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generations

Derrybrien Wind Farm Project

Gort Windfarms Ltd.

Remedial Environmental Impact Assessment Report Chapter 18 Remedial Measures

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18 Remedial Measures/ Mitigation and Monitoring

18.1 Introduction

The Chapter has been prepared to set out a summary of the measures identified in this Remedial EIAR as being those already implemented to date, ongoing and also necessary for the continued operation and decommissioning of the project to avoid, prevent, reduce or, if possible, offset any significant adverse effects on the environment.

This ensures that adequate information is set out in the rEIAR to enable the Planning Authority to undertake an assessment of the EIA, as required under the Planning Acts and Regulations.

18.2 Chapter Scope

The requirements under the Planning and Development Act 2000 (as amended) with respect to remedial measures in substitute consent is set out as follows:

‘177F.— (1)

(a) a statement of the significant effects, if any, on the environment, which have occurred, or which are occurring or which can reasonably be expected to occur because the development the subject of the application for substitute consent was carried out;

(b) details of—

(i) any appropriate remedial measures undertaken or proposed to be undertaken by the applicant for substitute consent to remedy any significant adverse effects on the environment;

(ii) the period of time within which any proposed remedial measures shall be carried out by or on behalf of the applicant;

(c) such information as may be prescribed under section 177N.’

Table 18-1 and Table 18-2 provide details of the remedial measures set out in the rEIAR as required by Section 177f of the PDA.

Table 18-2 sets out the remedial measures which should be undertaken by third parties.

18.3 Statement of Authority

The chapter was prepared by Clodagh Moran, BE (Electrical), MIEI., HDip Project Management, HDip Management, drawing together information provided by each of the contributors to the rEIAR.

18.4 Methodology

Each Chapter author prepared a list of remedial measures which were subsequently compiled into this Chapter. Duration and timing of the measures was derived from project records where such measures were completed. Measures which are ongoing, such as maintenance activity on drainage, have been identified and listed as such and measures to be implemented include those identified to ensure that future operations and decommissioning of the wind farm do not give rise to significant adverse effects.

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Table 18-1 Schedule of Environmental Commitments with respect to Mitigation and Monitoring that Gort Windfarms Ltd will implement

Remedial/ Mitigation Measure No.	rEIAR Reference No.	rEIAR Sub- section Reference	EIA Topic	Description of Remedial Measure / Environmental Commitments	Duration	Stage of Impact (i.e. Construction, Operation, Decommissioning Phase)	Status (completed/ ongoing/ proposed)
4-1	Chapter 4	4.5.5	Population and Human Health	Significant negative impacts to the health of the population in the area have not occurred but potentially could have occurred or could occur from site instability in the absence of mitigation. Mitigation for noise has been included in Chapter 5 for all project phases. Chapter 10, Section 10.5 sets out detailed remedial and mitigation measures, which were implemented during construction and operation to date, which will be implemented during the operation period to circa 2040 and also during the project decommissioning. Mitigation has also been developed for potential cumulative impacts with turbary cutting. These mitigation measures will be key to ensuring that peat instability on site does not arise and that no impact on human health will occur.	Lifetime of the Project	Operation and decommissioning phases	ongoing
4-2	Chapter 4	4.5.5	Population and Human Health	Chapter 12 on air and climate includes mitigation for decommissioning to ensure no impact from particulate matter on air quality and human health also.	Duration of decommissioning	Decommissioning	proposed
4-3	Chapter 4	4.5.5	Population and Human Health	Derrybrien Wind Farm operates a Safety Management System (SMS) which meets the requirements of OHSAS 18001 and this will continue to be implemented throughout its operational life.	Lifetime of the Project	Operation	ongoing
4-4	Chapter 4	4.5.5	Population and Human Health	Derrybrien Wind Farm also operates an emergency procedure. This covers procedure in event of accidents, lone working, persons falling into water, forest/gorse fire, fire in wind turbine towers and procedure in event of landslide. Contact details are provided for emergency services, including the local authority and An Garda Síochána. The emergency procedure will be maintained throughout the lifetime of the wind farm. To reduce potential for accidents access restrictions are in place for mobile cranes on the narrow turbary road near turbine T40 between turbine T31 and T45.	Lifetime of the Project	Operation	ongoing
4-5	Chapter 4	4.5.5	Population and Human Health	Decommissioning will be carried out in accordance with legislation and best practice with respect to Health and Safety. This will involve site inductions, risk assessment and method statements. In general mitigation of impacts on human health has been considered in the context of mitigation of other aspects of this development in the relevant Sections of the Environmental Report which when fully implemented will ensure no likely impact on human health.	Duration of decommissioning	Decommissioning	proposed
5-1	Chapter 5		Noise & Vibration	None required.	N/A	construction	completed
5-2	Chapter 5		Noise & Vibration	None required.	N/A	operation	ongoing
6-1	Chapter 6		Shadow Flicker	N/A	N/A	construction	completed

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6-2	Chapter 6	6.5	Shadow Flicker	The assessment has been carried out based on worst case theoretical modelling and the identified sensitive receptor (R01) will not be significantly affected. It is evident that, without operational constraints, the expected potential occurrence of Shadow Flicker at Derrybrien Wind Farm is well below DoEHLG (2006) Wind Energy Development Guidelines. If a complaint arises relating to shadow flicker it will be fully investigated and mitigation to prevent a re-occurrence will be put in place. The mitigation proposed will be in the form of a programmed hard shutdown of the identified wind turbines (T23, T70 and T71 as presented in Appendix C) giving rise to the flicker effect and/or suitable landscaping to provide intervening foliage to shield from any such flicker.	N/A	Operation	proposed
6-3	Chapter 6		Shadow Flicker	N/A	N/A	Decommissioning	completed
7-1	Chapter 7	7.6.1.2	Biodiversity (Terrestrial Ecology)	Monitoring of the hen harrier population in the vicinity of the Project has been on-going since 2004. This has allowed for maintenance activities during the operational phase of the wind farm to be undertaken without causing disturbance to nesting birds in the area surrounding the wind farm. This monitoring will continue for the lifetime of the project to ensure that mitigation of future works is based on the most up-to-date information.	Monitoring of hen harrier is required prior to any works which have the potential to cause disturbance during the lifetime of the Project.	Operation and decommissioning phases	ongoing
7-2	Chapter 7	7.6.1.2	Biodiversity (Terrestrial Ecology)	Should a pair of hen harrier be found nesting within the wind farm project boundary or within a distance of 2 km from the project boundary, seasonal restrictions on works may be required (depending on location of works, local topography etc.) to minimise risk of disturbance.	Seasonal restrictions shall apply during future works where required.	Operation and decommissioning phases	ongoing
7-3	Chapter 7	7.6.1.2	Biodiversity (Terrestrial Ecology)	Routine maintenance works, other than those associated with individual turbine maintenance and works within the substations, will be undertaken outside of the bird nesting season (1st March-31st August) in compliance with the Wildlife Acts 1976 & 2000.	Outside March to August annually	Operational phase.	proposed
7-4	Chapter 7	7.6.1.2	Biodiversity (Terrestrial Ecology)	Bird flight diverters will be placed along the entire length (at appropriate spacing) of the Derrybrien to Agannygal 110kV OHL in order to minimise the risk of collision.	Remaining lifetime of the Project	Operational phase.	proposed
7-5	Chapter 7	7.6.1.3	Biodiversity (Terrestrial Ecology)	A minimum of two bat boxes will be fixed to each of the three bridges that were affected by the peat slide. If suitable locations for the bat boxes cannot be found on the bridges, they should be placed on nearby trees at a suitable aspect.	2020 - until end of Project	Construction	proposed
7-6	Chapter 7	7.6.1.3	Biodiversity (Terrestrial Ecology)	A curtailment scheme will be in effect April to October (inclusive), it will stop the operation of turbines when temperatures are above 11 degrees Celsius and wind speed is below 5 m/s between dusk and dawn each night to mitigate the collision risk to bats.	2020 - until end of operational phase	Operational phase.	ongoing

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8-1	Chapter 8	8.5.1	Aquatic Ecology and Fisheries	During the removal of Barrages 3 and 4, a pump-over system will be used to minimise the escape of suspended solids into the watercourse downstream. The work will only be undertaken during a period of dry weather between May and September. All the retained material upstream has been removed and the channel re-profiled to its original pre-slide form and gradient. Consultation will be undertaken with Inland Fisheries Ireland (IFI) prior to works.	temporary during decommissioning	Decommissioning phase	proposed
8-2	Chapter 8	8.5.1	Aquatic Ecology and Fisheries	During the removal of structures along the OHL, all decommissioning traffic will follow only the proposed access tracks indicated on Figures 2.27 and 2.28 Chapter 2. Avoid direct crossing of all minor or larger drains and streams to access structure in order to minimise solids loss. Where crossings cannot be avoided, bog mats or other suitable bridging method will be used to protect the drains in question.	temporary during decommissioning	Decommissioning phase	proposed
8-3	Chapter 8	8.5.1	Aquatic Ecology and Fisheries	All pole-sets and masts will be cut at the base and foundations left in-situ, i.e. they will require little if any ground excavation and any that will take place at masts will be very limited.	temporary during decommissioning	Decommissioning phase	proposed
8-4	Chapter 8	8.5.1	Aquatic Ecology and Fisheries	silt control measures should be used in all minor drains likely to act as conduits for solids-contaminated water arising as a result of vehicular-associated ground damage, thereby preventing them from reaching any of the larger watercourses along the OHL corridor.	temporary during decommissioning	Decommissioning phase	proposed
8-5	Chapter 8	8.5.1	Aquatic Ecology and Fisheries	For the main crossing of the Owendalulleagh for access to structure AM 24, etc. IFI should be consulted in advance about the most appropriate crossing method. Electrofishing will be used at the crossing corridor in advance of works to prevent or minimise fish mortalities. Other measures will be implemented to prevent fish mortality and damage to the river - 1) the minimum number of vehicles required will be used and the lowest possible frequency of over-and-back crossings will take place 2) A narrow crossing corridor will be demarcated. Only one vehicle at a time will be allowed to cross and at a very slow speed.	temporary during decommissioning	Decommissioning phase	proposed
8-6	Chapter 8	8.5.1	Aquatic Ecology and Fisheries	The electrofishing approach would not be practicable if the work required very frequent back-and-forth trafficking, in which case a more structured approach might be required e.g. the installation of a baily bridge.	temporary during decommissioning	Decommissioning phase	proposed
9-1	Chapter 9		Landscape and Visual	None Required.	N/A	construction	completed
9-2	Chapter 9		Landscape and Visual	None Required.	N/A	operation	ongoing
9-3	Chapter 9		Landscape and Visual	None Required.	N/A	decommissioning	proposed
10-1	Chapter 10	10.5.2.5	Soils, Geology and Land	The carriageway requirements for the large mobile crane that will be used to dismantle the turbines along the narrow section of turbary road between Turbines T31 and T45 will be reviewed in advance of the works.	Decommissioning phase	in advance of decommissioning	Decommissioning phase

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10-2	Chapter 10	10.5.2.5	Soils, Geology and Land	Should more substantial upgrade works on sections of the turbary road on the site be required that the following will be required; detailed design and analysis by a suitably qualified geotechnical engineer, additional site investigations and supervision of all works by a suitably qualified engineer from ESB Engineering and Major Projects.	Decommissioning phase	Decommissioning	Decommissioning phase
10-3	Chapter 10	10.5.2.5	Soils, Geology and Land	The size, weight and axle load of the large mobile crane that is used to dismantle the turbines shall not exceed the design load for the floating roads.	Decommissioning phase	Decommissioning	Decommissioning phase
10-4	Chapter 10	10.5.2.5	Soils, Geology and Land	For decommissioning the size, weight and axle load of the low-loader transporter used to transport the transformer off the site shall not exceed the combined design load of the vehicle that was used to bring the transformer to the substation site during construction.	Decommissioning phase	Decommissioning	Decommissioning phase
10-5	Chapter 10	10.5.2.5	Soils, Geology and Land	The electrical cables that have been direct-buried in the peat will be pulled out by winching from hardstanding areas, manholes or junction boxes only, where possible, to minimise the extent of trench excavations in the peat.	Decommissioning phase	Decommissioning	Decommissioning phase
10-6	Chapter 10	10.5.2.5	Soils, Geology and Land	A permit to work scheme will be implemented on the site for the works. The Contractor's method statements will be reviewed and certified by a suitably qualified geotechnical engineer.	Decommissioning phase	Decommissioning	Decommissioning phase
10-7	Chapter 10	10.5.2.5	Soils, Geology and Land	The decommissioning works will be supervised by a suitably qualified engineer from ESB Engineering and Major Projects.	Decommissioning phase	Decommissioning	Decommissioning phase
10-8	Chapter 10	10.5.2.4	Soils, Geology and Land	Periodic inspections of the site will be carried out by a suitably qualified geotechnical engineer on behalf of Gort Wind Farms Ltd.	2020-onwards	2020 - until end of the Project	Operations & maintenance phase 2020 - 2040
10-9	Chapter 10	10.5.2.4	Soils, Geology and Land	If a crane is required to pass along the narrow section of turbary road between Turbines T31 and T45 then the carriageway requirements for the crane will be reviewed and the road will be widened where required to prevent the crane going off the road.	2020-onwards	2020 - until end of the Project, as and when required	Operations & maintenance phase 2020 - 2040
10-10	Chapter 10	10.5.2.4	Soils, Geology and Land	Should the turbary road require widening the following will be required; a detailed design, additional site investigations, stability analyses to relevant eurocode standards and the works on site will be supervised by a suitably qualified geotechnical engineer on behalf of Gort Wind Farms Ltd.	2020-onwards	2020 - until end of the Project, as and when required	Operations & maintenance phase 2020 - 2040
10-11	Chapter 10	10.5.2.4	Soils, Geology and Land	Should more substantial upgrade works on sections of the floating roads on the site be required that the following will be required at a minimum; review by a suitably qualified geotechnical engineer, additional site investigations and supervision of all works by a suitably qualified engineer from ESB Engineering and Major Projects, all in line with mitigation measures undertaken 2001-2014.	2020-onwards	2020 - until end of the Project	Operations & maintenance phase 2020 - 2040
10-12	Chapter 10	10.5.2.3.1.9	Soils, Geology and Land	Stock piling of timber at the site prohibited.	2017-onwards	2017 - until end of the Project	Operations & maintenance

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							phases and decommissioning
10-13	Chapter 10	10.5.2.3.1.8	Soils, Geology and Land	No commercial forestry planting or felling was permitted on the wind farm site during the operation and maintenance period between October 2005 and Q2 2020 and none is planned.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-14	Chapter 10	10.5.2.3.1.8	Soils, Geology and Land	Tree-topping works to be limited to clearing small trees (typically conifers <4-5 m high) and shrubs that had re-grown naturally within areas that had been cleared during the construction of the project.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-15	Chapter 10	10.5.2.3.1.8	Soils, Geology and Land	Tree topping to be only carried out using a light 10 tonne wide-tracked excavator with a saw head attachment, which is a specialist low-ground bearing pressure forestry machine suitable for working directly on the peat.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-16	Chapter 10	10.5.2.3.1.8	Soils, Geology and Land	All of the trimmed vegetation to be cut and left in place on the peat slopes with no additional handling.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-17	Chapter 10	10.5.2.3.1.8	Soils, Geology and Land	Tree topping works were and to be carried out at the end of the drier summer months when the risk of peat instability on the site is lower.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-18	Chapter 10	10.5.2.3.1.8	Soils, Geology and Land	The tree topping works scheduled on a priority basis as part of a multi-year annual maintenance plan under the supervision of the ESB site maintenance manager. No unscheduled works were or to be carried out.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-19	Chapter 10	10.5.2.3.1.7	Soils, Geology and Land	Minimising the length of cable ducts on site by combining clusters of fibre-optic cables and adopting the shortest route possible.	Sept 2017	Sept 2017	Operations & maintenance phase 2006 - 2020
10-20	Chapter 10	10.5.2.3.1.7	Soils, Geology and Land	Installation of ducts via a low ground-bearing tracked mole-plough capable of installing the ducts directly into the peat without the need for open-trench excavation and backfilling.	Sept 2017	Sept 2017	Operations & maintenance phase 2006 - 2020
10-21	Chapter 10	10.5.2.3.1.7	Soils, Geology and Land	Manholes were constructed on the glacial till below the peat to avoid any loading on the peat.	Sept 2017	Sept 2017	Operations & maintenance phase 2006 - 2020
10-22	Chapter 10	10.5.2.3.1.6	Soils, Geology and Land	Minor maintenance works and drain clearing carried out by hand to avoid machine or equipment loading on the peat. Where mechanical excavators required the works carried out using wide-tracked low ground bearing pressure 10-13 tonne excavators suitable for working directly on the peat.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-23	Chapter 10	10.5.2.3.1.6	Soils, Geology and Land	For instances where significant excavations required for drainage maintenance the excavated peat and mineral soil to be removed to a secure material disposal area to avoid side-casting the material on the peat adjacent to the drain.	Post construction	operation & maintenance phases	Operations & maintenance phases

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10-24	Chapter 10	10.5.2.3.1.6	Soils, Geology and Land	When culverts required widening at road crossings all of the peat was excavated out from under the rockfill used to widen the road to avoid surcharge loading on the peat.	Post construction	operation & maintenance phase 2006-2020	Operations & maintenance phase 2006 - 2020
10-25	Chapter 10	10.5.2.1.3.6	Soils, Geology and Land	The inspections used to assess the requirements for maintenance and improvement works to the drainage network are typically carried out over the wetter months in winter or early spring when groundwater levels on the site are higher and drainage issues are more apparent.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-26	Chapter 10	10.5.2.3.1.6	Soils, Geology and Land	General drainage improvement works. These are generally undertaken at appropriate times based on weather conditions to minimise risk of stability.	Post construction	operation & maintenance phases	Operations & maintenance phases
10-27	Chapter 10	10.5.2.3.1.5	Soils, Geology and Land	All maintenance operations at the substation carried out from the hardstanding area around the substation and control building which was designed to support the loads from the vehicles.	Post construction	operation & maintenance phases and decommissioning	Operations & maintenance phases and decommissioning
10-28	Chapter 10	10.5.2.3.1.5	Soils, Geology and Land	For work required at the substation the dead weight and axle loads of the vehicles and equipment kept to a minimum and the loads to be within the design crane load that was verified by the proof load tests that were carried out on the floating roads	Post construction	operation & maintenance phases and decommissioning	Operations & maintenance phases and decommissioning
10-29	Chapter 10	10.5.2.3.1.5	Soils, Geology and Land	Trucks used to bring materials or large equipment such to the substation escorted along the roads by the ESB site maintenance manager who ensures that speed limits of 15km/hr.	Post construction	operation & maintenance phases and decommissioning	Operations & maintenance phases and decommissioning
10-30	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	Maintenance turbines restricted to cranes operating from the hardstand only with steel plates beneath the outriggers.	Post construction	operation & maintenance phases and decommissioning	Operations & maintenance phases and decommissioning
10-31	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	Full scale testing of floating roads prior to crane use and transport of the unit to site.	Post construction in 2005, 2014 and 2018	Post construction in 2005, 2014 and 2018	Construction, Operations & maintenance phase 2006 - 2020
10-32	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	Minimising the size of the crane and the number of crane mobilisations to site during the operation and maintenance period.	O&M and Decommissioning	O&M and Decommissioning	Operations & maintenance phases and decommissioning
10-33	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	Reduction of additional ballast adding to the weight of the crane being transported to site.	During construction work, O&M Phases and Decommissioning	operation & maintenance phase 2006-2020	Operations & maintenance phases and decommissioning
10-34	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	Crane transportation to site permitted only under the supervision of the wind farm manager and by adopting the shortest route across floating road sections.	Maintenance period between Oct 2005 - Q2 2020	operation & maintenance phase 2006-2020	Operations & maintenance phase 2006 - 2020

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10-35	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	ESB site manager to supervise all crane movements on site to ensure the crane is always driven in a smooth and steady manner at 5km/hr or less with stopping movements restricted to the hardstand locations only.	During construction work, O&M Phases and Decommissioning	operation & maintenance phases and decommissioning	O&M Phases and Decommissioning
10-36	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	Strict restrictions in place on access for cranes along the narrow 3.0-3.5m wide turbary road between Turbines T25 and T45.	During construction work, O&M Phases and Decommissioning	operation & maintenance phases and decommissioning	During construction work, O&M Phases and Decommissioning
10-37	Chapter 10	10.5.2.3.1.3	Soils, Geology and Land	Proof-load testing of floating roads to assess condition so as to inform upgrade works.	2011	2011	Operations & maintenance phase 2006 - 2020
10-38	Chapter 10	10.5.2.3.1.3	Soils, Geology and Land	Adoption of relevant construction stage risk mitigations measures into the GRR for O&M work onsite.	2014	during 2014	Operations & maintenance phase 2006 - 2020
10-39	Chapter 10	10.5.2.3.1.3	Soils, Geology and Land	Full time supervision of O&M works by engineers from AGL and ESBI who also carried out certification procedure works. Inspections also conducted for full scale proof load tests for upgraded roads.	2014	during 2014	Operations & maintenance phase 2006 - 2020
10-40	Chapter 10	10.5.2.3.1.2	Soils, Geology and Land	Appointment of a site manager who is responsible for coordinating and managing the operation of the wind farm and the maintenance of the turbines and site infrastructure. Duties also include inspections and general supervision to all works on site.	Post construction	operation & maintenance phases and decommissioning	Operations & maintenance phase and decommissioning
10-41	Chapter 10	10.5.2.3.1.2	Soils, Geology and Land	ESBI engineers carried out regular periodic geotechnical inspections to assess maintenance requirements for short and long-term stability.	2005 - 2020	operation & maintenance phases	Operations & maintenance phases
10-42	Chapter 10	10.5.2.3.1.2	Soils, Geology and Land	Specialist geotechnical engineering consultants were appointed by ESB International to provide geotechnical support services periodically.	2011 - 2020	operation & maintenance phases and decommissioning	operation & maintenance phases and decommissioning
10-43	Chapter 10	10.5.2.3.1.1	Soils, Geology and Land	Monitoring of groundwater levels and movement in the peat at the clusters of electronic piezometers and tiltmeters installed near Turbines T2, T18, T34 and T49/50.	2006 - 2012	2004-2012	Construction and operations & maintenance phase 2006-2020
10-44	Chapter 10	10.5.2.3.1.1	Soils, Geology and Land	7 No. monitoring points were established on the peat within the slide area for long-term monitoring of movement and settlement of the disturbed peat.	May 2005 - 2020	2005-2020	Construction and operations & maintenance phases
10-45	Chapter 10	10.5.2.2.2.9	Soils, Geology and Land	Only wide-tracked LGBP 10-13 tonne excavators suitable for working directly on the peat were permitted for drainage works. Peat excavated was typically limited to 0.5m depth when sidecast.	Construction post peat slide	Construction period post slide	Construction

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10-46	Chapter 10	10.5.2.2.2.9	Soils, Geology and Land	Where large culverts were constructed at road crossings over the main watercourses on the site all of the peat was excavated out from under the culverts and granular surround to avoid surcharge loading on the peat.		Construction period post slide	Construction
10-47	Chapter 10	10.5.2.2.2.8	Soils, Geology and Land	The pattern, sequence, timing and maximum instantaneous charge of rock blasts were utilised to minimise blast-induced vibrations on the slopes around the perimeter of the borrow pit targeted.	Construction post peat slide	Construction period post slide	Construction
10-48	Chapter 10	10.5.2.2.2.8	Soils, Geology and Land	Blast monitoring records and vibration monitoring was carried out on the site for the rock blasts carried out enabling AGL to establish a radius of impact.	Construction post peat slide	Construction period post slide	Construction
10-49	Chapter 10	10.5.2.2.2.8	Soils, Geology and Land	Berm constructed from glacial till along the face of the peat at the top of the rock slope around the perimeter of the borrow pit to act as a shear key to prevent a localised peat slide inundating the pit where the surrounding slopes were sloping down towards the pit.	Construction post peat slide	Construction period post slide	Construction
10-50	Chapter 10	10.5.2.2.2.9	Soils, Geology and Land	Minor drainage works were carried out by hand to avoid machine or equipment loading on the peat.	Construction post peat slide	Construction period post slide	Construction
10-51	Chapter 10	10.5.2.2.2.7	Soils, Geology and Land	Additional geotechnical investigations, site stability analyses, avoidance of particular areas, modification of felling methodologies and use of specialised equipment by experienced personnel.	Construction post peat slide	Construction period post slide	Construction
10-52	Chapter 10	10.5.2.2.2.7	Soils, Geology and Land	Use of hand-held machinery for felling smaller trees unsuitable for larger machinery.	Construction post peat slide	Construction period post slide	Construction
10-53	Chapter 10	10.5.2.2.2.6	Soils, Geology and Land	Segregation of peat and till in the excavated material with different disposal rules applied to each .	Construction post peat slide	Construction period post slide	Construction
10-54	Chapter 10	10.5.2.2.2.6	Soils, Geology and Land	Measures associated with the assessment, design and use of peat repository areas including desk studies, walkover surveys, stability analyses, certification and site control measures.	Construction post peat slide	Construction period post slide	Construction
10-55	Chapter 10	10.5.2.2.2.5	Soils, Geology and Land	After the slide supplemental investigations were carried out at the remaining turbine foundations and crane hardstanding areas in advance of excavation.	Construction post peat slide	Construction period post slide	Construction
10-56	Chapter 10	10.5.2.2.2.5	Soils, Geology and Land	A Review and Certification process used for the Contractor's Method Statements for each turbine detailing the nature of the location and the spectrum of works being undertaken.	Construction post peat slide	Construction period post slide	Construction
10-57	Chapter 10	10.5.2.2.2.4	Soils, Geology and Land	Analyses and testing were carried out on the floating roads.	Construction post peat slide	Prior to and during Construction period post slide	Construction
10-58	Chapter 10	10.5.2.2.2.4	Soils, Geology and Land	Slope stability analyses were carried out on representative profiles of the roads.	Construction post peat slide	Prior to and during Construction period post slide	Construction
10-59	Chapter 10	10.5.2.2.2.4	Soils, Geology and Land	Full-scale serviceability and proof load tests were carried out incrementally on the floating roads to confirm capacity and performance.	Construction post peat slide	Prior to Construction period post slide	Construction
10-60	Chapter 10	10.5.2.2.2.4	Soils, Geology and Land	Remedial work on sections of floating roads judged to have performed poorly during testing.	Construction post peat slide	Construction period post slide	Construction

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10-61	Chapter 10	10.5.2.2.2.4	Soils, Geology and Land	Site controls were implemented for the use of the floating roads which included certification for use, speed and loading restrictions, direct supervision during high loading, use of steel plates where required.	Construction post peat slide	Construction period post slide	Construction and operations and maintenance
10-62	Chapter 10	10.5.2.2.2.4	Soils, Geology and Land	Reconstruction of a 30m long section of the floating road at Turbine T68, and a 105m long section of the floating road to the west of Turbine T70 as rockfill berms.	Construction post peat slide	At the start of the second phase of construction works	Construction
10-63	Chapter 10	10.5.2.2.2.4	Soils, Geology and Land	The sections of partially completed floating roads that had been constructed between T15 and T17 at were closed and abandoned after the slide occurred.	Construction post peat slide	Construction period post slide	Construction
10-64	Chapter 10	10.5.2.2.2.2	Soils, Geology and Land	Increased geotechnical supervision adopted and certification for civil works.	Construction post peat slide	Construction period post slide	Construction
10-65	Chapter 10	10.5.2.2.2.2	Soils, Geology and Land	AGL Consulting appointed by the main contractor to provide geotechnical analysis, design, supervision and inspection services for the project.	Oct 2003 - End of civil works in 2005	Construction period post slide	Construction
10-66	Chapter 10	10.5.2.2.2.2	Soils, Geology and Land	Extensive supplemental ground investigations assessing the potential impact of tree felling operations on peat stability carried out by Geotechnical engineers from ESBI.	Construction post peat slide	Construction period post slide	Construction
10-67	Chapter 10	10.5.2.2.2.2	Soils, Geology and Land	AGEC appointed by ESBI to provide client side geotechnical services including construction appraisals.	Oct 2003 - End of civil works in 2005	Construction period post slide	Construction
10-68	Chapter 10	10.5.2.2.2.3	Soils, Geology and Land	Comprehensive supplemental geotechnical investigations were carried out after the peat slide in October 2003 across the site to characterise the depth and material characteristics of the peat.	Construction post peat slide	Prior and during the second phase of construction works	Construction
10-69	Chapter 10	10.5.2.2.2.10	Soils, Geology and Land	The alignment of the cable trenches were designed to follow the shortest, most direct route across the site to the control building with the minimum number of road crossings.	Applied during cable installation work	Duration of cable installation works during the construction phase	Planning and construction
10-70	Chapter 10	10.5.2.2.2.10	Soils, Geology and Land	Most of the cable trenches were aligned alongside the site access tracks so that the cable spools could be transported along the floating roads, minimising construction traffic on the intact peat slopes. Works were carried out by specialist sub-contractors.	Throughout cable installation work	Duration of cable installation works during the construction phase	Planning and construction
10-71	Chapter 10	10.5.2.2.2.10	Soils, Geology and Land	The cable trenches in the peat were excavated using wide-tracked LGBP 10-13 tonne excavators suitable for working directly on the peat and operators were experienced with work in blanket peat.	Throughout cable installation work	Duration of cable installation works during the construction phase	Construction and operations & maintenance phase 2006-2020
10-72	Chapter 10	10.5.2.2.2.10	Soils, Geology and Land	Minimise the impact of the road crossings on the floating roads by ensuring the new ducts were pushed horizontally through the peat under the roads to avoid having to open up a trench across the road, which would cut through the geogrid reinforcement.	Throughout cable installation work	Duration of cable installation works during the construction and O&M phases	Construction and operations & maintenance phase 2006-2020
10-73	Chapter 10	10.5.2.2.2.1	Soils, Geology and Land	Installation of instrumentation and monitoring for groundwater levels and ground movements in four areas of the site.	Construction post peat slide	Duration of the second phase of construction works	Construction and operation
10-74	Chapter 10	10.5.2.2.1	Soils, Geology and Land	Omittance of turbine T16 and a 475m long section of floating road between turbines T15 and T17.	Construction post peat slide	During second phase of construction works	Construction
10-75	Chapter 10	10.5.2.2	Soils, Geology and Land	Layer of brash and small trees in combination with geogrid incorporated into the design of floating roads.	Construction prior to the slide	During both construction phases	Construction

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10-76	Chapter 10	10.5.2.1.2.7	Soils, Geology and Land	Tree felling works carried out by experienced specialist subcontractors. Brash and trimmed branches placed along access routes for harvesters and forwarders during tree felling.	Construction prior to the slide	During both construction phases	Construction
10-77	Chapter 10	10.5.2.1.2.6	Soils, Geology and Land	Blasting for borrow-pit No. 3 carried out by an experienced licensed professional. Charge delays were used.	Construction prior to the slide	During both construction phases	Construction
10-78	Chapter 10	10.5.2.1.2.5	Soils, Geology and Land	Improvement to drainage works. Culverts installed where required.	Construction prior to the slide	During both construction phases	Construction and operation
10-79	Chapter 10	10.5.2.1.2.4	Soils, Geology and Land	Temporary peat slopes restricted to having batters of 1V:1H or flatter. Rockfill used to support if required.	Construction prior to the slide	During both construction phases	Construction
10-80	Chapter 10	10.5.2.1.2.3	Soils, Geology and Land	Sidecasting of excavated material from the turbine foundations spread typically 0.5-1.5m in depth over surface of peat over a wide area.	Construction prior to the slide	During first phase of the construction works	Construction
10-81	Chapter 10	10.5.2.1.2.3	Soils, Geology and Land	Safe working procedures on peat adopted. Restriction of permitted machinery working with peat. LGBP wide-tracked excavators allowed directly on peat and long reach excavators permitted for peat works from access track positions.	Construction prior to the slide	During both construction phases	
10-82	Chapter 10	10.5.2.1.2.2	Soils, Geology and Land	Realignment of access track linking T50 to T47, route changed from the north side of the turbines to the south.	Construction prior to the slide	During first phase of the construction works	
10-83	Chapter 10	10.5.2.1.1	Soils, Geology and Land	Adoption of mainly new and existing floating roads as the access track construction method.	Construction prior to the slide	During first phase of the construction works	Construction
10-84	Chapter 10	10.4.5.2.3	Soils, Geology and Land	Minor drainage works to release ponded surface water within tension cracks in the turbary zones.	2020-onwards		Operations & maintenance phase 2020 - 2040
10-85	Chapter 10	10.4.5.2.4	Soils, Geology and Land	The peat stability risk assessment and the associated mitigation measures will be made available to the turbary rights holders whose plots have been or are proposed to be harvested by mechanical means, and the turbary rights holders will be made aware of the potential site stability risks associated with mechanical peat harvesting methods in the absence of mitigation.		During operations phase 2020 - c.2040	Operations & maintenance phase 2020 - 2040
10-86	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Warning signs will be erected at the site by Gort Wind Farms Ltd to raise awareness of the peat stability risks associated with mechanical peat harvesting in the turbary area and to highlight the recommended mitigation measures.		During operations phase 2020 - c.2040	Operations & maintenance phase 2020 - 2040
10-87	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Communication will be established between turbary plot owners, turf cutting contractors and the wind farm site manager for Gort Wind Farms Ltd.		During operations phase 2020 - c.2040	Operations & maintenance phase 2020 - 2040
10-88	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Ongoing maintenance will be carried out on the existing drainage network, where required, during the drier months of May to September.		During operations phase 2020 - c.2040	Operations & maintenance phase 2020 - 2040
10-89	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Periodic inspections of the mechanical peat harvesting will be carried out by the wind farm site manager for Gort Wind Farms Ltd.		During operations phase 2020 - c.2040	Operations & maintenance phase 2020 - 2040

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10-90	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Gort Wind Farms Ltd. Will implement the monitoring and remedial drainage works recommended for the areas where the peat failures occurred in Turbary Plots 161 and 30 and the areas will be inspected by geotechnical engineers from ESB Engineering & Major Projects during their periodic wind farm inspections.		During operations phase 2020 - c.2040	Operations & maintenance phase 2020 - 2040
10-91	Chapter 10	10.5.2.1.2.1	Soils, Geology and Land	Civil works were carried out by an experienced earthworks and civil contractor and supervised by experienced engineering.		During both construction phases	Construction
10-92	Chapter 10	10.5.2.3.1.3	Soils, Geology and Land	Minimise loading on peat during upgrade works in 2014.	2014	during 2014	Operations & maintenance phase 2006 - 2020
10-93	Chapter 10	10.5.2.3.1.3	Soils, Geology and Land	Stability analysis undertaken of floating roads and loading limited to maintain safe factor of safety on floating works.	2014	during 2014	Operations & maintenance phase 2006 - 2020
10-94	Chapter 10	10.5.2.3.1.3	Soils, Geology and Land	PSRA undertaken in advance of road upgrade works.	2014	during 2014	Operations & maintenance phase 2006 - 2020
10-95	Chapter 10	10.5.2.3.1.3	Soils, Geology and Land	Full-scale proof load testing of roads following upgrade works.	2014	during 2014	Operations & maintenance phase 2006 - 2020
10-96	Chapter 10	10.5.2.3.1.4	Soils, Geology and Land	Use of steel plates at road edges to facilitate site access around tight bends.	During construction work, O&M Phases and Decommissioning	operation & maintenance phases and decommissioning	Operations & maintenance phase and decommissioning
10-97	Chapter 10	10.5.3 & 10.5.4	Soils, Geology and Land	General mitigation for the Grid connection and peat slide response works during construction works construction, O&M and decommissioning: •Use of suitable low load bearing track machinery to gain access to works area • Use of suitable plant and equipment for completion of works • Routine detailed inspection of area, while works are being carried out • Monitoring in the form of inspections and toolbox talks of ground conditions and working practices • Contractor providing method statement for any proposed works in areas of peat/sloping ground/overhead power lines • Maintenance of hydrology of area as far as possible; • Use of experienced contractors and trained operators to carry out the work; • Use of experienced geotechnical staff for site supervision where necessary. • Use of the existing forestry access tracks	During construction work and decommissioning	During construction work and decommissioning	Construction, O&M and Decommissioning Phases

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10-98	Chapter 10	10.5.4	Soils, Geology and Land	Additional geotechnical investigations and surveys of the peat slide.	During construction work	During construction	Construction
10-99	Chapter 10	10.5.4	Soils, Geology and Land	Mobilisation of emergency resources by ESB and construction contractor.	During construction work	During construction	Construction
10-100	Chapter 10	10.5.4	Soils, Geology and Land	Construction of temporary and permanent barrages.	During construction work	During construction	Construction
10-101	Chapter 10	10.5.4	Soils, Geology and Land	Construction of peat repositories to store peat debris.	During construction work	During construction	Construction
10-102	Chapter 10	10.5.4	Soils, Geology and Land	Assessment of suitability of areas for peat repositories for responses works.	During construction work	During construction	Construction
10-103	Chapter 10	10.5.4	Soils, Geology and Land	Removal of debris material from behind the barrages.	During construction work and early O&M period	During construction work and early O&M period	Construction and O&M 2006-2020
10-104	Chapter 10	10.5.4	Soils, Geology and Land	Inspection of Responses works during construction and during O&M by experienced geotechnical engineers from ESB and AGECE, which identified any recommended maintenance works to maintain site stability.	During construction work and O&M period	During construction work and O&M period	Construction and O&M
11-1	Chapter 11	11.5.1.5	Hydrology and Hydrogeology	Off-site Peat Repositories The peat repositories constructed following the slide have over time stabilised, become grassed and not prone to slippage risk, erosion or the release of soiled peat water and have no effect on the local hydrological regime apart from where drainage was diverted around the repository at Black Road Bridge.	ongoing	construction	completed
11-2	Chapter 11	11.5.1.4	Hydrology and Hydrogeology	Containment Barrages The containment barrages were installed for the purposes of mitigating geotechnical risks following the peat slide; it should be noted that they were not designed to fulfil any hydrological function and also have not done so in practice.	Oct-Nov 2003	construction	completed
11-3	Chapter 11	11.5.1.3	Hydrology and Hydrogeology	Repairs to In-stream Structures - At Black Road Bridge - At Flaggy Bridge on the R353 - At Unnamed Bridge C	Intermittently during the period 2003-2006	construction	completed

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11-4	Chapter 11	11.5.1.2	Hydrology and Hydrogeology	Drainage diversions following landslide- Including around the displaced peat just upstream of Black Road- Drainage was re-routed away permanently from entering the slide area by the digging of new drains to divert water via an alternative route down the slope. - Drainage management was generally improved in the slide area of the wind farm through construction of silt traps and clearance of obstructions to release of any visibly trapped water. - A diversion channel was also excavated immediately upstream of Black Road Bridge around the repository area established to store debris following the peat slide. The original stream and local public road were later re-established.	For a short period immediately following the peat slide in Oct-Nov 2003	construction	completed
11-5	Chapter 11	11.5.1.3	Hydrology and Hydrogeology	Further downstream on the main Owendalulleagh River, stepping stones which had become displaced were replaced.	Post peat slide between 2003 and 2006	construction	completed
11-6	Chapter 11		Hydrology and Hydrogeology		N/A	operation	ongoing
11-7	Chapter 11		Hydrology and Hydrogeology	None required.	N/A	decommissioning	proposed
12-1	Chapter 12	12.6	Air and Climate	Following the SF6 leakage in 2015, the switchgear was replaced. There has been no further loss of SF6. Routine maintenance checks will be made on this equipment to minimise the potential for leakages of SF6 in future.	Lifetime of the Project	Operational phase.	ongoing
13-1	Chapter 13	13.5	Material Assets	None Required.	N/A	construction	completed
13-2	Chapter 13	13.5	Material Assets	None Required.	N/A	operation	ongoing
13-3	Chapter 13	13.5	Material Assets	None Required.	N/A	decommissioning	proposed
14-1	Chapter 14	14.5	Roads, Traffic & Transport	Significant volumes of construction materials were sourced on-site to minimise traffic impacts on the surrounding transport network in relation to material movements to the site.	Duration of Works	construction	completed
14-2	Chapter 14	14.5	Roads, Traffic & Transport	Deliveries of abnormal loads were undertaken in the hours of darkness as much as possible in order to minimise impacts on road users and effects experienced by them.	April - September 2005	construction	completed
14-3	Chapter 14	14.5	Roads, Traffic & Transport	None Required.	N/A	operation	ongoing
14-4	Chapter 14	14.5	Roads, Traffic & Transport	Decommissioning activities will only be undertaken between the hours of 7am - 7pm Monday to Saturday Exceptional circumstances may exist where works outside these times are required however these will only be undertaken with the prior agreement of GCC.	During the decommissioning period	decommissioning	proposed

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14-5	Chapter 14	14.5	Roads, Traffic & Transport	A Traffic Management Plan (TMP) will be prepared and agreed with GCC in advance of decommissioning activities in order to minimise impacts on the surround transport network and its users.	In advance of the decommissioning period	decommissioning	proposed
14-6	Chapter 14	14.5	Roads, Traffic & Transport	Use of designated haul routes per TMP.	During the decommissioning period	decommissioning	proposed
14-7	Chapter 14	14.5	Roads, Traffic & Transport	Transportation of abnormal loads to be undertaken overnight where feasible and safe. Movements are proposed to take place overnight along the majority of the route wherever possible, however due to safety requirements it is likely that movements from the Wind Farm site to Derrybrien Village on the R353 will take place in the hours of daylight.	During the decommissioning period	decommissioning	proposed
15-1	Chapter 15		Cultural Heritage	None required	N/A	All	N/A
16-1	Chapter 16	16.7.1	Major Accidents and Emergencies	Mitigation measures were implemented to prevent any further peat instability on the site.	At the start of the second phase of construction works	Construction	completed
16-2	Chapter 16	16.7.1	Major Accidents and Emergencies	Emergency management plan, which i. Identified the hazards on site ii. Listed contact numbers of emergency services iii. Defined the roles and responsibilities of key personnel on site; iv. Detailed emergency procedure in the event of specific major accidents; v. outlined the safety systems available which would reduce the impact of a major accident. Site emergency procedures were updated following the peat slide.	At the start of the second phase of construction works	Construction	completed
16-3	Chapter 16	16.7.2	Major Accidents and Emergencies	Aircraft collision: As required by the relevant planning consents, details of aeronautical requirements were agreed with the Planning Authority (Galway County Council) and the as-constructed co-ordinates of turbines and maximum elevation of each turbine were provided to the planning authority. The aeronautical requirements comprised the installation of low-intensity aviation lights on certain turbines. Low-intensity aviation lights were installed on T1, T47, T52, T65, T44, T46, T71, T18 and T62 (9 in total). The Irish Aviation Authority (IAA) was provided with the as-constructed co-ordinates of turbines and maximum elevation of each turbine on completion of development. The wind farm is marked on the relevant Aeronautical chart. The Project location is outside the aviation exclusion zone for Galway Airport and other airfields in the County so as not to affect the safe operation of these airport/airfield facilities.	Ongoing, in place until the end of the Project	Operation	Ongoing

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16-4	Chapter 16	16.7.2	Major Accidents and Emergencies	Forest/Gorse Fire: The mitigation measures comprise: a) Restrictions apply to burning of vegetation and DAFM national warning systems b) The use of firebreaks	Ongoing, until the end of the Project	Operation	Ongoing
16-5	Chapter 16	16.7.2	Major Accidents and Emergencies	Emergency Management Plan: The hazards on site have been identified for the operational phase and procedures are in place to address them, as follows: • Accidents • Fire in control room and/or switchgear room on electrical equipment • Fire involving wood, paper in control room or in switchgear room • Forest/gorse fire • Fire in tower • Landslide Details of local Fire Service Control Centre are provided in Emergency Procedure	Ongoing, until the end of operations phase	Operation	Ongoing
16-6	Chapter 16	16.7.3	Major Accidents and Emergencies	Peat slide: Mitigation measures for the peat stability for the Derrybrien Wind Farm site are detailed in Section 10.4 Chapter 10. For the cumulative impact with the turbary activities the mitigation is set out in Section 10.5. Detailed peat stability risk assessments in relation to each activity and the combined activities which will occur during project decommissioning have been undertaken. Effective and proven risk mitigation measures are in place at the project site to reduce the likelihood of a peat slide to a low or negligible level as detailed in Chapter 10- Soils, Geology and Land.	During decommissioning	Decommissioning	proposed
16-7	Chapter 16	16.7.3	Major Accidents and Emergencies	Emergency Management Plan: A Major Accident and Emergency Plan will be put in place during the decommissioning phase of the project, which will: • Identify the hazards on site• Provide contact numbers of emergency services • Define the roles and responsibilities of key personnel on site• Detail emergency procedures in the event of specific major accidents• Outline the safety systems available which will reduce the impact of a major accident.	During decommissioning	Decommissioning	proposed

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Table 18-2 Schedule of Environmental Commitments with respect to Mitigation and Monitoring that are recommended for implementation by others

Remedial/ Mitigation Measure No.	rEIAR reference number	rEIAR sub- section reference	EIA Topic	Description of Remedial Measure / Environmental Commitments	Duration	Stage of Impact (i.e. Construction, Operation, Decommissioning Phase)	Status (completed/ ongoing/ proposed)
10-105	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Recommend to turbary rights holders that no peat extraction by saw cutting in the turbary plots.	During operations phase 2020 - c.2040	Operations & maintenance phase 2020 -2040	To be implemented by third parties
10-106	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Recommend to turbary rights holders that no mechanical peat extraction in turbary plots where the likelihood of a peat failure is interpreted as Very Possible to Likely (L=4.0 to 5.0) without appropriate mitigation measures. Only manual turf cutting will be permitted.	During operations phase 2020 - c.2040	Operations & maintenance phase 2020 -2040	To be implemented by third parties
10-107	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Recommend to turbary rights holders that limitations be placed on the type and size of equipment and the maximum level of surcharge loading that can be used for mechanical peat extraction in turbary plots where the likelihood of a peat failure is interpreted as Possible to Very Possible (L=3.0 to 3.5) without appropriate mitigation measures.	During operations phase 2020 - c.2040	Operations & maintenance phase 2020 -2040	To be implemented by third parties
10-108	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Recommend to turbary rights holders that no mechanical peat extraction during the decommissioning stage of the Project.	During decommissioning phase	Decommissioning phase	To be implemented by third parties
10-109	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Recommend to turbary rights holders that the operational control measures recommended in Section 6.0 of AGL Report No. 11-147-R06 should be implemented by the turbary plot owner and their turf cutting contractor to manage the stability of peat excavations and to prevent excessive damage to the integrity of the vegetated surface of the peat.	During operations phase 2020 - c.2040	Operations & maintenance phase 2020 -2040	To be implemented by third parties
10-110	Chapter 10	10.4.5.2.4	Soils, Geology and Land	Recommend to the turbary rights holders that communication will be established between the turbary plot owners, turf cutting contractors and the wind farm site manager for Gort Wind Farms Ltd. To allow the turbary rights holders to give notice of peat harvesting activities and to report any peat instability on the site.	During operations phase 2020 - c.2040	Operations & maintenance phase 2020 -2040	To be implemented by third parties