the surrounding formation. A leak-stopping compound may be used to prevent the leak from migrating further into the formation. If the leak-stopping compound is not successful, the drilling direction may need to change to avoid the area where the leak occurred.
- If damming and over-pumping is adopted for the open cut watercourse crossings the water will be discharged through a filtering medium to limit silt carry over or bed disturbance downstream of the crossing point.
- There will be no tracking of machinery within watercourses other than that related to the temporary works associated with construction of the watercourse crossings for the onshore cable route.
- Where short-term over pumping or flume pipes are required, equipment will be sized to accommodate surface water flow that might reasonably be expected over the period in question.

36.13.1.3 Monitoring during construction

As stated above, all excavations will be monitored in accordance with good practice and guidelines at the time of the works.

Any excavation and stockpiled material will be monitored to ensure the stability of slopes and to ensure that the materials designated for disposal are consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations.

Visual monitoring will be undertaken as part of the regular site audits during the construction of the proposed development to ensure existing surface water drainage runoff and natural infiltration to ground is not affected by the proposed development.

36.13.2 Operational Phase

Diesel storage tanks in the grid facility will be bunded. If glycol is used as a coolant in the compensation station, the bulk glycol tank will be bunded. Surface water runoff from impermeable yard areas and site roads in the grid facility will be managed and treated prior to discharge. Refer to Section 7.4.5 in the Onshore Development Chapter.

36.13.3 Decommissioning Phase

The mitigation measures, described above for the construction phase which are relevant to decommissioning, updated to reflect good practice at the time, will be implemented for the decommissioning phase.

36.14 Water (includes hydrology, surface water quality and flooding) Mitigation and Monitoring Measures

36.14.1 Construction Phase Mitigation Measures

As part of the proposed development, best practice construction methods will be implemented that will ensure the construction related effects are avoided or reduced to a minimum as much as practicable. This section outlines this best practice and or mitigation measures that will be implemented to mitigate the potential effects identified in Section 22.5 of Chapter 22.

36.14.1.1 Project Wide Mitigation Measures

Industry good practice guidance will be followed by the Contractor during construction including, where relevant, those listed in the guidance below:

- Construction Industry Research and Information Association (CIRIA), (2001). C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors
- CIRIA, (2005). C650 Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site
- BPGCS005, Oil Storage Guidelines
- Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition projects, EPA (2021)
- Control of Water Pollution from Linear Construction Projects, CIRIA (C649)
- The SuDS Manual, CIRIA (C753)
- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters, IFI (2016)
- The Management of Waste from National Road Construction Projects, GE-ENV-01101, TII (2017)

The Contractor will be required to put in place a Surface Water Management Plan (SWMP) to protect the water environment during construction. This will include all mitigation measures listed in this chapter and any other water related mitigation measures listed in other chapters including but not limited to the Biodiversity chapter, Land and Soils chapter etc.

Specific Mitigation and Monitoring Measures

Once the project-wide mitigation measures are implemented, other specific water pollution and flooding mitigation and / or monitoring measures include, but are not limited to those listed below:

Monitoring

- A suitably qualified Environmental Clerk of Works (EnCoW) and Ecological Clerk of Works (ECoW) will be appointed prior to commencement of works. The duties of these will be to monitor the efficacy of mitigation measures implemented by the contractors and to report on the application and success of these measures.
- Water quality monitoring will be undertaken in advance of construction to establish baseline levels of potential contaminants in all watercourses across the proposed development.
- At the watercourse crossing locations background samples (i.e. baseline) shall be collected in the same season as the construction will occur at that location to ensure the results are representative. This may mean that sampling is undertaken in the various watercourses at different times.
- Upstream and downstream samples will be collected at each watercourse crossing location and will be tested for a range of parameters that occur naturally and for pollutants¹ including temperature, Electrical Conductivity (EC), pH, Dissolved Oxygen (DO), Turbidity, Total Petroleum Hydrocarbon (TPH) and Diesel Range Organics (DRO).
- Water pollution trigger levels will be determined against baseline monitoring results. The baseline monitoring results will present naturally occurring parameters. Any abnormally high concentrations monitored during construction will flag for construction to be stopped.
- During construction of the watercourse crossings, field parameters (temperature, pH, turbidity, DO and EC) shall be monitored upstream and downstream of the construction works twice a day. Visual inspections of the watercourses at these locations will be conducted hourly during construction to identify any plumes of sediment or sheens of oil which may indicate spillages. If these are identified, works will stop until the source has been identified and remediated.
- When there is construction on the same day at multiple watercourse crossing locations the ECoW is required to be present at instream works and designated person chosen by the contractor to do visual checks at the other watercourse crossings. Should the designated person observe a plume then they shall advise the ECoW and follow the mitigation measure above.
- In the event of pollution occurring or the potential to occur, the EnCoW and ECoW have a 'Stop Works' authority to ensure measures to stop a pollution event are implemented immediately.
- Post construction monitoring will be conducted for three months subsequent to construction.

Prevention of release of hydrocarbons and contaminates

During construction the contractor will be required to implement the following specific mitigation measures to prevent the release of hydrocarbons, polluting chemicals, sediment/silt:

- Storage of sand/gravel/soil will be as far as practicable from watercourses or hydrological pathways to designated sites and grading adjacent to these stockpiles kept to a minimum.
- Surface water run-off from temporary works area to be collected in silt/gravel traps prior to discharge to the surface water drainage network.
- Silt fences (to Hy-Tex Premium specification or similar) and silt traps will be installed prior to commencement of works and will be inspected daily to inform adaptive management as required. The locations of same will be determined by the EnCoW.
- All refuelling to take place in bunded enclosures and a minimum of 50m from any watercourse, or coastline. The only exception to this would be plant of limited mobility such as HDD rigs: for refuelling of these items, a small mobile fuel bowser will be used for refuelling, drip trays and plant nappies would be utilised to mitigate any potential spill of fuel during refuelling, and additional supervision employed.

¹ According to CIRIA (2001) pollutants are defined as substances that occur either in a location where it is not naturally occurring or in an abnormally high concentration.

- Visual checks of the working areas and all silt/gravel traps will be carried out during weekly audits and maintenance works undertaken, if required.
- All chemical/fuel etc. will be stored in bunded containers and all storage will have sufficient bunding for all liquids stored (110% of the capacity of the largest drum).
- Spill Kits will be maintained on sites and works areas.
- The contractor will prepare a spill response procedure and implement it, if required.
- Spill incidents will be reported to the EnCoW.
- Oil interceptors will be installed on surface water drainage network at the grid facility works areas for the construction phase.
- No foul sewer discharge will be allowed to enter the surface water drainage network.
- Toolbox talks for all staff will be carried out by the contractor before work commences to identify environmental issues.

Protection of watercourses

- For works occurring within 50m of an open watercourse, weather forecasts will be monitored prior to and during works to avoid working in adverse weather conditions such as heavy rains. No excavations for watercourse crossings will take place during a yellow, or higher, issued rain warning by Met Eireann.
- All instream works will only take place during the permitted annual instream working window which runs from July to September (IFI, 2016), unless otherwise agreed with IFI.
- At the offline open cut trench crossings, the riverbed levels will be surveyed to allow them to be reprofiled back to their original condition at the completion of construction of the crossing.
- Instream dewatered working zones, once construction is completed, will be reinstated with clean rounded river gravels of various sizes (30-100mm) and not the excavated material removed as this material will have become unstable and will release suspended solids if used for reinstatement of the watercourse bed. Alternatively, the excavated material will be cleaned and reinstated.
- Excavated material will be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses.
- An ECoW will be present for the entire duration of any instream works and monitoring will be conducted in line with the monitoring requirements above.
- Settlement tanks, silt traps / bags and bunds will be used where required to remove silt from surface water runoff. Sizing of the tanks will be based on best available guidelines. Any construction work within a 10m buffer zone of the watercourse edge will be provided with these measures to minimise sediment discharge to a watercourse.
- Where over pumping of water is required, flow will be discharged back to the same stream at a downstream location to maintain continuity and avoid flooding and water quality impacts to adjacent streams.
- Dewatering, if required during excavation works, will be designed such that water will be adequately treated prior to discharge.
- The existing drainage infrastructure will be surveyed where possible prior to construction. Land drains, open drains, drainage pipework or watercourses, affected by the works, will be maintained until completion of the works, and restored to their original condition. Where required, drainage will be temporarily diverted or over pumped, with appropriate water treatment as required. Further details are provided in Section 9.5.5 of the Onshore Construction chapter. Crossings will be undertaken following the methodology proposed in the Onshore Construction chapter and the drain or watercourse reinstated following to their original condition following construction.

- All machinery will have been suitably serviced and inspected prior site delivery. A hydrocarbon/oil boom will be available at working areas for immediate deployment within any watercourse in the event of any hydrocarbon spillage at the site. A fuel spillage will be considered to be any loss of fuel, oil or lubricant, including hydraulic oil and spot leakage.
- Deposition areas for spoil will be enclosed with silt fencing to prevent mobilisation of solids during adverse weather conditions and no drainage from these areas will be directed into the temporary drainage systems. A SuDS will be implemented to allow controls to be designed for the retention of large volumes of water that may arise from spoil deposition areas.
- Silt traps and fencing to be placed in working areas that have the potential to carry silt laden material from the working area to aquatic environments. Silt traps and fences will not be erected within flowing watercourses as these can act as a barrier for movement of species.
- Re-seeding of all areas of bare ground or the placement of jute matting will take place as soon as practicable to prevent run-off.
- All onsite welfare facilities will be installed and managed as per regulations to prevent nutrient overloading of aquatic environments.
- Mitigation measures in relation to soil stripping, earth removal, stockpiling are detailed in Section 21.6.1 of the Land and Soils chapter.
- Where an open-cut watercourse crossing method is proposed at Wx13 (Ballyboghill Stream), which flows directly into the Rogerstown Estuary SAC and SPA, no in-stream works will occur within 150m of the SAC boundary.

Works to manage flooding

The contractor will be required to put in place a Flood Risk Management Plan (FRMP) to ensure staff are not exposed to the risk of flooding, to minimise damage to the construction works in case of flooding and to reduce risk of flooding to nearby properties. As part of the FRMP, the following will be included:

- The work near watercourses will be planned to be undertaken at appropriate periods when low flow is expected.
- Weather warning notifications will be issued and the weather forecast checked regularly when working near areas at risk of flooding.
- Where offline open cut trench method is proposed, water levels upstream of the watercourse crossings will be monitored.
- A flood warning system and management plan will be implemented.

Further mitigation measures specific to each construction methodology are outlined below:

- **Inline open cut trenches:** Trenches will be excavated in short lengths and will be backfilled following installation of the ducts. Excavated material will be stockpiled outside areas at risk of flooding to prevent impoundment of water or changes to flow paths.
- **Inline HDD compounds:** HDD compounds will be located where practicable outside the 0.1% AEP flood extents.
- **Offline open cut crossing:**
 - *With Over-pump Methodology:* If expected flows in the watercourse are within the capacity of available pumps, temporary bunding and over-pumping methodology can be adopted. In that case, soil filled sandbags will be used to create a seal and bund both the upstream and downstream sides of the watercourse crossing. Then appropriately sized pumps will be located adjacent to the watercourse crossing, the intake pipe will be positioned upstream of the upstream bund and the discharge pipe downstream of the downstream bund, with appropriate water treatment provided in between, as required. The bunds, pump and treatment will be inspected daily.

- Water levels in the watercourse will be monitored to prevent flooding upstream of the bunds, back up pumps may be required. It is recommended that works are undertaken during low flows and avoided if a storm is expected.
 - *With Culvert/Flume Pipe Methodology:* In this method, the water flow will be diverted into a culvert or flume pipe to the side of the watercourse. The culvert/flume pipe watercourse crossing will be prepared by stripping the topsoil from the banks and areas adjacent to the river at the crossing point and storing it separately within the working area, away from the watercourse.
 - The excavated bank material and a selection of vegetation will be stored for replacement or reinstatement of the watercourse, after the cable ducts have been laid. A flume pipe bridge will be installed to one side of the watercourse channel. The culvert/flume pipe will be long enough to extend below the haul road to allow safe passage of plant and materials along the cable route. A suitably sized culvert/flume pipe will be installed at the crossing point. The invert of the culvert/flume pipe will typically be 100mm below the existing watercourse invert, to replicate natural free flow through the channel. The culvert/flume pipe will extend on the upstream and downstream sides of the crossing point for a suitable distance. The culvert/flume pipe will then be bedded and packed or surrounded with soil filled sandbags to create a seal or dam across the watercourse, to prevent scouring and to divert the water flow into the flume pipe. The flume pipe will take all the flow to the downstream side of the crossing point and the ducts will be installed beneath the dry watercourse channel.
 - Once the flume pipe or dam bund and over-pump method has been installed and sandbags are securely in place, the construction of the cable trench can proceed by excavating through the bed of the watercourse. Trench supports may be used to facilitate safe excavation and dewatering of the excavation area will be carried out if required. Final reinstatement will use the stored river-bed materials with reinforcement mesh included along with yellow marker warning tape.
 - The banks of the temporary watercourse crossings will be reformed to their original profile. The excavated bed materials which had been removed for construction, and stored separately, will be reinstated to the original profile. The temporary flume pipe, packing and sand-bags will be removed once the watercourse profile has been reinstated, ensuring the correct sequencing of substrate reinstatement.
 - Final bank reinstatement may require further measures to stabilise the banks and prevent erosion. Bank stabilisation works will be discussed with the NPWS/IFI to ensure that suitable materials and methodologies are being used. Any bank protection, where it is required, will be adequately keyed into both the bed and banks. The materials and methods employed will be in keeping with the surrounding environment and will comply with any conditions attached to the planning approval.
- The limited number of permanent access tracks proposed at offline crossings could potentially alter the flood mechanism at the watercourses if located within the floodplain. As also outlined in Section 22.6.2, where reasonably possible, the tracks will be positioned outside the flood extents and designed to minimise changes to the existing ground. If encroaching within the floodplain, they will be constructed at-grade to prevent changes to flow paths or impoundment and will be made of semi-impermeable material (crushed stone) to mimic the natural infiltration potential of the existing land.

Protection from HDD Operations and Frac-Out

The contractor will implement a number of specific measures with respect to HDD operations at the landfall and the relevant crossings along the cable route, as detailed below.

- Any groundwater or rainwater that collects in the HDD drilling pit will be pumped away. Then it will be discharged onto the adjacent land, not directly into a waterway, and through a filter medium. This will avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water from the trench.
- The contractor and the ECoW will monitor weather conditions and will carry out daily inspections of the mud pit to ensure the volume of the mud pit does not ‘overtop’ to the surrounding land. Where required, measures such as pumping will be used to prevent overtopping.

- Any bentonite (or similar HDD drilling head lubrication material) will be handled and removed by the drilling contractor. The volume of bentonite (or similar material) will be determined by the ground conditions encountered and length of HDD.

In order to eliminate the migration of drilling fluids through the subsurface to waterbodies the following measures will be employed

- Drilling pressures will be closely monitored and will not exceed those needed to penetrate the formation.
- Exit and entry points for the HDD on land (exit point for landfall HDD is in the seabed) will be enclosed by silt barriers (e.g. straw or silt fence) to prevent any runoff into surface water bodies.
- If pressure drops during drilling or if there is a lack of returns, the drilling will be stopped immediately to allow an assessment of a potential leakage of drilling fluid into the surrounding formation. A leak stopping compound, such as mica, may be used to prevent the leak from migrating further into the formation. If the leak stopping compound is not successful, the drilling direction may need to change to avoid the area where the leak occurred.

While the bentonite drilling fluid is non-toxic and can be commonly used in farming practices, if sufficient quantity enters a watercourse, it can potentially settle on the bottom, smothering benthic flora and affecting faunal feeding and breeding sites. The drilling contractor will develop a location specific HDD frac-out contingency plan, detailing measures to be taken to reduce the risk of bentonite breakout and measures to be taken for the protection of sensitive ecological receptors, should a breakout occur.

In event of managing a breakout or frac-out, the following measures will be adopted:

- Drilling will be stopped immediately.
- The bentonite will be contained by constructing a bund e.g. Using sandbags.
- The bentonite will be recovered from the bund by pumping to a suitable container or back to the entry pit for recycling.
- If necessary, inert and non-toxic lost circulation material (mica) will be pumped into the bore profile, which will swell and plug any fissures.
- The area will be monitored closely to determine if the breakout has been sealed.
- Mud volumes and pressures will be checked and monitored as the works recommence.

In event of managing a breakout or frac-out under water, the following measures will be adopted:

- The drilling will be stopped immediately.
- Lost circulation material (mica), which will swell and plug any fissures, will be pumped into the bore.
- Mud volumes and pressures will be checked and monitored as the works recommence.
- The process will be repeated as necessary until the breakout has been sealed.

Any bentonite will be managed and removed by the specialist drilling contractor on completion of the operation. Water will be brought to site in tankers (to make up the drilling fluid) for lubrication of the bore and to provide the requisite volumes of water to the compound. The water used will be non-saline and non-potable water.

On completion of the operation the drill fluid will be disposed of to an appropriately licensed facility.

36.14.2 Operational Phase

An attenuation basin will be provided at the grid facility and this will ensure that the instantaneous surface water runoff rate from the site will not exceed the greenfield runoff rate. Water quality will be managed by controlling the volume and treating the discharge in line with SuDS principles.

Emergency procedures detailing the measures to be undertaken should any accidental spill happen during operation will be developed as part of the operations manual for the proposed development. These will be based on the same emergency procedures detailed in the Onshore CEMP.

The limited number of permanent access tracks proposed at offline crossings could potentially alter the flood mechanism at the watercourses if located within the floodplain. Where reasonably possible, the tracks will be positioned outside the flood extents and designed to minimise changes to the existing ground.

If encroaching within the floodplain, they will be constructed at-grade to prevent changes to flow paths or impoundment and will be made of semi-impermeable material (crushed stone) to mimic the natural infiltration potential of the existing land. With the above design restrictions in place, the effect of the permanent tracks on flood risk is imperceptible at the operational stage.

With the implementation of the proposed design, no additional mitigation measures for water are considered necessary for the operation of the proposed development.

36.14.3 Decommissioning

The mitigation measures, described above for the construction phase which are relevant to decommissioning, updated to reflect good practice at the time, will be implemented for the decommissioning phase.

36.15 Biodiversity Mitigation and Monitoring Measures

Mitigation provided at two key areas is shown on landscape plans and referred to in this section: one for the grid facility area (see planning drawing 281240_MCR_ONS_GF_DR_YE_1010 *Grid facility Landscape Plan* in Appendix 7.1 of Volume 8 of the EIAR) and one for Blakes Cross North (see planning drawing 281240_MCR_ONS_GF_DR_YE_1011 *Blakes Cross North Landscape Plan*, in Appendix 7.1). These plans show the combined landscaping and biodiversity mitigation proposals at these locations. A Habitat and Species Management Plan has been prepared for these areas to ensure the desired outcome for biodiversity is achieved, see Appendix 23.10 of Volume 10 of the EIAR.

36.15.1 Construction Phase

A suitably qualified Ecological Clerk of Works (ECoW) will be appointed to ensure the mitigation measures outlined in this section, in the Habitat and Species Management Plan (Appendix 23.10) and in Volume 8, Appendix 9.1: Onshore Construction Environmental Management Plan (CEMP) are implemented during the construction phase of the onshore infrastructure of the proposed development.

The appointed ECoW will deliver a toolbox talk to all contractors, including sub-contractors, prior to construction starting on ecologically sensitive features within or in close proximity to the works area. The duties of the ECoW will be to monitor the efficacy of mitigation measures implemented by the contractors and to report on the application and success of these measures. In the event of pollution occurring or the potential to occur, the ECoW will have a 'Stop Works' authority to ensure measures to stop a pollution event are implemented immediately.

All mitigation measures detailed in the below sections have been incorporated into the CEMP.

36.15.1.1 Designated Sites

Measures to mitigate against downstream water quality impacts

Best practice guidelines during construction

The following measures will be implemented by the contractor to ensure the protection of downstream waters and habitats in European and nationally designated sites. The measures have been based on the following best practice guidelines to ensure that water bodies are adequately protected during construction work:

- Construction Industry Research and Information Association (CIRIA), (2001). C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors

- CIRIA, (2005). C650 Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site
- BPGCS005, Oil Storage Guidelines
- CIRIA, (2007). C697 The SUDS Manual
- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004
- CIRIA, (2006). C648 Control of water pollution from linear construction projects: Technical guidance (Murnane et al. 2006)
- CIRIA, (2006). C648 Control of water pollution from linear construction projects: Site guide (Murnane et al. 2006)
- Inland Fisheries Ireland (IFI), (2016). Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters
- Fisheries Protection during Development Works (Foyle and Carlingford areas) Environmental Guidelines Series – No. 1. Loughs Agency

Release of hydrocarbons and contaminants

The contractor will be required to implement the following standard practice construction methods and mitigation measures for release of hydrocarbons, polluting chemicals, sediment/silt, and contaminated waters control:

- Storage of sand/gravel/soil will be kept away from watercourses or hydrological pathways to designated sites and grading adjacent to these kept to a minimum.
- Surface water run-off from temporary works area to be collected in silt/gravel traps prior to discharge to the surface water drainage network.
- Silt fences (to Hy-Tex Premium specification or similar) and silt traps will be installed prior to commencement of works and will be inspected daily to inform adaptive management as required. The locations of same will be determined by the EnCoW.
- All refuelling to take place in bunded enclosures and a minimum of 50m from any watercourse, or coastline. The only exception to this would be plant of limited mobility such as HDD rigs: for refuelling of these items, a small mobile fuel bowser will be used for refuelling, drip trays and plant nappies would be utilised to mitigate any potential spill of fuel during refuelling, and additional supervision employed.
- Visual checks of the working areas and all silt/gravel traps carried out during weekly audits and maintenance procedures applied.
- All chemical/fuel etc. will be stored in bunded containers and storage to have sufficient bunding for all liquids stored (110% of the capacity of the largest drum).
- Spill Kits will be maintained on sites and works areas.
- Implementation of the spill response procedure.
- Spill incidents to be reported.
- The contractor will prepare a spill response procedure and implement it, if required.
- Spill incidents will be reported to the EnCoW.
- Oil interceptors to be installed on surface water drainage network at the grid facility works areas for the construction phase.
- No foul sewer discharge to enter the surface water drainage network.

- Toolbox talks to be carried out by contractor with all staff before work commences to identify environmental issues.

Protection of watercourses

The contractor will be required to implement the following standard practice construction methods and mitigation measures for in-stream or near-stream works:

- For works occurring within 50m of a watercourse, weather forecasts will be monitored prior to and during works to avoid working in adverse weather conditions such as heavy rains. No excavations for watercourse crossings to take place during a yellow rain warning or higher issued by Met Eireann.
- All instream works will only take place during the permitted annual instream working window which runs from July to September (IFI, 2016), unless otherwise agreed with IFI.
- At the offline open cut trench crossings, the riverbed levels will be surveyed to allow them to be reprofiled back to their original condition at the completion of construction of the crossing.
- Instream dewatered working zones, once construction is completed, will be reinstated with clean rounded river gravels of various sizes (30-100mm) and not the excavated material removed as this material will have become unstable and will release suspended solids if used for reinstatement of the watercourse bed. Alternatively, the excavated material will be cleaned and reinstated.
- Excavated material will be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses.
- An ECoW will be present for the entire duration of any instream works and monitoring will be conducted in line with the monitoring requirements set out in the Water chapter.
- During instream works at offline open cut watercourse crossings, no materials, tools or machinery with the potential to cause pollution will be left within the dry works area outside of working hours. This will avoid a potential pollution event in the event of water entering the dry working area overnight.
- Instream dewatered working zones, once construction is completed, will be reinstated with clean rounded river gravels of various sizes (30-100mm) and not the excavated material removed as this material will have become unstable and will release suspended solids if used for reinstatement of the watercourse bed. Alternatively, the excavated material will be cleaned and reinstated.
- No crossing of watercourses by machinery outside of the working footprint unless within the dewatered, dry working area.
- All outflows from drainage associated with construction activities will be treated through temporary settlement ponds prior to release and will be released by diffuse overland drainage at appropriate locations.
- Refuelling of machinery will take place in bunded enclosures, at a minimum of 50m away from watercourses or coastlines to prevent runoff into nearby watercourses. All machinery must carry on onboard spill kit in the event of oil/ fuel spill during all phases.
- The only exception to refuelling within 50m of a watercourse or coastline, would be plant of limited mobility, such as HDD rigs: for refuelling of these items, a small capacity double-skinned fuel bowser will be used for refuelling. Drip trays and plant nappies would be utilised to mitigate any potential spill of fuel and the refuelling process supervised both at the bowser and at the plant item.
- A complete mechanical check of all hoses and fluid reservoirs of machinery will be carried out by a competent member of the construction team before machinery arrives to site.
- A hydrocarbon oil boom will be available at working areas for immediate deployment within any watercourse in the event of any hydrocarbon spillage at the site. A fuel spillage will be considered to be any loss of fuel, oil or lubricant, including hydraulic oil and spot leakage.

- To reduce the amount of silt laden water to be treated, clean water drains will be created to divert water away from dirty water and construction areas, this will lessen the volume of water to be treated onsite.
- The extent of open excavations along the onshore cable route will be kept to a practical minimum, e.g. do not excavate the entire onshore cable route as this acts as a pathway for the mobilisation of suspended solids.
- Deposition areas for spoil will be enclosed with silt fencing to prevent mobilisation of solids during adverse weather conditions and no drainage from these areas will be directed into the temporary drainage systems. A Sustainable Urban Drainage System (SUDS) will be implemented to allow controls to be designed for the retention of large volumes of water that may arise from spoil deposition areas.
- Silt traps and fencing will be placed in working areas that have the potential to carry silt laden material from the working area to aquatic environments. Silt traps and fences will not be erected within flowing watercourses as these can act as a barrier for movement of species.
- Re-seeding of all areas of bare ground or the placement of jute matting will take place as soon as practicable to prevent run-off.
- All onsite welfare facilities will be installed and managed as per regulations to prevent nutrient overloading of aquatic environments.

Protection from HDD Operations and Frac-Out

The contractor will be required to implement the following standard practice construction methods and mitigation measures for HDD operations and frac-out:

- The contractor will implement a number of specific measures with respect to HDD operations at the landfall and the relevant crossings along the cable route, as detailed below.
- Any groundwater or rainwater that collects in the HDD drilling pit will be pumped away. Then it will be discharged through a filter medium onto the adjacent land, not directly into a waterway. This will avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water from the pit.
- The contractor and the ECoW will monitor weather conditions and will carry out daily inspections of the mud pit to ensure the volume of the mud pit does not ‘overtop’ to the surrounding land. Where required, measures such as pumping to secure containment will be used where required to prevent overtopping.
- Any bentonite, which comprises 95% water and 5% bentonite clay which is a non-toxic, natural substance, (or similar HDD drilling head lubrication material) will be handled and removed by the drilling contractor.
- In order to eliminate the migration of drilling fluids through the subsurface to waterbodies the following measures will be employed:
 - Drilling pressures will be closely monitored and not exceed those needed to penetrate the formation.
- Exit and entry points for the HDD on land (entry point for landfall HDD is on the seabed) will be enclosed by silt barriers (e.g. straw or silt fence) to prevent any runoff into surface water bodies.
 - If pressure drops during drilling or if there is a lack of returns, the drilling will stop immediately to allow an assessment of a potential leakage of drilling fluid into the surrounding formation. A leak stopping compound, such as mica, may be used to prevent the leak from migrating further into the formation. If the leak stopping compound is not successful, the drilling direction may need to change to avoid the area where the leak occurred.
- While the bentonite drilling fluid is non-toxic, if sufficient quantity enters a watercourse, it can potentially settle on the bottom, smothering benthic flora and affecting faunal feeding and breeding sites. The drilling contractor will develop a location specific HDD frac-out contingency plan, detailing measures to be taken to reduce the risk of bentonite breakout and measures to be taken for the protection of sensitive ecological receptors, should a breakout occur.

- In event of managing a breakout or frac-out on land, the following measures will be adopted:
 - Stop drilling immediately
 - Contain the bentonite by constructing a bund e.g. using sandbags
 - Recover the bentonite from the bund by pumping to a suitable container or back to the entry pit for recycling
 - If necessary, inert and non-toxic lost circulation material (mica) will be pumped into the bore profile, which will swell and plug any fissures
 - The area will be monitored closely to determine if the breakout has been sealed
 - Check and monitor mud volumes and pressures as the works recommence
- In event of managing a breakout or frac-out under water, the following measures will be adopted:
 - Stop drilling immediately
 - Pump lost circulation material (mica), which will swell and plug any fissures
 - Check and monitor mud volumes and pressures as the works recommence
 - Repeat process as necessary until the breakout has been sealed
- Any bentonite will be managed and removed by the specialist drilling contractor on completion of the operation.
- The total volume of water required is estimated to be up to 1,000m³ for each land-based HDD bore, and for the landfall, the volume of water would be approximately 4,500m³ per HDD bore. Water will be brought to site in tankers (to make up drilling fluid) for lubrication of the bore and to provide the requisite volumes of water to the compound. The water used will be non-saline and non-potable water.
- On completion of the operation the drill fluid will be disposed of to an appropriately licensed facility.

Protection of the Rogerstown Estuary SAC at Wx13.

Where an open-cut watercourse crossing method is proposed at Wx13 (Ballyboghill Stream), which flows directly into the Rogerstown Estuary SAC and SPA, no in-stream works will occur within 150m of the SAC boundary.

Full watercourse protection measures for in-stream works, as outlined in the above sections for protection of downstream water quality and watercourses will be adhered to.

Measures to mitigate against dust impacts

The contractor will be required to implement the following standard practice construction methods and mitigation measures for release of dust:

Preparing and maintaining the site

- Plan construction compound layout so that machinery and dust causing activities are located away from receptors, as far as is possible
- Erect a 2m minimum site hoarding around all construction/ contractor compounds
- Keep site fencing, barriers and scaffolding clean using wet methods
- Cover, seed or fence stockpiles to prevent wind whipping

Construction Plant Operations

- Ensure an adequate water supply on the working areas for effective dust/particulate matter suppression/mitigation

- Use enclosed chutes where possible and conveyors and covered skips
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate
- Ensure equipment and spill kits are readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place

Measures specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
- Only remove the cover in small areas during work and not all at once

Measures specific to Track-out

- Ensure no mud or debris accumulates on the public road and public roads are clean of any mud, dust or debris by suitable means. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site
- Ensure vehicles entering and leaving sites are covered when transporting materials that are likely to generate dust to prevent escape during transport
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)

Measures specific to the grid facility construction activities are:

- Dust generation and dermal exposure during site construction works will be controlled by appropriate dust control measures e.g., water sprays and appropriate personal protective equipment (PPE).
- Where the asphalt layer is removed at the grid facility site this will occur in a phased basis and will be replaced with granular hardcore as soon as possible to prevent the generation of windblown dust.

Measures to be applied at the Malahide Estuary and the Landfall site:

- Erect a 2m minimum site hoarding around the working areas adjacent to the Malahide Estuary (Estuary Road) and where works are in proximity to the North West Irish Sea cSPA.

Measures to mitigate against disturbance impacts on SCI wintering waterbirds

Mitigation measures set out in Section 36.15.1.10 for wintering waterbirds will be implemented for the protection of SCI wintering waterbirds from disturbance.

36.15.1.2 Habitats

Measures to mitigate against habitat degradation and water quality impacts on lowland depositing rivers

Standard practice construction methods and mitigation measures set out in Section 36.15.1.1 for protection of watercourses will be implemented to minimise and reduce impacts on lowland depositing rivers.

Measures to protect lowland depositing rivers from HDD Operations and Frac-Out

Standard practice construction methods and mitigation measures set out in Section 36.15.1.1 for protection from HDD operations and frac-out, will be implemented to minimise and reduce impacts on lowland depositing rivers.

Measures to mitigate against habitat loss of hedgerows and trees/treelines

Hedgerow planting to be located around the periphery of the grid facility and at Blakes Cross North will supplement existing hedgerows where appropriate. The total length of new hedgerow planting at the grid facility will be 166m. Areas of supplementary hedgerow planting at Blakes Cross North will mirror existing hedgerows within the onshore development area to create double hedgerows and total 400m. Hedgerow planting will include the following species *Alnus glutinosa*, *Prunus spinosa*, *Ilex aquifolium*, *Rubus fruticosus*, *Corylus avellana*, *Rosa canina*, *Euonymus europaeus* and *Crataegus monogyna*.

Trees and woodland will be planted around the periphery of the grid facility. This planting area will measure a total 8,325m². Tree planting will include *Alnus glutinosa*, *Betula pubescens*, *Ilex aquifolium*, *Pinus sylvestris*, *Prunus padus*, *Prunus avium* and *Quercus robur*. This planting will have an understory and shrub planting of *Prunus spinosa*, *Rosa canina* and *Euonymus europaeus*.

Replanting will be in place at the earliest opportunity after the commencement of construction works, to facilitate early establishment/growth, but will not be put at risk of accidental damage due to ongoing construction works (e.g., machinery movement, material storage).

To enhance the biodiversity potential of hedgerow and tree planting, management measures will be undertaken which are outlined under the Biodiversity Enhancement section below and are described in the Habitat and Species Management Plan (see Appendix 23.10).

Measures to mitigate against habitat degradation of hedgerows and trees/treelines

Where works are occurring in close proximity to hedgerows, temporary and permanent access tracks will not be sited within 3m from the edge of the hedgerow vegetation, unless existing tracks in such locations are being utilised. Where existing agricultural tracks are present at the landfall, and other offline locations, these tracks will be used by traffic associated with the works. No other construction works or activities will be located within 5m of the hedgerow vegetation.

Under supervision of the ECoW, where works occur within close proximity to trees, e.g. at watercourse crossing Wx22 Sluice Stream, a root protection zone will be implemented at specific locations to protect trees from indirect damage to their root network.

Measures to avoid disturbance and damage to breeding birds during vegetation removal

In order to avoid disturbance to breeding birds, their nests, eggs and/or their unflown young, as protected under the Wildlife Acts, all works involving the removal of vegetation, not just trees and hedgerows but also grassland habitat suitable for ground nesting birds, will be undertaken outside of the breeding bird nesting season (1 March to 31 August inclusive). Only where seasonal restrictions cannot be met, see measures set out in Section 36.15.1.9 to protect breeding birds.

Measures to avoid dispersal of Non-native Invasive Species

Medium and high impact invasive species such as cherry laurel, butterfly bush, rock cotoneaster and Himalayan honeysuckle were recorded within the onshore development area, mainly within hedgerows and treelines. Where these terrestrial non-native invasive species not listed on the Third Schedule are present, vegetation will be removed and will be disposed of appropriately. Cherry laurel occurs in several hedgerows within the onshore development area and is a high impact invasive species in Ireland. Methods of removal include chemical treatment by a licensed contractor, or mechanical/physical treatment. Any invasive species plant material that is removed will be disposed of at an appropriate licenced waste facilitator.

See Appendix 23.10 Habitat and Species Management Plan for prescriptive detail on invasives species management methods and treatment.

Pre-construction surveys will be undertaken along the onshore cable route, at each offline section, and where works are proposed in close proximity to recorded of non-native invasive species. Appropriate avoidance and treatment measures will be taken if there is a risk of encountering non-native invasive species, with attention to Third Schedule species.

While Himalayan balsam does not occur within the onshore development area. Treatment measures including methods of mechanical/physical or chemical² for Himalayan balsam are included in the Habitat and Species Management Plan (Appendix 23.10).

36.15.1.3 *Habitat Enhancement*

No likely significant effects have been identified as a result of the construction phase on grassland habitats. While mitigation measures are therefore not required to reduce a likely significant effect, the below habitat enhancement measures will ensure habitat enhancement at the grid facility and Blakes Cross North is maximised through careful consideration of the planting scheme. The following biodiversity planting has been proposed and will be managed as outlined here and in Appendix 23.10 Habitat and Species Management Plan, to maximise its biodiversity potential for the widest range of species.

Natural reseeding method for semi-natural grasslands

Reseeding of grassland habitats will be implemented using hay transfer. This is an effective near-natural solution for grassland restoration³ which avoids importing a seed mix and instead utilises the existing seed bank and seed resource. Adjacent, or nearby, grassland similar to the grassland that is being removed will be cut when grasses and flowering plants are in seed. These cuttings will be laid over the reinstated bare ground for natural colonisation. This method will be used, but not limited to, the following scenarios: at the margins of arable and agricultural grassland fields, at field boundaries where drainage ditches and hedgerows are crossed, at watercourse riparian edges if HDD has not been used and at temporary compound locations where semi-natural grassland is present.

See Appendix 23.10 Habitat and Species Management Plan for prescriptive details on reseeding methods.

Habitat enhancement for semi-natural grasslands

A species rich grassland mix will be used in appropriate grassland areas of the grid facility in an area of 33,483m². At Blakes Cross North an additional area of species rich grassland will be sown, measuring 5,500m².

The species rich grassland seed mix will include the species as listed, or a similar native grassland seed mix: *Festuca pratensis*, *Festuca ovina*, *Lolium perenne* L., *Festuca rubra*, *Festuca rubra* subsp. *Communtate*, *Poa pratensis*, *Poa trivialis*, *Alopecurus pratensis*, *Phelum pratense*, *Plantago lanceolata*, *Prunella vulgaris*, *Achillea millefolium*, *Daucus carota*, *Leucanthemum vulgare*, *Galium verum*, *Rumex acetosella*, *Lotus corniculatus*, *Rhinanthus minor*, *Trifolium repens* and *Trifolium pratense*, *Centaurea nigra*, *Hypochoeris radicata*, *Anthriscus sylvestris*, *Vicia sepium*, *Lathyrus pratensis*, *Conopodium majus*.

In addition, the attenuation basin in the grid facility, which will be infrequently wet depending on rainfall levels, will be planted with a riparian grass and herb mix. The planted area will measure a total area of 6,411m². This species rich grassland mix will include important food plants for the butterflies and invertebrates and will benefit foraging bats and birds. This riparian grass and herb mix will include the following species as listed, or a similar native species mix: *Juncus effusus*, *Ranunculus peltatus*, *Sagittaria sagittifolia*, *Potamogeton natans*, *Mentha aquatica*, *Ceratophyllum demersum*, *Glyceria maxima*, *Hydrocharis morus-rane*, *Sparganium erectum*, *Berula eracta*, *Filipendula ulmaria*, *Callitriche platycarpa*, *Lychnis flos-cuculi*, *Myosotis scorpiodes*, *Iris psedudacorus*, *Alisma plantago-aquatica*, *Althaea officinalis*, *Berula eracta*, *Filipendula ulmaria*, *Mentha aquatica*, *Glyceria fluitans*, *Lychnis flos-cuculi*, *Myosotis scorpiodes*, *Iris psedudacorus*, *Alisma plantago-aquatica*, *Althaea officinalis*.

Areas of seeded grassland will be managed through a once or twice annual mowing regime, whereby mowing is undertaken outside of the breeding bird period (1 March to 31 August). Cuttings will be removed from the site after each mow. Strips will also be left unmown with seed heads intact for the winter period providing a winter food resource for birds.

² Invasive Species Ireland. Best Practice Management Guidelines for Himalayan Balsam (*Impatiens glandulifera*). Available at: <https://invasivespeciesireland.com/wp-content/uploads/2012/01/Himalayan-Balsam-BPM.pdf> [Accessed February 2023]

³ Orsolya Valko, O., Radai, Z. and Deak, B. (2022) Hay transfer is a nature-based and sustainable solution for restoring grassland biodiversity. *Journal of Environmental Management* Vol. 311

Insecticides and herbicides will not be used to manage habitats, with the exception of the treatment of non-native invasive species.

See Appendix 23.10 Habitat and Species Management Plan for details on management of grassland to enhance the biodiversity potential.

Habitat enhancement for hedgerow and trees

Hedgerow planting will be located around the periphery of the grid facility and at Blakes Cross North, which will supplement existing hedgerows where appropriate. The total length of new hedgerow planting at the grid facility will measure a distance of 166m. Areas of supplementary hedgerow planting at Blakes Cross North will mirror existing hedgerows within the onshore development area to create double hedgerows and total 400m. Hedgerow planting will include the following species *Alnus glutinosa*, *Prunus spinosa*, *Ilex aquifolium*, *Rubus fruticosus*, *Corylus avellana*, *Rosa canina*, *Euonymus europaeus* and *Crataegus monogyna*.

Trees and woodland will be planted around the periphery of the grid. This planting area will measure a total 8,325m². Tree planting will include *Alnus glutinosa*, *Betula pubescens*, *Ilex aquifolium*, *Pinus sylvestris*, *Prunus padus*, *Prunus avium* and *Quercus robur*. This planting will have an understory and shrub planting of *Prunus spinosa*, *Rosa canina* and *Euonymus europaeus*.

Leaf litter and fallen branches will not be removed from the understory of the woodland to create habitat for invertebrates, which will also be utilised by mammals.

Insecticides and herbicides will not be used to manage habitats, with the exception of treatment of non-native invasive species.

See Appendix 23.10 Habitat and Species Management Plan for details on management of hedgerows and tree planting to enhance the biodiversity potential.

36.15.1.4 Annex 1 Habitats

Mitigation measure to ensure protection of Annex I habitats at the landfall site

An exclusion zone of 50m will be implemented at the coastline to ensure there is no accidental damage or unnecessary trampling of these sensitive habitats. Demarcation of the exclusion zone will be implemented at the landward side of the landfall site, and the seaward side if necessary. No works will occur within this exclusion zone.

36.15.1.5 Terrestrial Mammals

Mitigation measure to ensure protection of badger setts from disturbance

While no badger setts were confirmed within the onshore development area during baseline ecological surveys, as mammals are mobile species and can move into new areas over time, pre-construction surveys for badger will be undertaken at offline sections which contain suitable habitat for setts.

For any setts identified during pre-construction surveys within 150m of the onshore development area, monitoring will be undertaken using trail cameras to confirm the status of the sett in line with NRA (2006a) guidelines. If any sett occurring within 150m is confirmed to be a breeding sett, no works will occur within 50m of the sett during the badger breeding period (1 December to 30 June). A 50m exclusion zone will be implemented and demarcated to ensure protection of any sett occurring within 50m from disturbance during the construction phase. Additionally, if any sett is confirmed to be a breeding sett no piling or blasting will occur within a 150m exclusion zone during the breeding period (1 December to 30 June).

36.15.1.6 Otter

Mitigation measure to ensure protection of otter from disturbance

No evidence of otter was recorded within the ecological study area. However, given their mobile nature pre-construction surveys will be undertaken at watercourse crossing and at the landfall site where suitable habitat for otter is present to ensure no holts or resting places occupy the works area and 150m either side of the works area. Pre-construction surveys for otter will be undertaken in line with NRA guidelines (2008).

Mitigation measure to ensure protection of otter from lighting impacts

Artificial lighting associated with construction activities and placed at the landfall site and at watercourse crossings will be of a design that limits light spill beyond the working areas. The ECoW will be consulted to ensure that lighting at the construction compounds and in active working areas, which are in close proximity to watercourses and the landfall site, will minimise light spill on habitats used by otter.

Some, or all, of the below mitigation measures will be employed to reduce light spill where necessary:

- The use of sensor / timer triggered lighting.
- LED luminaires to be used where practicable due to their sharp cut-off, lower intensity, good colour rendition and dimming capability.
- Column heights to be considered to minimise light spill.
- Accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only where needed; and
- Where night-time works are required, the appointed contractor will liaise with the engaged suitably experienced and qualified ecologist(s) and implement measures to mitigate the impact of such works on otter.

Mitigation measures to ensure protection of otter from water quality impacts

Mitigation measures set out in Section 36.15.1.1 for protection of downstream water quality will be implemented for the protection of otter from water quality impacts.

36.15.1.7 Amphibian & Reptiles

Mitigation measure to ensure protection of amphibians from habitat loss

No evidence of amphibians was recorded within the ecological study area. However, given their mobile nature, for works occurring in suitable breeding habitat for amphibians during the period February to March, pre-construction surveys will be undertaken to avoid mortality to breeding common frog or smooth newt. If either are confirmed to breed within the onshore development area, consultation with the NPWS will be undertaken and if deemed necessary a translocation licence application will be submitted.

Mitigation measures to ensure protection of amphibians from water quality impacts

Standard practice construction methods and mitigation measures set out in Section 36.15.1.1 for protection of downstream water quality will be implemented for the protection of amphibians from water quality impacts.

36.15.1.8 Bats

Mitigation measures to ensure protection of bats from lighting impacts

Floodlighting associated with construction activities will be of a design that limits light spill beyond the working areas. The ECoW will be consulted to ensure that lighting at the construction compounds and in active working areas, which are in close proximity to watercourses, hedgerows and treelines, and the landfall site, will be designed to minimise light spill onto habitats used by bats reducing any impacts to foraging or commuting bats.

Some, or all, of the below mitigation measures will be employed to reduce light spill where necessary:

- The use of sensor / timer triggered lighting
- LED luminaires to be used where practicable due to their sharp cut-off, lower intensity, good colour rendition and dimming capability
- Column heights to be considered to minimise light spill
- Accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only where needed
- Where night-time works are required, the appointed contractor will liaise with the engaged suitably experienced and qualified ecologist(s) to implement the measures outlined in the above bullet points to mitigate the impact of such works on bats

Mitigation measures to ensure protection of bats from loss of roosts

No tree roosts were confirmed during surveys within the ecological study area. Where practicable, tree removal, especially of trees that have been identified as Potential Roost Features (PRFs), will be avoided through micro-siting of the cable route and in consultation with the ECoW.

Where avoidance is not practicable, prior to removal of PRF trees, all trees that were confirmed as having potential for roosting bats will be re-examined immediately prior to their removal to assess whether bats are present. Pre-construction surveys will be undertaken as set out below:

- Low suitability trees will be subject to a visual inspection at height using an endoscope. If no bats are confirmed to use the tree it will be felled on the same day using sectional felling or soft felling technique. Limbs and tree sections will be left *in situ* on the ground for at least 24 hours before they are processed, to allow any bats to fly out.
- Trees of moderate suitability or higher will be subject to a roost emergence and re-entry survey to confirm there are no bats using the tree prior to felling. If no bats are found to use the tree, it will be felled on the same day using sectional felling or soft felling technique. Limbs and tree sections will be left *in situ* on the ground for at least 24 hours before they are processed, to allow any bats to fly out.
- For trees identified as having moderate PRF suitability, which could be used as a maternity roost, these will be felled during the period March-April and/or October-early November which is outside the maternity season and when bats are capable of flight.
- For trees identified as having low PRF suitability, subject to visual inspection as outlined above, these trees can be felled during the period March to early November as there is an unlikely risk of these features having suitability to hold a maternity roost.
- To minimise habitat loss due to the removal of PRF trees and areas of treeline, bat boxes to the specification of a woodcrete box intended for bats that normally reside in tree cavities⁴, or similar, will be installed in appropriate locations within lands under the control of the applicant, including lands at the grid facility and Blakes Cross North. A variety of types of bat boxes will be erected to provide bats with alternatives and a variety of conditions. Bat boxes will be installed by a suitably qualified ecologist, or the project ECoW.

⁴ An example of such a box is 'The Convex Bat Box is a woodcrete box intended for bats that normally reside in tree cavities, it has two access options, one at the front and one at the bottom allowing bats to land on the tree and crawl inside.' Available at: <https://www.wildcare.co.uk/convex-bat-box.html>

Mitigation measures to ensure protection of breeding birds from disturbance

In order to avoid disturbance of breeding birds, their nests, eggs and/or their unflown young, as protected under the Wildlife Acts, all works involving the removal of vegetation within the onshore development area, not just trees and hedgerows but also grassland habitat suitable for ground nesting birds, will be undertaken outside of the breeding bird nesting season (1 March to 31 August inclusive).

Only where this seasonal restriction cannot be observed, a breeding bird survey will be undertaken during the appropriate survey season (between early March and late June, and as late as August for late nesting birds) by an ecologist with experience undertaking breeding bird surveys in order to confirm whether birds are nesting within suitable habitat affected by or immediately adjacent to. Where nesting birds are encountered during surveys, the removal of trees, hedgerows or suitable grassland habitat will be delayed until after the nesting season (1 March to 31 August inclusive).

Mitigation measures to ensure protection of yellowhammer from habitat loss

Habitat enhancement at the grid facility for yellowhammer will include a suitable nesting habitat, summer food resource and winter food resource. Nesting habitat will include new hedgerow planting and supplementary planting at existing periphery hedgerows with an adjacent grassland margin which will be under a minimal management regime. A pollinator/wildflower grass mix will support invertebrate populations and provide a summer food resource for yellowhammer. Unmown grass strips will be left with seed heads intact for the winter period providing a food resource for yellowhammer.

At Blakes Cross North, hedgerow enhancement for yellowhammer will consist of planting a double hedgerow immediately adjacent to existing hedgerows.

Hedgerows and marginal grassland will not be cut during the breeding bird season (1 March to 31 August inclusive). Only where this seasonal restriction cannot be observed, a thorough breeding bird survey and nest check will be undertaken by an ecologist with experience undertaking breeding bird surveys in order to confirm the presence of breeding yellowhammer within suitable habitat affected by or immediately adjacent to vegetation removal. Where displaying yellowhammer or nesting birds are encountered during surveys, the removal of trees, hedgerows or suitable grassland habitat will be delayed until after the nesting season (1 March to 31 August inclusive). Yellowhammer can breed late in the season so the delay until after period must be strictly adhered to.

See Appendix 23.10 of Volume 10 of EIAR - Habitat and Species Management Plan for details on management of habitats for yellowhammer.

Mitigation measures to ensure protection of meadow pipit from habitat loss

Habitat enhancement at the grid facility will provide a summer and winter food resource for meadow pipits. As meadow pipits are ground nesting birds, grassland margins and semi-natural grassland planting at the grid facility and Blakes Cross North managed under a minimal management regime, will develop into suitable nesting habitat in the form of grassland tussocks. A pollinator/wildflower grass mix will support invertebrate populations and provide a summer food resource for meadow pipit. Unmown grass strips will be left with seed heads intact for the winter period providing a food resource.

Grassland will not be cut during the breeding bird season (1 March to 31 August inclusive). Only where this seasonal restriction cannot be observed, a thorough breeding bird survey and nest check will be undertaken by an ecologist with experience undertaking breeding bird surveys in order to confirm the presence of breeding meadow pipit within suitable habitat affected by or immediately adjacent to the area of vegetation removal. Where displaying meadow pipit or nesting birds are encountered during surveys, the removal of suitable grassland habitat will be delayed until after the nesting season (1 March to 31 August inclusive).

See Appendix 23.10 Habitat and Species Management Plan for details on management of habitats for meadow pipit.

36.15.1.10 Wintering Waterbirds

Mitigation measures to ensure protection of wintering waterbirds from lighting impacts

Construction lighting used during months August to March will be reviewed by the project ECoW. Construction lighting in areas at the landfall site and Malahide Estuary will be kept to a minimum where practicable and will be directed away from habitats utilised by wintering waterbirds to minimise light spill and avoid disturbance.

Some, or all, of the below mitigation measures will be employed to reduce light spill where necessary

- The use of sensor / timer triggered lighting
- LED luminaires to be used where practicable due to their sharp cut-off, lower intensity, good colour rendition and dimming capability
- Column heights to be considered to minimise light spill
- Accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only where needed
- Where night-time works are required, the appointed contractor will liaise with the ECoW and implement measures outlined in the bullet points above to mitigate the impact of such works on wintering birds

Mitigation measures to avoid disturbance impacts on wintering waterbirds

At the landfall site, the HDD compounds near the shoreline will have noise barriers on the northerly, easterly and southerly perimeters, to reduce noise levels in these directions.

At Malahide Estuary, the first measure will be to avoid works along the Estuary Road during the period September to March when wintering birds are present.

Where this is not practicable, for works at Malahide Estuary during the period September to March, noise barriers will line the works area within the Estuary Road on the estuary side to protect wintering waterbirds utilising the nearest estuarine habitats.

In addition, the temporary noise barriers at the landfall site and at Malahide Estuary along the Estuary Road will act as a visual barrier and reduce disturbance impacts and potential likely effects on wintering waterbirds.

An ECoW will be present during all works along the Estuary Road.

Toolbox talks will be delivered by the appointed ECoW to all construction staff on the sensitivity of wintering waterbirds at the landfall site and at Malahide Estuary.

Mitigation measures to ensure protection of wintering waterbirds from water quality impacts

Standard practice construction methods and mitigation measures set out in Section 36.15.1.1 1 for protection of downstream water quality will be implemented for the protection of wintering waterbirds from water quality impacts.

36.15.1.11 Aquatic & Fisheries

Measures to mitigation against impacts on watercourses

Standard practice construction methods and mitigation measures set out in Section 36.15.1.1 and 36.15.1.4, for the protection of lowland depositing rivers and downstream water quality, will be implemented for the protection of aquatic features and fisheries.

Measures to protect from HDD Operations and Frac-Out

Standard practice construction methods and mitigation measures set out in Section 36.15.1.1 for protection of downstream water quality, including protection from HDD operations and frac-out, will be implemented for the protection of aquatic features and fisheries from water quality impacts.

Measures to protect fish and aquatic species during instream works

- The contractor will be required to implement the following standard practice construction methods and mitigation measures for in-stream works:
- All personnel must ensure strict bio-security measures are employed prior to any contact of equipment with the aquatic environment, as per Inland Fisheries Ireland (IFI) guidance⁵ and detailed below. On completion of work in freshwater habitats the following procedures will be undertaken (where relevant).
- Visual inspection of all equipment that has come in to contact with water for evidence of attached plant or animal material or other substances.
- Removal of any identified plant or animal material or other substances before leaving the operation site.
- Ensure that all water will be drained from boats and other water retaining equipment before transportation elsewhere.
- High-pressure steam cleaning with water >40 degrees C will be undertaken on all boats and associated equipment (this facility is available at a number of roadside garages). After this cleaning, a further visual inspection will be undertaken. Disinfectant will be applied to the undercarriage and wheels of the vehicle and trailer after this cleaning has taken place.
- Any wet or live wells and other retaining compartments in survey boats will be cleaned with a 1% solution of Virkon Aquatic or another proprietary disinfection product and rinsed with water.
- Outboard motors will be flushed with a 1% solution of Virkon Aquatic or another proprietary disinfection product, or with water > 40 degrees C.
- Nets (to include monofilament and braided gill nets, fyke nets and seine nets) will be cleaned of all vegetation and debris before returning to base. The clean nets will be placed in a freezer for a period of four days (3 days will suffice for monofilament nets). Following this treatment, the nets will be soaked in a 1% solution of Virkon Aquatic or a proprietary disinfectant for a period of not less than 15 minutes and thoroughly rinsed thereafter.
- Footwear will be dipped in or scrubbed with a disinfectant solution (e.g. 1% solution of Virkon Aquatic or another proprietary disinfection product) and thoroughly dried afterwards.
- All personal protective equipment (PPE) will be visually inspected, and any attached vegetation or debris removed. Where appropriate, the gear will be wiped down with a cloth soaked in 1% solution of Virkon Aquatic or another proprietary disinfection product.
- Sampling equipment (e.g. electrofishing electrodes and cable, grab samplers, meter sticks, buckets and bins, etc.) will be cleaned, rinsed or wiped down with or dipped in a suitable disinfectant solution.
- Landing nets and hand nets will be dipped in disinfectant solution and rinsed in clean water.
- Once the dams are constructed for the creation of any instream working areas, translocation of any fish trapped within the dammed channel will take place before total dewatering of the works area starts. If the area is too deep for electrofishing, then dewatering will begin in a controlled manner to reach a preferred water height where electrofishing can take place. Translocation of fish will be through the method of electrofishing by a competent operator and the placement of captured fish will be upstream of the works.

⁵ Available at: https://www.fisheriesireland.ie/sites/default/files/2021-06/research_biosecurity_biosecurity_for_fieldsurveys_2010.pdf [Accessed January 2023]

Electrofishing will be conducted under an authorisation under Section 14 of the Fisheries (Consolidation) Act 1959 from the Department of Communications, Climate Change, and the Environment. This method will mitigate against direct impacts on fish species within this area.

- If any dammed dry working area becomes inundated with flood waters due to dam breaches during flood conditions, then the method of fish removal through electrofishing will recommence before full dewatering take place.
- If crayfish are encountered within any dry working area, then they will be removed by a licensed ecologist outside of the working zone to prevent direct impacts on this species.
- All pumps will have a mesh cover over the intake to prevent fish from entering the pump during dewatering processes thus preventing direct impacts on fish species.
- Mitigation measures set out in Section 36.15.1.1 for protection of downstream water quality will be implemented for the protection of aquatic features and fisheries from water quality impacts.

36.15.2 Operational Phase

No likely significant effects have been identified as a result of the operational phase of the onshore infrastructure of the proposed development. While mitigation measures are therefore not required to reduce a likely significant effect, the below management and monitoring of habitat enhancement areas will ensure the full biodiversity potential is reached in these areas at the landfall site and Blakes Cross North.

36.15.2.1 Habitat management

Areas of seeded species rich grassland at the grid facility and Blakes Cross North will be managed through an annual mowing regime, whereby mowing is undertaken outside of the period March to August. Cuttings will be removed from the grassland after each mow. Strips of unmown flowering plants and seed heads in the species rich grassland areas will retain their seed heads throughout the winter and provide a valuable food resource for birds throughout the year especially during the winter months when food is limited.

No vegetation will be cut during the breeding bird season (1 March to 31 August).

Leaf litter and fallen branches will not be removed from the understory of the woodland to create habitat for invertebrates, which will also be utilised by mammals.

Insecticides and herbicides will not be used to manage habitats, with the exception of treatment of non-native invasive species.

See Appendix 23.10 Habitat and Species Management Plan for details of the operational management of habitats at the grid facility and Blakes Cross North to enhance the biodiversity potential.

36.15.2.2 Monitoring

Monitoring the success of establishment of reseeded grassland habitats and replanted hedgerows and trees at the grid facility and Blakes Cross North will be undertaken in Years 1, 2, 3 and 5 post planting. Reporting in monitoring years will include any remedial action required to achieve mitigation measures and biodiversity enhancement aims.

Any remedial action identified the grid facility and Blakes Cross North (which may include replacement of planted species or reseeded/stabilising of ground), will be undertaken at an appropriate time within one year of the monitoring visit.

See Appendix 23.10 Habitat and Species Management Plan for details of the monitoring schedule of habitats at the grid facility and Blakes Cross North.

36.15.3 Decommissioning Phase

Mitigation measures, described above for the construction phase and which are relevant to decommissioning, updated to reflect good practice at the time, will be implemented for the decommissioning phase.

36.16 Traffic and Transportation Mitigation and Monitoring Measures

36.16.1 Construction Phase

36.16.1.1 *Embedded mitigation measures*

The following mitigation measures are embedded in the construction strategy, as detailed in Section 24.4.2 of Volume 4, Chapter 24: Traffic and Transportation (hereafter referred to as the ‘Traffic and Transportation Chapter’):

- The duration and sequencing of construction activities at the landfall and grid facility area
- The duration and sequencing of construction activities along the onshore cable route
- The identification of appropriate primary construction compound delivery routes
- Provision of adequate parking at all compounds to avoid queuing at the site entrances and prevent disruption to neighbouring businesses and residences
- The identification of local diversion routes where partial road closures will be operational
- The direction of traffic to strategic diversion routes where full road closures will be operational.
- The identification of local diversion routes where full road closures will be operational
- The identification of bus diversion routes and bus stop relocations where full road closures will be operational
- Bus prioritisation in the case of partial road closures
- Local property access will be maintained for car, active travel, and service vehicles throughout construction
- The identification of delivery routes for abnormal loads
- Abnormal load deliveries restricted to outside peak traffic times where practicable
- Designated areas within the compounds for abnormal load unloading
- The use of the HDD technique for the Dublin-Belfast railway crossing, to avoid any disruption to railway infrastructure and the rail services between Dublin-Belfast and Dublin-Drogheda/Dundalk.
- The use of the HDD technique for the M1 motorway crossing, to avoid any disruption to the national road network

The primary construction compound delivery route to the landfall site and grid facility will be via Junction 7 on the M1 along the R132, as shown on Figure 24.2. Construction traffic related to the construction of the compounds at the landfall and grid facility area will be directed to avoid the alternative route (R122 and Harry Reynolds Road) through Balbriggan town centre.

The use of the HDD technique to route the onshore export cables under the Dublin to Belfast railway and under the M1 Motorway will avoid any disruption to railway infrastructure and the rail services between Dublin-Belfast and Dublin-Drogheda/Dundalk, and to users of the M1 Motorway.

Vehicles accessing the Blakes Cross cable contractor compound will be restricted to the primary construction compound delivery route. Vehicular access to the remaining site contractor compounds and working areas will be restricted to the construction traffic access routes along the onshore cable route.

The primary construction compound delivery routes and the construction traffic access routes along the onshore cable route are shown on Figure 24.2 of Volume 7A of the EIAR.

In order to limit the construction impact in Balbriggan, construction activities related to the onshore cable route itself will be restricted to the R122 and Harry Reynolds Road only.

The full road closures have been identified along narrower roads where the construction width is limited and where it would not be possible to lay the cable while safely maintaining partial traffic flows. In the case of full road closures local property access will still be maintained for car, active travel (pedestrians and cyclists) and service/emergency vehicles throughout, through the contractor's implementation of safe traffic management measures. Local diversion routes have been identified to maintain local community accessibility by car and active modes (See Appendix 24.1 in Volume 11 of the EIAR which provides details on full and partial road closure diversion routes). Strategic diversion routes have also been identified to mitigate the impact on local roads and will be recommended for general 'through' traffic where possible (See Appendix 24.1 in Volume 11). Bus diversion routes and bus stop relocations have been identified to ensure access to bus services is reasonably maintained where possible (See Appendix 24.1 in Volume 11). The strategic diversion routes will limit the volume of diverted general 'through' traffic along the bus diversion routes.

There will also be rolling temporary partial (single lane) closures (each approximately 200 - 300m in length) throughout the remaining onshore cable route sections along the public road network. For temporary partial road closures, traffic flow will be maintained with the use of rolling temporary stop/go traffic signals along each section. Local diversion routes have been identified that will alleviate congestion along the corridor (See Appendix 24.1 in Volume 11). Local property access will be maintained for car, active travel and service/emergency vehicles throughout. Buses will be prioritised at stop/go locations where possible. Strategic diversion routes are not proposed for these partial closure locations.

Diversion routes will be managed according to the Contractor's Construction Traffic Management Plan (CTMP), refer to further details on the CTMP below.

As outlined above, those living along the road closure section will be able to access their properties throughout the road closure.

Abnormal load deliveries will be routed to the grid facility via the M1 junction 7 and along the R132 as shown on Figure 24.2. The cable drums will be delivered to the cable contractor compounds on specialist low loader vehicles. They will be routed to either the Bremore cable contractor compound via the M1 junction 7 and the R132, or to the Blakes Cross cable contractor compound via the M1 junction 4 and the R132. During the construction of the onshore cable route, cable drums of typical dimensions 3.7m wide, by 3.7m long and 4m high will then be transported along the onshore cable route on specialist low loader vehicles. The delivery routes are displayed on Figure 24.2 of Volume 7A of the EIAR.

The Contractor will confirm this prior to the first abnormal load deliveries and provide all details in the Contractor Construction Traffic Management Plan (CTMP). This version of the CTMP will update and further develop the CTMP which has been prepared and included in the Onshore Construction Environmental Management Plan (Onshore CEMP), refer to Volume 8, Appendix 9.1. Within the Contractor CTMP the contractor will also detail any traffic management associated with abnormal load deliveries and how they will adhere to all applicable permitting and approvals requirements with the Local Authority and An Garda Síochána prior to starting construction.

The transportation of abnormal loads will be restricted to outside peak traffic times where practicable.

All access roads to the proposed compounds will be designed to ensure abnormal loads can exit the public road during delivery with minimal disruption to the public road. A designated route and parking area for abnormal loads will be provided within the confines of the proposed compound for unloading, which will be detailed in the Contractors CTMP. Additionally, the Contractor CTMP will detail the temporary traffic management to be implemented during abnormal load deliveries, such as temporary stop/go lane or road closures, escort vehicles, banksman, etc., to be agreed by the contractor with the local authority and An Garda Síochána prior to starting construction.

36.16.1.2 Additional mitigation measures

Construction Traffic Management Plan (CTMP)

A Construction Traffic Management Plan (CTMP) has been prepared and is included in the Onshore CEMP (refer to Appendix 9.1 in Volume 8).

Following consultation with An Garda Síochána, Fingal County Council and Dublin City Council, the CTMP will be further developed by the contractor, prior to the commencement of construction, to ensure that construction traffic will be managed and monitored safely and efficiently throughout the construction phase.

The following traffic management measures will be incorporated into the Contractor's CTMP during the construction stage of the proposed development:

- Deliveries of materials will be planned and programmed to ensure that the materials are delivered to the extent possible, only as they are required at the compounds and along the onshore cable route and will avoid peak hours for set-up and removal of equipment where practicable.
- Works requiring multiple vehicle deliveries will be planned so as to ensure that queuing on the public roadways will be avoided wherever possible, around the compounds, at the compounds and along the onshore cable route section.
- For any works related to the compounds or onshore cable route that require lane closures, the length of lane closure and the required working area will be kept as small as possible.
- All trucks entering and exiting the compounds and along the onshore cable route which are carrying materials which could become windborne will be covered with tarpaulin.
- No parking or queuing of trucks will be allowed on public roads, either outside the compounds or any of the approach roads leading to the compounds or along the cable route, save during delivery/collection of materials (short term periods).
- All trucks entering the compounds will be restricted to suitable speed limits and will be directed to the relevant area by the site manager.
- All trucks will avoid school areas at drop off and collection times.
- Roads immediately adjacent to the compounds will be visually inspected on a daily basis and power swept and washed as and when required.
- Site entrance gates will be set back from the main road to allow a vehicle to pull in off the road before the gate is opened.
- The contractor will be required to inspect the delivery routes to identify any issues and propose remedial measures as part of the permitting requirements for abnormal loads. This should include a detailed swept path analyses for the contractor's specific vehicle type and weight (dimensions to be confirmed) to ensure that the specific abnormal load can be transported safely.
- Temporary traffic arrangements will be in place to accommodate wide turning circles at compound access points, such as stop/go road closures or equivalent arrangements to maintain local access and safely accommodate through traffic.
- Road Safety Audits (stage 2/3) will be carried prior to construction and additional interim Road Safety Audits can be prepared ahead of and during construction as part of the Contractor's CTMP, and final RSA (stage 4) will be completed post-construction.
- The Contractor's CTMP will be agreed with the relevant local authorities and An Garda Síochána.
- The effectiveness of the CTMP will be continually monitored by the Contractor to ensure the effects on traffic flows on the surrounding road network are minimised. The monitoring regime will consider all modes of traffic including pedestrians, cyclists, and car parking provision.

Minimising durations of full road closures

Due to the potential negative, significant, temporary impact of the full road closures on local diversion route operations, strategic diversion route operations and bus services it is proposed to limit the duration of full road closures by assigning multiple construction crews to route sections along the length of the cable route, as an additional mitigation measure. The addition of multiple crews working simultaneously will add to the efficiency of the construction work.

By incorporating this additional mitigation measure the duration of full road closures will be limited to between 1 and 4 weeks, depending on the route section (refer to Table 36.16).

Table 36.16 Approximate Road Closure Durations

Route Section	Mitigation Measure	Road Impacted
1	2 crews will reduce the duration of full road closures from 2-3 weeks to 1 to 2 weeks.	R132 (north of Balbriggan)
10.1	2 crews will reduce the duration of full road closures from 5-6 weeks to 2-3 weeks.	Estuary Road
10.2	3 crews will reduce the duration of full road closures from 11-12 weeks to 3-4 weeks.	Estuary Road
12	2 crews will reduce the duration of full road closures from 6-7 weeks to 3-4 weeks.	R106 Swords Road
13	3 crews will reduce the duration of full road closures from 10-11 weeks to 3-4 weeks.	R107 Malahide Road
14 B.1	3 crews will reduce the duration of full road closures from 6-7 weeks to 2-3 weeks.	Chapel Road
14 B.2	3 crews will reduce the duration of full road closures from 7-8 weeks to 2-3 weeks.	R124 Drumnigh Road
14 B.3	3 crews will reduce the duration of full road closures from 1-2 weeks to less than 1 week.	Balgriffin Park

Diverting Bus Services (currently operating along proposed partial road closures)

Bus services will be prioritised at stop/go lane closures along partial road closures, however, could potentially still incur significant delays along heavily trafficked routes. Due to the potential negative, significant, temporary impact of the partial road closures on bus services it is proposed to reduce the likelihood of bus services incurring delays by diverting bus services currently operating along proposed partial road closures towards local diversion routes, as an additional mitigation measure. The appropriate bus route or local diversion route is to be determined the operator.

36.16.2 Operational Phase

As there are no significant operational effects associated with the proposed development no mitigation measures are required for the operational phase.

36.16.3 Decommissioning Phase

The mitigation measures, described above for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase.

36.17 Onshore Archaeology, Architectural and Cultural Heritage Mitigation and Monitoring Measures

36.17.1 Construction Phase

36.17.1.1 Landfall Site

It is acknowledged that the preservation in-situ of archaeological remains is the preferred method in which to conserve the archaeological resource. To that end, every effort will be made during detailed design to avoid directly effecting the identified archaeological areas within the landfall site (AA5, 6, 7, 8, 9, 10, 11).

Following detailed design, a further programme of archaeological test trenching will be carried out within the refined development footprint with the aim of identifying any smaller archaeological remains that may survive within the onshore development area, which were not identified during geophysical survey or the first phase of archaeological testing.

If it is not possible to avoid direct impacts on the archaeological resource, the archaeological remains will be preserved by record prior to the commencement of construction. This will be carried out under licence, as issued by the National Monuments Service of the Department of Housing, Local Government and Heritage (DoHLGH). Full provision, within the programme of works, will be made for the resolution of any archaeological remains, both on site and during the post excavation process.

36.17.1.2 Grid Facility

It is acknowledged that the preservation in-situ of archaeological remains is the preferred method in which to conserve the archaeological resource. The location of the grid facility includes the identified archaeological areas AA1, 2, 3, 4 and CH01 but potential impacts on these sites could not be avoided by the footprint of the required infrastructure.

A further programme of archaeological test trenching will be carried out within the refined development footprint with the aim of identifying smaller archaeological remains that may survive within the development area, which were not identified during geophysical survey or the first phase of archaeological testing.

If it is not possible to avoid direct impacts on the archaeological resource, the archaeological remains will be preserved by record prior to the commencement of construction. This will be carried out under licence, as issued by the National Monuments Service of the DoHLGH. Full provision, within the programme of works, will be made for the resolution of any archaeological remains, both on site and during the post excavation process.

36.17.1.3 Onshore cable route

Table 36.17 details the mitigation measures that will be carried out prior to construction in order to reduce or remove potential impacts.

Table 36.17 Onshore Archaeology, Architectural and Cultural Heritage mitigation measures as part of the onshore cable route

Ref.:	Description	Mitigation
AAP04	Watercourse and townland boundary.	Should the construction of the cable impact on the channel or banks of the watercourse (if offline open cut is required), an archaeological wade survey will be carried out in advance. This will be carried out under licence as issued by the DoHLGH.
CH04	Site of structures associated with Ballough	Should the onshore cable route be laid through CH04, the excavation of the trench will be subject to archaeological monitoring, carried out by a suitably qualified archaeologist contracted by the developer, under licence, as issued by the DoHLGH.
BH06	Milestone (not located during field inspection)	It is possible that this small item of roadside furniture has been removed. Further inspection, including the removal of vegetation, will be carried out. If the milestone is located, it will be hoarded off and protected during construction works in order to preserve the feature in-situ.
BH10	Milestone	The milestone will be hoarded off and protected during construction works in order to preserve the feature in-situ.
CH23	Site of post medieval structures	This is a greenfield area, which will be subject to a programme of geophysical survey and archaeological testing prior to the commencement of construction. This will be carried out under licence as issued by the DoHLGH.
AAP07	Watercourse	Should the construction of the cable impact on the channel or banks of the watercourse (if offline open cut is required), an archaeological wade survey will be carried out in advance. This will be carried out under licence as issued by the DoHLGH.
BH12	Daws Bridge	Should inline HDD be required to lay the cable beneath Daws Bridge, detailed design will be subject to assessment and supervision of a Grade 1 Conservation Architect. Archaeological monitoring may be also required for the works. Any archaeological works will be carried out under licence as issued by the DoHLGH.
CH37	Three anomalies of archaeological potential (Google Earth)	This is a greenfield area, which will be subject to a programme of geophysical survey and archaeological testing prior to the commencement of construction. This will be carried out under licence as issued by the DoHLGH.
AH25	Holy well (site of)	This monument appears to have been removed in the past due to the construction of the existing road network; however, all excavation works within proximity of the site will be subject to archaeological monitoring, under licence as issued by the DoHLGH.

Ref.:	Description	Mitigation
AAP08	Estuarine/coastal margin	The excavation of the trench through AAP08 will be subject to archaeological monitoring, under licence, as issued by the DoHLGH.
AAP09	Watercourse	Should the construction of the cable impact on the channel or banks of the watercourse (if offline open cut is required), an archaeological wade survey will be carried out in advance. This will be carried out under licence as issued by the DoHLGH.
AAP10	Watercourse	Should the construction of the cable impact on the channel or banks of the watercourse (if offline open cut is required), an archaeological wade survey will be carried out in advance. This will be carried out under licence as issued by the DoHLGH.
BH19	Milestone	The milestone will be hoarded off and protected during construction works in order to preserve the feature in-situ.
DL14/ Abbey- ville ACA	Designed landscape associated with Abbeyville	This is a greenfield area, which will be subject to a programme of geophysical survey and archaeological testing prior to the commencement of construction. This will be carried out under licence as issued by the DoHLGH.
BH21	Milestone	The milestone will be hoarded off and protected during construction works in order to preserve the feature in-situ.
BH22	Bridge	Should the onshore cable route cross this bridge, detailed design will be subject to assessment and supervision of a Grade 1 Conservation Architect. Archaeological monitoring may be required for the works. Any archaeological works will be carried out under licence as issued by the DoHLGH.
AH30d	Ecclesiastical enclosure at Saint Doolaghs	The excavation of 130m of the cable trench through the road to the east of Saint Doolagh's ecclesiastical site will be subject to archaeological monitoring, under licence as issued by the DoHLGH.
AH30g	Cross at Saint Doolaghs	The cross will be hoarded off and protected during construction works in order to preserve the feature in-situ.
CH10	Bridge	All excavation works across the bridge will be subject to archaeological monitoring under licence, as issued by the DoHLGH.
AAP11	River Mayne	Should the construction of the cable impact on the channel or banks of the watercourse (if offline open cut is required), an archaeological wade survey will be carried out in advance. This will be carried out under licence as issued by the DoHLGH.
BH33	Belcamp House (surviving walled garden)	All excavation works adjacent to the wall will be subject to archaeological monitoring under licence, as issued by the DoHLGH.

All greenfield areas that are required for the construction of the onshore cable route, will be subject to a programme of geophysical survey, followed by a programme of archaeological testing, prior to the commencement of construction in any one area. These programmes of investigation will be carried out under licence from the DoHLGH. Dependant on the results of the assessments in these areas, further mitigation may be required, such as preservation in-situ or by record. Any further mitigation will require the agreement of the National Monuments Service of the DoHLGH.

All excavation works within the zones of notification for AH28 and AH32 will be subject to archaeological monitoring under licence, as issued by the DoHLGH.

A draft Cultural Heritage Mitigation Strategy detailing the required mitigation measures (including definitions of same) has been appended to this EIAR (Appendix 25.4 of Volume 10 of the EIAR). This document will remain a live document and will require updating by the relevant heritage contractors during the course of the project at pre-construction and construction stages.

36.17.2 Operational Phase

No mitigation is required for the operational phase of the onshore proposed development.

Whilst some indirect negative effects will occur upon the setting of identified coastal archaeological, architectural, and cultural heritage sites (refer to Section 25.5.3.4 of Volume 4, Chapter 25: Onshore Archaeology, Architectural and Cultural Heritage), including CHPV59 Rockabill Lighthouse, it is not possible to mitigate impacts due to the visible nature of the turbines (tip heights of 290m-316m) within the seascape. Regardless, no likely significant effects will arise.

36.17.3 Decommissioning Phase

No mitigation is required for the decommissioning phase of the proposed development.

36.18 Material Assets Mitigation and Monitoring Measures

36.18.1 Construction Phase

Effects during the construction phase will be short-term to temporary in nature and will last only for the duration of the localised construction works. As a result of the assessment undertaken in Section 26.5 of Volume 4, Chapter 26: Material Assets, no likely significant effects are anticipated during construction, operation or decommissioning of the proposed development. Therefore, the mitigation measures presented in this section are included as best practice measures.

Where works are required alongside or to cross known utility infrastructure, precautions will be implemented by the appointed contractor to protect the infrastructure from damage, in accordance with best practice methodologies and the requirements of the utility companies, where practicable. Protection measures during construction will include warning signs and markings indicating the location of utility infrastructure, safe digging techniques in the vicinity of known utilities, and in certain circumstances where possible, isolation of the section of infrastructure during works in the immediate vicinity. Further methods that will be used to mitigate the risk of damage to existing services will be as follows.

- Assessing route records for existing assets to understand their depth, location and proximity to the planned cable trenches
- Where the onshore cable route passes beneath existing overhead services, suitable fencing, goal posts, and guarding will be installed during construction in accordance with best practice
- The use of Ground Penetration Radar (GPR), to provide greater confirmation of the locations of existing assets
- All excavation works to be completed in accordance with Guidelines for Managing Openings in Public Roads
- The use of trial holes/slit trenches to provide greater knowledge on the exact location of existing assets
- Full liaison with asset owners to discuss and agree clearances and where necessary, final details

Interruptions to existing utilities will be kept to a minimum and these will only occur where interruptions are unavoidable. In these instances, any interruption will be planned in advance by the appointed contractor and prior notice will be given to all impacted residents or businesses. This notification shall include all information on when the works will take place and the expected duration of such interruptions. All works will be carefully planned by the contractor to minimise any disturbances as far as practicable.

For all crossings taking place within the bridges listed in Section 26.5.2.2 of Volume 4, Chapter 26: Material Assets, in addition to the embedded mitigation inherent in the design of the bridge crossings, all details of the bridge crossings, including any pre-construction surveys will be agreed with local authorities prior to construction. Further mitigation measures relating to the protection of structures listed under the Record of Protected Structures (RPS) are provided in Volume 4, Chapter 25: Onshore Archaeology, Architecture and Cultural Heritage.

Pre-construction surveys to determine the structural capacity of the existing bridge at the landfall site (OBB62) will be undertaken and assessed against the anticipated construction traffic. This will inform what interventions (if any) in terms of strengthening or temporary works may be required. Further information is provided in Section 9.5 of the Volume 2, Chapter 9: Construction Strategy – Onshore (See also Section 36.17 above).

All works near existing services and utilities will be carried out in consultation with the relevant Utility Provider and Local Authority and will follow any requirements or guidelines they may have.

36.18.2 Operational Phase

Due to the measures already incorporated in the design as outlined in Section 26.3 and Section 26.5 of Volume 4, Chapter 26: Material Assets, there will be minimal negative impact on services during operation. No mitigation measures will be necessary during the operational phase.

The restrictions on the activities which can be undertaken within the wayleave width cannot be mitigated. However, the wayleave width has been minimised as far as is reasonably practicable.

36.18.3 Decommissioning Phase

As there are no likely significant effects arising from the decommissioning of the proposed development, no mitigation measures are required.

36.19 Air Quality Mitigation and Monitoring Measures

36.19.1 Construction Phase

The following mitigation measures will be implemented for the construction phase of the proposed development, in order to reduce the dust risk and impacts associated with the construction, earthworks and track-out as per IAQM guidance.

36.19.1.1 Mitigation for all working areas

- A Community Liaison Plan that includes community engagement before work commences on site will be developed. The proposed procedures for community liaison and engagement relating to Air Quality are set out in Volume 8, Appendix 9.1: Onshore Construction Environmental Management Plan.
- The Contractor will hold regular liaison meetings with other construction sites within 500m of the proposed development boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised when works are occurring concurrently.

Site Management

- Record all dust and air quality incidents, complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken

Preparing and maintaining the site

- Plan construction compound layout so that machinery and dust causing activities are located away from receptors, as far as is possible
- Erect a 2m minimum site hoarding around all construction/ contractor compounds
- Keep site fencing, barriers and scaffolding clean using wet methods
- Cover, seed or fence stockpiles to prevent wind whipping

Construction Plant Operations

- Ensure an adequate water supply on the working areas for effective dust/particulate matter suppression/mitigation
- Use enclosed chutes where possible and conveyors and covered skips

- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate
- Ensure equipment and spill kits are readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place

36.19.1.2 Measures specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
- Only remove the cover in small areas during work and not all at once

36.19.1.3 Measures specific to Track-out

- Ensure no mud or debris accumulates on the public road and public roads are clean of any mud, dust or debris by suitable means. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.
- Ensure vehicles entering and leaving sites are covered when transporting materials that are likely to generate dust to prevent escape during transport
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)

36.19.1.4 Measures specific to the grid facility construction activities

- Dust generation and dermal exposure during site construction works will be controlled by appropriate dust control measures e.g., water sprays and appropriate personal protective equipment (PPE).
- Where the asphalt layer is removed at the grid facility site this will occur in a phased basis and will be replaced with granular hardcore as soon as possible to prevent the generation of windblown dust.

36.19.1.5 Measures to be applied at the Malahide Estuary

- Erect a 2m minimum site hoarding around the working areas adjacent to the Malahide Estuary (Estuary Road) and where works are in proximity to the North West Irish Sea cSPA

36.19.1.6 Construction Phase Monitoring Measures

The following monitoring measures, will be implemented for the construction phase of the proposed development:

- The contractor will undertake on-site and off-site inspection, where receptors are nearby, to monitor dust, record inspection results, and make the log available to Dublin City Council and Fingal County Council on request. The frequency of the inspections will be increased during site activities with a high potential to produce dust are being carried out, such as during excavation activities during dry periods.
- Dust monitoring will be undertaken at the three nearest sensitive receptors (with agreement from the landowner) to major works during works likely to generate dust (refer to Section 27.4 of Air Quality chapter).
- The TA Luft dust deposition limit values of 350 mg/m²/day applied as a 30-day average.

36.19.2 Operational Phase

There are no significant adverse effects to air quality predicted during the operational phase, therefore, no specific operation phase mitigation or monitoring measures are required.

36.19.3 Decommissioning Phase

The mitigation measures specified for the construction phase will be applied during the decommissioning phase.

36.20 Climate Mitigation and Monitoring Measures

36.20.1 Construction Phase

A series of mitigation measures have been incorporated into the construction design with the goal of reducing the embodied carbon associated with the construction phase of the proposed development. These mitigation measures include:

- The substitution, where feasible, of concrete containing Portland cement with concrete containing ground granulated blast furnace slag (GGBS). This measure has led to an estimated saving of c.2,800 tonnes of CO₂eq in the current design of the proposed development.
- The proposed development will minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the proposed development.
- Where practicable, opportunities for materials reuse will be incorporated within the extent of the proposed development including the use of reclaimed asphalt and recycled aggregate. This measure has led to an estimated saving of 2,545 tonnes of CO₂eq.
- Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.

The combined measures, including the incorporation of GGBS, recycled and reused material where practicable has led to an estimated saving of 5,340 tonnes of CO₂eq.

The construction traffic GHG emissions associated with the construction phase of the proposed development will be short-term and temporary in nature. A Construction Traffic Management Plan for the proposed development is included as part of Volume 8, Appendix 9.1: Onshore Construction Environmental Management Plan.

36.20.2 Operational Phase

The proposed development will have a beneficial impact on climate during its full lifecycle, so no mitigation measures are proposed.

As no significant adverse impacts are likely due to the vulnerability of the proposed development to climate change no mitigation measures are required.

36.20.3 Decommissioning Phase

It is expected that the offshore infrastructure will be reused as much as possible, thereby minimising carbon emissions during the decommissioning phase.

36.21 Seascape, Landscape and Visual Mitigation and Monitoring Measures

36.21.1 Construction Phase

There are no specific SLVIA mitigation measures proposed during the Construction Phase for the offshore infrastructure aspects of the proposed development.

There are no specific LVIA mitigation measures proposed during the construction phase for the onshore infrastructure aspects of the proposed development. However, site hoarding around the Grid Facility, which has a number of functions including safety and security, will also serve as a visual screen. It will at least partially screen the movement and clutter associated with the building site including movement of people and vehicles / small machinery as well as stockpiles of excavated material, building material and bare ground.

There will also be hoarding placed around other construction compounds throughout the landfall site and onshore cable route. These will have a similar benefit of reducing visibility of ground-based activity and materials.

36.21.2 Operational Phase

There are no specific SLVIA mitigation measures proposed during the Operational Phase in relation to the offshore elements of the proposed development.

Mitigation is proposed in relation to the grid facility (see drawing ref. 281240_MCR_ONS_GF_DR_YE_1010 which is provided in Appendix 7.1 of Volume 8 of the EIAR), which will consist of perimeter screen planting around the grid facility compound and a recessive colour scheme for the grid facility structures. The proposed planting measures have been designed in conjunction with the ecology experts who prepared the biodiversity chapter in order to maximise the benefit of both visual screening and to biodiversity Refer to Volume 4, Chapter 23: Biodiversity. The planting consists of native woodland and hedgerow species which will be planted as a combination of small whips and advanced nursery stock (3-4m high trees) in order to allow for resilient and dense establishment. Note: Photomontages show planting having established over approximately 5-6 growing seasons from immediately post construction.

The recessive colour scheme consists of a dark olive shade of green at the base of the tallest GIS substation buildings in the form of a flowing band that rises 4-5m to the approximate height of surrounding hedgerows. Above that a flowing mid green band takes over for 3-4m where it reflects the approximate height of surrounding trees and tree lines. Finally, the upper sections of the buildings, being those elements most likely to be viewed against a backdrop of sky, will be given a light grey colour. The proposed mitigation planting and colour scheme have been incorporated into the relevant substation photomontages and before and after mitigation visual impact assessments were undertaken.

The mitigation for the onshore cable route is embedded in its design as it will be run predominantly within the existing roadbed for the majority of its course from the grid facility to the connection at Belcamp. Most watercourse crossings will be by in-road open cut trench or inline HDD. For eight crossings offline HDD and/or offline open cut trench will be considered. Where HDD is employed, it will have less impact on both the watercourses and the riparian vegetation that flanks them. There will be a few instances where trenching techniques will be employed through hedgerows and treelines and where this occurs it will consist of the minimum disturbance necessary and replanting insofar as possible once construction of the cable route is complete (only non-woody species can be replanted directly above the cable route for maintenance reasons).

36.21.3 Decommissioning Phase

There are no specific SLVIA mitigation measures proposed during the Operational Phase in relation to the offshore elements of the proposed development.

There are no specific LVIA mitigation measures proposed during the Decommissioning Phase for the onshore infrastructure of the proposed development.

36.22 Noise and Vibration Mitigation and Monitoring Measures

36.22.1 Construction Phase

36.22.1.1 Temporary noise barriers

It has been assumed that along with the good industry practice measures set out in Section 36.22.2 below, temporary noise barriers/site hoarding will be erected around the works at the main compounds and static construction worksites to reduce noise to nearby residences and/or key ecological receptors. Barriers will be erected around the following sites as follows:

- Grid facility, barriers to be provided (bar at access gates and adjacent to the R132) along the site perimeter where residential dwellings lie within 200m of the onshore development area
- Grid facility contractor compound (whole perimeter bar at access gates)

- Bremore cable contractor compound: barriers to be provided along the parts of the compound perimeter (bar at access gates) where residential dwellings lie within 200m of the compound
- Along the eastern edge (bar at access gates) of the Blakes Cross cable contractor compound
- Railway HDD entry site contractor compound at the landfall site (whole perimeter bar at access gates)
- Landfall HDD contractor compound at the landfall site (whole perimeter bar at access gates)
- M1 HDD entry site contractor compound (northern, eastern and southern edges of the compound perimeter, bar at access gates)
- If night-time HDD works are to be carried out at the following sites, barriers will be erected at the HDD entry contractor compounds (whole perimeter bar access gates) at water crossings WX9, WX10, WX16, WX17 and WX18

Noise barriers have been assumed to provide 10dB(A) of noise mitigation for the above works.

The onshore cable route works will progress relatively quickly and will be primarily carried out on roads where the works need to be kept to a minimum of working width to minimise the need for road closures. Therefore, no noise barriers have been assumed for the onshore cable route works other than at the following specific locations:

Temporary noise barriers will be provided between the onshore cable route construction working area and the following four schools:

- Corduff National School: a primary school on the R132 in Corduff
- St Nicholas of Myra National School, Kinsealy on the R107 Malahide Road
- St Molagas National School on the R132 Dublin Road, Balbriggan
- Malahide/Portmarnock Educate Together National School on the R107

At the Malahide Estuary, which is separated from the works area by, in most parts, 20-50m, the first measure of avoidance will be to avoid works along the Estuary Road during the period September to March when wintering birds are present. Where this is not practicable, for works at Malahide Estuary during the period of September to March, noise barriers will line the works area within Estuary Road on the estuary side to protect wintering birds utilising the nearest estuarine habitats.

36.22.1.2 Good Industry Practice

Good industry standards, guidance and practice procedures will be followed in order to minimise noise and vibration effects during construction, and these are documented within the Construction Environmental Management Plan (CEMP) Volume 11, Appendix 9.1. The following provisions, although not exhaustive, will be adhered to where practicable throughout the construction programme:

- Vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, maintained in good and efficient working order, and operated in such a manner as to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements.
- Machines in intermittent use will be shut down or throttled down to a minimum when not in use.
- Compressors will be fitted with properly lined and sealed acoustic covers which will be kept closed whenever in use. Pneumatic percussive tools will be fitted with mufflers or silencers.
- Equipment which breaks concrete, brickwork, or masonry by bending, bursting, or “nibbling” will be used in preference to percussive tools. Where possible, the use of impact tools will be avoided where the site is close to occupied premises.
- Rotary drills and bursters activated by hydraulic, chemical, or electrical power will be used for excavating hard or extrusive material.

- Wherever possible, equipment powered by mains electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity.
- No part of the works nor any maintenance of plant will be carried out in such a manner as to cause unnecessary noise except in the case of an emergency when the work is absolutely necessary for the saving of life or property or the safety of the works.
- Plant will be maintained in good working order so that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum; and
- Noise emitting machinery which is required to run continuously will be housed in a suitable acoustically lined enclosure.

36.22.1.3 *Communications*

Community Liaison will be led by the Developer, however, the Contractor will also take all reasonable steps to engage with stakeholders in the local community, focusing on those who may be affected by the construction works including residents, businesses, community resources and specific vulnerable groups.

Communication with the local community and other relevant stakeholders will be undertaken at an appropriate level and frequency throughout construction.

The Contractor will follow the Community Liaison Plan as provided by the Developer, which will include details of how the local community, road users and affected residents will be notified in advance of the scheduling of major works, any temporary traffic diversions and the progress of the construction works. A dedicated website will be established for the proposed scheme, which will describe the progress and will be kept up to date by the Developer.

Further detail of the community liaison and environmental management measures to be applied during the construction period can be found in Volume 8, Appendix 9.1: Onshore CEMP.

36.22.1.4 *Noise and Vibration Monitoring*

Monitoring of noise and vibration levels at the construction site boundary will be undertaken at noise-sensitive receptors near the working areas to identify where work procedures need to be modified. In the event of a valid complaint a noise monitoring protocol will be submitted to the relevant local authority prior to commencement of any noise monitoring. The protocol will include details of:

- A description of the complaint
- Construction activities taking place at the time of the complaint
- Noise monitoring methodology and results
- Any actions taken

36.22.2 *Operational Phase*

- For the operation of the grid facility, the following operating parameters have been assumed
- A static VAR compensator (SVC) cooler have been selected as the low noise option
- The SVC transformer and shunt reactors will be within an enclosure that provides acoustic attenuation; alternatively, lower-noise units which achieve the same reduction in noise level as an enclosure would be used

36.22.3 *Decommissioning Phase*

The mitigation and monitoring measures described for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase where required.

36.23 Resource and Waste Management Mitigation and Monitoring Measures

No significant negative effects are anticipated during either the construction phase, the operational phase or the decommissioning phase of the proposed development. Nonetheless, a suite of mitigation and monitoring measures is outlined below. These measures will ensure that the sustainable resource and waste management principles outlined in Section 31.2.1 of Volume 5, Chapter 31: Resource and Waste Management (hereafter referred to as the ‘Resource and Waste Chapter’), including circular economy principles related to the use of resources and adherence to the waste hierarchy, are implemented.

36.23.1 Construction Phase

Every reasonable effort will be made to ensure that significant environmental effects will be prevented or reduced during the construction phase of the proposed development.

An offshore waste management procedure is included in the Offshore EMP (Volume 8, Appendix 6.1) and a Construction Resource Waste Management Plan (CRWMP) is included in the Onshore CEMP (Volume 8, Appendix 9.1). These plans meet the requirements outlined in the Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects (EPA, 2021) as well as the requirements outlined in Annexes IV and V of the MARPOL Convention. The appointed contractor will be obliged to further develop, implement, and maintain the waste management plan and CRWMP during the construction phase.

36.23.1.1 General Mitigation Measures

The key principles underlying the waste management plan and the CRWMP will be to minimise waste generation and to segregate waste at source. The measures to achieve these which are relevant to both the offshore and onshore aspects of the proposed development include:

- Where waste generation cannot be avoided, waste disposal will be minimised.
- Where possible, recyclable material will be segregated and removed off site to a permitted / licensed facility for recycling. Waste stream colour coding and photographs will be used to facilitate segregation by clearly labelling waste types.
- All staff on-site will be trained on how to minimise waste (i.e., training, induction, inspections, and meetings).
- Materials on-site will be correctly and securely stored.
- Waste generated on-site will be removed as soon as practicable following generation for delivery to an authorised waste facility.
- The appointed contractor will record the quantity in tonnes and types of waste and materials leaving the site during the construction phase. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show material which is recovered, which is recycled and which is disposed of.
- Any hazardous waste arising will be managed by the appointed contractor in accordance with the applicable legislation.
- Waste generated from on-site offices will be source separated at least into residual waste, dry mixed recyclables and organic waste.
- The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e., certificate of registration, waste facility permit and / or EPA waste licence).

36.23.1.2 Offshore Mitigation

In addition to the measures proposed in Section 31.6.1.1 of the Resource and Waste Chapter, the management of wastes generated during the offshore construction works will be undertaken in such a way as to minimise waste generation and segregate waste at source. The measures to achieve these aims have been prepared in accordance with the requirements outlined in Annexes IV and V of the MARPOL Convention and include:

- Vessels will operate in line with international agreements such as the MARPOL Convention to manage on-board waste streams including wastewater and sewage.
- Any waste generated during offshore construction works will be segregated and stored in designated containers and returned to port by the appointed contractor to be collected and delivered to an authorised waste facility.
- Waste arising from the works associated with the offshore elements of the proposed development will be segregated based on its classification as non-hazardous or (potentially) hazardous on board the vessels.

36.23.1.3 Onshore Mitigation

For the management of resources and waste generated from the onshore construction works, specific measures have been adopted and included within the CRWMP. These include:

- Paints, sealants and hazardous chemicals will be stored in secure, bunded locations.
- Opportunities for the reuse of materials, by-products and wastes will be sought throughout the construction phase.
- Possibilities for reuse of clean non-hazardous excavation material as fill on the site will be considered following appropriate testing to ensure material is suitable for its proposed end use.
- Where non-hazardous excavation material cannot be reused within the proposed development works, material will be sent for recycling or recovery.
- Any identified contaminated material will be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure that the hotspot does not cross contaminate clean soils elsewhere throughout the site.
- If encountered, any potential asbestos during the construction phase will be managed using standard health and safety measures as outlined in ‘Asbestos-containing Materials (ACMs) in Workplaces: Practical Guidelines on ACM Management and Abatement’ (HSA, 2013). This document states that “removal of asbestos from contaminated soil will require a specialist asbestos contractor for any friable asbestos to be removed” and “a risk assessment by an independent competent person should determine the most appropriate control measures and remediation strategies” (HSA, 2013).
- Paints, sealants and hazardous chemicals will be stored in secure, bunded locations.
- Where excavation material cannot be reused within the proposed development, the appointed contractor will endeavour to send material offsite for reuse as a by-product, recovery or recycling, in so far as is reasonably practicable.
- The appointed contractor will ensure that any off-site interim storage facilities for excavation material have the appropriate certificate of registration, waste facility permit and / or EPA waste licence in place.
- Where Regulation 27 notifications are required in relation to the proposed development, the appointed contractor will complete and submit these Regulation 27 notifications to the EPA for by-product reuse.
- The site will be maintained to prevent litter and regular litter picking will take place throughout the site.

36.23.2 Operational Phase

Materials will be reused and recycled throughout the proposed development site and resources required will be locally and nationally sourced, to the maximum extent possible, thereby minimising potential impacts.

The sustainable resource and waste management principles detailed in Section 31.2.1 in the Resource and Waste Chapter will be implemented to ensure that circular economy principles are met and that the waste hierarchy is adhered to.

No additional mitigation or monitoring measures are considered necessary.

36.23.3 Decommissioning Phase

The mitigation and monitoring measures outlined herein for the construction phase, will be applied as appropriate, during the decommissioning phase.

In advance of the decommissioning phase, a Rehabilitation Schedule (Appendix 6.2) will be prepared. The Rehabilitation Schedule will cover the same topics and will be based on the same general principles as those included in the construction phase waste management plan included in the Offshore EMP (Volume 8, Appendix 6.1) and the construction phase CRWMP included in the Onshore CEMP (Volume 8, Appendix 9.1).

36.24 Population and Human Health Mitigation and Monitoring Measures

36.24.1 Construction Phase

Mitigation measures proposed in the Air Quality, Noise and Vibration, Traffic and Transportation and the Seascape, Landscape and Visual Chapters will help to avoid or minimise adverse population and human health effects during the construction phase of the proposed development. This mitigation is embedded within the residual assessments on which the population and human health assessment is based, and includes:

- The implementation of an Onshore Construction Environmental Management Plan (CEMP) (see Appendix 9.1 in Volume 8)
- The erection of directional and information signage where paths are temporarily closed
- The provision of information to local householders and the wider community in a phased approach before construction begins and iteratively as the construction progresses via direct mail campaigns, social media alerts and frequent updates via a dedicated news section on the proposed development website (www.northirishsearray.ie)
- The on-going provision of a dedicated community liaison officer to manage community relations, be available via mobile phone and email to provide a link between the community and the developer throughout the construction phase; and
- The preparation of an emergency response plan to cover foreseeable risks

Industry-standard traffic management measures will be put in place to alleviate construction-related traffic disruption. Further details are provided in the Construction Traffic Management Plan (CTMP) which is contained within Appendix 9.1.

The construction strategy requires all contractors to comply with legislation and good industry practice with regard to the health and safety of both workers and the public. As required by regulation and legislation, a Health and Safety Plan will be prepared to address health and safety issues from the design stages through to completion of the construction and maintenance phases. This plan will be reviewed and updated as required, as the development progresses. The Project Supervisor Construction Stage will assemble the Safety File as the project progresses on site. Prior to commencement of site work, the appointed Contractor(s) will produce detailed construction method statements, work programmes and risk assessments.

No further mitigation measures are proposed in relation to population and human health in addition to the embedded mitigation measures described above.

36.24.2 Operational Phase

The overall population and human health effects of the proposed development in the operational phase will be positive and neutral. Therefore, no mitigation is proposed.

36.24.3 Decommissioning Phase

No significant population and human health effects are identified during the decommissioning phase of the proposed development. Therefore, no mitigation is proposed.

36.25 Socio-Economic, Tourism and Recreation Mitigation and Monitoring Measures

36.25.1 Construction Phase

Mitigation measures are proposed to reduce any potential impacts relating to access of tourism or recreational receptors during the construction phase. Pedestrian access to Bremore Beach will be maintained to the south of the proposed development boundary at the landfall site to allow for public enjoyment of the remainder of the southern section of Bremore Beach.

Road closures will be localised and are detailed fully in the Traffic and Transportation Chapter. Access to recreational facilities impacted by road closures will be maintained as far as practicable.

36.25.2 Operational Phase

Specific mitigation measures are not proposed for the operational phase of the proposed development.

36.25.3 Decommissioning Phase

Specific mitigation measures are not proposed for the decommissioning phase of the proposed development.

36.26 Major Accidents and Disasters Mitigation and Monitoring Measures

Embedded mitigation measures were considered in order to reduce the likelihood rating of identified potential risk events occurring. These embedded mitigation measures for the construction, operation and decommissioning phases are documented in Table 34.8 of Volume 5, Chapter 34: Major Accidents and Disasters.

Additional mitigation measures during construction are proposed for two risk events which are identified as falling in the amber zone i.e. medium risk (which are deemed to present a risk of significant effects as described in Section 34.2.6.5 of Volume 5, Chapter 34: Major Accidents and Disasters), based on the absence of control measures to limit the consequence.

Risk event C13 is a cliff collapse at landfall during HDD activities. This would have the consequence of the loss of an Annex 1 habitat. With adequate control measures including workforce training and adherence to good industry practice, the consequence should be minimised. No additional mitigation measures are proposed.

Risk event C23 is damage to Interconnector 1 or 2 during the construction of the onshore cable crossing. This event could result in significant loss of life or serious injury, and serious economic and societal consequences. With adequate control measures including workforce training, adherence to good industry practice and compliance with the GNI guidance, the consequence should be minimised. No additional mitigation measures are proposed.

36.27 Offshore Bats

36.27.1 Mitigation Measures

Significant effects cannot be ruled out, due to the precautionary principle, in relation to impacts due to collision and barotrauma on the inferred bat population at Rockabill based on the current baseline. Further monitoring is required as set out in Section 36.27.2. No further mitigation is proposed at this time.

36.27.2 Monitoring Measures

The surveys set out in Sections 36.27.2.1 to 36.27.2.3 will be conducted in 2024.

36.27.2.1 *Island Surveys*

Preliminary Roost Assessment

Buildings on Rockabill will be subject to an internal / external inspection for evidence or potential for bat roosting. Surveys will be carried out in accordance with Marnell et al., (2022), Collins (2023) and NIEA (2022 and 2024) guidance. Buildings / structures will to be assigned negligible, low, medium or high potential for bat roosting in accordance with BCT (2023).

Roost Characterisation Survey

Upon completion of the PRA, 3 no. roost characterisation surveys will be conducted on the buildings identified as having roost potential (safety permitting). The surveys will be conducted 1 no. per spring (April to end May), summer (June to end August) and autumn (September to end October) season. The surveys will be accompanied using Infra-Red/ Thermal cameras.

Acoustic Detector Survey

Deployment of static acoustic bat detectors with high-capacity batteries and memory cards on Rockabill off Co. Dublin (as during the pre-application surveys), to characterise the use of the island by bat species. The data will further assist determination of the potential population levels for attraction within the array area. All surveys will require monthly maintenance visits to ensure microphones, batteries, detectors etc are functioning appropriately.

36.27.2.2 *Headland Surveys*

Deployment of static acoustic bat detectors with high-capacity batteries and memory cards at the entry pit location and Skerries harbour (as during the pre-application surveys) will be undertaken in 2024. Coverage will be undertaken for a minimum of one survey season and will require monthly maintenance visits to ensure microphones, batteries, detectors etc are functioning appropriately.

36.27.2.3 *Vessel Surveys*

Three static acoustic bat detectors with high-capacity batteries and memory cards will be deployed on a vessel (used for other surveys) traveling within the array area (as during the 2022 surveys). The siting of the detectors will be undertaken prior to vessel departure and will require maintenance visits to ensure microphones, batteries, detectors etc are functioning appropriately.

36.27.3 *Further Monitoring*

As the topic of offshore bats is a fluid topic at present with several countries within Europe updating their approach to policy and guidance, the monitoring scope and schedule will be produced in discussion with NPWS and collaboration with other appropriate bodies.

The proposed development is committed to participating in the ‘East Coast Monitoring Group’ (ECMG), to discuss and agree potential strategic monitoring initiatives in relation to offshore bats. The need for strategic monitoring, and the level of participation by individual projects, will be determined by the conclusions of the EIAR process, in consultation with statutory and technical stakeholders, and with a focus on validation and evidence gathering.

36.28 *Likely Significant Residual Effects*

The residual effects for each EIAR topic – those effects which remain after taking into account the mitigation and monitoring measures set out in the EIAR - are detailed in the Residual Effects sections of the relevant topic chapters (Ch 10-35). This section summarises those reported residual effects which are defined as likely significant effects (as defined in Volume 2, Chapter 2: EIA and Methodology for the Preparation of an EIAR). Likely significant residual cumulative effects and likely significant residual transboundary effects are detailed in Chapters 37 and 38 and are summarised below.

36.28.1 Construction Phase

The likely significant effects arising from the construction phase of the proposed development are reported in the individual EIAR topic-specific chapters. A summary of these likely significant effects arising from the construction phase of the proposed development is presented in Table 36.18 below.

Table 36.18 Summary of likely significant residual effects during the construction phase of the proposed development

Assessment Topic	Relevant Receptor	Likely Significant Residual Effects
Marine Geology, Oceanography and Physical Processes	N/A	No likely significant residual effects
Marine Water and Sediment Quality	N/A	No likely significant residual effects
Benthic Subtidal and Intertidal	N/A	No likely significant residual effects
Fish and Shellfish Ecology	N/A	No likely significant residual effects
Marine Mammal Ecology	N/A	No likely significant residual effects
Offshore Ornithology	N/A	No likely significant residual effects
Commercial Fisheries	N/A	No likely significant residual effects
Shipping and Navigation	N/A	No likely significant residual effects
Offshore Archaeology and Cultural Heritage	N/A	No likely significant residual effects
Aviation and Radar	N/A	No likely significant residual effects
Infrastructure and Other Users	N/A	No likely significant residual effects
Land and Soils	N/A	No likely significant residual effects
Water	N/A	No likely significant residual effects
Biodiversity	FW2 Lowland depositing river	Negative, short-term, reversible likely significant residual effect due to habitat loss at a local geographical scale, until lowland depositing rivers are reinstated at dry working areas
	WL1 Hedgerows, WL2 Treelines	Negative, short-term, reversible likely significant residual effect due to habitat loss at a local geographical scale until replacement planting is established at the landfall site and Blakes Cross North.
	Breeding birds	Negative, short-term, reversible likely significant residual effect due to habitat loss at a local geographical scale until habitats are reinstated and replacement planting is established at the landfall site and Blakes Cross North.
	Aquatic & fish species	Negative, short-term, reversible likely significant residual effect due to habitat loss at a local geographical scale until watercourses are reinstated at dry working areas.
Traffic and Transportation	Local diversion routes (as listed in tables 24.53 and 24.54 of Chapter 24: Traffic and Transportation) during temporary full road closures associated with construction of the onshore cable route	Negative, and temporary likely significant residual effects from increased traffic flows along local diversion routes
Onshore Archaeology	N/A	No likely significant residual effects
Material Assets	N/A	No likely significant residual effects
Air Quality	N/A	No likely significant residual effects
Climate	N/A	No likely significant residual effects
Seascape, Landscape & Visual	N/A	No likely significant residual effects

Assessment Topic	Relevant Receptor	Likely Significant Residual Effects
Noise and Vibration	N/A	No likely significant residual effects
Resource and Waste Management	N/A	No likely significant residual effects
Population and Human Health	Communities as listed in Table 32.9 of Volume 5: Chapter 32: Population and Human Health local to the proposed development	Negative and temporary likely significant effects relating to accessibility and journey patterns as a result of full and partial road closures during the construction of the onshore cable route
	Economic regeneration, as listed in Table 32.10 of Chapter 32	Positive and long-term likely significant residual effect on economic regeneration
Socioeconomic, Tourism and Recreation	Employment impact on regional economy	Positive and short-term likely significant residual effect
	Gross Value Added (GVA) impact on regional economy	Positive and short-term likely significant residual effect
Major Accidents and Disasters	N/A	No likely significant residual effects
Offshore Bats	N/A	No likely significant residual effects

36.28.2 Operational Phase

The likely significant effects arising from the operational phase of the proposed development are reported in the individual EIAR topic-specific chapters. A summary of these operational phase effects of the proposed development is presented in Table 36.19 below.

Table 36.19 Summary of likely significant residual effects during the operational phase of the proposed development

Assessment Topic/Receptor	Relevant Receptor	Likely Significant Residual Effects
Marine Geology, Oceanography and Physical Processes	N/A	No likely significant residual effects
Marine Water and Sediment Quality	N/A	No likely significant residual effects
Benthic Subtidal and Intertidal	N/A	No likely significant residual effects
Fish and Shellfish Ecology	N/A	No likely significant residual effects
Marine Mammal Ecology	N/A	No likely significant residual effects
Offshore Ornithology	N/A	No likely significant residual effects
Commercial Fisheries	N/A	No likely significant residual effects
Shipping and Navigation	N/A	No likely significant residual effects
Offshore Archaeology and Cultural Heritage	N/A	No likely significant residual effects
Aviation and Radar	N/A	No likely significant residual effects
Infrastructure and Other Users	N/A	No likely significant residual effects
Land and Soils	N/A	No likely significant residual effects
Water	N/A	No likely significant residual effects
Biodiversity	N/A	No likely significant residual effects
Traffic and Transportation	N/A	No likely significant residual effects
Onshore Archaeology	N/A	No likely significant residual effects
Material Assets	Electricity network in Ireland	Positive and long-term likely significant effect on the electricity network in Ireland
Air Quality	N/A	No likely significant residual effects
Climate	Greenhouse gas emissions	Positive and long-term likely significant effect
Seascape, Landscape & Visual	N/A	No likely significant residual effects

Assessment Topic/Receptor	Relevant Receptor	Likely Significant Residual Effects
Noise and Vibration	N/A	No likely significant residual effects
Resource and Waste Management	N/A	No likely significant residual effects
Population and Human Health	Economic regeneration	Positive and long-term likely significant residual effect
Socioeconomic, Tourism and Recreation	Regional economy – employment	Positive and long-term likely significant residual effect
	Regional economy – GVA generation	Positive and long-term likely significant residual effect
	Community benefit fund	Positive and long-term likely significant residual effect
Major Accidents and Disasters	N/A	No likely significant residual effects
Offshore Bats	N/A	Under the precautionary principle a likely significant effect cannot be ruled out for foraging bats from the potential bat population at Rockabill due to collision and barotrauma, as further monitoring is required to determine if a roost exists on the island

36.28.3 Decommissioning Phase

The likely significant residual effects arising from the decommissioning phase of the proposed development are reported in the individual EIAR topic-specific chapters. A summary of these cumulative effects of the proposed development is presented in Table 36.20 below.

Table 36.20 Summary of likely significant residual effects during the decommissioning phase of the proposed development

Assessment Topic/Receptor	Relevant Receptor	Likely Significant Residual Effects
Marine Geology, Oceanography and Physical Processes	N/A	No likely significant residual effects
Marine Water and Sediment Quality	N/A	No likely significant residual effects
Benthic Subtidal and Intertidal	N/A	No likely significant residual effects
Fish and Shellfish Ecology	N/A	No likely significant residual effects
Marine Mammal Ecology	N/A	No likely significant residual effects
Offshore Ornithology	N/A	No likely significant residual effects
Commercial Fisheries	N/A	No likely significant residual effects
Shipping and Navigation	N/A	No likely significant residual effects
Offshore Archaeology and Cultural Heritage	N/A	No likely significant residual effects
Aviation and Radar	N/A	No likely significant residual effects
Infrastructure and Other Users	N/A	No likely significant residual effects
Land and Soils	N/A	No likely significant residual effects
Water	N/A	No likely significant residual effects
Biodiversity	N/A	No likely significant residual effects
Traffic and Transportation	N/A	No likely significant residual effects
Onshore Archaeology	N/A	No likely significant residual effects
Material Assets	N/A	No likely significant residual effects
Air Quality	N/A	No likely significant residual effects
Climate	N/A	No likely significant residual effects
Seascape, Landscape & Visual	N/A	No likely significant residual effects
Noise and Vibration	N/A	No likely significant residual effects

Assessment Topic/Receptor	Relevant Receptor	Likely Significant Residual Effects
Resource and Waste Management	N/A	No likely significant residual effects
Population and Human Health	N/A	No likely significant residual effects
Socioeconomic, Tourism and Recreation	Regional economy – employment	Negative and permanent likely significant residual effect due to loss of employment from the proposed development
	Regional economy – GVA generation	Negative and permanent likely significant residual effect
Major Accidents and Disasters	N/A	No likely significant residual effects
Offshore Bats	N/A	No likely significant residual effects

36.28.4 Likely Significant Residual Cumulative Effects

Cumulative effects are effects of the proposed development on the receiving environment in combination with other projects. Cumulative effects are reported in Volume 6, Chapter 38: Cumulative and Interrelated Effects. A summary of the likely significant residual cumulative effects of the proposed development is presented in Table 38.7 of Volume 6, Chapter 38 and replicated in Table 36.21 below.

Table 36.21 Overall Cumulative Effects

Potential Cumulative Effects on Environmental	
CEA of all screened in projects together with the proposed development	<p>Marine Geology, Oceanography and Physical Processes:</p> <p>The CEA undertaken in Section 10.9 of Chapter 10 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with marine geology, oceanography and physical processes.</p>
	<p>Marine Water and Sediment Quality:</p> <p>The CEA undertaken in Section 11.9 of Chapter 11 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with marine water and sediment quality.</p>
	<p>Intertidal and Subtidal Ecology:</p> <p>The CEA undertaken in Section 12.9 of Chapter 12 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with intertidal and subtidal ecology.</p>
	<p>Fish and Shellfish Ecology:</p> <p>The CEA undertaken in Section 13.9 of Chapter 13 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with fish and shellfish ecology.</p>
	<p>Marine Mammals:</p> <p>The CEA undertaken in Section 14.9 of Chapter 14 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with marine mammals</p>
	<p>Intertidal and Offshore Ornithology:</p> <p>The CEA undertaken in Section 15.9 of Chapter 15 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with intertidal and offshore ornithology.</p>
	<p>Commercial Fisheries:</p> <p>The CEA undertaken in Section 16.9 of Chapter 16 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with commercial fisheries.</p>
	<p>Shipping & Navigation:</p> <p>The CEA undertaken in Section 35.9 of Chapter 17 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with shipping and navigation.</p>
	<p>Offshore Archaeology and Cultural Heritage:</p> <p>The CEA undertaken in Section 18.9 of Chapter 18 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with offshore archaeology and cultural heritage.</p>
	Aviation & Radar:

Potential Cumulative Effects on Environmental	
	<p>The CEA undertaken in Section 19.9 of Chapter 19 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with aviation and radar.</p>
	<p>Infrastructure and Other Users:</p> <p>The CEA undertaken in Section 20.9 of Chapter 20 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with infrastructure and other users.</p>
	<p>Offshore Bats:</p> <p>The CEA undertaken in Section 35.9 of Chapter 35 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with offshore bats.</p>
	<p>Land and Soils:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with onshore land and soils.</p>
	<p>Water:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with water (onshore).</p>
	<p>Biodiversity:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with biodiversity (onshore).</p>
	<p>Traffic and Transport:</p> <p>There are likely to be negative, significant but temporary residual effects from the proposed development alone during construction due to road closures on local and strategic diversion routes. As a result, the CEA undertaken in Section 38.2.3 presents an outcome of likely significant temporary negative cumulative effects during the construction stage. No likely significant effects are predicted for the operation and decommissioning stages.</p>
	<p>Archaeological, Architectural and Cultural Heritage:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with archaeological, architectural and cultural heritage (onshore).</p>
	<p>Material Assets:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of a positive, significant and long-term cumulative effects arising with the Tier 2 projects on the national electricity supply (due to the combined generation/connection of renewable energy into the grid).</p>
	<p>Air Quality:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with air quality.</p>
	<p>Climate:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of a significant beneficial impact on climate due to the proposed development alone is predicted to occur over its lifecycle. Due to the nature of the Tier 2 projects (renewable offshore energy) there will be significant beneficial cumulative effects with the proposed development and these screened in projects due to the significant cumulative reduction in greenhouse gas emissions.</p>
	<p>Seascape, Landscape and Visual Impact Assessment:</p> <p>The CEA undertaken in Section 29.9 of Chapter 29 notes that the assessment concluded that the greatest significance of effect on the seascape and landscape of the area, and on visual amenity, will be major to moderate negative, which is not significant in EIA terms. The cumulative effect assessment carried out for the Seascape, Landscape and Visual Chapter concluded that though there is Negligible or Low-negligible contribution of the proposed development to the overall cumulative effect from the southerly viewpoints (VP36 to VP47), it is acknowledged that a significant cumulative effect is generated at these viewpoints predominantly in relation to other projects.</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with landscape and visual.</p>
	<p>Noise:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects for the impacts assessed on receptors associated with noise.</p>

Potential Cumulative Effects on Environmental	
	<p>Resource and Waste Management:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of a direct, negative, significant and short-term cumulative effect on the capacity of waste management facilities and waste industry trends in Ireland during the construction phase due to an increased demand on waster recovery and/or disposal sites. This is as a result of the cumulative effect of the proposed development with Project No. 8.</p>
	<p>Population and Human Health:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of likely significant negative but temporary cumulative effects for the impacts assessed on receptors associated with population and human health due to significant negative cumulative traffic effects predicted.</p>
	<p>Socio-Economic, Tourism and Recreation:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of a cumulative positive, significant and long-term effect given that the Tier 2 Phase One projects will also each be providing a Community Benefit Fund and employment.</p>
	<p>Major Accidents and Disasters:</p> <p>The CEA undertaken in Section 38.2.3 presents an outcome of no likely significant cumulative effects with the potential to cause a major accident or disaster or result in the proposed development being vulnerable to a major accident or disaster during the construction, operation or decommissioning phases of the proposed development.</p>

36.28.5 Likely Significant Residual Transboundary Effects

Transboundary effects are effects that a proposed development in one international state may have on the environment or interests of another. Transboundary effects are discussed in Volume 6, Chapter 37: Transboundary Effects.

No likely significant residual transboundary effects have been identified as a result of the proposed development.