TOBIN

Rooaunalaghta Green Energy Project

Appendix 2-2

CEMP

ROOAUNALAGHTA
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BUILT ON KNOWLEDGE

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Rooaunalaghta Wind Farm Construction Environmental Management Plan (CEMP)

ROOAUNALAGHTA
Green Energy

BUILT ON KNOWLEDGE

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1. INTRODUCTION

The Applicant, Rooaunalaghta Green Energy Ltd., a company wholly owned by Greensource Sustainable Developments Ltd, intends to seek planning permission to construct the proposed Rooaunalaghta Wind Farm.

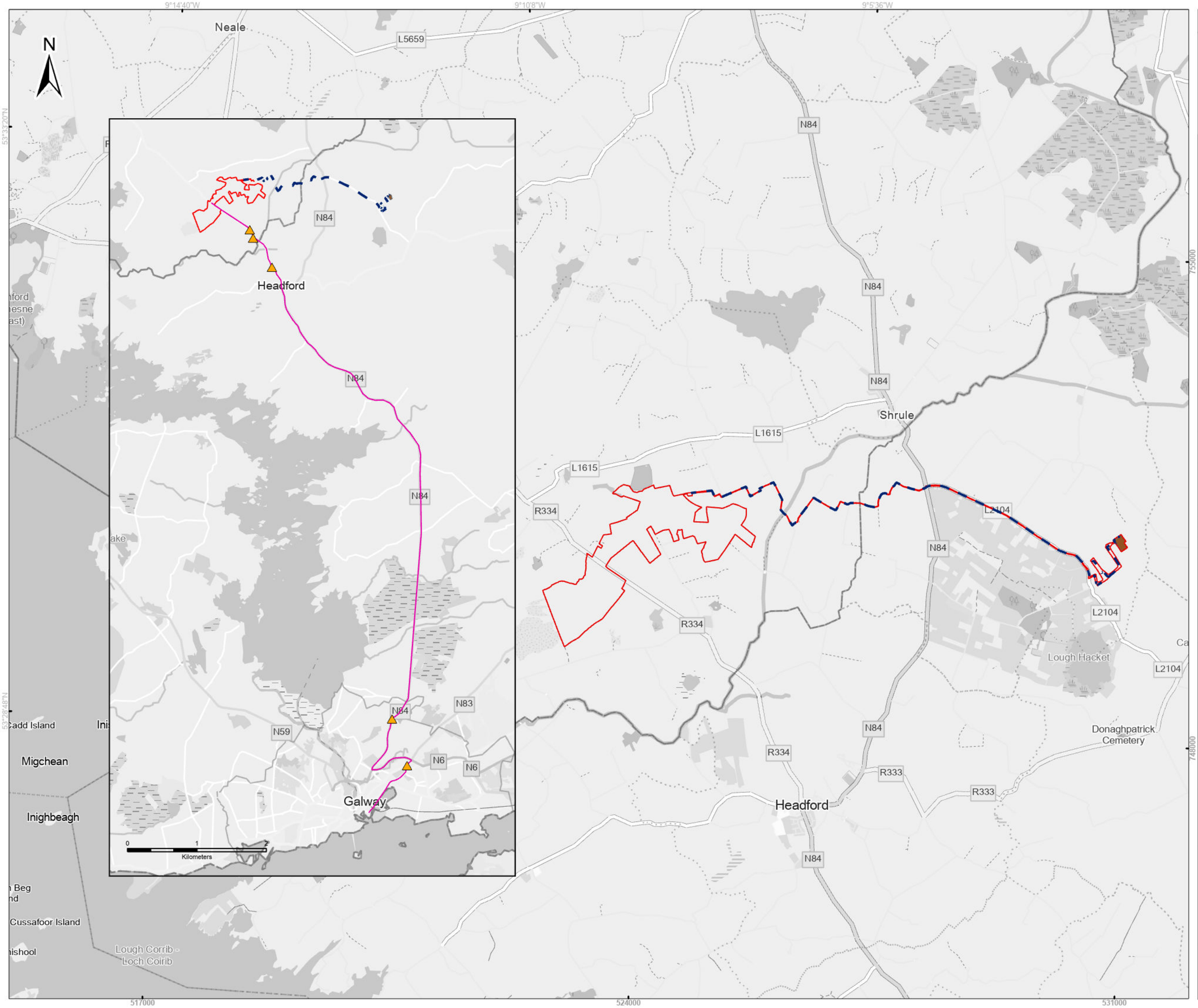
The proposed project is described in detail in Chapter 2 of the project Environmental Impact Assessment Report (EIAR) and comprises;

- The wind farm site to include a wind farm of thirteen turbines, an onsite control building, a permanent Light Detection and Ranging (LiDAR) device and ancillary infrastructure such as turbine foundations, hardstanding areas, borrow pit, and access tracks;
- Grid Connection; and,
- Temporary accommodation works along the proposed Turbine Delivery Route (TDR)

1.1 DESCRIPTION OF THE WIND FARM SITE

The proposed wind farm site is located approximately 2.5 km to the southwest of Shrule, Co. Mayo and approximately 3.5 km to the northwest of Headford, County Galway. It consists primarily of agricultural fields bounded by stone walls, hedgerows and treelines with pockets of scrub and woodland in the eastern half of the site. The site of the proposed wind farm has an area of approximately 222 ha and comprises an irregularly shaped contiguous land parcel approximately 1.2 km wide in the northwest/southeast direction and is approximately 3.2 km in length in a northeast/southwest direction. The topography ranges in elevation from approximately 25 to 60 m AOD.

The site is located on either side of the R334 Regional Road, which runs in a northwest-southeast direction connecting Headford and Ballinrobe. The area surrounding the site can be described as rural with a mostly dispersed settlement type (though some clustering at Moyne). The nearest settlements are Moyne village to the southeast of the site and Glencorrib to the northwest, both along the R334. Glencorrib contains a church, national school and other amenities while Moyne is primarily a grouping of houses without many obvious services apart from private businesses and accommodation. Refer to Figure 1-1 below for site location.





Legend

- Proposed wind farm site
- Proposed Grid Connection Route
- Proposed 110kV substation
- Proposed TDR Nodes
- Proposed Turbine Delivery Route

0 1 2 Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Rev	Date	Description	By	Chkd.
A	27/10/2026	First issue	KK	J.S

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 1-1:
Proposed project location

Scale @ A3:	1:50,000	
Prepared by:	Checked by:	Date:
K.Kale	J.Staunton	October 2026

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Map Ref: 11981-001-OSM-S.BO-TOB-A

Draft: A

1.2 DESCRIPTION OF THE PROPOSED PROJECT

The proposed project is described in detail in Chapter 2 of the project Environmental Impact Assessment Report (EIAR) and comprises the following:

- 13 no. wind turbines with a blade tip height of 150 m, a rotor diameter of 136 m, a hub height of 82 m, and all associated foundations and hard-standing areas in respect of each turbine;
- Creation of two new permanent site entrances onto the R334 Regional Road;
- Two temporary construction compounds with associated temporary site offices, parking areas and security fencing;
- One borrow pit. All works associated with the opening, aggregate and spoil extraction, and decommissioning of the borrow pit;
- New internal site access tracks, to include passing bays and all associated drainage;
- A temporary new access track to connect to the boundary of an adjacent operating quarry;
- Construction of drainage and sediment control systems;
- New on-site control building
- Construction of one permanent loop-in 110 kV electrical substation compound including
    - Two control buildings containing worker welfare facilities;
    - Electrical infrastructure and grid ancillary services equipment
    - Parking
    - Lighting
    - Fencing
    - Wastewater holding tank
    - Rainwater harvesting equipment
    - Communications equipment and storage
    - Associated electrical plant
    - All associated infrastructure, services, and site works including landscaping
- All works associated with the connection of the proposed wind farm to the proposed 110 kV loop-in substation, which will be via a 33 kV underground cable connection (circa 8.7 km in length), including 4 no. watercourse crossings, and the onward connection from the substation to the existing overhead line via 110 kV cables and steel lattice interface masts;
- All associated infrastructure and services including site works, signage and permanent underground electrical and communications cabling connecting the wind turbines to the proposed wind farm control building;
- A lidar unit, and associated foundation and hard-standing area;

- All related site works and ancillary development including site drainage, security gates, fencing, permanent and temporary signage, berms, landscaping, soil excavation and biodiversity mitigation and enhancements, including habitat, hedgerow and treeline removal, creation and management.
- Temporary additional works required within the public road corridor to accommodate delivery of oversize turbine components.

Refer to Figure 1-2 below for site layout details.

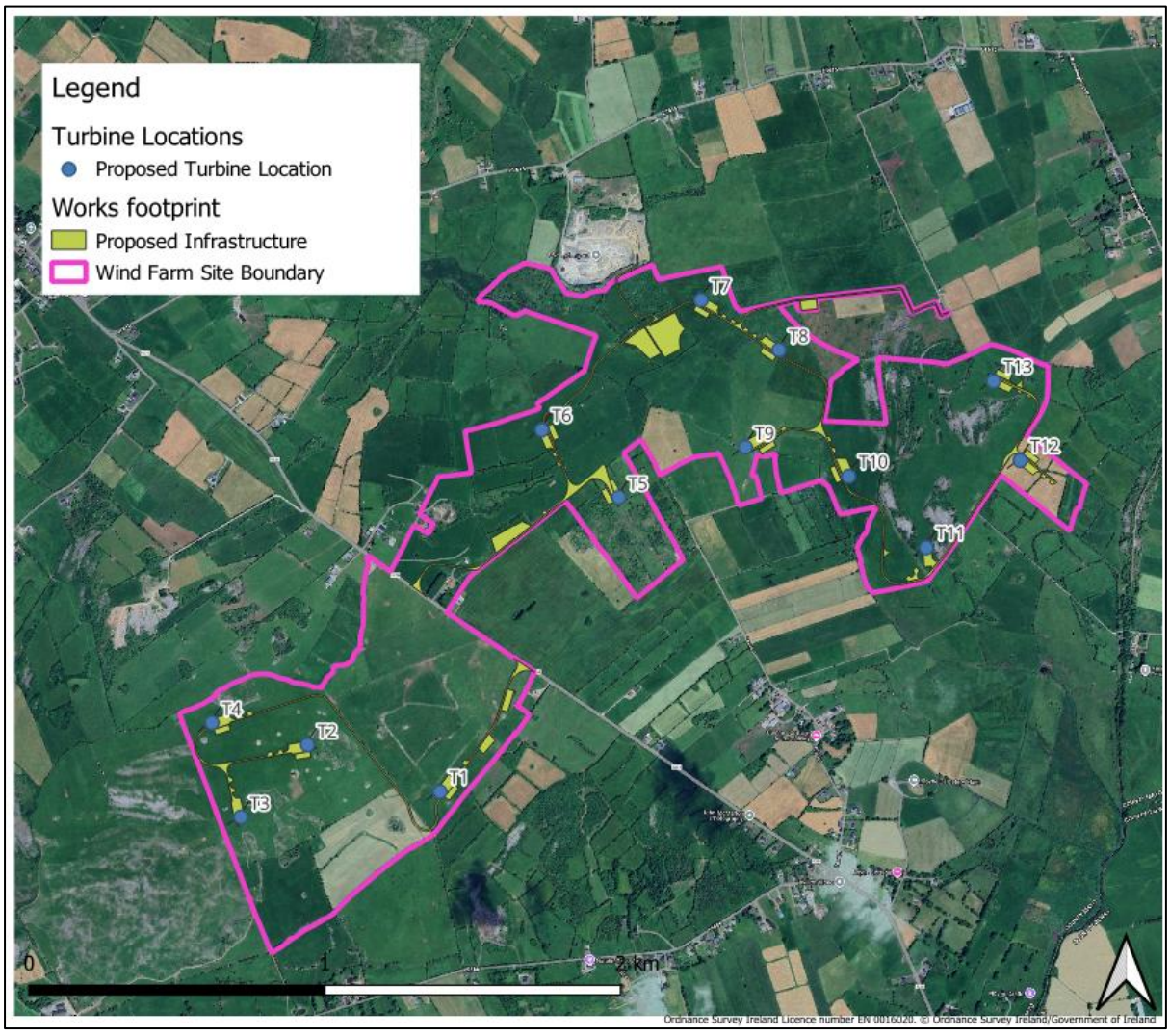


Figure 1-2: Site Layout

1.3 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

This CEMP has been prepared to present the proposed management and administration of site activities for the construction phase of the proposed project, to ensure that all construction activities are undertaken in an environmentally responsible manner. This CEMP summarises the environmental commitments related to the construction of the proposed project, and the measures to ensure compliance with legislation and the requirements of statutory bodies. Legislative compliance and relevant mitigation measures are detailed in the proposed project EIAR and Natura Impact Statement (NIS) submitted as part of this planning application.

This CEMP will be a live document and will be reviewed and updated, as necessary. Upon appointment, the Main Contractor for construction of the proposed project shall update this document to produce an updated version of the CEMP (i.e. the Contractor's CEMP) which will account for any additional requirements set out in Planning Conditions.

This CEMP provides a summary of the requirements from relevant guidance, standards, and codes of practice applicable to the work being undertaken as part of the proposed project. The following is a non-exhaustive list of relevant guidance / standards / codes referenced in the preparation of this CEMP:

- Environmental Protection Agency (EPA), Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022);
- Department of Housing, Planning and Local Government (DHPLG), Draft Revised Wind Energy Development Guidelines (December 2019);
- Department of Environment, Heritage and Local Government (DEHLG), Wind Energy Development Guidelines (December 2006);
- EPA Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects (November, 2021);
- Inland Fisheries Ireland (IFI) Guidelines on the Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016);
- Construction Industry Research and Information Association (CIRIA) C532 publication 'Control of Water Pollution from Construction-sites: Guidance for Consultants and Contractors' (CIRIA, 2001);
- CIRIA C648 publication 'Control of water pollution from linear construction projects' (CIRIA, 2006);
- CIRIA C811 publication 'Environmental Good Practice On Site' (5th Edition) (CIRIA, 2023);
- CIRIA C750, 'Groundwater control: design and practice' (CIRIA, 2016);
- CIRIA C697 & C753F publications 'SuDS Manual' (CIRIA, 2007 & 2015);
- National Roads Authority (NRA) (2008). Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes. National Roads Authority;
- Irish Working Group on Groundwater (2005) Guidance Document GW5, Groundwater Working Group (WGGW) 2005;
- British Standards Institution (BSI), BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise;
- BSI, BS 5228: Part 1 and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels);

- Scottish Natural Heritage (SNH) (2019) 'Good Practice during Wind Farm Construction' (4th edition). Scottish Natural Heritage;
- The Institute of Air Quality Management (IAQM) publication 'Guidance on the Assessment of Dust from Demolition and Construction '(2014);
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes published by the NRA (now TII) in 2011;
- The Control of Dust and Emissions during Construction and Demolition published by the Greater London Authority (GLA) in 2014; and,
- Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites".

1.4 Objectives of this CEMP

The objectives of the CEMP are to:

- Outline the proposed mechanisms for ensuring the delivery of environmental measures to avoid or reduce environmental effects identified;
- Ensure procedures are in place so that there is a prompt response to effects requiring remediation, including reporting and any additional mitigation measures required to prevent a recurrence;
- Provide an outline of the content that would be supplied in the construction method statements and strategies that would be prepared in order to secure mitigation measures in relation to different design aspects of the proposed project;
- Ensure compliance with legislation and identify where it would be necessary to obtain authorisation from relevant statutory bodies;
- Ensure that appropriate proposed project monitoring and reporting would be in place;
- Provide a framework for reporting, compliance auditing and inspection to ensure environmental aims would be met; and,
- Set out the client's expectations to guide contractors on their requirements with regards to environmental commitments and environmental management.

1.5 Implementation and Control of the CEMP

In terms of overall environmental responsibility, everyone on-site is responsible for ensuring that their actions constitute good environmental practice. All site personnel are charged with following good practice and encouraged to provide feedback and suggestions for improvements. All site personnel are also required to ensure compliance with the requirements of the CEMP.

Compliance with the CEMP, the procedures, work practices and controls will be mandatory and must be adhered to by the appointed Contractor, all site personnel, and sub-contractors employed during the construction phase. The CEMP seeks to:

- Provide a basis for achieving and implementing the construction related mitigation measures identified in the EIAR and NIS; and,
- Promote best environmental on-site practices for the duration of the construction phase.

1.6 REVISIONS TO THE CEMP

As mentioned above, the CEMP is considered a 'live' document and as such will be reviewed on a regular basis to allow any changes to construction programme, operations or unforeseen issues be incorporated at any stage throughout the proposed project as deemed necessary by the Applicant, their agents or relevant authorities. The CEMP will be subject to continual review to address, for example:

- Any conditions stipulated in the planning approval;
- Any requirements / issues highlighted through consultations prior to works e.g. by the National Parks and Wildlife Service (NPWS), Mayo and Galway County Councils etc.;
- To ensure it reflects best practice at the time of construction; and,
- To ensure it incorporates the findings of any pre-construction-site investigations.

This CEMP will be provided to the appointed Main Contractor who will have responsibility for updating the document as necessary through the construction phase.

The Contractor's CEMP will incorporate the conditions associated with any grant of planning for the proposed project. This CEMP will be subject to ongoing review (throughout the construction phase of the proposed project), through regular environmental auditing and site inspections. This will confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in the application documentation.

The appointed Contractor is required to include further details and / or confirmation in the updated version of the CEMP which will include:

- Details of emergency plan including personnel and contact numbers;
- Site and traffic signage; and,
- Method statements.

The appointed Contractor shall also agree and implement monitoring measures to monitor the effectiveness of the CEMP.

1.7 ENVIRONMENTAL AWARENESS AND CONTROL

In order to ensure that environmental awareness and compliance is communicated effectively at the start and throughout the construction works, this CEMP and its contents will be communicated to all site personnel, including management staff, operatives and subcontractors. The key elements of this CEMP will form part of the site induction which will be mandatory for all employees, Contractors and any visitors attending the site.
Environmental toolbox talks will be provided to all site personnel and sub-contractors on a regular basis. These will be targeted at particularly sensitive environmental issues such as:

- Protection of sensitive ecological habitats and key ecological receptors;
- Works close to sensitive water bodies;
- Invasive species management;
- Water pollution and silt control;
- Water pollution in relation to cement and concrete handling;
- Spill prevention and control; and,
- Dust management.

Further environmental awareness and compliance is outlined in section 5 Environmental Management Procedures (EMP).

1.8 EMERGENCY RESPONSE PLAN

The Contractor will be responsible for developing a detailed environmental Emergency Response Plan (ERP) for the proposed works, to cover environmental emergencies, as part of the Health & Safety Plan. Details related to the ERP are outlined in Section 6 of this CEMP.
Further information relating to the management of spills or leaks and the procedure for responding to an environmental incident is outlined in Section 5, EMP 3, Fuel and Oils Management of this CEMP.

1.9 INCIDENTS AND COMPLAINTS

Details related to the incidents / complaints are outlined in Section 6.1.3 of this CEMP.

2. SCOPE OF THE CEMP

The purpose of this document is to communicate the key environmental obligations that apply to all Contractors, sub-contractors and relevant personnel while carrying out any form of construction activity for the development of the proposed project.

This CEMP should be read in conjunction with the Planning Documents and Drawings, especially the EIAR and NIS, and the construction stage elements of the Traffic Management Plan (TMP) and Surface Water Management Plan (SWMP) (see Appendix 17-1 and 2-6 of the EIAR respectively). The CEMP draws from relevant good practice guidance, standards, and codes of practice applicable to the work being undertaken as part of the proposed project. The documents used to prepare the CEMP are listed in the reference section at the end of this document.

As this CEMP is a live document that will evolve during the project, it will be subject to constant review to address:

- Any conditions required in the planning permission;
- To ensure it reflects best practice at the time of construction;
- To ensure it incorporates the findings of pre-construction-site investigations;
- Changes resulting from the construction methods used by the contractor(s); and,
- Unforeseen conditions encountered during construction.

This CEMP provides a mechanism for ensuring compliance with environmental legislation and statutory consents. It defines the approach to environmental management at the site during the construction phase and addresses all relevant environmental aspects of the management of site preparation and construction work within the proposed works area.

2.1 KEY ROLES AND RESPONSIBILITIES

At this stage it is envisaged that the following roles will be appointed for the construction phase of the proposed project; Construction / Site Manager; Environmental Manager, Ecological Clerk of Works (ECoW); Project Geotechnical Engineer / Geologist; and Project Archaeologist.

The names and contact details of the individuals with responsibility for implementation and supervision of mitigation measures during all phases of the proposed project will be clearly identified and set out in documents such as the Contractor's CEMP and site- specific method statements as appropriate.

Summary details of these roles are outlined in the following sections, with an example organisation chart in Figure 2-1 below. Prior to the construction stage, the Contractor's CEMP will confirm roles and finalise responsibilities and contact details once appointed

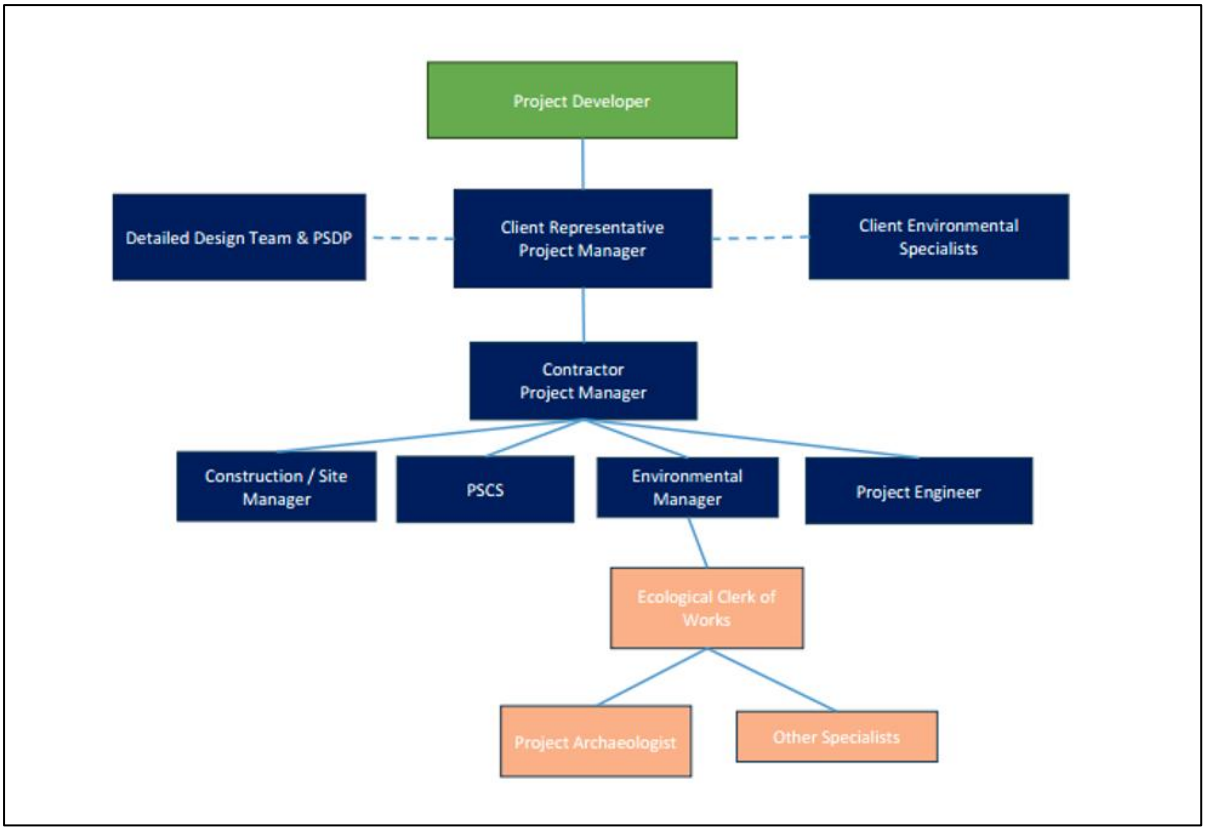


Figure 2-1: Example Project Development Organisation Chart

2.2 CONSTRUCTION / SITE MANAGER

A suitably qualified Construction / Site Manager will be appointed by the Contractor for the duration of the construction period. The Construction / Site Manager will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements. The Construction/Site Manager will be responsible for:

- Assist the Developer with the appointment of suitably qualified Environmental Clerk of Works (ECoW), Project Supervisor Design Process (PSDP), Project Supervisor Construction Stage (PSCS), Designers, Project Archaeologist, Ecologist, Geotechnical Engineer, Turbine Supply Contractor, Civil Engineering Contractors and other contractors.
- Hold design team meetings, site meetings and other stakeholder meetings as required;
- Coordinate with the above roles and liaise with other project stakeholders;
- Ensure that all works are designed, planned and constructed safely and with minimal environmental risk;
- Update this CEMP to create a "Construction Stage" CEMP;
- Implement the CEMP on site, monitor the compliance through audits and site visits and take corrective action where necessary;
- Put communication protocols in place to ensure that all personnel on site are made aware that they are responsible for ensuring good construction and environmental

practice and that they are encouraged to provide feedback and suggestions for improvements.

2.3 Environmental Manager

The Environmental Manager will ensure compliance with all relevant environmental regulations, and environmental quality control on-site during the construction stage. The Environmental Manager will be responsible for:

- The daily implementation of the CEMP and any other monitoring / mitigation proposals required under the planning consent;
- Ensuring that the objectives of the CEMP are achieved and maintained;
- Informing the appointed Contractor and sub-contractors of the CEMP and ensuring that appropriate training and awareness materials are developed and implemented on-site;
- Co-ordinating and monitoring the inputs from the ECoW, Project Geotechnical Engineer and Project Archaeologist;
- Implementing appropriate measures in the event of any environmental incidents and managing communications with relevant authorities; and,
- Regular communication with the Construction / Site Manager detailing the execution and progress of environmental activities on-site.

2.4 Ecological Clerk of Works

The role of the ECoW is defined by British Standard BS 42020:2013 as a "*person who has the ecological qualifications, training, skills and relevant experience to undertake appropriate monitoring and to provide specialist advice to "development" site personnel on necessary working practices required to i) safeguard ecological features on-site and ii) aid compliance with any consents and relevant wildlife legislation related to the works.*"

Typically, the requirements of the ECoW role is largely fulfilled by a single individual, with support and assistance provided by technical specialists and senior colleagues when required, and will include:

- The ECoW (individual or team of individuals) must therefore have appropriate qualifications, training and experience to meet the requirements of the role and in addition, where needed, can access support from senior ecologists within the company with the required qualifications, training and experience;
- The ECoW will have the power to stop works at any time they deem it necessary to do so;
- The ECoW will be responsible for monitoring compliance with the mitigation measures and construction phase monitoring requirements relating to ecology / biodiversity as set out project EIAR, NIS and supporting documents such as the, CEMP etc.;
- The ECoW will be responsible for the day-to-day management and interaction with the project Environmental Manager;
- The ECoW will have authority over the content of routine reports and will act independently in determining instances of non-compliance with the consents and licenses or any breaches of environmental legislation;

- The ECoW will provide the contractors team, with advice on environmental issues and compliance with planning conditions, commitments etc. as required. This includes managing certain activities that may be required in discharging consent conditions; and,
- The ECoW will inform the Contractor and relevant site personnel of any information that could increase the risk of a non-compliance and / or require a new licence, consent or approval.

During construction there will be occasions when the ECoW will be required to rapidly respond to unplanned events such as any wildlife incidents, pollution incidents, etc. The ECoW will have a very specific role within the emergency response teams responding to these incidents. Further detail is provided in Section 6.1.1 of this report. The ECoW will also be expected to support the project team in resolving any other unplanned events that are not classified as emergency responses or incidents.

Non-Compliance Events

The ECoW shall produce a procedure setting out the sequence of actions to be completed and the lines of communication required to resolve and appropriately report on a non-compliance event relating to ecology / biodiversity, should one occur.

This procedure shall be approved by the Contractor prior to construction works commencing. The ECoW, and any other individual present on-site, has a duty of care to report any wildlife crime or breach of environmental legislation to the Contractor and the Applicant. The Applicant must report such breaches to the relevant authorities.

Reporting and Follow Up

If the ECoW has responded to an incident or non-compliance event the ECoW will produce a report to the Environmental Manager for approval before it is issued to the Contractor and the Applicant. The report will set out the following information as a minimum;

- Precise details of the event and those involved;
- Assessment of impact and severity (method for assessment to be developed by ECoW);
- Mitigation introduced;
- Subsequent revision of risk assessments and construction method statements and / or construction programme; and,
- Lessons Learnt.

Ad-Hoc Advice and Support

The ECoW will provide the Contractors Team, with advice on environmental issues and compliance with planning conditions, commitments etc. as required. This includes managing certain activities that may be required in discharging consent conditions.

2.5 Project Geotechnical Engineer / Geologist

The Geotechnical Engineer / Project Geologist will report to the Environmental Manager and is responsible for inspection and review of geotechnical aspects associated with construction stage of the project. The Geotechnical Engineer / Project Geologist will be full time on-site during the site preparation and groundworks (such as excavation activities) and will visit site regularly at agreed periods during the construction phase.

2.6 PROJECT ARCHAEOLOGIST

The Project Archaeologist will report to the Environmental Manager and is responsible for inspection and review of any finds discovered during the construction of the wind farm. The Project Archaeologist will monitor all stripping of topsoil for the proposed project, including the proposed grid connection and accommodation works along the TDR

2.7 PROJECT ECOLOGIST

The Project Ecologist will report to the Environmental Manager and will support the Project ECoW during construction of the wind farm by providing specialist ecological advice and technical expertise to inform ecological decision-making. The Project Ecologist will undertake ecological surveys as required, including pre-construction and pre-clearance surveys, and will provide specialist input on ecological matters arising during construction.

2.8 COMPLIANCE AUDITS AND COMMUNICATIONS

The ECoW and Environmental Manager will develop appropriate procedures and programmes for the following non exhaustive list of items:

- Environmental Audits, a programme of planned and spot check audits shall be developed and approved by the client;
- A programme of toolbox talks shall be developed. Toolbox talks covering relevant topics during construction;
- The ECoW and Environmental Manager will support the project team in producing site induction material tailored to the different activities carried out on-site, and ensuring this material is appropriately incorporated into the overall project induction material. This will require attendance to project meetings, and production of material relevant to planning conditions and Environmental Legislation. The toolbox talks and site inductions shall include information on the role of the ECoW in the event of an incident;
- The ECoW shall ensure this information is included in the relevant induction and toolbox talk material. Once the above programmes and plans have been agreed, the Environmental Manager will be responsible for managing these plans and conducting the necessary audits, toolbox talks etc.;
- The ECoW shall check progress, and the Environmental Manager will be reporting on progress against the programmes, plans and status of completed audits, toolbox talks etc to the ECoW on a daily basis;
- The ECoW will be required to report on audits and toolbox talks delivered in a monthly compliance report; and,
- Occasionally the ECoW will be required to deliver toolbox talks and produce site induction material depending on the topic being considered.

2.9 FACILITIES, SAFETY AND SECURITY

The proposed project will be constructed, in accordance with all relevant Health and Safety Legislation, including:

- Safety, Health and Welfare at Work Act 2005 - 2014 (as amended);

- Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2023 (as amended); and,
- Safety, Health and Welfare at Work (Construction) Regulations 2013 – 2021 (as amended).

Aspects of the proposed project that will present health and safety issues include:

- Health and safety aspects of construction activities;
- General construction-site safety (e.g. slip / trip, moving vehicles etc);
- On-site traffic safety during construction associated with localised high road embankments;
- Traffic safety during the transport of abnormal loads to the site;
- Lifting of heavy loads overhead using cranes;
- Working at heights; and,
- Working with electricity during commissioning.

A (preliminary) Health and Safety (H&S) Plan covering all aspects of the construction process will address relevant health and safety requirements in detail. This will be prepared prior to the construction stage by the Project Supervisor for the Design Process (PSDP).

Rigorous safety checks will be conducted on the turbines during construction. Signs will be erected at suitable locations across the site as required.

3. CONSTRUCTION METHODOLOGIES

3.1 OVERVIEW OF CONSTRUCTION METHODOLOGIES

3.1.3 Pre-Construction Surveys

Prior to commencement of the construction works pre-construction surveys will be carried out to be used as part of the construction phase design and to meet the requirements of any conditions of planning.

These surveys will include: -

- Detailed Geotechnical Site Investigations;
- Road Condition Surveys;
- Environmental Surveys;
- Archaeological Surveys;
- Bird Surveys; and
- Telecommunications Surveys.

3.1.4 Turbine Hardstand, Foundations and Erections

The topsoil will be stripped where development of the hardstands are proposed. The hardstands will be built up to create a level base as seen on Planning Drawing 11981-2022.

The geotechnical investigations to date indicate that the foundations at the proposed wind farm site will utilise excavated gravity foundations with the potential requirement for micropiled foundation at 4 of the 13 no. turbine locations (Turbines 2, 6, 7 and 9). Both methods are assessed in the EIAR for these turbines with the exact method being confirmed following detailed pre-construction-site investigations. Piling is not anticipated to be required elsewhere.

Each of the turbines to be erected on-site will have a reinforced concrete base. Overburden will be stripped from the foundation area to a suitable formation using a 360° excavator. The sides of the excavated areas will be sloped sufficiently (2:1 or as determined by a suitably qualified site engineer) to ensure that slippage does not occur. Ground investigations in the form of trial pitting, boreholes, geophysical survey and the use of augers have been carried out around the site, including at the proposed turbine and hardstanding locations to inform the proposed design and excavation / upfill requirements (See Site Investigation Report in Appendix 2-5 of the EIAR submitted as part of this planning application).

Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation, or for reinstatement elsewhere on-site (such as the borrow pit). The excavated material will be smoothed with the back of an excavator bucket and surrounded by silt fences to minimise the potential for sediment-laden run-off occurrence. Where there are large volumes of material to be stored, the material will be brought to the proposed on-site temporary spoil storage area which can be seen on Planning Drawing 11981-2010.

Where rock may need to be removed at each location to construct the foundations, a rock breaking excavator will be used. A hydraulic rock breaking attachment is fitted to the arm of a large, tracked excavator, and this breaks large pieces of rock from the ground. These large rocks

are broken down into smaller pieces using these hydraulic rock breaking attachments and fed into a mobile rock crusher, where they are crushed, graded into various sizes and reused on-site.

In the case of gravity foundations, if the formation level is reached at a depth lower than the depth of the foundation, the formation layer will have to be raised with hardcore material and / or lean mix concrete, compacted in layers as required, with sufficient compaction effort. See Planning Drawing 11981-2029 for gravity foundation details. Site investigations have shown the site to have shallow soils, generally <3 metres. Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base which will outfall out at the lowest point level with the spreader or settlement pond.

In the case of piled foundations, the construction of concrete piles to the required depth will be carried out. The piles will either be constructed by coring and inserting a steel sleeve which will either be filled with reinforced concrete prior to sleeve removal or driven. Where piling is carried out, soil / stone will be excavated with the provision of a surrounding work area to allow placing of shuttering etc.

An embankment approximately 600 mm high and a fence or berm will be constructed around the perimeter of each turbine base to prevent construction traffic from driving into the excavated hole and to demarcate the working area. All necessary health and safety signage will be erected to warn of deep excavations etc. Access to and from excavated bases will be formed by excavating a gangway to a standard 1:12 grade, thereby allowing safe passage into / out of the foundation area.

Formwork to concrete bases will be propped / supported sufficiently to prevent failure. Concrete for bases will be poured using a concrete pump. After a period of time when the concrete has set sufficiently, the top surface of the concrete surface is to be finished with a power float.

Once the base has sufficient curing time it will be filled with suitable fill (i.e. hardcore) up to existing ground level. The working area around the perimeter of the foundation will be backfilled with suitable material (hardcore). These hardstand areas around the turbines will be levelled, compacted and finished with a suitable surface material for traffic (clause 804 or similar) as per the site access tracks and remainder of the hardstand areas as detailed in Planning Drawing 11981-2002.

Turbines will be erected in suitable weather windows (i.e. low wind speed). Following crane setup, the turbine tower sections will be delivered by truck and hoisted into place. This is followed by the nacelle and finally each blade. In accordance with an agreed lifting plan, turbine sections will be lifted by crane into place. Wind speeds will be monitored at all times during lifting operations. Turbine sections will be fitted together by workers within the structure. Following erection of the turbine, lightning protection, lighting and other ancillary components will be installed on the turbine and commissioned.

The turbines will be decommissioned using a similar methodology as the construction except in reverse.

3.1.5 Traffic Management

As outlined in Chapter 17 of this EIAR, mitigation measures will be put in place before and during the construction and operational phase of the proposed project in order to minimise the effects of the additional traffic generated by the proposed project. A Traffic Management Plan (TMP)

proposed for the project is included as Appendix 17-1 of the EIAR as well as Section 5, Environment Management Plan 6 of this CEMP detail the measures to be implemented. This is a live document and will be updated ahead of construction to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by An Coimisiún Pleanála, in the event planning permission/approval is granted. Also, a confirmatory survey of road condition will be carried out along the proposed GCR in advance of any works.

3.1.6 Site Entrance

The proposed wind farm site will be accessed via two new site accesses off the R334 Regional Road and will facilitate both materials delivery (stone, steel and concrete) as well as large oversize / abnormal components such as turbine blades and tower sections. There will also be an entrance to the proposed 110 kV substation required on the L2104. See Planning Drawings 11981-2049 to 2051 for details. For further information see Chapter 17 and the TMP (Appendix 17-1 of the EIAR).

The site accesses / entrances will remain in place during the operation and decommissioning phases as they will facilitate access for operation and maintenance vehicles as well as the delivery of any wind turbine or substation components that may require replacement / upgrade. The proposed site entrances will have adequate visibility as also discussed in Chapter 17. They will be constructed to the requirements of the relevant road authority and ACP and will provide the visibility splays and geometric standards identified within the Road Safety Audit. Secure gates will be installed at gates to ensure site security during all phases of the proposed project, with sufficient space outside the gates to allow trucks to pull safely off the road and stop to open / close the gates.

3.1.7 Internal Site Access Tracks

Internal site access tracks will provide access to the wind turbines, hardstands, borrow pit and associated infrastructure. Approximately 6.8 km of new access tracks and 1.5 km of upgraded existing tracks are proposed. Internal electrical cabling will be installed within or adjacent to the access tracks in underground ducts.

All site tracks will be maintained for the duration of the proposed project with the exception of the proposed 340 m of temporary access track to the adjacent quarry which will be removed at the end of the construction phase.

Internal cables connecting the wind turbines to the on-site control building will be laid within or immediately adjacent to the on-site access roads. All cables will be laid in underground ducts. Ducts will be installed by open trenching.

3.1.7.1 Construction of Internal Site Access Tracks

It is proposed to construct approximately 6.8 km of new internal site access tracks, with an upgrade of approximately 1.5 km additional existing internal site access tracks. Tracked excavators will carry out excavation for new tracks with appropriate equipment attached. Any surplus excavated material will be dealt with as set out in the spoil management section 3.1.11 of this CEMP. As the proposed project footprint is located on predominantly well drained mineral soil, this material will be either side-cast, profiled and bermed as close to the excavation

areas as practical, temporarily stored in the spoil storage area, or directly used to reinstate the borrow pit.

Stone from the on-site borrow pit shall be placed to form the track foundation. A geotextile layer will be placed under this on the existing ground surface. The final top layer of unbound material will be provided on top of this and will be regularly checked and dressed as necessary during the construction phase, particularly after turbine bases have been poured. This top surface may be required to be sourced from local quarries. Please see Planning Drawing 11981-2024 for access track cross section detail. All site tracks will be maintained for the duration of the proposed project.

All on-site tracks will be maintained for the duration of the construction and operational phases of the project (with the exception of the short proposed temporary access track connecting to the adjacent quarry). They will also be left in-situ upon decommissioning of the proposed project and will be used for access around the farmland, as they are inert and digging them up would be considered more environmentally damaging.

3.1.8 Underground Private 33 kV Cable from On-Site Control Building to proposed 110 kV substation

A 33 kV private connection will be required to connect to the proposed 110 kV substation. After converging at the proposed on-site control building, the 33 kV cables will proceed in a triple circuit along an approximately 8.7 km long route to the proposed 110 kV substation in the townland of Killamanagh, Co. Galway

There will also be internal wind farm site cables connecting each proposed turbine to the proposed onsite control room. These will follow the same construction methodology as the proposed 33 kV GCR cable.

Construction methodology for this 33 kV cable is provided in Appendix 2-3 of the EIAR. Drawings for these cables are provided in Planning drawings 300101121-U-DR-125 to 140.

3.1.8.1 Watercourse, Bridge & Culvert Crossings

The proposed cable route will require one stream crossings, one river crossing and two drainage ditch crossings as detailed in Appendix 2-3 to the EIAR. The River Black will be crossed using Hydraulic Directional Drilling (HDD) while the remaining crossings will have culvert underpass crossings.

Table 3-1: Watercourse Crossings on the GCR (33 kV and 110 kV)

Crossing no.	Location (approx. chainage)	Crossing type	Crossing methodology	110 kV and/or 33 kV
1	Near proposed 110 kV Substation on private land (200 m)	Open channel with existing poor culvert - Stream	Undercrossing with upgraded culvert	110 kV and 33 kV
2	On L16157 at county boundary (5400 m)	Culvert – Drainage ditch	Undercrossing	33 kV
3	On L16157 (5810 m)	Stone culvert – Drainage ditch	Undercrossing	33 kV
4	On L16152. River Black crossing (6780 m)	Bridge - River	HDD	33 kV

3.1.8.2 Horizontal Directional Drilling

There will be a requirement to drill beneath one watercourse obstacle in this underground 33 kV grid connection route. The HDD will follow a standard sequence as follows;

- A works area of circa 20 m² for the HDD entry side, and circa 20 m² on the HDD exit side, will be required for the HDD equipment and vehicles. These areas will be fenced off during the HDD implementation;
- The drilling rig and fluid handling units will be located on the designated entry side of the bridge and will be appropriately bunded using sandbags, which will contain any fluid spills and stormwater run-off;
- Entry and exit pits (approximately 2 m (width) x 3 m (length) x 1 m depth) will be excavated using an excavator. The excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility;
- The HDD pilot bore will be undertaken using a wireline guidance system. Assembly will be set up by the drilling team and steering engineer;
- The pilot bore will be drilled to the pre-determined profile and alignment under the bridge crossing;
- The steering engineer and drill team will monitor the drilling works to ensure that modelled stresses and pressures are not exceeded;
- The drilled cuttings will be flushed back by drilling fluid to the entry pit and treated for re-use;
- Once the first pilot hole has been completed, a hole-opener or back-reamer will be fitted in the exit side which will then be pulled back to the entry side as part of the pre-reaming / hole opening process to enlarge the hole to the needed size;
- When the pre-reaming / hole opening / hole cleaning has been completed, a reamer of slightly smaller diameter than the final cut will be installed on the drill string to which the ducts will be attached for installation;
- The drilling fluid will be disposed of to a licensed facility. The interior of the ducts will be cleaned, and the ducts will be proven to ascertain their suitability. Their installed location will be mapped;
- The entry and exit pit areas will be reinstated to the specification of ESB Networks and any requirements of Mayo County Council and Galway County Council; and,

- A joint bay / transition chamber / transition coupler will be installed on either side of the drill shot, following the horizontal directional drilling procedure, as per ESB requirements, which will serve as interface between the HDD ducts and the standard ducts.

3.1.8.3 Watercourse Damming and Diversion with In-Stream Works

One crossing point, near the proposed 110 kV substation on the Shancloon Stream will require trenching and ducting and will involve instream works in order to install cabling and upgrade the existing culvert. To facilitate the works, the watercourse will be dammed, and the water diverted over or around the works using either a flume pipe or a diversion channel. Following the completion of works at the watercourse, the dam will be removed, and the natural surface water flows will be restored through the reinstated channel and culvert structure . These works will require engagement with IFI to agree environmental controls required.

3.1.8.3.1 Standard Methods- Dam & Flume Work:

- The flume pipe(s) will be set out on the bed of the existing stream.
- A dam will be constructed using sandbags around the flume pipe(s) and across the watercourse so that all the flows are diverted through the pipe(s).
- Silt traps, such as geotextile membrane, straw bales etc. will be placed downstream of the in-stream trenching location prior to construction, to minimise silt loss.
- The ducting installation works will be carried out in the dry stream bed and under/around the flume pipe(s).
- If required, a temporary sump will be established and used to collect any additional water. This water will be removed by pumping to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the de-watering.
- Following the completion of works, the watercourse bed will be reinstated with original or similar material and any spawning gravels will be replaced under the supervision of an aquatic ecologist.
- Once the watercourse bed is appropriately reinstated the dam and the flume pipe(s) will be removed thus restoring the watercourse to its original condition.

3.1.8.3.2 Standard Methods- Dam & Divert Work

- A suitable channel for the watercourse will be excavated adjacent to the original channel. Bedding stone will be placed on the bed of the new channel.
- A dam will be constructed using sandbags and suitable clay material across the watercourse so that the flow is diverted down the new channel.
- Silt traps, such as geotextile membrane, straw bales etc. will be placed downstream of the in-stream trenching location prior to construction, to minimise silt loss.
- The trench will be excavated in the dry watercourse bed. If required, a temporary sump will be established and used to collect any additional water. This water will be removed by pumping to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the de-watering.
- Following the installation of the cable ducts, the watercourse bed will be reinstated with original or similar material and any spawning gravels will be replaced under the supervision of an aquatic ecologist.

- Once the watercourse bed is appropriately reinstated, the dam will be removed thus restoring the watercourse to its original alignment.
- The temporary channel will then be reinstated with the previously excavated material.

3.1.9 Proposed 110 kV Substation

It is proposed to construct a 110 kV substation compound in the townland of Killamanagh, Co. Galway.

The proposed 110 kV substation has been designed and constructed to meet all the required EirGrid / ESB standards. An area will be levelled and built to the required level with stone fill material, capped by high quality compacted stone. One on-site control building will be constructed using traditional techniques for constructing small buildings (i.e. concrete block walls, timber and slate tile roof). Foundations will be built for all of the proposed electrical infrastructure. All the electrical equipment will be installed to EirGrid / ESB requirements. Perimeter fencing will be constructed around the proposed 110 kV substation compound for security and safety purposes. The construction of the proposed 110 kV substation should be read in conjunction with the construction methodologies contained in Appendix 2-3, as this appendix provides the detailed methodology for the construction of the proposed 110 kV substation. Further information and drawings of the proposed 110 kV substation and electrical infrastructure are provided in Planning Drawings 300101121-U-DR-160 to 171.

A local electricity supply will be made from the nearest suitable power lines at the time of construction in the same way that residential houses are connected. Standard overhead electricity poles and cables will be installed using a minimal footprint.

3.1.10 110 kV Grid Connection Route

A 110 kV GCR is proposed to connect the proposed 110 kV substation compound to the national electricity transmission network. The connection will comprise an underground 110 kV cable linking the proposed 110 kV substation to the existing Dalton-Cashla 110 kV overhead line, together with two associated interface masts and ancillary infrastructure. The proposed GCR has been designed in accordance with EirGrid requirements and is described in detail in the following sections. Construction methodologies for the GCR are provided in Appendix 2-3 of this EIAR. Further information and drawings of the proposed 110 kV grid connection are provided in Planning Drawings 300101121-U-DR-151 to 157.

3.1.11 Operational Phase Lidar

The operational phase lidar installation works will be carried out by a small crew at the final stage of the construction phase and are described as follows.

General construction methods for the operational phase lidar hard standing match those described for wind farm access tracks, hard standings and construction compounds. The stone hard standing area will measure approximately 4 m x 4 m.

The slab foundation will be excavated followed by shuttering, steel fixing and finally concrete pouring by a ready-mix truck. Excavation and concrete operations will be carried out in accordance with this CEMP. The foundation will be 2 m x 2 m x 0.3 m in size. See Planning Drawing 11981-2026 for details.

Following this, the lidar unit will be delivered and unloaded by truck. It will be connected to a power source from either the wind farm on-site control building or the closest wind turbine.

The unit will be decommissioned after 35 years using a similar methodology as the construction except in reverse.

3.1.12 Temporary Construction Compound

At the commencement of the construction phase, a temporary compound area will be constructed close to each proposed site entrance to the proposed wind farm site. The compounds will cover approximately 1,875 m^2 and 5,350 m^2 on the southern and northern side of the regional road respectively, as shown on the site layout drawings which accompany this application. The topsoil will be stripped where development of the temporary compound is proposed.

The compound shall be constructed to heights of up to approximately 0.3 m above existing ground level using granular fill from the on-site borrow pit. See Planning Drawings 11981-2020 to 2021 for the temporary construction compound details.

At the end of the construction phase, the temporary compound will be restored to agricultural grassland. The stone will be removed and used to reinstate the borrow pit and soil will be spread over the area before it is reseeded.

3.1.13 Borrow Pit

It is proposed that one borrow pit will be constructed as part of the proposed project, in order to provide a source for the majority of stone material requirements within the site itself. This will be located within the northern part of the proposed wind farm site, covering an area of approximately 1.1 ha. The location of this borrow pit can be seen on Planning Drawings 11981-2001-2002 which accompany this application. Having a borrow pit on-site will minimise material transport to the proposed wind farm site and will minimise the associated impacts to traffic and local residents.

Further details of the site investigations that were carried out and the stone type / suitability of the borrow pit are provided in Chapter 8 of the EIAR.

The construction of the borrow pit will follow a standard sequence as follows;

- Prior to work commencing, an extensive Ground Penetrating Radar (GPR) scan for hidden services will be carried out and services will be relocated if required;
- The working area will be cordoned using temporary fencing;
- Extraction plant and vehicles on low loaders will be mobilised to site;
- An interceptor drain will be installed upslope of the borrow pit, where necessary. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and when reinstated;
- Overburden will be stripped using a 360° excavator and stored as detailed in this CEMP, within the Spoil Management section;
- Material will be extracted using a combination of blasting and excavators:

  - A large rock breaking excavator will progressively break out the solid rock from the ground in the borrow pit area. Where the rock is difficult to break, blasting will be employed to fracture the rock into loose pieces;
  - A smaller rock breaker, in the 30-40 tonne size range, will then break the rocks down to a size that can then be fed into a crusher; and
  - Other extracted materials deemed unsuitable for re-use, will be reinstated within the borrow pit.
- Material will be processed by using a mobile crusher and screener. The extracted, broken rock is loaded into a mobile crusher using a wheeled loading shovel and crushed down to the necessary size of graded stone required for the on-site civil works;
- The processed material will be stockpiled in designated areas within the borrow pit;
- A site access track to the borrow pit will be constructed to tie in with the internal site access track infrastructure;
- Processed material will be loaded into lorries or articulated dumpers and transported to areas within the site for the construction of internal tracks, hardstand, compound and other infrastructure which require stone fill;
- Temporary excavation side slopes will be designed by a geotechnical engineer;
- Temporary control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations will be required during construction;
- Temporary construction settlement ponds have been designed at the lower side / outfall location of the borrow pit;
- Upon completion, all faces of excavation will be constructed to safe permanent side slopes to be designed by a geotechnical engineer as part of the detailed design on approval of the application;
- Infilling of the spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance;
- Once full, the area will be finished with soil and reseeded to revert to agricultural use; and,
- Extraction plant and vehicles on low loaders will be demobilised via internal site tracks and the main site entrance.

3.1.13.1 Stone Extraction Methods

The stone / rock will be extracted from the proposed borrow pit, and any proposed turbine foundation locations requiring extraction. It is proposed that the primary method will be rock breaking due to good fracture spacing and rock characteristics, however some blasting is likely to be required at the proposed borrow pit.

Rock breaking can be used to extract rock in many situations and is particularly suitable for any brittle rock and rock near the surface. A hydraulic rock breaking attachment is fitted to the arm of a large, tracked excavator, and this breaks large pieces of rock from the ground. These large rocks are broken down into smaller pieces using these hydraulic rock breaking attachments, until they are small enough for use or to fit into a rock crusher. At that point, a large loader feeds them into a mobile rock crusher, where they are crushed, graded into various sizes, and removed by the loader for use on-site.

In the event when blasting is required, local residents and noise sensitive locations will be notified of the upcoming blast. After a blast, the rock will be able to be loaded into a crusher with a loader and processed for use on-site. The potential noise and vibration effects of rock breaking have been assessed in Chapter 12 of the EIAR.

Operations in the borrow pit, particularly relating to blasting will be coordinated with the adjacent commercial quarry to minimise impacts to local residents.

3.1.14 Spoil Management

The use of the borrow pit shall be phased. This will then allow materials to be placed in one end of the borrow pit while the other end is still being extracted, thereby minimizing the volume of soils requiring temporary storage. In order to further reduce temporary storage requirements, reinstatement of soils and turves around infrastructure, and in restoration and landscaping works on areas of excavated / disturbed ground, will be carried out during the construction phase or as soon as is practical after the completion of the works in any one area of the site.

Topsoil and sub-soil are to be stockpiled separately. There will be two designated temporary spoil storage areas for the duration of the construction phase which will be clearly demarcated at the start of the works. Any large volumes of material which cannot be sidecast or used in site landscaping will be temporarily stored here until they can be used for borrow pit reinstatement. Turves will be stored grass side up and will not be allowed to dry out. Stockpiles are to be isolated from any surface drains and a minimum of 50 m away from watercourses. Measures such as interceptor ditches around the bases of these areas, sediment traps and seeding of the bunds shall be incorporated to prevent runoff of suspended solids laden surface water and soil erosion. No permanent spoil or stockpiles will be left on site.

The method for restoration of excavated or disturbed areas is to encourage stabilisation and early establishment of vegetation cover, where available, and vegetative sods / turves or other topsoil in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.

To prevent erosion and run-off and to facilitate vegetation reinstatement, any sloped embankment will be graded such that the slope angle is not too steep and that embankments match the surrounding ground profile.

It is not anticipated that there will be any peat excavated on site as part of the proposed project as there were no peat deposits encountered during the ground investigations completed across the proposed wind farm site, as detailed in Chapter 8 and Appendix 2-5 of the EIAR.

A thin layer of peaty topsoils (up to 0.4 m thick), observed at trial pit (TP)-14, at the proposed 110 kV substation (see Appendix 2-5 of the EIAR - Site Investigation Report). The land at the proposed 110 kV substation site is relatively flat, drained and in intensive agricultural production. Additional peat probing in July 2026 at the proposed 110 kV substation building

encountered 0.3 m of peaty topsoil. Generally, the soils encountered during the site investigation works were as expected for this region, and predominantly consisted of topsoil overlying glacial tills, overlying bedrock. It is envisaged that the majority of the excavated topsoil (including the peaty topsoil) will be used for landscaping and reinstatement on site. Any excess material that cannot be used for landscaping here will be disposed of in a suitably licenced facility. It will not be used for borrow pit reinstatement.

3.1.15 Turbine Delivery Accommodation Works

It is proposed that the turbine components will be delivered to the proposed wind farm site via Port of Galway in Galway City. The turbine delivery route (TDR) has been identified from a detailed traffic and transport assessment.

The deliveries of turbine components to the proposed wind farm site will be made in convoys of three to five vehicles and mostly at night when roads are quietest.

Convoys will be accompanied by escorts at the front and rear operating a "stop and go" system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users.

There will be some delays to local traffic at pinch points. During these periods, it may be necessary to operate local diversions for through traffic.

Prior to delivery of abnormal loads i.e. turbine components, the Applicant or their representatives, will consult with An Garda Síochána, Transport Infrastructure Ireland (TII), Public Private Partnership (PPP) operators and all relevant Local Authorities to obtain all necessary abnormal load permits and discuss the requirement for a Garda escort. The Applicant will also outline the intended timescale for deliveries and efforts will be made to avoid peak times such as school drop off times, church services, peak traffic times where it is considered this may lead to unnecessary disruption, and abnormal loads may travel at night and outside the normal construction times as may be required by An Garda Síochána. Local residents at sensitive locations along the affected route will be notified of the timescale for all deliveries.

Before delivery of abnormal loads, a test run of the proposed transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the turbine components. Following this test run, the Traffic Management Plan will be reviewed and updated with the haulage company when the final transport arrangements are known, delivery dates confirmed and escort proposals in place. The plan will then be submitted to the relevant County Councils for agreement in writing in advance of any abnormal loads using the local roads. The plan will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning / reversing movements and any necessary safety controls.

There is one location along the TDR requiring temporary accommodation works in order to facilitate the delivery of turbine components to the proposed wind farm site, which is referred to as a Node. Details of this are provided in the Turbine Delivery Route Report presented in Appendix 2-4 of the EIAR, which includes Swept Path Analysis (SPA).

This involves modifying a small area of footpath to allow it to support the turbine transport vehicle weight in the townlands of Ballybaan Beg, within Galway City. Hedgerow / vegetation

trimming and temporary demounting of signage will also be required at various locations along the route prior to delivery, but no other significant works or hardstanding areas are required. All of the accommodation works required are contained within the extents of the road infrastructure and verge.

The current planning application does not include the proposed temporary works required for turbine delivery, but they are fully assessed as part of the EIAR. A further consenting process will be used to obtain permission for the works as required. These works include:

- Temporary strengthening / modification works to a small area of the footpath in the townland of Ballybaan Beg, in Galway city.
- Vegetation / hedgerow trimming at various locations along the route, in particular on the N84 and R334 in the townlands of Ballindooley and Cordarragh Co. Galway and Moyne, Co. Mayo.
- Temporary signage demounting on the route, in particular on the R334 in the townland of Moyne, Co. Mayo.

All of the accommodation works required are contained within the extents of the road infrastructure and verge.

3.1.16 Vegetation and Tree Removal / Felling

Vegetation clearance will be kept to a minimum. Any necessary removal of trees or scrub will be implemented outside of the bird breeding season in line with the Wildlife Act as amended, which prohibits the removal of trees or scrubs with the bird nesting season of 1 March to the 31 August . Where the construction programme does not allow this time restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. The project ecologist will have the authority to halt work for as long as required where such breeding birds are found.

3.1.17 Biodiversity Enhancement Measures

In addition to mitigation measures designed to reduce impacts on biodiversity, the Project will implement habitat enhancement and management measures to provide long-term biodiversity benefits in accordance with Chapter 6 and the Habitat Management Plan (Appendix 6-6 of the EIAR).

The following enhancement measures shall be implemented:

3.1.17.1 Habitat Enhancement

- Areas of dense bracken shall be actively managed to promote the restoration and expansion of species-rich dry calcareous grassland and associated heath vegetation. Management measures may include selective cutting, rolling and scrub control in accordance with the Habitat Management Plan.
- Existing areas of dry calcareous grassland shall be protected and enhanced through appropriate grazing management and control of scrub encroachment to maintain favourable habitat condition.

- A new native hedgerow/treeline shall be established between Turbines T5 and T6 to improve habitat connectivity and provide additional commuting, foraging and shelter opportunities for wildlife. Native species shall include typical locally occurring species such as hawthorn, hazel and blackthorn.
- Existing hedgerows and treelines shall be enhanced through supplementary planting, gap filling and long-term management to improve ecological connectivity across the site.
- Biodiversity enhancement measures shall be implemented in accordance with the Habitat Management Plan and monitored throughout the construction and post-construction periods.

4. CONSTRUCTION MANAGEMENT

4.1 CONSTRUCTION PHASE MONITORING AND OVERSIGHT

The requirement for a CEMP to be prepared in advance of any construction works commencing on any wind farm site and submitted for agreement to the Planning Authority is now well-established.

The appointed construction Contractor will be responsible for implementing the mitigation measures specified in Section 8 of this CEMP and for communicating the requirements with all staff on-site. The implementation of the mitigation measures will be overseen by the supervising site staff, including the ECoW, construction site manager, project archaeologists and / or project geotechnical engineers, as appropriate.

A comprehensive water quality monitoring programme will be implemented preconstruction, during and post construction of the proposed project. The programme will include monitoring of both surface water and groundwater at monitoring locations across the site, with continuous water level and turbidity monitoring supplemented by daily construction inspections, weekly construction field measurements and routine laboratory analysis of key parameters, including pH, electrical conductivity, suspended solids, nutrients and hydrocarbons. Monitoring results will be assessed against predefined trigger values and baseline conditions established during the pre-construction monitoring period. The Environmental Manager will oversee the programme and will have authority to require corrective actions, including cessation of works where trigger values are exceeded. Inspection records, monitoring data and incident investigations will be documented and reported throughout the construction period to ensure the effectiveness of mitigation measures and the protection of surface water and groundwater resources.

This CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment are implemented.

4.2 CONSTRUCTION TIMING AND SEQUENCING

Approximately 60 persons will be employed on-site during the peak construction period and it is estimated that the construction phase will take approximately 24 months from starting on-site to completion of turbine commissioning. A reduction in construction staff on-site is expected when the construction activities are more technical and less labour intensive, i.e. May 2030 as per the below indicative construction schedule.

Vegetation clearance will be kept to a minimum, where possible. Any necessary removal of trees or scrub will be implemented outside of the bird breeding season in line with the Wildlife Act as amended. Where the construction programme does not allow this time restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. The ecologist will have the authority to halt work for as long as required where such breeding birds are found.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 08:00 hrs and 20:00 hrs weekdays and between 08:00 hrs and 13:00 hrs on Saturdays. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours) or to accommodate delivery of large turbine component along public routes it may be

necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the local authority.

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours. Such activities are limited to the day of turbine foundation concrete pours, which are completed in a single day per turbine (can take >12 hours). Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance and refined in the days leading up to the pour. Concrete pours are required for 13 no. wind turbines so they will require 13 days of longer working hours. A similar number of days with longer working hours will be needed for installation of the turbines during a period of calm weather (this is mostly limited to on-site activity).

The construction phase of 24 months can be broken down into five main phases as follows (there will be overlap between these):

- 14 months – Civils (including site tracks, hardstands, turbine foundations, vegetation clearance, drainage, borrow pit extraction)
- 12 months – Electrical grid connection / substation installation and commissioning
- 12 months – Site electrical (installing between turbines and substation, pulling cables)
- 7 months – Turbine deliveries and erection
- 2 months – Commissioning

The phasing and scheduling of the main construction task items are outlined in Table 4-1 below, where November 2028 has been selected as an arbitrary start date for construction activities. Where there is overlap between phases, this reflects the anticipated progression of work through the proposed wind farm site, with different areas within the site at different stages of completeness.

Table 4-1: Indicative Construction Schedule

Ref	Task Name	Task Description	Nov -28	Dec – 28	Jan - 29	Feb - 29	Mar – 29	Apr - 29	May - 29	Jun – 29	Jul – 29	Aug – 29	Sep – 29	Oct – 29	Nov – 29	Dec – 29	Jan – 30	Feb – 30	Mar – 30	Apr – 30	May – 30	Jun – 30	Jul – 30	Aug – 30	Sep – 30	Oct - 30
1	Site Health & Safety																									
2	Site Compounds (civils)	Site compound, site access, fencing, gates																								
3	Site Access Tracks (civils)	Construct access tracks, install drainage measures, create borrow pit and temporary spoil storage area																								
4	Turbine Hardstands (civils)	Excavate base, construct hardstand areas																								
5	Turbine Foundations (civils)	Fix steel, erect shuttering, concrete pouring																								
6	Control Room, Substation & GCR Construction & Electrical Works (civils and electrical)	Construct control room, substation, underground cabling between turbines, cabling (33 kV and 110 kV)																								
7	Backfilling & Landscape (civils)	Backfill and reinstate excavated material, landscaping																								
8	Turbine Delivery & Erection	Turbine component deliveries, assemble and erection of turbines																								
9	Substation Commissioning (electrical)																									
10	Turbine Commissioning (electrical)																									

5. ENVIRONMENTAL MANAGEMENT PROCEDURES (EMP)

5.1 EMP 1: MANAGEMENT OF EXCAVATIONS

5.1.3 Purpose

To describe measures for the management of all excavations on the site.

5.1.4 Excavation

- To reduce the construction impact, the movement of machinery throughout the site will be controlled by requiring that construction vehicles and machinery do not encroach onto land beyond the proposed project footprint. These vehicles will also be required to travel via the constructed tracks when moving between works areas. To emphasise this requirement, the boundaries of the works area for the project will be fenced off with post and wire. The Environmental Manager will monitor vehicle movements throughout the construction phase.
- Over the course of the construction phase there will be a requirement to stockpile some spoil, including topsoil, subsoil and stone that might be unsuitable for construction purposes. It is proposed to do this in a designated area immediately adjacent to the proposed borrow pit. This will facilitate efficient material handling and site reinstatement. This area, currently characterised by improved grassland, will be stripped of turves and topsoil, which will be stockpiled separately. Excavated material will be stored within the area in managed mounds that utilise safe slopes and heights, to be determined at pre-construction stage and to be monitored through the construction phase by a geotechnical engineer to ensure safety. A double silt fence and a temporary drainage channel will be installed around the perimeter of this area. Following the extraction phase, the stored material will be backfilled into the borrow pit to reinstate it. The area will then be top-soiled using the same material that was removed originally and reseeded with a grass mixture to ensure the land successfully reverts to its baseline grassland state.
- To prevent sedimentation of local watercourses, excavation works in an area will not commence until the surrounding existing drainage regime is protected by interceptor drains and settlement ponds / silt fencing. Excavated material will be reused where appropriate on-site for re-grading or re-vegetation.

Turves, where identified by the project ecologist, will be separated and stored with the vegetated side upwards.

5.1.5 Excavation of Stone

- To minimise the requirement for stockpiling stone / rock and to reduce the volume of crushed stone imported onto site, excavated rock can be reused in construction activities on-site.
- A detailed, site-specific method statement for excavation of stone / rock will be required from the Contractor prior to commencement of works.

5.1.6 Responsibility

- The Geotechnical Engineer will supervise all excavation activities, ensuring they are carried out in accordance with the relevant designs and procedures, while also reviewing and monitoring associated data.
- Turves, where identified by the project ecologist, will be separated and stored with the vegetated side upwards.
- The Environmental Manager will monitor the excavation areas and associated drainage.
- The Construction Manager will monitor vehicle movements throughout the construction phase.
- The Project Manager will oversee the phasing of the excavation and machinery movement across the site.
- Construction personnel will be informed of the measures to prevent pollution of water courses, particularly at stream crossings.
- The Design Engineer and sub-contractors will have responsibilities as appropriate.
- All responsibilities will be finalised by the appointed Contractor.

5.2 EMP 2: Control and Management of Surface Water Run-Off

5.2.3 Purpose

To describe measures for the management of all surface water and run-off on the site, for the protection of watercourses and in particular, sediment and erosion control.

5.2.3.1 Existing Site Drainage

The proposed wind farm site lies within the Black (Shrule_020), Black (Shrule_030), Knocknageeha_010, and Mocorha_010 river sub basins. The proposed wind farm site lies within the Corrib (30) surface water catchment. The majority of the proposed wind farm site drains towards the Black (Shrule) river and Lough Corrib. The Black (Shrule) River flows along the northeast and south site boundary of the proposed wind farm site, before entering Lough Corrib. The Corrib_010 watercourse is located approximately 1.4 km to the southwest of turbine T3 and is hydrologically connected to Lough Corrib. Lough Corrib is located approximately 3.1 km to the southwest of the proposed project.

There are several mapped drains located in the proposed wind farm site which flow towards the Rooaunalaghta Stream (EPA Code 30R03) and the Black [Shrule] River (EPA Code 30B02). These are generally modified and used to assist in the drainage of agricultural land-use. The proposed GCR crosses two watercourses, namely the Black River (Black (Shrule_020) and the Shancloon River (Black (Shrule) _010). Two streams are mapped by the EPA (Raheen_030 and Killamanagh) near the proposed 110 kV substation however there is no stream present at these locations.

5.2.3.2 Constructed Drainage

The proposed wind farm site drainage will be integrated into the existing surface water network. The drainage incorporated into the design will facilitate the collection of surface water runoff from upstream of the proposed wind farm infrastructure and provide for the attenuation and controlled discharge of treated runoff downstream following passage through the constructed treatment train, as described further in the Surface Water Management Plan (SWMP), in Appendix 2-6 of the EIAR.

The principal behind Sustainable Drainage Systems (SuDS) devices is to reduce the quantity of discharge from developments such as the proposed wind farm to predevelopment flows and to improve the quality of run-off. The SuDS devices, as part of the proposed wind farm design, mimic existing greenfield runoff in terms of volume, rate of runoff and quality of runoff. For the proposed wind farm the quantity of run-off will be decreased to greenfield rates by providing SuDs methods such as surface water settlement ponds.

Interceptor drains will be installed up-gradient of all proposed wind farm infrastructure, at strategic locations to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained.

Swales will be implemented to control run-off from the surface running to lower water levels in the subgrade, to control surface water and to carry this flow to outlet points. Swales along access tracks will be installed in advance of the main construction phase.

Swales will provide additional storage of storm water, located on an at-gradient basis.

Swales will be re-vegetated following excavation. Vegetation will reduce the flow velocity, treat potential pollutants, increase filtration and silt retention.

Settlement ponds will be located downstream of road swale sections and at hardstand locations, as illustrated on Drawing 11981-2041 to 2044, to manage / buffer volumes of runoff discharging from the drainage system during periods of high rainfall, thereby reducing the hydraulic loading to watercourses. Settlement ponds are designed in consideration of the greenfield runoff rates.

Any settlement pond design is based on primary settling out of suspended solids from aqueous suspension. Settlement ponds will be installed alongside the formation of the road and will be fenced off for safety.

Further embedded design measures include the following:

- Hazardous substances (fuel, oils, chemicals) will be stored in bunded areas (110% capacity) with impermeable bases; and
- All concrete will be mixed off-site and imported into the site. All concrete bowsers (trucks) will be washed down at a dedicated concrete washout off-site at least 50 m from a drainage ditch or watercourse. Concrete washings will not be disposed of on-site to any surface or ground water feature. All washings will be removed off-site and treated at a licensed facility.

5.2.4 Plan

- Implement erosion control measures to prevent runoff flowing across exposed ground and become polluted by sediments;
- Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads;
- Implement the erosion and sediment controls before starting site clearance works;
- Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the wind farm infrastructure and keeping excavated areas to a minimum;
- Delay clearing of soil until before construction begins rather than stripping the entire site months in advance particularly during road construction;
- Avoid working near drains during or after prolonged rainfall or an intense rainfall event and cease work entirely near drains when it is evident that pollution is occurring;
- Install a series of silt fences or other appropriate silt retention measure where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event;
- Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water;
- Install appropriate silt control measures such as silt-traps, check dams and sedimentation ponds;
- Provide public road cleaning where needed particularly in the vicinity of drains; and,
- Controls need to be regularly inspected and maintained otherwise a failure may result, such as a build-up of silt or tear in a fence, which will lead to water pollution so controls must work well until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.

5.2.5 Monitoring

A comprehensive water quality monitoring programme will be implemented preconstruction, during and post construction of the proposed project. The programme will include monitoring of both surface water and groundwater at monitoring locations across the site, with continuous water level and turbidity monitoring supplemented by daily inspections, weekly field measurements and routine laboratory analysis of key parameters, including pH, electrical conductivity, suspended solids, nutrients and hydrocarbons. Monitoring results will be assessed against predefined trigger values and baseline conditions established during the pre-construction monitoring period. An Environmental Manager will oversee the programme and will have authority to require corrective actions, including cessation of works where trigger values are exceeded. Inspection records, monitoring data and incident investigations will be documented and reported throughout the construction period to ensure the effectiveness of mitigation measures and the protection of surface water and groundwater resources.

5.2.6 Responsibility

- The Environmental Manager is responsible for ensuring that appropriate water pollution prevention measures are put in place and that water sampling is carried out. Where standards are breached and remedial action is taken, an investigation must be carried out in conjunction with the Construction Manager, and further samples must be taken to verify that the situation has returned to normal.
- The Environmental Manager is responsible for ensuring spill kits are readily available in vulnerable locations and that booms for watercourses are long enough and have adequate anchorage.
- The Construction Manager (or a designate) is responsible for ensuring the spill kits are adequately stocked and should inform the Environmental Manager when items have been used.

5.3 EMP 3: Fuel and Oils Management

5.3.3 Purpose

To describe measures for the management of all fuel and oils on-site for the protection of watercourses from any spills.

5.3.4 Construction Machinery and Vehicles

- The potential for hydrocarbons getting into the existing drains and local watercourses will be mitigated by only refuelling construction machinery and vehicles in designated refuelling areas using a prescribed re-fuelling procedure.
- There will be no storage of fuels / drilling fluid within 30 m of a watercourse.
- Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using.
- Plant nappies or absorbent mats to be place under refuelling point during all refuelling to absorb drips. Plant nappies to be provided beneath small mobile plant (e.g. small generators, pumps etc).
- Mobile bowsers, tanks and drums should be stored in secure, impermeable storage area, away from drains and open water.
- To reduce the potential for oil leaks, only vehicles and machinery that are mechanically sound will be allowed onto the site. An up-to-date service record will be required from the main contractor(s).
- Potential leaks from delivery vehicles will be reduced by visually inspecting all delivery vehicles for major leaks. Contractors supplying concrete and crushed stone to the site will be contractually required to supply their products using roadworthy vehicles.
- Potential leaks from the cranes used for turbine erection will be mitigated by contractually requiring the crane suppler to supply cranes to site that are in good working order, up to date in servicing and free of leaks.

- Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel / oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility.
- The Environmental Manager will be immediately informed of the oil leak / spill and will assess the cause and the management of the clean-up of the leak or spill. They will inspect nearby drains for the presence of oil and initiate the clean-up if necessary.
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery.
- Correct action in the event of a leak or spill will be facilitated by training all vehicle / machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction.
- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery.

5.3.5 Oil Storage during the Construction Phase

- The scale of potential impacts on downstream water quality will be reduced by only storing the required volume of oils for the works taking place at the time.
- Fuel containers must be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores.
- Access to oil stores will be controlled by the storage of oils within a locked steel container within the site compound. The site compound will be surrounded by a palisade fence and locked when there are no site personnel present.
- Collision with oil stores will be prevented by locating oils within a steel container in a designated area of the site compound away from vehicle movements.
- Leakages of oil from oil stores will be prevented by storing these oils in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Taps, nozzles or valves will be fitted with a lock system.
- The volume of leakages will be prevented through monitoring oil storage tanks / drums for leaks and signs of damage. This will be carried out daily by the Environmental Manager.
- Long term storage of waste oils will not be allowed on-site. These waste oils will be collected in leak-proof containers and removed from the site for disposal or re-cycling by an approved service provider.

5.3.6 Responsibilities

The Construction Manager and Environmental Manager are responsible for ensuring Fuel and Oils are managed in line with this procedure. The appointed Contractor, in updating the CEMP, must designate personnel to the tasks relating to Fuels and Oil, as outlined in example text below.

(Insert name)..... is the designated person for (insert area)..... area responsible for being present during tanker refilling operations of oil storage tanks.

(Insert name)..... is the designated person responsible for checking bunds weekly.

(Insert name)..... is the designated person authorised to pump from the bund only when accumulated rainwater is clear.

5.3.7 Reference

- Best Practice Guidelines BPGCS005 – Oil Storage Guidelines (Enterprise Ireland).

5.4 EMP 4: Management of Concrete

5.4.3 Purpose

To describe measures for the management of concrete on-site for the protection of watercourses.

5.4.4 Supervision of Concrete Pours

- To reduce the potential for cementitious material entering watercourses, concrete pours will be supervised by the Construction Manager, a suitably qualified Engineer and the Environmental Manager.
- The Construction Manager will ensure that the area of the pour is completely drained of water before a pour commences.
- Pours will not take place during forecasted heavy rainfall.
- Incidental rainfall from light showers during the period of a pour is typically absorbed into the concrete matrix but heavier showers can result in some run off from the top surface of the concrete pour. If run-off is encountered, the Environmental Manager will block the outflow from the drains to retain or treat the run-off until the pH is neutral before discharge to the drainage network.
- In the event of a spillage on-site, the Environmental Manager will temporarily block the dirty water drains in the immediate area and monitor the pH levels of the water in the associated settlement ponds and if necessary, will adjust the pH levels using CO_2 entrainment. Any spillage will be cleared immediately and deposited in the Chute wash down area.

5.4.5 Concrete Water

- Pours will not take place during heavy rainfall.
- To reduce the volume of cementitious water, washout of concrete trucks will not

take place on-site. Concrete trucks will be washed out off site at the source quarry.

- To reduce the volume of cementitious water, all concrete bowsers (trucks) will be washed down at a dedicated concrete washout off-site at least 50 m from a drainage ditch or watercourse. Concrete washings will not be disposed of on-site to any surface or ground water feature. All washings will be removed off-site and treated at a licensed facility. the Environmental Manager will monitor the pH of the water in the chute wash down bund and can dose with CO_2 or acidic water from the drains until the washout water achieves neutrality before discharge.

5.4.6 Responsibilities

- All concrete pours will be supervised by suitable personnel.
- The Environmental Manager is responsible for ensuring that appropriate water pollution prevention measures are put in place and that water sampling is carried out. Where standards are breached, he / she should carry out an investigation and in conjunction with the Construction Manager, he / she should ensure remedial action is taken and further samples taken to verify that the situation has returned to normal.
- The Environmental Manager is responsible for ensuring spill kits are readily available in vulnerable locations and that booms for watercourses are long enough and have adequate anchorage.

5.5 EMP 5: Construction Waste Management Plan

5.5.3 Purpose

To describe measures for the management of waste associated with the construction of the wind farm. Based on a 24-month construction period and up to 60 construction staff each year, the maximum municipal waste generated for the proposed project is expected to be in region of 69,360 kg over 2 years. This is a worst-case assessment based on national statistics for the average person (as outlined in Chapter 11 of the EIAR).

5.5.4 Waste Management Plan

- The Waste Management Hierarchy (illustrated below) will be assessed and applied in the preparation and maintenance of the Construction Phase Waste Management Plan.
- The Construction Phase Waste Management Plan will address the following aspects of the Project:
    - Analysis of the waste arising / material surpluses;
    - Specific waste management objectives for the project;
    - Methods proposed for prevention, reuse and recycling of wastes; and,
    - Material handling procedures.

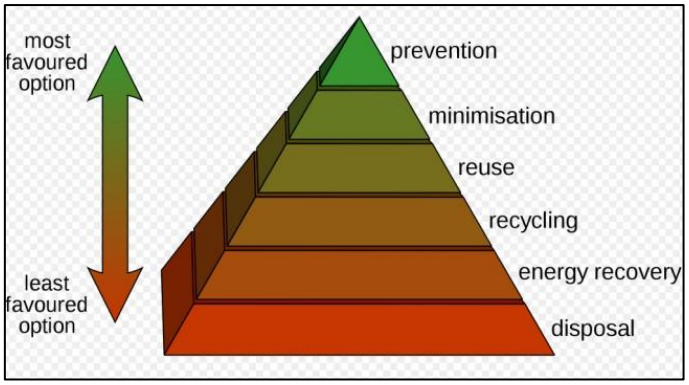


Figure 5-1: The Waste Management Hierarchy

5.5.4.1 Construction Methodology and Raw Materials

The construction phase of the wind farm will require a variety of construction methodologies. The anticipated phasing of the construction phase will be as follows:

Table 5-1: Construction Phasing

Activity
Prepare site, pre-construction activities, site accesses
Access track construction & drainage plan implementation
Crane hardstand construction
Turbine foundation construction
Substation construction
Internal trenching and ducting
External grid connection trenching and ducting
Turbine delivery
Turbine erection
LiDAR installation
Reinstatement / Landscaping
Wind farm commissioning
Project closeout

5.5.4.2 Construction

Contractors working on-site during the works will be responsible for the collection, control and disposal of all waste generated by the works. Construction phase waste may consist of hardcore, stone, concrete, steel reinforcement, shuttering timber, food waste and unused oil, diesel and building materials. This waste will be collected at the end of the construction phase and taken off site to be reused, recycled and disposed of in accordance with best practice procedures at an approved facility. Domestic wastewater from the on-site holding tank will be collected on a regular basis by approved contractors and disposed of in an authorised facility in accordance with best practice. Plastic waste will be taken for recycling by an approved contractor(s) and disposed or recycled at an approved facility.

5.5.4.3 General Waste Management on-site

To manage waste effectively, focus on the following:

- Ordering the correct amount of materials to be delivered when needed;
- Ensuring materials are not delivered to site damaged and unusable;
- Reducing the amount of packaging used by suppliers;
- Where possible, establish a 'take back' system with suppliers;
- Ensuring wastes are handled and stored correctly; and,
- Limiting the amount waste going to landfill by reusing and recycling where possible.

5.5.4.4 Construction Compounds

Construction compounds / waste storage area(s) will be created for storage of waste materials, plant, and equipment and for site offices, and welfare facilities.

5.5.4.5 Waste Generation

Best practice procedures in general will minimise waste generated on-site. Measures including good site management will be taken to limit the quantity of waste generated during construction phase. Waste such as excavated material on-site will be recycled where possible.

Surplus materials will include materials generated by the excavation /extraction works during construction of tracks, construction compounds and turbine foundations, mainly comprising excavated excess sub-soils.

Waste streams will include wastes generated by plant, machinery and construction workers over the period of the works, for example waste oils, sewage, refuse (paper, carton, plastic etc), wooden pallets, waste batteries, fluorescent tubes etc.

5.5.4.6 Minimisation, Reuse, Recycling and Management of Construction Waste

The primary aim of this Waste Management Plan is to ensure that wastes generated during the course of the project are managed in a systematic manner in accordance with Waste Management Legislation and the principles of the waste Hierarchy, i.e. Prevention, Minimisation, Reuse, Recovery, and Recycling.

Waste generated during the construction phase will be identified and segregated according to their category as described by the European Waste Catalogue (EWC).

In order to implement this, designated waste storage areas will be created at the construction compound and other suitable locations for storage and segregation of wastes prior to transport for recovery / disposal at suitably licensed / permitted facilities. Suitably sized containers for each waste stream will be provided and will be supervised by a designated Waste Management Coordinator (WMC) as appointed by the main Contractor. The WMC will be responsible for the management of wastes during the entire project. The numbers and sizing of the containers will be agreed with the Waste Contractors / Hauliers in advance of the commencement of the road improvement works. Source segregation of the wastes generated will result in cost savings, in addition to providing an environmentally sound route for the management of all the Construction and Demolition Waste.

Under Waste Management Regulations 2007 a waste collection permit, for appropriate waste codes and destinations is required by the waste haulier, to transport the waste from one site to another. The contractor(s) will ensure the movement of all wastes are carried out in compliance with relevant waste regulations.

Wastes will only be treated or disposed of at waste facilities to carry out a specific activity (i.e. chemical treatment, landfill, incineration etc.) for the specific waste types. Records of all waste movements and associated documentation will be held on-site. It is planned that all waste activities at the site will comprise of;

- Source;
- Segregation;
- Storage; and,
- Collection.

In order to prevent / minimise the generation of wastes, the contractor(s) will ensure that raw materials are ordered so that the timing of the delivery / quantity delivered, and the storage is not conducive to the creation of unnecessary waste.

The Contractor will continuously seek to improve the waste management process on the site during all stages of the construction phase and maximise opportunities for reuse / recycling wherever they exist. For example, in relation to waste packaging, the contractor(s) will seek to negotiate take back of as much packaging waste as possible at source, to ensure maximum recycling. The Construction Waste Management Plan will be included in the team weekly meetings. In addition, the plan will be communicated to the whole construction team regularly on-site, including any updates from earlier revisions of the plan.

An overview of the methods to manage the primary waste streams is presented in the following sections.

Soils and Spoil

Any materials excavated on-site in the course of the construction works (i.e. soil stripping for track construction, turbine foundations / hardstanding areas) will be stored on-site and re-used on-site. As such, off-site disposal of this material is not expected.

No waste soils, subsoils, bedrock will require disposal outside the overall boundary of the proposed wind farm site. All excavated material will be reused within the site except for some material used during the construction of the GCR.

Concrete

Concrete waste may potentially occur. There shall be no washout of trucks at site. Excess concrete will be returned to the supplier for reuse. Concrete trucks will be washed out off site at the source quarry. All concrete bowsers (trucks) will be washed down at a dedicated concrete washout off-site at least 50 m from a drainage ditch or watercourse. Concrete washings will not be disposed of on-site to any surface or ground water feature. All washings will be removed off-site and treated at a licensed facility.

Waste-Water Treatment / Effluent disposal

During the construction phase, staff facilities will be provided at the temporary construction compound. A cabin comprising a canteen, washroom and toilets will be provided. This cabin will contain three integrated holding tanks; one for clean water, one for wastewater and the third for sewage. This wastewater will be collected in a sealed and alarmed tank and removed off-site by a permitted collector for disposal at a licensed wastewater treatment facility, ensuring no discharge to ground or surface water. These staff facilities will be removed at the end of the construction phase, and there will be no wastewater or wastewater facilities associated with the operational phase of the proposed project.

Hazardous and Other Waste

The following tables list some of the waste types that may be generated during the construction works. Although some waste types may be generated in locations other than the construction compounds (for example if absorbent filters are required at foundation / track locations etc., such waste materials will be stored within the construction compounds only. Waste materials generated outside the construction compounds will be taken to the compounds on a daily basis.

Table 5-2: Common Construction Wastes

Common Construction Wastes					
Concrete	Wood	Cables	Ducting	Metallic Packaging / tins	Cardboard packaging
Paper packaging	Plastic packaging	Wooden packaging	Office paper	Non-hazardous detergent	Plastic containers
Plastic bottles	Mixed waste	Septic tank sludge	Ferrous metal	Non-hazardous electrical waste (WEEE)	

Table 5-3: Hazardous Waste

Hazardous Waste, as categorised by the European Waste Catalogue	
13 01 10: Used mineral hydraulic oil (non-chlorinated).	13 02 08: Other waste engine, gear or lube oil.
13 02 05: Waste engine, gear or lube oil (non-chlorinated).	13 02 08: Other waste engine, gear or lube oil.
16 01 07: Oil filters.	20 01 23: Discarded equipment containing CFCs.
16 06 01: Lead batteries.	16 07 08: Oily waste from transport and storage tanks.
16 10 01: Hazardous liquid waste to be treated off-site.	20 01 21: Fluorescent tubes and other mercury-containing waste.
20 01 33: Hazardous batteries and accumulators that are collected separately.	15 02 02: Absorbents, filter materials, wiping cloths, clothing contaminated by dangerous substances.

If hazardous waste is encountered, then appropriate handling, storage, transportation, and disposal will be carried out. Prior to being removed from the site, the waste will undergo a comprehensive waste assessment and classification by suitably trained / qualified person(s), in accordance with the European Waste Catalogue hazardous waste list.

If non-hazardous waste becomes contaminated with hazardous waste, the entire load will be considered hazardous. At the site every effort will be made to segregate waste, and properly segregate hazardous waste from non-hazardous and inert waste arising. Hazard wastes will be identified, removed and kept separate from other wastes in order to avoid cross contamination. Specific method statement detailing the necessary mitigation measures during the excavation / handling, transportation, and disposal of hazardous materials encountered at the site will be prepared as required.

Oil paints, adhesives and chemicals will be kept in a separate contained secured storage area. Lids will be kept on containers to avoid spillage / evaporation. Waste oils, adhesives etc will handled, and disposed of appropriately. Every effort will be made at the site for no long-term storage of hazardous materials / fuels / oils / chemicals, etc. There shall be no long-term storage of waste oils etc. at the site.

Gravel /Stone / Asphalt / Bituminous Materials

There will be no requirement for the storage of Asphalt / bitumen materials on-site. Track surface materials will be delivered to site as required, with excess returned to supplier.

Metals

It is now common practice to segregate metals for reuse and recycling. However, there are still sites where waste metal is thrown away in the general rubbish. One of primary sources of metal on-sites is rebar. Waste of rebar will be reduced by ordering 'made to measure' from the source, and detailed scheduling of all reinforced concrete structural elements.

Timber

Timber waste will be stored separately. Any pallets will be returned to the supplier for reuse. Off- cuts / trimmings will be used in formwork where at all possible. A container for waste wood, covered where possible will be located at compound / other storage areas. This waste will be collected by the waste contractor and will forward it for wood recycling.

- An open skip will be put in place to collect at the temporary site construction compounds.
- Special care will be taken to segregate the timber into treated and untreated fractions.
- The following timber materials are considered as waste by timber recyclers - plywood, painted timber and pressure treated timber. This waste timber fraction will be disposed using a mixed waste skip.
- This material will be collected by the contracted and licensed non-hazardous waste collectors and brought to a licensed waste recycling facility.

Blocks, Bricks, and Tiles

The careful storage of these materials will significantly reduce the volumes of wastes occurring at the site. Every effort will be made to use broken blocks / off-cuts. Final quantities of these wastes generated will be stockpiled (possibly crushed / screened) and reused at the site as subbase materials for track / other suitable hardstanding locations.

Packaging / Plastic

Double handling will be avoided by segregating packaging waste immediately after un-wrapping. Waste packaging will be segregated and in separate containers, at storage area for collection by the waste contractor for disposal to licensed facility.

Construction Mixed Waste

- This waste stream will arise from waste packaging of electrical and engineering components.
- An open skip will be put in place to collect mixed waste within a designated waste area at the temporary site construction compound.
- This skip will accept plastic packaging, plastic piping, cardboard and timber waste.
- Special care will be taken to ensure that no green waste or food waste will be disposed of in this skip. The purpose of this arrangement is to stop birds scattering food items across the site and therefore prevent vermin infestation.
- This material will be collected by contracted and licensed non-hazardous waste collectors.

Welfare Facility Waste

Staff canteens have the potential to generate food waste and packaging waste. Designated receptacles will be provided at the canteen to allow for segregation, and storage of individual waste streams. These will include receptacles for food waste, dry recyclables, and residual bin. All offices and canteens will be equipped with black plastic refuse bags and wheelie bins for the purpose of collecting and delivering this waste stream to the compactor.

This material will be collected by the contracted waste management company / transported to licensed facility.

Dry recyclable collection from welfare facilities

All offices and canteens will be equipped with clear plastic bags and wheelie bins for the purpose of collecting dry recyclables. This will be strictly managed to prevent any food waste entering the dry recyclable stream. Recycling wheelie bins will be located at the welfare facility associated with the wind farm project. This material will be collected by the contracted and licensed non-hazardous waste collectors.

Other waste

Other wastes which may be generated may include residual non-recyclable waste such as paper, cloth, some cardboards, or plastics. Others may include fibreglass and geotextiles, and polystyrene. These types of materials will be stored in a dedicated container at the construction compound. All residual wastes will be dispatched to suitably licensed facility for disposal. Other construction and demolition waste will be collected and disposed of appropriately.

5.5.4.6.1 Management of General Waste

Access to materials will be controlled. A dedicated storage area will be provided in the site construction compound for building materials such as cables, plastic piling for the settlement ponds, geotextile matting, blocks, tools and equipment, fence posts and wire, booms, pipes.

Access to stored materials will be restricted; the construction compound will be securely fenced from the outset and will be locked when there are no site personnel present.

To contain and manage construction phase waste, multiple skips will be provided at the temporary construction compound; one for recyclable waste and others for various construction waste. These skips will be emptied when required by a licensed waste management company. Waste oil and waste oil drums will be collected and stored in containers and on a bunded tray within the storage container.

At the end of each phase, the completed works areas will be tidied of any unused material or waste; this material will be brought to the site compound for storage and reuse or placed in the appropriate skip for disposal.

5.5.4.7 Construction Phase General Waste

- Construction waste (timber, steel, concrete) These elements will be segregated and stored in dedicated bins on-site for recycling.
- Timber waste will be kept to a minimum through the re-use of shutters throughout the job. At the end of the job, the majority of timber will be sent onto a new site for re-use. Any timber that cannot be re-used because of poor quality will be recycled.
- All waste steel reinforcing will be stockpiled and at the end of each work unit, it will be collected for recycling by Licensed Facility.
- Plastics and packaging will be segregated and stored in dedicated bins on-site for recycling.
- Waste oil stored on-site will be stored in labelled containers and will be collected by licensed facility / licensed oil-recycling contractor as necessary. Records will be maintained on the volumes of waste oil generated.

- Paper / cardboard, this material will be recycled.
- Wastewater from office and welfare facilities. These facilities will be regularly emptied by licensed / suitable contractors.

5.5.4.8 Alignment of Responsibilities

A Waste Management Coordinator (WMC) will be assigned at the wind farm site, to have an overall responsibility for the management of waste that may be generated at the site. As part of the record keeping procedures, the WMC will keep records of all waste being removed from site. This information will be recorded in a standard format. The effectiveness and accuracy of the documentation will be monitored on a regular basis. The Waste Management Plan will be updated on a regular basis where required and made available as required (i.e. subcontractors). The WMC will be appropriately trained / suitably qualified in all aspects of materials wastes management, and the site personnel will be in a position to:

- Distinguish reusable materials from materials suitable for recycling;
- Ensure maximum segregation at source;
- Cooperate with Site Management, on locations for stockpiling reusable materials;
- Separate materials for recovery; and,
- Identify and liaise with operators for recovery outlets.

The WMC will be responsible for educating site personnel, subcontractors, and suppliers about the best alternatives to conventional waste disposal / Waste Management Regime at the wind farm site. Training will also be given to site personnel in materials management on-site. The WMC will continually identify waste minimisation actions on-site and these will be updated in the plan.

5.5.4.9 Training

Copies of the Waste Management Plan will be available to all site personnel. All site personnel and subcontractors will be instructed about the objectives of the Waste Management Plan for the site and informed of the responsibilities which fall upon them as a consequence of its provisions. This will be carried out during the site induction process for all site personnel. Where source segregation and materials reuse techniques apply, each member of the construction team will be given instructions on how to comply with the Waste Management Plan for the site. Site notices will be designed to reinforce the key messages of the waste management plan and will be displayed prominently for the benefit for all on-site personnel.

5.5.4.10 Waste Records

All details of wastes (arising / generated / movement, etc) will be recorded during the project. Each consignment of waste removed from the site will be documented in the form of a waste management movement record form which will ensure full traceability of the material to its final destination. All records will be retained at a designated location at the construction compound and made available for auditing of the waste management plan.

5.5.4.11 Waste Management Plan Summary

Wastes will inevitably be generated during the construction phase of the project. There shall be no requirement to remove spoil etc from the site. A certain amount of surplus soils / materials

will be generated. These materials will be reused as backfill / landscaping around turbine bases and hardstands.

Other than spoils from excavations, waste arising during the construction phase will be minimised by site management, by timing the ordering of materials required at the site, in a manner which reduces the likelihood of over-ordering, or damaging during storage. Furthermore, several of the traditional waste streams arising maybe used at the site where appropriate. Waste will be segregated and stored on-site at designated locations / in containers prior to transport to appropriate licensed facilities.

A Waste Management Coordinator will be appointed to ensure the Waste Management Plan is followed. Training will be given to all site personnel, so that they are aware of the Waste Management Regime at the site and know their responsibilities.

Records will be kept tracing the inputs and outputs of the construction works at the site. These records will be made available to relevant authorities, should it be required.

The design and implementation of the Waste Management Plan will provide for the optimum planning / management and handling of wastes generated during the construction phase of the wind farm project.

5.5.5 References

Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, July 2006).

5.6 EMP 6: Construction Traffic Management

5.6.3 Purpose

To describe measures for the management of all traffic, including construction traffic and oversized loads, for the minimisation of disturbance and nuisance to the local community.

5.6.4 General

The appointed Contractor will prepare a detailed Traffic Management Plan prior to the works commencing. This Plan will be finalised in agreement with An Garda Síochána and Galway County Council and Mayo County Council.

The plan will include provision for:

- Communicating with the local community, An Garda Síochána, Galway County Council, and Mayo County Council;
- Details of site access and any site traffic rules, including security, parking, loading and unloading, required speed or other relevant details;
- Details of the turbine component delivery and any road closures;
- Programme of maintenance and upkeep of public roads; and,
- Site operating hours (including delivery) to be outlined.

A detailed Traffic Management Plan is included as Appendix 17-1 to the EIAR.

5.6.5 Additional Traffic Mitigation Measures

- HGV movements shall, where practicable, be scheduled to avoid peak traffic periods and school opening and closing times.
- Temporary traffic management measures, including stop/go systems, temporary traffic signals, escort vehicles and traffic marshals, shall be implemented where required for AIL deliveries.
- Pre-construction and post-construction condition surveys shall be undertaken along approved haul routes, including public roads, bridges and associated infrastructure. Any damage attributable to the construction works shall be repaired following agreement with the relevant Roads Authority.
- Temporary lane closures, road closures and diversion routes shall be agreed in advance with the relevant Roads Authority and An Garda Síochána.
- Access for residents, agricultural traffic, businesses and emergency services shall be maintained throughout the construction phase, where practicable.
- All road opening works shall be undertaken in accordance with the Guidelines for Managing Openings in Public Roads (the Purple Book).
- All permits, licences and approvals required for works affecting the public road network shall be obtained prior to commencement of the relevant works.
- A full Traffic Management Plan is included in Appendix 17-1 of the EIAR.

5.6.6 Public Roads

In order to mitigate from a significant impact during peak traffic hours, the majority of staff will either arrive on-site before or after the peak morning traffic and finish work before or after the evening peak traffic hours. The condition of the public roads will be monitored on an on-going basis and a road sweeper provided to clean public roads if required.

5.6.7 Site Entrance

There will be no parking of any vehicles on public roads near the wind farm site entrance. Adequate parking will be provided on-site for both employees and visitors. The condition of the site entrance will be monitored on an on-going basis and a road sweeper provided to clean the public road if required.

5.6.8 Responsibility

- Project Manager;
- Construction Manager;
- Construction personnel; and,
- Delivery personnel.

5.7 EMP 7: Wheel Wash Management Procedure

5.7.3 Purpose

To describe measures for the protection of watercourses and public roads from dirty water from vehicles.

5.7.4 Procedure

The appointed Contractor will reduce the potential for the roads being dirtied by heavy vehicle traffic, by including the following:

- A Wheel Wash facility will be provided at the site entrance; and,
- Wheel washes will be cleaned as required.

Dry Option: At assigned locations at the site entrance a wheel wash will be installed for wheel washing prior to vehicles leaving site. A dry wheel wash (vibrating) will be used to remove any mud from the vehicle's wheels, with excess mud / etc. being collected and treated / disposed of following treatment.

The wheel wash station will remain on-site until the construction of the proposed project is complete. The wheel cleaning procedure will consist of:

1) Before leaving the site, vehicles will enter the wheel wash and be inspected for any heavy deposits left on wheels. If present, these will be removed manually;
2) Following inspection, all wheels are to be cleaned down with the vibration system, until clear of all deposits; and
3) Vehicles will be permitted to leave site following approval of the operating manager / site representative that the above steps have been completed to a satisfactory standard.

Daily inspections of the wheel wash will be completed to check it is operating as described above, and to make sure there is no excess material collected posing risk during periods of rain. The washout area will be cleaned as required, with excess material disposed of appropriately or used as back fill within the site. If required, drainage ditches / berms will divert dirty water to sedimentation pond for treatment, prior to outfall to vegetated area (preventing sedimentation (runoff / rainwater washing material away).

On-site tracks / local roads will be kept as free of mud as is practicable during ground working operations. Machine trafficking around the site will be kept to a minimum in order to reduce the effects of rain on 'broken' ground.

If wheel wash facility is not sufficient, a road sweeper will also be used in the immediate area which will be ordered directly via the site manager.

5.7.5 Responsibility

The Construction Manager / Environmental Manager will monitor the wheel wash area / sediment control infrastructure and carry out corrective action where required.

5.8 EMP 8: Construction Dust Management

5.8.3 Purpose

To describe the measures for the management of nuisance impacts on air quality from construction generated dust.

5.8.4 Procedure

In order to ensure that no dust nuisance occurs, a series of measures will be implemented:

- A temporary vehicle wheel wash facility will be installed in proximity to the site entrances;
- Site tracks will be regularly cleaned and maintained as appropriate;
- Construction compounds shall be laid out so that dust-generating activities and stockpiles are located as far as practicable from sensitive receptors;
- Stockpiles of fine material shall be covered or otherwise protected from wind whipping;
- Exposed surfaces and stockpiles shall be stabilised and revegetated as soon as practicable;
- Water suppression shall be applied to dust-generating activities during dry weather conditions;
- Hard surface roads will be swept to remove mud and aggregate materials from their surface;
- Furthermore, any road / track that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- Speeds will be restricted on hard surfaced roads as site management dictates; and,
- Public roads in the vicinity of the site will be regularly inspected for cleanliness and cleaned as necessary.

The dust minimisation plan will 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.

5.8.5 Responsibility

The Environmental Manager is responsible for ensuring the standard construction dust management measures highlighted in Chapter 14 of the EIAR are followed.

5.8.6 References

- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (Consultation Draft, National Roads Authority, October 2006); and
- Control of Dust from Construction and Demolition Activities (BRE, 2003).

5.9 EMP 9: Construction Noise Management

5.9.3 Purpose

To describe measures for the management of impacts from construction noise.

Prior to the commissioning of the project, the developer will submit a Noise Compliance Monitoring Programme (NCMP) to the planning authority for written agreement. The NCMP will include a detailed methodology for noise measurements, procedures for recording results and locations at which noise is to be monitored.

The NCMP will include both commissioning noise surveys to test compliance with the noise levels in the planning condition, and also a Complaint Management Protocol with a clear path to address any noise complaint. Appropriate corrective measures shall be implemented where necessary.

5.9.4 Procedure- Control of Noise at Source

- Only properly functioning and maintained plant / equipment will be permitted on-site.
- No unnecessary revving of machinery on-site.
- All construction activities shall be undertaken in accordance with BS 5228-1:2009+A1:2014 Code of Practice for Noise Control on Construction and Open Sites and BS 5228-2:2009+A1:2014 Code of Practice for Vibration Control on Construction and Open Sites.
- Construction activities shall normally be restricted to working hours namely, between 8:00 hrs and 20:00 hrs Monday to Friday (excluding public holidays) and between 08:00 hrs and 13:00 hrs on Saturdays.
- Plant will be properly used and regularly maintained.
- Compressors, if needed, will be 'sound related' models fitted with properly lined and sealed acoustic covers which will be kept closed whenever machines are in use.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers.
- Machinery will be turned off where practicable when not in use.

5.9.5 Responsibility

- The Construction Manager will be familiar with the noise sensitive receptors and alert the Environmental Manager in good time prior to work commencing in the areas closest to any noise sensitive receptors.
- The Environmental Manager will review any relevant planning conditions in updating this plan.

5.9.6 References

- BS5228 –1&2:2009, Code of Practice for the Control of Noise and Vibration on Construction and Open Site

5.10 EMP 10: Archaeological and Heritage Protection

5.10.3 Purpose

To describe measures for the protection of archaeological, architectural and cultural heritage resources during the construction phase and to ensure implementation of all mitigation and monitoring measures.

5.10.4 Procedure

- A suitably qualified Project Archaeologist shall be appointed prior to commencement of construction works.
- Archaeological monitoring shall be undertaken during construction works in areas identified by the Project Archaeologist, including locations of archaeological sensitivity, works affecting historic townland boundaries and other areas identified through the archaeological testing programme.
- Prior to the commencement of construction, a programme of archaeological test trenching will be carried out at the greenfield locations across the proposed wind farm site. This work will be carried out under licence to the National Monuments Service (NMS). Dependent on the results of the testing assessment, further mitigation will be implemented as required and agreed with the NMS.
- If archaeological remains are identified during the course of these works, further mitigation will be implemented as required and agreed with the NMS.

5.10.5 Responsibility

- Project Manager;
- Environmental Manager;
- Construction Manager; and
- Project Archaeologist.

5.11 EMP 11: Ecological Management Plan for the Protection of Habitats and Fauna

5.11.3 Purpose

To describe measures for the management and protection of habitats and fauna on the site.

5.11.4 Procedure

- Ensuring implementation of ecological protection measures outlined below and within the Habitat Management Plan (see Appendix 6-6 of the EIAR).
- Advising on re-vegetation on-site.
- Monitoring of success of re-vegetation.

5.11.5 Ecological Protection Measures

5.11.5.1 General Habitats

Habitat degradation will be limited by controlling the movement of construction vehicles and machinery. Construction vehicles and machinery will not encroach onto habitats beyond the proposed project footprint and will be required to travel via the constructed tracks when moving between works areas. To emphasise this requirement, the boundaries of the works area for the proposed project will be fenced off with posts and wire in advance of the works occurring. The Environmental Manager will also monitor vehicle movements.

5.11.5.2 Monitoring

- The following confirmatory surveys will be undertaken:
  - Confirmatory bird surveys breeding season.
  - Confirmatory terrestrial mammal survey.
  - Confirmatory surveys for Flora Protection Order species.
- Bird surveys will be carried out prior to the construction phase and post construction in accordance with the approved Bird Monitoring Programme.
- Water quality monitoring will take place prior to, during the construction phase and post construction in accordance with the approved Water Quality Monitoring Programme.
- Routine inspections and maintenance of sediment and erosion control measures will take place regularly during the construction phase and during the operational life of the project. Silt traps and settlement ponds will be cleaned on a regular basis to ensure their effectiveness.
- To reduce the level of disturbance to fauna, construction activities will be restricted to between 8:00 hrs and 20:00 hrs Monday to Friday (excluding public holidays) and between 08:00 hrs and 13:00 hrs on Saturdays. Construction work will not take place outside of these hours unless in exceptional circumstances. Construction activities along the GCR will not begin until one hour after dawn and will cease an hour before dusk.
- In the unlikely event that protected faunal species are found actively using the Site for breeding / roosting during the construction phase, works in the affected areas will cease immediately, and the relevant area will be cordoned off until advice is sought from a suitable qualified expert / NPWS. Full details on pre-construction confirmatory surveys can be found in Chapter 6 of the proposed project EIAR.

5.11.5.3 Aquatic Habitat Protection and Enhancement

- Surface water, groundwater and aquatic habitats shall be protected through implementation of the Surface Water Management Plan (Appendix 2-6), drainage controls and pollution prevention measures detailed elsewhere within this CEMP.
- Habitat restoration shall be undertaken in all temporary working areas following completion of construction activities to facilitate recovery of vegetation and ecological functions.

5.11.5.4 Ecological Supervision

- The ECoW shall oversee implementation of biodiversity mitigation and enhancement measures throughout the construction phase.

5.11.6 Responsibility

- Ecological Clerk of Works;
- Environmental Manager;
- Construction Manager; and
- Project Ecologist.

5.12 EMP 12: Management Of Invasive Species

5.12.3 Purpose

To describe measures for the management of invasive species on-site.

5.12.4 Procedure

Areas where invasive species are present will be identified and demarcated prior to commencement of construction:

Invasive Species Control

The following principles will be applied during the management of Invasive Species at the proposed project site:

- Prevention / Biosecurity: Preventing invasive species from arriving on-site / preventing spread of invasive species;
- Response: Regular monitoring combined with a rapid response to treat / eradicate invasive species that are identified encroaching on the site, to ensure that they do not become established;
- Eradication: Aiming to eradicate invasive species on-site will prevent the problem increasing; and,
- Containment: It may not be realistic to completely eradicate invasive species from a particular site. This could be due to level of infestation or the species involved, and resourcing limitations (both financial and personnel required).

Informing

- Invasive Species 'Toolbox Talks' / Site Inductions will be delivered to ensure all site personnel are of aware of / what invasive species looks like that are potentially at the location / greater area and issues associated with the same. To reduce the likelihood of invasive species spreading, the construction personnel involved in works will be trained in basic relevant invasive species prevention and management ('Toolbox talk').
- Prior to the commencement of construction, the wind farm site footprint will be

surveyed for the presence of invasive species. If invasive species are present, the Project Manager / Environmental Manager will manage their control. The control methods will be specific to the local site conditions as well as the invasive species being managed. Control methods can include physical and / or chemical control methods and monitoring.

- Where any non-native species is present, a management plan will be put in place, to manage the risks and implications of the species, along with legal requirements.
- A distribution map of the invasive alien plant species at the wind farm site has been developed and will be incorporated into the CEMP.
- Where a non-native species is identified as a risk of being introduced, spread within, or moved off-site, mitigation measures will be in place to prevent spread of the species.
- If required, the project will be phased, to allow time to deal with the presence and / or risk of spread of non-native species.
- Where a species requires long-term management, a site management plan will be developed that addresses all issues associated with it.
- Locations of invasive species within the overall site will be highlighted and excluded from the works.
- To reduce the likelihood of invasive species being introduced to the site from quarries, any aggregates will be sourced from suitable suppliers and inspected, where appropriate, in accordance with the invasive species management measures set out in the HMP (see Appendix 6-6 of the EIAR).
- No machinery will be permitted to park within demarcated / exclusion areas.
- If excavation or movement of invasive species is required, any necessary licences will be obtained, and any such activities will be undertaken in accordance with current best practice.

Biosecurity

To reduce the likelihood of invasive species being introduced to the site from construction works on other sites, it will be required that vehicles and tools will arrive on-site clean. Work boots will be dipped in or scrubbed with a disinfectant solution and thoroughly dried afterwards before being used on the site for the first time (Also requirement during water quality sampling between different catchments). All personal protective equipment (PPE) will be visually inspected and any attached vegetation or debris removed. PPE and tools will remain on-site for the duration of construction. Any machinery or equipment returning from a different construction-site will be cleaned, power washed / steam washed and visually inspected again before re-entering the site.

Equipment / Machinery

To maintain good site hygiene when dealing with any non-native species:

- A fence / signage that can be clearly seen will mark out any area of issue. Signs should be erected to warn people working there that the area is infested / contaminated. No entry signage will be put in place;

- Where contaminated soil, materials or water are located, signage should be erected to indicate them;
- Personnel working on or between sites will ensure their clothing and footwear are cleaned where appropriate to prevent spread;
- Tracked vehicles should not be used within the area of infestation;
- All vehicles leaving the infested area and / or transporting infested soil / materials must be thoroughly pressure-washed in a designated wash-down area before being used for other work;
- Where cross-contamination is possible (i.e. from one site to another), vehicles or machinery will be designated to specific sites where possible to prevent spread;
- Material / water left after vehicles have been pressure-washed must be contained, collected and disposed of appropriately; and,
- All chemicals used for the control of non-native species should be stored and used in an appropriate manner carried out by specialist / suitability trained personnel.

Methodologies

Invasive species management methodologies and plans outlining Best Available Techniques (BAT) will be sourced from the National Invasive Species Database, from previously published documents / current best practice, and from the Invasive Species Ireland and Inland Fisheries Ireland websites. See targeted habitat management plans detailed in Appendix 6-6 of the proposed project EIAR.

5.12.5 Responsibility

- Project Manager;
- Environmental Manager;
- Construction Manager; and,
- Project Ecologist.

5.12.6 References

Information on invasive species is provided in guidance including **TII (2020)[1], *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance* (Publication No. GE-ENV-01105)** and **IFI (2010)[2], *Biosecurity Protocol for Field Survey Work***, which set out measures for the identification, management, control and prevention of the spread of invasive alien plant species.

[1] The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (Publication No. GE-ENV-01105). Available via: https://www.tiipublications.ie/document/?id=3075

[2] ***Biosecurity Protocol for Field Survey Work*** *– Available via: https://www.fisheriesireland.ie/sites/default/files/2021-06/research_biosecurity_biosecurity_for_fieldsurveys_2010.pdf*

5.13 EMP 13: KARST MANAGEMENT PROCEDURE

5.13.3 Purpose

To describe the measures for the protection of karst features, groundwater resources and karstified limestone bedrock during the construction phase of the proposed project.

The proposed wind farm site is underlain by a Regionally Important Karstified Aquifer (Rkc). A detailed karst assessment identified four dolines (enclosed depressions) and one losing stream within the wider study area. No proposed turbines, hardstands, borrow pit, access tracks, construction compounds or substation infrastructure are located within identified karst features, and a minimum 30 m buffer has been incorporated into the project design.

This procedure aims to:

- Prevent contamination of groundwater resources;
- Protect identified karst features from direct or indirect impacts;
- Provide a protocol for responding to the discovery of previously unidentified karst features during construction;
- Ensure that construction activities do not create new pathways for pollutants to enter the groundwater environment; and
- Ensure compliance with the commitments contained within the project Hydrology and Hydrogeology Assessment and Karst Assessment.

5.13.4 Existing Karst Environment

The proposed wind farm site is underlain by Dinantian limestone bedrock classified as a Regionally Important Karstified Aquifer. Groundwater vulnerability across much of the site is classified as Extreme (E) or Rock at Surface/Karst (X).

Karst investigations undertaken as part of the project identified:

- Four dolines (enclosed depressions) within the wind farm study area;
- One losing stream located southwest of Turbine T10;
- No active swallow holes, caves or significant dissolution cavities within proposed infrastructure footprints;
- No evidence of significant subsurface voids beneath turbine, borrow pit or substation locations; and
- A low to medium residual karst risk following avoidance-based design measures.

5.13.5 Procedure

The following measures shall be implemented throughout the construction phase:

- All site personnel shall receive environmental induction training covering groundwater protection and karst awareness;

- The Karst Assessment and Karst Protocol (Appendix A) shall be available within the site office throughout the construction period; and
- Construction activities shall be undertaken in accordance with the Chapter 9 of the EIAR, Karst Assessment and approved CEMP.

5.13.6 Karst Feature Protection

- A minimum 30 m exclusion zone shall be maintained around all identified karst features;
- No excavation, stockpiling, storage of materials, refuelling activities, concrete washout or waste storage shall be permitted within these exclusion zones;
- Existing karst features shall be clearly marked on site environmental constraint drawings and communicated during site inductions;
- Temporary fencing shall be installed where deemed necessary by the Environmental Manager; and
- Surface water runoff shall not be directed towards any identified karst feature.

5.13.7 Karst Encounter Protocol

If previously unidentified karst features are encountered during excavation works, the following protocol shall be implemented immediately:

- All works within the vicinity of the feature shall cease immediately;
- The area shall be secured and clearly demarcated;
- The Environmental Manager and Project Geotechnical Engineer/Geologist shall be notified immediately;
- The feature shall be inspected and assessed by a suitably qualified Geotechnical Engineer and/or Hydrogeologist;
- The feature shall be recorded, photographed and mapped;
- A risk assessment shall be completed to determine the potential implications for foundation stability, groundwater protection and construction activities;
- Works shall not recommence until written approval is provided by the Environmental Manager and Project Geotechnical Engineer/Geologist; and
- Any required mitigation measures shall be documented and incorporated into site records.

5.13.8 Management of Karst Features Encountered During Construction

Where karst features are encountered during construction, appropriate mitigation measures may include:

- Re-design of infrastructure to avoid the feature;
- Controlled backfilling using engineered granular material;

- Installation of geogrid reinforcement;
- Ground stabilisation measures;
- Grouting of voids where deemed appropriate by the Geotechnical Engineer and Hydrogeologist;
- Installation of micropile foundations where required; and
- Additional geophysical surveys or intrusive investigations.

All remediation measures shall be approved by the Project Geotechnical Engineer and Environmental Manager prior to implementation. Where grouting or stabilisation works are required, works shall be supervised by a suitably qualified Hydrogeologist to ensure protection of groundwater resources.

5.13.9 Monitoring

The following monitoring measures shall be undertaken during construction:

- Daily inspection of active excavation areas;
- Weekly inspection of known karst feature buffer zones;
- Routine inspection of settlement ponds, interceptor drains and SuDS infrastructure;
- Monitoring of groundwater levels within installed monitoring wells during major excavation activities;
- Inspection following significant rainfall events;
- Recording of any newly identified karst features or groundwater seepages encountered during construction; and
- All inspections and observations shall be documented in site environmental records.

5.13.10 Responsibility

- Environmental Manager;
- Project Geotechnical Engineer / Geologist; and
- Construction Manager

5.14 EMP 14: MONITORING AND AUDITING

5.14.3 Purpose

To describe measures for environmental monitoring during the construction works and audit of control measures to ensure environmental protection.

5.14.4 Procedure

All mitigation measures, any planning conditions and relevant construction methods will be monitored on-site. The appointed Contractor will nominate an Environmental Manager for the works. The Environmental Manager will provide Audit Checklists to ensure regular checks of the site's control measures for the ongoing protection of the environment.

Monitoring will be carried out to ensure adherence with the following:

EMP-1	Management of Excavation
EMP-2	Control and Management of Surface Water Run-off
EMP-3	Fuels and Oils Management
EMP-4	Management of Concrete
EMP-5	Construction Waste Management Plan
EMP-6	Construction Traffic Management
EMP-7	Wheel Wash Management Procedure
EMP-8	Construction Dust Management
EMP-9	Construction Noise Management
EMP-10	Archaeological & Heritage Protection
EMP-11	Ecological Management Plan for the protection of habitats and fauna
EMP-12	Management of Invasive Species
EMP-13	Karst Management Procedure
EMP-14	Monitoring and Auditing

Checklists for daily, weekly or monthly site audits will be finalised by the Environmental Manager and the relevant personnel informed of their duties. Checklists will include (but are not limited to) confirmation that fuel is stored appropriately, waste management rules are adhered to, all environmental buffers are maintained, Surface water and run-off control measures of the are in place and functioning, and concrete chute wash-out procedure is being followed. All environmental records, including completed checklists, will be retained at the site office, in the temporary construction compound.

5.14.5 Responsibility

- Project Manager;
- Environmental Manager;
- Construction Manager;
- Project Ecologist; and
- Project Archaeologist.

Details of Monitoring Procedure and Checklists are to be finalised by the appointed Contractor's Environmental Manager

6. ENVIRONMENTAL EMERGENCY RESPONSE PLAN / PROCEDURES

6.1 ENVIRONMENTAL EMERGENCY RESPONSE PROCEDURES

Every effort will be made to prevent environmental emergencies and incidents during the construction and operational phase of the project.

The Contractor will be responsible for developing a detailed environmental Emergency Response Plan (ERP) for the proposed construction works, environmental emergencies, as part of the H&S Plan.

This ERP will be activated in the event of an environmental emergency such as a fire, spillage, structure collapse etc. and will provide details on who is required to be notified etc. The ERP will also include details of all personnel inducted and authorised to work on the site.

In the event of an environmental emergency, the Environmental Manager, ECoW and Project Manager will be notified immediately and will determine the scale of the emergency and the requirement for the assistance of emergency services. Works will cease in the area of the incident and contact will be maintained with the emergency services to direct them to the scene of the incident as required.

If necessary, the Environmental Manager, with support from the ECoW will inform the appropriate regulatory authority depending on the nature of the incident. Details of the incident will be recorded (e.g. cause, extent, actions and remedial measures).

A record of all environmental incidents will be kept on file by the Environmental Manager. These records will be made available to the relevant authorities if required.

Furthermore, the Environmental Manager and ECoW will be responsible for outlining corrective actions required and will advise the Contractor and relevant construction staff as appropriate.

The ERP must include contact names and telephone numbers for the relevant local authorities (all sections / departments) including ambulance, fire brigade, An Garda Siochána and the HSA. Reporting of environmental emergencies to the local authority will be required as well as other relevant stakeholders such as IFI, NPWS or the EPA.

6.1.3 ECoW Responsibilities

During construction there will be occasions when the ECoW will be required to rapidly respond to unplanned events such as any wildlife incidents, pollution incidents, etc. The ECoW will have a very specific role within the emergency response teams responding to these incidents. The ECoW will also be expected to support the project team in resolving any other unplanned events that are not classified as emergency responses or incidents.

6.1.4 Site Evacuation and Fire Drills

A site evacuation / fire drill procedure will be developed to provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. At induction, all personnel will be made aware of the evacuation procedure. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specific intervals and maintaining

records of such drills. The details of this procedure will be finalised in the Contractor's CEMP at construction stage and will include:

- Details regarding the notification of emergency situations to all those on-site including use of a siren / horn to notify all personnel;
- Details of assembly point(s) and signage;
- Details of the roll call procedure to account for all personnel on-site;
- Communication process between the Site Security Officer and the Site Manager during the procedure (i.e. notification of roll count etc.); and,
- Course of action to be undertaken by the Site Manager.

6.1.5 Incidents / Complaints

All safety or environmental incidents associated with the project will be reported and investigated in line with the ERP. Typically, the following procedures will be followed in the event of an incident:

- Works will stop immediately where safe to do so;
- The Environmental Manager will be contacted;
- The size of the incident will be assessed and determined if it can be controlled by site staff or if emergency services are required to attend;
- The appropriate enforcing authority will be contacted;
- The Environmental Manager will investigate after the incident;
- The findings will be sent to the appropriate authority; and,
- An action plan will be prepared to set out any modifications to working practices required to prevent a recurrence.

This section sets out a procedure to manage and resolve any complaints received from members of the public during the construction phase of the proposed project. The following measures will be adopted and refined, as necessary, taking account of any relevant planning conditions.

The following measures will be implemented to deal with complaints, and the Contractor's CEMP will contain more specific details with regard to phone numbers to contact:

- Clearly display a notice board at the site entrance so that the public know whom to contact if they have a complaint or comment;
- Personnel on-site, including sub-contractors are required to perform their duties in accordance with this CEMP, and in such a way as to minimise the risk of complaints from third parties;
- All complaints received regarding the construction works will be recorded and categorised (e.g. noise, property damage, traffic, dust etc.) within a central Site Complaints Log. This complaints log will include the following key details:
    - Name, address and contact details of the complainant (with the complainant's permission);
    - Brief outline of the complaint;

- Date of Complaint;
- Name of person receiving complaint details; and,
- Agreed timeline for response to complaint.

- All complaints will be communicated to the Project Manager and the Applicant immediately;
- All complaints will be followed up and resolved in so far as is practicable; and,
- The complainant, the Applicant and other stakeholders will be kept informed of the progress in resolving the complaint.

6.1.6 Emergency Contact Details

A list of emergency contacts is presented in Table 6-1. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 6-1: List of Emergency Contacts

Contact	Telephone
Emergency Services – Ambulance, Fire, Gardaí	112 / 999
Local Garda Station – Headford	(093) 35412
Local Fire Service- Tuam	TBC at contract stage
Local Doctor / GP Service – Headford Health Centre	(093) 35740
University Hospital Galway	(091) 524 222
ESB Faults / Emergencies	1850 372 999
Gas Networks Ireland 24hr Emergency Line	1850 20 50 50
Site Manager / Construction Manager / Site Supervisor	TBC at contract stage
Client: Rooaunalaghta Green Energy Ltd.	353 (0)61 953600
Ecological Clerk of Works (ECoW)	TBC at contract stage
Environmental Manager	TBC at contract stage
Project Supervisor Design Stage (PSDS)	TBC at contract stage
Project Supervisor Construction Stage (PSCS)	TBC at contract stage
Health and Safety Authority Ireland (HSA)	0818 289 389
Inland Fisheries Ireland (IFI)	1800 365 123
Project Ecologist	TBC at contract stage
Project Hydrologist	TBC at contract stage
Project Geotechnical Engineer / Geologist	TBC at contract stage
Project Archaeologist	TBC at contract stage

6.2 Emergency Communication Procedure

The Contractor's CEMP will be updated with an agreed Emergency Communication Response Procedure following appointment of the Contractor.

6.3 Induction Checklist

Table 6-2 below provides a list of items highlighted in the Emergency Response Procedure (ERP) which must be included in the induction or gathered from all personnel that will work on the proposed project during the mandatory site induction. This will be revised throughout the various stages of the project. This list will be updated and expanded on within the Contractor's CEMP and in the Environmental Management Procedures.

Table 6-2: Site Induction Checklist

Emergency Response Plan – Site Induction Items TBC	Status
Site Induction (all personnel must undergo the site induction prior to commencing work on-site)	
All personnel must be made aware of site evacuation and fire drill procedures	
All personnel must be made aware of the spill response and control procedure	
All personnel must be made aware of environmental incident procedures	
All personnel must be made aware of incident and complaints procedures	
All personnel must be made aware of the emergency communication procedure and Emergency Contact Details for the project	
All personnel must be made aware and have access to the Site Safety Manual	
All personnel must be made aware of the personnel tracking procedure and provide their contact details at induction	

7. DECOMMISSIONING PLAN

The wind turbines proposed as part of the proposed project are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site will be decommissioned fully, except for the proposed 110 kV substation as it will form part of the national electricity network. Therefore, the proposed 110 kV substation will be retained as a permanent structure and will not be decommissioned.

The site will be decommissioned by the following steps:

- Disconnect turbines from the grid;
- Dismantle and removal by competent contractor;
- Cranes will be erected on hardstand areas left after the construction phase;
- Turbine to be dismantled fully from blade tip to top of foundation;
- Firstly, the rotor blades and hub will be taken down and then the nacelle (incl. generator) will be taken down;
- Depending on Original Equipment Manufacturer (OEM) requirements the generator may need to come down first and temporary works are sometimes utilised to hold hub and blades in place whilst it comes down;
- Sequence above might alter slightly from above depending on OEMs requirements and crane company's lift plan;
- The tower sections will be removed section by section and lowered to the ground;
- Finally, all parts will be transported by road to its final destination either wholly intact or in more transportable components and will be either properly disposed or reused;
- The turbines will be removed from site by articulated trucks as part of the proposed Traffic Management Plan which will be finalised post consent;
- Upon dismantling of turbines, the concrete foundation will remain in situ;
- The turbine foundations will be infilled with excavated material and where the foundation is above ground locally that ground will be built up to cover the foundation;
- The MV cable will be removed from the ducting at joint bay locations and ducting will remain in the ground;
- The cable along the GCR will be disposed of in an orderly fashion by an approved contractor and the joint bays will be backfilled after excavation and post cable removal;
- The transport route for turbine components will be assessed and subject to that assessment any required temporary modifications will be agreed with the local authority in advance of works;

- The components involved in decommissioning will be re-used, recycled or sent for waste disposal and these include, but not limited, to cables, metals, fibreglass and hydrocarbons; and,
- A waste management plan will be produced prior to works commencing on-site.

All above ground turbine components will be separated and removed off-site for recycling.

Turbine foundations and hardstanding areas will remain in place underground and will be covered with earth and allowed to revegetate or reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in potentially significant environment nuisances such as noise, dust and / or vibration. The site tracks will be in use for additional purposes to the operation of the wind farm by the time the decommissioning of the project is to be considered, and therefore it will be more appropriate to leave the site tracks in situ for future use. If it were to be confirmed that the tracks were not required in the future for any other useful purpose, they could also be removed.

The proposed 110 kV substation and all the associated transmission infrastructure i.e. underground cables and overhead lines will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network and will be managed by EirGrid / ESB. Therefore, the proposed 110 kV substation will be retained as a permanent structure and will not be decommissioned.

A detailed decommissioning plan will be agreed in advance of works taking place with the local planning authority.

8. MITIGATION AND MONITORING MEASURES AGREED

All mitigation and monitoring measures relating to the pre-construction and construction phases of the proposed project were set out in the various sections of the project EIAR, and NIS prepared as part of the planning applications for this project.

This section of the CEMP groups together all of the mitigation and monitoring measures in a table and is presented throughout the following pages.

By presenting the mitigation and monitoring measures in this format, it is intended to provide a review list that can be easily checked and reported on during the future phases of the project. The use of a table to present the information will be further expanded upon over the course of the proposed project and will provide a template for use during site compliance audits.

Table 8-1: Table of Mitigation Measures (MM)

Ref No.	Related to	Location	Mitigation Measure	Monitoring
Pre-construction Phase				
Description of Proposed Project				
MM1	Environmental Management – Construction Environmental Management Plan (CEMP)	EIAR Chapter 2	A Construction, Environmental, Management Plan (CEMP) has been prepared for the proposed project and is included as Appendix 2-2 of the EIAR. The CEMP will be updated prior to commencement of any site works to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned. The appointed Contractor will update the CEMP and submit to the planning authority for approval.	As required through the Contractor's CEMP.
MM2	Health and Safety	EIAR Chapter 2	A Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) are required to be appointed in accordance with the provisions of the Safety, Health and Welfare at Work (Construction) Regulations.	As required through the Contractor's CEMP and the Health and Safety Plan.
Population and Human Health				
MM3	Health and Safety	EIAR Chapter 5	Health and safety plans will be developed prior to any construction taking place. A Health and Safety Plan covering all aspects of the construction process will outline Health and Safety requirements in detail. At the procurement stage, the Health and Safety Plan will be prepared on a preliminary basis and developed further at construction stage, with all hazards and risks identified and assessed.	As required through the Contractor's CEMP.
Biodiversity				
MM4	Habitats & Flora	EIAR Chapter 6 / Appendix 6-6 HMP	Habitat protection, restoration and offsetting shall be implemented in accordance with the Habitat Management Plan (Appendix 6-6 of the EIAR). Measures include the protection of retained habitats and the restoration of affected habitats, including the management of bracken and scrub encroachment where required.	Habitat monitoring and management undertaken in accordance with Appendix 6-6 of the EIAR.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			Any vegetation clearance will take place outside of bird nesting season (01 March – 31 August), in accordance with the Wildlife Act, 1976 (as amended).	
MM5	Badger	EIAR Chapter 6	Pre-construction surveys will be undertaken by a suitably qualified ecologist/Ecological Clerk of Works (ECoW), and appropriate exclusion buffers will be established around any active setts. Blasting works will be programmed to avoid sensitive periods (i.e., December to July, inclusive) and carried out in accordance with relevant guidance and any required licences. Mammal escape ramps will be installed in excavations to prevent entrapment.	Implementation of mitigation measures and exclusion buffers shall be monitored by the ECoW during construction works.
MM6	Otter	EIAR Chapter 6 / NIS	Pre-construction otter surveys will be completed at watercourse crossings and works areas. Water quality protection measures and pollution prevention measures will be implemented throughout construction/decommissioning. Construction lighting will be controlled to avoid illumination of watercourses and riparian habitats	Implementation of otter protection measures shall be overseen by the ECoW, with water quality monitoring undertaken in accordance with the CEMP and the SWMP (Appendices 2-2 and 2-6 of the EIAR).
MM7	Amphibians and Reptiles	EIAR Chapter 6	Pre-construction checks will be undertaken where suitable habitat occurs. Works will avoid impacts on refugia and hibernation features where present, and vegetation clearance, ground preparation and stone movement will be timed to minimise the risk of injury or mortality, including avoidance of the main hibernation period (October to March). Water quality protection measures will be implemented to protect amphibian habitat.	Implementation of habitat protection measures, timing restrictions and good practice working methods shall be monitored by the ECoW during construction works.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
Ornithology				
MM8	Breeding Birds / Construction Disturbance	EIAR Chapter 7	In addition to embedded mitigation measures, a Bird Protection Plan (BPP) shall be prepared and implemented prior to construction. Vegetation clearance shall be undertaken outside the main bird breeding season (01 March – 31 August), in accordance with the Wildlife Act, 1976 (as amended).	Compliance with the Bird Protection Plan and breeding bird protection measures shall be monitored by the ECoW during construction works.
MM9	Peregrine falcon	EIAR Chapter 7	Pre-construction surveys shall determine whether the known peregrine nest site is occupied in the year of construction. Where occupied, a 500-750 m construction disturbance buffer shall be implemented, unless otherwise agreed with NPWS. The nest shall be monitored throughout the breeding season by a suitably qualified ornithologist, with restrictions applied to high-disturbance activities where required.	Breeding activity, nest occupancy and fledging success shall be monitored during the construction phase where the territory is occupied.
Material Assets				
MM10	Underground Services	EIAR Chapter 11	Standard measures / practices to avoid or otherwise minimise impacts to existing utility assets and / or services provision will be undertaken, including: • Prior to the commencement of the construction phase the Applicant will engage with all utility asset owners / service providers; • A confirmatory survey of all existing services (electrical / ESB, water / Uisce Éireann, gas / Gas Networks Ireland (GNI), telecoms cables etc.) will be carried out prior to construction to verify the assumptions in this report and identify the precise locations of any services. Where assets / services are identified, the Applicant will liaise with the service provider;	As required through the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• Utility assets / services (underground and overhead) will be identified and clearly marked prior to any pre-construction (site clearance) / construction / demolition activity occurring; • No excavations will take place without prior consultation with relevant utility asset owners / service providers; • Digging around existing services, if present, will be carried out as per best practice / guidance[3] by hand to minimise the potential for accidental damage; • Prior to any mechanical excavation taking place ESBN will be consulted with and the exact locations of all underground electricity cables established and verified; • All works undertaken in the vicinity of underground assets will be carried out in accordance with current HSA guidance, namely the HSA 'Code of Practice for Avoiding Danger from Underground Services'; • All works will be undertaken with in accordance with the exclusion and safe operating distances around electricity infrastructure as set out in the ESB Code of Practice, as well as HSA guidance including the 'Code of Practice for Avoiding Danger from Overhead Electricity Lines'; • Any proposed works will require a minimum clearance distance of 1 m either side of electrical cables; and, • Liaison with asset owners / service providers will continue as required throughout the construction phase.	
Archaeological, Architectural & Cultural Heritage				

[3] https://www.gasnetworks.ie/home/safety/dial-before-you-dig/
Transmission Policies and Standards (eirgridgroup.com)/ Publications (esbnetworks.ie)

Ref No.	Related to	Location	Mitigation Measure	Monitoring
MM11	Archaeological test-trenching	EIAR Chapter 16	All elements of the Proposed Project that are located within existing greenfield will be subject to a programme of archaeological test trenching prior to the commencement of construction, including proposed works within the Zones of Notification for AH79 and AH99 and test trenches to target the geophysical anomalies that may be impacted by the Proposed Project (Areas 1-5). This work will be carried out under licence to the National Monuments Service of the DoHLGH. If archaeological remains are identified during the course of these works further mitigation will be implemented as required, and will include preservation by record or in-situ. Any further mitigation will require agreement from the DHLGH.	As required through the Programme of Works agreed with NMS.
Construction Phase				
Description of Proposed Project				
MM12	Construction Hours	EIAR Chapter 2	The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 08:00 hrs and 20:00 hrs weekdays and between 08:00 hrs and 13:00 hrs on Saturdays. However, during the following critical periods longer hours will be required: • Concrete pours for turbine foundations; • During turbine installation when the weather is suitable (i.e. light winds); • Delivery of oversized loads; and, • In the unlikely event of an emergency (this is unlikely - see Chapter 18 - Major Accidents and Natural Disasters).	As required through the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			Any such out of hours working will be agreed in advance with Mayo County Council apart from in the case of an emergency and in line with the Schedule of Mitigation requirements.	
MM13	Surface Water Drainage / Silt Control	EIAR Chapter 2 and 8	A Surface Water Management Plan (SWMP) has been prepared (Appendix 2-6). The purpose of this plan is to ensure that all works are conducted in an environmentally responsible manner so as to minimise any potential adverse impacts from the proposed project on surface water quality. The plan incorporates the following specific objectives: • Provide overall surface water management principles and guidelines for all phases of the proposed project; • Address erosion, sedimentation and other water quality issues; and, • Present measures and management practices for the prevention and/or mitigation of potential downstream impacts.	As required through the Contractor's CEMP and SWMP.
Population and Human Health				
MM14	Health and Safety	EIAR Chapter 5	All activities carried out by the appointed Contractor during the construction phase will be in accordance with the relevant requirements of the Safety, Health and Welfare at Work Act 2005 as amended and Regulations made under this Act.	As required through the Contractor's CEMP
Biodiversity				
MM15	Designated Sites & Aquatic Ecology	EIAR Chapter 6 / NIS	Potential effects on designated sites and aquatic ecology have been reduced through the application of embedded mitigation measures and a constraints-led design process, including the avoidance of sensitive hydrological and hydrogeological receptors, as outlined in Chapter 9 (Hydrology and Hydrogeology). Additional water quality protection measures shall be implemented in accordance with the CEMP (Appendix 2-2 of the EIAR) and SWMP	Water quality monitoring shall be undertaken in accordance with the CEMP (Appendix 2-2 of the EIAR) and the SWMP (Appendix 2-6 of the EIAR), including monitoring of surface water and groundwater and inspection of water quality protection measures. Monitoring shall be overseen by the Environmental Manager throughout construction works.



Ref No.	Related to	Location	Mitigation Measure	Monitoring
			(Appendix 2-6 of the EIAR), with the most stringent controls applied during the construction phase and day-to-day environmental management measures implemented during operation.	
MM16	Other Mammals	EIAR Chapter 6	Open excavations will be fitted with escape ramps and checked regularly. Vegetation clearance will be supervised, where required, by the ECoW to minimise the risk of injury or mortality to protected mammals.	Implementation of mammal protection measures shall be monitored by the ECoW during construction works in accordance with the Contractor's CEMP.
Ornithology				
MM17	Breeding Birds / Construction Disturbance	EIAR Chapter 7	In addition to embedded mitigation measures, a Bird Protection Plan (BPP) shall be prepared and implemented prior to construction. Vegetation clearance shall be undertaken outside the main bird breeding season (01 March – 31 August), in accordance with the Wildlife Act, 1976 (as amended). Where works are required during the breeding season, pre-construction nesting bird surveys shall be undertaken by a suitably qualified ecologist and appropriate exclusion zones established around active nests. An ECoW shall oversee implementation of bird protection measures throughout construction.	Compliance with the Bird Protection Plan and breeding bird protection measures shall be monitored by the ECoW during construction works.
Land, Soils and Geology				
MM18	Land Use	EIAR Chapter 8 and Chapter 6	• Vegetation clearance will be kept to a minimum. The proposed construction work areas will be demarcated prior to the construction works commencing. No clearance of vegetation will be undertaken outside of the demarcated areas. Construction vehicles will be restricted to designated areas and access tracks in order to avoid impacting adjacent habitats and to ensure that soil compaction is restricted to these areas.	As required by the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• All disturbed ground outside of the permanent footprint will be fully reinstated following the completion of the works. Biodiversity enhancement measures will be undertaken to improve ecological habitats as detailed in Chapter 6.	
MM19	Potential for Contamination	EIAR Chapter 8 and Chapter 6 and CEMP	• Given the pre-mitigation effects are not significant, no additional project-specific mitigation is required beyond standard best practices. All listed measures including concrete/cement management (designated washout bins, offsite batching plant disposal, waste to permitted facilities), bunded storage for plant/oils/IBCs with drip trays, impermeable surfaces with oil interceptors, and spill response planning/training are fully incorporated within the Construction Environmental Management Plan (CEMP) and SuDS Manual, which the contractor will implement as standard procedure. • Any identified soil contamination will be remedied and soil stored in designated area pending removal from the site. Contaminated soils will be removed in accordance with the Waste Management Act 1996 as amended. • Imported stone will be sourced from appropriately regulated quarries and inspected prior to use to minimise the risk of introducing or spreading invasive species. For further discussion on invasive species, see Chapter 6. • All wastes generated on site will be segregated and appropriate materials are re-used on site. Residual materials will be collected by licensed waste hauliers for appropriate sorting, recycling and disposal.	As required by the Contractor's CEMP.
MM20	Soil Compaction and Erosion	EIAR Chapter 8	• Landscaping areas will be sealed and levelled using the back of an excavator bucket to minimise the potential for erosion. The upper vegetative layer will be stored with	As required by the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
		and CEMP	the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface, to prevent erosion. No additional soil will be imported to the site. • Overburden and rock will be reused on site to reinstate the borrow pit and other excavations. The borrow pit deposition area provides an opportunity for landscaping and restoration to match the natural surroundings. On completion, the borrow pit deposition area surface will be stabilised by using site sourced material, free from invasive species. The soil will be stabilised with the establishment of natural vegetation. • A key project goal is to incorporate sustainability into the design and construction of the proposed project where practical. Where mineral soils are encountered in the excavation and construction of site access tracks, bases, etc, this material will be stockpiled for assessment and subsequent re-use. Where mineral soil is not directly suitable for construction it will be used for reinstatement works and will be geo-engineered as necessary. • As part of the proposed works a borrow pit is proposed to provide materials suitable for construction, the purpose of which is to minimise the need to import aggregates from elsewhere, reducing the project's environmental footprint. It is not intended that the borrow pit be fully reinstated, although it is proposed that the borrow pit will be partially reinstated using suitable excess materials. Approximately 2m of soil will be used to reinstation the borrow pit. • The construction traffic will utilise the permanent access track network for access and egress, and this access will	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			be constructed in advance of other ground works in a sequential manner. • A CEMP was developed as part of the planning application – See Appendix 2-2. This plan documents how spoil will be managed on site for re-use of materials, the design for on-site re-use and disposal options, and a scheme for the tracking and recording of soil movements. These measures will prevent the erosion of soil in the short and long term. Soils, overburden, and rock will be reused on site to reinstate any excavations where appropriate. • Access tracks and the construction compound will be constructed first to allow for access within the proposed wind farm site. • Construction of internal electricity transmission cables will present similar, but lower-level risks, to the construction risks outlined above, and the same mitigation measures will be adopted as above. Surplus material from the onsite access tracks will be reused on site in the borrow pit or on access track upgrades. Proposed GCR/ Substation • The majority of the proposed GCR cabling will be laid in the public road. Construction method statements and templates will be implemented to ensure that the proposed GCR infrastructure is installed in accordance with the correct requirements, materials, and specifications of ESBN and EirGrid. The ducts will be installed, and the trenches will be reinstated in accordance with ESBN/EirGrid, private third-party landowners and County Council specifications. Once all	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			are satisfied, then the cables are pulled through the installed ducts in approximately 500 m to 700 m sections. • Excavated mineral material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2 m in height. Stockpiles will be located a minimum of 50 m from surface water features, and all stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW). • For concrete and asphalt/bitmac road sections, it is proposed to carry out immediate permanent reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with the local authority. Surplus excavated bitmac material will be brought to a recycling facility for processing in accordance with the circular economy approach. • For offroad, i.e. access tracks/grass sections, the cable section will be laid within an existing access track, where possible. Silt fences will be utilised along the offroad sections. Short sections (<50m) will be excavated and reinstated on a phased basis with suitable excavated material to ground level and finish in a gravel track as per the EirGrid/ESBN specification. By limiting the excavated sections, the potential for compaction or erosion is limited.	
MM21	Geohazards	Chapter 8	A karst protocol will be employed during construction and involves a series of steps and methodologies in karst areas. An example of the karst feature inspection protocol is	As detailed in the Karst Protocol (See Appendix A of Appendix 2-2 and Appendix 8-1)

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			documented by Madden & O'Hara (2016)[4] Ground stabilisation measures that will be employed include compaction, grouting/stabilisation supervision, geotextile or utilising raft foundations where required. Where weathered limestone or karst is encountered at formation level, the feature will be mapped in detail. Each feature and associated mitigation measure will be documented and included in the safety file for the Proposed Project. The stabilisation measures will be approved by a geotechnical engineer. Where discrete voids or highly fractured rock are encountered, grouting will be used to infill cavities and improve the strength and continuity of the rock mass beneath foundations. Where infilling or grouting is required, works will be supervised by a suitably qualified hydrogeologist to ensure there is no effect on groundwater. The use of micropiles if required is not expected to result in significant effects on groundwater due to their small diameter, limited footprint and the low volumes of excavation required. Installation involves drilling narrow boreholes (typically 100-200 mm diameter) and grouting within the cased borehole, resulting in only minor and highly localised disturbance to the underlying bedrock and any groundwater.	
MM22	Karst Assessment Mitigation	Appendix 8-1	• All proposed infrastructure has been sited to avoid areas of very high karst hazard. Best practice measures as detailed in the Karst Protocol will be implemented if any karst feature is encountered during construction (See Appendix A of Appendix 2-2 and Appendix 8-1)	As detailed in the Karst Protocol (See Appendix A of Appendix 2-2 and Appendix 8-1)

[4] Madden and Hara (2016) The treatment of karst features encountered during road construction in County Galway

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• All earthworks will be designed by a suitably qualified Geotechnical Engineer during the detailed design stage and informed by a detailed confirmatory ground investigation. This investigation will include intrusive methods, such as trial pitting and borehole drilling, with a specified suite of in-situ and geotechnical laboratory testing to further assess the engineering characteristics of the infrastructure locations. • Portions of the proposed wind farm site have been classed as having moderate karst hazard, based on professional judgement following site investigation and desktop analysis and proximity to features. In these areas, specific mitigation measures may be required, i.e micropiles and geogrid reinforcement. The following ground investigation works will be carried out at infrastructure locations identified as having medium or greater karst risk: ○ Rotary core boreholes to confirm rockhead depth and quality. ○ Geophysical Surveying to detect voids and solution features, including: ▪ Electrical Resistivity Tomography (ERT) ▪ Microgravity; and ▪ Seismic Refraction ○ Trial pits and dynamic probing to assess near-surface variability and soils • Mitigation will be implemented at detailed design stage to reduce the karst risk: ○ For the turbine foundations, a geotechnical investigation will be carried out at each location prior to works commencing. Surveying will	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			include the drilling of boreholes by rotary core to depth within competent bedrock to determine the strength of rock and assess the potential for karst or weathered rock at each location by a qualified geotechnical engineer to inform foundation design. Micropiles will only be undertaken if geogrid and backfilling is not suitable in areas of weak rock to ensure long term stability, and that the turbine loads are taken to intact rock. A larger number of small piles or micropiles designed with rock sockets to transfer loads via skin friction are preferred in karst landscapes (Rutty & Jennings, 2012, Traylor et al., 2002), rather than a smaller number of large piles relying on end bearing. It is recommended that piles are designed on the basis of transferring loads via skin friction to a rock socket. ○ For access tracks and hardstandings, the karst feature inspection protocol documented by Madden & O'Hara (2016), included in Appendix A of the CEMP (Appendix 2-2), is routinely followed for construction of linear infrastructure in karst landscapes. A similar karst feature inspection protocol will be developed and followed during detailed design. ○ Where small-scale dissolution and voiding are encountered at turbine foundations during detailed ground investigation, mitigation strategy is the use of drilled or grouted piles. The use of piles transfers structural loads to	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			competent rock beneath karst-affected zones. This approach bypasses voids and weak soils, reducing the risk of differential settlement or collapse. ○ Ground stabilisation measures to be employed include compaction, grouting/stabilisation, geotextile or utilising raft foundations. Where weathered limestone or karst is encountered at formation level, the feature will be mapped in detail. Each feature and associated mitigation measure will be documented and included in the safety file. The stabilisation measures will be approved by a geotechnical engineer. Where infilling or grouting is undertaken works will be supervised by a suitably qualified hydrogeologist to ensure there is no effect on groundwater. ○ Waltham et al. (2005) outline an approach for the remediation of shallow karst features. This methodology involves adding coarse granular fill to the base of karst feature, and progressive backfilling upwards with progressively finer granular fill. All backfill is to be placed in layers 150 mm deep and compacted. Soil around the doline/sinkhole is to be excavated to a radius of 3-5m, before being replaced and compacted with or without incorporation of anchored geogrid. This methodology has been used effectively on Irish road projects in similar karst terrains in East Galway (Madden and O'Hara, 2016).	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			This methodology is applicable to the proposed wind farm site access tracks and shall be implemented if small scale sinkhole features (<5m in depth) are encountered beneath access tracks. No karst features were observed in line with any access track or other proposed infrastructure. • Where construction takes place in areas of high karst hazard, and if karstic features are identified elsewhere during construction, the following measures shall be implemented: ○ Access tracks will incorporate geogrid-reinforced bridging layers over areas identified as having potential voids or collapse-prone soils ○ Crane hardstands will be designed with enhanced bridging layers to accommodate high point loads and dynamic stresses. • Crane hardstands will be designed with enhanced bridging layers to accommodate high point loads and dynamic stresses.	
Hydrology and Hydrogeology				
MM23	Standard Practice Pollution Control Measures	EIAR Chapter 9	• Near-stream construction work will only be carried out during the period permitted by IFI (2016)[5] guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", that is, May to September inclusive. The	As required by the Contractor's CEMP.

[5] IFI (2016) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites* https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters *[Accessed February 2026].*

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			excavation, installation and reinstatement process for the general GCR works will take on average of two days to complete a 100-metre section similar to minor road works. The proposed HDD will be undertaken over a 2-3 day period with additional time to install the launch and reception pits. The proposed HDD is designed to avoid direct effects on streams in accordance with the IFI guidance (2016)[5] guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites". A HDD crossing is proposed for the Black River • On completion of the works, all apparatus, plant, tools, offices, sheds, surplus materials, rubbish and temporary erections or works of any kind will be removed from the site; • All works must follow the guidance set out in the Guidance document entitled: CIRIA guidance note Control of Water Pollution from Construction Sites (CIRIA, 2001); • A 24-hour, seven-day week Emergency Response protocol will be drawn up and implemented. This will be implementable in the unlikely event of an accidental spillage of chemicals, hydrocarbons or release of sediment to the surface or ground water system; • All excavated material will be removed to suitable stockpile areas; • Stockpiling will be limited to areas where the ground is stable and well drained; • Spoil disposal areas will be located where the risk of soil erosion and water quality deterioration is minimal and must also have an adequate buffer from aquatic zones;	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• Where spoil disposal areas are bunded, the bunds will extend to a level above the top of the spoil; • Any water discharge from the stockpiles will be monitored (see Section 9.6.4.1). Runoff water will be prevented from flowing directly into the site adjacent drainage channels; • All machinery will be regularly maintained and checked for leaks. Services will not be undertaken within 50 m of aquatic features. Servicing will be undertaken on level, hard surfaced designated areas; • An adequate supply of spill kits and hydrocarbon adsorbent packs will be available at labelled stations throughout the sites with all vehicles on-site carrying spill kits. All relevant personnel will be fully trained in the use of the equipment. Any used spill kits will be disposed of appropriately off-site; • All equipment and machinery will be cleaned prior to entry as a bio security measure. This is to avoid transfer of invasive species on equipment and machinery which may have been used elsewhere to the receiving catchment.	
MM24	Alteration of Surface Water Flow	EIAR Chapter 9 and Appendix 2-6 SWMP	The proposed project is characterised by infiltration rather than surface water flow. Settlement of runoff from hardstand areas will be provided as detailed in chapter 9 section 9.5.1. Prior to the construction of infiltration features, the underlying ground conditions will be verified. Should preferential groundwater pathways be encountered during excavation works, the Karst Management Protocol (See Appendix 8-2 and Appendix 2-2 CEMP) will be implemented.	Local surface water features at the proposed project will be monitored pre-construction and during construction to take account of any variations in the quality of the local surface water environment as a result of activities related to the proposed project.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			A suitably qualified hydrogeologist will inspect the feature and recommend appropriate measures. **Proposed GCR** The proposed watercourse crossings will be completed in the summer months to avoid periods of potential flooding. 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. Mitigation measures in relation to the proposed GCR are outlined in the CEMP in Appendix 2-2 of the EIAR. The mitigation measures include • Near-stream construction work will only be carried out during the period permitted by IFI (2016)[5] • All works must follow the guidance set out in the Guidance document entitled: CIRIA guidance note Control of Water Pollution from Construction Sites (CIRIA, 2001); • A 24-hour, seven-day week Emergency Response protocol will be drawn up and implemented. This will be implementable in the unlikely event of an accidental spillage of chemicals, hydrocarbons or release of sediment to the surface or ground water system;	The locations and main water parameters are outlined in the proposed surface water monitoring schedule in the Surface Water Management Plan, Appendix 2-6. Inspections of silt traps are critical after prolonged or intense rainfall while maintenance will ensure maximum effectiveness of the proposed measures. Stockpiles and the borrow pit will be evaluated and monitored and kept stable for safety and to minimise erosion. Turbidity monitors/alarms will be strategically placed upstream and downstream of works to assess the main construction period i.e. turbine base construction. Where elevated turbidity is noted, visual checks will be undertaken. All monitoring equipment will be calibrated regularly to ensure that results are accurately measured as detailed in the SWMP[6] . Corrective Actions will include: • Investigate whether channels used to convey water are protected with vegetation, erosion control blankets, or a similar erosion control measure. If not, implement appropriate erosion control measures. • Check all outlets and location of turbidity monitors • Stop dewatering if the downstream area shows elevated turbidity or erosion. • Check outlet protection or a velocity dissipation device.

[6]Note – SWMP includes for groundwater level and water quality monitoring

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• All excavated material will be removed to suitable stockpile areas; • Stockpiling will be limited to areas where the ground is stable and well drained; • Spoil disposal areas will be located where the risk of soil erosion and water quality deterioration is minimal and must also have an adequate buffer from aquatic zones; • Where spoil disposal areas are bunded, the bunds will extend to a level above the top of the spoil; • Any water discharge from the stockpiles will be monitored (See Section 9.6.4.1). Runoff water will be prevented from flowing directly into the site adjacent drainage channels; • All machinery will be regularly maintained and checked for leaks. Services will not be undertaken within 50 m of aquatic features. Servicing will be undertaken on level, hard surfaced designated areas; • An adequate supply of spill kits and hydrocarbon adsorbent packs will be available at labelled stations throughout the sites with all vehicles on-site carrying spill kits. All relevant personnel will be fully trained in the use of the equipment. Any used spill kits will be disposed of appropriately off-site; • All equipment and machinery will be cleaned prior to entry as a bio security measure. This is to avoid transfer of invasive species on equipment and machinery which may have been used elsewhere to the receiving catchment. Imported stone material will be checked to ensure no invasive species.	• Ensure a stable, erosion-resistant surface (e.g., well-vegetated grassy areas, clean filter stone, geotextile underlayment) in place at outlets. • Check for leaking pumps, hoses, and pipe connections and fix if identified. A programme of inspection and maintenance will be designed, and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed, and records kept in accordance with the SWMP. During the construction phase, field testing and laboratory analysis of a range of parameters will be undertaken at adjacent watercourses, specifically following heavy rainfall events (i.e., weekly, monthly and event based as appropriate).



Ref No.	Related to	Location	Mitigation Measure	Monitoring
			One HDD crossing is proposed on the GCR. HDD is a trenchless method to remove direct impact to watercourses/drains however a number of control measures are proposed to ensure there are no significant effects from the HDD. Mitigation measures applicable to HDD include: • A competent and experienced Contractor will be appointed to undertake the HDD works; • The Contractor will prepare a HDD Method Statement using industry best practice and relevant guidance to inform the optimal methodology for the works. The Method Statement will include biosecurity controls and an incident response plan for any potential frac-out; • The Contractor will undertake the directional drilling in accordance with industry best practice including British Standard EN 16191:2014 Tunnelling machinery, safety requirements and CIRIA C648 'Control of water pollution from linear construction projects Technical Guidance' (CIRIA, 2006a); • The contractor will ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required to avoid works in very wet conditions. The Contractor will be required to prepare a response plan in advance of the works commencing; • Weather conditions will be considered when planning construction activities to minimise the risk of runoff from site, no works will be scheduled when an orange or red weather warning is in place; • There will be no storage of fuels/drilling fluid within 30 m of a watercourse;	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• Provision of exclusion zones and barriers (sand bags and silt fences) between any excavated material and any surface water features will be installed to prevent sediment washing into the receiving water environment. Silt fences will be installed and the contractor will ensure that silt fences are regularly inspected and maintained during the construction phase; • Clay (Bentonite) based drilling fluids will not be used; instead, inert food-grade, biodegradable drilling fluids will only be used for these works. The drill profile will achieve a minimum 1.5 m depth beneath the riverbed. • To prevent loss of drilling fluids or 'frac-out' from occurring, a series of actions and controls will be implemented; the drill fluids operator will monitor drill fluid density, viscosity and solids content on an ongoing basis, to ensure that the fluid does not increase in viscosity, requiring additional pressure to maintain mobility; • Viscometers will be used to measure drill fluid gel strength and shear strength. Filtrate can also be measured to calculate the amount of filter cake building up on the internal wall of the bore. Any increases in pump pressure experienced by the drill operator will be investigated immediately to prevent the risk of pressure build up within the annulus. In some circumstances, depending on the drilling equipment used, the pilot drill borehole assembly will be fitted with a down hole pressure monitor to measure pressure in the annulus between the drill and the bore wall. This will give an early indication of pressure build up in the hole and allow the drill operator to prevent a 'frac-out'. If there is a risk of a	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			'frac-out' a number of measures will be implemented including: ○ pumping a high viscous drilling fluid with a higher density to the risk zone; and ○ circulate and pump loss circulation material (typically cork or manufactured inert polymers) to the risk zone to seal the risk zone, grouting of the risk zone, and, or launch a packer before the risk zone. • Reception pits will be situated outside of the riparian zone. A buffer zone width of 30 m or greater will be maintained from the drainage channel; • The contractor will implement procedures to maximise the recirculation or reuse of drilling fluid to minimise waste disposal; • Disposal of drilling fluids will be the responsibility of the contractor to an approved and licenced waste facility; • Monitoring of the drilling operations will be undertaken at all times by the contractor under the supervision of an Ecological Clerk of Works (ECoW) with stop works authority. The monitoring will include visual inspection of the pits and monitoring of the volume of returns flowing back to the entry pit. The monitoring personnel will be in constant communication with the drilling rig operator and thus will be able to immediately cease drilling if necessary; and • As part of the SWMP, pre-Construction and construction phase baseline water quality monitoring will be undertaken.	



Ref No.	Related to	Location	Mitigation Measure	Monitoring
			With regard to the Shancloon stream crossing, instream works will be scheduled during periods of low flow and undertaken within the appropriate fisheries working window, as set out in IFI (2016)[5] guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", Prior to commencement of the Shancloon stream crossing works, appropriate sediment and erosion control measures, including geotextile silt curtains, straw bales, silt fences or equivalent filtration measures, will be installed downstream of the works area, to minimise the release of suspended solids and to protect downstream water quality. The Shancloon Stream is a historically straightened, heavily modified watercourse characterised by a U-shaped channel. Owing to its small catchment area and limited contributing flows, the watercourse exhibited semi-dry conditions in summer period including the August 2026 aquatic survey, with only isolated standing pools present and no observable flow. To facilitate the crossing works, temporary upstream and downstream dams will be installed using sandbags and water-filled dams, and flume pipe(s) will be placed to convey all stream flows around the work area. Once the diversion system is operational, the existing culvert will be removed and the crossing works undertaken within the isolated section of channel. Any residual water within the work area will be directed to a temporary sump and removed by pumping. Where ground	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			conditions are suitable, water will be discharged to a vegetated infiltration area. Where infiltration is not feasible due to saturated ground conditions, water will first be directed through an appropriately sized settlement tank prior to discharge. This will ensure that suspended sediments are removed before any water leaves the work area. Installation of the cable ducting will then be undertaken within the isolated and dewatered section of channel. On completion of the works, the stream bed, banks and culvert crossing will be reinstated to their original profile and condition, the temporary diversion structures will be removed, and natural surface water flows will be restored. All disturbed areas will be stabilised as soon as practicable to minimise the potential for erosion and sediment mobilisation.	
MM25	Alteration of Groundwater Flow	EIAR Chapter 9	Based on the site investigation data, no significant dewatering would be required at the borrow pit or turbine locations; however, minor inflows may occur in the proposed excavations. Groundwater encountered will be managed and treated in accordance with CIRIA C750, 'Groundwater control: design and practice' (CIRIA, 2016). Groundwater from the borrow pit will be treated initially in a proprietary settlement tank and in the settlement ponds with overland flow towards the surface water network, see Drawing 11981-2040 to 11981-2044. An infiltration basin following the settlement ponds will be utilised to manage storm water runoff from hardstanding. The construction of soakaway chambers and filter drains to disperse surface water in a controlled manner. In addition,	The dewatering operations will be inspected each day when dewatering water is ongoing to ensure that dewatering treatment controls are working correctly; to evaluate whether there are observable indicators of sediment discharges; Where any issues are encountered, action will be undertaken to correct any problems at the proposed project or with the dewatering controls that may have contributed to the discharges. Regular inspections of the infiltration basins will be undertaken to ensure no direct discharge to groundwater. Regular monitoring of groundwater (levels and quality) will take place using the monitoring boreholes installed

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			the proposed site layout would include an infiltration basin which would be used for control of any surface water runoff. In accordance with NRA 2015 guidance (Road Drainage and the Environment)[7] , where rock is shallow (<2m), the soakaway design would include a minimum of 1m of engineered material (1 x 10-7 permeability) across the base of the basin. While the guidance is for higher risk road construction scheme, the guidance will be applied to the proposed wind farm. The base of an infiltration basin will have a slope of <1% to allow infiltration throughout the entire basin. Side slopes will be <1/3 to prevent erosion of the sides of the basin. The outfall from the settlement will discharge to a filter strip to provide additional water quality treatment.	onsite and any available well data immediately downstream of turbines during the construction phase.
MM26	Alteration of Groundwater Quality	EIAR Chapter 9	If groundwater is encountered during excavation works, water pumped from excavations will be treated to remove sediment by the use of silt bags. Silt bags will be managed and monitored to ensure no breakthrough or bypass. Water will discharge from the silt bags into settlement ponds and the SuDS network. During the construction phase, all works associated with the construction of the GCR will be undertaken in accordance with the guidance contained within CIRIA Document C811 'Environmental Good Practice on Site' (CIRIA, 2023). Groundwater pumped from excavations will be treated to remove silt by the use of silt bags. When undertaking HDD works, turbidity monitoring will be undertaken.	
Material Assets				

[7] NRA (2015) DN-DNG-03065 - Road Drainage and the Environment

Ref No.	Related to	Location	Mitigation Measure	Monitoring
MM27	Aviation	EIAR Chapter 11	The following standard practices will be undertaken: • An aeronautical warning light scheme will be agreed with the IAA and Irish Air Corps; • The final as-constructed coordinates and dimensions of each turbine be mapped and provided to Mayo County Council and other stakeholders, including the IAA and Irish Air Corps prior to erection of turbines to ensure that maps and databases are up-to-date for flight navigation; and • 30 days' notice will be given to the IAA prior to any crane operations commencing during the construction phase.	As required by the Contractor's CEMP.
MM28	Telecommunications	EIAR Chapter 11	In order to ensure there are no issues with construction, all telecommunication operators will be contacted in advance of construction to check that they have no new links in operation at that time. Prior to construction, Ground Penetrating Radar (GPR) surveys will be undertaken to accurately locate existing underground infrastructure. In the unlikely event that a communication underground cable or link is damaged or interfered with during construction, the operator will be contacted to agree to arrange a repair which will be carried out as soon as possible at the developers' cost.	As agreed with the relevant Operators / 2RN.
			The developer will sign an agreement with 2RN prior to construction to commit to restoring service to any end users that may have their service disrupted as a result of the proposed project. This is standard industry practice and will eliminate any potential effects in this regard.	As agreed with 2RN.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
MM29	Waste Management (inc. wastewater)	EIAR Chapter 11	Best practice waste management practices will be employed. Segregation of waste will be carried out to maximise the potential for waste recycling and minimise potential effect on waste services. Suitably permitted commercial waste collectors will be employed to remove any waste arisings generated from construction to the nearest appropriately licensed waste management facilities.	As required by the Contractor's CEMP.
			During the construction phase, wastewater from the staff welfare facilities will be managed by means of a sealed storage tank, with all wastewater being tankered off-site occasionally (as required) by a permitted waste collector to a wastewater treatment plant. The permitted waste collector will also be responsible for ensuring clean water storage tanks are topped up. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Low volume flush toilets (such as those in commonly used port-a- loos) and low volume sink faucets will be used to significantly reduce the volume of wastewater produced. In addition, the number of staff is likely to fluctuate rather than being constantly at 60 people per day, thereby reducing the volume of wastewater produced.	
Noise & Vibration				
MM30	Noise and Vibration Best Practice	EIAR Chapter 12	The contract documents will specify that the Contractor undertaking the construction works will be obliged to adopt best practice noise abatement measures contained in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise and BS 5228-2:2009+A1:2014 Code of practice for	As required by the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			noise and vibration control on construction and open sites – Vibration. To ameliorate any potential noise effects that may present during the construction phase, a schedule of noise control measures has been formulated in accordance with best practice guidance, and the contract documents will require the Contractor to implement these measures. These are outlined in the Construction and Environmental Management Plan (CEMP) that has been prepared for the proposed project (see Appendix 2-3, EIAR Volume III). For blasting associated with borrow pits, the guidance documents discussed in BS 5228-2:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration and The Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA)) publication Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004) contain appropriate criteria for blasting activities and a detailed assessment will be undertaken by a specialist blast design engineer to determine the blast design parameters. Recommendations contained within BS 5228: Part 1 and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1988 will be implemented in relation to blasting operations.	
Air Quality				
MM31	Air Quality – Communications	EIAR Chapter 14	An Environmental Manager (EM) will be in assigned by the appointed contractor. The EM will be responsible for co-ordinating the day-to-day management of environmental	• To determine if any short-term dust impacts will occur, a minimum of daily visual inspections for dust soiling of receptors (including roads, and surfaces

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			impacts during the Construction Phase. The EM will be responsible for performing inspections as deemed necessary and manage responses to environmental incidents. The name and contact details of the EM will be responsible for construction dust management and air quality issues will be displayed at the construction compound/site boundary hoarding, as well as head/regional office contact details. A complaints register will be kept by the appointed contractor detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out.	such as street furniture, cars and windowsills) adjoining the construction works areas will be undertaken. Inspection results will be recorded in the site inspection log. Cleaning will be provided, if necessary, such as in the event of a dust complaint resulting from the proposed project construction works. • The potential for dust generation increases when rainfall is less than 0.2 mm / day and at wind speeds of greater than 10 m/s. To determine if these conditions are likely to affect the site, the weather forecast will be consulted daily, specifically the hourly forecasts for wind speeds as well as 12-hour rainfall radar showing anticipated amounts of precipitation in mm. • The frequency of site inspections by the EM responsible for dust management will be increased to a minimum of twice daily during the above conditions. The effectiveness of dust control methods will be monitored via visual inspections and work that would generate dust (e.g. moving materials from stockpiles or transferring loose dry materials from trucks) will be limited in so far as is practicable during these weather conditions.
MM32	Construction Works Area Management	EIAR Chapter 14	• Construction compounds will be laid out so that machinery and dust causing activities such as stockpiles are located away from receptors, as far as is practicable. • The appointed contractor will provide a site hoarding of 2.4 m height at a minimum at construction compounds, which will assist in minimising the potential for dust impacts off-site. Construction works area fencing,	As required by the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			barriers and scaffolding will be kept clean using wet methods. • Stockpiles will be covered to prevent wind whipping. • Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable. • Any chutes and conveyors will be enclosed and skips will be covered. • Drop heights from any conveyors, loading shovels, hoppers and other loading or handling equipment will be minimised. Fine water sprays will be used on such equipment where visible dust plumes are generated. • Cutting, grinding or sawing equipment will be fitted with or used in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. • Equipment will be readily available in the construction works areas site to clean any dry spillages. Spillages will be cleaned up as soon as reasonably practicable after the event using wet cleaning methods. • A water bowser will be used to spray work areas (hardstands and access tracks and grid connection route) and haul roads, especially during periods of excavations works coinciding with dry periods of weather. • An adequate water supply for effective dust or particulate matter suppression and mitigation will be ensured, and non-potable water will be used where possible and appropriate. Construction works area runoff of water or mud will be managed as per the Surface Water Management Plan (SWMP, Appendix 2-6) and Chapter 9 Hydrology and Hydrogeology.	



Ref No.	Related to	Location	Mitigation Measure	Monitoring
MM33	Operating Vehicles / Machinery	EIAR Chapter 14	• Engines of all vehicles will be switched off engines when stationary - idling vehicles are not permitted; • The use of diesel- or petrol-powered generators will be avoided, and mains electricity or battery powered equipment will be used where practicable; and,	As required by the Contractor's CEMP.
MM34	Earthworks Activities	EIAR Chapter 14	• Materials with the potential to produce dust, such as excavated material, will be removed from the construction works area as soon as possible, unless being re-used within the construction works area. Management of extracted material is detailed in the Construction and Demolition Resource and Waste Management Plan (CEMP, Appendix 2-2). • Areas exposed by earthworks will be re-vegetated to stabilise surfaces as soon as practicable. Hessian, mulches or trackifiers will be used where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. Cover will only be removed in small areas during work and not all at once. • During dry and windy periods and when there is a likelihood of dust nuisance (defined under "Monitoring" measures below), water-based dust suppression (e.g. bowser) will operate to ensure soil moisture content is high enough to increase the stability of the soil and thus suppress dust. • For areas of earthworks that are within 50m of Cloughmoyne SAC, dust screen barriers will be used between activities and the SAC edge to ensure that where minimal dust is generated despite the other mitigation measures for earthworks, this will be prevented from blowing onto the SAC.	As required by the Contractor's CEMP.



Ref No.	Related to	Location	Mitigation Measure	Monitoring
MM35	Construction Activities	EIAR Chapter 14	• Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out, unless this is required for a particular process. • Smaller supplies of fine power materials bags will be sealed after use and stored appropriately to prevent dust escaping.	As required by the Contractor's CEMP.
MM36	Measures specific to trackout (transport of dust and dirt from the construction works areas onto the public road network)	EIAR Chapter 14	• A speed restriction of 25 kph will be applied as an effective control measure for dust for on-site vehicles. • Vehicles transporting loose materials (e.g. spoil or sand) entering and leaving the proposed project works areas and construction compounds will be covered with tarpaulin to prevent escape of materials during transport. Before entrance onto public roads, trucks will be checked to ensure the tarpaulins are properly in place. • Where construction work area or construction compound conditions result in large amounts of mud building up on truck wheels, wheel washing will be carried out for trucks before they use the public road network. • Water-assisted dust sweeper(s) will be used at the access points to a construction compound and the immediate adjoining local road, to remove, as necessary, any material tracked out of the compound. • Any on-site haul routes will be inspected for integrity and necessary repairs to the surface will be carried out as soon as reasonably practicable.	As required by the Contractor's CEMP.
Climate				
MM37	Construction Activities	EIAR Chapter 15	Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. During the construction phase the	As required by the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			following best practice measures shall be implemented on site to prevent significant GHG emissions and reduce impacts to climate and are further detailed in the CEMP (Appendix 2-2): • Appointing a suitably competent contractor who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled; • The replacement, where feasible, of standard concrete containing Portland cement concrete with an alternative concrete mix with lower associated embodied carbon, as per the Climate Action Plan. This will be a minimum of 30% GGBS replacement, or concrete with equivalent or lower associated embodied carbon; • Procurement contracts will ensure that material choices with lower associated embodied carbon relative to standard construction materials are considered favourable during tender; • Materials will be reused on site where possible; • Prevention of on-site or delivery vehicles from leaving engines idling, when not in use, even over short periods; • Ensure all plant and machinery are well maintained and inspected regularly; • Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the GHG emissions associated with the site; • Where practicable, opportunities for materials reuse will be incorporated within the extent of the proposed project including the use of reclaimed asphalt and recycled aggregate, which will reduce the virgin material needs;	



Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• Sourcing materials (aggregates, concrete and steel) locally where possible to reduce transport related CO_2 emissions; • Bare soil areas will be minimised in extent and duration. Temporary soil stockpiles will be covered or seeded to minimise run-off. All landscape areas, including temporary compound areas, will be reinstated; • Use of EV's during construction, where feasible; • Use of HVO during construction, where feasible; • Use of mains electricity or batteries during construction of the 110 kV substation; • Backloading of HGVs to reduce transport emissions; and • Use of geogrids in paved areas.	
Cultural Heritage				
MM38	Archaeological Monitoring Along Townland Boundaries	EIAR Chapter 16	Archaeological Monitoring	All interventions that are required along townland boundaries, as part of the construction of the Proposed wind farm, will be subject to archaeological monitoring, and will include a full record of the sections of townland boundaries that are removed. This work will be carried out under licence to the National Monuments Service of the DoHLGH.
MM39	Archaeological Monitoring Where the Proposed GCR Passes Recorded Monuments	EIAR Chapter 16	Archaeological Monitoring	The three areas where the proposed GCR passes recorded monuments will each be monitored. All three of these areas are located within the existing roads network. This work will be carried out under licence to the National Monuments Service of the DoHLGH.
Traffic and Transportation				
MM40	Traffic Management Plan (TMP)	EIAR Chapter 17	A comprehensive Traffic Management Plan (TMP) has been prepared and is provided in Appendix 17-1. The mitigation measures outlined in that and below will be implemented	As required through the TMP and CEMP

Ref No.	Related to	Location	Mitigation Measure	Monitoring
		Appendix 17-1 Appendix 2-2	during the construction phase of the Proposed Development and will be incorporated into the Construction Environmental Management Plan (CEMP) (Appendix 2-2) and TMP.	
MM41	Proposed Wind Farm Mitigation Measures	EIAR Chapter 17	The following measures will be implemented to minimise construction traffic effects associated with the wind farm infrastructure: • Sufficient advance warning signage shall be provided in advance of all site entrances on the R334 and L2104 and maintained for the duration of the construction phase. • HGV movements shall, where practicable, be scheduled to avoid peak traffic periods and school opening and closing times. • Loading and unloading of deliveries shall be undertaken within designated areas inside the site compound to avoid obstruction of the public road network. • Access for residents, agricultural traffic, businesses and emergency services shall be maintained throughout the construction phase, where practicable. • Wheel wash facilities shall be provided at site exits, where required, to minimise the transfer of mud and debris onto public roads. • Public roads in the vicinity of the site shall be inspected regularly and cleaned, where necessary, to maintain road safety and cleanliness. • Adequate barriers, signage, cones and warning systems shall be provided around temporary works areas and excavations in accordance with relevant health and safety requirements.	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• Pre-construction and post-construction condition surveys shall be undertaken along approved haul routes, including public roads, bridges and associated infrastructure. • Any damage attributable to construction activities shall be repaired and reinstated following agreement with the relevant Roads Authority.	
MM42	Proposed Turbine Delivery Route (TDR) Mitigation Measures	EIAR Chapter 17	The following measures will be implemented in relation to turbine component deliveries and AILs: • Temporary traffic management measures, including stop/go systems, temporary traffic signals, escort vehicles and traffic marshals, shall be implemented where required. • Temporary lane closures, road closures and traffic diversions shall be agreed in advance with the relevant Roads Authority and An Garda Síochána. • Abnormal load deliveries shall be managed in accordance with agreed delivery protocols and permit requirements. • Where sufficient road width is available, stop/go arrangements shall be utilised to minimise the requirement for road closures. • Advance notification of abnormal load movements shall be provided to relevant stakeholders, road authorities and emergency services, where required.	
MM43	Proposed Grid Connection Route (GCR) Mitigation Measures	EIAR Chapter 17	The following measures will be implemented during construction of the grid connection (including 110 kV substation and all underground cables) infrastructure: • All road opening works shall be undertaken in accordance with the Guidelines for Managing Openings in Public Roads (Purple Book) and any relevant road opening licence requirements.	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• All permits, licences and approvals required for works affecting the public road network shall be obtained prior to commencement of the relevant works. • Traffic management measures shall be implemented at all locations where works have the potential to affect public roads. • Temporary traffic management and reinstatement measures shall be undertaken in consultation with the relevant Roads Authorities. The mitigation measures outlined above have been assessed as part of this EIAR and will be implemented through the CEMP (Appendix 2-2) and the TMP (Appendix 17-1) for the duration of the construction phase. A Construction & Environmental Management Plan is included in Appendix 2-2 which also details the mitigation measures that will be implemented during the construction phase. Pre and post construction pavement and bridge surveys will be carried out to determine any road deterioration that needs to be rectified. This will be agreed with the Planning Authority prior to construction and where damage is caused by the works road surfaces will be repaired and reinstated.	
MM44	Areas where excavations are being carried out	Appendix 17-1 (TMP)	• Provide adequate protection in the form of barriers. • This should be supplemented by use of warning tape and/ or cones to prevent any pedestrians from falling into excavated areas.	As required through the TMP
MM45	High risk areas (Eg. LPG, Fuel, Gas, Electrical)	Appendix 17-1 (TMP)	• Provide appropriate signage around high-risk areas	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
MM46	Pedestrian safety throughout the site	Appendix 17-1 (TMP)	• Provision of pedestrian pathways. • Pedestrians to wear high-vis vests and other relevant PPE. • Required training for machine operators and vehicle drivers. • Clearly defined traffic routes. • Designated parking areas for site personnel. • Proper maintenance of vehicles and equipment. - Ensure site is well lit. • Ensure site is clear of any trip hazards which could cause harm to pedestrians. • Ensure that when the turbine blade reaches the site there are no interferences with pedestrians and the blade.	
MM47	Collisions at the site entrance/exit	Appendix 17-1 (TMP)	• Ensure adequate spacing is provided • Ensure sufficient traffic control is put in place both on site, on the R334 and on the L2104 when required.	
MM48	Speeding on site	Appendix 17-1 (TMP)	• Provide relevant speed limit signage. • Provide ramps if deemed necessary.	
MM49	Emergencies	Appendix 17-1 (TMP)	• Staff trained for emergency situations. • Designated area for emergency services. • Ensure emergency area parking is unobstructed at all times	
MM50	Potential visitor injury	Appendix 17-1 (TMP)	• Visitors should be accompanied at all times on site. • Visitors should sign in upon entry and be briefed on the site.	
MM51	Delivery Driver Collision	Appendix 17-1 (TMP)	• Delivery drivers to be instructed upon entry. • A safe route for delivery drivers should be provided on site including the appropriate signage.	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			• Loading and unloading are carried out in a designated area on site. • Adequate space to be provided at the site entrance for delivery drivers.	
MM52	Reversing Vehicles and machinery	Appendix 17-1 (TMP)	• Vehicles and machinery to be equipped with the appropriate audio and visual devices where required.	
MM53	Poorly lit areas around the site	Appendix 17-1 (TMP)	• Ensure that the site is well lit throughout the site for the duration of working hours.	
Operational Phase				
Description of Proposed Project				
MM54	Operational Health and Safety	EIAR Chapter 2	Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits.	As required through the project Operational Management Plan / Health and Safety Plan.
			Signs will be erected at suitable locations across the site as required for the ease and safety of operation of the wind farm. Further details are provided in the CEMP (Appendix 2-2 of the EIAR).	As required through the project Operational Management Plan / Health and Safety Plan.
			The components of a wind turbine are anticipated to have a useful lifespan of 35 years or more and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements.	As required through the project Operational Management Plan / Health and Safety Plan.
Biodiversity				
MM55	Bats	EIAR Chapter 6	Existing roost features and associated habitat will be retained and protected. Bat buffers will be maintained	Post-construction bat activity monitoring shall be undertaken during operational Years 1, 2 and 3 to assess

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			around turbines, and habitat management measures implemented to reduce collision risk. A targeted smart curtailment strategy will be applied to turbines T1, T5, T8, T12 and T13 during suitable weather conditions within the bat activity season (May to October, inclusive). Lighting will be designed to minimise disturbance to bats and key commuting features.	bat activity levels, turbine-specific activity patterns and the effectiveness of mitigation measures, including curtailment and habitat management. Post-construction mortality monitoring shall be undertaken during operational Years 1, 2 and 3, and subsequently during Years 5, 10, 15 and 25, to assess collision and barotrauma mortality and to inform adaptive management measures where required. (see Chapter 6 of the EIAR)
Ornithology				
MM56	Operational Monitoring	EIAR Chapter 7	A Bird Monitoring Plan shall be agreed with the Planning Authority and NPWS prior to operation. Ornithological monitoring shall be undertaken during operational Years 1, 2, 3 and 5 and shall include collision monitoring (carcass searches), vantage point surveys, winter walkover surveys and nocturnal goose surveys as specified within Chapter 7. Monitoring results shall be reviewed with NPWS to confirm predicted collision risk, displacement and barrier effects and to identify any unforeseen impacts requiring adaptive management.	Ornithological monitoring shall be undertaken during operational Years 1, 2, 3 and 5 in accordance with Chapter 7 to verify predicted collision risk, displacement and barrier effects, and to identify any unforeseen impacts requiring adaptive management (see Chapter 7 of the EIAR).
Land, Soils and Geology				
MM57	Contamination	EIAR Chapter 8 and Chapter 6	• Fuel and oil storage and handling requirements will be as detailed for construction, with permanent fuel and oil storage located within permanent covered bunds. Regular ecological inspections will be conducted to ensure no invasive species are present – See Chapter 6. • Welfare facilities will be provided at the substation location. These welfare facilities will produce foul effluent, and these effluents will be stored in a holding	As required by the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			tank prior to removal to an approved treatment facility. These wastewater treatment systems and bunds shall be subject to inspection and maintained as required, with effluent removed by a licenced contractor as required.	
MM58	Geohazards	EIAR Chapter 8 and CEMP	No significant effects were identified in Section 8.5.3 of Chapter 8 and therefore no additional mitigation measures are required.	Monitoring will consist of regular inspection of drains to prevent blockages and inspections of specific areas after significant rainfall events, as per the CEMP.
Hydrology and Hydrogeology				
MM59	Alterations to Surface Water Quality	EIAR Chapter 9	No additional mitigation over and above what is stated in Chapter 2 is required during operational phase.	Regular bund testing will be undertaken along with inspections of the SuDS infrastructure. Monitoring of swales (visually) will be undertaken to ensure check dams and silt entrapment measures are effective and operating to specification.
Shadow Flicker				
MM60	Turbine Shutdown	EIAR Chapter 10	Shadow Flicker Control System: Shadow flicker control systems, consisting of light sensors and specialised software, will be installed on each of the wind turbines. The control system will calculate, in real-time: • Whether shadow flicker has the potential to effect nearby sensitive receptors, based on pre-programmed co-ordinates for the sensitive receptors and turbines; • Wind speed (can affect how fast the turbine will turn and how quickly the flicker will occur); • Wind direction; and • The intensity of the sunlight.	As required through the Shadow Flicker Control System.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			When the control system detects that the sunlight is strong enough to cast a shadow, and the shadow falls on a sensitive receptor or sensitive receptors, then the turbine will automatically shut down; and will restart when the potential for shadow flicker ceases at the effected sensitive receptors. The atmospheric variables that determine whether shadow flicker will occur or not, will be continuously monitored at the wind farm site and the data fed into the wind farm's SCADA control system. The strength of direct sunlight is measured by way of photocells, and if the sunlight is of sufficient strength to cast a shadow, the shadow flicker control mechanisms come into effect. Wind speed and direction are measured by anemometers and wind vanes on each turbine and on the wind farm's met mast, and if wind speed and direction is such that a shadow will be cast, the shadow flicker control mechanisms come into effect. The moving blades of the turbine will require a short period of time to cease rotating and as such there may be a very short period (less than 60 seconds (depending on site specific wind conditions)) during which the blades are slowed to a complete halt. The proposed method of mitigation will be implemented to mitigate shadow flicker effects at all sensitive receptors within the study area, allowing for a short period of time for the rotor to come to a stop. Appendix 10-1 of the EIAR contains all calculated potential shadow flicker periods for each turbine. The relevant data will be input into the turbine control software. In the event that complaints of shadow flicker are received by the Applicant / site operator or by the local authority, the Applicant will conduct an investigation and the complaints frequency, duration and time of	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			complaints will be considered and specialist modelling software will be used to confirm the occurrence(s). Should the complaint persist, a shadow flicker survey involving the collection of light data will also be carried out at the sensitive receptor in which the complaint was made. Further refinement of the shadow control system will be conducted to mitigate adverse shadow flicker occurrence.	
Material Assets				
MM61	Aviation	EIAR Chapter 11	Standard aviation safeguarding measures will be implemented. The details of any aviation lighting requirements will be agreed with the relevant aviation stakeholders, including the IAA and, where required, the Department of Defence/Irish Air Corps. This will ensure that the proposed project is appropriately identified as an aviation obstacle. The final turbine locations and dimensions will be provided to the relevant authorities to facilitate updates to aeronautical charts, obstacle datasets and navigation systems.	As required by the Contractor's CEMP.
MM62	Telecommunications	EIAR Chapter 11	Where potential effects on telecommunications infrastructure were identified, mitigation measures have been developed in consultation with the relevant network operators. These measures include operator agreements, implementation of protocol arrangements where appropriate, and modification or relocation of affected telecommunications infrastructure where required. The details of such mitigation would be confirmed prior to construction by ongoing consultation with the telecom	As required by the Contractor's CEMP.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			operators. Further details are provided in Appendices 11-1 and 11-2 of the EIAR.	
			The Applicant have committed to sign an agreement with 2RN prior to construction to commit to restoring service to any end users that may have their service disrupted as a result of the proposed project. This is standard industry practice and will eliminate any potential effects in this regard.	As agreed with 2RN.
Noise and Vibration				
MM63	Wind Turbine Noise	EIAR Chapter 12	Mitigation in the form of turbine curtailment can ensure that the residual turbine noise levels will be within the turbine noise criteria in specific wind conditions (i.e., wind speed and direction). To address the potential exceedances predicted, the Vestas V136 turbine in this assessment can be programmed to operate in low noise modes for specific wind speed bins and periods. The V136 turbines can be configured for up to 3 different operating modes (SO11, SO12 and SO13) and all modern wind turbines will have similar controls to reduce the noise emission of the turbine in certain conditions. For any turbine curtailment strategy that is developed, consideration must be given to the practical benefits. Such curtailment may unnecessarily reduce the electrical power generating capacity of a wind farm, for an imperceptible change to the overall turbine noise levels. When curtailing for exceedance of the night-time criterion consideration should be given to the background noise at the specific NSL to avoid unnecessarily curtailing turbine noise when the	**Noise Compliance Monitoring Programme** Noise Compliance Monitoring refers to testing the wind turbine noise levels due to the Proposed Project against the planning conditions, in terms of overall noise levels. Prior to the commissioning of the project, the developer will submit a Noise Compliance Monitoring Programme (NCMP) to the planning authority for written agreement. The NCMP will include a detailed methodology for noise measurements, procedures for recording results and locations at which noise is to be monitored. The NCMP will include both commissioning noise surveys to test compliance with the noise levels in the planning condition, and also a Complaint Management Protocol with a clear path to address any noise complaint. Under the NCMP, compliance noise surveys will be undertaken to verify compliance with any noise conditions applied to the development. Surveys will

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			result would yield an imperceptible change to the overall turbine noise levels. The principles outlined in this section for addressing potential exceedances at a limited range of operational wind speeds and directions will be applied to all turbines considered in this assessment, if required, to ensure compliance with noise limits With curtailment in place the operation of proposed project will be within the proposed turbine noise limits at all locations. This would be controlled in practice through a planning condition imposing noise limits on operational noise from the wind turbines at neighbouring residential properties, in line with the noise criteria outlined in Chapter 12 section 12.5.2 and/or the relevant operational criteria associated with the grant of planning for the proposed project.	commence within six months of a wind farm being commissioned. The guidance outlined in the IOA GPG and Supplementary Guidance Note 5: Post Completion Measurements (July 2014) will be complied with. In the unlikely event that an exceedance of the noise criteria is identified as part of the commissioning assessment, detailed mitigation strategy will be followed in the form of curtailment. Following the implementation of the measures, the commissioning noise survey will be repeated. **Noise Complaint Management Protocol** In the event of a noise-related complaint associated with the operation of the Proposed Project, the Operator will fully investigate the complaint in accordance with the agreed NCMP. In the event of a complaint associated with noise tonality or amplitude modulation associated with the proposed project, the operator will fully investigate the complaint in accordance with the agreed NCMP. A Noise Complaint Management Protocol for addressing amplitude modulation and tonality is presented in Appendix 12-7. A final version of this protocol will be contained within the NCMP to be agreed the relevant Local Authority.
MM64	Amplitude Modulation and Tonality	EIAR Chapter 12 Appendix 12-7	In the event that a complaint which indicates potential excessive amplitude modulation (AM) associated with the proposed project, the operator will fully investigate the complaint in collaboration with the turbine manufacturer, through review of the meteorological periods and conditions during which the reported AM occurs. If an ongoing issue with excessive AM is identified, a mitigation strategy to reduce the level of AM will be implemented through engineering methods and/or curtailment of specific turbines. The operator may appoint a qualified acoustic consultant to objectively assess the level of AM in	

Ref No.	Related to	Location	Mitigation Measure	Monitoring
			accordance with the methods outlined in the IOA AMWG or subsequent revisions. The measurement method outlined in the IOA AMWG document, known as the 'Reference Method', will provide a robust and reliable indicator of AM and yield important objective information on the frequency and duration of occurrence, which can be used to evaluate different operational conditions including methods to mitigate any excessive AM. These mitigation measures, if required, will consist of the implementation of operational controls for the relevant turbine type, which will include turbine curtailment under specific operational conditions and may in very unlikely circumstance require turning specific turbine off under certain conditions to minimise adverse impacts from excessive AM associated with the proposed project. If the complaints suggest the potential occurrence of clearly audible tonality in the wind turbine noise, the audibility of the tones will be investigated from measured data with a robust, objective method such as that included in ISO 1996-2:2017 with modifications in IEC 61400-11-2. If the rated level of the wind farm is above the limit, then the operator would liaise with the turbine manufacturer to investigate and implement measures to reduce the rated level to below the limit. This may involve engineering methods, operational changes and/or (in very unlikely circumstance) curtailment of specific turbines. The commitment outlined to control amplitude modulation (AM) from wind turbines are considered best practice. The proposed approach will ensure that any adverse impacts from excessive amplitude modulation (AM) associated with	



Ref No.	Related to	Location	Mitigation Measure	Monitoring
			the operation of the proposed project are effectively managed by the operator.	
Air Quality				
MM65	Maintenance Associated with the Wind Farm Components	EIAR Chapter 14	During the operational phase of the proposed project, the works onsite will be limited to maintenance associated with the wind farm components. Although the intensity of activity will be only a small fraction of the construction phase, all employees and contractors that are on site will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic.	None
Decommissioning Phase				
Land, Soils and Geology				
MM66	Decommissioning activities	EIAR Chapter 8	A fuel management plan to avoid contamination by fuel leakage during decommissioning works will be implemented as per the construction phase mitigation measures.	As required by the agreed decommissioning plan / mitigation measures agreed at the time of decommissioning.
Hydrology and Hydrogeology				
MM67	Decommissioning activities	EIAR Chapter 9	Decommissioning of the proposed project will involve the disassembly and removal of the turbines offsite. The potential effects have been assessed as similar to the construction phase and, therefore, the mitigation measures for the construction phase will also be implemented during decommissioning. Turbine hardstands will be covered over with soil and allowed to vegetate. It is not proposed to restore all hardstanding areas after decommissioning. The risks associated with leaving tracks and infrastructural components in situ are low. Therefore, no likely significant effects will occur based on the proposed decommissioning.	As required by the agreed decommissioning plan / mitigation measures agreed at the time of decommissioning.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
MM68	Alteration of Surface Water Flow	EIAR Chapter 9	SuDS measures will remain in place during the decommissioning period.	
MM69	Alteration of Surface Water Quality	EIAR Chapter 9	Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant. Some of the effects will be avoided by leaving elements of the proposed wind farm site and GCR in place.	
Material Assets				
MM70	Material Assets: Decommissioning activities	EIAR Chapter 11	During decommissioning, the activities required to facilitate wind turbine decommissioning and removal from site will be similar to those outlined for the construction phase, albeit in reverse to a lesser extent and duration than during the construction stage. The onsite substation and grid connection will remain part of the national network. Mitigation measures proposed for the decommissioning phase will include liaising with telecommunication providers to check if any new links are in the area which could potentially be obstructed by works and best practice waste management practices will continue to be employed.	As required by the agreed decommissioning plan / mitigation measures agreed at the time of decommissioning.
Noise and Vibration				
MM71	Noise and Vibration	EIAR Chapter 12	Prior to the decommissioning phase, a decommissioning plan will be agreed with the local authority and implemented by the contractor during the works.	As required by the agreed decommissioning plan / mitigation measures agreed at the time of decommissioning.
Air Quality				
MM72	Air Quality: Decommissioning activities	EIAR Chapter 14	As the dust emissions during the decommissioning phase are expected to be of a similar or lesser magnitude to those identified during the construction phase, the mitigation measures applicable to construction phase dust emissions are also considered suitable for those during the decommissioning phase where applicable.	As required by the agreed decommissioning plan / mitigation measures agreed at the time of decommissioning.

Ref No.	Related to	Location	Mitigation Measure	Monitoring
Climate				
MM73	Climate: Decommissioning activities	EIAR Chapter 15	The same mitigation measures implemented during the construction phase will be applied during the decommissioning works for the management of GHG emissions and reduction of impacts to climate.	As required by the agreed decommissioning plan / mitigation measures agreed at the time of decommissioning.
Traffic and Transportation				
MM74	Decommissioning Activities and Traffic	EIAR Chapter 17 and Appendix 17-1 (TMP)	During the project design development, embedded mitigation was a fundamental part of the design process. This included the decommission phase of the proposed project as outlined above. To allow the vehicles to travel on some of the roads of narrower width, temporary traffic management operations will be implemented.	As required by the agreed decommissioning plan and TMP / mitigation measures agreed at the time of decommissioning.

Appendix A KARST PROTOCOL

TOBIN

Rooaunalaghta Wind Farm
Karst Assessment
Appendix 8-1

BUILT ON KNOWLEDGE

Document Control Sheet	
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SUMMARY

TOBIN has undertaken a karst assessment for the Proposed Rooaunalaghta Wind Farm, Glencorrib, Co. Mayo. The assessment has been undertaken due to the identification of karst features within the 2 km study area of the proposed wind farm site and substation.

The purpose of this report is to evaluate the potential risks to karst associated with the construction and operation of the proposed project and to outline mitigation measures and recommendations for consideration at the detailed design and construction stages. Works for the TDR include hardcore at one roundabout along with some demounting of signs or hedge trimming. As no significant works are required for the TDR, this is screened out from further assessment in this report.

The assessment was completed using a staged approach. Firstly, a desk study was undertaken to identify potential karst indicators from published datasets, aerial imagery and topographic information. Secondly, field walkovers were completed to verify desktop observations and identify additional karst features. Thirdly, targeted intrusive ground investigations were undertaken to characterise subsurface conditions and confirm bedrock structure. Finally, geophysical surveys were completed in selected infrastructure locations to assess bedrock variability, weathering and the potential presence of voids or dissolution features. The results of all elements were integrated within the karst hazard assessment.

A total of five potential karst features have been identified within 1km of the proposed wind farm site. The assessment findings indicate that the majority of the proposed infrastructure is located within areas of low to medium karst susceptibility, reflecting the presence of shallow limestone bedrock and a regionally important karstified aquifer. Site walkovers, geophysical surveys and intrusive ground investigations identified no evidence of significant subsurface cavities beneath the proposed infrastructure footprints.

While localised areas of higher karst hazard occur within the wider site, these areas have been avoided through the design process, and no turbines, hardstands, access tracks or substation infrastructure are located within mapped karst features or areas assessed as high or very high karst hazard. No identified karst feature occurs within the proposed infrastructure footprint.

Subject to implementation of the proposed embedded mitigation measures and Karst Management Protocol, the residual risk associated with karst is considered low and no significant effects on geological, hydrogeological or karst receptors are predicted.

1. INTRODUCTION

1.1 SITE LOCATION & ENVIRONMENTAL SETTING

The proposed project, known as Rooaunalaghta Green Energy Project, is located in County Mayo with some elements in County Galway. The proposed wind farm site and 110 kV substation includes the construction of 13 no. wind turbines and ancillary works, installation of the 33 kV private grid connection cable along the Grid Connection Route (GCR) with a proposed new loop-in 110 kV substation with associated works (including two steel lattice end masts) to connect to an existing overhead line. It also includes temporary accommodation works (nodes) on the proposed Turbine Delivery Route (TDR). A full description is included in Chapter 2 of the submitted EIAR.

Temporary accommodation works (nodes) associated with the TDR will not require specific karst considerations as works comprise only hedge/vegetation trimming, temporary signage demounting and works to a small area of existing footpath which are not considered significant. The TDR is therefore not considered further in this document.

This assessment relates to the wind farm site. The land use on the site is predominantly agricultural land. There are existing internal access tracks across the proposed wind farm to facilitate the ongoing farming operations. The wind farm site is characterised by gently rolling to locally steep topography.

The study area for this assessment is defined by the methodology (see Section 2), i.e. 250m for karst methodology criteria. A wider study area of 2 km, as per the assessments in Chapter 8 of the EIAR, is used for further context.

1.2 DEFINITION OF KARST

Karst is a landscape with distinctive hydrology and landforms that arise when the underlying rock is soluble. Although karst can develop on evaporate rocks such as gypsum the vast majority of karst landforms are found on carbonate rocks, such as limestones. Karst landscapes may have sinkholes, caves, enclosed depressions, disappearing streams, springs and sinkholes[1].

Karstification is an important process in Irish geology. It involves the enlargement of rock fissures when groundwater dissolves the fissure walls as it flows through them. The process can result in significantly enhanced permeability and groundwater flow rates. It occurs in 'purer' limestones. Pure, clean coarse limestone (90–100% calcium carbonate $CaCO_3$) is prone to dissolution by rainfall. The enlargement (by dissolution) of geological discontinuities (joints, fractures, etc.) leads to the formation of a distinctive karst landscape which includes landforms such as closed depressions (dolines), sinkholes, springs, turloughs (seasonal lakes which occur in winter and early spring when the groundwater table rises above the land surface) and caves.

[1] (https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-irish-karst/Pages/What-is-karst.aspx)

2. METHODOLOGY

The karst risk assessment methodology is based on the approach adopted for road schemes in Ireland (Madden and O'Hara, 2016, and Rutty and Jennings, 2012); published literature (Waltham et al., 2005); and project expertise of the project team on large infrastructure projects in karstic environments including the M17/M18 motorway project. Experience in the construction of a number of wind farm projects constructed and operational in areas of karstified and dolomitised limestone including three wind farms at Lisheen, Co. Tipperary, Carrickeeny and Manorhamilton, Co. Leitrim, Mount Lucas, Co. Offaly and four other windfarms in Galway/Mayo .

The assessment was completed using a staged approach. Firstly, a desk study was undertaken to identify potential karst indicators from published datasets, aerial imagery and topographic information. Secondly, field walkovers were completed to verify desktop observations and identify additional karst features. Thirdly, targeted intrusive ground investigations were undertaken to characterise subsurface conditions and confirm bedrock structure. Finally, geophysical surveys were completed in selected infrastructure locations to assess bedrock variability, weathering and the potential presence of voids or dissolution features. The results of all elements were integrated within the karst hazard assessment – See section 4 with mitigation proposed in Section 5.

2.1 DESK STUDY

A desk study was undertaken to collate and review background information of the receiving environment. The following publicly available data sources and datasets were consulted:

- Geological Survey Ireland (GSI) datasets, including the karst feature database, bedrock geology, quaternary geology, and extractive industry data[2];
- Environmental Protection Agency (EPA) datasets on soils, subsoils, and land cover[3];
- National Parks and Wildlife Service (NPWS) data on designated conservation sites[4];
- GeoHive platform for mapping, topographic, and base imagery data[5];
- LiDAR (Light Detection and Ranging) data and other publicly available digital elevation models (DEMs) to support interpretation of topography and geomorphology;[6]
- Aerial imagery from the following sources has been used to identify potential karst features:
    - Bing Aerial Imagery (Jan and Sept 2025);
    - Google Earth Multitemporal Aerial Imagery (2009-2025);
    - Ordnance Survey Ireland Orthophoto (OSi, 1995-2013); and
    - OSI 6-inch and 25-inch historic base mapping.

2 Geological Survey Ireland (GSI). Available at: https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx
3 Environmental Protection Agency (EPA) Maps and Data. Available at: https://gis.epa.ie/EPAMaps/
4 National Parks and Wildlife Service (NPWS) Map Viewer. Available at: https://www.npws.ie/maps-and-data
5 GeoHive Public Mapping Platform. Ordnance Survey Ireland. Available at: https://www.geohive.ie/
6 Lidar and Digital Elevation Models from Bluesky, Geological Survey Ireland and Ordnance Survey Ireland via GeoHive. Available at: https://www.geohive.ie/ and GSI's Open Topographic Data Viewer (https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b7c4b0e763964070ad69bf8c1572c9f5)

2.2 SITE WALKOVERS, GEOLOGICAL & KARST FEATURE MAPPING

To aid in the identification and mapping of potential karst features across the proposed wind farm site. Five site walkovers were also conducted in May 2025, November 2025, February 2026, April 2026 and July 2026, to assess the ground conditions at the proposed wind farm site. The survey work was completed by Peter McSherry (BSc, MSc, PGeo) and John Dillon (BSc, MSc, MCIWM, PGeo). John Dillon who has over 20 years' professional experience including 10 years with karst assessment while Peter has 5 years of professional experience. The purpose of the karst walkover was to:

- Examine exposed soils, subsoils and bedrock;
- Verify and record the presence of potential surface karst features identified from the desk study; and
- Identify any karst features not visible from the desk study.

2.3 GROUND INVESTIGATIONS AND GEOPHYSICAL SURVEY

The Site Investigation (SI) methodology is described in Section 8.3, Chapter 8 of the EIAR. The SI results are summarised in Table 8-5, and the investigation locations are shown in Figure 8-9 of the EIAR.

All exploratory locations were surveyed, and their positions and elevations were accurately recorded using standard coordinate and elevation references. Laboratory testing was conducted on samples collected and included geotechnical analysis of soil samples — covering moisture content, Atterberg Limits, particle size distribution, compaction characteristics, and pH, as well as rock testing for Point Load Index and Slake Durability. All testing was carried out in accordance with BS 1377 and relevant rock mechanics standards. The ground investigation was completed in accordance with Eurocode 7 – Geotechnical Design, Part 2 (EN 1997-2) and BS 5930:2015 – Code of Practice for Ground Investigations. Mineral subsoils were logged according to BS: 5930.

All field work was conducted in compliance with best practice standards and relevant guidance, with oversight from qualified geologists and engineers. The site investigation works outlined above locations are shown on Figure 8-9, Chapter 8 Volume II of the EIAR.

Based on the findings of the desk study, a geophysical survey was undertaken by Minerex Geophysics. The geophysics investigation that was undertaken comprised the following survey methods:

- 15 No. Electrical Resistivity Tomography (ERT) and
- 15 No. seismic profiles

3. SITE CHARACTERISATION

3.1 GEOLOGICAL SETTING

The bedrock geology underlying the proposed wind farm site, GCR and substation is shown in Figure 8-7, Chapter 8, Volume II of the EIAR. The proposed wind farm site is underlain by Dinantian limestones comprising bedrock formations detailed in Table 3-1. Bedrock outcrops are present across the proposed wind farm site, particularly concentrated to the north and centre. Regional geological mapping indicates the presence of structural lineaments and mapped faults (>1km from the wind farm); however, no significant fault structures have been confirmed within the proposed wind farm site. Structural controls may have influenced localised dissolution and weathering of the limestone bedrock but do not represent a significant development constraint.

Table 3-1 Bedrock Formations - proposed wind farm site

Formation	Location	RUGS group	Lithology
Oakport Limestone Formation	Dominant lithology throughout the site.	Dinantian Pure Bedded Limestone	Dark crinoidal calcarenites and shales – site investigation information indicates Very strong locally strong thinly bedded grey bioclastic fine and coarse grained limestone.
Old Chapel Limestone Formation	Lithology located towards the south of the site.	Dinantian Pure Bedded Limestone	It comprises bioclastic calcarenites with a relative abundance of macrofauna of brachiopods and corals. Chert nodules occur throughout but are more common in the middle of the formation
Illaunagappul Formation	Lithology located towards the south of the site.	Dinantian Pure Bedded Limestone	The formation consists of dark grey to black, fine-grained calcarenites (packstones with peloids).
Ardnasillagh Formation	Lithology located along the GCR	Dinantian Pure Bedded Limestone	The formation consists of dark cherty limestones and thin shales



Image 3-1 Photo of old quarry facing south. Reservoir fencing evident on right of photo. Bedrock is competent and dips <2deg to the south.

3.2 KARST FEATURES

No karst features are mapped on the GSI karst database[7] within the proposed wind farm site, substation and GCR. A total of five unmapped karst features were identified from the desk study using aerial photography, LiDAR data and site walkovers in the wind farm study area, see Chapter 8, Volume II of the EIAR. These karst features include dolines (enclosed depressions) with a losing stream/drain noted. The distribution of their locations is presented in Figure 3-1 below.

From the site walkovers five features were mapped: four enclosed depressions (dolines) and a section of losing stream. Table 3-2 summarises the mapped karst features on the wind farm site. In general, the enclosed depressions (dolines) were circular in shape, had a bowl-like morphology, and are 0.5 m in depth. A drainage channel located near T10 exhibits intermittent flow losses where sections of the channel bed become dry during low-flow conditions. No point recharge feature was identified during the walkover surveys. The feature is therefore interpreted as a localised losing section of drainage channel associated with permeable limestone-derived deposits. The stream becomes permanent near the southern wind farm site boundary, emerging at the base of some gravels.

7 https://gsi.geodata.gov.ie/portal/apps/webappviewer/

Table 3-2 Karst Feature Summary

ID	x	y	Dimension	Type	Description	Distance to infrastructure
1	523681	749957	6 x 5m	Doline	Shallow oval shaped depression – near T1	60 m
2	523567	750000	25 x 16	Doline	Shallow oval shaped depression - near T1	120 m
3	523162	749256	30 x 20 m	Doline	Shallow oval shaped depression - near T3	700 m
4	530846	750818	30 x 25m	Doline	Shallow oval shaped depression – near GCR/substation	200 m
5	525044	750853	<1m wide Small ephemeral drain	Losing stream	Section of losing stream near T10	120 m

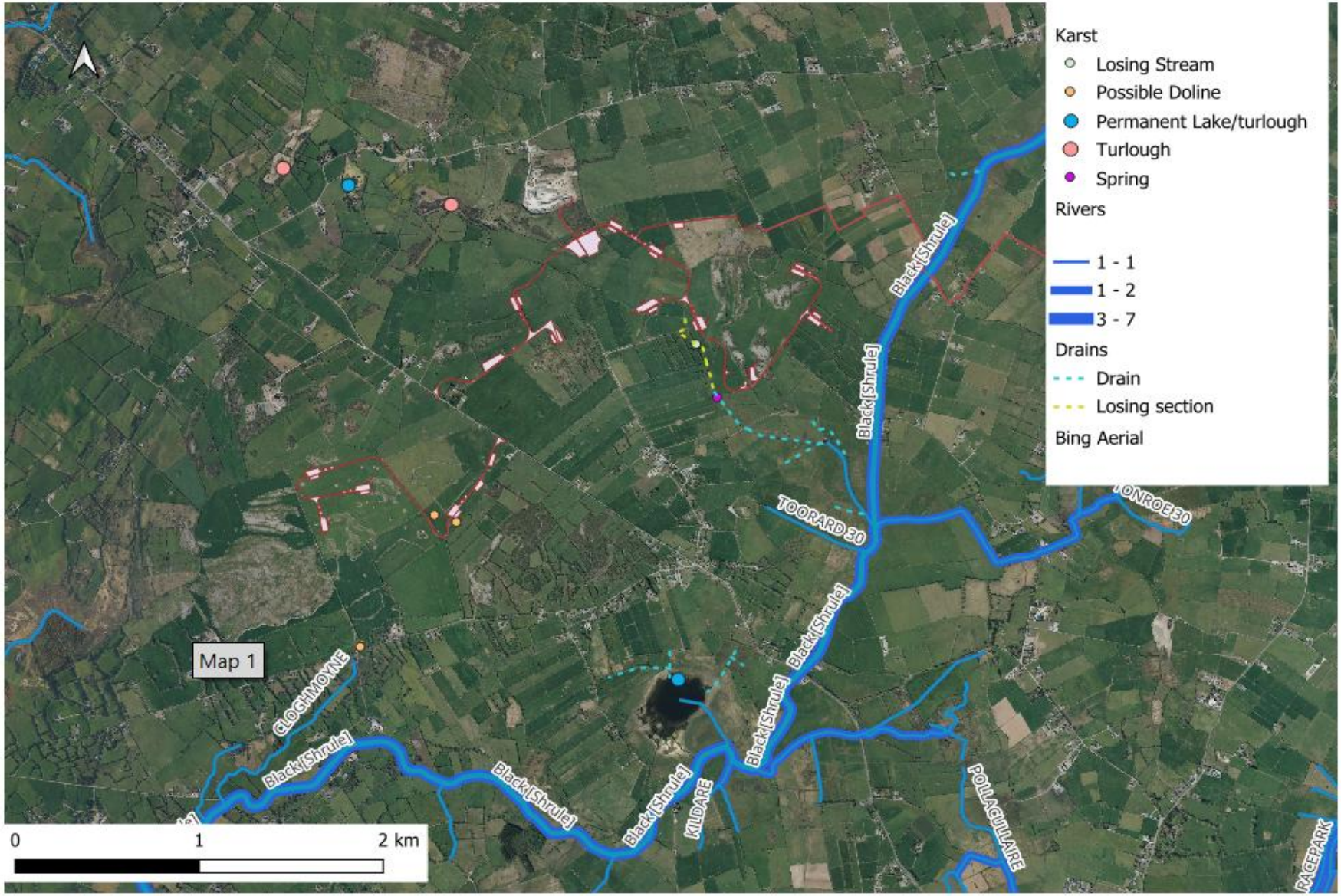


Figure 3-1 Karst Locations

3.3 SUBSURFACE CONDITIONS

The following subsoils and Quaternary sediments are present within the proposed wind farm site boundary (Figure 8-5 and 8-6, Chapter 8, Volume II of the EIAR):

- Karstified Bedrock Outcrop or subcrop (KaRck);
- Bedrock outcrop or subcrop (Rck)
- Silty to gravelly till derived from limestones
- Alluvium (A).

The proposed wind farm site is generally overlain by a thin mantle of topsoil, gravelly silt, sandy silt and limestone-derived gravel, with the nature and thickness of the overburden varying across the proposed wind farm site. The majority of trial pits encountered granular glacial deposits comprising sandy gravel, gravelly silt, cobbles and occasional boulders derived from limestone. Topsoil thickness is typically less than 0.5 m, with shallow granular subsoils commonly extending to depths of between 1 m and 5 m bgl. These deposits are generally firm to dense and provide evidence of glacially derived materials reworked from the underlying limestone bedrock.

Localised peaty and organic soils (0.4 m) were encountered at the proposed 110 kV substation location where thin peaty horizons overlie gravelly silts and sands. Some locations, including T6 and portions of the on-site control building area, contain predominantly silty deposits with frequent cobbles, while other turbine locations such as T3, T5, T8 and T10 are dominated by coarse granular gravels and boulder-rich horizons. The overburden is therefore heterogeneous but is generally characterised by a predominance of granular materials with relatively low compressibility.

Weathered limestone was encountered beneath the overburden, with a gradual transition from glacial deposits into more competent bedrock. Rockhead is generally shallow, typically occurring between approximately 1 m and 5 m bgl where proven. The predominance of granular soils and limestone-derived gravels suggests a relatively low potential for concealed collapse-type karst features within the overburden; however, localised variability in rockhead elevation and the presence of weathered rock zones require management.

No peat material was encountered during the site walkovers or during site investigation works on the wind farm site. A thin layer of peaty topsoils (up to 0.4 m thick), observed at TP-14, at the proposed 110 kV substation. The land at the substation site is flat, drained and in intensive agricultural production. Additional peat probing in July 2026 at the substation building encountered 0.3 m of peaty topsoil. Generally, the soils encountered during the site investigation works were as expected for this region, and predominantly consisted of topsoil overlying glacial tills, overlying bedrock.

The pits were excavated to depths ranging from 0.60 m to 2.90 m below ground level (bgl). Topsoil consisting predominantly of firm brown gravelly silt with frequent cobbles to firm brown silt to soft brown peaty silt (TP-14 & TP-15) was encountered in the trial pits at depths ranging from 0.15 m to 0.50 m depth. The glacial till like soils in general consisted of gravelly silt to sandy gravel to coarse sand and gravel to gravelly sandy silt with occasional to frequent

cobbles and boulders. All trial pits were dry during excavations. Depth to bedrock is approximately 2m on average across the site.

Intact bedrock was encountered in the rotary core boreholes at depths ranging from 1.10 m bgl to 4.90 m bgl. The bedrock is generally described as very strong, locally strong, thinly bedded, grey, slightly bioclastic, fine- and coarse-grained Limestone with subvertical and horizontal white calcitic veinlets.

For detailed descriptions of the ground conditions encountered please refer to the geotechnical logs which are included in Appendix 2-5.

Additionally, the investigations assessed soil composition, bedrock depth, groundwater conditions, and potential subsurface instability. Table 8-5, Chapter 8, Volume II of the EIAR summarises the SI data findings.

Soil samples were collected during the SI works, with samples submitted for geotechnical analysis including moisture content, Atterberg testing, particle size distribution and point load testing. These tests provided essential data on soil properties, ensuring compliance with engineering standards for the proposed wind farm site and proposed 110 kV substation. The laboratory testing results can be located in Appendix 2-5.

Three boreholes were finished as groundwater monitoring wells. BH-01 was completed with a PVC slotted screen from 2.3 m to 6.3 m below ground level. BH-05 was completed with a PVC slotted screen from 3.5 m to 6.4 m below ground level and BH-07 was completed with a similar slotted screen from 7.0 m to 10.2 m below ground level. A disused groundwater abstraction borehole also provided groundwater level data.

Based on the borehole data the subsoils comprise silty or gravelly till derived from limestones. As detailed in Table 8-5 the proposed wind farm site is underlain by weathered limestone bedrock and strong to very strong thinly bedded grey bioclastic fine-grained and coarse-grained LIMESTONE. Weathered zones are typically confined to the top 2-3 m. No record of cavities was encountered during the drilling – see Appendix 2-5.

3.3.1 Geophysics

Geophysics was undertaken at turbines, borrow pit and proposed 110 kV substation locations. The geophysical surveys carried out at the proposed wind farm site consisted of 2D-Resistivity (ERT) and Seismic Refraction (p-wave). There was a strong correlation between both geophysical survey methods, and a combined interpretation has been made using both methods. The data was modelled with 3 layers based on the 2D-Resistivity and seismic velocities. Layer 1 is interpreted as soft or loose soil and the thickness of this layer across the site is up to 2 m. Limited areas of karstified/weathered limestone were found at a number of geophysical survey locations.

Results indicate that most turbine locations are underlain by competent limestone at shallow depths of approximately 1-2 m bgl. Areas of partially karstified or weathered limestone were identified at T2, T6 - T10 and the proposed 110 kV substation.

The geophysical survey and intrusive investigation indicate that the area around BH8 has good potential as a borrow pit. BH8 encountered glacial till, underlain by weathered limestone and then strong to very strong limestone bedrock from about 4 m depth. The geophysical survey confirms a consistent subsurface profile comprising a thin soil layer, weathered limestone and underlying good quality limestone, with no evidence of karstification. Rock quality is generally

high, with strong point-load strengths and good rock quality designation values, suggesting the limestone would be suitable for producing rock fill, engineered fill and crushed aggregate for wind farm construction. No dissolution cavities, voids or significant geophysical anomalies indicative of karstification were identified within the proposed borrow pit area.

4. KARST HAZARD ASSESSMENT

The hazard assessment framework has been adapted from the karst risk assessment methodologies described by Madden and O'Hara (2016), Rutty and Jennings (2012) and Waltham et al. (2005), and modified to reflect the site-specific geological conditions encountered at the proposed wind farm site and 110 kV substation.

The identified karst features inventory provides the basis for the hazard assessment and allows the proximity of infrastructure to identified karst features to be assessed. Table 3-2 summarises the location, dimensions and characteristics of the karst features identified during the assessment These oval/circular features display varying diameters. The morphology suggests that these features are most likely enclosed depressions (dolines), with limited permeability.

The proposed design has avoided the identified karst features (i.e. Dolines and losing stream/drain) and applied a 30 m buffer. The number of identified karst features within 250 m of turbines and the substation has been determined using *ArcGIS Pro*. A 250 m buffer has been used for this analysis as this is considered to provide a localised, yet sufficiently broad, spatial context to capture nearby karst features that may pose indirect or cumulative risks to infrastructure. A high density of karst features within 250 m indicates that the development of karstic features at the location being assessed is more likely. There are two or less karst features within 250 m of the various infrastructure i.e. turbines, construction compounds, borrow pits, substation and LiDAR unit. Details of the karst features are identified below in Table 3-2.

A qualitative Karst Hazard Assessment was undertaken to identify areas where karst features may present a geotechnical risk to the proposed wind farm and 110 kV substation site.

The assessment adopts a risk-based approach that considers both the likelihood of karst occurrence and the potential interaction between karst features and the proposed wind farm and 110 kV substation site .

Particular emphasis has been placed on evidence obtained from site investigations and walkovers, which provide a greater degree of confidence than desk-based mapping alone. As a result, the assessment considers both the regional karst setting and site-specific ground conditions when assigning hazard ratings.

The methodology follows established Irish karst assessment approaches and is based on the principle that karst hazard is influenced by both the geological conditions that favour karst development and the presence of evidence indicating existing karstification. The assessment was completed using information obtained from the desk study, karst feature mapping, site walkovers, ground investigations and geophysical surveys.

Based on information contained in Chapter 8 and 9, Volume II of the EIAR, the original hazard matrix reflects the site-specific karst setting, identified karst features, groundwater vulnerability, infrastructure avoidance measures and receptor sensitivity, rather than using a simple hazard ranking approach. Chapter 8 and 9 of the EIAR identifies:

- Predominantly Extreme (E) and Rock at Surface/Karst (X) groundwater vulnerability.
- Regionally Important Karstified Aquifer (Rkc).

- Four unmapped dolines/enclosed depressions identified from LiDAR/aerials and walkover surveys.
- A losing stream occurs approximately 100 m southwest of T10.
- No surficial karst features are directly located on turbines, hardstand, proposed 110 kV substation or GCR infrastructure.
- No evidence of active swallow holes or direct point recharge features within proposed infrastructure footprints. Where dolines are present these do not appear to be point recharge locations as they appear to represent topographic depressions underlain by low permeability material.

The karst hazard assessment is based on multiplication of four geological factors (A-D – see Table 4-1 below) and two evidence-based factors (E-F):

Hazard Score = (A × B × C × D) × (E × F)

Maximum possible score = **288**.

Karst hazard has been assessed using a matrix scoring methodology that considers both geological conditions favourable to karst development and direct evidence of karstification. The selected factors reflect the principal controls on dissolution feature development including bedrock type, structural influence, overburden characteristics and the presence of nearby karst features – See Table 4-1 below.

Table 4-1 Hazard tables[8]

Factor	Criterion	Score
A. Bedrock Type	Pure limestone	2
	Impure limestone	1
	Non-carbonate rock	0
B. Geological Boundaries/Faults	Within 100 m of fault	2
	>100 m from fault	1
C. Overburden Thickness	0-5 m	3
	5-10 m	2
	>10 m	1
D. Overburden Type	Cohesive till/clay	2
	Granular deposits	1
	Peat	1
	Overburden <1 m	1

[8] Based on Madden and O'Hara, 2016

E. Karst Feature Density (within 250 m)	>4 features	4
	3-4 features	3
	1-2 features	2
	No features	1
F. Direct Interaction with Karst Feature	Within feature footprint	3
	No interaction	1

The calculated hazard scores were subsequently assigned to hazard categories reflecting the likelihood that karst-related ground conditions may influence development. The classifications are intended to guide engineering design requirements and determine the level of mitigation or additional investigation that may be required as part of the construction phase. Summary hazard classes are identified below in Table 4-2.

Table 4-2 Hazard tables

Hazard Rating	Description	Development Implication
Low 0-10	Little evidence of karstification	Normal design and construction practices
Moderate 10-40	Evidence of weathered limestone or nearby karst features	Standard geotechnical review and Karst Protocol
High 40-80	Significant karst indicators present within footprint	Additional targeted investigation and design measures
Very High >80	Confirmed significant karst features or voids within footprint	Avoidance preferred or major engineering mitigation required

Summary details for the turbines and proposed 110 kV substation is included below in Table 4-3.

Table 4-3 Proposed permanent structures (Turbine and 110kV Substation) Karst Risk Screening[9]

Location	Rockhead Depth	Overburden Type	Karst Susceptibility	Assessment
T1	2.1 m	Sandy silt and limestone gravel	Moderate	Limestone encountered at shallow depth. Limited cover thickness and possibility of irregular rockhead. Doline located within 60 m of turbine. No evidence of cavities or open karst voids during drilling.

[9] Key infrastructure locations – no karst features within 250 m of compounds or borrow pits

Location	Rockhead Depth	Overburden Type	Karst Susceptibility	Assessment
T2	c 3 m	Gravelly silt	Low	Limestone at shallow depth based on trial pits and geophysics. Competent bedrock at turbine.
T3	2.3 m	Sandy gravel	Low	Granular soil deposits. No weathered limestone or cavities identified. Competent bedrock at turbine.
T4	1.1 m	Sandy silt to weathered limestone	Low	Shallow limestone and weathered rock beneath very thin cover. Competent bedrock at turbine.
T5	Limestone boulders/bedrock at 0.8 m	Gravel/Boulders	Low	Shallow limestone and weathered rock beneath very thin cover. Competent bedrock at turbine.
T6	Bedrock at 2.35 m	Sandy silt with cobbles	Low	Shallow limestone and weathered rock beneath very thin cover. Competent bedrock at turbine based on geophysics.
T7	3.1 m	Limestone gravel over weathered limestone	Low	Weathered limestone profile identified. Rockhead is deeper. Competent bedrock at turbine based on geophysics.
T8	Not proven to 1.7 m	Silty sand and gravel	Low	Granular deposits. No evidence of weathered rock or dissolution features within GI. Competent bedrock at turbine based on geophysics.
T9	Weathered rock at 2.9 m; limestone at 4.9 m	Limestone gravel over weathered limestone	Low	Weathered rock profile indicates prolonged dissolution/weathering processes. Deeper competent rock.
T10	Weathered limestone from 4.1 m	Limestone gravel	Moderate	Thick zone of weathered limestone between 4.1 m and 7.3 m. The weathered limestone encountered is described as: Very strong to strong limestone; Point load strengths of approximately 4.1-4.5 MPa Is(50), indicating strong rock material. One karst feature within 250 m.

Location	Rockhead Depth	Overburden Type	Karst Susceptibility	Assessment
T11	Bedrock at 0.7 m	Gravel	Low	Shallow granular deposits only. No karst indicators in GI.
T12	Bedrock at 0.8 m	Gravelly silt	Low	No karst indicators in GI.
T13	Bedrock at 2.7 m	Sandy silt over limestone gravel	Moderate	Similar to T1. Shallow limestone and relatively thin overburden
110 kV Substation	Bedrock >1.6m	Sandy silt over limestone gravel	Low	Similar to T1. Shallow limestone and relatively thin overburden

The assessment matrix below in Table 4-4 demonstrates that areas classified as medium karst susceptibility are primarily associated with shallow limestone bedrock, localised weathering and limited overburden thickness rather than confirmed karst voids or active dissolution features. No cavities, open conduits or collapse features were encountered during drilling, trial pitting or geophysical investigations.

Consequently, the identified risks are considered suitable for construction of turbine foundations and hardstands through conventional geotechnical design and the implementation of the Karst Encounter Protocol during construction.

Table 4-4 Karst Risk Assessment Matrix

Location	A	B	C	D	E	F	Hazard Score	Risk Category
Location	Bedrock type[10]	Geological faults	Overburden thickness	Overburden thickness	Karst feature density – within 250 m	Karst feature density - direct		
T1	2	1	3	1	2	1	12	Moderate
T2	2	1	3	1	1	1	6	Low
T3	2	1	3	1	1	1	6	Low
T4	2	1	3	1	1	1	6	Low
T5	2	1	3	1	1	1	6	Low
T6	2	1	3	1	1	1	6	Low
T7	2	1	3	1	1	1	6	Low
T8	2	1	3	1	1	1	6	Low
T9	2	1	3	1	1	1	6	Low
T10	2	1	3	1	2	1	12	Moderate
T11	2	1	3	1	1	1	6	Low
T12	2	1	3	1	1	1	6	Low
T13	2	1	3	1	2	1	12	Moderate
110 kV Substation	2	1	3	1	1	1	6	Low

[10] See Tables 4-1 to 4-3

An infrastructure-specific review was undertaken to determine whether any element of the proposed wind farm site and 110 kV substation could directly interact with identified karst features or create pathways that may adversely affect the karst environment.

5. MITIGATION MEASURES

5.1 EMBEDDED DESIGN MITIGATION

Karst risk has been addressed at the earliest stages of the project through the iterative site design process. The findings of the desk study, site walkovers, ground investigations and geophysical surveys were used to inform the siting of key infrastructure, with turbines, borrow pit, the proposed 110 kV substation and other permanent infrastructure positioned to avoid identified karst features. In addition, a 30 m buffer around karst features was applied to further limit the potential for karst.

The four mapped dolines and the identified losing stream have been excluded from direct disturbance, and no infrastructure is proposed within these features. Ground investigation results did not identify subsurface cavities, significant dissolution features or evidence of instability beneath the proposed infrastructure locations, further reducing potential geotechnical and hydrogeological risks. Through the application of this avoidance-based design approach, potential interactions with the karst environment have been minimised at source, significantly reducing the requirement for engineering intervention and representing the primary mitigation measure incorporated into the project design.

5.2 CONSTRUCTION PHASE MITIGATION

The findings of the assessment indicate that the majority of the proposed wind farm site/substation can be classed as having a low to medium karst risk. In these locations, it is considered that significant karst development is unlikely, and unstable ground and significant cavities are not anticipated. All proposed infrastructure has been sited to avoid areas of very high karst hazard. Best practice measures as detailed in the Karst Protocol will be implemented if any karst feature is encountered during construction – See Appendix A.

All earthworks will be designed by a suitably qualified Geotechnical Engineer during the detailed design stage and informed by a detailed confirmatory ground investigation. This investigation will include intrusive methods, such as trial pitting and borehole drilling, with a specified suite of in-situ and geotechnical laboratory testing to further assess the engineering characteristics of the infrastructure locations.

Portions of the proposed wind farm site have been classed as having moderate karst hazard, based on professional judgement following site investigation and desktop analysis and proximity to features. In these areas, specific mitigation measures may be required, i.e micropiles and geogrid reinforcement. The following ground investigation works will be carried out at infrastructure locations identified as having medium or greater karst risk:

- Rotary core boreholes to confirm rockhead depth and quality.
- Geophysical Surveying to detect voids and solution features, including:
  - Electrical Resistivity Tomography (ERT)
  - Microgravity; and
  - Seismic Refraction
- Trial pits and dynamic probing to assess near-surface variability and soils.

Mitigation will be implemented at detailed design stage to reduce the karst risk:

- For the turbine foundations, a geotechnical investigation will be carried out at each location prior to works commencing. Surveying will include the drilling of boreholes by rotary core to depth within competent bedrock to determine the strength of rock and assess the potential for karst or weathered rock at each location by a qualified geotechnical engineer to inform foundation design. Micropiles will only be undertaken if geogrid and backfilling is not suitable in areas of weak rock to ensure long term stability, and that the turbine loads are taken to intact rock. A larger number of small piles or micropiles designed with rock sockets to transfer loads via skin friction are preferred in karst landscapes (Rutty & Jennings, 2012, Traylor et al., 2002), rather than a smaller number of large piles relying on end bearing. It is recommended that piles are designed on the basis of transferring loads via skin friction to a rock socket.
- For access tracks and hardstandings, the karst feature inspection protocol documented by Madden & O'Hara (2016), included in Appendix A, is routinely followed for construction of linear infrastructure in karst landscapes. A similar karst feature inspection protocol will be developed and followed during detailed design.
- Where small-scale dissolution and voiding are encountered at turbine foundations during detailed ground investigation, mitigation strategy is the use of drilled or grouted piles. The use of piles transfers structural loads to competent rock beneath karst-affected zones. This approach bypasses voids and weak soils, reducing the risk of differential settlement or collapse.
- Ground stabilisation measures to be employed include compaction, grouting/stabilisation, geotextile or utilising raft foundations. Where weathered limestone or karst is encountered at formation level, the feature will be mapped in detail. Each feature and associated mitigation measure will be documented and included in the safety file. The stabilisation measures will be approved by a geotechnical engineer. Where infilling or grouting is undertaken works will be supervised by a suitably qualified hydrogeologist to ensure there is no effect on groundwater.
- Waltham et al. (2005) outline an approach for the remediation of shallow karst features. This methodology involves adding coarse granular fill to the base of karst feature, and progressive backfilling upwards with progressively finer granular fill. All backfill is to be placed in layers 150 mm deep and compacted. Soil around the doline/sinkhole is to be excavated to a radius of 3-5m, before being replaced and compacted with or without incorporation of anchored geogrid. This methodology has been used effectively on Irish road projects in similar karst terrains in East Galway (Madden and O'Hara, 2016).

  This methodology is applicable to the proposed wind farm site access tracks and shall be implemented if small scale sinkhole features (<5m in depth) are encountered beneath access tracks. No karst features were observed in line with any access track or other proposed infrastructure.

- Where construction takes place in areas of high karst hazard, and if karstic features are identified elsewhere during construction, the following measures shall be implemented:
    - Access tracks will incorporate geogrid-reinforced bridging layers over areas identified as having potential voids or collapse-prone soils.
    - Crane hardstands will be designed with enhanced bridging layers to accommodate high point loads and dynamic stresses.
- Proper drainage control is therefore essential to maintain the stability of foundations and prevent erosion of fill materials. All works will be supervised by a suitably qualified geotechnical engineer or hydrogeologist.

6. CONCLUSION AND RECOMMENDATIONS

The proposed wind farm site is located within a Regionally Important karstified limestone aquifer with bedrock at or close to the surface. Four enclosed depressions and one losing stream were mapped at the proposed wind farm site.

The combination of desk studies, aerial photograph interpretation, site walkovers, geophysical surveys and intrusive ground investigations indicates that significant karst development is limited within the proposed infrastructure areas. No mapped or verified karst features will be directly affected by the development, and no subsurface cavities were encountered during ground investigations. The principal residual risks relate to potential contamination pathways and localised instability associated with weathered limestone zones. Subject to implementation of the drainage design, groundwater protection measures, hydrogeological supervision and Karst Protocol, the residual effects on the karst environment are assessed as not significant. Following the implementation of mitigation measures, the residual risk at each infrastructure location is low.

The assessment incorporates the adopted infrastructure layout, karst avoidance measures and proposed drainage controls. The resulting residual risks are summarised in Table 6-1.

Table 6-1 Karst Infrastructure-Specific Karst Screening Matrix

Infrastructure Element	Presence of Karst Features within Footprint	Residual Risk Rating
Turbine Foundations	None identified, Avoidance of karst features through design	Low
Hardstands	None identified	Low
Borrow Pit	No karst features; shallow groundwater possible	Low
Wind Farm Access Tracks	None identified. Avoidance of karst features through design	Low
110 kV Substation	None identified, Doline approximately 200 m away	Low
Construction Compound	None identified, Avoidance of karst features through design	Low

Following implementation of the proposed mitigation measures, residual risks have been classified according to the potential for interaction with karst features and groundwater pathways. The risk categories provide a consistent framework for evaluating the significance of residual effects and demonstrate the effectiveness of the embedded and proposed mitigation measures. Table 6-1 presents the residual risk classification criteria applied in this assessment

A post-construction monitoring plan will be implemented, including visual inspections, settlement monitoring, and geophysical re-surveys. This proactive approach ensures that any emerging issues are detected and addressed promptly, maintaining the long-term integrity of the wind farm infrastructure.

A suitably qualified hydrogeologist and engineering geologist shall provide supervision during excavation of turbine foundations, borrow pit development and other deep excavations in areas underlain by limestone bedrock. Should evidence of karstification, dissolution features, voids or unexpectedly high groundwater inflows be encountered, works shall cease within the affected area and the Karst Protocol shall be implemented. Any remedial measures, including stabilisation or grouting, shall be implemented to avoid adverse impacts on the hydrogeological regime.

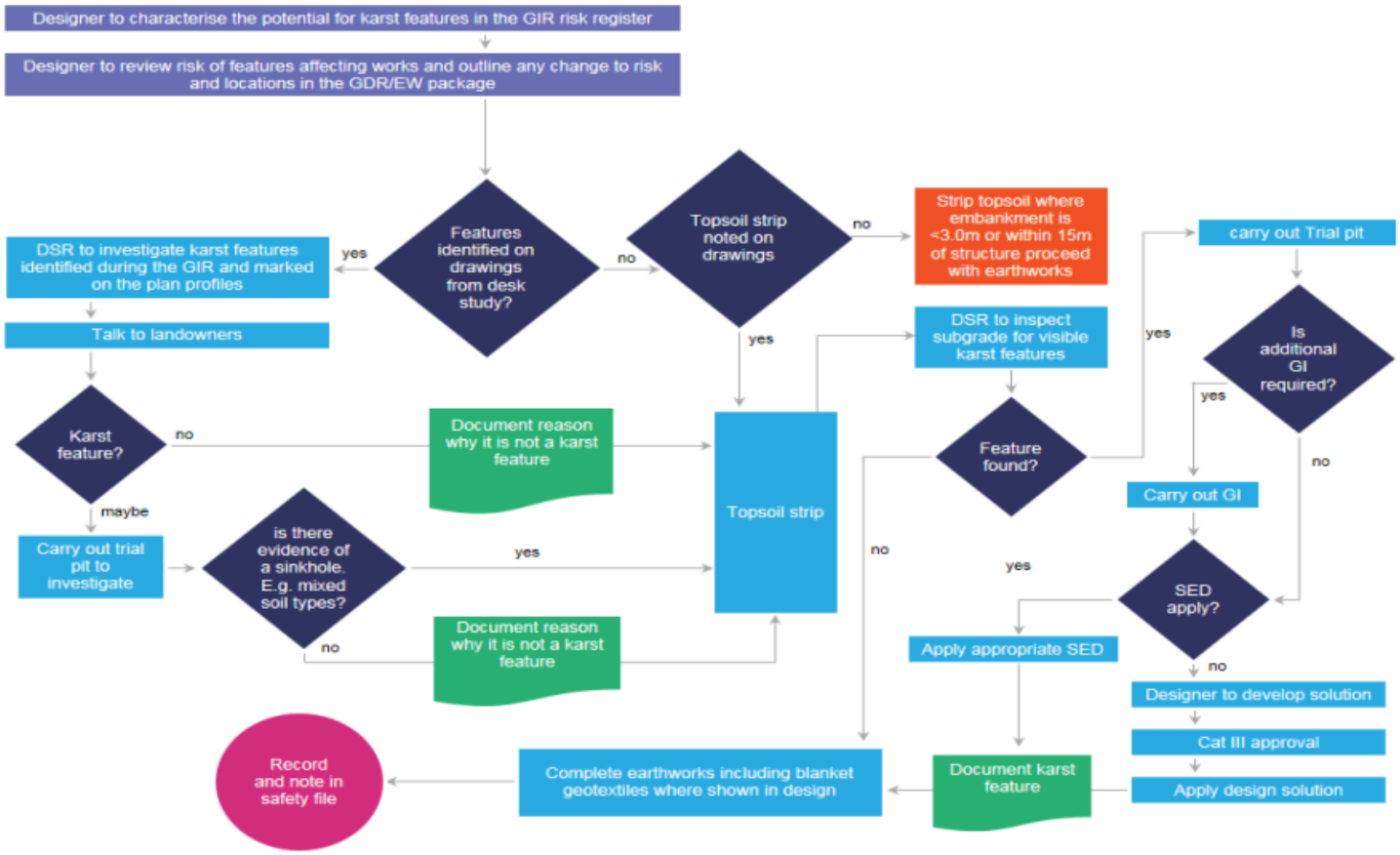
Monitoring shall include routine inspections of excavations, drainage infrastructure, settlement ponds and identified karst features located in proximity to the proposed wind farm site and 110 kV substation. Groundwater levels within monitoring wells shall be recorded during major excavation activities and following significant rainfall events. Any changes in groundwater response shall trigger investigation by a suitably qualified hydrogeologist or geotechnical engineer.

7. REFERENCES

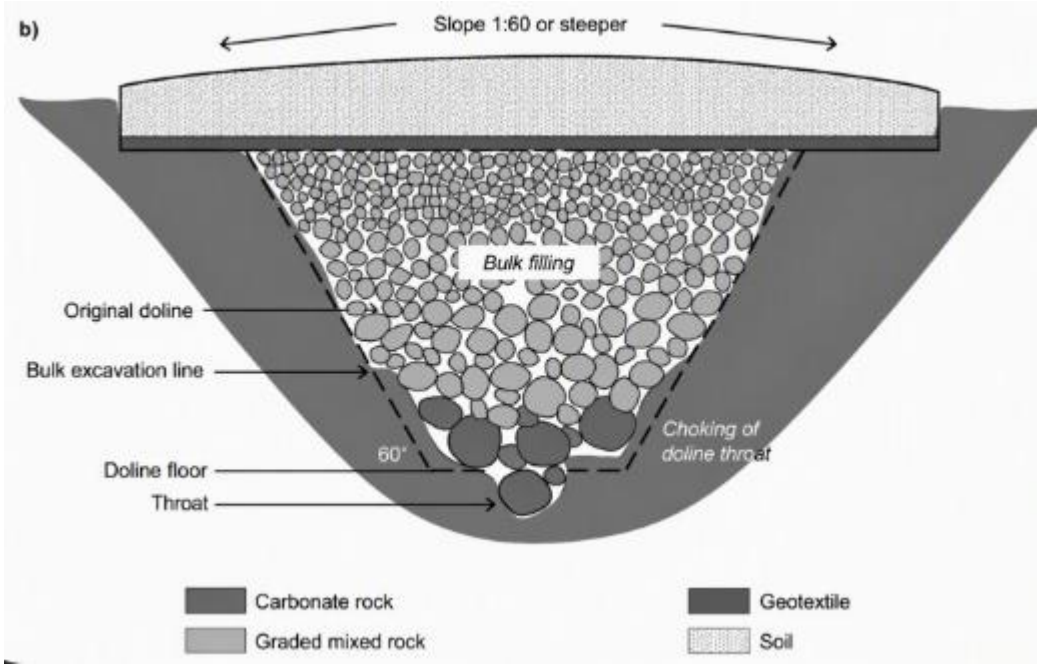
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APPENDIX A – KARST PROTOCOL

Madden and Hara (2016)



APPENDIX B EXAMPLE CONSTRUCTION METHOD





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