



White Hill Wind Farm

# Environmental Impact Assessment Report

## Annex 1.10: Schedule of Mitigation Measures

White Hill Wind Limited

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## Contents

1.0	Introduction.....	1
1.1	Purpose of this Report.....	1
1.2	Implementation of Mitigation Measures.....	1
1.3	Environmental Impact Assessment Report (EIAR) Mitigation Measures.....	2



## 1.0 Introduction

Galetech Energy Services (GES) has prepared this collated and consolidated Schedule of Mitigation Measures in respect of the proposed White Hill Wind Farm.

The project; which comprises a wind farm, its connection to the national electricity grid, and all associated ancillary development, traverses the administrative boundary between County Carlow and County Kilkenny; and is located c. 13km southwest of Carlow, c. 14km northeast of Kilkenny City and c. 4 km west of Oldleighlin, Co. Carlow.

The project will comprise:-

- 7 no. wind turbines with an overall tip height of 185m, and all associated ancillary infrastructure;
- Upgrades to the turbine component haul route; and
- Construction of an electricity substation and installation of c. 15km of underground grid connection cable between the White Hill Wind Farm and the existing Kilkenny 110kV electricity substation; and
- All associated and ancillary site development, excavation, construction, landscaping and reinstatement works, including provision of site drainage infrastructure.

The turbine component haul route, and associated upgrade works as described at **Chapter 3**, are located within counties Kilkenny, Waterford, Carlow, and Kildare. It is envisaged that the turbines will be transported from the Port of Waterford, through the counties of Kilkenny, Waterford, Carlow and Kildare to the project site.

### 1.1 Purpose of this Report

This report has been prepared to provide a concise document of all mitigation measures proposed within the proposed White Hill Wind Farm Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS).

Article 8(a)(4) of the Environmental Impact Assessment (EIA) Directive 2014/52/EU states:-

*'...Member States shall ensure that the features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment are implemented by the developer...'*

This document therefore provides a list of all mitigation measures proposed within **Volume I** of the EIAR (**Section 1.3** below), along with those proposed in the NIS (**Section 1.4** below), which will be implemented during the pre-construction, construction, operational and decommissioning phases of the project.

### 1.2 Implementation of Mitigation Measures

White Hill Wind Limited ('the Developer') can confirm that all mitigation measures outlined below, in addition to the measures inherent to the design of the project described at **Chapter 3**, will be implemented except as may be required in order to comply with conditions of consent.

It should be noted that a number of the below measures will be supervised and overseen by personnel who have not yet been appointed. Such personnel will include:-

- Project Supervisor for the Construction Stage (PSCS);

- Civil Works Contractor;
- Electrical Works Contractor;
- Turbine Component Delivery Contractor;
- Ecological Clerk of Works;
- Environmental Manager;
- Geotechnical Clerk of Works;
- Archaeological Clerk of Works; and
- Acoustic Specialist.

Prior to the commencement of development, each of the above will be appointed, as necessary, by the Developer who will have ultimate responsibility for the implementation of all mitigation measures.

### **1.3 Environmental Impact Assessment Report (EIAR) Mitigation Measures**

Environmental Impact Assessment Report – Schedule of Mitigation Measures		
Topic	Mitigation Measure	Phase of Development for Implementation
Population & Human Health	A suite of measures has been agreed with involved landowners regarding the management of agricultural activities during the construction phase. These measures have been incorporated into signed legal agreements and will be implemented in full.	Pre-Construction
Biodiversity	A suitably qualified Ecological Clerk of Works (ECoW) will be employed to oversee the full and proper implementation of the ecological mitigation strategy throughout the construction and commissioning of the project.	Construction
Biodiversity	There will be no removal/clearance of habitats, or movement of construction machinery outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked.	Construction
Biodiversity	Existing hedgerows and trees to be retained at/near the site will be protected in line with current guidelines (e.g. NRA 2006). Measures to protect trees will include the installation of tree protection barriers around the root protection zones of retained trees. Where essential works are required within the root protection zones, ground protection (such as a cellweb membrane) will be installed following consultation with a qualified and experience arborist and/or engineer, to minimise risks of damage to roots.	Construction
Biodiversity	The construction of the project will be undertaken in accordance with the detailed Construction Environmental Management Plan (CEMP) to be prepared prior to construction.	Construction
Biodiversity	Detailed surface water management measures have been incorporated into the proposed wind farm design to reduce the likelihood of significant effects on water quality, including downstream designated sites. Furthermore, a self-imposed buffer from natural watercourses (apart from the stream crossings) has been employed during the design layout so as to avoid sensitive hydrological features. All general/sanitary waste generated at the site during construction will be appropriately managed prior to removal off site by licenced contractors with no disposal of waste to nearby water features.	Construction
Biodiversity	New hedgerows will be created, away from turbines to avoid attracting bats to these areas and existing hedgerows are to be retained and enhanced where possible with gaps to be restored as necessary with native hedgerow mix.	Construction

Biodiversity	Native hedgerow whips to be planted consisting of White thorn <i>Crataegus monogyna</i> , Black thorn <i>Prunus spinose</i> , Guelder rose <i>Viburnum opulus</i> , Holly <i>Ilex aquifolium</i> , Hazel <i>Corylus avellana</i> , Spindle <i>Euonymus europeus</i> , Dog rose <i>Rosa canina</i> .	Construction
Biodiversity	Native woodland trees to be planted and will include Oak <i>Quercus robur</i> , Alder <i>Alnus glutinosa</i> , Holly <i>Ilex aquifolium</i> , Apple <i>Malus sylvestris</i> , Hazel <i>Corylus avellana</i> , Downy birch <i>Betula pubescens</i> , Willow e.g. <i>Salix cinerea/aurita</i> and Scots pine <i>Pinus sylvestris</i> .	Construction
Biodiversity	<p>Prior to the commencement of vegetation clearance activity, a survey by an appropriately experienced ecologist will be carried out to confirm that no Third Schedule Plant species are present within the project site, including along the grid connection route and replant lands. If present, the full extent(s) of the invasive plant species will be mapped. The appointed contractor(s) will prepare and implement an Invasive Species Management Plan (ISMP) for the works with the input from a suitably qualified ecologist. The ISMP will include measures such as:-</p> <ul style="list-style-type: none"> <li>• Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site;</li> <li>• Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk;</li> <li>• Avoid if possible using machinery with tracks in infested areas;</li> <li>• Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within 75m of any watercourse or within a flood zone;</li> <li>• If soil is imported to the site for landscaping, infilling or embankments, the contractor will gain documentation from suppliers stating that it is free from invasive species;</li> <li>• Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan; and,</li> <li>• Erection of adequate site hygiene signage in relation to the management of non-native invasive material as appropriate.</li> </ul>	Pre-Construction
Biodiversity	Construction operations will largely take place during the hours of daylight to minimise disturbances to roosting birds or any active crepuscular/nocturnal bird species.	Construction
Biodiversity	A Toolbox Talk will be prepared and incorporated as part of the construction phase site induction. A wildlife register will be maintained by the environmental site staff during the construction phase. Site staff will be encouraged to report any bird sightings of note made during the construction phase and this information will be logged by the environmental site staff. The site manager will continue to maintain a wildlife register throughout the operational phase.	Construction
Biodiversity	All lighting systems, at the electricity substation and compound, will be designed to minimise	Construction

	nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.	
Biodiversity	All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled at prescribed locations and all waste materials will be disposed of to licensed facilities.	Construction
Biodiversity	Mitigation measures outlined in this EIAR to minimise and prevent the likely effects on aquatic habitats and species will be fully implemented. In addition, tree felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000), to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff.	Construction
Biodiversity	Tree-felling and removal of mature vegetation will be undertaken outside of the bird breeding season (1 March – 1 August). Hedgerows and mature trees will be retained insofar as possible.	Construction
Biodiversity	To avoid effects on nesting birds, the works on the grid connection route will be carried outside of the bird breeding season where possible. If works on the grid connection route are to be carried out during the bird breeding season, the areas where works are to be carried out will be checked immediately prior to such works by a suitably qualified ecologist to ensure that no protected species are present. No works will proceed in areas identified to have nesting birds until an appropriately qualified and experienced ECoW is appointed to monitor the construction activity and implementation of the environmental and ecological mitigation measures.	Construction
Biodiversity	Standard VP monitoring in accordance with the <i>Survey Methods for Use in Assessing the Impacts of Onshore Wind farms on Bird Communities</i> (Scottish Natural Heritage 2017) will be carried out during the construction phase by experienced ecologists. A VP survey will be carried out between mid-March and mid-August. If construction activity extends into the winter period (October-March) a winter VP survey will be carried out to monitor the occurrence of waders, wildfowl and raptors. The survey shall cover the development footprint and all areas within 500m of the works.	Construction
Biodiversity	A total of 30 no. bird nest boxes (woodcrete and/or recycled plastic) will be erected within the wind farm site during the construction phase with the selection of boxes and suitable deployment locations decided by a suitably qualified ecologist.	Construction
Biodiversity	A pre-construction mammal survey will be carried out immediately prior to the commencement of vegetation clearance. All areas where vegetation and built features will	Pre-Construction

	be removed will be first checked for evidence of the presence of roosting bats.	
Biodiversity	All watercourse crossings will be surveyed prior to the commencement of work to identify any resting or breeding sites of protected mammal species.	Pre-Construction
Biodiversity	An ecologist will supervise/check areas where tree-felling and vegetation removal will occur prior to and during construction. This will ensure that any site-specific issues in relation to wildlife will be highlighted and appropriate mitigation measures (e.g., NRA/TII guidelines) are applied	Pre-Construction / Construction
Biodiversity	The outlier Badger setts recorded in vicinity of access tracks will be surveyed and activity confirmed ahead of any works, including vegetation clearance. NatureScot (2017) advises employing a minimum exclusion zone of 30m from active sett entrances to construction works, which is in line with NRA (2006) for non-breeding season works, although under these guidelines this increases to 50m of active setts during the breeding season (December to June inclusive), with no blasting or pile driving within 150m of active setts. A suitably experienced ecologist will assess the evidence of activity at these outlier setts and, if appropriate, discuss the need for derogation licence with the NPWS. The ecologist will advise on appropriate actions to ensure that the risk of disturbance to badgers is minimised.	Pre-Construction / Construction
Biodiversity	If any breeding or resting sites of protected mammal species are located at any stage in the construction phase, no works will continue until such time as the ECoW advises and/or any required derogation licences are in place.	Construction
Biodiversity	Mitigation measures outlined in this EIAR to minimise and prevent likely effects on aquatic habitats and species will be fully implemented. In addition, tree felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000), to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff.	Construction
Biodiversity	Construction operations will largely take place during the hours of daylight to minimise disturbances to nocturnal mammal species.	Construction
Biodiversity	All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.	Construction
Biodiversity	All edible and putrescible wastes will be stored and disposed of in an appropriate manner.	Construction
Biodiversity	Any sightings of mammals on-site will be logged on the wildlife register. This includes any fatalities recorded during construction phase.	Construction



Biodiversity	A total of 30-bat boxes (woodcrete and/or recycled plastic) will be erected at suitable locations in the area, with the type of boxes and the deployment locations selected by a suitably qualified ecologist.	Construction
Biodiversity	Except for specific points, such as stream crossings, a 50m buffer around watercourses will be observed within which works will be limited and will require the installation of appropriate measures.	Pre-Construction
Biodiversity	The other major mitigation to prevent the potential impacts to the ecology of watercourses, is the design and implementation of a highly functional site drainage system, or Surface Water Management System, with integrated silt management and flow attenuation management. For this project, a bespoke drainage system taking into account parameters such as rainfall rates, gradient, area, etc was designed.	Pre-Construction
Biodiversity	Measures integrated into the drainage system will include silt traps, settlement ponds <sup>1</sup> , check dams, silt fences, separated clean/dirty water drains and vegetated swales. Crucially, the site drainage system will not outflow to the existing drainage network directly, but will discharge, via settlement ponds and vegetated swales, to numerous buffered overland outfalls which will promote percolation and vegetation filtration. The large number of these outfalls across the site are intended to keep volumes at each outfall low thus ensuring high filtration efficiency and low erosion rates.	Pre-Construction
Biodiversity	The input of silt will be managed using a range of techniques integrated into the design of the Surface Water Management System including Altmuller and Dettmer settlement ponds, check dams, silt fences, vegetated swales and buffered overland outfalls.	Pre-Construction
Biodiversity	The input of nutrients, the main source being clear felling, will also be managed using aspects of the site drainage system, particularly the vegetated swales and the overland outflows. Clear felling, in line with current timber industry practices, is part of the current land usage and the proposed drainage design will improve outfall from this existing practice.	Construction
Biodiversity	The input of cement to watercourses will be mitigated onsite. Where concrete is delivered to the wind farm site, only the chute will be cleaned onsite. Chute cleaning water is to be isolated in temporary lined wash-out pits. No discharge of cement contaminated water to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed.	Construction

<sup>1</sup> Settlement ponds will be as described in Altmuller & Dettmer; a design element that has been proven to work, both in the short and long term, and have clearly demonstrated results in terms of habitat improvement and FPM population dynamics. They also provide excellent spawning and larval habitat for frogs and newts.

Biodiversity	The input of hydrocarbons and other chemicals to watercourses will be mitigated against onsite. All plant will be inspected and certified to ensure they are leak free and in good working order prior to use on the wind farm site. On-site re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser will be re-filled off site and will be towed/driven around the wind farm site to where machinery are located. Any chemical storage areas will be bunded appropriately for the fuel storage volume. An emergency plan for the construction phase to deal with accidental spillages will be contained within the CEMP. Spill kits will be available to deal with accidental spillages. In a worst-case scenario, if there is an incident onsite, the site drainage system does not discharge directly to any watercourse, thus insulating watercourses from such an event.	Construction
Biodiversity	Hydromorphological changes to watercourses, brought about by changes within the catchment, will be mitigated to a large extent by the use of settlement ponds and check dams to attenuate water, as well as vegetation swales and overland outfalls to promote percolation. As such, hydromorphological changes within watercourses are not expected as a result of the project.	Construction
Biodiversity	A Water Quality Monitoring Plan be put in place and will provide for an inspection and maintenance plan for the site drainage system. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.	Construction
Biodiversity	Any excess build-up of silt levels at dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. This will be given careful consideration by the ECoW. During the construction phase field testing, sampling and analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse at the wind farm site. Monitoring shall be carried out following heavy rainfall events and during 95 <sup>th</sup> percentile low flow rates (the flow which is surpassed 95% of the time) as this is the stage when pressures and threats are highest on aquatic biota.	Construction
Biodiversity	<p>Stream crossings will primarily use box culverts for stream crossings 1, 2, 3 and 4, while a bottomless culvert is proposed for crossing 5. All small drains to be crossed within the site will be piped. The design and installation of these crossings will follow the guidelines set out in "National Roads Authority National Roads Authority. (2005). Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes":-</p> <ul style="list-style-type: none"> <li>In terms of the box culverts, the key measure is that culverts should be installed so that the bottom (invert) is at least 500mm below the grade line of the natural stream bed and that</li> </ul>	Construction

	<p>the culvert should be 'drowned out<sup>2</sup>'; this negates issues with fish passage. The open-bottom culvert is essentially a span bridge and the installation of it has no potential to cause fish passage issues. In terms of the piping of drains onsite, the pipes will be level, or close to level, and will be set below water level (drowned out) to ensure fish passage. In terms of ensuring water quality during the construction/installation of these stream crossings, each crossing will be site specific and the particulars will be agreed onsite between the engineers, the ECoW and IFI, however a number of basic principles will be used. Firstly, for the piped drain crossings, if sufficient depth of water is present in the drain, it may be best to drop the pipe into place and backfill. If excavation is required to get levels, it may be best to dam the drain with sandbags if flow is sufficiently low to permit this approach, or otherwise to dam the drain and overpump. Pipes in dry drains will be installed making sure to keep the slope at grade. For the culverts, a stretch of river will be electrofished before being dammed at both ends and overpumped; this will contain dirty water within the working cell while the excavation is taking place to attain the depth for the culvert. For the installation of the bottomless culvert it is likely that a temporary dam-and-flume will be put in place to allow for the infilling behind the abutments without water quality issues.</p>	
Biodiversity	All instream works will be carried out in the months of July, August and September to avoid the salmonid spawning season and to avoid the times when the young of the year are at their most vulnerable.	Construction
Biodiversity	In terms of directional drilling, the works, including launch and receiver pits, will be carried out outside 20m from each watercourse. This is the buffer zone width recommended by IFI. The drilling process shall be constantly monitored to detect any possible breakout or leaking of bentonite into the surrounding geology; this is gauged by observation and by monitoring pumping rates and pressures. Monitoring by an ecologist/environmental engineer will be required during directional drilling works. IFI and NPWS will be notified of the works in advance.	Construction
Biodiversity	In terms of crossing within the bridge deck, critical elements with respect to aquatic ecology include for the placement of a sealed silt fence at both sides of the bridge crossing point and to a minimum of 10m upstream and downstream of each crossing on both sides of the road to divert water and runoff from the road into silt traps at each corner of the road. The size and design of these silt traps will vary and be suited to local conditions. The silt traps and sealed silt fence will be installed prior to any construction works commencing at the bridge crossing. An	Construction

<sup>2</sup> Meaning that meaning that the culvert sits well below low water levels rather than perched above it

	ecologist/environmental engineer will again be monitoring for the duration of the works.	
Biodiversity	Areas where soil or water is to be stored (e.g. settlement ponds) will be checked regularly throughout the construction phase for the presence of Frogs (and spawn) and other protected aquatic and semi-aquatic fauna. If protected species are present, the environmental staff will translocate these, if possible (under licence if applicable). The same measure will be applied for any drains or areas of standing water forded by construction machinery. These areas will be checked on an ongoing basis by the ECoW and any areas with breeding frogs, spawn or tadpoles will be mapped and if possible fenced off temporarily to allow Frogs to metamorphose. If such areas cannot be avoided by site traffic the environmental staff will translocate the frogs (adults/young) under licence if applicable.	Construction
Biodiversity	An updated survey for adult Marsh Fritillary, <i>Euphydras aurinia</i> , will be carried out in the year of construction (May/June) ideally before construction commences. Locations with Devil's Bit Scabious within the site (along the edge of existing access tracks) will be checked in September/October for the presence of larval webs. Marsh Fritillary butterfly is the only Irish insect listed under Annex II of the EU Habitats Directive. In the event that larval webs are recorded within the works area, mitigation measures will follow best practice guidelines as outlined in the ' <i>Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes</i> ' (NRA, 2008).	Pre-Construction / Construction
Biodiversity	If other taxa such as other species of Lepidoptera, Common Viviparous Lizard etc. are recorded within or adjacent to the wind farm, or the haul route works locations or grid connection route, these sightings will be logged on the wildlife register.	Construction
Biodiversity	Any sightings of rare or protected invertebrates, amphibians etc. made in the course of operational phase monitoring will be recorded and if appropriate this information will be submitted to the National Biodiversity Data Centre.	Construction
Biodiversity	Bird activity will be monitored for 3-years post construction by a suitably qualified ecologist. Standard breeding bird surveys will be carried out (transects and point counts) and winter VP surveys will be undertaken with reference to standard methodology (e.g. SNH, 2017, Gilbert <i>et al.</i> 2011). Annual reports will be prepared and submitted to the Planning Authority (Authorities) as required:- <ul style="list-style-type: none"> <li>• Monthly fatality searches will be carried out around the turbine bases for the first 3 no. years of operation, with a minimum of half of the winter season searches using trained cadaver dogs (minimum 3 no. cadaver dog searches); and,</li> <li>• All feather spots and bird (and bat) carcasses will be photographed and logged and an</li> </ul>	Operational

	<p>annual fatality search report will be prepared and submitted to the Planning Authority (Authorities). Any fatalities noted by site staff or maintenance crews will be logged on the wildlife register and this register will be made available to the ecologist carrying out the monitoring program.</p>	
Biodiversity	<p>Bird and bat boxes will be checked and maintained annually for the first 3-years of operation by a suitably qualified ecologist. Any boxes requiring maintenance or replacement will be identified and removed/replaced under the supervision of an ecologist.</p>	Operational
Biodiversity	<p>As a precautionary mitigation measure, in addition to the creation of buffers between the proposed turbines and surrounding vegetation (discussed above) reduced rotation speed will be implemented when turbines are idling. Automatic 'feathering' of idling blades will be implemented (through SCADA) to reduce rotation speed of blades to below 2rpm while idling. Feathering blades has been shown to be effective in reducing fatality rates of bats by up to 50% and does not result in a significant loss of energy output (NatureScot 2021). No additional control measures to avoid/reduce collision related bat fatalities are considered warranted in this instance.</p>	Operational
Biodiversity	<p>Monitoring of the bat activity at the wind farm during the operational phase is recommended, based on the NatureScot 2021 guidelines, as several bat species were recorded within and adjacent the project site. Under these guidelines and EUROBATS (Rodrigues <i>et al.</i>, 2008) guidelines, it is recommended that monitoring of bats be implemented for at least 3-years once the wind farm is operational. Surveys will be conducted from March/April to October/November inclusive, during temperate weather conditions (i.e. air temperatures not lower than 10°C, calm, dry and overcast conditions). This monitoring will include detector surveys of bat activity near all turbines and the continuing status of any nearby potential roosts. Passive detector(s) will be deployed at several locations, a number of these close to turbines and others remote from turbine locations, within the wind farm site during the summer/autumn months. These deployment locations will be the same used in the pre-construction bat monitoring. An annual report of operational phase bat activity will be prepared and submitted for the attention of the Planning Authority (Authorities) as required:-</p> <ul style="list-style-type: none"> <li>• Over the first three years of operation a combination of data will be collected from:-             <ul style="list-style-type: none"> <li>○ bat activity monitoring (seasonal deployment of static bat detectors) including continuous monitoring at height (if feasible);</li> <li>○ fatality search around turbines;</li> <li>○ recording of weather data including wind speed and direction, air temperature, precipitation and barometric pressure;</li> </ul> </li> </ul>	Operational

	<ul style="list-style-type: none"> <li>• At the end of the first year of operation, the bat activity data will be reviewed by a suitably qualified and experienced ecologist and, if deemed necessary, a curtailment strategy will be implemented. It is anticipated that the clearance of vegetation to create bat buffers will limit bat activity in the vicinity of turbines and will be effective in reducing the potential for collision risk. However, as acknowledged in NatureScot (2021) it is difficult to predict how bat behaviour will change post-construction. Therefore, further mitigation informed by post-construction monitoring may be required. One such option is smart curtailment, whereby turbines identified in high-risk locations by post-construction monitoring are feathered to run at &lt; 2rpm, while optimal flight conditions for bats occurs;             <ul style="list-style-type: none"> <li>○ Any requirement for smart curtailment, and the parameters that would influence it, will be guided by the comprehensive post-construction monitoring methodology, which will clarify the bat usage of the site at turbine locations post-construction and identify the likely relationship with temporal and weather parameters, and any potential collision fatalities; and,</li> <li>○ The need for, and implementation of, a smart curtailment strategy will be reviewed by a bat specialist at the end of the second and third years of operation taking into account the accumulated survey data.</li> </ul> </li> </ul>	
Biodiversity	Infiltration interceptor drains will be retained for the duration of the project to ensure that up-slope ('clean') runoff is directed away from site infrastructure and managed in an appropriate manner.	Operational
Biodiversity	Swales and check dams (i.e. for the management of 'dirty' water) shall be retained for the duration of the project. The swales, having become vegetated, and check dams will act as a filtration feature for the low volume of surface water runoff arising and will be sufficient to ensure the avoidance of any deleterious matter being discharged to downstream watercourses. Accordingly, it is proposed that the silt/settlement ponds and lagoon-type sediment ponds will be decommissioned 1-year following the completion of construction. This period will ensure that the swales have become sufficiently vegetated to filter any silt/sediment which may arise.	Operational
Biodiversity	Interceptor drains will be installed up-gradient of all infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader.	Operational
Biodiversity	Swales/roadside drains will be used to collect runoff from access tracks, turbine hardstanding areas and substation compound areas which may contain entrained suspended sediment,	Operational

	and channel it to settlement ponds for sediment settling.	
Biodiversity	Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains.	Operational
Biodiversity	Check dams will be used along sections of access tracks drains to intercept silts at source. Check dams will be constructed from a 40mm non-friable crushed rock or similar.	Operational
Biodiversity	Swales and check dams will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses.	Operational
Biodiversity	Settlement ponds will be designed in accordance the greenfield runoff rate requirements.	Operational
Biodiversity	Imported rock for construction purposes and road surfacing will be strong, well graded limestone which will be resistant to erosion and have a low likelihood to generate fines in hardstand runoff. The operation of the underground grid connection will not result in any likely hydrological or water quality effects and therefore do not require mitigation measures.	Operational
Biodiversity	Fuels stored on site will be minimised. Any storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction.	Operational
Biodiversity	The substation transformer and oil storage tanks will be located in a concrete bund, impervious to rainwater ingress, capable of holding 110% of the stored oil volume.	Operational
Biodiversity	Turbine transformers will be located within the turbines, and any leaks will be fully contained within the turbine thus eliminating any pathway for leakages to affect land and soil.	Operational
Biodiversity	Maintenance vehicles will be regularly inspected for leaks and fitness for purpose.	Operational
Biodiversity	An emergency plan for the operational phase to deal with accidental spillages will be contained within an Operational-Phase Environmental Management Plan. Spill kits will be available to deal with accidental spillages.	Operational
Biodiversity	A decommissioning phase environmental management plan will be prepared in advance of the works. This will include all appropriate surface water and spoil management commitments.	Decommissioning
Biodiversity	The site compound will need to conform to the construction phase mitigation measures including those related to lighting design and proper treatment of edible and putrescible wastes.	Decommissioning
Biodiversity	Following reinstatement, the site will be monitored by a suitably qualified ecologist for a 2-year	Decommissioning

	period to determine the progress of revegetation and if necessary to introduce supplementary planting with native species. A reassessment of the site will be carried out at the end of Year-1 to assess the site's progression over the previous year and to take photographic evidence of the site vegetation status, drainage management and general site appearance.	
Land & Soil	Mats will be used, as necessary, to support construction plant and machinery on soft ground, thus reducing the likelihood of soil and subsoil erosion and avoiding the formation of rutted areas. This will substantially reduce the likelihood for surface water ponding to occur.	Construction
Land & Soil	Excavated soil will be side cast and stored temporarily adjacent to excavation areas for use during reinstatement and landscaping. Where material is not required for reinstatement or landscaping, it shall be immediately transported to the spoil deposition areas.	Construction
Land & Soil	Silt fences, and all necessary surface water management measures (including upslope interceptor drains), will be installed around all temporary stockpiles to limit movement of entrained sediment in surface water runoff. All slopes will be sealed with the bucket of an excavator.	Construction
Land & Soil	In order to minimise erosion during the construction phase, works will not take place during periods of intense or prolonged rainfall (to prevent increased silt laden runoff). Drainage systems, as outlined in <b>Chapter 7</b> , will be implemented to limit runoff effects during the construction phase.	Construction
Land & Soil	At the designated spoil deposition areas, material will be placed in layers to ensure stability is maintained and works will be undertaken in accordance with best practice construction methodologies. Works at the spoil deposition areas will be monitored, on a weekly basis during the construction phase and monthly for a 6 no. month period thereafter, by an appropriately qualified Geotechnical Engineer. In the event that any ground stability issues arise, the Engineer will have the power to cease works until such time as remedial works have been completed to his/her satisfaction.	Construction
Land & Soil	Permanently mounded soils and subsoils; for example, berms surrounding turbines and hardstands, berms located along access tracks and at the spoil deposition areas; will be seeded and grassed over at the earliest opportunity to prevent erosion.	Construction
Land & Soil	The electricity line (grid connection) trench will be reinstated to the required specification and in accordance with landowner requirements and will be reseeded or allowed to vegetate naturally (on agricultural land) or topped with tarmacadam (or similar along public roads) at the earliest opportunity to prevent erosion.	Construction



Land & Soil	The volume of fuels or oils stored on site will be minimised. All fuel and oil will be stored in an appropriately bunded area within the temporary construction compound. Only an appropriate volume of fuel will be stored at any given time. The bunded area will be roofed to avoid the ingress of rainfall and will be fitted with a storm drainage system and an appropriate oil interceptor.	Construction
Land & Soil	All bunded areas will have 110% capacity of the volume to be stored.	Construction
Land & Soil	On site re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled at the temporary compound and will be towed around the site by a 4x4 jeep to where plant and machinery is located. The 4x4 jeep will also be fully stocked with fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use and only designated, trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations to avoid any accidental leakages.	Construction
Land & Soil	All plant and machinery used during construction will be regularly inspected for leaks and fitness for purpose.	Construction
Land & Soil	Spill kits will be available to deal with any accidental spillages within the temporary construction compound and during re-fuelling.	Construction
Land & Soil	All waste tar material arising from road cuttings (from trenching in public roads and haul route upgrade works) will be removed off-site and disposed of at a licensed waste facility. Due to the potential for contamination of soils and subsoils, it is not proposed to utilise this material for any reinstatement works or to store it within the spoil deposition areas.	Construction
Land & Soil	An emergency plan for the construction phase to deal with accidental spillages is contained within the Planning-Stage Construction and Environmental Management Plan ( <b>Annex 3.4</b> ). This emergency plan will be further developed by the contractor prior to the commencement of construction.	Construction
Land & Soil	15ha of forestry will be felled to accommodate wind farm infrastructure. However, all tree coverage felled will be replaced at a re-planting site(s) which will be subject to technical approval through a separate consenting process. No specific measures, other than best-practice felling and re-planting methodologies are proposed and the efficacy and appropriateness of these measures will be assessed, separately, through the felling and replanting licensing process.	Construction

Land & Soil	Oil used in transformers (at the substation and within each turbine) and storage of oils at the substation could leak during the operational phase and result in effects on soil and subsoils. The substation transformer and oil storage tanks will be located in a roofed concrete bund capable of holding 110% of the stored oil volume. Turbine transformers will be located within the turbines, and any leaks will be fully contained within the turbine thus eliminating any pathway for leakages to affect land and soil.	Operational
Land & Soil	Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant. Some of the effects will be avoided by retaining some elements of the project in place where appropriate; for example, access tracks within the site may be retained for agricultural and forestry uses. Mitigation measures, to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant and machinery, will be implemented as per the construction phase mitigation measures.	Decommissioning
Water	Best practice methods related to water incorporated into the forestry management and mitigation measures have been derived from:- <ul style="list-style-type: none"> <li>• Department of Agricultural, Food and the Marine (2019) <i>Standards for Felling and Reforestation</i>;</li> <li>• Forestry Commission (2004) <i>Forests and Water Guidelines, Fourth Edition</i>. Publ. Forestry Commission, Edinburgh;</li> <li>• Coillte (2009) <i>Forest Operations and Water Protection Guidelines</i>;</li> <li>• Forest Services (Draft) <i>Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures</i>;</li> <li>• Coillte (2009) <i>Methodology for Clear Felling Harvesting Operations</i>; and,</li> <li>• Forest Service (2000: <i>Forestry and Water Quality Guidelines</i>. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.</li> </ul>	Construction
Water	There is a requirement in the <i>Forest Service Code of Practice</i> and in the <i>FSC Certification Standard</i> for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document <i>Forestry and Water Quality Guidelines</i> will be adhered to.	Pre-Construction / Construction
Water	During the construction phase, a self-imposed conservative buffer zone of 50m will be maintained for all streams.	Construction
Water	Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods, as follows:- <ul style="list-style-type: none"> <li>• Machine combinations (i.e. handheld or mechanical) will be chosen which are most</li> </ul>	Construction

	<p>suitable for ground conditions and which will minimise soils disturbance;</p> <ul style="list-style-type: none"> <li>• Checking and maintenance of tracks and culverts will be ongoing through any felling operation. No tracking of vehicles through watercourses will occur. Where possible, existing drains will not be disturbed during felling works;</li> <li>• Ditches which drain from the areas to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and avoid being placed at right angles to the contour;</li> <li>• Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the spoil disposal areas. All new silt traps will be constructed on even ground and not on sloping ground;</li> <li>• In areas particularly sensitive to erosion or where felling inside the 50m buffer is required, it will be necessary to install double or triple sediment traps;</li> <li>• All drainage channels will taper out before entering the 50m buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;</li> <li>• Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled;</li> <li>• Brash mats will be used to support vehicles on soft ground, reducing topsoil and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place before they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;</li> <li>• Timber will be stacked in dry areas, and outside the 50m watercourse buffer. Straw bales and check dams will be emplaced on the down gradient side of timber storage/processing sites;</li> <li>• Works will be carried out during periods of no, or low, rainfall in order to minimise entrainment of exposed sediment in surface water run-off;</li> </ul>	
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	<ul style="list-style-type: none"> <li>• Checking and maintenance of roads/tracks and culverts will be ongoing through the felling operation;</li> <li>• Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required;</li> <li>• A permit to refuel system will be adopted;</li> <li>• Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors;</li> <li>• Trees will be cut manually from along streams and using machinery to extract whole trees; and</li> <li>• Travel will only be permitted perpendicular to and away from surface water features.</li> </ul>	
Water	Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time and allow settling of silt in a controlled manner.	Construction
Water	<p>The following items will be carried out during pre-felling inspections and regularly thereafter:-</p> <ul style="list-style-type: none"> <li>• Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual waterlogging or bogging of machines;</li> <li>• Inspection of all areas reported as having unusual ground conditions;</li> <li>• Inspection of main drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches will be identified. Where possible, the pre-felling inspection will be carried out during rainfall;</li> <li>• Following tree felling, all main drains will be inspected to ensure that they are functioning;</li> <li>• Extraction tracks within 10m of drains will be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground;</li> <li>• Culverts on drains exiting the site, if impeded by silt or debris, will be unblocked; and</li> <li>• All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.</li> </ul>	Pre-Construction / Construction
Water	<p>Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within 4-weeks of the felling activity commencing, preferably in medium-to-high water flow conditions. The 'during' sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e. where an impact has been shown).</p> <p>Details of the proposed surface water quality monitoring programme are outlined in the Water</p>	Pre-Construction / Construction

	<p>Quality Monitoring Plan (refer to <b>Annex 3.4</b>).</p> <p>The surface water sampling locations used in this EIAR for the wind farm site (i.e. SW1 – SW2) will also be used as sampling locations during felling activities.</p> <p>Also, daily surface water monitoring forms (for visual inspections and field chemistry measurements) will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.</p>	
Water	<p>Specific mitigation measures, incorporated into the design of the project and through implementation of best practice methodologies (discussed below) will be employed where work inside buffer zones is proposed.</p> <p>The generally large setback distance from sensitive hydrological features ensures that sufficient space is provided for the installation of drainage mitigation measures (discussed below) and to ensure their effective operation. The proposed buffer zone will ensure:-</p> <ul style="list-style-type: none"> <li>• Avoidance of physical damage to watercourses, and associated release of sediment;</li> <li>• Avoidance of excavations within close proximity to surface water courses;</li> <li>• Avoidance of the entry of suspended sediment from earthworks into watercourses; and,</li> <li>• Avoidance of the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.</li> </ul>	Pre-Construction / Construction
Water	<p>Source controls to limit the likelihood for 'dirty water' to occur include:-</p> <ul style="list-style-type: none"> <li>• Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with clean washed gravel, filter fabrics, and other similar/equivalent or appropriate systems; and</li> <li>• Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.</li> </ul>	Construction
Water	<p>In-Line controls to ensure appropriate management of silt laden water include:-</p> <ul style="list-style-type: none"> <li>• Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.</li> </ul>	Construction
Water	<p>Treatment systems to fully attenuate silt laden waters prior to discharge:-</p> <ul style="list-style-type: none"> <li>• Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other</li> </ul>	Construction

	<p>similar/equivalent or appropriate systems; and</p> <ul style="list-style-type: none"> <li>Final tertiary treatment lagoons which follow a design outlined by Altmüller and Dettmer (2006)<sup>3</sup>.</li> </ul>	
Water	<p>It should be noted for this site that an extensive network of land and forestry drains already exists and these will be integrated and enhanced as required and used within the wind farm drainage system. The integration of the existing land drainage network and the proposed wind farm network is common practice in wind energy developments and will also result in benefits to surrounding agricultural lands.</p> <p>The main elements of interaction with existing drains will be as follows:-</p> <ul style="list-style-type: none"> <li>Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction and attenuation for flow management) of runoff from the wind farm drainage into the existing site drainage network. This will reduce the likelihood of any increased risk of downstream flooding or sediment transport/erosion;</li> <li>Silt traps will be placed in the existing drains upstream of any streams where construction works is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area; and</li> <li>Buffered outfalls, which will be numerous over the site, will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site.</li> </ul>	Pre-Construction / Construction
Water	<p>While the primary, secondary and tertiary silt/sediment ponds and lagoons are assessed as providing a sufficient level of protection to avoid any deterioration in downstream water quality; a final line of defence can be provided by a water treatment train such as a 'Siltbuster', if required. If the discharge water from construction areas fails to be of a high quality, then a filtration treatment system (such as a 'Siltbuster' or similar equivalent treatment train [sequence of water treatment processes]) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This water treatment train will apply for the entirety of the construction phase.</p>	Construction
Water	<p>Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and</p>	Construction

<sup>3</sup> Altmüller R. & Dettmer, R. (2006) *Successful species protection measures for the Freshwater Pearl Mussel (Margaritifera margaritifera) through the reduction of unnaturally high loading of silt and sand in running waters – Experiences within the scope of the Lutterproject.*

	glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these of these structures during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be emplaced within drains down-gradient of all construction areas inside the hydrological buffer zones to provide an additional layer of protection in these areas.	
Water	Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats (sediment entrapment mats, consisting of coir or jute matting) placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.	Construction
Water	In addition to the silt/settlement ponds, a tertiary treatment system will also be provided to remove any fine particles that may not settle in the primary and secondary settlement ponds. From the silt/settlement ponds, water will flow through lagoon which will be designed with a retention time of 10-days. These ponds; the design of which will be adapted to the characteristics of the project site but based on the principles of Altmuller & Dettmer (2006); will be vegetated so as to perform the role of a 'plant filtration bed'.	Construction
Water	<p>It is proposed that excavated overburden/spoil will be utilised for reinstatement of excavated areas etc. and for landscaping purposes. Excess material, or material which is unsuitable for this purpose, will be stored, permanently, at 2 no. dedicated spoil deposition areas and in the 3 no. spent borrow pits (if developed).</p> <p>Both proposed spoil deposition areas and all borrow pits are located outside the 50m stream buffer zone (refer to <b>Annex 7.2</b>).</p> <p>During the initial placement of spoil in the deposition areas, silt fences, straw bales and biodegradable matting will be used to control surface water runoff. Drainage from overburden deposition areas will ultimately be routed to an oversized swale and a number of silt/settlement ponds (and lagoons) with appropriate storage and settlement capacity, designed for a '1-in-100 year 6-hour return' period, before being discharged.</p> <p>Spoil deposition areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised, spoil deposition areas will no longer be a likely source of silt laden runoff. Surface water protection infrastructure will be left in place until the areas have stabilised.</p>	Construction

<p>Water</p>	<p>Temporary silt fencing/silt trap arrangements will be placed within existing roadside/field drainage features along the grid connection route to remove any suspended sediments from the works area. The trapped sediment will be removed and disposed of at an appropriate licenced facility. Any bare-ground will be re-seeded/reinstated immediately and silt fencing temporarily left in place if necessary.</p>	<p>Construction</p>
<p>Water</p>	<p>The following mitigation will be carried out during directional drilling works:-</p> <ul style="list-style-type: none"> <li>• The works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;</li> <li>• A minimum 10m buffer zone will be maintained between disturbed areas and the watercourse bank. There will be no storage of material/equipment, excavated material (see below) or overnight parking of machinery inside the 10m buffer zone;</li> <li>• Double silt fencing will be placed upslope of the buffer zone on each side of the watercourse.</li> <li>• Temporary storage of excavated material will be undertaken outside of the 10m buffer on flat ground or within a local hollow area. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the watercourse;</li> <li>• Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;</li> <li>• There will be no refuelling allowed within 100m of the watercourse crossing;</li> <li>• All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing; and</li> <li>• Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted.</li> </ul> <p>Measures relating to the use of a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water for directional drilling include:-</p> <ul style="list-style-type: none"> <li>• The area around the Clear Bore™ batching, pumping and recycling plants will be bunded using terram and sandbags in order to contain any spillages;</li> <li>• One or more lines of silt fences will be placed between the works area and adjacent rivers and streams on both banks;</li> <li>• Accidental spillage of fluids will be cleaned up immediately and transported off site for disposal at a licensed facility; and,</li> <li>• Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.</li> </ul>	<p>Pre-Construction / Construction</p>



<p>Water</p>	<p>The works programme for the initial construction stage of the development will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of soil/subsoil or vegetation stripping will be suspended or scaled back if prolonged or intense rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.</p> <p>The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:-</p> <ul style="list-style-type: none"> <li>• General Forecasts: Available on a national, regional and county level from the Met Eireann website (<a href="http://www.met.ie/forecasts">www.met.ie/forecasts</a>). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;</li> <li>• Meteo Alarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;</li> <li>• 3 hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;</li> <li>• Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (<a href="http://www.met.ie/latest/rainfall_radar.asp">www.met.ie/latest/rainfall_radar.asp</a>). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3 hour record is given and is updated every 15 minutes. Radar images are not predictive; and,</li> <li>• Consultancy Service: Met Eireann provide a 24 hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.</li> </ul> <p>Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of an impending high rainfall intensity event.</p> <p>Works will be suspended if forecasting suggests either of the following is likely to occur:-</p> <ul style="list-style-type: none"> <li>• &gt;10 mm/hr (i.e. high intensity local rainfall events);</li> <li>• &gt;25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,</li> <li>• &gt;half monthly average rainfall in any 7 days.</li> </ul> <p>Prior to works being suspended the following control measures will be completed:-</p> <ul style="list-style-type: none"> <li>• Secure all open excavations;</li> <li>• Provide temporary or emergency drainage to prevent back-up of surface runoff; and,</li> <li>• Avoid working during heavy rainfall and for up to 24-hours after heavy events to ensure drainage systems are not overloaded.</li> </ul>	<p>Pre-Construction / Construction</p>
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<p>Water</p>	<p>The construction of the site drainage system will be carried out, at the respective locations, prior to other activities being commenced. The construction of the drainage system will only be carried out during periods of, where possible, no rainfall, therefore avoiding runoff. This will avoid the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and functional for all subsequent construction works.</p>	<p>Pre-Construction / Construction</p>
<p>Water</p>	<p>Prior to the commencement of development, a detailed Site Drainage Plan and SWMP will be prepared to detail the siting and composition of the surface water management measures. The respective plans, which will form part of a detailed Construction Environmental Management Plan (CEMP), will be prepared prior to the commencement of development.</p> <p>The CEMP will also include a detailed Water Quality Monitoring Plan for the monitoring of surface waters in the vicinity of the construction site by a designated Environmental Manager. The monitoring programme will comprise field testing and laboratory analysis of a range of agreed parameters. The civil works contractor, who will be responsible for the construction of the site drainage system, and Environmental Manager will undertake regular inspections of the drainage system to ensure that all measures are functioning effectively. The surface water sampling locations used in this EIAR (i.e. SW1 – SW4) will be used during construction activities. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.</p> <p>Any excess build-up of silt levels that may decrease the effectiveness of the drainage feature, will be removed and disposed of in an appropriate manner.</p>	<p>Pre-Construction / Construction</p>
<p>Water</p>	<p>The management of excavation dewatering (pumping), particularly in relation to any accumulation of water in foundations or electricity line trenches, and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:-</p> <ul style="list-style-type: none"> <li>• Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations, will be put in place;</li> <li>• The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters to ensure that Greenfield runoff rates are mimicked;</li> <li>• If required, pumping of excavation inflows will prevent build-up of water in the excavation;</li> <li>• The pumped water volumes will be discharged via volume and silt/sediment ponds and settlement lagoons adjacent to excavation areas, or via specialist treatment systems such</li> </ul>	<p>Pre-Construction / Construction</p>

	<p>as a Siltbuster unit;</p> <ul style="list-style-type: none"> <li>• There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;</li> <li>• Daily monitoring of wind farm excavations by the Environmental Manager will occur during the construction phase. If high levels of seepage inflow occur, excavation work at this location will cease immediately and a geotechnical assessment undertaken; and,</li> <li>• A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site for emergencies. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed.</li> </ul>	
Water	<p>Environmental management guidelines from the EPA guidance document <i>Environmental Management in the Extractive Industry</i> in relation to groundwater protection will be implemented during the construction phase, particularly the best practice measures relating to oil and fuels.</p>	Pre-Construction / Construction
Water	<p>Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:-</p> <ul style="list-style-type: none"> <li>• The volume of fuels or oils stored on site will be minimised. All fuel and oil will be stored in an appropriately bunded area within the temporary construction compound. Only an appropriate volume of fuel will be stored at any given time. The bunded area will be roofed to avoid the ingress of rainfall and will be fitted with a storm drainage system and an appropriate oil interceptor;</li> <li>• All bunded areas will have 110% capacity of the volume to be stored;</li> <li>• On site refuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled at the temporary compound and will be towed around the site by a 4x4 jeep to where plant and machinery is located. No refuelling will be permitted at works locations within the 50m hydrological buffer. The 4x4 jeep will also be fully stocked with fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations to avoid any accidental leakages;</li> <li>• All plant and machinery used during construction will be regularly inspected for leaks and fitness for purpose;</li> <li>• Spill kits will be readily available to deal with and accidental spillages;</li> </ul>	Construction

	<ul style="list-style-type: none"> <li>All waste tar material arising from road cuttings (from trenching or other works in public roads) will be removed off-site and taken to a licensed waste facility. Due to the potential for contamination of soils and subsoils, it is not proposed to utilise this material for any reinstatement works; and</li> <li>An outline emergency plan for the construction phase to deal with accidental spillages is contained within the Planning-Stage CEMP (<b>Annex 3.4</b>). This emergency plan will be further developed prior to the commencement of development, and will be agreed with the Planning Authority as part of the detailed CEMP.</li> </ul>	
Water	<p>Measures to avoid contamination of ground and surface waters by wastewaters will comprise:-</p> <ul style="list-style-type: none"> <li>Self-contained port-a-loos (chemical toilets) with an integrated waste holding tank will be installed at the site compound, maintained by the providing contractor, and removed from site on completion of the construction works;</li> <li>Water supply for the site office and other sanitation will be brought to site and removed after use to be discharged at a suitable off-site treatment location; and</li> <li>No water will be sourced on the site, nor will any wastewater be discharged to the site.</li> </ul>	Construction
Water	<p>The following mitigation measures are proposed to ensure that the release of cement-based products is avoided:-</p> <ul style="list-style-type: none"> <li>No batching of wet-cement products will occur on site. Ready-mixed concrete will be brought to site as required and, where possible, emplacement of pre-cast products, will take utilised;</li> <li>All watercourse crossings will utilise pre-cast products and the use of wet-cement products within the hydrological buffer will be avoided</li> <li>Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. Chute cleaning will be undertaken at lined cement washout ponds with waters being stored in the temporary construction compound, removed off site and disposed of at an approved licensed facility. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed;</li> <li>Weather forecasting will be used to ensure that prolonged or intense rainfall is not predicted during concrete pouring activities; and</li> <li>The concrete pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.</li> </ul>	Construction
Water	<p>The following mitigation measures are proposed in respect of morphological changes to watercourses and drainage patterns:-</p>	Pre-Construction / Construction

	<ul style="list-style-type: none"> <li>• All proposed new stream crossings will be clear span bridges (bottomless culverts) and the stream beds will remain undisturbed. No in-stream excavation works at the crossing locations are proposed and therefore there will be no impact on the stream at the proposed crossing location;</li> <li>• Where internal wind farm electrical cabling or grid connection cabling will pass above or below the existing culvert and will not directly interfere with the culvert;</li> <li>• At the time of construction, all guidance/best practice requirements of the Office of Public Works (OPW) or Inland Fisheries Ireland will be incorporated into the design/construction of the proposed watercourse/culvert crossings;</li> <li>• As a further precaution, in-stream construction work (if/where required) will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to <i>Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters</i> (2016) (i.e., July to September inclusive). This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);</li> <li>• During the near stream construction works (i.e. within the 50m buffer zone), double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase;</li> <li>• The 5 no. new watercourse crossings at the wind farm site will require a Section 50 license application to the OPW in accordance with the Arterial Drainage Act 1945. The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent; and</li> <li>• No instream works are proposed at the grid connection watercourse crossings.</li> </ul>	
Water	<p>The proposed mitigation measures for protection of surface water quality, which will include buffer zones and robust drainage control measures (i.e. interceptor drains, swales, silt/settlement ponds, settlement lagoons), will ensure that the quality of runoff from development areas will be very high. In particular, we refer to the inclusion of the tertiary sediment lagoons (as per Altmuller &amp; Dettmer (2006)) which are recognised as providing a high level of protection against downstream water quality deterioration thus ensuring the protection of Freshwater Pearl Mussel and Nore Pearl Mussel within the River Barrow &amp; River Nore SAC.</p>	Construction
Water	<p>The operational phase drainage system of the project is described below:-</p> <ul style="list-style-type: none"> <li>• Interceptor drains will be installed up-gradient of all infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-</li> </ul>	Operational

	<p>distributed over the ground by means of a level spreader;</p> <ul style="list-style-type: none"> <li>• Swales/road side drains will be used to collect runoff from access tracks, turbine hardstanding areas and substation compound areas which may contain entrained suspended sediment, and channel it to settlement ponds for sediment settling;</li> <li>• Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains;</li> <li>• Check dams will be used along sections of access tracks drains to intercept silts at source. Check dams will be constructed from a 40mm non-friable crushed rock or similar;</li> <li>• Swales and check dams will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and,</li> <li>• Settlement ponds will be designed in accordance the greenfield runoff rate requirements; and,</li> <li>• Imported rock for construction purposes and road surfacing will be strong, well-graded limestone which will be resistant to erosion and have a low likelihood to generate fines in hardstand runoff.</li> </ul> <p>The operation of the underground grid connection will not result in any likely hydrological or water quality effects and therefore do not require mitigation measures.</p>	
Water	<p>Mitigation measures relating to oils and fuels are as follows:-</p> <ul style="list-style-type: none"> <li>• Fuels stored on site will be minimised. Any storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction;</li> <li>• The substation transformer and oil storage tanks will be located in a concrete bund, impervious to rainwater ingress, capable of holding 110% of the stored oil volume.</li> <li>• Turbine transformers will be located within the turbines, and any leaks will be fully contained within the turbine thus eliminating any pathway for leakages to affect land and soil.</li> <li>• Maintenance vehicles will be regularly inspected for leaks and fitness for purpose; and</li> <li>• An emergency plan for the operational phase to deal with accidental spillages will be contained within an Operational-Phase Environmental Management Plan. Spill kits will be available to deal with accidental spillages.</li> </ul>	Operational
Water	<p>Temporary surface runoff control measures will again be put in place during decommissioning works. The drainage system will remain operational during the decommissioning phase and will serve to treat any sediment laden surface water run-off due to a renewed disturbance of soils. Following decommissioning, re-vegetation will be implemented as soon as practicable and</p>	Decommissioning

	monitored to ensure vegetation is established.	
Air Quality & Climate	<p>A detailed Dust Management Plan will be formulated prior to the construction phase of the project, and will include the following:-</p> <ul style="list-style-type: none"> <li>• Access tracks and public roads in the vicinity of the site shall be regularly cleaned to remove mud, aggregates and debris and maintained as appropriate. All road sweepers shall be water assisted;</li> <li>• Any road that has the potential to give rise to fugitive dust shall be regularly watered, as appropriate, during dry and/or windy conditions;</li> <li>• Public roads in the vicinity of the site shall be regularly inspected for cleanliness and cleaned as necessary;</li> <li>• In the event of dust nuisance occurring outside the site boundary, movement of materials will be immediately terminated and satisfactory procedures implemented to rectify the problem before the resumption of operations;</li> <li>• If issues persist and the above measures are not satisfactorily control dust emissions, a wheel washing system with rumble grids to dislodge accumulated dust and mud prior to leaving the site should be installed;</li> <li>• During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions;</li> <li>• Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; and</li> <li>• The Dust Management Plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.</li> </ul> <p>At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.</p>	Construction
Air Quality & Climate	Best practice construction methods including just in time delivery methods to prevent material waste, reuse of on-site materials, where possible; and the minimisation of fuel use, including generators, will reduce construction related climate emissions.	Construction
Air Quality & Climate	Measures similar to those implemented during the construction phase will also be implemented during the decommissioning phase.	Decommissioning

Landscape	Aside from construction stage mitigation measures to minimise land and vegetation disturbance and dust emissions (which may reduce visual amenity), there are no specific mitigation measures to be implemented. The appropriate management and reinstatement of excavations, in a timely manner, will ensure that any adverse effects caused, for example at site entrances or road upgrade locations, are minimised insofar as possible. Similarly, the progressive reinstatement and landscaping of the site will remediate any short term adverse effects on the local landscape.	Construction
Landscape	Given the highly visible nature of commercial wind energy developments it is not generally feasible to screen them from view using on-site screening measures typically employed for other forms of development during the operational phase. Instead, landscape and visual mitigation measures have been incorporated into the siting and design of the project at an early stage (see <b>Chapter 2</b> ). In the case of the wind farm, the guidance provided in the <i>Wind Energy Development Guidelines for Planning Authorities 2006</i> (and 2019 revision) was the principal consideration. The relevant guidance for the landscape types that constitute the landscape and visual setting of the wind farm are discussed in detail in <b>Section 9.3.2.1</b> above. It is considered that the wind farm is broadly in line with the recommendations contained within the Guidelines.	Pre-Construction
Landscape	The colour will be industry standard off-white/light grey semi-matt non-reflective finish.	Pre-Construction
Landscape	Electricity lines between individual turbines and the substation, and the grid connection infrastructure, will be placed underground.	Pre-Construction / Construction
Landscape	Special care will be taken to preserve any features, insofar as possible, which contribute to the landscape character of the study area.	Pre-Construction / Construction
Landscape	Counter rotation of blade sets will be avoided.	Pre-Construction / Construction
Landscape	The turbines are expected to be fully operational for up to 35-years. After this period, and if planning permission is not sought for an extension of this use at the site, the turbines and ancillary developments will be deconstructed and removed from the site with the exception of electricity grid infrastructure which may remain as part of the national grid network in perpetuity. Aspects of the ancillary site development including the access tracks may be retained in-situ. These may facilitate the use of the site for, as stated, suitable future rural development uses including animal grazing.	Decommissioning
Cultural Heritage	Post-consent pre-construction test trenching shall be carried out in the area of land take	Pre-Construction



	closest to RMP MO020-012 (ringfort) within the forestry re-plant lands. Test trenching will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during test trenching. Further recommendations, which may include preservation <i>in situ</i> , archaeological excavation or archaeological monitoring, may be made on completion of the test trenching programme.	
Cultural Heritage	Archaeological monitoring of all excavations associated with the construction of the wind farm shall be carried out. Monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring.	Construction
Cultural Heritage	Archaeological monitoring of all excavations associated with the grid connection infrastructure shall be carried out. Monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring.	Construction
Cultural Heritage	Archaeological monitoring of all excavations within the temporary access track between the N78 and L1834 shall be carried out. Monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring.	Construction
Cultural Heritage	Archaeological monitoring of all excavations at townland, parish, barony or county boundaries shall be carried out. Monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring.	Construction
Cultural Heritage	Written and photographic records will be created of any townland, parish, barony or county boundaries that may be impacted on. The written and photographic records will be created in advance of excavations commencing on site.	Pre-Construction
Cultural Heritage	A post-consent pre-construction Architectural Impact Assessment of Black Bridge, containing written, drawn and photographic records, shall be carried out by a suitably qualified historic building consultant/Conservation Architect.	Pre-Construction

Cultural Heritage	A post-consent pre-construction Architectural Impact Assessment of Crettyard Bridge, containing written, drawn and photographic records, shall be carried out by a suitably qualified historic building consultant/Conservation Architect.	Pre-Construction
Noise & Vibration	<p>Construction activities will be completed in accordance with the provisions, where relevant, of <i>BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise</i> which offers detailed guidance on the control of noise &amp; vibration from demolition and construction activities. The relevant practices to be adopted during construction shall include:-</p> <ul style="list-style-type: none"> <li>• Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;</li> <li>• Establishing channels of communication between the contractor/developer, Local Authorities and residents;</li> <li>• Appointing a site representative responsible for matters relating to noise and vibration;</li> <li>• Monitoring typical levels of noise and vibration during critical periods and at sensitive locations; and</li> <li>• Keeping site access tracks even to mitigate the potential for vibration from HGVs.</li> </ul>	Pre-Construction / Construction
Noise & Vibration	<p>A variety of practical noise control measures will be employed. These include:-</p> <ul style="list-style-type: none"> <li>• Selection of plant with low inherent potential for generation of noise and/or vibration;</li> <li>• Placing of noisy/vibratory plant as far away from sensitive properties as permitted by site constraints, and;</li> <li>• Regular maintenance and servicing of plant items.</li> </ul>	Pre-Construction / Construction
Noise & Vibration	<p>The following list of measures will be implemented, as relevant, to ensure compliance with the relevant construction noise criteria:-</p> <ul style="list-style-type: none"> <li>• No plant or machinery will be permitted to cause a public nuisance due to noise;</li> <li>• The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.</li> <li>• All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;</li> <li>• Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;</li> <li>• Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use;</li> </ul>	Construction

	<ul style="list-style-type: none"> <li>Any plant, such as generators or pumps, which may be required to operate outside of general construction hours will be surrounded by an acoustic enclosure or portable screen;</li> <li>During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed using methods outlined in <i>BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise</i>; and</li> <li>The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations, including the delivery of construction materials, shall generally be restricted to between 07:00hrs and 19:00hrs Monday to Friday and between 07:00hrs and 13:00hrs on Saturdays, with no operations on Sundays or public holidays. However, to ensure that optimal use is made of good weather periods, at occasional critical periods within the construction programme (i.e. concrete pours, turbine component deliveries and turbine erection) or in the event of an emergency; activities may be necessary outside out of these hours.</li> </ul>	
Noise & Vibration	<p>If rock breaking is required, the following measures will be implemented, where necessary, to mitigate noise emissions:-</p> <ul style="list-style-type: none"> <li>Fit suitably designed muffler or sound reduction equipment to the rock breaking tool to reduce noise without impairing machine efficiency;</li> <li>Ensure all air lines are sealed;</li> <li>Use a dampened bit to eliminate a 'ringing' sound;</li> <li>Erect an acoustic screen between compressors or generators and noise sensitive area. When possible, line of sight between top of machine and reception point will be obscured; and</li> <li>Enclose the breaker or rock drill in portable or fixed acoustic enclosure with suitable ventilation.</li> </ul>	Construction
Noise & Vibration	<p>If alternative turbine technologies are considered for installation, an updated noise assessment will be prepared to confirm that the associated noise levels comply with the noise criteria curves and/or the relevant operational noise criteria associated with any condition of consent.</p>	Pre-Construction
Noise & Vibration	<p>In the unlikely event that an issue with low frequency noise is associated with the project, an appropriate detailed investigation, by an independent acoustic consultant, shall be undertaken. Due consideration shall be given to guidance on conducting such an investigation which is outlined in Appendix VI of the EPA document entitled <i>Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)</i> (EPA, 2016). This guidance is based on the threshold values outlined in the Salford University</p>	Operational

	document Procedure for the assessment of low frequency noise complaints, Revision 1, December 2011.	
Noise & Vibration	In the unlikely event that a complaint is received which indicates potential amplitude modulation (AM) associated with turbine operation, an independent acoustic consultant shall be employed to assess the level of AM in accordance with the methods outlined in the IOA Wind Turbine Noise Amplitude Modulation Working Group (AMWG) document <i>A Method for Rating Amplitude Modulation in Wind Turbine Noise</i> (IOA, 2016) or subsequent revisions, and suitable measures implemented as necessary.	Operational
Noise & Vibration	Post-commissioning operational noise monitoring will be undertaken to demonstrate compliance with the relevant noise criteria. In relation to the assessment of operational phase wind turbine noise, the guidance outlined in the IOA GPG and <i>Supplementary Guidance Note 5: Post Completion Measurements</i> (July 2014) will be followed. Should the assessment identify any exceedances of the appropriate criteria, relevant corrective actions will be immediately implemented by the Developer.	Operational
Shadow Flicker	<p>The Draft 2019 Guidelines propose to fully eliminate the occurrence of shadow flicker at all dwellings, places of work and schools through the installation of automated turbine shut down software. While the Draft 2019 Guidelines have not been formally adopted, the Developer has, as discussed above, committed to the implementation of design/mitigation measures to fully eliminate shadow flicker at all dwellings, places of work and schools.</p> <p>Automated turbine shut-down software is available and is already widely implemented to eliminate the occurrence of shadow flicker on wind farm developments where shadow flicker levels are proven to occur. Shut down software effectively limits (curtails) the operation of turbines during the infrequent and rare periods when shadow flicker occurs. The proposed wind turbines will each be fitted with automated turbine shut down software, inherent to their design, to facilitate their shut down as required.</p> <p>The shut-down software will be programmed with a set of predetermined times when shadow flicker could theoretically occur; if the wind is blowing and the sun is shining. The software will determine; based on the operation, or otherwise, of each turbine; whether the wind is blowing and; based on a sunlight sensor fitted within the wind farm; whether the sun is shining.</p> <p>If the wind is blowing and the sun is shining during the set of predetermined times discussed above, the software will temporarily switch off a turbine (or turbines) which is (or are) predicted to give rise to shadow flicker effects at a particular receptor. Having switched off a turbine (or turbines), the software will then recognise when the generation of shadow flicker at a receptor can no longer occur and will switch on the turbine (or turbines). This automated process will</p>	Operational

	ensure that no shadow flicker, whatsoever, is experienced at any dwelling, place of work or school.	
Shadow Flicker	<p>Within 12-months of the commencement of commercial operations, a shadow flicker survey will be undertaken by a suitably qualified person to verify the implementation of the turbine shut down software. Monitoring will be undertaken when and where the model predicts shadow flicker is expected to occur.</p> <p>The data which will be collected during the survey will include:-</p> <ul style="list-style-type: none"> <li>• The date, time, location (turbine ID) and duration of the measurement;</li> <li>• Sunlight intensity and direction;</li> <li>• Wind speed and direction/rotor angle; and</li> <li>• Time, date and duration of any sensor triggered shut down.</li> </ul> <p>A site visit will be carried out by a suitably qualified person during each calendar season, to obtain representative samples of year-round conditions, to monitor the site when shadow flicker is predicted to occur to verify the effectiveness of the shut-down software.</p>	Operational
Shadow Flicker	Should any third party complaints be raised in respect of shadow flicker at any time during the lifetime of the project, additional specific monitoring will be undertaken as per the methods described above.	Operational
Material Assets (Transport & Access)	Traffic movements will be limited to 07:00-19:00 Monday to Friday and 07:00-13:00 on Saturdays with no movements on Sundays or public holidays. It may be occasionally necessary to undertake works outside of these hours to avail of favourable weather conditions or during extended concrete pours. Where construction activities are necessary outside of the normal working hours, local residents and the Planning Authority will receive prior notification.	Construction
Material Assets (Transport & Access)	A wheel washing facility will be provided, as necessary, to prevent any debris being transferred from site to the adjacent public roads. All drivers will be required to ensure that their vehicle is free from dirt and stones prior to departure from the project site. Where conditions exist for dust to become friable, techniques such as damping down of the affected areas will be employed and vehicles/loads will be covered to reduce dust emissions.	Construction
Material Assets (Transport & Access)	A Traffic Management Plan shall be agreed as part of the Construction Environmental Management Plan (CEMP) with the Local Authority prior to the commencement of development. The Traffic Management Plan shall include <i>inter alia</i> confirmed details of construction material haul routes; confirmed details of vehicle specifications; a materials delivery programme; traffic management measures including details of 'Stop/Go' systems, signage, road closures and diversionary routes; and road reinstatement details.	Pre-Construction / Construction

Material Assets (Transport & Access)	All works to the public road shall be undertaken in consultation with, and agreed in advance with, the relevant local authority.	Pre-Construction / Construction
Material Assets (Transport & Access)	All reasonable steps shall be taken to ensure that only national and regional routes are used to transport all materials to the site, in so far as is possible.	Pre-Construction / Construction
Material Assets (Transport & Access)	Prior to, and post, construction; pavement condition surveys will be undertaken along all non-national access routes proposed to be utilised in the delivery of construction materials. Given the high-quality and well-maintained nature of motorways and national routes, it is not assessed as necessary to carry out surveys of these carriageways or structures. Following the completion of the pre-construction survey, any works which are assessed as necessary to facilitate the delivery of components and materials to the project site shall be undertaken, while any deterioration of carriageways or structures identified in the post-construction survey shall be put right at the expense of the developer and to the satisfaction of the relevant local authority.	Pre-Construction / Construction
Material Assets (Transport & Access)	Adequate signage shall be provided at entrances providing access, safety and warning information.	Construction
Material Assets (Transport & Access)	Speed limit compliance; particularly along the L1834, L1835, L3037, L7117 and along the grid connection route; will be emphasised to all staff and contractors prior to the commencement of construction during site induction, and will be strictly enforced throughout the construction phase.	Construction
Material Assets (Transport & Access)	Sufficient car parking spaces will be available at the temporary construction compound during the construction phase. Additionally, during construction of the proposed grid connection, it is likely that agricultural premises will be used for the temporary storage of materials (e.g. ducting, cabling, etc.) and for the parking of construction plant, machinery, and work vehicles (cars, vans, etc.). No parking of cars by persons associated with the project will be permitted on any part of the public road that is not closed to traffic. All staff will be instructed to ensure that private entrances remain unobscured (particularly along the grid connection route).	Construction
Material Assets (Transport & Access)	Road sweeping, particularly along the proposed grid connection route, will be carried out as appropriate to ensure construction traffic does not adversely affect road conditions.	Construction
Material Assets (Transport & Access)	Traffic restrictions shall be kept to minimum duration and extent.	Construction

Material Assets (Transport & Access)	Appropriate traffic management; including maintenance of local access, pedestrian access (where safe to do so) and diversions (where required); shall be implemented to facilitate continued public use of roads where temporary traffic restrictions have to be put in place. Precise details of these measures will be detailed in the Traffic Management Plan to be agreed with the Planning Authority prior to the commencement of development.	Pre-Construction / Construction
Material Assets (Transport & Access)	The timing of oversized/abnormal loads shall be agreed with the relevant local authorities and An Garda Síochána, and all relevant licenses and permits shall be obtained in advance. All oversized/abnormal loads shall be accompanied by escort vehicles to ensure the maintenance of public safety.	Pre-Construction / Construction
Material Assets (Transport & Access)	Maximum axle loadings for abnormal/oversized loads shall be strictly enforced in accordance with the Road Traffic (Construction and Use of Vehicles) Regulations 2003 (S.I. No. 5 of 2003).	Construction
Material Assets (Transport & Access)	A designated contact point and coordinator will be put in place to manage all access arrangements and to interface with the public and the respective local authorities.	Construction
Material Assets (Transport & Access)	The site shall be closed, and strictly secured, to the public during the construction phase.	Construction
Material Assets (Transport & Access)	Prior to and post construction, pavement condition surveys will be undertaken along all non-national access routes proposed to be utilised in the delivery of construction materials. Following the completion of the pre-construction survey, any works (additional to those which have been identified and described at <b>Chapter 3</b> ) which are assessed as necessary to facilitate the delivery of components and materials to the project site shall be undertaken. Any deterioration of carriageways or structures identified in the post-construction survey shall be put right at the expense of the developer and to the satisfaction of the relevant local authority.	Pre-Construction / Construction
Material Assets (Aviation)	Due to the absence of likely effects, there are no specific mitigation measures proposed during the construction phase. As requested by the IAA in its consultation response, a minimum of 30-days prior notification will be provided regarding the commencement of crane operations at the project site. Additionally, as is best practice and implemented as standard, warning lights will be fitted to cranes during the erection of the wind turbines.	Pre-Construction / Construction
Material Assets (Aviation)	At a maximum of 30-days following the installation of all proposed turbines, 'as-constructed details' will be provided to the IAA to allow for the updating of mapping charts, including:- <ul style="list-style-type: none"> <li>• The number of wind turbines;</li> <li>• WGS-84 coordinates of each turbine;</li> </ul>	Operational

	<ul style="list-style-type: none"> <li>• Ground elevation of each turbine (Malin Head OD);</li> <li>• Blade tip elevation of each turbine (Malin Head OD);</li> <li>• Height of Turbine;</li> <li>• Contour maps at the requisite scale; and</li> <li>• A note of which turbines have been fitted with obstacle warning lights.</li> </ul>	
Material Assets (Aviation)	<p>In the event that the obstacle warning lights fail or if there are plans to withdraw them from use for a period of time, the IAA will be contacted, via <a href="mailto:AISOPs@iaa.ie">AISOPs@iaa.ie</a>, as a matter of urgency, to request that a NOTAM (Notice to Airmen) is issued concerning the absence of obstacle lighting. The following information will be provided to the IAA:-</p> <ul style="list-style-type: none"> <li>• Obstacle ID;</li> <li>• Obstacle type;</li> <li>• Obstacle Position;</li> <li>• Elevation; and</li> <li>• Colour of Light.</li> </ul> <p>It should also be noted, however, that the proposed wind turbines will be fitted with an uninterruptable power supply (UPS) to ensure that the aviation warning lights remain operational even in the event of a power outage. This UPS is sufficient for a period of 12-hours; after which, the warning lights can be powered by a small generator should the power outage continue.</p>	Operational
Material Assets (Telecommunications)	<p>With regards to Enet, following extensive consultation, a technical solution has been identified and agreed with the service provider. The solution comprises the re-routing of the affected microwave link to avoid the project site. The cost of the solution shall be borne by the Developer and shall be implemented and operational prior to the erection of the proposed wind turbines. The implementation of this measure shall be undertaken in consultation with Enet to ensure that there is no interruption to broadcast services.</p>	Pre-Construction / Construction
Material Assets (Telecommunications)	<p>Similarly, with respect to Radio Services &amp; Building Limited (KCLR Radio), it is proposed to re-route the affected transmission link between Johnswell (Co. Kilkeny) and Rathmore (Co. Laois) to avoid the proposed development site. The cost of the solution shall be borne by the Developer and shall be implemented and operational a minimum of 6-months prior to the installation of turbines T6 &amp; T7. The implementation of this measure shall be undertaken in consultation with Radio Services &amp; Building Limited (KCLR Radio) to ensure that there is no interruption to broadcast services.</p>	Pre-Construction / Construction
Material Assets	<p>In its consultation response, 2rn recommended that a protocol agreement be entered into to ensure that any complaints received from members of the public are appropriately managed,</p>	Operational



(Telecommunications)	addressed, and remediated. This is a standard protocol for wind energy developments and has been agreed between the parties. A signed copy of the protocol is enclosed at <b>Annex 13.3</b> .	
Material Assets (Telecommunications)	While assessed to be unlikely, if significant signal interference in any form is identified and is directly attributed to the project, appropriate remedial measures will immediately be undertaken. A range of technical measures are available to mitigate any instances of interference including signal amplifiers, active deflectors and relay transmitters, repeater stations, booster units, realignment of domestic aerials, installation of higher quality aerials and the installation of suppression equipment. Remedial works will be promptly undertaken, at the Developer's expense, to ensure uninterrupted telecommunication, broadcasting and mobile phone service provision.	Operational

