GARRANE GREEN ENERGY LIMITED

GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

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DOCUMENT APPROVAL

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CLIENT / JOB NO	Garrane Green Energy Limited	6839
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	Prepared by	**Reviewed /Approved by**
Document Final	Name Sarah Moore	Name David Kiely
Date August 2025	Signature 	Signature 

GARRANE GREEN ENERGY, CO. LIMERICK

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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1 INTRODUCTION

1.1 BACKGROUND TO REPORT

Jennings O'Donovan & Partners Limited, on behalf of Garrane Green Energy Limited has prepared this Construction Environmental Management Plan (CEMP) for the construction of the Project of 9 no. wind turbines, a Permanent Met Mast, a 110 kV Onsite Substation and Control Building; all ancillary works and the construction of an overhead 'loop in' Grid Connection to a 110kV overhead line between Charleville and Limerick. The Project has been designed to ensure that any environmental impacts which may arise can be appropriately mitigated such that there will be no likely significant environmental effects.

This document has been prepared on the basis that this CEMP may be subject to minor amendments and expanded following the appointment of the Contractors for the main construction works. Some items of this CEMP can only be finalised with appropriate input from the Contractors who will actually carry out the main construction works. This CEMP identifies, for the incoming Contractors, the key planning, environmental and contract document constraints that must be adhered to in order to deliver optimum environmental reassurance for the Site.

The preparation of this document, and its continued development, is considered to be an appropriate mechanism to ensure the appropriate management of construction activities in accordance with the relevant environmental requirements.

This document should be read in conjunction with the Appropriate Assessment Screening Report, Natura Impact Statement, Environmental Impact Assessment Report (EIAR), Planning Report, Planning Drawings.

1.2 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP): AIMS & OBJECTIVES

This CEMP has been developed in accordance with the Institute of Environmental Management and Assessment Practitioner "*Environmental Management Plans*", Best Practice Series, Volume 12, December 2008.

The principal objective of this CEMP is to avoid, minimise and control adverse environmental impacts associated with the development of the wind farm. As such, the Contractors commit to safeguarding the environment through the identification, avoidance and mitigation of the potential negative environmental impacts associated with the Project.

This CEMP defines good practice as well as specific actions required to implement the mitigation measures required to comply with the environmental commitments outlined in the EIAR, NIS, the planning process and/or other licensing or consenting processes.

The CEMP will also be developed further, and/or amended where necessary, to take into account any additional information which may be made available from the detailed design process or pre-construction confirmatory surveys within the parameters prescribed in this CEMP and in consultation with the planning authority.

In the event planning permission is granted for the Project, this CEMP will be updated prior to the commencement of the Project, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to An Coimisiún Pleanála for written approval. The contractors will be contractually obliged to comply with all measures identified in this CEMP, as above. This CEMP will form part of the main Civil Balance of Plant (CBoP) Construction works Contract as well as the Electrical Balance of Plant (EBoP) Construction works contract. Garrane Green Energy Limited will take account of the structure, content, methods and requirements contained within the various sections of this CEMP when further developing this CEMP and Management Plans as required by their Contract.

While this version of this CEMP provides a benchmark for good practice, where avoidance or further minimisation of risks to the environment can be demonstrated through use of alternative methods or improvements to current practices, the Contractors will implement these wherever possible, subject to approval from environmental monitoring personnel.

1.3 CEMP DEVELOPMENT & IMPLEMENTATION

This CEMP has been prepared as part of the planning application for Garrane Green Energy. It is a live document on site and will be developed further by the Contractors with site specific method statements and plans as required prior to each phase of the works, as set out above. It is also effectively a document management system for recording information and data relating to environmental checks, reports, surveys, monitoring data and auditing. Upon completion of the construction works, the Contractors will submit a complete electronic copy of the final CEMP to the client for their records. This final CEMP will include electronic scans of all hard copy reports, data, field records and correspondence which are gathered over the course of the construction works.

While version numbers will remain fixed depending on the stage of the Project, it is acknowledged that this CEMP is a continually evolving document which can be updated in

part or whole, at any phase of the Project. Hence, revision and document distribution records are included at the front of each CEMP document to enable individual documents to be updated at any time. A summary of this CEMP development process and the required input from the main parties involved in the post planning and construction of the wind farm are indicated in **Figure 1.1**. The Contractors will be responsible for further development of this CEMP in line with other relevant licenses and consents. This may involve liaising with statutory bodies where appropriate. This CEMP will only be updated in line with the parameters in this version of the CEMP or to incorporate any planning conditions.

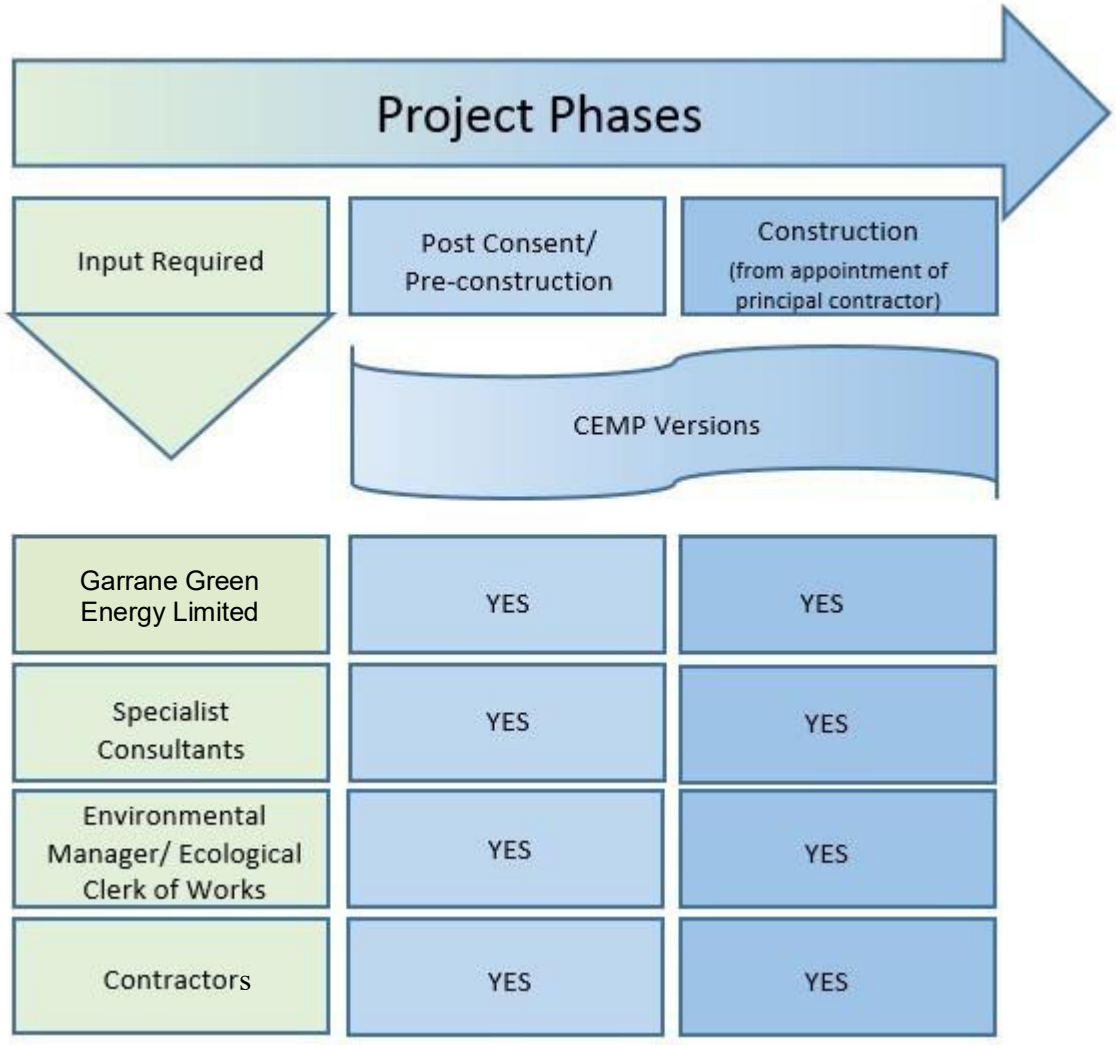

Figure 1.1 Summary of CEMP Development Process

1.4 CEMP ROLES & RESPONSIBILITIES

Prior to commencement of construction works, Garrane Green Energy Limited will identify a core Environmental Management Group, comprising of specific project personnel (Environmental Manager and Ecological Clerk of Works) .The Environmental Management Group will meet monthly to discuss the monthly environmental report and will advise site personnel on areas where improvements may be made on site. The group will draw on technical expertise from relevant specialists where required.

Garrane Green Energy Limited will appoint an Ecological Clerk of Works who will be responsible for coordination, compliance monitoring and continued development of this CEMP and any other surveys, reports or method statements required. The Ecological Clerk of Works will also review the Contractors' method statements and environmental plans as required by this CEMP, carry out compliance auditing during the construction phase and coordinate the Environmental Management Group and required liaisons between Garrane Green Energy Limited, An Coimisiún Pleanála and other statutory authorities.

The Contractor will appoint an Environmental Manager who will be responsible for coordination, compliance monitoring and any further necessary minor amendments of this CEMP and any other surveys, reports or construction management plans required for discharge of relevant pre-commencement planning conditions. In conjunction with the Ecological Clerk of Works, the Environmental Manager will also review the Contractor's construction management plans, method statements and environmental plans as required by this CEMP, carry out compliance auditing during the construction phase and coordinate the Environmental Management Group and required liaisons between the Developer the Contractor and other statutory authorities.

Garrane Green Energy Limited will appoint a Project Manager to monitor the construction phase of The Project and ensure works are being carried out in accordance with the agreed method statements, safety procedures and pollution control measures. The Environmental Management Group will liaise regularly with the Project Manager.

1.5 CEMP STRUCTURE

This CEMP is divided into distinct sections which are designed to be filed as separate documents / folders if required. A copy of the CEMP documents / folder(s) will be kept in the site offices for the duration of the site works and will be made available for review at any time. The Ecological Clerk of Works/Environmental Manager will be responsible for the CEMP and will keep all sections updated throughout the construction phase.

Where a Contractor has standard documents within their own company / corporate Environmental Management Plans which cover a particular requirement of this CEMP, these will be reviewed by the Ecological Clerk of Works to confirm that they are appropriate and sufficient to meet the environmental commitments outlined in the EIAR and NIS, and in the event that they do meet these requirements the documents will either be inserted or inserted or cross referenced within the relevant Section of this CEMP.

The CEMP Sections are listed in **Table 1.1** as follows:

Table 1.1: CEMP – Document Structure

Section	Title & Brief Description	Contractors Development Required
1	**Introduction**	No (Information purposes only)
2	**Project Information** Provides details on site location, scheme description and a summary of the environmental sensitivities at the Site (as derived from the Appropriate Assessment Screenings and other information where available).	No (Information purposes only)
3	**Environmental Controls** Provides details on relevant Planning Consent Conditions and mitigation measures outlined in the EIAR and NIS. Any documents prepared by Garrane Green Energy Limited in response to Consent Conditions will be recorded in Table 3.9. Table 3.10 contains a Register of Variations.	**Yes** Any documents prepared by the Contractors in response to Consent Conditions will be recorded by the Contractors in Table 3.9 and inserted in this CEMP where necessary. Variations to this CEMP required during the works will be recorded by the Contractors in Table 3.10.
4	**Environmental Communications Plan** Contains details on specific requirements relating to: • Contact details for Garrane Green Energy Limited, personnel, technical specialists, Contractor's personnel, regulators, landowners, other stakeholders etc.; • Meetings, reports and consultations; • Roles and responsibilities; and • General reporting procedures and tasks.	Yes The Contractors will: i) Insert contact information for regulatory authorities and other stakeholders (where not already provided) into Table 4.1 ii) Refer to Table 4.2 for details on requirements for meetings, reports and consultations iii) Insert information on Contractors appointments and responsibilities relating to environmental management and implementation of this CEMP into Table 4.3. iv) Refer to Figure 4.1 for a summary of the main communication lines.
5	**Correspondence, Records, Reports** This Section relates to document control and retention of records. The information at the start of Section 4 provides: • A list of all documents to be retained / filed within this CEMP.	**Yes** The Contractors will complete Table 5.1. Throughout the duration of the Contract, the Contractors will insert / file all communication records, data, field records and reports associated with

Section	Title & Brief Description	Contractors Development Required
	Table 5.1 provides a record of all Environmental Consents, Licenses and Permits issued for The Project.	Environmental Management and implementation of this CEMP into this Section 5. This Section may be sub-divided into sub-folders for specific information relating to discrete areas of Environmental Management (such as waste management, pollution prevention, water quality monitoring, ecology etc). Alternatively, this information may be filed within the individual Management Plans in Section 6. The filing method selected by the Contractors will be made explicit at the start of Section 5.
6	**Management Plans & Available Information** Management Plans include the following: • MP1 Emergency Response Plan (ERP) • MP2 Water Quality Management Plan (WQMP) • MP3 Surface Water Management Plan • MP4 Spoil Management Plan • MP5 Waste Management Plan • MP6 Decommissioning Plan • MP7 Method Statement for Crossing Industrial Pipeline	**Yes** The Contractors are required to develop the Management Plans and/or include additional information or method statements as appropriate and where required by the Contract. The development of the Management Plans will generate more site-specific documents which address particular environmental management procedures applicable for works in specified areas of the Site. These Management Plans form the Contractors' Environmental Plans (for example, Spoil Management Plan). Table 6.1 lists all Management Plans and provides information on Contractor's responsibilities.

2 PROJECT INFORMATION

2.1 SITE LOCATION AND SCHEME DESCRIPTION

The Site, as shown in **Figure 2.1**, is located within an agricultural landscape. The Site is comprised of agricultural pastures with fields separated by hedgerows. The Site is located 22.9km south of Limerick City, 46.9km north of Cork City and 2.5km (closest turbine) north of Charleville, Co. Cork.

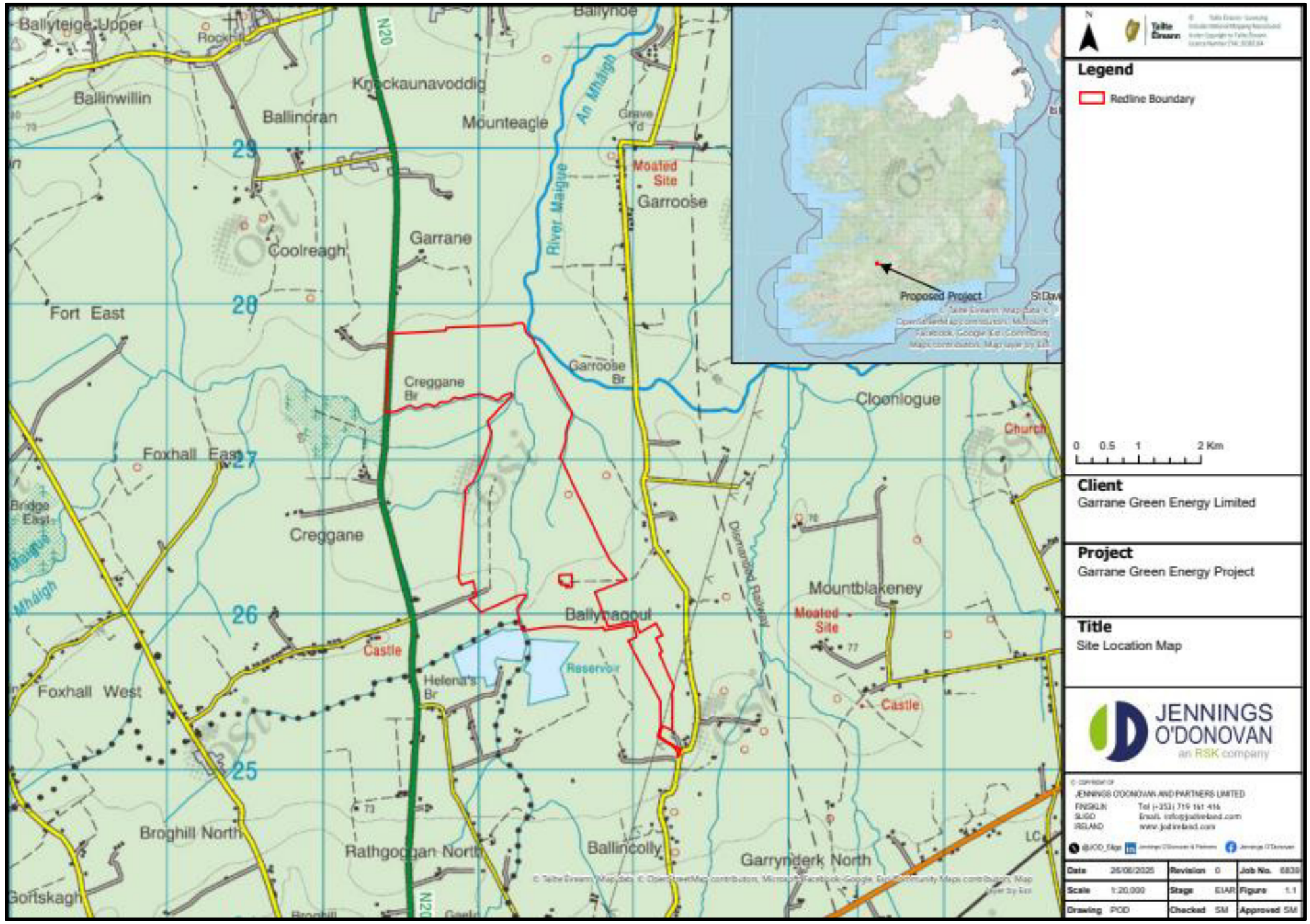

Figure 2.1: Map showing the location of Garrane Green Energy Project and Grid Connection (Ref EIAR Figure 1.1)

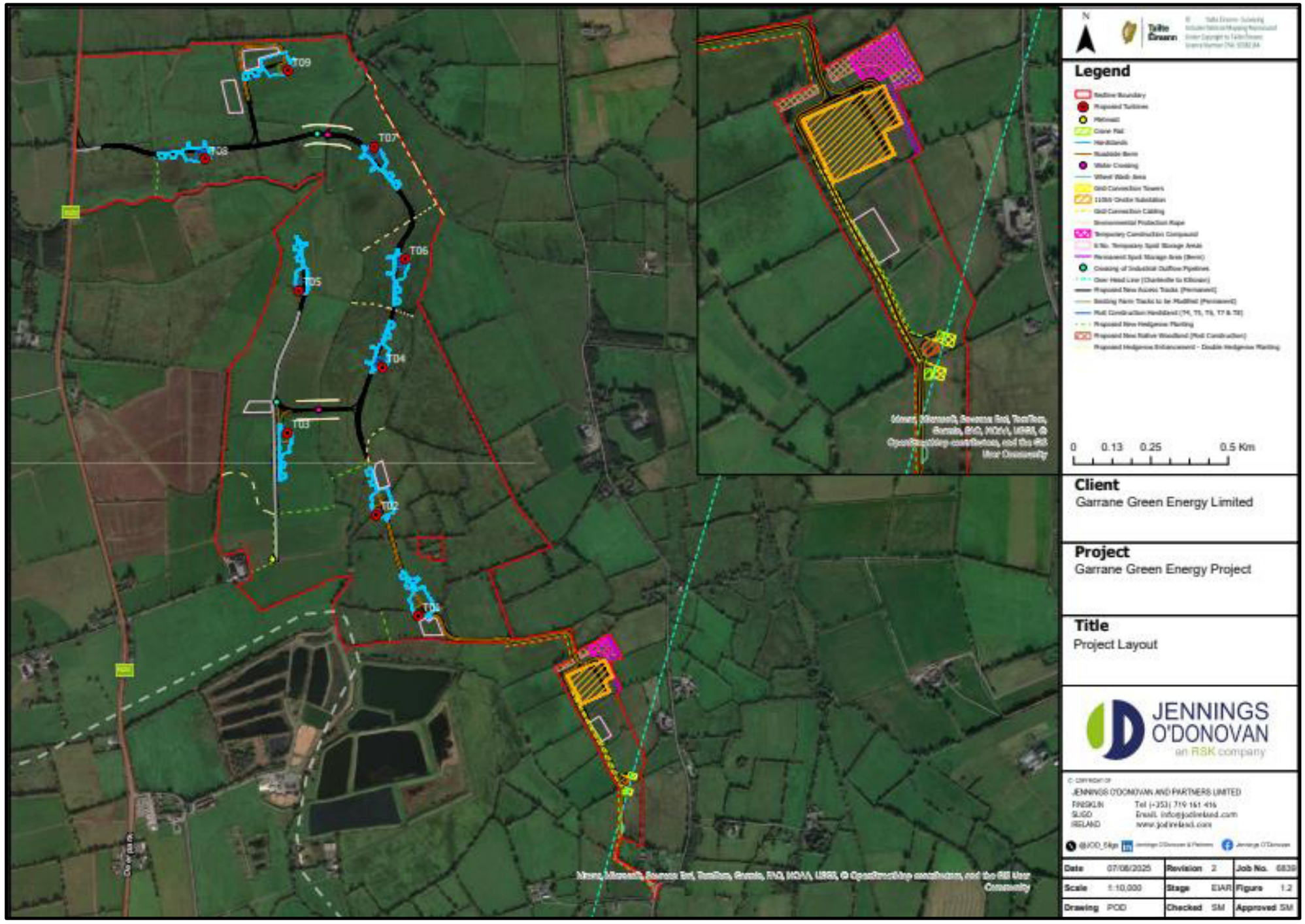

Figure 2.2: Site Layout of Garrane Green Energy Project (Ref EIAR Figure 1.2)

The Project will consist of the following:

- Erection of 9 No. wind turbines with a tip height of 170m. The wind turbines will have a rotor diameter of 150m and a hub height of 95m.
- Upgrade of existing Access Tracks and construction of new permanent Access Tracks, permanent turbine hardstand areas and turbine foundations.
- Construction of two new bridge crossings on-site, one over the River Maigue and one over the Charleville Stream.
- Upgrade of existing site drainage network and installation of new site drainage.
- Wind Farm Internal Cabling connecting the wind turbines to the electrical substation.
- Construction of a permanent on-site AIS 110kV Substation, with a 'loop in' Grid Connection to the existing 110kV overhead line between Charleville and Killonan, including two single-storey control buildings with welfare facilities, all associated electrical plant and equipment, security fencing, gates, signage, all associated underground cabling, private well for water supply, wastewater holding tank, and all ancillary structures and works.
- Construction of a permanent double circuit 110kV underground cable and two steel cable interface masts to connect to the existing overhead line OHL.
- Erection of a permanent 60m Meteorological Mast for monitoring wind speeds.
- Construction of a Temporary Construction Compound for use during construction.
- Upgrade of the existing entrance on the N20 (Site Entrance 1) (to be used for abnormal loads and turbine component delivery) and upgrade of an existing site entrance on the L1537 (Site Entrance 2) (to be used for all construction traffic except for abnormal loads and turbine component delivery).
- 6 No. temporary spoil storage areas and 1 No. permanent spoil storage area.
- Biodiversity enhancement and improvements associated with the Project.
- Landscaping, fencing and all associated ancillary works.

3 ENVIRONMENTAL CONTROLS

This CEMP sets out the key environmental considerations to be taken into account by the contractor during construction of the Project. This CEMP details the mitigation measures to be implemented in order to comply with the environmental commitments outlined in the EIAR, NIS and associated documents, and the applicable guidance documents and best practice measures as listed below. The contractor will be contractually obliged to comply with all measures outlined in this CEMP. In the event planning permission is granted for the Project, this CEMP will be updated prior to the commencement of the Project, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to An Coimisiún Pleanála for written approval. This CEMP will be adhered to and further developed by the Contactor and will be overseen by the Project representative/foreman.

Guidance Documents

The guidance documents listed below must be complied with by the appointed Contractor.

- Construction Industry Research and Information Association (CIRIA) (2006) Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London.
- CIRIA (2006) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).
- COFORD (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- CIRIA (2015) SuDS Manual, (CIRIA Report C753, 2015)
- Coillte (2009): Forest Operations & Water Protection Guidelines.
- Department of Agriculture, Food and the Marine (2018) DRAFT Plan for Forests & Freshwater Pearl Mussel in Ireland – Consultation Document.
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh.
- Forest Services (2006) Draft Plan for Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forest Service (2000) Forestry and Water Quality Guidelines. Forest Service,
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- GPP1 (2020) Understanding your Environmental Responsibilities – Good environmental Practices, NetRegs.
- GPP 5 (2018) Works and Maintenance In or Near Water, NetRegs.

- GPP21 (2021) Pollution Incident Response Planning, NetRegs.
- GPP 22 (2018) Dealing with Spills, NetRegs.

3.1 HUMAN BEINGS AND COMMUNITY

The assessment set out in **Chapter 5: Population & Human Health** has not identified any likely significant effects from the Project on population or human health.

The main mitigation measure is by design or avoidance. A suitable separation distance from turbines and other key infrastructure to properties has been embedded in the EIA Project design. Additional mitigation to protect site personnel and the public will also be implemented.

These are:

- Turbines will be procured from a reliable manufacturer and will have undergone vigorous safety checks during design, construction, commissioning and operation.
- Physical and visual warnings such as signs will be erected at access points and close to turbines for the protection of site personnel and the public.
- Facility for remote turbine deactivation will be provided.
- Access to turbines for site personnel will be restricted in storm events. Where access by site personnel is required the following safety precautions will be implemented: remotely shutting down the turbine, yawing to place the rotor on the opposite side of the tower door and parking vehicles at a distance of at least 100 m from the tower. All personnel will be fitted with appropriate Personal Protective Equipment. Regular maintenance and inspections will take place during the 35-year operational phase. The final turbine model chosen will be in line with International Electrotechnical Commission 61400-1 safety standards. Maintenance visits will take place as needed with the Supervisory Control and Data Acquisition (SCADA) control system monitoring turbine performance remotely. If a fault occurs, then a message is automatically sent to the operations personnel preventing emergency situations. Warning signs and security infrastructure will be in place around the onsite switchgear and control building to provide for public safety.
- Access to the turbines will be via the door at the base of the turbines. The turbine access door will otherwise be securely locked at all times.
- Measures are set out in **Chapter 17: Transport and Transportation** relating to how delivery of goods and services would be managed during works to minimise impacts.
- All machinery and relevant equipment shall be in compliance with The Machinery Directive (2006/42/EC).

3.2 ECOLOGY

All mitigation measures have been developed in the context of national and international legislative guidance for the protection and management of flora, habitats of conservation importance, fauna and aquatic ecological interest.

Guidelines to be adhered to in the delivery of this CEMP and method statements are as follows:

- *'Guidelines on protection of fisheries during construction works in and adjacent to waters'* (Inland Fisheries Ireland, 2016)
- *'Guidelines for the treatment of Badgers prior to the construction of National Road Schemes'* (National Roads Authority, 2005)
- *'Guidelines for the protection and preservation of trees, hedgerows and scrub prior to, during and post construction of National Road Schemes'* (National Roads Authority, 2006a)
- '*Guidelines for the treatment of bats during the construction of national road schemes'* (National Roads Authority, 2006b)
- *'Guidelines for the treatment of Otters prior to the Construction of National Road Schemes'* (National Roads Authority, 2006c)
- *'Guidelines for the crossing of watercourses during the construction of national road schemes' (*National Roads Authority*, 2008)*
- *'Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'* (National Roads Authority, 2010)

The description of mitigation measures is provided in terms of mitigation by avoidance, reduction and remediation.

3.2.1 Ecology Mitigation Measures

3.2.1.1 Designated Sites

The mitigation proposed to maintain water quality in the watercourses which drain the area of the proposed Project are detailed in the **Chapter 7: Aquatic Ecology,** in **Chapter 10: Hydrology and Hydrogeology**, and in **Sections 3.2.3** and **3.4** of this **CEMP**. The mitigation measures which are required to ensure that there are no adverse effects on the Conservation Objectives of the European Site are also contained within the accompanying NIS. The implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative measures have been incorporated into the project design in order to minimise potential significant adverse impacts on water quality at the Site.

Within the Site all turbine locations and associated infrastructure have a buffer zone of at least 50 m from watercourses, with a 10 m buffer to drainage channels see **Section 3.4**. No works will take place within these buffer zones except for the watercourse crossings on the access track network. Implementation of such buffer zones will result in the avoidance of sensitive hydrological features. Direct discharges to surface waters of dewatered loads will not be permitted under any circumstances. This in turn will avoid or reduce the potential for adverse impacts on downstream designated sites.

All of the mitigation measures described in the above-mentioned EIAR chapters are contained in this Construction and Environmental Management Plan (CEMP). The CEMP provides a contractual commitment to mitigation and monitoring and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental commitments of the Project will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later phases, such that there will be a robust mechanism in place for their implementation. The CEMP addresses the construction phase, and will be continued through to the commissioning, operation and final Decommissioning phases.

An Ecological Clerk of Works (ECoW) with experience in overseeing wind farm construction projects will be appointed by the Contractor for the duration of the construction phase to ensure that the CEMP is effectively implemented and that all planning conditions relating to biodiversity are complied with. An Environmental Manager will be appointed by Garrane Green Energy Limited to oversee the environmental management of the Project, advise on the environmental issues and ensure compliance by the Contractor.

3.2.1.2 Habitats Loss

The principal significant impact on habitats as a result of the proposed Project is the loss of 1,649m of hedgerows, which includes 692m for provision of bat buffers where required.

This loss will be mitigated by the planting of 1,620m of new hedging, enhancement of 1,359m of existing hedging and re-vitalisation of 4,074m of hedging within the Redline Boundary of the Site. Details of the planting programme, along with hedgerow enhancement measures and the planting of native woodland, are given in the Biodiversity Enhancement and Management Plan (BEMP) (see **EIAR Appendix 6.2**).

The described hedgerow replacement within the site is in line with Objective EH O10 “Trees and Hedgerows” of the Limerick Development Plan 2022-2028.

Full details of the new planting programme are given in the BEMP. The following key points are noted:

- The planting will follow best practice, including guidance from the Department of Agriculture, Food and the Marine ACRES scheme.
- The programmes within the BEMP will be overseen by an ecologist.
- New plantings will consist of native Irish species from Irish genetic stock (certified Irish).
- The species will reflect the existing species diversity in the immediate and wider areas, and will include hawthorn, blackthorn, willows, poplar, hazel, holly, rowan, alder, guelder rose and spindle. Formerly ash would be used as a principal tree standard but is not being planted due to ash dieback disease. Instead, sessile oak (*Quercus petraea*) is a suitable species. See EIAR **Appendix 6.2** for full list of species.
- The new plantings will connect in with existing hedging on site so as provide corridors for wildlife.
- The plantings will be fenced off from livestock at least until they are fully established.
- Monitoring will occur and any plants that fail will be replaced on an annual basis.

3.2.1.3 Protection of Hedgerows and Trees

The implementation of buffer zones of 50 m from watercourses and 10 m from drains will protect associated hedgerows and trees from potential disturbance during the construction phase.

Elsewhere on site, hedgerows will be protected from potential disturbance, including storage of materials, by the implementation of a 5m buffer zone parallel to the base of the hedge.

Individual mature specimen trees will be protected from possible root damage by the implementation of an exclusion zone to the outer edge of the canopy (often termed the drip-point). This will be marked by a suitable temporary fence erected prior to the commencement of works.

The Ecological Clerk of Works will ensure the implementation of the above protective measures, which will be maintained throughout the construction phase.

3.2.1.4 Habitat Disturbance

At the end of construction, disturbed surfaces adjoining the wind farm infrastructure (hard stands, tracks etc) will be re-profiled and landscaped according to the Spoil Management Plan (Management Plan 4 of this CEMP). The objective is to re-vegetate the areas of bare soil surfaces as quickly as possible so as to minimise the risk of soil run-off.

Topsoil originally excavated from the work locations and stored in the dedicated spoil storage areas will be used, as such will still contain a seed source as well as underground parts (rhizomes etc.) of species such as yellow iris. In the wetter areas, it is likely that rushes, especially soft rush, will dominate any bare surface within 1-2 seasons.

3.2.1.5 Otter

While there was no evidence of otter breeding sites within the site area, there are otter forages within the various watercourses associated with the Site, as well as downstream of the Site. Such populations could be affected adversely by pollutants entering the watercourses as a result of activities associated with the Project and especially during the construction phase.

The mitigation proposed to maintain water quality in the aquatic zones (as detailed in the **Chapter 7: Aquatic Ecology** & **Chapter 10: Hydrology and Hydrogeology**, and **Section 3.2.3** and **3.5** of this **CEMP**) will ensure that the food supplies for otters within local watercourses are not affected by contaminants generated by the proposed Project.

A confirmatory survey for otter breeding sites will take place at the crossing locations (upstream and downstream on both banks) prior to the commencement of works on site to ensure that otter holts have not been established since the baseline survey.

3.2.1.6 Badger

Whilst no signs of badger presence were found within the proposed Project Site during the baseline surveys, badger does occur in the wider area and distribution of local populations can change over time.

Should more than 36 months have elapsed since the baseline surveys in 2023 and the projected date for commencement of construction, a pre-construction confirmatory survey will be undertaken in accordance with NRA Guidance (NRA 2006; NRA 2009b). This will focus on the areas of the site where works will take place (to a distance of approximately 100 m).

Should an active sett be located within a 50 m distance of the works area, mitigation will require the closure of the sett (in consultation with NPWS) or the enforcement of a restrictive zone to prevent disturbance to underground tunnels. The ecologist would advise on the appropriate mitigation taking into account the type of sett (i.e. main, secondary, outlier) and the proximity of any works. This procedure would be carried out in strict accordance with relevant legislation and guidance.

3.2.1.7 Common Frog

The common frog is widespread within the Site occurring in drains and wet fields. Areas where construction works are due to commence during the period February to August will be checked by the ECoW for the presence of frog spawn, tadpoles and adult frogs. If present, these will be removed under licence from NPWS and transferred to suitable ponds, drains or wetlands in the vicinity and away from the construction footprint.

3.2.1.8 Bats

3.2.1.8.1 Buffer zone

Bats typically use hedgerows/treelines and woodland edge habitats for commuting and feeding purposes. Various publications provide guidelines on buffer zones surrounding turbines to reduce the favourability of the site for bat activity. Eurobats 'Guidelines for consideration of bats in wind farm projects' (Rodrigues, et al., 2015) recommend buffer zones of 200 m from turbine base to high potential features, whilst Natural England Bats (England, 2014) recommend 50m buffers from blade tip to tree. NIEA (2021) recommends a minimum buffer of 100 m between the turbines at the edge of commercial forestry where wind farms are proposed to be key-holed.

The proposed Garrane Green Energy Project is situated within habitats dominated primarily by grassland with accompanying treelines and hedgerows. The proposed wind turbines; Vestas V-150, have a hub height of 95m and has a blade length of 75 m. Should the typical 50 m buffer be put in place it would require a buffer of 103 m from the turbine base where treelines are affected and 96 m buffer when hedgerows are impacted.

The following formula is used to calculate the distance required from the turbine base.
√((50+BL)^2-(HH-FH)^2)

Buffer for treelines	√((50+75)^2-(95 – 25)^2)
	103m buffer zone for treelines
Buffer for hedgerows	√((50+75)^2-(95 – 15)^2)
	96m buffer zone for hedgerows

Where: bl = blade length, hh = hub height, fh = feature height (all in metres).

Based on a review of aerial photographs, a review of the habitat map and ground truthing, Turbines 1, 2, 5 and 9 should have a clearing of **103m** given these are surrounded by treelines, while all others require a **96m** buffer. Not all treelines and hedgerows within the buffers will be removed as the loss is deemed too high given the ecological value these hedgerows and treelines have in a local context. As such alternative mitigation measures

have been proposed to reduce bat fatalities while retaining portions of these features (see **Table 3.1** & **Figure 3.1**).

Table 3.1: Portions of hedge / treelines to be felled and retained within buffer of turbines (Ref: EIAR Appendix 6.1 - Table 3-1)

Turbine no	*Buffer Size*	*Notes*	*Length of hedgerows / treelines to be removed (m).*
1	***103***	Treelines can be found to the north, east and south of the turbine. These treelines are of value to Natterer's bats. 25% of the 2022 static recordings from Natterers calls were from detector 12 located to the south of T1. Unexpectedly, very low numbers of Natterer's bats were recorded from D1 2023, located by the proposed turbine (3 calls) however 19% of Myotis calls from the 2023 surveys were recorded from here. A portion of these will have been from Natterer's bats. **Given the value of the southern and eastern treelines for these bats it is proposed to retain these and strengthen curtailment. Both southern and eastern treelines are not located in areas that would draw bats into the sweep zone.**	***170m close (treeline)***
2	***103***	The proposed turbine is located adjacent to a treeline from the western Charleville stream heading north-east past the turbine location. The 103m buffer encompasses a treeline to the south leading towards the derelict dwelling where a Natterer's roost was found. Detector 11 2022 was placed along this treeline, 83m from the roost building. The detector recorded a total of 28 Natterers over the 5 periods and represent 8% of the total Natterers calls for the 20-22 season. This indicates Natterer's were only occasionally utilising this treeline during this period. Similarly, detector 2 2023 located top the NW of the proposed turbine only recorded 2 Natterers bats over the 2023 period. **It is proposed to remove the treeline adjacent to the turbine but retain treelines along the stream to the east and the southern treeline and instead strengthen curtailment. Both treelines provide good connectivity for bats without drawing bats into the turbine sweep area.**	205m (treeline) 20m hedge to N
3	***96***	Hedge being removed provides connectivity E-W between Charleville stream and western treeline. Compensationary hedgerow will be planted to south of turbine which will connect stream and western treeline. At this point, the Charleville stream has a nice associated treeline in comparison to the existing.	***150m***
4	***96***	The proposed turbine is located within the centre of a field with little landscape features surrounding. The closest hedgerow / treeline is a gappy hedge found 65m to the east.	***130m (hedgerow)***
5	***103***	***A gappy hedge just to the north of the proposed turbine will be removed. This provides E-W connectivity between the Charleville and Graigues streams. A portion of hedge along the Graigues stream (to the west of the turbine) within the 103m buffer will be retained as these have value as a landscape feature. Instead, curtailment will be strengthened. As compensation for the loss of the hedge, the eastern stream will be supplemented with riparian type treelines.***	174m hedge
6	***96***	The proposed turbine is located within the centre of a field with little landscape features surrounding. ***An eastern hedgerow / treeline can be found some 75m from the proposed turbine. This hedge follows the Loobagh drain/ stream and would not act to draw bats into the turbine. Instead of felling, curtailment will be strengthened.***	***0***
7	***96***	*While the turbine is proposed for the centre of a field there is a hedge to the east within the buffer zone.* ***Instead of felling, curtailment will be strengthened.***	***0***

Turbine no	***Buffer Size***	***Notes***	***Length of hedgerows / treelines to be removed (m).***
8	***96***	*A hedgerow located 18m to the north will be removed to achieve a buffer surrounding the turbine. Compensatory planting to the east and west will provide mitigation.*	***185m***
9	***103***	*The proposed turbine is located within the centre of a field with little landscape features surrounding. A northern hedgerow / treeline can be found some 80m from the proposed turbine. This E-W hedge would not act to draw bats into the turbine.* ***Instead of felling, curtailment will be strengthened.***	***0***
Length			1014m
Hedgerow losses accrued from civil works outside bat buffers[1]			601m
Total			1.649km

[1] Crossover exists where some of the hedgerows proposed for removal due to bat buffers would have had to be removed to allow construction. The total figure of 1.649km is correct

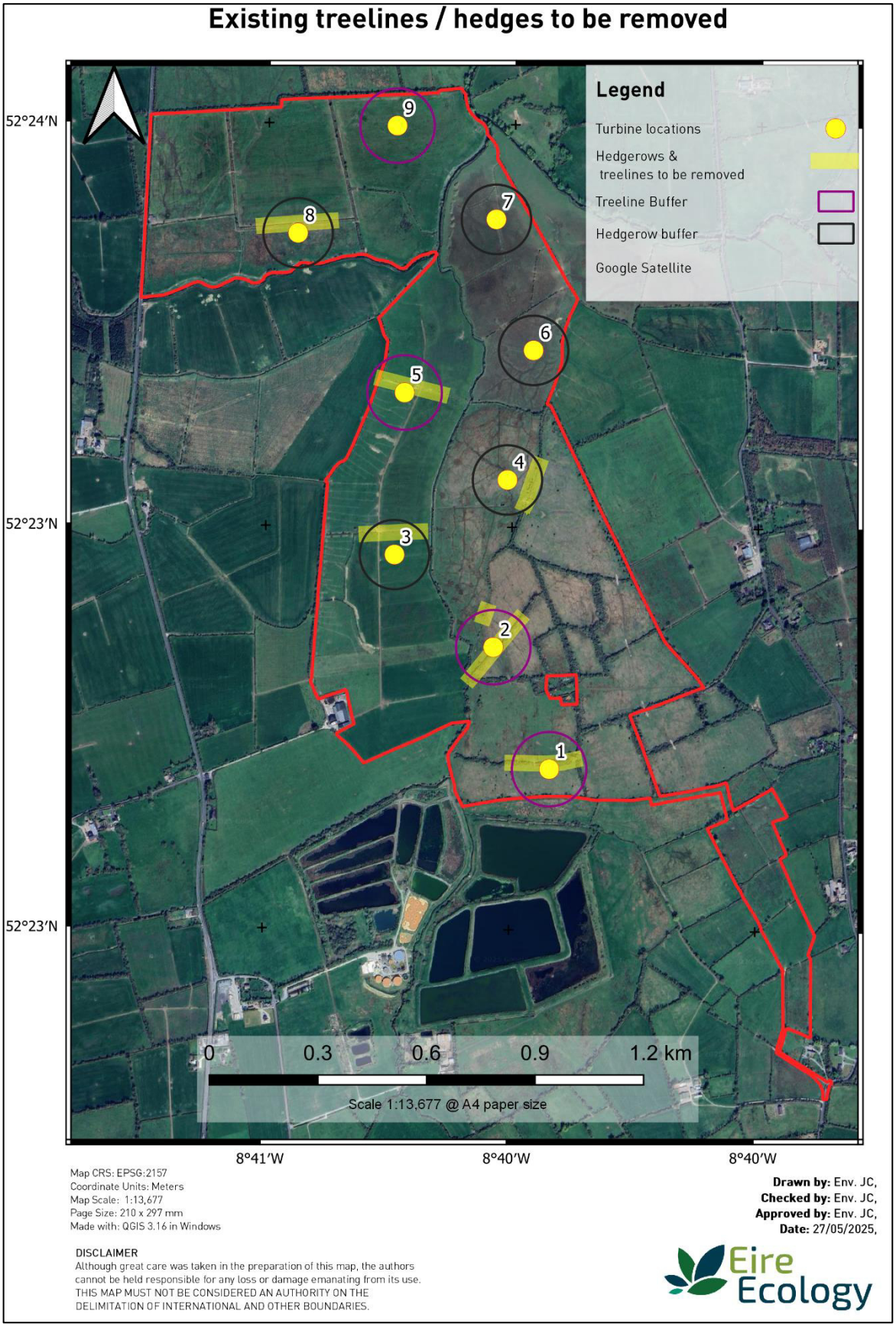

Figure 3.1: Existing Treelines/Hedges to be Removed (Ref: EIAR Appendix 6.1 – Figure 7.2)

3.2.1.8.2 Habitat loss replacement

To offset the loss of hedgerows and trees which are used for foraging by bats, as well as offsetting the loss of connectivity along commuting routes, a hedgerow replanting scheme will be undertaken within the Site (see **Section 3.2.1.2** above). This will involve the planting of 1,620m of hedging to replace the loss of approximately 1,630.5m. The enhancement of existing hedgerows and treelines and the planting of a native woodland plot will also be undertaken as part of a Biodiversity Enhancement Management Plan (BEMP) (**EIAR Appendix 6.2**).

3.2.1.8.3 Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Construction operations within the Site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. However, some works may occur during hours of darkness but the Environmental Manager/ECoW shall limit night-time works to sections of the Site which avoid sensitive features (e.g. mature treelines). Where lighting is required, directional lighting, i.e. lighting which only shines on work areas and not nearby countryside, will be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

3.2.1.9 Invasive Species

While the baseline surveys did not record the presence of any Third Schedule invasive species within the Site, best practice measures will be taken throughout the construction phase to prevent the introduction or spread of invasive alien species. The commencement of works will be preceded by a confirmatory survey for invasive species, especially Japanese knotweed, Giant Hogweed and Gunnera species.

During construction, the following best practice measures will be implemented:

- Good construction site hygiene will be employed to prevent introduction of invasive plant species by thoroughly washing vehicles prior to entering the site
- Any soil or topsoil required on the site will be sourced only from a stock that has been screened for the presence of invasive species
- Should the presence of an invasive species be detected, the treatment and control of same will follow guidelines issued by the National Roads Authority - The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (NRA 2010).

3.2.2 Ornithology Mitigation Measures

From the early stages of the Project design development, an iterative process of a constraints led design was employed, whereby ecological information was utilised to avoid impacting potentially important ornithological features where possible.

Likely impacts on ornithological features were a contributing factor to the determination of the Site, with the selected Site generally comprising relatively low suitability habitat for breeding and non-breeding birds and therefore being unlikely to support particularly notable bird populations. Areas of greater importance to avian features (e.g., waterbodies, mature trees and hedgerows) will be retained where possible within the design of the Project. The Project has been designed to minimise the extent of habitat loss required.

The Project design has followed the basic principles outlined below to eliminate the potential for significant effects on ornithological features.

Best practice construction measures will be adopted to minimise potential construction impacts on bird populations. These are detailed within this CEMP and include measures to minimise working areas to avoid alteration of hydrology, unnecessary habitat removal/alteration and disturbance, and measures to avoid/minimise the generation of additional noise, dust, light spill and vibration. Whilst significant effects on barn owls are not anticipated, works will aim to avoid the use of artificial lighting of suitable habitat (i.e., rough grassland, hedgerows and tree lines). This CEMP (**Section 3.4)** has also included details of measures to avoid pollution of waterbodies within and adjacent to the Site. All plant and machinery will comply with specific noise legislation (for example, Construction Plant and Equipment Permissible Noise Levels Regulations, 1998) and will be turned off when not in use **Section 3.7**.

The following potentially significant effects on ornithological features during the construction of the Project:

- Direct loss and fragmentation of habitat used by non-target farmland bird species such as meadow pipit, skylark, starling, swallow and redwing; and
- Disturbance and displacement of these non-target farmland bird species.

The Project design includes the following measures which will serve to minimise these effects:

- Retainment of areas of more important habitat as much as possible within the development design (e.g., waterbodies and hedgerows);

- Minimisation of the extent of habitat loss during construction as much as possible within the development design;
- Selection of delivery routes which use existing built infrastructure wherever possible, with laying of cables underground on the public roadway; and
- Presence of an ECoW on site to oversee any ornithological issues during construction.

3.2.3 Aquatic Ecology Mitigation Measures

3.2.3.1 Mitigation by Avoidance

The greatest risk of significant adverse effects on the aquatic environment will occur during the construction phase of the Project. The key to minimising this risk is the siting of all turbine locations and other key infrastructure at a minimum set-back of 50 m from watercourses and 10 m from drains, following best practice guideline of the Irish Wind Energy Authority (IWEA, 2012). The only exception to this rule will be where there are works to access tracks that are located within the 50m buffer zone are required, where unavoidable stream crossings are required. In designing the layout of the access tracks careful consideration has been given to minimise the number of watercourse crossings, and in choosing locations where crossing design can readily achieve the objective of maintaining the potential for unimpeded fish pass and ecological connectivity.

The large setback distance from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures (discussed below) to be properly installed and operate effectively. The proposed buffer zone will:

- Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment.
- Avoid excavations within close proximity to surface watercourses.
- Avoid the entry of suspended sediment from earthworks into watercourses.
- Avoid the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

The Project layout was specifically designed to reduce the number of watercourse crossings to the absolute minimum, with only two (WC01 on the Maigue River and WC02 on the Charleville Stream) retained, both located where clear-span bridge designs can maintain hydrological and ecological continuity for an unimpeded fish pass.

No construction activity will occur within the active watercourse. All water crossings will be clear-span bridges constructed from the bank using machinery operating outside the channel, thereby avoiding any disturbance to aquatic habitats or sediment release.

3.2.3.2 Mitigation by Design

A comprehensive suite of drainage measures has been developed to protect all receiving waters from potential significant effects during the construction of the Project in the catchment, and along the proposed TDR. They are outlined in full in **Section 3.4 and Management Plan - 3 SWMP** of this CEMP. These measures are aimed at preventing sediments or other pollutants from entering watercourses through the containment and treatment of all surface water run-off from areas of works. Garrane Green Energy Limited will appoint an Ecological Clerk of Works (ECoW) to ensure compliance during the construction stage with all mitigation measures, planning conditions and legislative requirements related to ecology. They will consult and assist with the Client in evaluating compliance with applicable legislation by means of a monthly Environmental Audit.

The mitigation measures have been incorporated into a CEMP (this document), for the Project which includes construction method statements for key works. The CEMP includes a Surface Water Management Plan (SWMP). The CEMP and SWMP will require mandatory adherence by all parties involved in the construction of the Project (including any sub-contractors) in order to protect aquatic conservation interests within the Study Area. The development of the mitigation measures and all method statements for watercourse crossings follows all relevant guidance and current best practice as detailed in:

- Construction Industry Research and Information Association (CIRIA) (2006) Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London.
- CIRIA (2006) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).
- COFORD (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- CIRIA (2015) SuDS Manual, (CIRIA Report C753, 2015)
- Coillte (2009): Forest Operations & Water Protection Guidelines.
- Department of Agriculture, Food and the Marine (2018) DRAFT Plan for Forests & Freshwater Pearl Mussel in Ireland – Consultation Document.
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh.

- Forest Services (2006) Draft Plan for Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forest Service (2000) Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- GPP1 (2020) Understanding your Environmental Responsibilities – Good environmental Practices, NetRegs.
- GPP 5 (2018) Works and Maintenance in or Near Water, NetRegs.
- GPP21 (2021) Pollution Incident Response Planning, NetRegs.
- GPP 22 (2018) Dealing with Spills, NetRegs.
- EU Construction and Demolition Waste Management Protocol - BIBM.
- EPA Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects.
- IEMA's latest Impact Assessment Guidance, 'A New Perspective on Land and Soil in Environmental Impact Assessment' (Feb 2022).

3.2.3.2.1 Prevention of the release of suspended solids/nutrients, dissolved substances, concrete and hydrocarbons into the drainage network and site run-off as a result of clearance of vegetation and other associated earthworks

Nature Based Solutions (NBS) will be implemented on site where possible. These measures aim to mimic natural hydrological processes and restore ecological functions. The use of Sustainable Drainage Systems (SuDS) will be central to water management at the Site and will eliminate the risk of sedimentation to watercourses during both construction and operational phases. SuDS follows a treatment train approach with design principles that include:

Minimise → Intercept → Treat → Disperse → Dilute.

This system improves water quality, slows down flow rates, and encourages sediment settlement.

Extending or maximising this approach has the potential to deliver net beneficial effects, such as a reduction in overall runoff rates at the Site, improved water quality in receiving watercourses, and a decrease in downstream flood risk.

Surface water management measures will be implemented early in the project timeline, including the installation of silt fencing and delineation of riparian buffer zones prior to any

internal road construction. Additional key elements, described in detail in the Surface Water Management Plan (**MP4**), include:

- Open constructed drains to collect and treat development-related runoff.
- Collection drains for upslope "clean" water to ensure it is dispersed away from disturbed construction areas.
- Filtration check dams along roads running perpendicular to contours to reduce flow velocity and trap sediment.
- Settlement ponds, lagoons, proprietary systems like Siltbusters, and buffered outfalls to encourage sedimentation before discharge at greenfield runoff rates.

A combination of source, in-line, and end-of-line controls will be used during all construction activities. These include interceptor drains, check dams, silt fences, sumps, settlement ponds, level spreaders, vegetation filters, and proprietary systems such as Siltbusters. These measures are designed to capture and treat sediment-laden runoff and control flow velocities, reducing the risk of downstream impacts. Clean water diversion drains will also be installed upslope of construction areas to separate uncontaminated water from the treatment system.

Initial drainage works at commencement of construction will include blocking of dry drains downgradient of construction areas, installation of silt traps and check dams, and implementation of a double silt fence system where work occurs within the 50m buffer zone of watercourses.

Pumped water from excavations will pass through silt bags before discharge to ensure sediment removal. All drainage features will be regularly inspected and maintained throughout the construction period.

To prevent sediment transport from spoil storage, temporary stockpiles will be covered or stabilised, and weather forecasts will be used to schedule works, with large-scale soil disturbance avoided during heavy rainfall events. The site team will monitor real-time rainfall data using Met Éireann resources and adjust activities accordingly.

There will be no direct site runoff to watercourses during construction. All outflows will be directed through sediment control features like check dams and stilling ponds and finally dispersed via diffuse overland flow through buffered outfalls.

To minimise treatment load, clean water drains will divert uncontaminated runoff away from the construction area. This proactive measure reduces the volume of potentially silt-laden water and the risk of suspended solids or dissolved substances entering nearby watercourses.

Contaminated water from construction activities such as excavations, drilling, and temporary stockpiling will be isolated, contained, and appropriately treated prior to any discharge.

Earthworks will be suspended in the event of an orange warning for rainfall. Prior to earthworks being suspended the following further control measures will be completed:

- All open spoil excavations will be secured and sealed.
- Temporary or emergency drainage will be created to prevent back-up of surface runoff.
- Working during heavy rainfall and for up to 24 hours after heavy events will not be allowed to ensure drainage systems are not overloaded.

3.2.3.2.2 Prevention of pollution from debris caused by vehicles during the crossing of watercourses within the Site on the site access track.

To minimise pollution risks at watercourse crossings, strict movement protocols for machinery will be enforced. There will be no tracking of machinery directly across watercourses. Instead, all plant will remain on designated access routes within the defined working corridor.

This working corridor will be clearly delineated using posts and high-visibility tape to prevent unintentional encroachment into sensitive habitats. The delineation ensures that contractors' plant remains within permitted areas and does not disturb adjacent watercourses or ecological features.

Where working within the 50m buffer is unavoidable, such as at watercourse crossings or upgrades to existing roads, additional controls such as silt fences and sediment barriers will be installed. These will serve to capture sediment and reduce the risk of pollution entering nearby waterbodies.

These measures will ensure that sediment and vehicular debris are retained and treated on-site, thereby protecting downstream aquatic habitats from turbidity spikes and sedimentation.

3.2.3.2.3 Prevention of pollution to Natura 2000 sites that are hydrologically connected downstream from the site

The Site drains into watercourses that are hydrologically connected to designated Natura 2000 sites downstream. To prevent any adverse effects on these protected habitats and species, a suite of mitigation measures will be implemented, including Nature Based Solutions and a SuDS approach, ensuring no sediment or pollutants reach these sensitive receptors.

All surface water runoff will be directed through multiple treatment stages, including check dams, settlement ponds, and buffered outfalls, ensuring only clean, treated water is discharged. No direct discharge to watercourses will occur at any phase of the Project.

If required, a Siltbuster or similar proprietary system will be used to enhance water treatment, particularly during high-risk activities like excavation and dewatering. This system, when managed correctly, reduces suspended solids and has an overall positive effect on water quality.

Additionally, early consultation with the OPW will ensure that scheduled drainage maintenance works do not coincide with construction activities, avoiding the potential for cumulative impacts on downstream water quality and, by extension, aquatic ecology within Natura 2000 sites.

3.2.3.2.4 Potential for accidental spillage of hydrocarbons and other pollutants including concrete laitance.

Accidental spillage of hydrocarbons, concrete, or other pollutants presents a known risk during construction. To mitigate this, robust dewatering and containment protocols will be in place.

Dewatering flow rates will be tightly regulated using inline gate valves or similar infrastructure to prevent sudden surges that could overload drainage and attenuation systems. Pumped water will be directed through an on-site treatment train or discharged to vegetated surfaces via silt bags, always outside designated buffer zones.

Continuous monitoring and adaptive management of dewatering operations will be carried out to ensure environmental performance under varying site conditions. Contaminated water resulting from activities like drilling, excavation, and temporary stockpiling will be isolated, treated, and only discharged when safe and compliant.

These preventative measures, along with routine inspections and emergency spill response plans, will ensure no unintentional release of pollutants into surface waters.

3.2.3.2.5 Prevention of loss of natural watercourses due to 2 no. new watercourse crossings and the placement of bridges and culverts.

Two new watercourse crossings are proposed within the Site. These crossings will utilise clear-span bridges and culverts, with mitigation measures to avoid release of pollutants to downstream waters as detailed in **Section 3.4.**

There will be no tracking of machinery through any watercourse. Construction plant will operate exclusively within designated routes and the established working corridor.

Where buffer zone encroachments are unavoidable for crossing works, appropriate sediment control measures such as silt fencing and settlement features will be installed to prevent mobilisation of sediment and protect aquatic habitats.

The design avoids in-stream works, thereby preserving channel morphology, flow continuity, and ecological connectivity. As a result, permanent loss or fragmentation of natural watercourses is not anticipated.

3.2.3.2.6 Management of Runoff from Spoil Storage Areas to prevent contamination of watercourses.

It is proposed that excavated spoil will be temporarily stored in the 6 no. proposed spoil storage areas and permanently stored in 1 no permanent spoil storage area. These designated spoil storage areas are all located outside of the fluvial flood zones and above the 1 in 1,000 year flood level. These spoil storage areas are also located outside of the 50m hydrological buffer zones. During the initial placement of subsoil, silt fences and biodegradable matting will be used to control surface water runoff from the spoil storage areas.

Where applicable the vegetative topsoil layer of the spoil storage areas will be rolled back to facilitate placement of excavated spoil, following which the vegetative topsoil later will be reinstated. Where reinstatement is not possible, the spoil storage areas will be sealed with a digger bucket and seeded as soon as possible to reduce sediment entrainment in runoff.

Drainage from the spoil storage areas will ultimately be routed to oversized swales and a number of stilling ponds and a 'Siltbuster' with appropriate storage and settlement designed for a 1 in 10 year return period before being discharged to the onsite watercourses.

3.2.3.2.7 Prevention of risk of chemical carryover from use of Siltbuster

Measures employed to prevent overdosing and potential chemical carryover:

- The Siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding agents, so overdosing does not occur.
- Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system.
- Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment.
- Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover.
- Use of biodegradable chemical agents can be used at very sensitive sites (i.e. adjacent to SACs).
- Sludge from the Siltbuster will be removed off site for disposal at a licenced facility.

3.2.3.2.8 Ecological Enhancement Proposals

The proposed Ecological Enhancement proposals at the Site includes the planting of approximately 0.669ha of woodland, 1,620m of hedgerow to compensate for the loss of existing hedgerow and the enhancement and re-vitalisation of 5,433m of existing degraded hedgerow. Further details are provided in the **BEMP** in **EIAR Appendix 6.2**.

Riparian planting plays a vital role in enhancing the resilience of freshwater ecosystems to climate change, while also providing critical support for fish species. Vegetation along watercourse margins offers shade, which helps regulate stream temperatures, an increasingly important function as rising air temperatures threaten to exceed thermal tolerances for sensitive fish, such as salmonids. The root systems of riparian plants stabilise banks, reduce erosion, and improve water quality by filtering runoff, thereby maintaining the clean, oxygen-rich habitats required for spawning and juvenile development. Additionally, leaf litter and woody debris contribute essential nutrients and structural habitat diversity, supporting aquatic invertebrates that form the base of the aquatic food web. By increasing habitat complexity, flood attenuation, and ecological connectivity, riparian planting serves as a natural buffer against climate-driven hydrological extremes and supports the long-term sustainability of fish populations.

The measures have limited potential to impact the hydrological/hydrogeological environment due to the scale of the proposed works. During the planting works there may be a potential for temporary negative effects on surface water quality. However, the long-term effect of the ecological enhancement will be a positive effect. To mitigate this, all planting works will be undertaken during dry weather.

This will also include preparatory work in the vicinity of all watercourses and all riverbank works. Method statements for watercourse crossings will be prepared at the construction stage and submitted to the ECoW for prior approval. All banksides in the vicinity of the new crossings will be fully reinstated with vegetation cover as quickly as possible using only native species appropriate to the existing environment.

To address the identified issue of livestock-induced pollution and physical damage to on-site streams, the implementation of protective fencing along stream corridors will be implemented. This would prevent cattle from directly accessing sensitive watercourses, thereby reducing bank erosion, sedimentation, and nutrient enrichment. As required under the European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022, such measures are consistent with best practice for watercourse protection. To ensure animal welfare, alternative drinking water sources, such as troughs supplied from piped or rainwater-fed systems, will be provided outside of fenced riparian zones. Incorporating these protections into the Project would likely have a net positive effect on local water quality and habitat integrity, particularly for species of conservation concern.

3.2.3.3 Mitigation by Reduction

The specified measures detailed below are aimed at protection of instream aquatic biota within the vicinity of any proposed works at watercourses on the Site but equally with regards to the protection of the downstream population of salmonids and other fish species. These measures are a summary of the principal requirements with full detail being presented in **Section 3.4.**

During the construction phase the appointed contractor(s) will ensure that the following mitigation is adhered to in line with IFI (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters:

- A buffer zone of at least 50m will be in place for the EPA mapped watercourses, with the exception of the sections of proposed Access Tracks to be constructed across the Maigue River and the Charleville (Stream) see **Drawing No. 6839-JOD-GGE-XX-DR-C-0202** and **Drawing No. 6839-JOD-GGE-XX-DR-C-0205** attached as part of the EIAR application.

- The Temporary Construction Compound and any temporary spoil storage areas will be located at a minimum distance of 50m from any watercourse. All drainage from these facilities will be directed through a settlement pond with appropriate capacity and measures to provide spill containment. Details on how such measures will be applied (objectives, design considerations, layout) will be contained in a Surface Water Management Plan (**SWMP-MP4**). Designated spoil storage areas are shown in **Figure 1.2.**
- All site drainage, as described in the SWMP and shown on associated drawings, will be directed through either sediment traps, settlement ponds and/or buffered drainage outfalls to ensure that total suspended solid levels in all waters discharging to any watercourse will not exceed 25mg/l (IFI, 2016). All construction site run-off will be channelled through a stilling process to allow suspended solids to settle out and through a spill-containment facility prior to discharge.
- Daily monitoring of all sediment traps and settlement ponds will be undertaken by the Environmental Manager or Ecological Clerk of Works to ensure satisfactory operation and/or maintenance requirements. A full specification for the water quality monitoring is presented in the Water Quality Management Plan (WQMP) - **MP 2**.
- The storage of oils, hydraulic fluids, etc., will be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005).
- All machinery operating at the Site will be fully maintained and routinely checked to ensure no leakage of oils or lubricants occurs vehicles will be refuelled off-site where possible. For vehicles that require being refuelled on-site, fuels will be stored in the temporary construction compound and bunded to at least 110% of the storage capacity of fuels to be stored. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axel refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Site.
- Any extensions to existing drainage culverts on the Site Access Roads will be undertaken in dry conditions and in low flow.
- During the culvert installation and associated construction work, double silt fences shall be installed immediately downgradient and downstream of the construction area for the duration of the construction phase.
- The pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc., will be completed in the dry to avoid pollution of the freshwater environment (see **Section 3.4.**). There will be no batching or storage of cement in the vicinity of any watercourse crossing construction area.

- Procedures (as detailed in **Section 3.4.**) will be put in place to ensure the full control of raw or uncured waste concrete to ensure that watercourses will not be affected.
- Should there be any incidents of pollution to watercourses, immediate steps as specified in the Emergency Response Plan – **MP1** will be undertaken to resolve the cause of the pollution and where feasible, mitigate against the effect of pollution.
- Re-seeding / re-vegetation of all areas of bare ground or the placement of geo-jute (or similar) matting will take place prior to the operational phase to prevent silt-laden run-off. Seed mixes will contain only suitable native species of plant that occur in the local area. Species selection is outlined in **Section 2.4** of the **BEMP**.
- Silt traps erected during the construction phase within roadside and artificial drainage will be replaced with stone check dams for the lifetime of the Project. These stone check dams will only be placed within artificial drainage systems such as roadside drains and not in natural streams or drainage lines.
- A full review of construction stage temporary drainage will be undertaken by Garrane Green Energy Limited (in conjunction with the Project Hydrologist/ Site Engineer and the Project Ecologist) following the completion of construction, and drainage removed or appropriately blocked where this will not interfere with infrastructure.

3.3 SOILS AND GEOLOGY

3.3.1 Design Phase Mitigation

With regard to the proposed Project design, the principles or risk management and best practice has been followed and will continue to be implemented as follows:

The primary mitigation measure employed has been the design of the Project in terms of locating the turbines, access roads, material storage areas and other site infrastructure on agricultural lands and minor forestry, where the soils are extensively worked and drained, so as to be remote from residential and sensitive commercial properties.

In order to reduce the impacts on geology, hydrogeology and slope stability, infrastructure has also been positioned within areas of thinner organic soils / soft ground and lower slope gradients away from designated watercourses and other sensitive features. Extensive work has already been undertaken at the preliminary design stage to apply risk avoidance by design which has included the following:

- Peat probing to screen for the presence of peat or other organic soil deposits across the site and layout.
- Excavation of trial pits and undertaking of geophysical surveys to establish overburden and bedrock characteristics.

- Relocation and micro-siting of turbines, hardstandings, access roads and other infrastructure based on the site assessments and geotechnical assessments in order to reduce ground risk associated with the proposed Project.
- The works have been designed and checked by geotechnical engineers, who are suitably qualified and experienced in excavation and earthworks design and construction methodologies.
- Where the construction footprint for the Project coincides with the Floodplain of the River Maigue, no permanent storage of spoil will be undertaken. Temporary storage will be limited to the period of construction only and scheduled to coincide with optimal annual weather conditions.
- Prior to commencement of construction works at structures in the proximity of sensitive waterbodies and Access Track crossing watercourses, appropriate pollution prevention arrangements will be put in place to prevent contaminated surface water run-off from construction activities entering these watercourses, other water bodies or the existing underground pipeline. Refer **Section 3.4** for details.

The following will also be implemented:

- Any excavation and construction related works will be subject to a design risk assessment at detailed design stage to determine risk levels for the construction, operation and maintenance and Decommissioning of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded and relayed to appropriate parties.
- A detailed method statement for each element of the works will be prepared by the Contractor prior to any element of the work being conducted.
- Given that the works comprise a sizeable proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.
- The Contract will require programming of the works such that earthworks are not scheduled during severe weather conditions or at times of prolonged high rainfall.

3.3.2 Construction Phase Mitigation

The following sections outline appropriate mitigation measures to avoid or reduce the potential effect of the Project during the construction phase.

3.3.2.1 Construction Environmental Management Plan

This CEMP has been prepared for the proposed Project and defines the work practices, environmental management procedures and management responsibilities relating to the construction phase of the proposed project.

This CEMP sets out the key environmental management measures associated with the construction, operation and Decommissioning of the proposed Project , to ensure that during these phases of the Project, the environment is protected, and any potential impacts are minimised.

This CEMP will be developed further at the construction stage, on the appointment of the main contractor to the project to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned and shall be submitted to the planning authority prior to the commencement of the construction phase.

The CEMP will incorporate the mitigation of potential effects to land, soils and geology from the proposed Project outlined in the following sections.

3.3.2.2 Erosion, Degradation and Soil Sealing

The Project will be constructed in a phased manner in order to reduce the potential effects of the Project on the Soils and Geology. Phased construction reduces the amount of open, exposed excavations at any one time, lowering the risk of compaction and reducing soil exposure to degradation.

To further mitigate against the compaction of soil at the Site, prior to the commencement of any earthworks, the work corridor will be demarcated, and machinery will stay within this corridor so that soils outside the work area are not damaged or suffer degradation.

Excavations will then be conducted from access tracks as they are constructed in order to reduce the compaction of soft or otherwise sensitive ground.

The amount of exposed ground and soil stockpiles will also be kept to a minimum and any stockpiles in place for an extended period of time will be allowed to re-vegetate naturally.

3.3.2.3 Subsoil and Bedrock Removal

Construction of the Project will result in the removal of soils in parts of the Site to facilitate excavation for the construction of Access Tracks and hardstands for the wind turbines within a competent stratum suitable for the emplacement of foundations.

Ground conditions vary across the site with mineral soils of varying depths and competence present. At the proposed turbine bases the excavation depth required is anticipated to be a maximum of 6.00m to a suitable bearing stratum. For Access Tracks and turbine hardstands this is expected to be average 0.50m and consequently less significant.

Excavation volumes will also be minimised by the use of piled foundations for turbines T4, T5, T6, T7 and T8.

One of the primary mitigation measures employed at the preliminary design stage was the minimisation of volumes of excavated overburden deposits to be exported off site. In the case of the construction of the Project, all excavated overburden will either be re-used or retained on-site for reinstatement purposes during the Decommissioning phase.

This will include:

- Use of suitable site-won material (mineral soils consisting predominantly of sands and gravels) as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations.
- Surplus overburden will be re-used on site in the form of landscaping and for reinstatement purposes.
- Residual surplus overburden will also be stored at a permanent spoil repository, located adjacent to the Substation. Refer to **Spoil Management Plan (MP4)** for details.

Surplus overburden deposits excavated during the course of the works will be stored, for the duration of the Project, in designated spoil deposition areas until they can be employed for Site reinstatement.

Temporary stockpiles (not exceeding 2m in height) of separated soil material types will be placed adjacent to the excavation areas prior to reinstatement, but outside the Floodplain of the River Maigue. These stockpiles will be shaped and sealed to prevent the ingress of water from rainfall.

3.3.2.3.1 Mitigation by Avoidance

Preliminary site investigation has allowed for selection of the most appropriate type of foundation for structures, Access Tracks, Substation, Substation Compound, Met Mast and other infrastructure. This in turn has allowed the extent of excavations required to be minimised and consequently, generation of excessive spoil material will be avoided.

3.3.2.3.2 Mitigation by Good Practices

Good practices, such as limiting the construction zone by demarcation and the sealing of temporary stockpiles against degradation from rainfall will be employed impacts on the soil resource.

3.3.2.3.3 Mitigation by Reduction

Apart from the measures taken in the design phase of the Project (avoiding the need for and reducing volumes of subsoils to be removed) there are no other reductive mitigation measures in terms of subsoil and bedrock removal, the layout of the Project minimises the impact of subsoil and bedrock removal in so far as practical, without compromising or reducing the Project itself.

3.3.2.3.4 Mitigation by Reuse

All topsoil will either be reused for landscaping purposes during the construction phase or stored on-site for reuse during the Decommissioning phase of the works.

3.3.2.4 Storage and Stockpiles

Spoil types will be treated separately. Mineral soils and topsoils / organic soils will be separated during excavation and these two types of spoil will be disposed of generally as follows:

A *Till soils will be deposited directly on top of other mineral soils. This will require the removal of peat where present to facilitate the process.*

B *Topsoils / Organic Soils will be stored separately, protected from the environment to maintain their integrity and used to reinstate the minerals soil surfaces following completion of construction works. No topsoil will be disposed of as part of the Project.*

1. Mineral soil spoil disposal will take place at various locations within the wind farmland holding where low surface gradients combine with minimal peat depth and sufficient distance from sensitive receptors. These proposed spoil deposition areas are detailed on Drawing TBC and the Spoil Management Plan (MP4).

2. It is intended that spoil movements will be minimised by disposing of the material within or immediately adjacent to the construction footprint of the structure from

whence it was excavated. No Spoil disposal will take place with the Floodplain of the River Maigue.

3. Preparation of the Spoil Disposal sites will involve the removal of the topsoil which will be transferred to a specific location to be stockpiled and maintained for re-use during restoration operations.
4. Spoil will be deposited, in layers of 0.50m and will not exceed a total thickness of 2.00m, unless contained by suitably designed and constrained berms.
5. Spoil will only be deposited on slopes of < 5 degrees to the horizontal and greater than 10m from the top of a cutting. The exact location of these deposition areas has been determined in consultation with the construction phase geotechnical specialist. Refer to **Drawings 6839-JOD-GGE-XX-DR-C-0200** to **0209** for details.
6. Spoil Disposal sites will have a regular weekly assessment, made by the construction manager or other suitably qualified individual, to ensure that stability and good condition is maintained.
7. Once disposal is complete the deposition areas will be re-vegetated with the existing upper vegetated layer removed at the commencement of disposal operations. Upon commencement of the Decommissioning / restoration phase guidance from a suitably qualified ecologist will be sought to provide a suitable methodology and programme of maintenance for the restored areas.

3.3.2.5 Vehicular Movements

Vehicular movements will be restricted to the footprint of the proposed Project, particularly with respect to the newly constructed Site Access Tracks. This ensures that machinery must be kept on tracks and will not move onto areas that are not permitted.

Vehicular traffic on Site will be minimised through the re-use of excavated material on Site which will reduce the need to source material from external quarries.

As discussed previously, excavation volumes have been reduced during the design phase by avoiding areas of sensitive or soft soils and by avoiding excessive cut and fill during construction. This will result in reduced excavation volumes and therefore reduced site traffic.

Best practice as described in the IWEA and Scottish Best Practice Guidelines[2] will be applied during construction which will minimise double handling, again reducing the site traffic.

[2] Irish Wind Energy Association (IWEA) (2012) Best Practice Guidelines for the Irish Wind Energy Industry, Fehily Timoney & Company, Cork

All works will be managed and conducted in accordance with this CEMP which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

3.3.2.6 Ground Stability

The Contractor will programme the works such that earthworks are not scheduled during severe weather conditions.

3.3.2.6.1 Earthworks Activities & Ground Stability – General Constraints and Anecdotal Evidence

Analysis of the historic conditions following soil movement indicates that the following main factors generally trigger slope failures:

1. Excessive quantities of spoil loaded onto sensitive topsoil, organic soils or sensitive soils covered sloping ground. (In such cases the gradient of the slope should be no more than 5 degrees to the horizontal). Topsoils and organic soils should always be removed prior to depositing spoil and retained for re-use as landscaping material.
2. The angle of repose of the cut face of excavations is often found to be too high, sometimes 70 – 80 degrees to the horizontal. Battering back the sides of an excavation to approx. 60 degrees in clay soils and 30 degrees in granular or organic soils helps to reduce the potential for slippage, which will significantly reduce the potential for soil movement.
3. The height of any temporary stockpile or deposition area will not exceed 2m, unless suitably constrained.
4. Surface water flows will compromise most granular or cohesive soils at any slope angle and care should be taken to stop the development of such flows during construction.

   The consequences of soil movements can be identified as Damage to Machinery, Damage or Loss of Access Track, Damage to Site Drainage, Site Works Damaged, Death or Injury to Personnel or Degradation to the Environment.

   An emergency plan is to be prepared and will be enacted should soil movement occur.

3.3.2.6.2 Earthworks & Ground Stability – Prevention of Landslide

Application of the following procedures will have the effect of reducing the Hazard with respect to Ground Stability:

1. Excavated spoil will not be deposited on the down slope or up slope edges of the adjacent topsoil. This spoil will instead be deposited on the two flanks either side of the excavation (where gradient is least) and spread in such a way as to limit the surcharge pressure on sensitive topsoils.

2. The hardstanding areas surrounding the turbine bases will be designed in a manner such that crane loadings can be transferred directly onto the competent strata underlying any sensitive mineral soils. In order to facilitate these works it will be necessary to undertake limited excavations. To ensure effective sidewall support during these operations the contractor will adopt an approved engineering solution (such as a suitable bracing system or other method) to maintain sidewall stability at all times.
3. Movement can often occur during or following severe rainstorm events, particularly when following a prolonged dry spell. Extra vigilance will be maintained at such times, during construction.
4. All slopes are to be regularly checked, during the construction and operational phases, for development of tension cracks, which are indicative of slope movement.
5. Method statements will be followed at all times. Where modification is required, this will be agreed by the supervising engineer.
6. Slopes will not be undercut or excavations left unsupported for periods in excess of 24 hours. Excavations are to be backfilled as soon as practicable. Excavation and filling operations shall be coordinated to minimise the time an excavation remains opened.
7. Pore water pressure within excavations should be kept low at all times by draining deliberate or intentional sumps at regular intervals. This is to prevent ponding of water within excavations which can in turn increase hydraulic heads locally and potentially lead to instability.
8. The potential for Soil Movement will be monitored regularly during the construction and operational phases by means of regular site visits and assessments, by a suitably qualified and experienced professional.
9. Only experienced and competent contractors will be appointed to conduct the construction works.
10. Low ground bearing pressure machinery shall be used for transport of construction materials in sensitive areas, where ground conditions dictate its requirement.
11. Construction at less sensitive areas will be completed first to allow suitable construction practices to be established before works commence in the more difficult areas.
12. Sufficient time should be allowed to conduct the works in a safe and timely manner.

3.3.2.7 Soil Contamination

Design for the Project has been cognisant of the high sensitivity of the local and regional environment. In particular there is recognition that localised soil contamination, either from

siltation, cementitious materials, hydrocarbons, the leaching of unknown contaminants from imported materials and from wastewater effluent percolation, has the potential to enter watercourses via surface water run-off and become entrained with flood waters or a rising groundwater table.

The probability for the unlikely event of contamination resulting via these mechanisms will be minimised through the application of good practice and adherence to this CEMP, which contains specific guidance in respect to Refuelling Procedures, pollution prevention and spoil management.

Likewise, the importation of materials from off-site will be closely monitored to ensure that no contamination is brought onto the site from external sources. Importation of materials such as aggregates and other forms of construction materials, will be subject to "wheel washing", documented, certified, sampled and evaluated as per the requirements of this CEMP and Waste Management Plan (**MP5**).

Similarly, but to a lesser degree, there is potential for adverse impact from wastewater percolation unless wastewater is constrained. The only source of wastewater production will be the welfare facilities at the substation. The normal method for dealing with effluent in this case is to design a percolation field and use this to disperse the low-level pollution throughout the groundwater body. However, to remove any potential effect on soils and geology from wastewater contamination, foul effluent will be retained within a "closed" system with all effluent being held within a bunded storage tank with a high-level alarm, drained on a regular basis and disposed of off-site at a suitable licensed facility. This will effectively break any potential pollution linkage to the wider environment.

Checking of assets (plant, vehicles, fuel bowsers on a regular basis during the construction phase of the Project. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.

3.3.2.7.1 Storage of Fuels and Chemicals

As per Best Practice Guidance (BPGCS005)[3], all fuels, oils and chemicals on site will have a secondary containment system of 110% capacity and will be located more than 20m from any watercourse (i.e. outside of the watercourse buffer).

[3] Best Practice Guide BPGCS005 - Oil Storage Guidelines. Available at: http://www.envirocentre.ie/includes/documents/OilStorageBPG.pdf;

A bunded diesel bowser will be located inside a fenced off area within the Temporary Construction Compound. Other chemicals will be stored within a storage container with an accompanying Control of Substances Hazardous to Health ("COSHH") Datasheet in accordance with health and safety regulations. If generators are used on site, these shall be bunded (the bund shall be capable of containing 110% of the fuel tank's capacity). The bund shall be kept empty of water.

Where chemicals are required on site, they must be placed in an appropriate bund to prevent ground contamination. All chemicals must be stored in a correctly marked container clearly identifying the contents. Where labels are worn off, they must have a new label placed on them or the contents transferred to a correctly marked container. All safety data sheets for all chemicals will be filed on site as part of a requirement under the provisions of this Construction Environmental Management Plan (CEMP).

Spill kits will be available at all work areas within machinery and at the site office. Contingency plans will be in place for dealing with a spillage should a spillage occur.

3.3.2.7.2 Refuelling

During construction, fuel and oil deliveries will take place within the designated refuelling area within the Temporary Construction Compound only. The Contractor will supervise site deliveries to ensure that the correct amount of material is delivered to the correct tank and the level is checked prior to refilling to avoid spillage.

Where refuelling of vehicles on site is necessary, the following guidelines will be strictly adhered to:

- Mobile plant will be filled in a designated area, on an impermeable surface well away from any drains
- A spill kit will be stored (and clearly marked) near refuelling areas.
- A bunded tank / bowser will be used with capacity of the bund to be 110% of the fuel storage capacity.
- Vehicles will never be left unattended during refuelling and drip trays should be located under all static plant vehicles.
- Hoses and valves will be checked regularly for signs of wear and will be turned off and securely locked when not in use.
- Vehicles will not be left running unnecessarily and low emission fuels will be used where possible.

- Diesel pumps and similar equipment will be checked regularly and any accumulated oil removed for appropriate disposal.

3.3.2.7.3 Existing Contamination and Imported Materials

The following practices will be followed in relation to the excavation and reinstatement of turbines, hardstands, site tracks, substation, cable trenches, borrow pit excavation, topsoil stripping and any other earthworks, whenever foreign or fill materials are encountered:

- Any suspected fill or material foreign to the Site will be stored separately and separated into individual component types, such as concrete, aggregate and bituminous materials.
- Prior to disposal each stockpile of material will be classified with the relevant EU Waste Code by a relevant competent individual.
- To determine the relevant contamination classification for each stockpile (Inert, Contaminated Non-Hazardous or Hazardous) Waste Acceptance Classification testing will be undertaken in line with EPA guidance. The frequency for these tests will be 1 suite of tests for each 100m^3 of material.
- The results of all testing and waste disposal certificates will be retained on Site, by the Site Supervisor.

3.3.2.7.4 Concrete

There will be no concrete batching on the Site. Rather, it will be transported to the Site as it is required. A dedicated, bunded area will be created to cater for concrete wash-out and this will be within the onsite Temporary Construction Compound. This will be for the wash-out of the chutes only after the pour. Concrete trucks will then exit the Site via Site Entrance 2 and return to the supply plant to wash out the mixer itself.

The main concrete pours at the turbine locations will be planned in advance and proposed mitigation measures will be as follows:

- Avoiding large concrete pours, for turbine foundations, on days when temperatures are not optimal as per (BS 8110) (EN1992-1-2) or when heavy or prolonged rainfall is forecast i.e., during a period in which a Met Éireann Status Red weather event will/has occurred.
- Providing that all concrete pour areas are dewatered prior to pouring concrete and while the concrete is curing.
- Making covers available so that areas can be covered if heavy rain arrives during the curing process which will prevent runoff of concrete which has a high pH.

The chutes wash out on-site will require a small volume of water. This water will be directed to the concrete washout area which will be a temporary lined impermeable containment area or a siltbuster type washout unit or similar. The unit catches solid concrete and filters and contains the washout liquid for pH adjustment and solid separation. The residual liquids and sediments will be disposed of at an appropriately licenced facility.

Temporary lined impermeable containment areas are usually constructed using straw bales and lined with an impermeable geotextile membrane.. An alternative construction method would be to dig a hole in the ground and place an impermeable geotextile membrane in the hole so that no wastewater can penetrate the cover and seep into the soil and groundwater.

3.3.2.7.5 Wastewater and Sanitation

Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank.

All wastewaters will be tankered off-site by a licensed waste collector to a suitable plant in the vicinity of the Project. There will be no onsite treatment or disposal of wastewater.

3.3.2.8 General Waste

All materials used on Site and wastes generated on Site will be reduced by good Site practice and attention to this CEMP (**Sections TBC** and **Waste Management Plan MP5**). A policy of reduce, re-use and recycle will apply.

All waste will be segregated and re-used where possible or removed from Site for recycling. Any waste which is not recyclable or compostable will be properly disposed to landfill.

Whenever possible, excavated spoil materials will be re-used close to the area of excavation. The careful design which has been achieved will result in minimal excess soil and rock.

Excess spoil material will be separated in terms of soil type (topsoil or mineral soils) and stored within a series of six temporary and one permanent spoil deposition areas, as identified on **Drawings 6839-JOD-GGE-XX-DR-C-0200** to **0209**. The locations for these spoil deposition areas have been carefully considered in terms of ground slope and soil characteristics as well as proximity to sensitive receptors and the flood zone. In this way

any potential negative effects have been minimised. Mitigation to be applied is presented in **sections 3.3.2.4 Storage and Stockpiles** and **3.3.2.6 Ground Stability**.

3.3.2.9 Pollution Prevention

Suitable protection for watercourses potentially affected by the works will be installed prior to relevant works proceeding. These measures will be in-line with EPA Pollution Prevention Guidelines. Protection measures will include:

- Plant and equipment will be stored on dedicated hard standing within the construction compound. This will minimise the risk of pollution caused by leakages occurring out of hours. Drip trays will be used where appropriate.
- All plant and equipment will use biodegradable hydraulic oil.
- Spill kits will be readily available to all personnel. The spill kits will be of an appropriate size and type for the materials held on site.
- Diesel fuel will be stored in a bunded diesel bowser which will be located within a fenced off area in the construction compound.
- Refuelling and maintenance of vehicles and plant will take place in designated areas of hardstanding.
- All other chemicals will be stored at the site compound within an appropriate storage facility along with an accompanying MDS Datasheet.
- Wastewater from the temporary staff toilets and washing facilities will be discharged to sealed containment systems and disposed via licensed contractors.
- Early seeding of lands near watercourses will be undertaken to reduce the potential for sediment runoff.

All staff on site will be made aware of the pollution prevention measures being implemented throughout the construction, operational and Decommissioning phases using appropriate toolbox talks and the site induction.

3.3.2.10 Emergency Response

The emergency response plan, as detailed in the Emergency Response Plan (MP1) of this CEMP, has been developed in order to deal with any emergency accidents or spills. In particular an emergency spill kit with oil boom and absorbers will be kept on Site in the event of an accidental spill. All Site operatives will be trained in its use. In addition, all vehicles will also contain emergency spill kits.

3.4 HYDROLOGY AND HYDROGEOLOGY

3.4.1 Design Phase

3.4.1.1 Mitigation by Avoidance

The proposed Project layout have been subject to an iterative design process which considered a wide range of environmental constraints including hydrological buffer zones around watercourses (50m) and manmade drains (10m), archaeological and ecological constraints, set back distances from local houses and the national road (N20), as well as minimising interaction with the industrial outflow pipeline which passes through the Site. The proposed Project layout also considered the fluvial flood zones within the Site which are mapped along the River Maigue and the Charleville Stream.

In terms of hydrology, all of the proposed Project infrastructure, with the exception of the 2 no. proposed watercourse crossings, are located outside of the 50m delineated hydrological buffer zone which was applied to the natural streams and rivers within the Site. This set-back distance ensures that there is no unnecessary disturbance to these streams and rivers and provides space for the proposed Project drainage system to be installed, thereby protecting downstream water quality. Furthermore, where possible, infrastructure has been placed outside of the 10m buffer zone assigned to the manmade drains. Whilst some infrastructure does encroach upon these drain buffers, the drains are manmade features and are not considered to be a significant hydrological constraint. They can be rerouted around or culverted beneath the proposed infrastructure.

Following a review of all of the identified constraints, the proposed 9 no. turbine layout is considered to be the optimum layout for the Project. A series of turbine layout were initially considered, and the proposed layout was optimised to ensure it has the least effect on flooding, and the least potential to cause downstream flood effects. As described above in Section 10.3.7, a total of 5 of the 9 no. turbines are located in fluvial flood zones within the Site (4 no. turbines in Flood Zone A and 1 no. turbine in Flood Zone B). Assessments have shown that the avoidance of infrastructure within the flood zones would have rendered the Project, a 4 no. turbine wind farm, unviable.

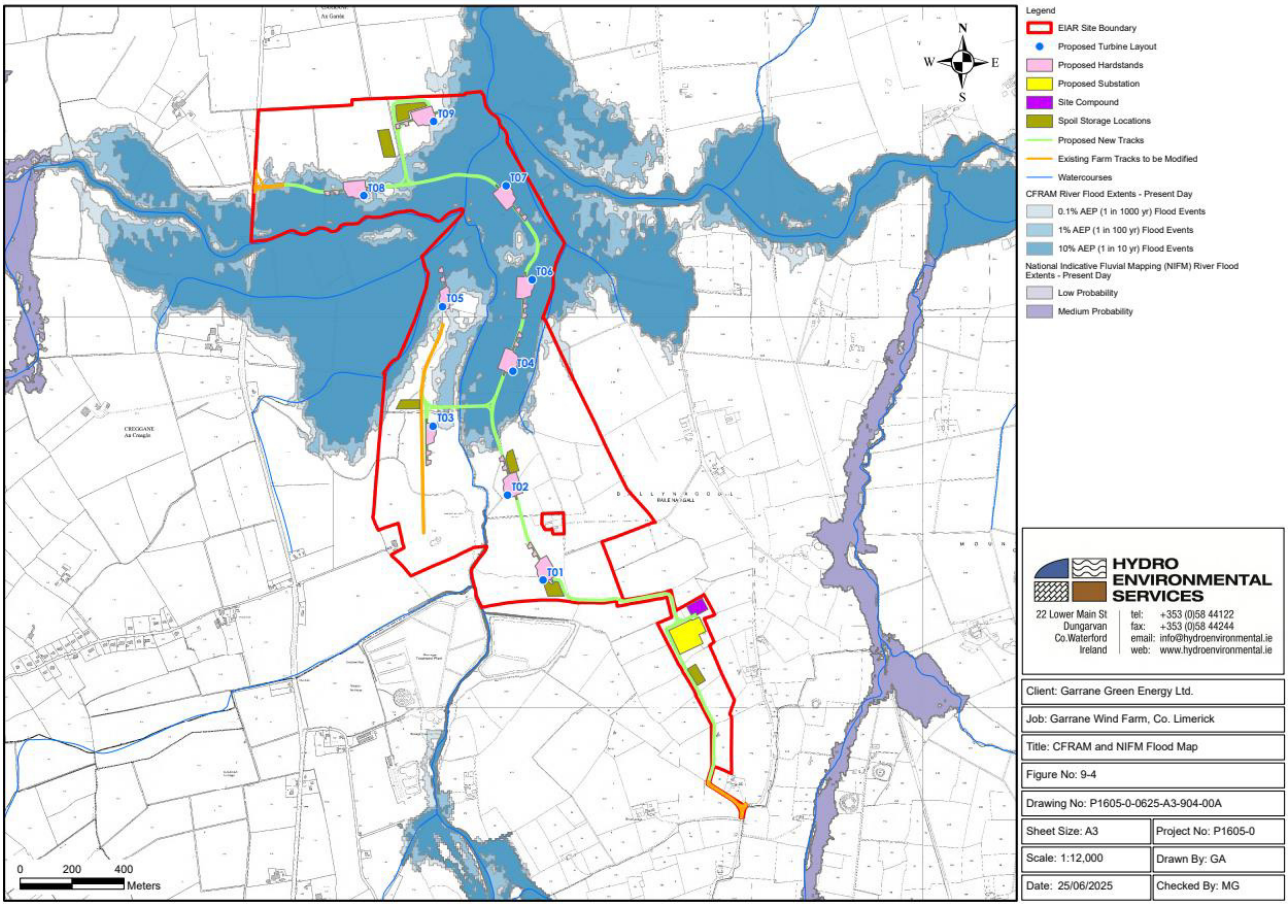

Figure 3.2: CFRAM and NIFM Flood Map (Ref: EIAR Figure 10.4)

Therefore, avoidance of infrastructure within the flood zones was not possible. However, the Project has been designed to minimise the potential effects of construction and operation of the wind farm within the flood zone. Several design workshops were completed between HES, Garrane Green Energy Limited and JOD to ensure that the Project has been designed to minimise the potential effects associated with flooding. Several key elements of the Project have avoided the flood zones, including the substation, 4 no. turbines, the construction compound and all spoil storage area which are located above the 1 in 1,000-year flood level. As discussed above, in order to ensure Project viability, it was necessary to propose 4 no. turbine within the flood zones. Bespoke design measures, detailed in **Section 10.6.1.3** of **Chapter 10: Hydrology and Hydrogeology** and in the Site Specific Flood Risk Assessment (**Appendix 9.1**), have been incorporated into the Project to ensure that the infrastructure is not at significant risk of flooding and to ensure that the Project does not significantly affect the downstream flood risk.

In summary, the mitigation by avoidance incorporated into the design of the Project is as follows:

- The location of all infrastructure outside of the 50m hydrological buffer zones, with the exception of the 2 no. watercourse crossings; and,
- The location of all infrastructure where possible outside of the 10m drain buffer.

3.4.1.2 The location of the substation, 4 no. turbines, the construction compound and all spoil storage area which are located above the 1 in 1,000-year flood level. Mitigation by Design

The descriptive mitigation measures outlined in this report will be applied to the Project design and construction methodologies with a view to avoiding and/or minimising any potential adverse effects to water quality in the receiving surface water network. Details on how such measures will be applied are contained in a Surface Water Management Plan (SWMP – MP3). The aims and examples of important considerations in relation to mitigation measures described in the SWMP are further clarified here in **Section 3.4.2** for the construction phase.

3.4.1.3 Flooding Considerations

A series of turbine layout were initially considered, and the proposed layout was optimised to ensure it has the least effect on flooding, and the least potential to cause downstream flood effects.

Additional design measures that were incorporated into the layout include the following:

- All proposed turbines are located outside of 50m watercourse buffers, and 10m buffers for drains.
- All proposed spoil storage areas are located outside of mapped flood zones. There will be no storage of spoil within the flood zones.
- The layout design is intended to minimise earthworks requirements, for hardstands, turbine bases, drainage management, and access tracks within the flood zones.
- All turbines within the flood zones will be constructed with piled foundations, and this will reduce earthworks volumes at those locations (as piled turbine bases are smaller than standard bases).
- Minimise access roads and hardstands buildups (in flood zones, by keeping them as close to existing ground level as possible) during the construction phase and increase to 1 in 20-year flood levels for operational phase.
- Access tracks will be marked with snow poles to allow for emergency vehicular access.
- The final operational phase hardstand area at each of the turbines in flood zones will be as small as possible (the large construction phase hardstand areas will be reinstated).

- All existing flood zone drainage pathways will be maintained, either by avoidance, by culverting, or by diverting existing drains locally.
- Bespoke construction phase and operational phase drainage has been designed to maximise water quality protection and minimize flooding effects.
- Detailed emergency response procedures have been outlined for potential flood events during the construction phase and during the operational phase.
- Certain biodiversity enhancement have been designed to avoid mapped flood zones.
- Critical electrical components at turbines, such as transformers in nacelles, and other sensitive electrical components are proposed above 1000-yr flood levels.
- The proposed substation is located in Flood Zone C (i.e. above the 1000-yr flood level).
- As per Section 50 requirements, the river crossings will be located at a height which includes a 300mm freeboard above the 1 in 100-year flood event plus climate change. Additional culverts will be constructed on the access roads on approach to the river crossings to minimise flow disruption during flood events.

3.4.2 Construction Phase

3.4.2.1 Potential Effects from Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

Proposed Mitigation by Avoidance: The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features, by application of suitable buffer zones (i.e. 50m to main watercourses and 10m to main drains).

Where possible all of the key development areas (turbines, hardstands, construction compounds etc.) have been located significantly away from the delineated 50m watercourse buffer zones. Where works are proposed within the buffer zone *i.e.* at watercourse crossings additional mitigation measures are proposed. The only infrastructure elements located within the 50m watercourse buffers are the river crossings over the River Maigue and the Charleville Stream.

The large setback distance from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures (discussed below) to be properly installed and operate effectively. The proposed buffer zone will:

- Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment.
- Avoid excavations within close proximity to surface watercourses.
- Avoid the entry of suspended sediment from earthworks into watercourses.

- Avoid the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

Furthermore, all designated spoil storage areas are located outside of the fluvial flood zones. There will be no storage of spoil material within the flood zones.

Proposed Mitigation by Design:

Presented below are temporary and long-term drainage control measures that will be utilised during the construction phase. As stated above there is an existing drainage network at the Site which comprises of agricultural drains and surface water streams. The measures outlined below will be used in conjunction with the existing drainage network to ensure the protection of all rivers and downstream watercourses.

Source controls:

- Interceptor drains, vee-drains, diversion drains, erosion and velocity control measures such as the use of sand bags, oyster bags filled with gravel, filter fabrics and other similar/equivalent or appropriate systems.
- Small working areas, covering temporary stockpiles, weathering off of side-cast spoil, cessation of works in certain areas or other similar/equivalent or appropriate measures.

In-Line controls:

- Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.

Treatment systems:

- Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as “Siltbuster” (mitigation measures in relation to the use of Siltbuster are prescribed in **Section 3.4.2.9**), and/or other similar/equivalent or appropriate systems.

It should be noted that the existing network of manmade agricultural drains present in some areas will be integrated and enhanced as required and used within the Project drainage system. The integration of the existing drainage network and the proposed Project network

is relatively simple. The key elements are the upgrading and improvements to water treatment elements, such as in-line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

The main elements of interaction with existing drains will be as follows:

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the proposed wind farm drainage into the existing site drainage network. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion.
- Temporary silt traps will be placed in the existing drains downstream of construction works, and these will be diverted into proposed interceptor drains, or culverted under/across the works area.
- During the operational phase, runoff from individual turbine hardstanding areas will not be discharged directly into the existing drainage network but discharged locally at each turbine location through field drains, main drains, and existing settlement ponds.
- Buffered outfalls which will be numerous over the Site will promote percolation of drainage waters across the bog surface and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the Site.
- Velocity and silt control measures such as check dams, sandbags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works.
- Existing culverts will be lengthened where necessary to facilitate access road widening.

Temporary Drainage Works at commencement: Prior to the commencement of Access Track upgrades (or new Access Track/hardstand or turbine base installs) the following key temporary drainage measures will be installed:

- All existing dry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using check dams/silt traps.
- Clean water diversion drains will be installed upgradient of the works areas.
- Check dams/silt fence arrangements (silt traps) will be placed in all existing drains that have surface water flows and also along existing roadside drains.
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone.

Silt Fences: Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent

entry to the existing drainage network of sand and gravel-sized sediment, released from the excavation of mineral sub-soils of glacial and glacio-fluvial origin and entrained in surface water runoff. Inspection and maintenance of these structures during the construction phase will be completed and is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase.

Silt Bags: Silt bags will be used where small to medium volumes of water need to be pumped from excavations (e.g. the proposed underpass locations). As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through.

Settlement Ponds: The Project footprint will be divided into drainage catchments (based on topography, outfall locations, catchment size) and stormwater runoff rates based on the 10-year return period rainfall event will be calculated for each catchment. These flows will then be used to design settlement ponds for each drainage catchment. The settlement ponds will either be designed for 4.1hr or 24hr retention times used to settle out medium silt (0.01mm) and fine silt (0.004mm) respectively (EPA, 2006). Settlement ponds along Access Tracks and at Turbine Hardstands will have 4.1hr retention as there is additional in-line drainage controls proposed along Access Tracks and at hardstands.

Level Spreaders and Vegetation Filters: The purpose of level spreaders is to release treated drainage flow in a diffuse manner, and to prevent the concentration of flows at any one location thereby avoiding erosion. Level spreaders are not intended to be a primary treatment component for Project surface water runoff. They are not stand alone but occur as part of a treatment train of systems that will reduce the velocity of runoff prior to be released at the level spreader. In the absence of level spreaders, the potential for ground erosion is significantly greater than not using them.

Vegetation filters are essentially end-of-line polishing filters that are located at the end of the treatment train. In fact, vegetation filters are ultimately a positive consequence of not discharging directly into watercourses which is one of the mitigation components of the drainage philosophy. This makes use of the natural vegetation of the Project Site to provide a polishing filter for the Project drainage prior to reaching the downstream watercourses. Again, vegetation filters are not intended to be a single or primary treatment component for treatment of works area runoff. They are not stand alone but are intended as part of a treatment train of water quality improvement/control systems (i.e. source controls >check dams > silt traps > settlement ponds > level spreaders > silt fences> vegetation filters).

Water Treatment Train: If the discharge water from construction areas fails to be of a high quality, then a filtration treatment system (such as a 'Siltbuster' or similar equivalent treatment train (sequence of water treatment processes)) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply to all of the construction phase.

Pre-emptive Site Drainage Management: The works programme for the construction stage of the proposed Project will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily/weekly basis, as required, to allow site staff to direct proposed and planned construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Éireann website (www.met.ie). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates.
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale.
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events.
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Éireann website (www.met.ie). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive.
- Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide an interpretation of weather data and give the best available forecast for the area of interest.

Earthworks will be suspended in the event of an orange warning for rainfall. Prior to earthworks being suspended the following further control measures will be completed:

- All open spoil excavations will be secured and sealed.
- Temporary or emergency drainage will be created to prevent back-up of surface runoff.
- Working during heavy rainfall and for up to 24 hours after heavy events will not be allowed to ensure drainage systems are not overloaded.

Management of Runoff from Spoil Storage Areas: It is proposed that excavated spoil will be temporarily stored in the 6 no. proposed spoil storage areas and permanently stored in the 1 no. These designated spoil storage areas are all located outside of the fluvial flood zones and above the 1 in 1,000 year flood level (refer to **Figure 3.2**). These spoil storage areas are also located outside of the 50m hydrological buffer zones. During the initial placement of subsoil, silt fences, straw bales and biodegradable matting will be used to control surface water runoff from the spoil storage areas.

Where applicable the vegetative topsoil layer of the spoil storage areas will be rolled back to facilitate placement of excavated spoil, following which the vegetative topsoil later will be reinstated. Where reinstatement is not possible, the spoil storage areas will be sealed with a digger bucket and seeded as soon as possible to reduce sediment entrainment in runoff.

Drainage from the spoil storage areas will ultimately be routed to oversized swales and a number of stilling ponds and a 'Siltbuster' with appropriate storage and settlement designed for a 1 in 10 year return period before being discharged to the onsite watercourses.

Timing of Site Construction Works: Construction of the site drainage system will only be carried out during periods of low 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. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and operational for all subsequent construction works.

Proposed Drainage and Water Quality Monitoring: Monitoring is detailed in **Section 3.4.3** below.

Allowance for Climate Change: Climate Change rainfall projections are typically for a mid-century (2050) timeline. The projected effects of climate change on rainfall are therefore modelled towards the end of the life cycle of the proposed Project, as the turbines have a life span of approximately 35 years. It is likely that the long-term effects of climate change on rainfall patterns will not be observed during the lifetime of the proposed Project. As outlined in the above sections we have designed settlement ponds for a 1 in 10 year return flow. This approach is conservative given that the Project will likely be built over a much shorter period (38-40 weeks), and therefore this in-built redundancy in the drainage design more than accounts for any potential short term climate change rainfall effects.

Additional Measures for Works within Buffer Zone: In addition to the above mitigation measures, where works are proposed within the delineated 50m hydrological buffer zone the following additional mitigation measures will be implemented:

- Double row silt fences will be emplaced immediately down-gradient of the construction areas.

Measures along the Grid Connection: The GCR will require excavation of cable trenches in greenfield areas. These works are transient in nature with very limited excavation at any one time. Spoil removed from the trench will be reinstated. Any excess spoil will be transported to a licenced facility. A silt fencing filtration system will be installed on all existing drainage channels for the duration of the cable construction to prevent contamination of any watercourse.

3.4.2.2 Potential Effects from Excavation Dewatering and Potential Effects on Surface Water Quality

Management of surface water and groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place.
- If required, pumping of excavation inflows will prevent build-up of water in the excavation.
- The interceptor drainage will be discharged to the Site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters.
- The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit.
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur.
- Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped and a geotechnical assessment undertaken.
- A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available onsite for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed.

3.4.2.3 Potential Effects from the Release of Hydrocarbons

- During construction, where possible, all refuelling on site will be within the temporary compound within the dedicated re-fuelling area.
- All plant will be inspected and certified to ensure they are leak free and in good working order prior to use onsite.
- Site vehicles will be refuelled offsite where possible.
- Only essential refuelling will be completed outside of the dedicated re-fuelling area but not within 50m of any watercourses. Onsite re-fuelling of plant and machinery will be carried out using a mobile double skinned fuel bowser:
    - The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site and will be towed around the site by a 4x4 jeep to where machinery is located.
    - The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages.
    - The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site.
    - Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
    - A non-permeable High-Density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. This membrane will be inspected and if there is any sign of oil contamination will be removed from the site by a specialist waste contractor.
- Onsite refuelling will be carried out by trained personnel only;
- A permit to fuel system will be put in place;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- All fuel storage areas will be bunded appropriately for the duration of the construction phase. Fuels will be stored in the Temporary Construction Compound and bunded to at least 110% of the storage capacity of fuels to be stored. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The electrical control building (at the substation) will be bunded appropriately to 110% of the volume of oils that will be stored, and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;

- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages is included within this Construction and Environmental Management in **Management Plan 1 - Emergency Response Plan**. Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.

3.4.2.4 Potential Effects from the Release of Cement-Based Products

- No batching of wet-cement products will occur onsite. Ready-mixed supply of wet concrete products and emplacement of pre-cast elements will take place.
- Where possible pre-cast elements for culverts and concrete works will be used.
- Vehicles will undergo a visual inspection prior to being permitted to drive into the wind farm Site to ensure that there is no excess cementitious material which could be deposited on site.
- Where concrete is delivered onsite, only the chute will be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. A dedicated bunded area will be created to cater for concrete wash-out and this will be located in the Temporary Construction Compound.
- The contractor will use weather forecasting to plan dry days for pouring concrete.
- The contractor will ensure pour site is free of standing water and plastic covers will be ready in case of a sudden rainfall event.
- No surplus concrete will be stored or deposited anywhere on Site.
- Raw or uncured waste concrete will be disposed of by removal from the Site and returned to the source location or disposed of appropriately at a suitably licensed facility.
- Where shuttering is required to be installed in order contain the concrete during pouring, it will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure minimal potential of leaking, these measures are the use of plastic sheeting and the use sealing products at joints.

3.4.2.5 Potential Effects from Wastewater Disposal

- During the construction phase, the Project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase with 90 construction workers on site at peak.

- A self-contained port-a-loo with an enclosed wastewater holding tank will be used at the on-site temporary construction compound area, maintained by the providing contractor, and removed from the site on completion of the construction works.
- Water supply for the site office and other sanitation will be brought to site and removed after use by a licensed contractor to be discharged at a suitable offsite treatment location.
- Wastewater/sewerage from the staff welfare facilities located in the temporary construction compound will be collected and held in a sealed storage holding tank, fitted with a high-level alarm. The high-level alarm is a device installed in the storage tank that is capable of sounding an alarm during a filling operation when the liquid level nears the top of the tank.
- All wastewater will be emptied periodically, tankered off-site by a licensed waste collector and disposed of at a suitable wastewater treatment plant that has sufficient capacity. There will be no onsite treatment of wastewater.
- No water or wastewater will be sourced on the Site, nor discharged to the Site.

3.4.2.6 Potential Effects from Morphological Changes to Surface Watercourses

Mitigation measures for the upgrade of the existing crossings and the new proposed crossing are detailed below:

- The 2 no. new watercourse crossings will be via clear span bridge crossings and the existing banks will remain undisturbed as much as possible.
- No instream excavation works are proposed and therefore there will be no direct effect on the stream at the proposed crossing location.
- Any guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland will be incorporated into the design of the proposed crossings.
- As a further precaution near stream construction work will only be carried out during the period permitted by Inland Fisheries Ireland (2016) in the guidance document: “Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters” (IFI, 2016), that is, May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates and the risk of entrainment of suspended sediment in runoff.
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area. There will be no batching or storage of cement allowed on-site.
- All new road river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

3.4.2.7 Potential Effects on Groundwater Levels During Excavation Works

The majority of the infrastructure is underlain by Locally Important Aquifers whilst some areas are underlain by a Regionally Important (Karstic) Aquifer.

No significant groundwater dewatering will be required due to the relatively shallow nature of the excavations. Direct rainfall and surface water runoff will be the main inflows that will require water volume and water quality management. For the avoidance of doubt, we would define dewatering as a requirement to permanently drawdown the local groundwater table by means of over pumping, e.g. as would be required for the operation of a bedrock quarry in a valley floor.

In relation to the proposed dewatering works located overlying the Regionally Important Aquifer, no significant effect on groundwater levels will occur due to the following reasons:

- No karst features are mapped by the GSI within the Site.
- No karst features were encountered during the site walkover surveys or trial pit excavations.
- No bedrock was encountered during the site investigations which extended to depths of 3.6mbgl.
- The Site was found to be underlain by low permeability till deposits.
- Shallow groundwater inflows into turbine base excavations will be largely fed by recent rainfall.
- Any shallow groundwater seepage will be small in comparison to the expected surface water flows during heavy rainfall events.
- The management of surface water will form the largest portion of water to be managed and treated.

In terms of locally mapped and unmapped wells, the implementation of the drainage design measures will ensure that the recharge to the aquifers will not be altered, thus downgradient water levels will not be altered. As such there are no well supplies down-gradient of the Site that can be affected by temporary dewatering during turbine base construction.

Relevant environmental management guidelines from the EPA quarry 2006 guidance document – “Environmental Management in the Extractive Industry” in relation to groundwater issues will be implemented during the construction phase.

3.4.2.8 Potential Effects on Groundwater Quality in Local Private Groundwater Well Supplies

Notwithstanding the potential for the location of private wells downstream/downslope of the Project (or if wells are installed in the future), the potential for effects is negligible for the following conclusive reasons:

- The Site is underlain by low permeability till subsoils.
- There is no shallow bedrock at the Site.
- Groundwater flowpaths are typically short (approximately 300m maximum).
- Groundwater flows within the Site emerge as springs/baseline along streams/rivers and leave the Site as surface water flows and not groundwater flows.
- Groundwater flow directions will mimic surface topography and flow towards the Charleville Stream and the River Maigue.
- All local dwellings are located upgradient of the Site.
- Therefore, the potential to effect local wells is very low as groundwater flowpaths between the Projects infrastructure and potential source typically do not exist.
- Nevertheless, mitigation is provided in the EIAR to deal with typical construction phase groundwater hazards such as oils and fuels.
- Therefore, based on our hydrogeological assessment of the Site with regard to groundwater user risk and the proposed mitigation measures, we can robustly say the potential to effect local wells/water supply sources is negligible.

3.4.2.9 Potential Effects from the Use of Siltbuster

Measures employed to prevent overdosing and potential chemical carryover:

- The Siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding agents, so overdosing does not occur.
- Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system.
- Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment.
- Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover.
- Use of biodegradable chemical agents can be used at very sensitive sites (i.e. adjacent to SACs).
- Sludge from the siltbuster will be removed off site for disposal at a licenced facility.

3.4.2.10 Potential Effects Associated with Piled Foundations

The proposed mitigation measures designed for the protection of downstream surface water quality and groundwater quality will be implemented at all construction work areas.

- Mitigation measures for sediment control are detailed in **Section 3.4.2.1**, **3.4.2.2** and **3.4.2.6**.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in **Section 3.4.2.3**.
- Mitigation measures for the control of cement-based products during construction works are detailed in **Section 3.4.2.4**.

Proposed mitigation measures relative to piling works will comprise:

- Strict QA/QC procedures for piling works will be followed;
- Piles will be kept vertical during piling works;
- Good workmanship will be employed during all piling works; and,
- Where required use bentonite seal to prevent upward/downward movement of surface water/groundwater.

For bored piles, as the temporary steel casing is removed, a steel reinforcement cage is added to the pile column and then concrete is added to the toe of the pile using a tremie pipe. Vermiculite is used to create a plug between the concrete and the displaced water, therefore the concrete seals the entire pile column and pushes the vermiculite plug to the surface as concrete is added. The temporary steel casing is removed carefully as the concreting works are being completed. This concreting process is similar to that used when grouting a water supply production well (IGI (2007), and EPA (2013)). This means that a direct long-term pathway between the surface and the lower bedrock aquifer will not be sustained.

<u>Scenario 1: Creating a Pathway for Downward Flow</u>

To ensure downward flow of water and/or pollutants from the piling works does not occur, the concrete added to the bored pile will seal the pile annulus. As a result, the potential for the piling works to create pathways for downward flow of water or pollutants that could affect groundwater quality in the underlying aquifer is imperceptible.

<u>Scenario 2: Creating a Pathway for Upward Flow</u>

To ensure upward flow of underlying groundwater via potential pathways created by piling works does not occur, the concrete added to the bored pile will seal the pile annulus. As a result, the potential for piling works to create pathways for upward flow of groundwater to the surface is imperceptible.

Scenario 3: Blocking Regional Groundwater Flow

The piles have a very small footprint and if required would account for a very small percentage of the overall footprint associated with the Project. The proposed piles would not penetrate any great distance into the underlying bedrock aquifer, as they will likely find sufficient resistance upon reaching the top of bedrock. The ability of a single cluster of piles, to alter or affect local or regional groundwater flow in the bedrock aquifer is imperceptible.

3.4.2.11 Potential Effects from Turbine Delivery Route Works

No significant effects will occur for the following reasons:

- All works are relatively minor and localised and cover very small areas.
- Excavation/earthworks will all be small scale.
- These works are distributed over a wide area.
- All works are temporary in nature.

Nevertheless, the "Temporary Drainage Works at commencement" described in **Section 3.4.2.1 of Chapter 10: Hydrology and Hydrogeology** will be employed at all the TDR works areas.

3.4.2.12 Potential Effect on Surface Water Quality Due to Fluvial Flooding During Construction

Despite the low likelihood of a fluvial flood event occurring during the construction of the Project , weather/rainfall events of those magnitudes likely to generate significant rainfall which would in turn cause fluvial flooding would be forecastable.

An emergency response system has been development for the construction phase of the project to respond to high rainfall events which may result in fluvial flooding.

A potential high intensity rainfall event would likely to be identified 3-5 days in advance, with more accurate forecasts of severity within 24-48 hours of occurrence. Preparations for a flood event would begin from the initial indications that there may be a high rainfall event. This would allow time for the preparation and the implementation of additional emergency mitigation measures.

As above, the first point of mitigation is ongoing monitoring of weather forecasts and weather warning. The project EM (Environmental Manager) or the site ECoW will be responsible for monitoring weather forecasts during the construction phase. There will be a 24-hour advance meteorological forecasting (Met Eireann download) linked to a trigger-

response system. When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4-hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken.

- Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.
- Exposed soils (exposed temporary stockpiles) will be covered with plastic sheeting during all relatively heavy rainfall events and during periods where works have temporarily ceased before completion at a particular area (e.g., overnight and weekends).

With regards to the fluvial flood zones at the Site, a managed retreat from the fluvial flood zones will be implemented in the event of a high intensity rainfall event and/or weather warning related to rainfall. This will include the following:

- Any areas where soil/subsoil is exposed at the surface will be compacted firmly with a digger bucket of a suitably sized excavator.
- Open trenches will be backfilled and compacted.
- All oils, fuels and waste material will be removed from the flood zones.
- Existing sediment control measures will be removed, as these may be washed away and deposited elsewhere by the floodwaters.
- Site access tracks will be scraped and any excess soft material will be removed from the flood zones.
- All plant, machinery and equipment will be removed from the flood zones.

The Project has also been designed to ensure that the infrastructure within the modelled flood zones during the construction phase will not result in any significant increase in the downstream flood risk due to the displacement of floodwaters:

- All proposed spoil storage areas are located outside of mapped flood zones. There will be no storage of spoil within the flood zones.
- Access Tracks and hardstands buildups will be kept as close to existing ground level as possible during the construction phase.

3.4.2.13 Potential Effects on Public Water Supplies

Mitigation measures implemented for the protection of groundwater and surface water quality at the Site will ensure that there is no potential for effects on the Bruree PWS or the Adare PWS.

- Mitigation measures for sediment control are detailed in **Section 3.4.2.1** and **Section 3.4.2.2**.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in **Section 3.4.2.3**.
- Mitigation measures for the control of cement-based products during construction works are detailed in **Section 3.4.2.4**.
- Mitigation measures for the protection of surface water quality in the event of a fluvial flood event during the construction phase are prescribed in Section Error! Reference source not found..

Implementation of these mitigation measures will ensure the protection of surface water quality in receiving waters.

3.4.2.14 Potential Effects on Hydrologically Connected Designated Sites

Mitigation measures implemented for the protection of surface water quality at the Site will ensure that there is no potential for effects on the Lower River Shannon SAC.

- Mitigation measures for sediment control are detailed in **Section 3.4.2.1** and **Section 3.4.2.2**.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in **Section 3.4.2.3**.
- Mitigation measures for the control of cement-based products during construction works are detailed in **Section 3.4.2.4**.
- Mitigation measures for the protection of surface water quality in the event of a fluvial flood event during the construction phase are prescribed in Section Error! Reference source not found..

Implementation of these mitigation measures will ensure the protection of surface water quality in receiving waters.

3.4.2.15 Potential Effects on WFD Status

Mitigation measures relating to the protection of surface water drainage regimes and surface water quality within the Site have been detailed in **Section** Error! Reference source not found. (suspended solids), **Section** Error! Reference source not found. (hydrocarbons), **Section** Error! Reference source not found. (cement-based products), **Section** Error!

Reference source not found. (wastewater) and **Section** Error! Reference source not found. (morphological changes to watercourses). These mitigation measures will also be implemented during the construction of the Grid Connection.

Similarly, mitigation measures for the protection of groundwater quantity and quality have been detailed in **Section** Error! Reference source not found. (groundwater levels), **Section** Error! Reference source not found. (hydrocarbons), **Section** Error! Reference source not found. (cement-based products), **Section** Error! Reference source not found. (wastewater).

The implementation of these mitigation measures will ensure the protection of downstream Surface Water Bodies (SWB)s and underlying Ground Water Bodies (GWB)s. There will be no deterioration in the status of any WFD waterbody and the Project will not impact the ability of any waterbody to achieve its WFD objectives.

3.4.2.16 Potential Effects Associated with Ecological Enhancement Proposals

All planting works will be undertaken during dry weather.

3.4.3 Monitoring

The monitoring programme during the course of construction works (unless otherwise specified by any required planning condition) will include:

- One baseline monitoring visit (in advance of construction), including upstream and downstream biological Q value sampling and reporting.
- Once daily general visual inspections by site EM at all sample sites identified.
- Weekly grab sample inspections by site EM (Sample parameters will include, suspended solids, and on-site measurement of: turbidity, pH, temperature, electrical conductivity). At two locations within the Project site in man-made drains, and at SW3 and SW4.
- Monthly grab sampling by site EM at surface water monitoring locations SW3, SE4 and SW5 (refer Water Quality Management Plan – MP2). Analysis suite will include (suspended solids, BOD, nitrite, nitrate, ammonia, orthophosphate and chloride).
- Monthly inspections and grab sampling during post construction for 3 months.
- Annual upstream and downstream biological Q value sampling and reporting, including one post construction event.

The Site Environmental Manager (EM) will have a stop works authority. Weekly site meeting will include for scheduling of works according to weather forecast. Suitable locations (further downstream) for biological Q-Value sampling will be identified by Site EM.

3.5 AIR AND CLIMATE

3.5.1 Air

The main potential impact during the construction phase of the Project will be from dust nuisance at sensitive receptors close to the Site. Good practice site procedures will be followed by the appointed contractor to prevent dirt and dust being transported onto the local road network and to minimise vehicle exhaust emissions. Good practice site control measures will comprise the following:

- Site Access Tracks will be upgraded and built in the initial construction phases. These roads will be finished with graded aggregate which compacts, preventing dust.
- Approach roads and construction areas will be cleaned on a regular basis to prevent build-up of mud and prevent it from migrating around the Site and onto the public road network.
- Wheel wash facilities will be provided near the Site entrance to prevent mud/dirt being transferred from the site to the public road network. All vehicles entering and exiting the site will be required to use these facilities.
- Public roads along the construction haul route will be inspected and cleaned when being used for construction delivery. In the unlikely event that dirt/mud is identified on public roads, the roads will be cleaned. The wheel wash facility will be investigated, and any issues identified will be fixed before the facility is used by further construction vehicles.
- During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network. This requires wetting material and ensuring water is supplied at the correct levels for the duration of the work activity. The weather will be monitored so that the need for damping down activities can be predicted. Water bowsers will be available to spray work areas (wind turbine area and grid connection route) and haul roads to suppress dust migration from the Site.
- Vehicles delivering materials to the site will be covered appropriately when transporting materials that could result in dust, e.g., crushed rock or sand.
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.
- All machinery when not in use will be turned off.
- Ready-mix concrete will be delivered to the Site, and no batching of concrete will take place on the Site. Only washing out of chutes will take place on site and this will be undertaken at a designated concrete washout facility at the contractor's compound. The concrete wash water will be disposed of at a licensed facility as outlined in the **MP 5 Waste Management Plan**.

- Speed restrictions of 15km/h on access roads will be implemented to reduce the likelihood of dust becoming airborne. On-site speed limits will be implemented, policed by the Contractor, and referred to in the toolbox talks.
- Stockpiling of materials will be carried out in such a way as to minimise their exposure to wind. Stockpiles will be covered with geotextiles layering and damping down will be carried out when weather conditions require it
  Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable.
- An independent, qualified Geotechnical Engineer will be contracted for the detailed design stage of the project and geotechnical services and will be retained throughout the construction phase, including monitoring and supervision of construction activities on a regular basis. The methodology statement will be signed off by a suitably qualified Geotechnical Engineer.
- A complaints procedure will be implemented on site where complaints will be reported, logged and appropriate action taken.

The appointed contractor responsible for the detailed design of the project will provide details to the planning authority for agreement in writing prior to the commencement of development of environmental safety methodology including best practice procedures to manage construction activities. The methodology statement will be signed off by a suitably qualified geotechnical engineer/engineering geologist.

3.5.2 Climate

The following mitigation measures will be implemented to reduce GHG emissions during the construction of the Project:

- All machinery when not in use will be turned off.
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.
- Use of local quarries, materials suppliers and waste facilities will be used, as outlined in **EIAR Chapter 17 Traffic and Transport**, minimising travel distances
- A robust Traffic Management Plan (**Management Plan 7**) has been developed, utilising the most direct routes where possible. This plan will be updated to reflect project needs.

3.6 ARCHAEOLOGY AND CULTURAL HERITAGE

The Wind Farm layout was informed by Cultural Heritage desktop studies and fieldwork undertaken during the design and assessment phases and was designed to avoid the locations of known and potential heritage receptors.

The mitigation measures presented below include pre-construction and construction phase archaeological site investigations as well as protection measures for known monuments. These mitigation measures are in accordance with guidelines for planning conditions for wind energy developments within close proximity to recorded archaeological monuments as detailed in the 2006 Wind Energy Development Guidelines (Section 7.4) and the 2019 Draft Revised Wind Energy Development Guidelines (Section 7.6) and EIAR Chapter 15: Cultural Heritage.

The locations of turbines and associated infrastructure within the boundary of the Site will be subject to a pre-construction geophysical survey, carried out by a suitably qualified consultancy, followed by a programme of archaeological test trenching. These site investigations will be carried out under licence by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage. The potential exists that areas of uneven and overgrown ground conditions within the boundary of the Site may not be suitable for pre-construction site investigations and a suitably qualified archaeologist will be employed to monitor ground works during the construction phase in any such locations. In the event that any sub-surface archaeological features are identified during these site investigations they will be recorded and then securely cordoned off while the NMS are consulted to determine further appropriate mitigation measures, which may include preservation in situ (by avoidance) or preservation by record (archaeological excavation) as well as monitoring of construction phase ground works within their environs. In the event that any archaeological sites are identified during monitoring of the construction phase, ground works will halt at that location and the archaeological remains will be cordoned off while their surfaces are manually cleaned and recorded. The NMS will then be notified of the discovery and consulted to determine further appropriate mitigation measures, which may include preservation in situ by avoidance or preservation by record through systematic, licensed archaeological excavation. Any identified archaeological features which will be preserved by avoidance will be securely cordoned off for the duration of the construction phase and clearly signed as a ‘No Entry’ areas.

Buffer zones extending for 20m from the outer edges of all known and potential archaeological sites within the boundary of the Site will also be securely cordoned off with

fencing and clearly signed as 'No Entry Areas' for the duration of the construction phase. No ground reduction works or other ancillary development works including, but not limited to, drainage/services, spoil storage, traffic/parking, compounds, or landscaping/planting, will occur within the archaeological exclusion areas and their locations will be identified during site inductions during the construction phase.
Any identified archaeological features which will be preserved by avoidance will be securely cordoned off for the duration of the construction phase and clearly signed as a 'No Entry' areas.

The Project will result in no predicted direct effects on any architectural or other cultural heritage constraints on Site or on the TDR and, therefore, no mitigation measures for these elements of the cultural heritage resource are required.

3.7 NOISE & VIBRATION

The core hours for the proposed works will be normal construction hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 Saturday. There will be no working on Saturday afternoons, Sundays and Public Holidays, however, it should be noted that out of necessity some activity outside of the core hours could arise, from delivery and unloading of abnormal loads or health and safety requirements, or to ensure optimal use is made of fair weather windows for concrete deliveries, the erection of turbines and the erection and dismantling of cranes. If occasional work is undertaken outside of core hours, especially during construction of access tracks at the site entrance, this will be agreed in advance with the local planning authority.

Good site practices, for the construction of the Project will be implemented to minimise the likely effects. Section 8 of BS5228-1:2009+A1:2014 recommends a number of simple control measures as summarised below that will be employed onsite:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;
- Select inherently quiet plant where appropriate - all major compressors will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use;

- All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines will be shut down between work periods (or when not in use) or throttled down to a minimum;
- Regularly maintain all equipment used on site, including maintenance related to noise emissions;
- Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided.

3.8 WASTE

Staff Facilities

Provision for separation of waste streams will be provided so that e.g., paper, and cardboard waste and bottles will be recycled. This waste will be appropriately stored to prevent exposure to wind, rain, and wildlife.

Wastewater

A rainwater harvesting system will be proposed as the source of water for toilet facilities for the operational phase. Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank.

Concrete

During the construction phase:

- See **Section 3.4.2.4 of** this CEMP.

Chemicals, Fuels and Oils

All storage containers of over 200 litres will have a secondary containment of 110% capacity to ensure that any leaking oil is contained and does not enter the aquatic environment.

Only essential refuelling (e.g., cranes) will be carried out, outside of this area but not within 65m of any watercourse. In such cases a non-permeable High-density Polyethylene

(HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection.

A Chemical and Waste Inventory will be kept, as outlined in the **Waste Management Plan – MP5**. This inventory will include:

- List of all substances stored on-site (volume and description)
- Procedures and location details for storage of all materials listed
- Waste disposal records, including copies of all Waste Transfer Notes detailing disposal routes and waste carriers used
- Any tap or valve permanently fixed to the mobile unit through which oil can be discharged to the open or when delivered through a flexible pipe which is fitted permanently to the mobile unit, will be fitted with a lock and locked shut when not in use
- Sight gauges will be fitted with a valve or tap, which will be shut when not in use. Sight gauge tubes, if used will be well supported and fitted with a valve
- Mobile units will have secondary containment when in use/out on site

All dangerous substances will be conveyed in a container that compiles with the ADR[4]. As such the manufacturer of each bowser will provide certification to contractors of the following:

- A leak-proof test certificate.
- A copy of the IBC (intermediate bulk containers) approval certificate.
- An identification plate attached to the container.

Where mobile bowsers are used on site, guidelines (EU Directive 95/55/EC) will be followed so that:

- Any flexible pipe, tap or valve will be fitted with a lock where it leaves the container and be locked shut when not in use;
- Flexible delivery pipes will be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use. Where possible, a nozzle designed to dispense oil is used;
- The pump or valve will have a lock and be locked shut when not in use.

Refuelling

See **Section 3.4.2.3** of this CEMP.

[4] ADR, 2023 (European Agreement Concerning the International Carriage of Dangerous Goods by Road). https://unece.org/transport/standards/transport/dangerous-goods/adr-2023-agreement-concerning-international-carriage Accessed 29/01/2024

Packaging

In accordance with the waste hierarchy, packaging will be returned to the originator ahead of re-use or recycling. Where this is not possible, waste will be separated as appropriate and safely stored on site appropriately in anticipation to be transferred offsite by a licensed contractor to a licenced facility.

Metals

Waste metals from concrete reinforcing etc, have a commercial value and therefore there is an additional economic incentive for the appropriate re-use or recycling with the licensed waste contractor.

3.9 CONSTRUCTION PLAN

The following sections detail an outline construction sequence to provide an overview of the construction process; The construction-stage details of the sequence and methodologies, to be undertaken within the framework of this CEMP, will be determined by the Contractors.

3.9.1 Phasing of Works

It is envisaged that the following will be the sequence of construction for the Project:

1. Site Preparation including drainage
2. Site Access Tracks
3. Contractors Compound and Welfare Facilities
4. Crane hardstandings
5. Turbine Foundations
6. Internal cable ducting
7. Installation of the Grid Connection
8. Erection of wind turbines
9. Commissioning and Energisation

3.9.2 Working Hours

It is estimated that the Project will have approximately 58 construction workers during the construction phase, increasing to 60 at peak construction Working hours for construction will be from 07:00 to 19:00 on weekdays, with reduced working hours at weekends, from 08:00 to 13:00 on a Saturday. No work will be carried out on Sundays or Public Holidays.

It should be noted that critical weather-dependent events, such as turbine erection, may need to take place outside those hours to ensure safe and efficient operation at the Site. Hours of working for turbine foundation construction will be agreed with Limerick City and County Council prior to the commencement of turbine foundation construction. The TMP (**Appendix 17.2**) will be updated to incorporate the agreed hours of working and will be submitted to and agreed with the Planning Authority, prior to the construction phase, so that all controls as described herein are in place with all suppliers coming to the Site.

3.9.3 Site Management Procedures and Construction Methodologies

Prior to commencement of construction, the appointed Contractors(s) will prepare detailed method statements and work programmes for the construction stage. These method statements will be prepared in the context of measures set out in this CEMP and will comply with mitigation measures as outlined in the planning application and accompanying environment reports, and site investigations to be carried out prior to construction. Any specific requirements will be fully incorporated into the appointed Contractors scopes of work and appropriate supervision and management will be carried out to ensure full compliance.

The method statements produced by the Contractors(s) will be reviewed by the Ecological Clerk of Works and will be agreed with the appropriate parties, including Limerick City and County Council. Garrane Green Energy Limited will employ a Project Manager to monitor the construction phase of the Project and ensure works are being carried out in accordance with the agreed method statements, safety procedures and pollution control measures.

3.9.3.1 Mobilisation of Contractors Plant

Prior to commencement of construction works, the selected Contractors shall submit to Garrane Green Energy Limited a full list of plant, equipment and accommodation (site offices etc.) proposed for use during the works.

Dates for mobilisation will be agreed with Garrane Green Energy Limited and/or his representative/Owners Engineer.

3.9.3.2 Site Infrastructure

Site Access Tracks / Turbines

Machinery and vehicles used in access track construction are operated from the track only as it is constructed.

The location of all infrastructure required for this Project shall be set out by GPS (Real-Time Kinematic enabled[5]) equipment to the permitted detail as noted on the approved drawings. The Site will be set out using wooden posts to mark the boundary and extent of construction activities, in accordance with the approved Site layout and environmental constraints drawings, and with contributions from the appointed ecologist. The boundaries of the buffer zones will be taped/fenced off to prevent construction plant from entering the buffer zones and impacting on water quality. Site personnel will be informed of the buffer zones through toolbox talks onsite, both before and during construction. New personnel will be informed of the construction buffer zones with induction training before commencing work.

3.9.3.3 Establish Pre- Commencement Mitigation Measures

Prior to construction works advancing on site, the Contractors shall confirm to the Employer of their intention to advance the works in a sound practical manner with no undue impact on the receiving environment. The Contractors shall identify all sensitive environmental areas within the Employer's site and confirm their intended method of construction works regarding these areas in line with the methods outlined in this CEMP. All environmentally sensitive areas shall be identified prior to the detailed design/construction phase.

Where the estimated working area is reduced by any sensitive environmental areas i.e., buffer zones, post and tape marking shall be used to set out these locations and thus prevent the entry of Contractors plant within these areas during construction works.

To protect any known ecological features that occur close to the planned infrastructure, a delineated working corridor will be employed throughout the construction. Posts and tape will be used to establish these areas and thus prevent the entry of Contractors plant outside the working corridor during construction works. Locations of ecological significance or where invasive species are identified will also be fenced off.

A 50 m buffer to natural watercourses will be employed during construction to protect water quality and to ensure that there is no significant direct effect on existing watercourses. The proposed locations for spoil storage are highlighted in the attached Spoil Management Plan. Where spoil storage areas are located in proximity to watercourse buffer zones, silt fencing will be installed along the area facing the buffer zone and maintained in line with the

[5] Real-time kinematic (RTK) processing on a drone **records GPS information and geotags images as they're captured during flight**.

instructions of the manufacturer. Works within the buffer zone will be subject to specific method statements.

3.9.3.4 Site Preparation

Entrance Formation

Abnormal loads will enter the Site via an existing entrance on the N20 (Site Entrance 1) which will be upgraded to allow vehicles to turn into the Site. Due to the fact that the N20 is a very busy National road, the Site Entrance 1 off the N20 will only be used for the transportation of abnormal loads to the Site. These vehicles will enter the Site via this entrance and exit the Site via Site Entrance 2 on the L1537 as they will have unloaded and shortened and will no longer be oversize and will therefore be able to exit onto the L1537. All the site entrances are Illustrated on **Figure 2.2**.

Works required at the site entrances will include the following:

- Clearing visibility splays of vegetation / soil to a level surface;
- Excavating to solid formation level;
- Installing roadside drainage features;
- Placing entrance sub-base with rockfill material;
- Placing capping layer;
- Providing surface dressing where necessary to prevent rutting of existing road surface.

The detailed construction method statement for site entrance preparation is included in **Table 3.2**.

Table 3.2: Site Entrance Preparation CMS

Activity	Notes
Video Road Condition Survey.	The Contractors will arrange and provide a video survey to establish the condition of the road prior to mobilisation to site.
Prepare a Traffic Management Plan (TMP) in coordination with Limerick City and County Council and An Garda Síochána and implement.	The Contractors will agree an approved TMP with the Roads Section at Limerick City and County Council, An Garda Síochána and Garrane Green Energy Limited.
Set out the alignment of the site entrance using GPS equipment.	Wooden pegs/posts or similar to be used in setting out, following a site walkover by the Ecological Clerk of Works.
Archaeology Requirements.	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Install drainage treatment features as per the Surface Water Management Plan.	Required to minimise the transportation of suspended solids generated during the construction stage.
Excavate and/or clear the area which is required to accommodate the visibility splays.	The top layer of vegetated material is set aside for re-use as a sealing layer to prevent sediment runoff and reduce visual impact.
Re-align private fences as required by the visibility splays and detailed design.	Required for stock control, security, and sight line visibility requirements.
Excavate to track formation level along the extent of the site entrance and accommodate drainage.	The Contractors shall provide that soil is carefully distributed and banked adjacent to the entrance within the construction boundary. Soil will be managed as per the spoil management plan. Any storage of material will be located to see that no interference with visibility splays occurs.

Activity	Notes
Installation of stone foundation and surfacing of apron to be installed.	In the interests of road safety, appropriate construction measures will be implemented to see that site debris is not deposited on the carriageway. In the unlikely event of same occurring, the Contractors shall ensure that all material is removed immediately in accordance with the provisions of the TMP to be agreed with Limerick County Council.
Installation of security gates/hut (where required), tied into the re-aligned fence.	Required for site security.

Contractors Compound and Welfare Facilities

The temporary site compound will be in place for the duration of the construction works only. The compound will be used as a secure storage area for construction materials and to contain temporary site accommodation units for sealed type staff welfare facilities. The compound will contain cabins for offices space, meeting rooms, canteen area, a drying room, parking facilities, and similar personnel type facilities.

An area within the compound will be used for the storage of fuel and oils and this will be suitably bunded to 110% of the storage volume. The bund will be lined with an impermeable membrane in order to prevent any contamination of the surrounding soils, vegetation and water table. Double protection containers / equipment will be used along with drip trays and details

During the construction phase, water will be supplied by water bowser. The maximum wastewater production is estimated to be the same as the maximum water consumption (2,000 litres per day). The Project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase with 50 construction workers on site at peak. A holding tank is proposed for wastewater management. Wastewater will be removed off-site and disposed at an appropriate licenced facility.

The proposed construction method statement for the construction compound / storage area is detailed in **Table 3.3**.

Table 3.3: Contractors' Compound and Welfare Facilities CMS

Activity	Notes
Set out the perimeter of the site compound using GPS equipment following a site walkover by the Ecological Clerk of Works.	Setting out must be undertaken to Irish Grid co-ordinates and to sub-centimetre accuracy in the X, Y and Z plane.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Install drainage treatment and flow attenuation features as per the detailed design.	Required to minimise the transportation of suspended solids generated during the construction stage.
The top layer of vegetated material will be stripped and stored for re-use onsite.	The top layer of vegetated material is set aside for re-use as a sealing layer to prevent sediment runoff and reduce visual impact. The location for storage of these vegetated turves will be around the perimeter of the site compound away from any sensitive habitats.
Stone will be placed in layers to form the hardstanding area for the site compound.	Hardcore area with Clause 804 stone on geotextile layer (Netlon SS30 or similar) for temporary site offices and for vehicle movements / parking.
The accommodation, eating and sanitary cabins will be installed in accordance with the construction drawings. The site office will be located in the temporary storage area.	Foul drainage from site welfare accommodation will discharge to a holding tank. The holding tank will be fully enclosed with no discharge outlet. The toilets will be the 'portaloo' chemical toilet type. The holding tank will be emptied as required by a licenced waste disposal operator. Temporary power supply and telecommunications will be connected to the relevant cabins.
Construct an impervious covered bunded area for plant refuelling and plant maintenance and cleaning operations.	Bund to absorb 110% of potential spill volume. Non-permeable concrete refuelling area with petrol interceptor. An oil interceptor will be installed on the drainage outlet from the bunded area to separate any oils from the surface run off. Generators and

Activity	Notes
	associated diesel tanks are to be installed on such an area.
Storage units for hazardous products and covered waste skips will be installed as per best industry practice.	All storage units for hazardous products will be fully lockable and bunded proprietary steel containers.
Provide measures for waste management.	Waste segregation skips will be deployed for optimum recycling and re-use of materials. Skips will be covered with lid.
Parking	Parking areas shall be identified by signage with a handrail system or barrier separating pedestrian areas and vehicle routes.
Reinstatement	Compound areas to be restored to pre-construction condition at completion and demobilisation stage.

Site Security

From an operational point of view, for control of site access and for proper site management, all access to the Site will require passage through a controlled safety barrier/gate or hut. The exact location(s) shall be decided by the Contractors with primary responsibility for safety on the Site. It is proposed that the barrier(s) be located at all site entrances. The barrier will be set back sufficiently so that HGVs can enter the Site without stopping.

The Contractors shall be responsible for securing each area of work, so as to ensure the safety and health of all affected persons (Contractors personnel, site supervision staff, members of the general public, traffic, etc.). The Contractors will provide details to Garrane Green Energy Limited of security arrangements for the following:

- Fencing specification;
- Provision of personnel to man site access point(s);
- Signage; and
- Signing in/out procedures.

3.10 SITE CLEARANCE AND CONSTRUCTION METHODS

The management of earthworks will be of paramount importance throughout the construction of the Project. The general principles that will apply to earthworks include:

- Excavations to only take place following implementation of setting out the working corridor, drainage treatment and flow attenuation provisions.

- Archaeological supervision works will be undertaken during all earthworks.
- Vegetation within the construction corridor shall be cleared as part of the excavation works.
- Suitable plant to be used, particularly when working off road i.e., use of geotextile mats.
- Machinery and vehicles used in access track construction are operated from the track only as it is constructed.
- Vegetated top-mat layer to be removed separately and set aside from other spoil and place around the excavations for use in reinstatement. Spoil storage areas will be around turbine bases as per the attached **MP4 - Spoil Management Plan**.
- Topsoil stockpiles shall be no more than 2m in height, smoothed to prevent erosion, and watered to prevent them drying out.
- Apply the vegetated capping layer to permanently exposed excavations or storage areas to mitigate against movement and to avoid sediment run-off. Input from the appointed ecologist will be used to apply the appropriate species of the immediate environment in the capping layer.
- Monitor all rock breaking activities and survey areas for indicators of soil movement/slide. Th
- e appropriate remedial action will be taken.

The construction method statement for excavation and spoil management is shown in **Table 3.4**.

Table 3.4: Excavation and Spoil Management Method Statement

Activity	Notes
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Install drainage treatment and flow attenuation features as per the detailed design, which includes recommendations of an expert ecologist	Required to minimise the transportation of suspended solids generated during the construction stage. Temporary and permanent ponds and outflow buffers will be constructed as per the attached Surface Water Management Plan.
Spoil locations to be identified to machine drivers	Spoil storage areas to be mapped and pegged out prior to excavation commencing.
A Risk Assessment shall be developed for each and every excavation location to be carried out on site.	Control measures to mitigate safety, stability and environmental risks specific to the local conditions.
The vegetated layer will always be removed and set aside separately from any spoil material.	Required to enhance revegetation.
Excavated material will only be stored to a maximum height of 1.0 m along site access roads.	Prevent movement of stored material and protect watercourses.
Excavated material will not be stored in areas which have been identified for spoil storage as detailed in the Spoil Management Plan and Drawings No. TBC. No material will be stored within the Flood Zone.	Prevent movement of stored material and protect watercourses against harmful run offs.
Excavated material will be separated and stored so that it is not left exposed to the elements. This will be provided for through the immediate application of a vegetated capping layer.	No spoil is permitted to be stored on areas identified as sensitive or high value habitats. Other material will be used for landscaping.
Interim (temporary) material storage during the construction stage will be kept to a minimum by the	Return and re-vegetate the Site to its original state as soon as possible.

Activity	Notes
implementation of a continuous construction cycle: 1) Excavate material; 2) Handle material; 3) Permanently store material	
Permanent excavated or spoil surfaces shall be re-vegetated without undue delay using seed collected pre-construction, final details of which will be approved by the ecologist. Reseeding will occur within the growing season.	To encourage growth of locally-common habitats
Material from excavations in rock, suitable sands and gravels will be carefully managed and re-used as structural fill in the locality of the excavation where possible.	To minimise the volume of imported material required and ensure no impact on the local pH level. No spoil will be permitted to be stored on areas identified as sensitive or high value habitats.

3.10.1 New Site Access Tracks

Carrying capacity will be based on the weight restriction for the installation crane, which is expected to have a maximum 20 tonne axle weight with a minimum of 12 tonnes. The construction method will be Cut and Fill.

Prior to advancing any construction works, final road design shall take into account the following:

- Existing Ground Profile
- Existing Ground Soil Type
- Bearing Capacity
- Natural Drainage
- Proposed Turbine Delivery Specification
- Existing Environmental Buffers

As this Project will most likely be advanced as Design & Build, the Contractors will be obliged to form the design and construction works with reference to the above and seek final approval from the Engineer for their design prior to advancing any work on site. In any event, it is proposed that the site access roads are built as follows:

- The alignment of the new site access tracks will be established and the centrelines will be marked out with ranging rods or timber posts.
- Any trees/hedgerow within the construction corridor that have been identified in **Section 3.2.1** shall be cleared prior to any construction works. All works will be undertaken outside of the breeding season.
- The first phase of drainage will then be installed in accordance with the detailed drainage design. Access Track construction will require the crossings of a number of cut drains and minor drainage paths.
- The angle of repose of the cut face of excavations shall be battered back approximately 45 degrees. However, where peat is encountered, it will be increased to 26.5 degrees.
- Slopes will not be undercut or excavations left unsupported for periods in excess of 24 hours.
- Soil excavation shall be observed by a qualified archaeologist, in accordance with the approved scheme of archaeological monitoring in order to respond appropriately to identification of any potential archaeological remains.
- The access road will be excavated to a suitable formation level. Roadside berms will be constructed. Where necessary, stone will be delivered to site by tipper trucks from approved local quarries detailed in Chapter 17 Traffic & Transport and will be placed, spread and compacted in layers to form the running surface. The compaction will be carried out using a dead weight roller.
  - Imported stone will be used throughout for the final surfacing layer.
- Well-graded granular fill (quarry sourced clean stone) will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Site Manager based on the characteristics of the material and the compaction plant to be used.

3.10.1.1 Cut and Fill (Excavated) Access Tracks

This form of Access Track construction is a traditional method whereby the final road construction is formed on a firm bearing strata. This is generally found following removal of the initial vegetation layer and more than likely the underlying layer of soft material found between the topsoil layer and the firm strata. Typically, this form of road construction could be founded on relatively shallow excavations. However, if soft spots are encountered locally, they will be excavated out and in-filled with suitable excavated material. Imported rock will be chemically compatible with the existing geology. It will be tested for compatibility prior to entering the Site. This involves using rock that is similar to the geology of the Site and locally sourced i.e., sandstone till. Construction of Cut and Fill Road sections will be

carried out in accordance with detailed design. This system will consist of either 1 or 2 layers of stone depending on the load bearing capacity of base layer and the design loading required with construction traffic. Where the underlying layer is clay, 2 layers of stone are used. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface.

If the vertical alignment requires local infilling for the formation of the road, the above process of exposing a firm strata is followed and infill material is employed to raise the road profile in a local embankment.

Note Access Tracks located within the Flood Zone will be constructed to existing ground level (egl) during the construction phase and will be increased to above 1:20yr +climate change flood level for the operational phase.

3.10.2 Access Track Drainage

A vegetative filter strip and under-road drainage will allow discharge in a controlled manner downslope of the works.

Any crossing of field drains, man-made drains and vegetated drains will be piped directly under the road through appropriately sized drainage pipes. Where appropriate, a lateral drainage ditch (interceptor drain) will be cut along the uphill side of the road to intercept the natural runoff. This lateral drain will be drained under the road at regular intervals through correctly sized cross drains. In cases where the roads must run significantly downhill, transverse drains ('grips') will be constructed where appropriate in the surface of the roads to divert any runoff down the road into the drainage ditch. Where the crossing of ditches, field drains, man-made drains and vegetated drains cannot be avoided, the design of the crossing, (in this case culverts) shall be prepared in line with the drainage design philosophy. This is further detailed in the **MP3 - Surface Water Management Plan** and **MP2 - Water Quality Management Plan**.

Under road drainage will be provided under the excavated roads at all locations where existing land drainage passes under the proposed roads. Conventional cross drains will be 150 mm diameter and increased to 300 mm diameter (minimum) at points for land drainage or natural drainage paths. The spacing of the cross drains will be dependent upon whether the roads run parallel or tangential with the general contours of the Site.

The detailed design of all under-road drains in areas near flushes will have the input from the Environmental Manger and Ecological Clerk of Works to see that there is sufficient flow connecting the upstream and downstream habitats. These will be inspected by the Environmental Manager and Ecological Clerk of Works during construction.

All existing site drainage channels and culverts shall be maintained, and any additional drainage design required on-site shall be carried out as per the detailed design. Any such additional requirements will be reviewed by the Engineer, Environmental Manager and Ecological Clerk of Works prior to site clearance activities taking place on-site.

The proposed water crossings on Site will be carried out in accordance with the attached Water Crossing Management Plan.

3.10.3 Turbine Bases/Foundations

Foundation requirements will be provided by the wind turbine supplier, and appropriate factors of safety will be applied to these in accordance with Wind Energy Development Guidelines, 2006. The turbine towers will be anchored to the concrete foundation using a bolt assembly which shall be cast into the concrete.

The turbine foundations for turbines outside of the flood zones, that is T1, T2, T3, and T9, will be 27.2m in diameter and have a depth of 3.5m. The central part of the foundation will be 6m in diameter, will be raised from the main Turbine Foundation below ground level and will encompass cast-in bolts to connect to the bottom of the turbine tower and reinforced bar structural elements.

The turbines within the flood zone, T4, T5, T6, T7 and T8, will require piled foundations, comprising rotary bored piles into bedrock supporting the concrete base slab with a central upstand to support the tower. The turbines will use a buoyant foundation type using 16 No. 10m long piles bored c.3m into the limestone bedrock. The foundations for each turbine will be designed by the appointed Designer. Piled foundation bases are generally 24m in diameter with detailed foundation design being dictated by the local ground conditions. The top of foundation levels for all turbines within the flood zone will be designed so that the top plinth will be above the 1:1000-year flood level plus climate change plus 150mm. The arrangement is shown on Drawing No. **6839-JOD-GGE-XX-DR-C-503.**

Plate 3.1: Turbine foundation under construction with adjoining crane pad[6]

There are two options for design and construction of Turbine foundations as follows:

- **Option 1 – Turbine Foundation constructed directly on in-situ ground:**
  The Contractors shall demonstrate that the soil/rock properties at the formation level are in compliance with the turbine Foundation Design limiting criteria for a ground bearing base.

- **Option 2 –Turbine Foundation constructed on engineering fill:**
  If it cannot be demonstrated that Option 1 is achievable, the Contractors shall establish and demonstrate a suitable bearing stratum at a lower level, design and construct engineering fill to the formation level of the foundation and demonstrate that the fill properties at the formation level are in compliance with the Turbine Foundation Design limiting criteria for a ground bearing base.

[6] Good Practice during Wind Farm Construction, 2019. Online: https://www.nature.scot/doc/guidance-good-practice-during-wind-farm-construction [Accessed 20/06/2024]

Plate 3.2: Proposed wind turbine foundation' to clarify that the intention is to use this type of foundation for the project

The construction method statement for the turbine bases will generally follow the sequence as defined in **Table 3.5** and **3.6**.

Table 3.5: Turbine Base (Gravity) Construction Method Statement

Activity	Notes
Set out the turbine location (T1, T2, T3 and T9) with the use of GPS (RTK) equipment.	The Contractors shall tape off buffer zones with assistance from the Ecological Clerk of Works , and toolbox talks will be used to inform site staff of the importance of the buffer zones.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours.

Activity	Notes
	The nominated archaeologist will monitor all invasive works.
Set out and install drainage treatment and flow attenuation features.	Required to minimise the transportation of suspended solids generated during the construction stage.
Remove and locally store the top layer of vegetated material over the excavation area.	This material will be stored for re-use to cover and promote natural re-vegetation of the inorganic spoils that will be deposited at the nearest suitable location to the excavation, monitored by the Ecological Clerk of Works.
Excavate remaining material to 1m depth and segregate organic material from mineral material.	Selected excavated organic material will be considered for re-use as backfilling material.
Excavate to formation level. Complete plate bearing tests.	Any excavated inorganic material will be re-used as structural ballast to minimise the required volumes of spoil and imported stone.
A reinforcement steel cage for the foundation will be assembled after insertion of the turbine foundation insert arrangement (required for fixing steel tower) and formwork will be fixed to surround the cage.	Reinforcing steel shall be checked for design compliance and signed off upon acceptance.
Reinforcement steel for the top section of the foundation is fixed along with the required number of cable ducts.	Reinforcing steel shall be checked for design compliance and signed off upon acceptance.
Erect the formwork to contain the concrete pour.	Formwork will be re-used and removed offsite when foundation construction is complete.
The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base. These checks will be passed to the appointed Turbine Contractors for their approval.	
The foundation will be backfilled with a cohesive material.	Using the material arising during the excavation and landscaped using the vegetated soil set-aside during the excavation.

Table 3.6: Turbine Base (Piled) Construction Method Statement

Activity	Notes
Set out the turbine location (T4, T5, T6, T7 & T8) with the use of GPS (RTK) equipment.	The Contractors shall tape off buffer zones with assistance from the Ecological Clerk of Works , and toolbox talks will be used to inform site staff of the importance of the buffer zones.
Ongoing monitoring of weather forecasts and weather warning.	The Project EM (Environmental Manager) or the site ECoW will be responsible for monitoring weather forecasts during the construction phase. There will be a 24-hour advance meteorological forecasting (Met Eireann download) linked to a trigger-response system. When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4 hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Set out and install drainage treatment and flow attenuation features.	Required to minimise the transportation of suspended solids generated during the construction stage.
Remove and store outside the flood zone the top layer of vegetated material over the excavation area.	This material will be stored for re-use to cover and promote natural re-vegetation of the inorganic spoils that will be deposited at the nearest suitable location to the excavation, monitored by the Ecological Clerk of Works.
Excavate remaining material to 500mm depth and install approximately 500mm of crushed stone, compacted in two layers.	This will form a stable platform used to support the piling rig during drilling.

Activity	Notes
Set out pile locations and construct piles by drilling vertical holes of approximately 900 mm in diameter to a minimum depth of 3 m into bedrock and installing steel reinforced cage and structural concrete.	Piles and reinforcing steel shall be checked for design compliance and signed off upon acceptance.
Excavate the footprint of the turbine foundation including working width for formwork and duct installation to formation level.	
Construct 100 mm thick concrete blinding layer.	
Prepare top of piles for connection to foundation reinforcement	
Erect the formwork to contain the concrete pour.	Formwork will be re-used and removed offsite when foundation construction is complete. the top of the foundation will be above current ground level so that the plinths are above the 1:1,000 year flood level + cc plus 150mm, top of foundation levels.
The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base. These checks will be passed to the appointed Turbine Contractors for their approval.	

Plate 3.3: Wind Turbine Erection[2]

Plate 3.4: Assembly of wind turbine blades [2]

3.10.3.1 Turbine Hardstands/Crane Pads

A crane pad hardstand area will be required at each turbine. The hardstands must allow for two cranes (including outriggers) to operate in the vicinity of the turbine to allow for turbine erection. The hardstand must also provide storage and set down areas for turbine components. The hardstand requirements are specified by the turbine supplier and require strict compliance so that there are no stability issues during erection of the turbine sections. The main turbine hardstands will be 3,867m^2 for T1, T2 and T9. The turbines located within the floodplain will have reduced footprint of 1,700m^2 (T3), 2180m^2 (T4, T6, T7 & T8) and 1,889m^2 (T5). Hardstands will be a maximum depth of 0.85m depending on the local bedrock profile and the varying soil depth giving a surface area of 23,910m^2 for nine turbines and will require a material volume of 20,323.5m^3.

All Turbine Hardstands will be designed to take account of the loadings which will be provided by the appointed turbine and installation Contractors and will consist of a compacted stone structure which is to be installed in accordance with the Transport Infrastructure Ireland (TII) Specification 800 2013.

Two types of hardstands are facilitated:

- Locations that will require a turning head.
- Standard Hardstand arrangement where delivery vehicles do not require a turning area.

Hardstand formation will consist of either 1 or 2 layers of stone depending on the properties of the underlying load bearing layer. Where the underlying layer is clay, 2 layers of stone formation are used, the stone capping layer and the running layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface (in this case siltstone).

The hardstand area will be excavated to a formation level of weathered rock where possible or on stiff bearing strata on overlaying material.

Following completion of the hardstands, a series of plate load tests will be undertaken to demonstrate compliance with the turbine supplier requirements of 260 kN/m^2.

Excavated material will be used for side slope formation local to the hardstands. Material from the excavation of the hardstands will be used to dress exposed areas around the hardstand with the remainder being used for landscaping around the turbine base in accordance with the attached **MP4 - Spoil Management Plan**. A Hardstand construction method statement is set out in **Table 3.5**.

Note the turbine hardstands located within the floodplain will have reduced footprint of 1,700m^2 (T3), 2180m^2 (T4, T6, T7 & T8) and 1,889m^2 (T5). During the construction phase they will be constructed to existing ground level. During the operational phase these hardstands will have an operational area of 1,120m^2, except for T5 which will have a post construction hardstand area of 940m^2 and will be constructed above the 1 in 20yr flood level.

Table 3.7: Typical Hardstands Construction Method Statement

Activity	Notes
Set out the crane hardstands with the use of GPS (RTK) equipment.	The Contractors ensure that buffer zones and areas of restricted working width are taped off with assistance from the ECoW and toolbox talks used to inform site staff of the importance of the buffer zones with identification of areas on drawings and maps.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours and monitor earthworks where appropriate.
Set out and install drainage treatment and flow attenuation features around the crane hardstand and turbine area.	Temporary and permanent ponds and outflow buffers will not be constructed in sensitive habitats or buffer zones. Liaison with the ECoW at the detailed design stage will assist in the identification of suitable locations.
Remove and locally store the top layer of vegetated material over the area of the crane hardstand excavation.	This material will be stored for re-use to cover and promote natural re-vegetation of the amorphous peat and /or inorganic spoils that will have to be deposited at the nearest suitable location to the excavation.
Excavate remaining material to 1m depth and segregate organic material from mineral material.	Selected excavated organic material will be considered for re-use as backfilling material.
Excavate material to the required formation level.	The formation level for the crane hardstands will be on weathered rock or stiff overlaying material. Where suitable, the excavated material will be re-used as structural backfill material to minimise the required volumes of spoil and stone.

Activity	Notes
Place rock fill in accordance with the design to form the crane hardstand structure. Where appropriate, geotextile and/or geogrid should be used to help reduce the volume of stone. Fence off steep edges.	Special consideration will be given towards the stone placement and compaction so that the structural integrity meets the loading requirements.
Plate bearing tests will be undertaken following completion of the hardstand structure.	The number and location of the plate bearing tests shall be specified by the Contractor's designer.

Plate 3.5: Proposed crane to be used for wind turbine erection

3.10.3.2 Handling/Disposal of Excavated Material

Details of spoil management methodology are outlined in the attached **MP4 - Spoil Management Plan**.

3.11 TRAFFIC MANAGEMENT

Although no long-term significant effects have been predicted, the proposed mitigation measures have been incorporated into the design to maintain the highest standard of road safety, minimise delay and disruption to all public road users, and to comply with statutory regulations:

- The appointed Contractor shall inform local residents, businesses and emergency services of proposed works on the public road network in advance of any works taking place on Site. Access shall be maintained to properties at all times during the course of the works. The Contractor will appoint a project coordinator who will be the main point of contact for matters relating to traffic which will affect the general public, local

businesses and emergency services. An out of hours contact number shall also be provided.

- Prior to delivery of abnormal loads i.e. turbine components, Garrane Green Energy Limited or their representatives, will consult with An Garda Síochána, TII, PPP operators and all relevant Local Authorities to obtain all necessary abnormal load permits and discuss the requirement for a Garda escort. Garrane Green Energy Limited will also outline the intended timescale for deliveries and efforts can 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 abnormal load deliveries.
- Prior to delivery of abnormal loads, Garrane Green Energy Limited or their representatives, will consult with TII, PPP operators and all Local Authorities through which the abnormal loads will pass and agree the specification for any enabling works to be carried out on the Turbine Delivery Route.
- Prior to the delivery of turbine components, a survey of the Turbine Delivery Route will be undertaken to identify if any overhead lines or height restrictions at toll booths will need to be lifted along the route to allow abnormal loads such as tower sections and nacelles to be delivered.
- Prior to the delivery of turbine components, a trial run shall be carried out between Foynes Port / Port of Galway and the Project entrance using an abnormal load vehicle with a retractable load gauge to determine that abnormal load vehicles can transverse the route without undue delay and disruption to public road users.
- During the construction and Decommissioning phases, road works signs in accordance with the requirements of Chapter 8 of the Traffic Signs Manual will be erected at all the Project entrance and at all locations on the Grid Connection route and Turbine Delivery Route which are being modified to facilitate turbine delivery. Details of signage are given in the Traffic Management Plan in **EIAR Appendix 14.2**.
- Wheel cleaning equipment will be used at all site entrance with the public road to prevent any mud and/or stones being transferred from Site to the public road network. All drivers will be required to see that their vehicle is free from dirt and stones prior to departure from the Site.
- To reduce dust emissions, vehicle containers/loads will be covered during both entrance and egress to the Site where required.
- All dust generating activities will be minimised where practical during windy conditions, and drivers will adopt driving practices to minimise the creation of dust. Where

conditions exist for dust to become friable, techniques such as damping down of the potentially affected areas may be employed.

- Access to the construction site will be controlled by on Site personnel and all visitors will be asked to sign in and out of the Site by security/Site personnel on entering and exiting the site.
- All Site visitors will undergo a Site induction covering Health and Safety issues at the Contractor's temporary compound and will be required to wear appropriate Personal Protective Equipment (PPE) while onsite.
- A condition survey of the road network in the vicinity of the site entrances will be carried out and agreed with Limerick City and County Council prior to any works being carried out on site.
- All works on the public road network will be carried out using an approved road opening licence and traffic management plan.
- All wind farm vehicles shall have roof mounted flashing beacons when working on the public road network or will use their hazard lights within the Site.
- A speed limit of 25 km/h shall apply to all vehicles within the Site.

Table 3.8: HGV and Abnormal Load Deliveries

Materials	Quantity	No. Of Deliveries	Timeframe (Months)	Maximum Loads / Day	Vehicle Type
Site Establishment (Plant, Offices, welfare facilities)		10	1	5	OGV2
Site entrance construction (3 No.)	1,700m^3	170	1	10	OGV2
Fencing	200m	10	1	5	OGV2
Temporary Construction Compound	600m^3	60	1	10	OGV2
Construction of Internal Access Road	12,750m^3	1,275	2-5	10	OGV2
Bridges	3 No.	60	2-5	5	OGV2
Site Drainage	-	20	2-5	5	OGV2
Substation Buildings	-	50	4-9	5	OGV2
Substation Compound Construction	210m^3	20	4	10	OGV2
Substation Electrical Works	-	20	10-14	5	OGV2
Substation Commissioning	-	5	15-16	1	
Construction of Turbine Hardstands	50,600m^3	5,060	2-10	10	OGV2

Materials	Quantity	No. Of Deliveries	Timeframe (Months)	Maximum Loads / Day	Vehicle Type
Construction of Turbine Foundations (950m^3 Per Base)	8,550m^3	960	2-10	120	OGV2
Wind Farm Internal Cabling Installation	4,700m	50	10-12	5	
Turbine Delivery and Erection (crane)	9 Turbines	140	11-16	3	OGV2
Grid Connection	-	30	12-16	5	OGV2
Energisation	-	5	16	2	OGV1
Turbine Commissioning	-	5	16-18	2	OGV1
Site Restoration	-	15	16-18	5	OGV1 / OGV2
Total		**7,965**			

3.11.1 Site Entrances

Site Entrance 1 on the N20 will be constructed as a temporary entrance for abnormal loads and will be used during the following phases of the wind farm construction, operation and Decommissioning,

- Construction of Site Entrance 1.
- Delivery of abnormal loads including turbine components, cranes and transformers only.
- Remain operational for agricultural uses
- Removal of turbine components from site using abnormal load vehicles during the Decommissioning period.

Site Entrance 2 on the L1537 will be used during the following phases of the wind farm construction, operation and Decommissioning,

- Construction of the access track infrastructure and watercourse crossings.
- Construction of turbine hardstands and foundations.
- Construction of the Onsite Substation.
- Construction of the Grid Connection.
- Emergency access during the operation of the Project.
- Access during the operation of the Project.
- Removal of material from site using during the Decommissioning period.
- Field access to agricultural land following during construction, operation and Decommissioning of the Project.

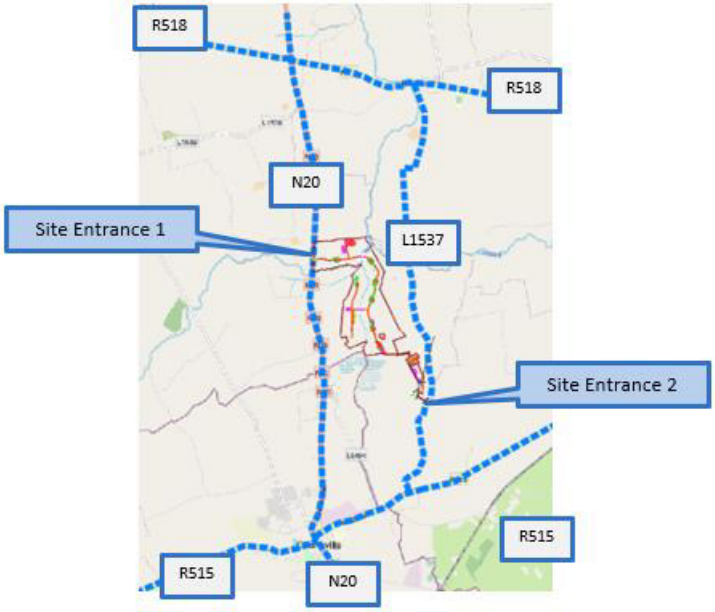

Figure 3.3: Construction Haul Route (Ref: EIAR Figure 17.4)

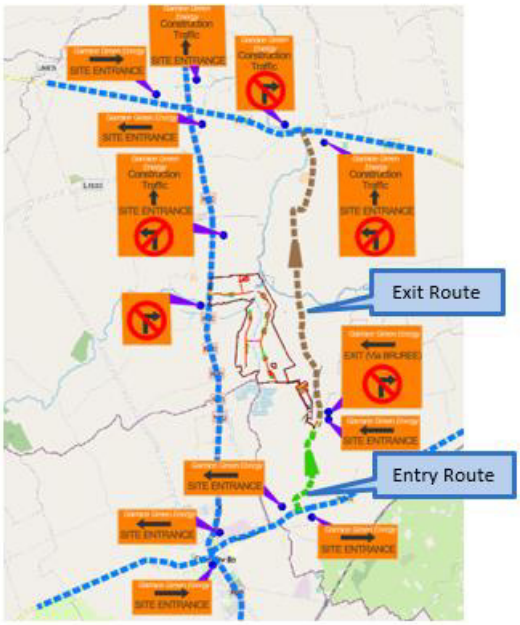

Figure 3.4: One Way System (Ref: EIAR Figure 17.5)

3.11.2 Construction Material Haul Route

The haul route of quarry materials i.e. readymix concrete will be established after the appointment of the Contractors, but it is envisaged that material will be sourced from quarries local to the Site to minimise disruption on the public road network as per **Figures 3.3** and **3.4** .

3.12 PLANNING CONDITIONS AND OUTLINE METHOD STATEMENTS

This CEMP and its future versions/revisions will form part of the Contract for Garrane Green Energy. It will therefore be updated and revised during the different phases of the Project. Where the Project is granted planning permission, all the planning conditions associated with the Planning Application will be listed in **Table 3.9**.

Table 3.9: Relevant Planning Conditions and Related Documentation

Condition No.	Planning Condition	Reason
Planning Ref: INSERT NUMBER		

The Contractors will ensure compliance with all of the mitigation measures and best practice construction methods detailed within the above consent in their design and in any detailed environmental plans as required by this CEMP or the Contract.

3.13 REGISTER OF VARIATIONS

Where any variations to the Management Plans and CEMP are required (either as a result of Scheme Amendments or through corrective actions or improvements noted and undertaken on site) these will be recorded in **Table 3.10**, Register of Variations. Furthermore, all changes to construction methods, design, mitigation and the implications of these changes and authorising personnel will be recorded in **Table 3.10**.

Table 3.10: Register of Variations

No.	Variation Description	Authorising Personnel	Completion Date

4 COMMUNICATION PLAN

4.1 INTRODUCTION

Appointed Project Managers will be the main points of contact during the construction phase. This includes the Contractors, Construction Project Manager and the Client.

It is envisaged that main project communications will take the form of structured reporting arrangements and meetings.

All issues in relation to environmental management/monitoring will be reported to the Ecological Clerk of Works. The Contractors Ecological Clerk of Works will report to the Contractors and Client on a regular basis.

4.2 CONTACT SHEETS

Table 4.1 provides a list of Garrane Green Energy Limited., Contractors and relevant third party contact details. This table will be updated and maintained by the Contractors for the duration of the Contract.

Table 4.1: Contact Sheets

Company	Position	Name	Telephone
Garrane Green Energy Limited	Client Project Manager	TBC	TBC
Contractors	Site Manager / EM	TBC	TBC
Contractors	Contracts Manager	TBC	TBC
Contractors	General Manager	TBC	TBC
Contractors	Foreman	TBC	TBC
Garrane Green Energy Limited	Construction Project Manager	TBC	TBC

4.3 MEETINGS REPORTS AND CONSULTATIONS

Table 4.2 lists all meetings and consultations as required by the Contract. The table also provides details on the schedule/frequency, scope & objectives and attendees / responsibility for each meeting.

4.4 ROLES & RESPONSIBILITIES

Roles and responsibilities for environmental management, monitoring and reporting are detailed in **Table 4.3**. The Ecological Clerk of Works/Environmental Manager Contractors will be responsible for the delivery of all elements of the Environmental Management Plan. The Ecological Clerk of Works/Environmental Manager Contractors will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan.

4.5 REPORTING PROCEDURES

Figure 4.1 provides a diagrammatic outline of the general tasks and communication lines, based on the roles described in **Tables 4.2** and **4.3** and tasks detailed in the Management Plans. The Contractors will update this information as part of the construction phase CEMP upon receipt of a planning permission.

Management Plan (1) Emergency Response Plan includes the communications plan for reporting procedures for all potential environmental risks, hazards or incidents which may relate to ecology, water quality, dust, noise or archaeology. Environmental reporting to statutory bodies, such as Limerick City and County Council, will be managed by the relevant Contractors in accordance with an agreed reporting schedule.

Table 4.2: Meetings, Reports and Consultations

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
A Record of all meetings, checks, permissions and licenses will be retained within Section 4 of this CEMP			
Site Inductions	All new site personnel and visitors		Contractors to organize and maintain records
Weekly environmental meetings	Weekly	To provide updates on environmental mitigation measures and performance and identify actions for improvement. The Ecological Clerk of Works Contractors is required to maintain a Pollution Prevention	Attendance required: Ecological Clerk of Works Contractors Site Manager, and any other relevant personnel or statutory consultees where necessary.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		Measures Register in which mitigation measures put into place will be listed and checked weekly to assess the requirement for maintenance. The results of these checks will be discussed at the meeting and corrective actions agreed as required.	
Monthly Environmental Report & Monthly Environmental Management Group Meeting	Monthly	To provide a compiled record of weekly meeting minutes and environmental performance and monitoring results (e.g. air, noise or water quality monitoring as appropriate). To identify any areas / action for improvement.	To be prepared by Ecological Clerk of Works/Environmental Manager. Report to be issued to the Contractors and Construction Project Manager before the end of each calendar month. Report to be discussed at the monthly meeting with recommendations for improvement passed to the Contractors in written format
Final Environmental Report	Upon completion of construction works	The final report will document the environmental and ecological effects of the construction period. The evidence for effects will be based on findings included in the minutes of weekly meetings and monthly meetings, together with other recording information maintained by the Ecological Clerk of Works. The report will	The Final Report will be prepared by the Ecological Clerk of Works. The report will be made available to the Contractors, Construction Project Manager and Planning Authority, if required.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		relate results to residual effects predicted in the EIS.	
Environmental Checks and Monitoring of Mitigation Works	As required in advance of construction works regular checks will also be made at least every 14 days.	Environmental Checks are to be carried out in advance of construction works. This will comprise an on-site meeting / inspection to confirm the appropriate use of identified mitigation measures and highlight any further issues / measures which may be relevant prior to commencement of works in any area. As a minimum, Environmental Checks will be completed at each main piece of site infrastructure (turbine bases, construction compounds, sub-station, control room) prior to works commencing in that area. Environmental Checks will include: • Checks for visual evidence of contamination / sediment alongside watercourses, nearby working areas and in areas of surface water discharge.	Environmental checks will be undertaken by the Contractors Ecological Clerk of Works. The Ecological Clerk of Works may also undertake regular checks, either independently or in conjunction with the Contractors checks as required. The Contractors and Ecological Clerk of Works will retain a record of all inspections / findings of Environmental Checks within Section 4 of this CEMP. All records will be made available for audit / review. All records will also be made available for discussion during regular meetings as scheduled herein.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		• Regular checks of all plant and equipment to identify any oil or fuel leaks to confirm the condition of the plant. • Inspection of drainage and erosion and sediment control measures. Additional checks will be made before, during (where safe to do so) and immediately following anticipated storm events or periods of continuous or heavy intermittent rainfall over one or more days. • Environmental checks will also encompass a review of: - Waste management procedures - General site tidiness - Temporary materials storage (extracted materials stockpiles) and restoration works and	

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		- Soil stability - Signs of any mammal activity on site - Buffer zones (if any) are being maintained	
Environmental Audit	At least once every month.		Environmental Audits may be carried out by the Contractors, or Garrane Green Energy Limited. at any time during the works. Audit procedures and forms are included within Section 4 and TS1. These will be followed / completed by the Employer when undertaking environmental audits and may also be adopted by the Contractors, unless alternative procedures and forms are submitted and approved as part of the Contractors' construction stage CEMP.
Liaison with regulator / statutory Consultees	As Required	Provide regular updates to relevant authority on environmental performance and maintain good working relationships with the regulatory bodies.	Contractors and Ecological Clerk of Works where required. Meetings will be initiated as required by Planning Conditions, Management Plans or as agreed throughout the duration of the construction phase. The Contractors are responsible for obtaining all relevant permissions, consents, licenses and permits. Some permits may require application and implementation by an appropriately qualified person. In these instances, the Contractors will consult with the other specialist Environmental Consultants where required.

Table 4.3: Roles and Responsibilities

Position	Roles and Responsibilities
Construction Project Manager	The Construction Project Manager will: Ensure that the Contractors have obtained the relevant approvals and licenses and consents from regulatory bodies and statutory consultees where required. Ensure that the Contractors has submitted all relevant documentation to liaise with the Site Manager and the Ecological Clerk of Works and ensure that corrective actions and variations to this CEMP have been instigated.
Project Site Manager/ Engineer	The Site Manager will provide liaison between the Ecological Clerk of Works and the Contractors where environmental sensitivities, instruction for environmental performance improvements or corrective actions are requested by the Ecological Clerk of Works or other appropriate person(s) as a result of environmental checks or audits conducted by these people(s). The Site Manager will ensure that all notifications of environmental sensitivities and incidents as well as other general observations on environmental performance are reported back to the Construction Project Manager. The Project Site Manager is responsible for review and further development of this CEMP.
Ecological Clerk of Works/Environmental Manager	The Ecological Clerk of Works will be a member of the Environmental Management group and will work with the Contractors to ensure compliance with best practice and with all environmental mitigation and monitoring requirements as detailed within the relevant planning conditions, compliance documents and CEMP during both the pre-construction and construction phases. The main roles of the Ecological Clerk of Works are as follows: • Organise start-up meeting / Toolbox talks with the Contractors to agree working methods, specifically including communications; schedules; monitoring of data storage; and preparation of plans indicating location of key features including mitigation measures, monitoring points and sensitive habitats (where not previously highlighted and approaches agreed). • Give toolbox talks as agreed with the Contractors to address key areas, including water pollution prevention, protected species management, and on-site biodiversity. Highlight to staff the requirement for compliance with planning conditions. • Undertake a pre-construction walkover with the Site Engineer / Site Manager to confirm that access routes remain appropriate to the conditions present at the time of construction • Delineate any sensitive habitats or features with wooden stakes and high visibility tape • Undertake or delegate to an appropriately qualified person, a pre-construction Invasive Alien Species survey along the works route • Monitor the installation of poles and infrastructure

Position	Roles and Responsibilities
	• Inspect pollution control measures during the works • Maintain a presence on site during the pre-construction and construction works, including setting out of access routes. • Organise a minimum of weekly meetings with the Site Environmental Supervisor and / or Foreman, to allow briefing on the programme of works on site and to provide on-site guidance during construction. • Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractors. • Develop written reports / audits and submit to the Contractors and present findings at meetings as required. Prepare updated reports and a final report on mitigation measures, procedures and monitoring. • Monitor potential environmental impacts and the successful implementation of all mitigation as detailed in the EIAR, NIS and this CEMP. • Maintain a weekly presence on site during the main construction works • Prepare a pre-construction Invasive Alien Species survey along the works route • Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractors. • Produce written reports to the Contractors following site visits and meetings. This includes monthly reports and a final report. The Contractors will provide comprehensive information on all proposed works and all scheduling to the Ecological Clerk of Works in advance, in order to anticipate and address any issues, especially access to new areas including areas where Invasive Alien Species may occur, vegetation clearance, setting out of buffer zones, excavation and silt mitigation measures, temporary compound works and vegetation reinstatement.
Ecological Clerk of Works and/ or Water Quality Specialist	The Ecological Clerk of Works will work with Garrane Green Energy Limited., the Contractors to ensure that compliance is achieved with best practice and with all environmental mitigation and monitoring requirements as detailed within the NIS, EIAR and CEMP and relevant planning conditions. The Ecological Clerk of Works will delegate and oversee the work to ensure competency of tasks achieved. Where a particular ecological concern exists at the Site, or specific habitat management activities are to be undertaken in conjunction with the main civils construction works, a Specialist Ecologist / Environmental Consultant may also be required unless the Ecological Clerk of Works is suitably qualified to undertake the particular ecological responsibilities. The main roles of the Ecological Clerk of Works are as follows:

Position	Roles and Responsibilities
	• Organise start-up meeting / Tool box talks with the Contractor to agree working methods, specifically including communications; weekly schedules; monitoring of data storage; and preparation of plans indicating location of key features including mitigation measures, monitoring points and sensitive habitats. • Maintain a weekly presence on site during the main construction works. • Organise a minimum of weekly meetings with the Site Manager and / or Foreman, to allow briefing on the programme of works on site and to provide on-site guidance during construction. Note: It is essential that the Contractor supplies information on works and scheduling to the ECoW in advance in order to anticipate and address any issues, specifically including drainage, buffer /protection zones, silt mitigation measures, cabling, roads, turbine bases, met masts, compounds, landscaping, topsoil removal, storage and replacement, vegetation reinstatement and restoration works, planting, felling and habitat management. • Highlight the need for compliance with planning conditions. Contractors Note: If failures occur and actions are taken which contravene legislation then the Project Ecologist has the power to stop works in the affected area with immediate effect. These actions will only be taken where appropriate. Notification to stop works will be by verbal means, followed up with written confirmation recording the time and date of the instruction, personnel involved and reasons for the instruction. Upon recommencement of works, details of any corrective actions and / or remedial measures implemented will be recorded within Section 4. • Give tool box talks as agreed with the site contractor to address key areas, including water pollution prevention, protected species management, and on-site biodiversity. • Monitor potential environmental impacts, including: - Use of and storage of oils and toxic chemicals on site, e.g. cement - Dewatering of excavations (including turbine bases) - Silt control - Water management, including working in or close to watercourses - Protection of ecological interests, e.g. protected species and habitats • Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractor • Produce written reports to the Contractor following site visits and meetings. This includes monthly reports and a final report.
Specialist Ecologist/	Where a Specialist Ecologist / Environmental Consultant is employed, this person(s) will:

Position	Roles and Responsibilities
Environmental Consultant	• Provide advice and maintain regular liaison with The Project Site Manager, Project Manager, Ecological Clerk of Works and Contractors and / or other specialist Environmental Consultant as and when required. • Undertake specific monitoring activities and reporting as defined in agreed documentation prepared as part of the planning process. • The Ecological Clerk of Works will be appointed. They will have responsibility for fulfilling the requirements of the Water Quality Management Plan, including: - Daily visual inspection of: access roads for signs of ground damage or solids escape to nearby watercourses in vicinity of construction works - The ground between the structure under construction and the nearest downslope watercourse for signs of solids escape or ground damage - Surface water features in vicinity of construction works - Any pollution control measures at structures and along access roads (e.g. silt fences, drain or stream crossings etc.) for evidence of contaminated run-off or mitigation failure - Attendance at the critical work phases including, access road construction, foundation excavation, watercourse crossings, concrete pouring and back-filling. - Collection and analysis of water samples at a number of monitoring locations (i.e. upstream & downstream) before, during (if potential pollution visually identified) and after construction works at that location. - EPA Q Value Biological Monitoring at monitoring locations (i.e., upstream & downstream of instream construction work locations) before and after construction works.
Archaeological Clerk of Works	The main roles of the Archaeological Clerk of Works (licenced) are as follows: • Maintain regular liaison with The Project Site Manager, Project Manager, Ecologist and Ecological Clerk of Works as appropriate. • Maintain liaison with officers of the Planning Authority, specifically the Council Archaeologist and Planning Officers as appropriate. • Where applicable apply for licence application; the Minister for Dept of Culture Heritage and Gaeltacht can approve and issue a licence under Section 26 of the National Monuments Act 1930. • Facilitate compliance with planning conditions and agreed Archaeological Programme of Works. • Demarcate any archaeologically sensitive areas and set up exclusion zones as required on site. • Immediately notify the relevant authorities in the event of the discovery of archaeological finds or remains and suspend works in the immediate area

Position	Roles and Responsibilities
	pending consultation. Allowance will also be made for full archaeological excavation if required. • Complete a full report for submission to the Planning Authority and the Department of Arts, Heritage and the Gaeltacht on completion of the works.
Geotechnical Clerk of Works or Appointed Geotechnical Consultant	The Geotechnical Clerk of Works will be responsible for preparation and monitoring of a geotechnical risk register as well as specific duties relating to geotechnical issues as they may arise during site construction works. Soil instability and the potential for slide even can have a significant impact on environmental receptors. In completing the geotechnical risk register, the Geotechnical Clerk of Works will work with the Contractors to identify suitable mitigation and monitoring methods. Where possible, construction works will avoid causing change to local hydrological and hydrogeological flow patterns and water levels.
Contractors Appointments	
Construction Manager	[The Contractors is required to specify roles and responsibilities for each individual below]
Site Agent	[To Be Confirmed]
Foreman	[To Be Confirmed]
Other Nominated Person(s)	[To Be Confirmed]

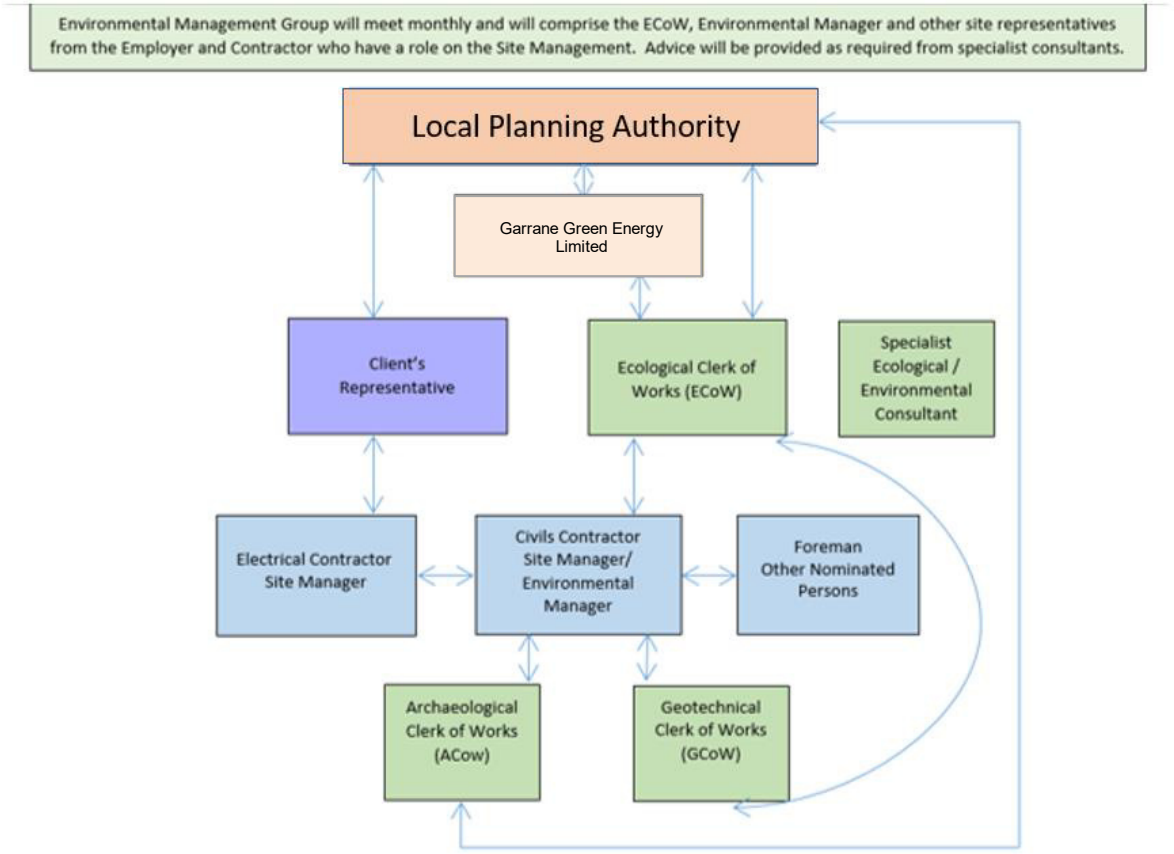

Figure 4.1: General Communication Plan

4.6 TRAINING, AWARENESS AND COMPETENCE

All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information will be tailored to the scope of their work on site. This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

This CEMP will be posted on the main site notice board during the Project. The environmental performance at the Site will be on the agenda of the monthly project management meetings for the Project. Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the Site.

4.7 EMERGENCY PREPAREDNESS AND RESPONSE

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Suitable spill kits and absorbent material for dealing with oil spills will be

maintained on site. In the event of pollution or potential risk of pollution, Limerick City and County Council will be informed immediately. In the case of water pollution, in addition to Limerick City and County Council, Inland Fisheries Ireland will also be informed immediately. Further details in relation to emergency responses are provided at **Management Plan 1: Emergency Response Plan.**

5 CORRESPONDENCE, RECORDS & REPORTS

5.1 REQUIREMENTS

The Contractors will insert / file all communication records and reports associated with Environmental Management and implementation of this CEMP under this Section 5. As a guide, the following sub-sections of filed information will be required (at a minimum):

5-A) Meeting minutes and attendance record

5-B) Weekly Environmental Reports

5-C) Monthly Environmental Reports

5-D) Environmental Checks

5-E) Audit Reports

5-F) Ecology documentation and monitoring records

5-G) Pollution Prevention, including a Pollution Prevention Measures Register

5-H) Water Quality documentation and monitoring records

5-I) Archaeology documentation and monitoring records

5-J) Ground Risk, including a Geotechnical Risk Register

5-K) Waste Management documentation

5-L) Licensing and Consents: copies of all permissions, consents, licenses and permits and related correspondence. A summary record of all such documents shall also be provided in accordance with **Table 5.1** of this CEMP.

5-M) General Correspondence: all other relevant internal and external communication records relating to environmental management issues and implementation of this CEMP.

5-N) Training Records

5-O) Toolbox Talk Records

5-P) Ecological Clerk of Works Reports

All of these documents and records will be made available for inspection in the site office. The documentation will be maintained and will be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

5.2 ENVIRONMENTAL AUDITS

The Contractors Ecological Clerk of Works will consult and assist with the Client in evaluating compliance with applicable legislation by means of a monthly Environmental Audit. A blank Environmental Audit Report form is included in **Management Plan 1: Emergency Response Plan**. All completed audit report forms and records of corrective actions (and close outs) must be filed within this section of this CEMP.

5.3 ENVIRONMENTAL CONSENTS, LICENSES & PERMITS

The Contractors Ecological Clerk of Works (or otherwise nominated responsible person(s)) will complete the summary record for all applicable permissions, consents, licenses and permits obtained for the Site. This record will follow the format provided in **Table 5.1**.

Table 5.1: Record of Environmental Consents, Licenses and Permits Issued

Consents, Licenses & Permits	Governing Legislation	Licensed Activity
Pollution Control & Hydrology		
Biodiversity		
Waste Management / Contaminated Land		
Noise / Vibration		
Archaeology		
Transport		
Other		

5.4 ENVIRONMENTAL MONITORING AND MEASURING

All of the mitigation measures outlined in Section 3.0 will be monitored, where applicable. The Contractors will put in place a program of monitoring for dust, noise, vibration and water sampling in accordance with the requirements of this CEMP.

Copies of all records will be maintained in the site office and will be reviewed by the Contractors.

5.5 NON-CONFORMANCE, CORRECTIVE AND PREVENTATIVE ACTION

Non-Conformance Notices will be issued where there is a situation where limits associated with activities on The Project are exceeded, or there is an internal/external complaint associated with environmental performance.

Non-Conformance is the situation where essential components of this CEMP are not met, or where there is insufficient control of the activities and processes to the extent that the functionality of this CEMP, is compromised in terms of the policy, objectives and management programmes

Correction will be required in order to improve the identified non-conformance. This CEMP must conform to its objectives and targets and the requirements of the ISO 14001 management standard. In the event of non-conformance with any of the above, the following must be undertaken:

- Investigate the non-compliance;
- Develop a plan for correction of the non-compliance;
- Determine preventive measures and ensure they are effective;
- Verify the effectiveness of the correction of the non-compliance.
- Ensure that any procedures affected by the corrective action taken are revised accordingly.

Responsibility must be designated for the investigation, correction, mitigation and prevention of non-conformance.

6 MANAGEMENT PLANS & AVAILABLE INFORMATION

6.1 MANAGEMENT PLANS

Various Management Plans have been prepared as listed in **Table 6.1**. These are intended to provide a benchmark for best practice and to define Garrane Green Energy Limited's minimum requirements for environmental management and mitigation.

6.2 CONTRACTORS REQUIREMENTS

The Contractor(s) is required to further develop the Management Plans into detailed site and works specific environmental plans, method statements and procedural documents. **Table 6.1** provides a summary of the content of the Management Plans and the Contractor's obligations for their further development.

Table 6.1: List of Management Plans

No.	Name	Details
MP1	Emergency Response Plan	The Contractors will further develop the (Emergency Response Plan). This will include procedures for dealing with containment of accidental chemical or fuel spills, potential overload of the drainage system by silt during unforeseen adverse weather conditions etc. The Contractors will prepare a Communication Plan for emergency response in the event of a spillage. Detailed procedures will be outlined in this document.
MP2	Surface Water Management Plan	The Contractors are obliged to implement the water quality monitoring proposals set out therein. The Contractors are obliged to implement the water crossing proposals set out therein.
MP3	Water Quality Management Plan	The Contractors is obliged to implement the water quality monitoring proposals set out therein. Where changes to the plan are required, the Contractors must consult with the Ecological Clerk of Works.
MP4	Spoil Management Plan	The Spoil Management Plan has estimated the volume of spoil that will be generated during the construction phase, and it outlines the locations where the material can be re-

No.	Name	Details
		used on site. The Spoil Management Plan is a live document and can be subject to the ability to amend if required.
MP5	Waste Management Plan	The Contractors will comply with and further develop the Waste Management Plan. The detailed plan will specify the licensed waste facilities that will be used for the duration of the Project.
MP6	Decommissioning Plan	The Contractors will comply with and further develop the Decommissioning Plan. Where changes to the plan are required, the Contractors must consult with the Ecological Clerk of Works.
MP 7	Method Statement for Crossing Industrial Pipeline	The Contractor is obliged to follow the methodology for crossing the existing industrial pipeline.

Management Plan 1

Emergency Response Plan

GARRANE GREEN ENERGY LIMITED

GARRANE GREEN ENERGY PROJECT

CO. LIMERICK

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

MANAGEMENT PLAN 1

EMERGENCY RESPONSE PLAN

AUGUST 2025

Garrane Green Energy Limited,
C/O Greensource Sustainable Developments Limited
Station Road,
Adare,
Co. Limerick.

Jennings O'Donovan & Partners Limited,
Consulting Engineers,
Finisklin Business Park,
Sligo.
Tel.: 071 9161416
Fax: 071 9161080
email: info@jodireland.com

JENNINGS O'DONOVAN & PARTNERS LIMITED
Project, Civil and Structural Consulting Engineers
FINISKLIN BUSINESS PARK,
SLIGO,
IRELAND.
Telephone (071) 9161416
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Email info@jodireland.com
Web Site www.jodireland.com

DOCUMENT APPROVAL

PROJECT	Garrane Green Energy Project	
CLIENT / JOB NO	Garrane Green Energy Limited	6839
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Emergency Response Plan	

	Prepared by	**Reviewed/Approved by**
Document Final	Name Sarah Moore	Name David Kiely
Date August 2025	Signature Sarah Moore	Signature David Kiely

CONTENTS

1. INTRODUCTION

1.1 Why have an Emergency Response Plan?

Many construction and industrial sites intrinsically have the potential to cause significant environmental harm which could threaten water supplies, public health and wildlife in the event of an environmental incident. The aim of this plan is to see that in the event of an emergency, quick action will limit any impacts on humans and the local environment.

This response plan forms part of the conditions of work for staff, and for every contractor or sub-contractor at the Site.

1.2 Outline of this Environmental (Incident & Emergency) Response Plan

The information contained in this plan forms the Emergency Response Plan (ERP), part of the outline Construction Environmental Management Plan (CEMP) for the Garrane Green Energy Project.

It contains details of:

- Who should be contacted in an emergency?
- Procedures to be followed in an emergency
- Staff responsibilities in an emergency

1.3 What is an Environmental Incident?

This plan should be instigated once there has been an emergency or environmental incident on site or elsewhere, linked to the construction of Garrane Green Energy Project. Such an incident is a discharge to air, land or water that could cause environmental damage. Causes of environmental incidents on this Site include:

- Leaking plant or equipment
- Containment Failure
- Fire
- Vandalism
- Overfilling of containment vessels
- Flooding on site
- Leaking Portaloo
- Discharge of raw or partially treated effluent
- Wind-blown waste, litter or dust

- Fuel drips or spills during refuelling
- Leak from fuel or chemical containers
- Contaminated water or sediment/silt entering a water course or drain
- Failure of pumps and pipelines
- Blade throw (results from wind turbine failure and may include the splintering of rotor blades and detachment of debris)

Any of these incidents could affect drainage systems, surface waters, aquatic ecosystems, groundwater and soil. These incidents could also affect air quality by producing toxic fumes and airborne pollutants which may damage human health, wild and domestic animals and ecosystems. The emergency procedures to be followed for each of the incidents listed above ae detailed in **Section 6.1**.

1.4 Reference Documents

Current legislation including the Safety, Health and Welfare at Work Act 2005 and the Safety Health and Welfare at Work (Construction) Regulations 2013, has been taken into account into the production of this Plan and will be accounted for in the further development of the Contractor's Construction Management Plan.

This plan has been developed alongside other Management Plans that form part of the Construction Environmental Management Plan (CEMP) including a:

- Water Quality Management Plan
- Surface Water Management Plan
- Spoil Management Plan
- Waste Management Plan
- Decommissioning Plan
- Method Statement for Crossing Industrial Pipeline

2. GENERAL REQUIREMENTS OF AN ERP

As mentioned, environmental incidents may include flooding, spillages (oil and chemicals), contaminated run-off, riverbed disturbance, damage to underground services, damage to habitats, poor waste disposal and storage.

This Emergency Response Plan:

- Identifies key staff and 24-hour contact details to be contacted in the event of an emergency (**Section 6.5**)
- Identifies key external bodies and emergency response numbers who should be contacted in the event of an emergency (**Section 6.4)**
- Details an Inventory of Chemical Products and Waste Inventory on Site (**Section 6.6**)*
- Details an Inventory of Pollution Prevention Equipment (**Section 6.7**)
- Provides details of staff trained in the use of spill kits and booms etc. (**Section 6.8**)
- Provides details of reporting requirements (**Sections 6.3 to 6.9**)
- Provides detailed procedures to be followed in the event of an emergency (**Sections 6.1 and 6.2**)
- Provides a Communication Plan for operatives outlining key actions in the event of an emergency (**Section 6.2**). This will be available to all operatives on site.

*****Because of the nature of wind farm construction operations and the nature of works on site, the potential pollutants will vary.*

3. INCIDENT & HAZARD REPORTING

A blank Environmental Incident Report Form for reporting environmental incidents or hazards for the site is attached in **Section 6.9**. A blank Site Environmental Audit Form is attached in **Section 6.10** to record audit results. The details recorded in these forms will be regularly reviewed and will form part of the response plan procedural review.

4. WASTE DISPOSAL AFTER ENVIRONMENTAL INCIDENCES

If spill kits etc. are used in the event of a pollution incident, operatives need to carefully dispose of used equipment by carefully placing them in a sealed bag or container. They should then be removed from site by a licensed waste contractor as per the **Waste Management Plan (MP5)**. Contaminated soil also needs to be disposed of as hazardous waste by a permit holder. This is also further detailed in the **Waste Management Plan (MP5)** of this CEMP.

5. SITE INDUCTION AND TOOLBOX TALKS

It is imperative that all contractors, sub-contractors and staff on site are fully familiar with this emergency response plan, and it will be detailed regularly in Toolbox Talks.

During these talks, they will also receive regular reminders of the importance of the local environment and of the necessary environmental controls that are in place on site.

6. PROCEDURE AND COMMUNICATION PLAN IN EVENT OF AN INCIDENT

6.1 Procedures to be followed in the event of an incident:

The following procedures are intended as a guide in dealing with incidents. Health & Safety guidance should be followed at all times applying common sense and ensuring the health & safety of yourself and others:

6.1.1 Spillages/Leaks/Containment Failure

1. Identify the source of the spillage and cut off source, if possible, e.g. by closing valve, tightening container etc.
2. Work on site will cease and all operatives will assist in placing spill mats on the affected area. Site Manager/ Main Contact must be notified.
3. Identify where spillage may go. If spillage is near a watercourse (drainage/ditch/ river) divert spillage away from the watercourse through the use of absorbent materials from the spill kit.
4. Notify all relevant parties in the order listed in **Sections 6.4** and **6.5**. Notification should be made by one member of staff whilst remainder of staff present deal with the spill/incident.
5. Dig up all contaminated ground as soon as possible/immediately. All contaminated materials should be placed in sealed polythene bags/containers and disposed of appropriately by an appropriate licensed waste contractor.
6. Complete required record of incident and response into reporting system

6.1.2 Contamination of Watercourse

Suspended Solids

If a watercourse is at risk of contamination from suspended solids from a slope failure the Site Manager/ Main Contact must be notified, and the following actions must be implemented:

a) Place straw bales wrapped in geotextile or sand/gravel bags with geotextile curtains **immediately** in the watercourse(s) at regular intervals downstream from the incident. These sand/straw bags and bales will be removed and replaced with stone filters once water quality is stabilised.

b) Stone check dams faced with a layer of geotextile will be constructed at critical points along the watercourse.
c) Small sumps will be formed intermittently between the check dams to reduce the amount of suspended solids contained in the water.

Oil Spill in Watercourse

If spill has reached the watercourse the Site Manager/ Main Contact must be notified, and the following actions must be implemented:
a) Place flexible absorbent booms across watercourse, ahead of the contamination within a quiet stretch of water.
b) Place absorbent cushions in the water immediately upstream of these booms as well as downstream of the booms.
c) Remove and replace saturated absorbent material as required. Please ensure removed cushions are placed in sealed polythene bags/containers and disposed of by the principal waste contractor.

6.1.3 Fire

In the unlikely event of a fire at a turbine or at the substation, all personnel on site will meet at a designated fire point (for example in the Temporary Construction Compound), and emergency services will be contacted.

Procedures in case of fire will be outlined by all contractors in their induction. Only appropriately trained personnel will be permitted to enter turbines. Firefighting equipment will be stored and maintained in the Temporary Construction compound. Firefighting equipment for different types of fires i.e. electrical and oil based will be segregated and clearly marked.

The Contractor's fire plans will be reviewed and updated on a regular basis. A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of firefighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on Site at all times.

6.1.4 Ice Throw

The wind turbines will be fitted with anti-vibration sensors, which will detect any imbalance caused by icing of the blades. The sensors will prevent the turbine from operating until the blades have been de-iced.

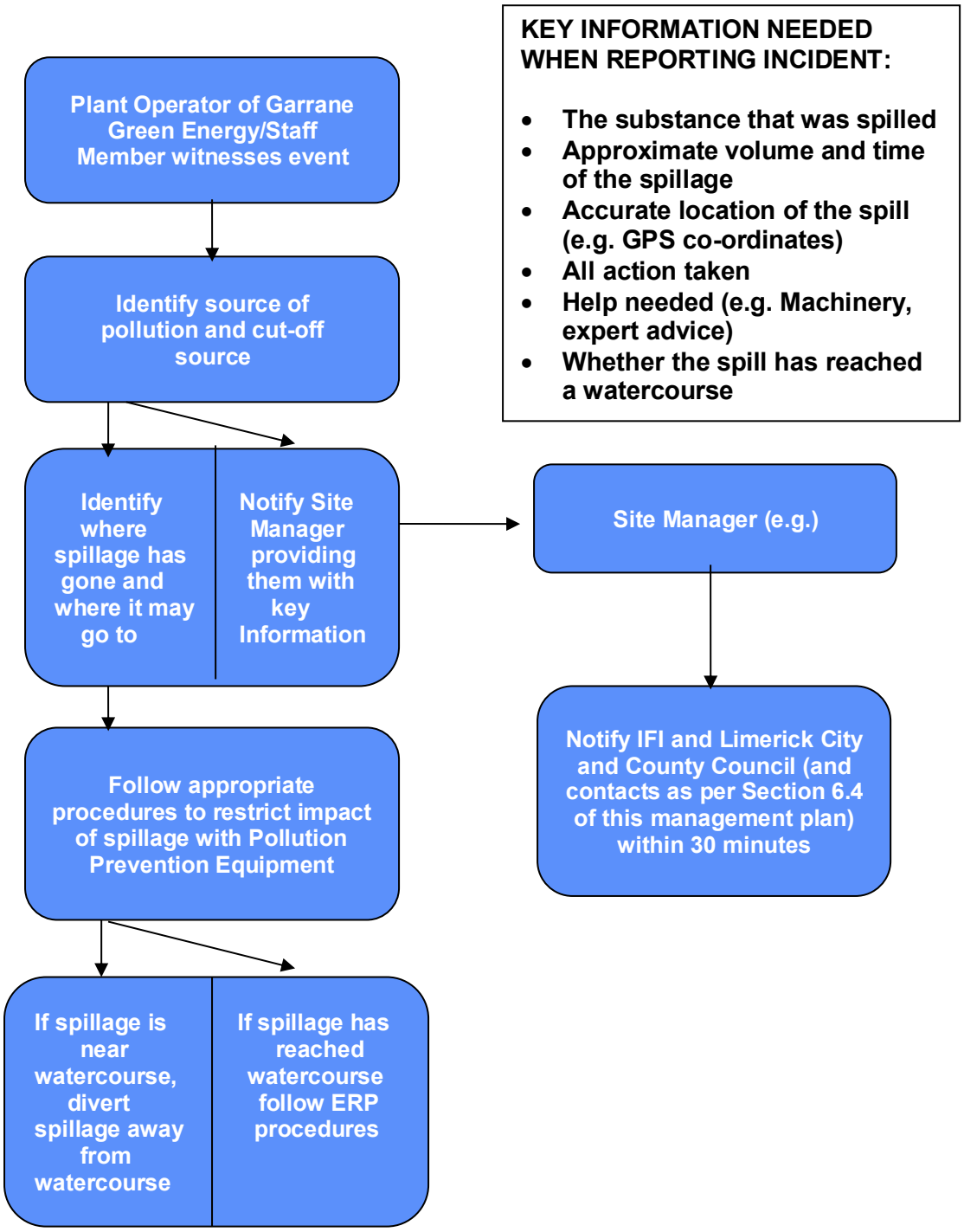
If any icing of blades occurs, all activities in the area will cease and site personnel will stand clear of turbines where possible until they have been shut down completely.

6.1.5 Vandalism

In the event of a vandalism at the site, all personnel on site will be notified and An Garda Síochána will be contacted.

6.2 Communication Plan

A Communication Plan (to be followed in the event of an incident) will be provided by the Contactor, in liaison with relevant stakeholders and will be included in the updated ERP prior to commencement of site development works. An outline Communication Plan is proposed below:



6.3 Environmental Response Plan for Garrane Green Energy Project

INCIDENT RESPONSE PLAN FOR THE GARRANE GREEN ENERGY PROJECT ***Based on template provided in GPP 21 – Pollution Prevention Guidelines.***	
Site Address: Garrane Green Energy, Co. Limerick **Official Company Address:** Garrane Green Energy Limited, C/O Greensource Sustainable Developments Ltd., Station Road, Adare, Co. Limerick, Ireland. **KEY HOLDERS FOR SITE – NAME & CONTACT NUMBERS:** **Tel:** **Email:**	**Middle of Site** **ITM:** (554398) E, (626882) N **Site Entrance 1:** **ITM:** (553387) E, (627546) N **Site Entrance 2:** **ITM:** (554983) E, (627415) N **Map references:** OSI Discovery Sheet (No.)
Overview of the activities on site: **Include number of employees at different time of the day:** Daylight Hours: Dusk to Dawn: Weekend Dusk to Dawn: Bank Holidays:	
Date & Version of the plan:	**Name & position of person responsible for compiling/approving the plan:**
Review Date:	**Date of next exercise:**
Objectives of the plan: To limit any potential harmful impact to the local environment through swift and appropriate actions in the event of an emergency.	
List of external organisations consulted in the preparation of this plan with contact details:	
Distribution list of who has received this plan and which version. *Please note that it is recommended that you review and revise this plan regularly:*	

6.4 External Contacts

Contact	Office Hours	Out of Office
Emergency Services (Fire/Police/Ambulance)	999 or 112	999 or 112
Local Garda Station Charleville Garda Station	063 21770	
Local Hospital Mallow General Hospital	022 21251	
Environment and Climate Action Department, Limerick City and County Council	061 556000	
EPA	053 916 0600	1850 365 123
Inland Fisheries Ireland	01 8842600	0818 34 74 24 (24 hours a day)
Roads, Traffic and Cleansing, Limerick City and County Council (Blocked/Flooded Roads)	061 556000	
ESB- Electricity Company	1800 372 757	1800 372 999 (24 hours a day)
Telecommunications – Eircom	1800 245 245	

6.5 Internal Contacts

Names and position of staff authorised and trainers to activate and co-ordinate the plan. Staff to be contacted if need to move or evacuate the site		
Other Staff:		
Managing Director		
Site Manager		
Environmental Manager		
Health & Safety Manager		

6.6 Chemical Product & Waste Inventory

Trade name/ substance	Solid/liquid/ gas or powder	UN number	Max amount	Location marked on site plan	Type of Containment	Relevant health & Environmental properties

6.7 Pollution Prevention Equipment Inventory (On/Off-Site Resources)			
Type	**Location**	**Amount**	**Staff contact**

For example:

- *Personal protective Equipment (PPE) available that should be worn*
- *absorbents*
- *drain mats/covers*
- *pipe blockers*
- *booms*
- *pumps*
- *sandbags*
- *silt fencing*
- *over drums*

IF ANY OF THIS EQUIPMENT REQUIRES SPECIALIST TRAINING – STATE WHO HAS BEEN TRAINED IN ITS USE AND DATE OF TRAINING (attach evidence where possible).

6.8 List of Staff Trained in the Use of Spill Kits and Booms

Name	Date of Training

6.9 Site Environmental Incident Report Form

Site:		Date:	
Time:		Weather:	
Report By:		Position:	
Garrane Green Energy Project personnel present:		Position:	
Contractor Personnel Present:		Position:	

Description of Incident:

Item Spilled:	
Serial Number (If Present):	
Estimate of Volume of Spillage:	

List of actions followed once incident was noted	Time	Corrective Action By:	
		Action	By
Who first observed incident?			
First action			
Next Action			
Time Pollution Hotline was contacted			
Other			

Details of Clean-Up contractor or how contamination was removed from site:

Details of how this could be avoided in future:	
Details of review of internal procedures as result of this incident:	

DATE REPORT COMPLETED_____

6.10 Site Environmental Audit Form

Site:		Date:	
Time:		Weather conditions:	
Report by:		Position:	
Garrane Green Energy Project personnel present:		Position:	
Contractor personnel present:		Position:	

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
1. Miscellaneous					
1.01	Does the contractor carry out regular internal environment audits on the site? Are recommendations recorded and is corrective action monitored?				
1.02	Have any environment incidents occurred and have these been reported as per on site procedure?				
1.03	Does the site induction contain a section on environmental requirements, including spill procedures, and is this communicated effectively?				
2. Land					
2.01	Are areas of hard standing (excluding bunded and refuelling areas) appropriately drained?				
2.02	Have local roads been inspected and cleaned where necessary?				
2.03	Has all test pitting and soil stripping been monitored by an archaeologist?				
2.04	Have all site clearance works been checked by an ecologist prior to works?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
3. Material and equipment					
3.01	Is there knowledge of the IFI Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016) and OPW Environmental Guidance: Drainage Maintenance & Construction (2019)				
3.02	Are transformers/ generators located in secondary containment bunds?				
3.03	Are all bunds capable of containing 110% of the volume of the largest container?				
3.04	Is refuelling carried out in a designated refuelling bay?				
3.05	Does all site drainage on hard standing drain to an oil interceptor?				
3.06	Is the designated area for oil, fuel and chemical storage appropriately sited (i.e. on hard standing at least 10m from a watercourse)?				
3.07	Are there procedures in place to monitor bund integrity and manage bund rainwater levels? Are these followed and recorded?				
3.08	Is there awareness that oil or residue from contaminated water removed from bunds should be disposed of as special waste and not discharged to land or the water environment? (oil absorbent materials (pads etc.) should be used first)				
3.09	Are all drums and mobile plant (e.g. generators) placed on drip trays more than 10m from any watercourse?				
3.10	Is all plant maintained in good condition, free of leaks? Are there records of this?				
3.11	Are there adequate spill kits available and stored in close proximity to potential risks?				
3.12	Are all refuelling bowsers double skinned, locked when not in use, and in a good state of repair?				
3.13	Is there evidence of unmanaged/ unrecorded fuel / oil spillages on site?				
3.14	Are dry or wet wheel washing facilities fully operational and effective?				
3.15	If wet wheel washing facilities are required, are these closed systems				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
	with no discharge to the water environment?				
3.16	Are there laboratory certificates (accredited by the Irish National Accreditation Board) to confirm that imported material stone aggregate brought onto site is free from any contamination?				
4. Noise, Dust and Light					
4.01	Are there facilities to dampen stockpiles and site working areas/roads to suppress dust?				
4.02	Are vehicles carrying loose material sheeted at all times?				
4.03	Are construction works, or deliveries of materials to and from the development, audible at noise sensitive premises?				
4.04	Has all external construction lighting received the approval of the planning authority?				
5. Waste					
5.01	Is the site tidy and free from litter?				
5.02	Is there evidence of waste beyond the site boundary?				
5.03	Is waste segregated and kept securely in containers in clearly designated areas?				
5.04	Does all waste leaving the site have the appropriate duty of care paperwork?				
5.05	Is all waste leaving the site being taken to an appropriately licenced site?				
5.06	Does all special/ hazardous waste (e.g. oil contaminated soils, waste oil) have the appropriate Special Waste Consignment Note?				
5.07	Is material re-used/recycled on site where possible?				
5.08	Are waste management practices in line with the site waste management plan?				
5.09	Are relevant Waste Management Exemptions in place for use of waste on site (e.g. use of waste concrete to create foundation sub-base)?				
5.10	Is there any evidence of burning on site?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
5.11	Is there any evidence of unlicensed burial of waste?				
6. Water					
6.01	Do all discharges to land or watercourses have appropriate authorisation from Local Authorities /IFI?				
6.02	Does all watercourse engineering (bank protection, crossing etc.) have the appropriate authorization from Local Authorities / IFI?				
6.03	Do any abstractions from a watercourse or groundwater body have the appropriate authorization from Local Authority / IFI?				
6.04	Has confirmation for the SUDS design for access roads been gained from Local Authority / IFI?				
6.05	Are cut-off ditches installed on the uphill side of the working area to avoid contaminated surface water run-off?				
6.06	Have field drains been diverted where necessary?				
6.07	Is adequate treatment (e.g. settlement tank/lagoons/discharge to land) provided to prevent silt contaminated water entering watercourses and groundwater?				
6.08	Has vegetation removal/ clearance of the site been minimised to avoid unnecessary areas of bare ground?				
6.09	Have buffer-strips been left between working area and watercourses?				
6.10	Is plant operating in the watercourse?				
6.11	Have all culverts been installed at the base of stockpiles situated within close proximity to watercourses?				
6.12	Have silt fences been installed at the base of stockpiles situated within close proximity to watercourses?				
6.13	Are there adequate controls on site construction roads to minimize sediment runoff into watercourses (in particular, are there adequate flow attenuation measures within surface drain)?				
6.14	Is there any sign of decaying straw bales in water courses? (this could lead to organic pollution of the water course)				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
6.15	Are silt traps regularly maintained?				
6.16	Has ease of maintenance been considered in the design of permanent drainage features?				
6.17	Is there evidence of contamination of any watercourse (e.g. with oil, sediment, concrete, waste) in the vicinity of the works?				
6.18	Is monitoring of potential impacts on watercourses carried out on a regular basis and fully recorded?				
6.19	Are dewatering operations being carried out in such a way to minimise sediment contamination?				
6.20	Is drainage and run off in concrete batching areas adequate?				
6.21	Are adequate pollution prevention measures considered and put in place during concrete pours?				
7. Landscape					
7.01	Have earthworks been designed to promote successful re- instatement of vegetation?				
7.02	Are reinstatement and restoration works being implemented in a timely manner as per the requirements of the Contract?				
8. Ecology					
8.01	Have storage sites (soil, plant etc.) been sited on areas of lower quality habitat where possible?				
8.02	Is the ECoW a member of the institute of Ecology and /or Environmental management as required by planning conditions?				
8.03	Have buffer zones been constructed and maintained around designated protected species exclusion areas (e.g. red squirrel dreys, water vole habitats, otter holts, badger holts etc.)?				
8.04	Have toolbox talks on the subject of ecology and environmental responsibilities on site been delivered? Have attendance records been maintained for these?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
9. Documentation Check					
9.01	Start-up meeting record				
9.02	Full contacts list in Section 4, Table 4.1 of CEMP				
9.03	Induction records				
9.04	Pollution Prevention Measures Register				
9.05	Geotechnical Risk Register				
9.06	Weekly meeting minutes				
9.07	Records of environmental checks and routine monitoring of mitigation measures				
9.10	Water Quality Monitoring Results				
9.11	Safety and Environmental Awareness Reports (SEARs). Filed and entered on database?				
9.12	Safety and Environmental Audit Reports for the site. (If yes, insert date of last audit_____)				
9.13	Contractor's Environmental Plans (or Construction Method Statements):				

Management Plan 2

Water Quality Management Plan

GARRANE GREEN ENERGY LIMITED

GARRANE GREEN ENERGY PROJECT

CO. LIMERICK

CONSTUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

MANAGEMENT PLAN 2

WATER QUALITY MANAGEMENT PLAN

AUGUST 2025

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DOCUMENT APPROVAL

PROJECT	Garrane Green Energy Project	
CLIENT / JOB NO	Garrane Green Energy Limited	6839
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Water Quality Management Plan (WQMP)	

	Prepared by	**Reviewed/Approved by**
Document Final	Name Sarah Moore	Name David Kiely
Date August 2025	Signature	Signature

CONTENTS

1 INTRODUCTION

1.1 Scope and Requirements

The Contractor is responsible for pollution prevention for the duration of the contract and until such time as permanent measures, such as permanent drainage and silt mitigation controls, are deemed to be adequate and appropriately constructed.

In order to verify the efficacy of pollution prevention and mitigation works during construction, Water Quality Monitoring is required to be undertaken by a suitably qualified Environmental Consultant(s), prior to, during and post completion of construction works. This will include all watercourses within the catchment of the construction area. The monitoring will comprise visual, hydrochemistry and grab sample monitoring.

The approved plan will be coordinated and implemented on site by the Environmental Consultant appointed by the Contractor.

1.2 Reference Documentation

Construction works have the potential to cause pollution of the water environment. All construction works on site, and specifically construction works to be undertaken within 50m of any EPA mapped watercourses or 10m drains, will be completed in compliance with current legislation and best practice as detailed within this CEMP and in particular the **MP4 - Spoil Management Plan** and the **MP3 - Surface Water Management Plan**.

The following reports (along with any further surveys conducted) will be used to inform the scope of the construction phase Water Quality Management Plan.

- Garrane Green Energy, Co. Limerick Environmental Impact Assessment Report (EIAR), August 2025
- Garrane Green Energy, Co. Limerick Natura Impact Statement (NIS), August 2025
- Garrane Green Energy, Co. Limerick CEMP, August 2025

2 RESPONSIBILITIES

2.1 General

Responsibility for the water quality monitoring programme, and coordination thereof, will lie with the independent site Environmental Manager appointed at the start of the programme.

Prior to works commencing, the site Environmental Manager will be retained by Garrane Green Energy Limited with a responsibility to implement this Water Quality Management Plan. Among other requirements, the Water Quality Management Plan requires a full baseline water quality survey to be undertaken prior to the commencement of construction and requires the contractor to provide a 'schedule of work' to the site Environmental Manager at the beginning of each week.

The site Environmental Manager will prepare and deliver site induction and training to all construction personnel, in liaison with the Site Engineer.

- Field monitoring (as described in Section 3) of water quality parameters and collection of samples will be undertaken by the site Environmental Manager or other suitably appointed person(s) (qualified to degree level with at least 5 years' experience in a similar role) based at the site. The site Environmental Manager or nominated site person(s) will be appropriately trained on the required monitoring methods and the use, calibration and maintenance of all monitoring equipment used. Training will be provided by the Environmental Consultant appointed to undertake the Water Quality Monitoring programme. Undertake specific monitoring activities and reporting as defined in agreed documentation prepared as part of the planning process.
- Daily visual inspection of access tracks for signs of ground damage or solids escape to nearby watercourses in vicinity of construction works
- The ground between the structure under construction and the nearest downslope watercourse for signs of solids escape or ground damage
- Surface water features in vicinity of construction works
- Any pollution control measures at structures and along access tracks (e.g., silt fences, drain or stream crossings etc.) for evidence of contaminated run-off or mitigation failure
- Attendance at the critical work phases including: access track construction, foundation excavation, watercourse crossings, concrete pouring and back-filling.

- Collection and analysis of water samples at a number of monitoring locations (i.e., upstream & downstream of the three onsite water crossing locations) before, during (if potential pollution visually identified) and after construction works at that location
- EPA Q Value Biological Monitoring at three water crossing locations (i.e., upstream & downstream of instream construction work locations) before and after construction works.

Collection and analysis of water samples at a number of monitoring locations (i.e., upstream and downstream of construction work locations) before, during (if potential pollution visually identified) and after construction works.

2.2 Hydrochemistry Monitoring

2.2.1 Field Monitoring

Field monitoring of water quality parameters and collection of samples will be undertaken by the site Environmental Manager. The site Environmental Manager will be appropriately qualified to third level education and experienced in the field for no less than 5 years on the required monitoring methods and the use, calibration and maintenance of all monitoring equipment used. Sampling will be in accordance with International Standards of Operation. The chosen laboratory will be accredited.

2.2.2 Laboratory Analysis

Laboratory analysis of water samples will also be undertaken as part of the monitoring programme by an independent and appropriately certified laboratory to be appointed by the site Environmental Manager. ISO 17025 Accreditation proves a laboratory has an acceptable quality management system in place, and it has the ability and competence to provide testing and calibration results.

Coordination of the laboratory sampling and analytical programme will be undertaken by the site Environmental Manager. Samples will be dispatched for analysis under chain of custody procedures. Laboratory analytical results will be sent directly to the site Environmental Manager

Interpretation and reporting of both the field and laboratory data will be the responsibility of the site Environmental Manager.

2.3 Reporting

2.3.1 Monthly Water Quality Reporting

Results of water quality monitoring will assist in determining requirements for improvements in drainage and pollution prevention measures implemented on site. A monthly report on water quality will be prepared by the site Environmental Manager.

It will be the responsibility of the site Environmental Manager to present the ongoing results of water quality and weather monitoring at site meetings and with outside bodies. This will be done at weekly meetings and reported within the overall Monthly Environmental Report to be prepared by the site Environmental Manager.

The monthly reports on water quality will consider all visual, field monitoring and results of laboratory analysis received that month. Reports will describe how the results compare with baseline data as well as previous monthly reports on water quality. The reports will also describe whether any deterioration or improvement in water quality has been observed and whether any effects are attributable to construction activities and what remedial measures or corrective actions have been implemented.

Monthly reports on water quality will be provided to the Client Project Manager and will be made available to Limerick City and County Council and Inland Fisheries Ireland on request.

2.3.2 Final Report on Water Quality

Upon completion of all post-construction monitoring, the site Environmental Manager will prepare a final report on water quality. This final report will cover the overall performance against baseline data, details on any impacts attributed to construction works and recommendations for remedial works if required.

The final report will be provided to Limerick City and County Council and Inland Fisheries Ireland.

2.4 Contingency Sampling & Emergency Response

In the event that a pollution incident arises which threatens to enter or has entered a watercourse from the construction works, additional sampling and analysis of surface water samples will be undertaken. Examples of such incidents include a spill or

accidental release of chemicals, oils and fuels or concrete. Additional sampling and analysis will determine the level of impact to the surface water receptor and remedial requirements, where necessary.

Where a pollution incident has occurred as a result of construction works, the site Environmental Manager and The Local Authority will be consulted to determine sampling requirements and any additional survey requirements where potentially significant impacts are identified. This will be done following the implementation of appropriate mitigation measures as per the **Emergency Response Plan** (Management Plan 1 of this CEMP).

The results of any monitoring or survey work undertaken by the Contractor will be made available to the site Environmental Manager and the Local Authority. Copies of all correspondence and test certificates will be retained on site.

3 WATER QUALITY MONITORING: OUTLINE SCOPE

3.1 General

Construction-stage details of monitoring and precise monitoring locations will be agreed in writing with the Local Authority prior to commencement of construction works and following consultation with Inland Fisheries Ireland. The baseline water quality monitoring stations are outlined in **EIAR Figure 10.5.**

Water Quality Monitoring locations will be identified through grid reference, photographic record and indicated on a plan. For repeat sampling locations, each location will also be marked on the ground (stake/post) to ensure that the correct location is sampled each time.

Sample locations will be labelled consistently for the duration of the monitoring period. Where any additional locations are sampled during the works, the location (grid reference) of the sampling point will be recorded, and a photograph will be taken at time of sampling.

'Control' sample locations will also be included in the scope of any monitoring.

A water sampling location map will be developed and included in the detailed method statements for precise locations at water crossings within this development.

Water quality monitoring locations will include both upstream and downstream points relative to the works locations. The locations of the water quality monitoring points will be flexible and will be moved as the construction phase progresses so that monitoring points remain representative of the most likely construction impact receptor points;

The downstream monitoring locations will be positioned as close as possible downstream of the works location and another positioned further downstream. This approach will allow for an assessment of the dilution of potential contaminations (if present) as the distance from the point of diffuse source location increases;

Watercourses which do not have year-round flows such as artificial drains, ditches or ephemeral streams will be avoided as water quality monitoring locations;

3.2 Monitoring Frequency

Monitoring frequency will be specified and agreed with Inland Fisheries Ireland and Limerick City and County Council prior to commencement of construction.

As a minimum, the monitoring programme will include:

- Daily visual checks across the construction works area;
- Weekly grab sampling for suspended solids and turbidity in catchments where construction is on-going and monthly monitoring for all other parameters;
- Event based sampling, e.g. after heavy rainfall (at least 4 no. event-based monitoring rounds per year);
- Additional sampling in the event of trigger level exceedance, e.g. after heavy rainfall; and,
- Post construction sampling programme (monthly sampling for 3 months).

3.3 Hydrochemistry Monitoring

Sample locations, monitoring frequency and precise hydrochemistry parameters will be agreed in writing with Limerick City and County Council and Inland Fisheries Ireland, prior to commencement of construction, and following consultation with Inland Fisheries Ireland.

As a minimum, the monitoring programme will include:

- During the construction phase, daily visual inspections of excavations, dewatering procedure, settlement ponds, silt traps, buffered outfalls and drainage channels

etc. will be carried out by a suitably qualified person. Any excess build-up of sediment at settlement ponds, drains or at any other drainage features that may decrease the effectiveness of the drainage feature will be promptly removed;

- During the construction phase of the Project, all development areas will be monitored on a daily basis for evidence of groundwater seepage, water ponding and wetting of previously dry spots;
- Following the completion of the construction phase, silt traps, buffered outfalls and drainage channels will be periodically inspected during maintenance visits to the Site when the operational phase water quality monitoring will also be carried out;
- Any proposed crossings of small unmapped drains will be monitored daily during construction and during each Site visit during the operational phase. These small culvert crossings will be monitored in terms of their impacts (if any) on the receiving watercourses and in terms of their structural integrity to identify any signs of erosion or potential for sediment release;
- It is proposed that a handheld turbidity meter is available at the Site to accurately measure the quality of water discharging from the Site. The meter will be maintained and calibrated before each use by a qualified site Environmental Manager; and,
- Any discharges of sediment treated water should meet the requirements of the *Surface Water Regulations 2009*, as amended.

Daily visual observation in areas of high construction activity or during high rainfall periods to identify any evidence of siltation, oil or silt. Visual inspections will include details of the colour of the water at the time of inspection.

Weekly visual inspections and monthly field hydrochemistry monitoring.

One round of post construction monitoring, to be agreed with Limerick City and County Council. Post construction will be defined as when the reinstatement phase is completed.

Monthly analysis of water parameters will be carried out. Construction-stage analytical determinants (including limits of detection and frequency of analysis) will be specified and agreed with the Local Authority and third parties for each sample location. The agreed suite of grab sample determinants will include the following:

Parameters for hydrochemistry analysis:

- pH
- Electrical Conductivity
- Temperature
- Ortho-Phosphate
- Biological Oxygen Demand
- Sulphate
- Chloride
- Ammoniacal Nitrogen
- Ammonia
- Nitrite
- Nitrate
- Total Petroleum Hydrocarbons
- Total Suspended Solids
- Turbidity

Management Plan 3

Surface Water Management Plan

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GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

Surface Water Management Plan

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GARRANE GREEN ENERGY LTD

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

DOCUMENT TITLE:	**GARRANE GREEN ENERGY PROJECT, CO. LIMERICK – SURFACE WATER MANAGEMENT PLAN**
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PROJECT REPORTING HISTORY:	**none**
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1. INTRODUCTION

1.1 BACKGROUND

This document presents a Surface Water Management Plan (SWMP) and pollution prevention measures for the construction and operation of the proposed Garrane Green Energy Project.

The following Surface Water Management Plan (SWMP) provides the water management framework for potential Contractors and Sub-contractors, and it incorporates the mitigating principles described in the accompanying Environmental Impact Assessment Report (EIAR) to ensure that work is carried out with minimal impact on the water environment and in accordance with the mitigation measures and commitments made in the EIAR.

This report also summarises the baseline geology and hydrology at the Garrane Green Energy Project site (*i.e.* the 'Site') and then sets out the proposed appropriate drainage measures required for surface water management during the construction and operational phase of the Project.

Design, management and mitigation proposals are presented for the following:

- Drainage design criteria and drainage design philosophy;
- Construction Phase drainage; and,
- Operational Phase drainage.

The SWMP also outlines proposed pollution prevention measures and surface water monitoring plan for the construction and operational phase of the Project.

The surface water drainage plan for the Project was developed by Hydro-Environmental Services and JOD, and for completeness the proposed drainage plan drawings for the Project are included on the planning drawings (including 6839-JOD-GGE-XX-DR-C-0200 to 6839-JOD-GGE-XX-DR-C-0212, 6839-JOD-GGE-XX-DR-C-0301 to 6839-JOD-GGE-XX-DR-C-0304).

1.2 SITE DESCRIPTION

The Site is located in south Co. Limerick and just north of the Cork-Limerick county border. The Site is located ~2.5km north of Charleville Town, Co. Cork, ~5.8km west of the village of Kilmallock and ~13.5km southeast of Croom village in Co. Limerick. The Site is located in the townlands of Garrane in the north and Ballynagoul and Creggane in the south. The EIAR site boundary has a total area of ~158.759hectares (ha).

The Site is comprised of agricultural pastures with field separated by hedgerows, deeply incised field drains and natural watercourses. Several existing farm access tracks are present in the west of the Site *i.e.* to the west of the Charleville Stream, a tributary of the Maigue River. Poor agricultural lands exist along the eastern banks of the Charleville Stream. Topography across the Site is generally flat to gently undulating, ranging from ~55 to 65mOD (meters above Ordnance Datum). Local topography falls gently towards the Maigue River which dissects the Site, flowing to the north.

The Site is located between the N20 to the west and the L1537 to the east and these north-south orientated public roads facilitate access to the existing Site. The N20 joins Charleville in the south to Croom in the north while the L1537 joins Bruree in the north to Charleville. An existing farm access track extends into the interior of the Site from the N20. Several farmhouses and dwellings are located along the local public roads in the lands surrounding the Site.

The proposed Substation and associated compound are located in the southeast of the Site in the townland of Ballynagoul. The Grid Connection extends to the southeast from the Substation for ~350m before it connects, via a loop-in connection, to the existing 110kV overhead line. The Grid Connection is located in agricultural lands.

A site location map is shown as **Figure A**.

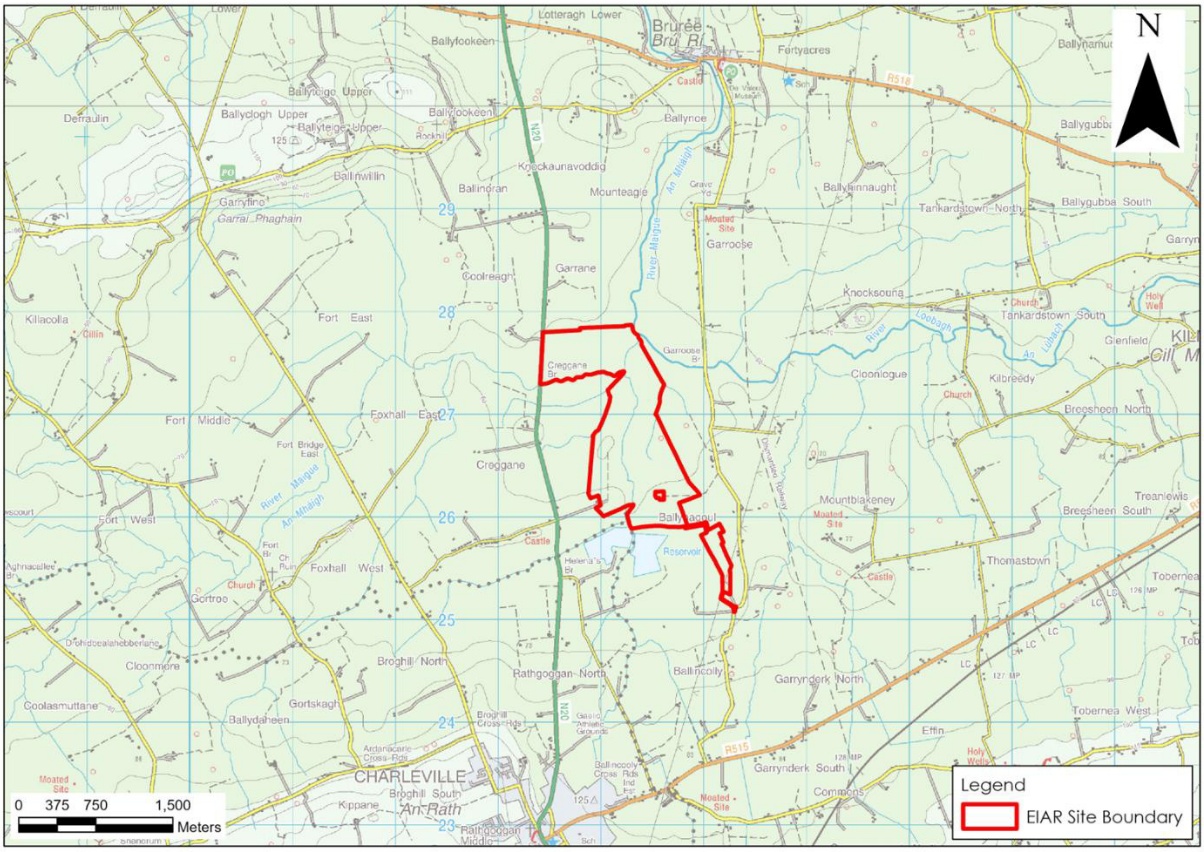

Figure A: Site Location Map

1.3 PROJECT DESCRIPTION

The Project comprises of the following:

- Erection of 9 No. wind turbines with a tip height of 170m. The wind turbine will have a rotor diameter of 150m and a hub height of 95m.
- Upgrade of existing Access Tracks and construction of new Access Tracks, turbine hardstand areas and turbine foundations.
- Construction of two new bridge crossings on-site, one over the River Maigue and one over the Charleville Stream.
- Upgrade of existing site drainage network and installation of new site drainage.
- Wind Farm Internal Cabling connecting the wind turbines to the electrical substation.
- Construction of an on-site AIS 110kV Substation with a 'loop in' Grid Connection to the existing 110kV overhead line between Charleville and Killonan.
- Construction of double circuit 110kV underground cable and two steel cable interface masts to connect to the existing overhead line OHL.
- Erection of a permanent 60m Meteorological Mast for monitoring wind speeds.
- Construction of a Temporary Construction Compound for use during construction.
- Upgrade of the existing entrance on the N20 (Site Entrance 1) (to be used for abnormal loads and turbine component delivery) and upgrade of an existing site entrance on the L1537 (Site Entrance 2) (to be used for all construction traffic except for abnormal loads and turbine component delivery).
- A permanent spoil storage area.
- Biodiversity enhancement and improvements associated with the Project.
- Landscaping, fencing and all associated ancillary works.

A full description of the Project is provided in Chapter 2: Development Description of this EIAR.

Please note for the purposes of this SWMP, where:

- the 'Project' is referred to, this related to all elements of the Project as described in EIAR Chapter 2: Development Description and includes all site infrastructure, the Grid Connection and all works required along the Turbine Delivery Route.
- the 'Site; is referred to, this related to the primary study area and includes lands which fall within the proposed Garrane Green Energy Redline Boundary as shown on **Figure 1.1** (of the EIAR).
- the 'Grid Connection' is referred to, this relates to the proposed loop in' connection to the existing 110kV overhead line to the Substation, which will form part of the national electricity network.
- the 'Turbine Delivery Route' (TDR) is referred to, this relates to the proposed delivery route from Foynes Port to the Site.
- the 'Haul Route' is referred to, this relates to the proposed routes from local quarries and supplies to the Site.

1.4 OUTLINE OF THE SURFACE WATER MANAGEMENT PLAN

This document aims to set out the proposed procedures and operations to be utilised at the Site to mitigate against any water related environmental effects. The mitigation and control measures outlined herein and in the EIAR will be employed on-site during the construction phase and operational phase of the Project.

The main areas of water related concerns covered by this document are:

(a) Pre-Construction, Construction Phase and Operational Phase drainage controls;
(b) Earthworks (*i.e.* infrastructure & drainage) and surface water quality protection;
(c) Temporary stockpiles water management and controls;
(d) Permanent soil/subsoil storage areas;
(e) Fuel usage, storage and management;

(f) Working at or near existing streams / watercourses;
(g) Wind farm, cable link and grid connection watercourse crossing works; and,
(h) Water supply and on-site sanitation.

1.5 SWMP REPORT STATUS

The SWMP is considered a live document and will be modified over time as detailed contractor methods of work are developed. If the Project is permitted an updated version of this document will be issued to all parties involved in the construction process when appropriate changes are deemed necessary.

2. EXISTING HYDROLOGICAL REGIME

2.1 INTRODUCTION

The existing geological and hydrological regime at the Site is described in Chapter 9 (Soils and Geology) and Chapter 10 (Hydrology and Hydrogeology) of the EIAR for the Project. A summary of geological and hydrological data is provided below in order to put the SWMP into perspective.

2.2 EXISTING GEOLOGICAL REGIME

Based on the Teagasc soils mapping (www.gsi.ie), the northern section of the Site is predominantly overlain by alluvial soils in the vicinity if the Maigue River. Alluvium is also mapped along the lower reaches of the tributaries of the Maigue River which drain the Site. Much of the centre of the Site is overlain by lacustrine type soils while acid poorly drained mineral soils are mapped in the south. The proposed Substation location and the northern section of the Grid Connection are overlain by basic poorly drained mineral soils whilst the southern section of the Grid Connection is overlain by acid poorly drained mineral soils.

The GSI subsoil map (www.gsi.ie) shows that the north and centre of the Site are underlain by alluvium and lacustrine subsoils. Meanwhile, the south of the Site is underlain by Till derived from Devonian sandstones. The proposed Substation location and the northern section of the Grid Connection are mapped to be underlain by Till derived from Limestones.

Based on the trial pit investigations, the Site is overlain by a dark-brown, organic, silty TOPSOIL which is underlain by glacial till deposits described as slightly gravelly SILT. Granular deposits were encountered at the base of 2 no. trial pits at depths of 2.7 and 3.4mbg.

No bedrock was encountered during the site investigations at the Site.

2.3 EXISTING HYDROGEOLOGICAL REGIME

The bedrock geology underlying the Site comprises various Dinantian Limestones lithologies. The north of the Site is underlain by Dinantian Lower Impure Limestones (undifferentiated Visean Limestones). An area towards the centre of the Site is underlain by Dinantian Pure Unbedded Limestones of the Waulsortian Limestone Formation. The south of the Site is underlain by Dinantian Upper Impure Limestones (undifferentiated Visean Limestones).

The undifferentiated Visean Limestones which underlie the north and south of the Site are classified by the GSI as a Locally Important Aquifer (Ll) - Bedrock which is Moderately Productive only in Local Zones. Meanwhile, the Dinantian Pure Unbedded Limestones towards the centre of the Site are classified by the GSI as a Regionally Important Aquifer - Karstified (diffuse).

There are no mapped karst features in the vicinity of the Site.

2.4 EXISTING HYDROLOGICAL REGIME

On a regional scale, the Site is located in the Shannon Estuary South surface water catchment within Hydrometric Area 24 of the Shannon River Basin District. The Site is drained by the Maigue River which flows through the northern section of the Site. Several tributaries of the Maigue River, including the Charleville Stream, flow northwards through the Site before discharging into the Maigue River to the east of T9.

More locally, the Site is located within 3 no. sub-catchments of the Maigue River: the Maigue_SC_020 to the east, the Maigue_SC_010 to the west and a small area in the north of the Site is mapped in the Maigue_SC_040.

Within the Maigue_SC_010 sub-catchment, the Site is mapped in the Charleville Stream_020 WFD river sub-basin. The Charleville Stream is a 2nd order stream which dissects the Site, flowing from south to north ~95m east of T3. The Charleville Stream discharges into the Maigue River ~180m southwest of T7. Several other watercourses are mapped by the EPA in this area of the Site. A small, locally unnamed, 1st order stream, referred to by the EPA as the Graigues Stream is mapped to originate along the N20 before flowing to the northeast through the Site and ~80m west of T5. This stream confluences with another small stream, referred to by the EPA as the Creggane Stream, which flows from the west, ~190m northwest of T5. The Graigues Stream then continues to flow for ~250m before it discharges into the Maigue River at the same location as the Charleville Stream. The Maigue River itself, flows to the east under the N20 at Creggane Bridge, and dissects the northwestern section of the Site. The Maigue River flows to the east ~85m south of T8, before veering to the north downstream of its confluence with the Charleville and Graigues streams.

Within the Maigue_SC_020 sub-catchment, the Site is mapped in the Maigue_030 WFD river sub-basin. The main drainage features in this area of the Site is the Loobagh River which enters the Site from the east, flowing under the L1537 at Garroose Bridge and discharges into the Maigue River ~230m east of T9. A small locally unnamed stream, also referred to by the EPA as the Loobagh, is mapped to originate in interior of the Site and flows to the north ~80m east of T4. This stream discharges into the Maigue River just south of the confluence of the Maigue River and the main Loobagh River.

Within the Maigue_SC_040, the Site is also mapped in the Maigue_030 WFD river sub-basin, with the Maigue River flowing to the north ~215m east of T9.

Downstream of the Site, the Maigue River continues to the north, flowing through Bruree and Croom before becoming tidal at Adare, ~20km northeast of the Site (straight line distance).

A summary of surface water catchments and project infrastructure is shown in **Table A** below.

Table A: Summary of Surface Water Catchments and Project Infrastructure

Sub-catchment	Local River Water Body (Sub-basin)	Proposed Infrastructure
Maigue_SC_010	Charleville Stream_020	T1, T2, T4, T6, access tracks, 4 no. spoil storage areas, met mast, Site Entrance 1 and ecological enhancement areas. T3 and T7 also lie on the catchment divide between the Charleville Stream_020 and the Maigue_030 WFD river sub-basins.
Maigue_SC_020	Maigue_030	T5, 110kV Substation, temporary construction compound, 2 no. spoil storage areas (to the south of the substation and to the north of T02), Grid Connection and Site Entrance 2 and ecological enhancement areas.
Maigue_SC_040	Maigue_030	T7 and T9 are proposed on the catchment divide between the Charleville Stream_020 and the Maigue_030 WFD river sub-basins. A spoil storage area in the vicinity of T9 also encroaches upon this sub-basin.

2.5 PROJECT SITE EXISTING DRAINAGE FEATURES

Drainage within the Site is facilitated primarily by the natural watercourse discussed above. In addition to the EPA mapped watercourses, drainage is further facilitated by a network of manmade drains. These are agricultural field drains which are typically deeply incised and are located along existing hedgerows and field boundaries. The drains connect to downstream natural watercourses.

2 no. new proposed watercourse crossings form part of the Project. A new crossing is proposed over the Charleville Stream between T3 and T4 and a crossing is proposed over the Maigue River between T7 and T8. Several other crossings are proposed over smaller field drains.

A site drainage map is attached as Figure B below.

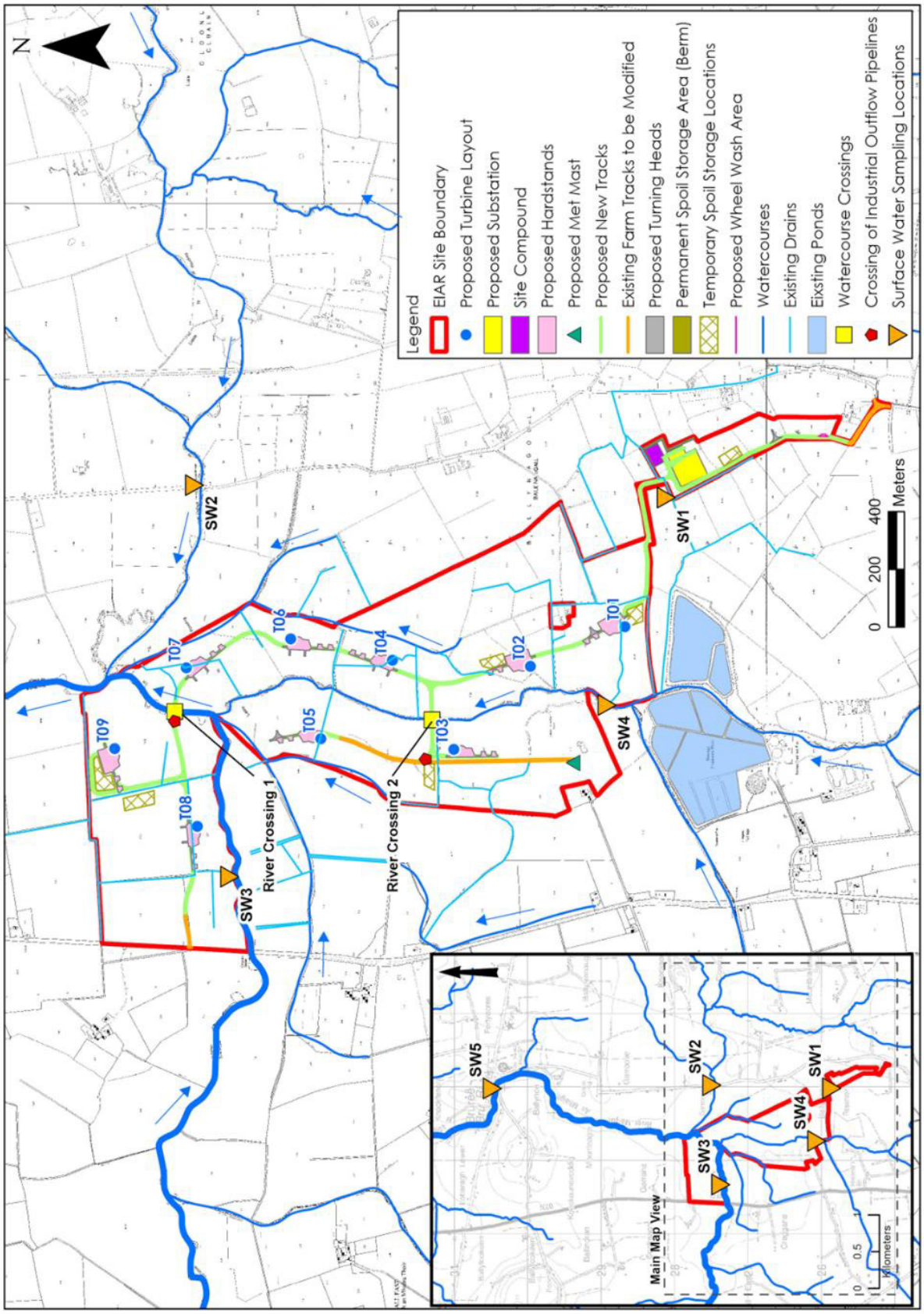

Figure B: Site Drainage Map

2.6 FLOOD RISK MAPPING

A site-specific flood risk assessment was prepared as part of the EIAR (refer to **Appendix 10.1** of the Hydrology and Hydrogeology Chapter).

To identify those areas as being at risk of flooding, OPW's Past Flood Event mapping (www.floodinfo.ie) were consulted. The OPW record historic and recurring flood instances immediately to the west of the Site where the N20 crosses the Maigue River at Creggane Bridge.

Catchment Flood Risk Assessment and Management (CFRAM)[1] River Flood Extent mapping has been completed for the area of the Site. Large areas of the Site are mapped within fluvial flood zones along the Maigue River and Charleville Stream and other smaller watercourses which drain the Site. CFRAM maps indicate that much of the Site is located in Fluvial Flood Zone A. However, the Substation is located in Fluvial Flood Zone C and is at low risk of flooding.

The GSI's Historic Winter 2015/2016 Surface Water Flood Map shows areas of surface water flooding in the northwest and west of the Site.

National Indicative Fluvial Mapping (NIFM) (www.floodinfo.ie) shows probabilistic fluvial flood zones for catchments greater than 5km^2 for which flood maps were not produced under the CFRAM Programme. For the present-day or future scenarios, no medium (1 in 100) and low probability (1 in 1,000) fluvial flood zones are mapped within the Site.

There is a very small likelihood that a significant flood event will occur during the construction phase. Notwithstanding this, emergency response measures are outlined in this document regarding appropriate responses in advance of such a flood event.

Emergency response procedures during a flood event arising during the operational phase are also outlined below.

2.7 SURFACE WATER ABSTRACTIONS

The Bruree Public Water Supply (PWS) uses an abstraction near the River Maigue, which is located ~2.7km downstream of the Site. The source of the raw water is from the underlying sandstones however recharge from the river is likely to be induced during pumping. There is no direct surface water abstraction from the Maigue River itself for the Bruree PWS.

The Adare PWS is located ~13.5km to the northwest (straight line distance) of the Site. This PWS comprises of a surface water abstraction point from the Maigue River.

1 CFRAM is Catchment Flood Risk Assessment and Management. The national CFRAM programme commenced in Ireland in 2011 and is managed by the OPW. The CFRAM Programme is central to the medium to long-term strategy for the reduction and management of flood risk in Ireland.

3. SURFACE WATER & SITE DRAINAGE MANAGEMENT

3.1 DRAINAGE DESIGN CRITERIA

The main design criteria for project drainage plans are shown below. These criteria were incorporated into the design of the drainage plan as shown in **Appendix I**.

- Minimise any change to the surface water and groundwater conditions within the Site;
- Avoid sensitive areas where possible by employing hydrological constraints (*i.e.* buffer zones);
- Using a SUDS philosophy where physically possible, to replicate the natural drainage of the Site;
- Minimise sediment loads in the runoff, with particular attention being given to the construction phase of the Project;
- Maintain runoff rates and volumes at Greenfield rates for a range of storm events (to be incorporated into final detailed design); and,
- Avoid high flow velocities internally within new drain networks and at outfall locations to prevent erosion.

3.2 DRAINAGE PHILOSOPHY

As a standard and best practice approach, surface water runoff attenuation and drainage management are key elements in terms of mitigation against impacts on surface water bodies.

Two distinct methods will be employed in the management of construction surface water runoff. The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the Site, that might carry silt or sediment, and nutrients, and to route them towards settlement ponds or provide in-line sediment controls prior to controlled diffuse release over vegetated natural surfaces within the project site. There will be no direct discharge to surface waters or drains; and where possible all release of wind farm site drainage should be done outside of hydrological buffer zones.

Also, where there is reduced risk to surface water, i.e. where proposed tracks require minimal excavation/fill and are remote from existing drains and watercourses over the edge drainage is proposed as a means of minimising excavation and disturbance. Such an approach replicates the construction of existing farm tracks which generally have no associated drainage.

Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after the new drainage system to handle the same water has been put in place.

Existing drains in the vicinity of the construction works area will be maintained in their present location where possible. If it is expected that these drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains.

3.3 PRE-CONSTRUCTION DRAINAGE MANAGEMENT

An existing drainage network exists within the Site. It comprises field drains, and an array of natural watercourses, including the Maigue River, the Charleville Stream, the Graigues Stream, and the Creggane Stream.

The drainage regime within the Site will continue to function as it is during the pre-construction phase. Prior to commencement of works, inspections will be competed to ensure drains and watercourses are free from debris and blockages that may impede drainage. It will also be required to complete these inspections as the construction works develop across the Site to ensure they remain in their original pre-construction condition.

3.4 PROXIMITY TO STREAMS / NATURAL WATERCOURSES

As outlined in the EIAR a key pollution prevention measure during the construction phase is the avoidance of watercourses and ecologically sensitive natural water features. A self-imposed 50m wide natural water feature buffer (i.e., rivers and streams) is proposed in the EIAR for surface water protection.

All of the key areas of the proposed Project infrastructure are generally away from the 50m delineated buffer zones with the exception of 2 no. proposed watercourse crossings (W1and W2).

3.5 WIND FARM CONSTRUCTION PHASE SURFACE WATER DRAINAGE MANGEMENT

The early establishment of temporary drainage facilities will reduce the risk of pollution problems during construction. In addition, construction operations will adopt best working practices. The development of the wind farm site will need to be phased accordingly. The construction of the drainage will start from the downstream sections and progress upstream, connecting conveyance systems with other drainage features as each development phase progresses. They will therefore need to be designed with sufficient flexibility to respond to an early phase of limited incoming flow during the construction phase.

Detailed measures to address surface water management based upon the design criteria and philosophy will be implemented. The drainage system will be excavated and constructed in conjunction with the road and hardstanding construction. Drains will be excavated and settlement ponds constructed to eliminate any suspended solids within surface water running off the project site.

The drainage plan presented in **Appendix I** will be further developed and refined by the design and build contractor with oversight from the supervising project engineer and specialist contractor, and can be refined with detailed turbine by turbine inspection of existing drainage details, and agreement with the site foreman with regards to locations and directions of proposed outfalls, settlement ponds and level spreader locations. Any changes will be subject to the compliance with planning conditions that may arise from the consenting process.

Construction Drainage Action Points:

- Establish drainage and runoff controls before starting site clearance groundworks and earthworks;
- Minimising the area of exposed ground;
- Retain as much vegetation as possible;
- Delay clearing and topsoil stripping of each phase of work until ready to proceed;
- Establish vegetation as soon as practical on all areas where soil has been exposed, or all exposed surfaces should be sealed with an excavator to ensure no erosion can occur;
- Close and backfill trenches/excavations as soon as practically possible;

- Through consultation with the Construction Manager/Site Supervisor, the site Environmental Manager should draw up a Schedule for surface water quality monitoring, which will be finalised prior to the start of construction; and,
- Where monitoring parameters are found to exceed the standards laid down, the Environmental Manager should initiate and report on corrective action(s). This may necessitate the alteration of the environmental control measures and in turn the relevant construction method statement(s).

Measures to control surface water runoff during the construction phase of the Project are as follows:

Access Tracks:

- Interceptor drains will be placed on the up-gradient side of the track/turbine/hardstanding excavations to divert clean runoff away from the section to be excavated;
- Use of in-line erosion and velocity control measures such as check dams, sand bags, flow limiters, weirs, baffles, silt fences, filter fabrics, and collection sumps should be used;
- Collector drains will be placed on the down-gradient side of the section to be excavated to collect any potential dirty excavation runoff and keep it away from clean surface water runoff;
- Settlement ponds and sediment traps along with proprietary settlement systems such as Siltbuster will be installed to treat dirty construction water runoff prior to controlled release onto the natural vegetation surfaces; and,
- As described above, there may be sections of access track that are remote from receiving water where over-the-edge (OTE) will occur.

Turbine Bases, Substation & Construction Compound area:

- Installation of interceptor drains up-gradient and around the excavation to intercept clean surface runoff and divert it around and away from the works;
- Surface water runoff may also be diverted around the excavation by silt fences, sand bags or similar laid on the surface of the ground;
- Collector drains will be placed on the down-gradient side of hardstand areas to collect any potential dirty excavation runoff and keep it away from clean surface water runoff;
- The base of the excavation will be constructed level, and water will be gathered in a temporary sump and pumped at a low flow rate into either a temporary settlement pond or swale type feature for treatment prior to controlled release onto the natural vegetation surface;
- Suitably sized silt traps and hydrocarbon interceptors will be installed on the outfall drain(s) from the substation and the construction compounds; and;
- The use of a proprietary settlement system such as Siltbuster may be required to treat dirty construction water where additional treatment is required.

Soil/Subsoil Storage areas:

- During the initial placement of soil and subsoil, silt fences and biodegradable geogrids will be used to control surface water runoff from the storage areas;
- Proposed soil/subsoil storage areas are small, and they will be surround by silt fencing until vegetation has re-established.
- Where possible, the vegetation layer shall be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the soil. This will reduce runoff velocities by encouraging diffuse flow and prevent erosion by a having a natural "cap" over the exposed soils and subsoil; and,
- The vegetation layer can be hydro-seeded to encourage further stabilisation if required.

A suite of general SuDs drainage controls available for surface water management are summarised (along with their application) in **Table B** below. These include avoidance controls, source controls, in-line controls, water treatment controls, and outfall controls. A more detailed description of the key components of the SuDs drainage system is provided in **Table B** below.

Table B: Summary of SuDs Drainage Control & their application

Management Type	Description of SuDs drainage control method	Applicable Works Area
Avoidance Controls:	• Application of 50m buffer zones to natural watercourses where possible; • Using small working areas; • Working in appropriate weather and suspending certain work activities in advance of forecasted wet weather.	Construction work areas where sediment is being generated.
Source Controls:	• Use of upstream interceptor drains and downstream collector drains, vee-drains, diversion drains, flumes and culvert pipes.	Construction work areas where sediment is being generated.
	• Using small working areas; • Covering/sealing temporary stockpiles; • Weathering off / sealing stockpiles and promoting vegetation growth.	Stockpile/overburden storage areas.
In-Line Controls:	• Interceptor drains, vee-drains, oversized swales/collector drains; • Erosion and velocity control measures such as: o sand bags; o oyster bags filled with gravel; o filter fabrics; o flow limiters; o weirs or baffles; o and/or other similar/equivalent or appropriate systems. • Silt fences, filter fabrics; • Collection sumps, temporary sumps, pumping systems; • Attenuation lagoons; • Sediment traps, settlement ponds.	Interceptor and collection drainage systems.
Water Treatment Controls:	• Temporary sumps; • Attenuation ponds; • Temporary storage lagoons; • Sediment traps, Settlement ponds, silt bags; • Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.	Surface water treatment locations.
Outfall Controls:	• Levelspreaders; • Buffered outfalls; • Vegetation filters; • Silt bags; • Flow limiters and weirs.	Drainage run outfalls and overland discharge points.

Silt fences:
Silt fences will be emplaced along drains and parallel to access tracks edges as required, down-gradient of all new tracks, turbine locations, construction compounds and at stream / watercourse crossings. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff to nearby watercourses.

Inspection and maintenance of these structures during construction phase is critical to their functioning to stated purpose. They should remain in place throughout the entire construction phase. Silt fence material should be Terra Stop Premium or equivalent, as per the specifications provided at: http://www.hy-tex.co.uk/index.php/products/geotextiles/terrastop-premium-silt-fence.

Double silt fences will be placed where work is required within the hydrological buffer zones.

Check Dams:

- The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at 20 – 30m regular intervals to ensure flow is non-erosive;
- Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains and swales are being excavated; and,
- Check dams will be constructed from a 4/40 mm non-friable crushed rock. Check dams are relatively simple and cost effective to construct.

Settlement Ponds:

- Settlement ponds will be used to attenuate runoff from works areas of the wind farm site during the construction phase, and will remain in place to handle runoff from track and hardstanding areas during the operational phase. The purpose of the settlement ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the settlement ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips down-gradient of any works areas;
- Settlement ponds will be constructed at each turbine location, control building and substation compounds, site construction compounds and along sections of access track. The points at which water enters and exits the settlement ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the settlement pond system, and prevent erosion. The primary settlement pond will reduce the velocity of flows to less than 0.5 m/s to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary settlement pond will reduce the velocity of flows to less than 0.3 m/s. Water will flow out of the secondary settlement pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out; and,
- The settlement ponds are sized according to the size of the area they will be receiving water from and are large enough to accommodate a 10-year return rainfall event. Settlement ponds will comply with the design requirements set out in Appendix D of Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals), (EPA, 2006).

Level Spreaders:

- A level spreader will be constructed at the outfalls of interceptor drains and settlement ponds to convert concentrated flows into diffuse sheet flow on areas of existing vegetated ground;
- The level spreaders will distribute wind farm site drainage runoff onto vegetated surfaces where the discharge will emerge as diffuse flow. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion; and,
- The level spreader lip over which the water will spill should be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader will be level across the top and bottom to prevent channelised flow leaving the spreader.

Silt Bags:

Silt bags will also be emplaced within drains down-gradient of all construction areas. Silt bags are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment.

Siltbuster:

- A "siltbuster" or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas, if necessary, prior to its discharge to settlement ponds or swales.

- Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction sites.
- The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile.
- The Siltbuster units are now considered best practice for the management of dirty water pumped from construction sites. The UK Environment Agency and the Scottish Environmental Protection Agency have all recommended/specified the use of Siltbuster units on construction projects.

Pre-emptive Site Drainage Management:

- The works programme for the initial construction stage of the project will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works should be scaled back or suspended will relate directly to the amount of rainfall forecast.
- Works will be suspended if forecasting suggests either of the following is likely to occur:
    - >10 mm/hr (*i.e.* high intensity local rainfall events); or
    - >25 mm in a 24 hour period (heavy frontal rainfall lasting most of the day); or,
    - >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures will be completed:

- Secure all open excavations to prevent ingress of rainwater/runoff;
- Provide temporary or emergency drainage in the form of diversion channels to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded.

Timing of site construction works:

Construction of the wind farm site drainage system will only be carried out during periods of low 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. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and operational for all subsequent construction works.

Post-Construction Phase Drainage Decommissioning:

During the operational phase when silt laden runoff is no longer generated by construction/excavation activities, some SuDS features may not be necessary for long term surface water management. Such features may be removed over time as follows:

- Temporary settlement ponds can be in-filled and the surrounding area fully reinstated post construction phase. Construction waste materials such as collected silt/sand material, gravel barriers, timber and sand bags etc will be disposed of at an appropriate waste disposal facility;
- Temporary sumps and silt traps along the access track will be in-filled with large open voided stone and covered over; and,
- Removal of geotextile material if used as sediment barriers at the inlet end of cross drainage pipes or as silt fences along surface water runoff routes.

3.6 WIND FARM OPERATIONAL PHASE DRAINAGE MANAGEMENT

The drainage system as outlined below will remain in place during the operational phase. The drainage system will be integrated with the existing site drainage where required.

- Interceptor drains (installed during construction) will be retained up-gradient of all proposed permanent infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It [clean drainage] will then be directed to areas where it can be re-discharged or distributed over the ground by means of a level spreader;
- Collector drains (installed during construction) will be retained downgradient of tracks and turbine locations and will be used to collect runoff, from access tracks and turbine hardstanding areas within the Site and channel it to settlement ponds for sediment settling;
- Check dams will be used along sections of access track drains to intercept silts at source. Check dams should be constructed from a 4/40 mm non-friable crushed rock;
- Some settlement ponds, installed during construction, will be retained downstream of track sections and turbine locations, and will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses;
- Settlement ponds will remain in place until the Site has stabilised in terms of re-vegetation of exposed ground;
- Maintenance of the operational phase drainage system is essential, and regular half-yearly clearance of any blockages or silt buildup will take place throughout the operational phase. Monthly ongoing inspections by site maintenance staff along with quarterly inspections by an independent consultant for a period of two years into the operational phase;
- Some maintenance works relating to site entrances, internal tracks, junctions and hardstand areas will be required. These works would be of a minor scale and would be very infrequent. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works; and,
- In addition to the permanent drainage outlined above, temporary check dams and silt fencing arrangements will be placed along sections of works areas where maintenance is being undertaken.

3.7 WIND FARM DECOMMISSIONING DRAINAGE MANAGEMENT

During decommissioning, it is intended to limit groundworks other than to rehabilitate, constructed areas such as turbine bases and hard standing areas. This will be done by covering with topsoil to encourage vegetation growth and reduce run-off and sedimentation.

The existing wind farm site access tracks will be kept and maintained following decommissioning of the wind farm infrastructure, as these will be utilised for farming by landowners.

The electrical cabling connecting the site infrastructure to the on-site substation will be removed, while the ducting itself will remain in-situ rather than excavating and removing it, as this is considered to have less of a potential environmental impact, in terms of soil exposure, and thus on the possibility of the generation of suspended sediment which could enter nearby watercourses.

The turbines will be removed by disassembling them in a reverse order to their erection. This will be completed using the same model cranes as used in their construction. They will then be transported off-site along their original delivery route. The turbine concrete bases will remain in the ground and backfilled.

Prior to the commencement of the decommissioning works the following key temporary drainage measures will be undertaken:

- All existing dry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using check dams/silt traps;
- Check dams/silt fence arrangements (silt traps) will be placed in all existing drains that have surface water flows and also along existing trackside drains;
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone;
- All reinstated areas will be vegetated at the soonest opportunity to prevent potential sediment entrainment in runoff;
- Avoidance of instream works will be required during the decommissioning phase; and,
- No dewatering or diversion of surface water flows will be required.

3.8 WATERCOURSE CROSSINGS

Within the Site, there are a total of 2 no. new proposed crossings over mapped natural watercourses. A new crossing is proposed over the Charleville Stream between T3 and T4 (WC02, refer to Drawing 6839-JOD-GGE-XX-DR-C-0403) and a crossing is proposed over the River Maigue between T7 and T8 (WC01, refer to Drawing 6839-JOD-GGE-XX-DR-C-0402).

A buffer zone will be maintained for all crossing locations where possible whereby all watercourses will be fenced off and construction works will be completed outside the fencing where possible. In addition, measures which are outlined below will be implemented to ensure that silt laden or contaminated surface water runoff from the excavation work does not discharge directly to the adjacent watercourse.

The purpose of the buffer zone is to:

- Avoid physical damage to surface water channels;
- Provide a buffer against hydraulic loading by additional surface water run-off;
- Avoid the entry of suspended sediment and associated nutrients into surface waters from the trench excavation;
- Provide a buffer against direct pollution of surface waters by pollutants such as hydrocarbons; and,
- Provide a buffer against construction plant and materials entering any watercourse.

General Best Practice Pollution Prevention Measures will also include:

- Protection of the riparian zone watercourses by implementing a constraints zone around watercourse/wet drainage channel crossings, in which construction activity will be limited to the minimum, i.e. works solely in connection with duct laying or structure construction at the crossing point;
- No stockpiling of construction materials will take place within the constraints zone. No refuelling of machinery or overnight parking of machinery is permitted in this area (at least 100m separation distance from the crossing locations);
- No concrete truck chute cleaning is permitted in this area;
- Works within the constraints zone will not take place at periods of high rainfall or high stream/river flows, and works will be scaled back or suspended if heavy rain is forecast;
- Plant will travel slowly across bare ground at a maximum of 5km/hr;
- All machinery operations will take place away from the watercourse and ditch banks, apart from where crossings occur;
- Any excess construction material shall be immediately removed from the area and taken to a licensed waste facility or designated soil storage area, as appropriate;
- No stockpiling of materials will be permitted in the constraint zones;
- Spill kits shall be available in each item of plant required to complete the stream crossing; and,
- Silt fencing will be erected on ground sloping towards watercourses at the stream/river crossings if required;

- Double silt fences will be placed down-gradient of all construction areas inside the hydrological buffer zones (i.e., near stream crossings); and,
- Any trackside drains will be temporarily blocked using sandbags in the area where trenching works is taking place.

3.9 BRIDGE / CULVERT DESIGN

All new river/stream crossings are designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent. Design levels are based on 100yr flood level + allowance for climate change + 300mm freeboard.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines *'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945'*, and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

Some culverts may be installed to manage drainage waters from works areas of the Project, particularly where the waters have to be taken from one side of an existing trackway/roadway to the other for discharge. The size of culverts will be influenced by the depth of the track or track sub-base. In some cases, two or more smaller diameter culverts may be used where this depth is limited, though this will be avoided as they will have a higher associated risk of blockage than a single, larger pipe. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water/drainage crossings will simply consist of an appropriately sized pipe buried in the sub-base of the track at the necessary invert level to ensure ponding or pooling doesn't occur above or below the culvert and water can continue to flow as necessary.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

4. POLLUTION PREVENTION & DRAINAGE CONTROL MEASURES

4.1 TEMPORARY MATERIAL STORAGE AREAS - DRAINAGE CONTROLS

For the protection of water quality, construction and drainage controls around temporary stockpiles at the Site, including at the substation, will be implemented as follows:

- All areas for temporary stockpiling will be initially marked out on the ground, and an agreed preliminary drainage plan should be drawn up by the Project Geotechnical Engineer in consultation with the Site Construction Manager, Project Hydrologist;
- The preliminary drainage plan will be agreed on the ground with the Site Foreman, and, in the case of the Site, pre drainage of the area will commence. Pre drainage will involve excavation of any required drainage ditches and surface water control ponds/swales;
- The marked temporary storage areas will also be surrounded on 3 no. sides with silt fencing, and the area will be filled by access through the open side;
- Once the temporary stockpile is filled to its intended area, silt fencing around the remaining edge will be installed;
- All exposed surfaces of temporary mineral soil and subsoil stockpiles will be sealed by smoothing the exposed surface with the back of an excavator bucket;
- Temporary management of runoff water during stockpile filling within the Site may require pumping to a local temporary settlement pond for sedimentation and water treatment prior to discharge;
- If there is no available local settlement pond, then a temporary settlement pond should be constructed and runoff from the temporary stockpile area should be routed to this settlement pond, and after treatment re-distribution locally across natural vegetated areas; and,
- Where required additional specialist treatment may be employed to ensure no deterioration in downstream water quality occurs.

4.2 EXCAVATION DRAINAGE CONTROLS

There will be no significant requirement for groundwater dewatering during the excavation of turbine base foundations at the Site or within excavations along the Grid Connection. As a worst case, minor seepages and localised surface water runoff may require management but this will only account for a minimal volume. Management of any water build-up and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Appropriate upstream interception drainage, to prevent upslope surface runoff from entering excavations at the turbine hardstanding/foundation areas;
- If required, sump pumps will be employed to prevent build-up of water in the turbine base excavations at the Site;
- The interception drainage will be discharged to the Site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters;
- Pumped water will only be discharged outside of the delineated 50m hydrological buffer zones;
- The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit or equivalent;
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;
- Daily monitoring of excavations by a suitably qualified person will occur during the construction phase of the project. If high levels of seepage inflow occur, excavation work will immediately be stopped and a geotechnical & hydrogeological assessment will be undertaken;
- Silt bags will be used to control discharges of pumped water into drainage swales at the Site;

- Only designated trained and competent operatives will be authorised to refuel plant on site (all Project works locations). Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. Machinery will be refuelled off site at the beginning of each day during works along the Grid Connection route, refuelling on site will be minimised;
- Fuels storage bunds within the wind farm site will not be located in excavated areas, instead will only be located in a designated part of the construction compounds;
- Erosion from excavation areas at the Site will be controlled by re-vegetation of exposed areas once backfilling is complete, and mounding and berms will also be employed to ensure runoff is controlled until vegetation is re-established following reinstatement of borrow pits areas;
- Erosion from excavation areas along the Grid Connection will not be an issue due to the temporal nature of the works, however control measures such as silt bags and fences will be put in place; and,
- Spill kits will be available to deal with any accidental spillage in and outside the excavation areas.

4.3 FUEL USAGE / STORAGE AND HAZARDOUS MATERIALS

Measures to control hydrocarbons at the project site are as follows:

- All plant will be inspected and certified to ensure they are leak free and in good working order prior to use at the Site;
- On-site refuelling will occur at the Site using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer or truck will be re-filled off site and will be towed/driven around the wind farm site to where machinery are located. The 4x4 jeep/fuel truck will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations;
- Fuels stored on the Site will be minimised. Any storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction, and located in a designated area of the construction site compounds;
- The electrical control building and substation compound will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- All plant used will be regularly inspected by the site Environmental Manager for leaks and fitness for purpose;
- Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area;
- Refuelling or Maintenance of vehicles will not take place within 100m of a watercourse;
- All spills and leaks will be reported directly to the Site Environmental Manager who in turn will report to the Construction Manager.

Hazardous Material Control Measures:

Hazardous materials, such as hydrocarbons, may be used on site within the wind farm site and during the construction of the project. This section covers any substance that is regarded as potentially harmful. They are usually marked with one of the symbols shown below

- All hazardous substances will be stored in a safe manner in such a way that they will not be at risk of spillage or damage, i.e. within a bunded storage area away from any vehicular traffic at a designated location within the site construction compounds;
- Chemicals stored on the wind farm project site will be minimised. This storage area if required will be bunded appropriately for the chemical storage volume (i.e., 110 % of maximum volume);
- All material data sheets will be readily available on site and the Environmental Manager will keep copies of Material Safety Data Sheets for all hazardous substances centrally;
- Anywhere hazardous materials are to be used they will be specifically mentioned in the Method Statement along with information on how to handle the substance and how to deal with any accidents;
- Empty canisters or containers that contained hazardous substances will be disposed of in hazardous waste skips which will be provided at the site construction compounds and appropriately recorded on the waste register;
- Subcontractors must provide a copy of the Material Safety Data Sheets to the site Environmental Manager for all hazardous substances brought on site; and,
- The contents of any tank/container/drum will be clearly marked with the appropriate warning signage, and a notice displayed requiring that valves and trigger guns be locked when not in use.

Cement Based Products Control Measures:

- Apart from very small volumes at the substation and control building (i.e. for block laying), no batching of wet-cement products will occur on the wind farm project site. In addition, wet cement will not be used during the construction of the grid connection, with semi-dry lean mix used as specified by EirGrid/ESBN standards;
- Ready-mixed supply of wet concrete products will be used for turbine foundations and for other foundations at the project site – i.e. foundations for the met mast, control buildings and as needed for structures at the substation compound. Watercourse crossing structures will utilize pre-cast concrete elements;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered to the wind farm site, only the chute will be cleaned, using the smallest volume of water possible (see reference to RCW wash unit below);
- No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water should be tanked and removed from the wind farm site to an appropriate waste facility;
- Weather forecasting will be used to plan dry days for pouring concrete;
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event; and,
- All concrete wash down at the site will be completed in a dedicated Trackside Concrete Washout pit.

4.4 WATER SUPPLY AND ON-SITE SANITATION

All water used at the Site will be as follows:

- Water supply for the site office and compound will be brought to site and removed after use from the Site to be discharged at a suitable off-site licenced treatment location; and, no water will be sourced on the windfarm site.
- Water supply to the Substation will be from a new on site groundwater well. The well is expected to abstract ~3m^3/day.

All wastewater effluent generated throughout the construction phase of the Project will be contained in port-a-loos and disposed of appropriately by a licensed provider as follows:

- A self-contained port-a-loo with an integrated waste holding tank will be used, maintained by the providing contractor, and removed from the Site on completion of the construction works. Collected wastewater will be removed by tanker and disposed of at a suitable off-site licenced wastewater facility; and,
- No wastewater will be discharged to the wind farm site drainage network or to any downstream watercourse or along the cable routes or at any other remote works locations.

5. WATER MONITORING PLAN

5.1 DRAINAGE INSPECTION & MAINTENANCE

Drainage performance will form part of the civil works contract requirements. During the construction phase the effectiveness of drainage measures, designed to minimise runoff entering works areas and the capture and treatment of potentially silt-laden water from the works areas will be monitored periodically (daily, weekly, and event-based monitoring, *i.e.* after heavy rainfall events) by the site Environmental Manager and/or the Project Engineer. This will primarily involve inspection of the drainage system within the Site, but also ongoing inspection of the efficacy of surface water treatment along the cable routes and at haul route works locations as works progress. The site Environmental Manager will respond to changing weather and drainage conditions on the ground as the Project proceeds, to ensure the effectiveness of the drainage design is maintained. Regular inspections of all existing and installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system. Any excess build-up of silt levels at check dams, the settlement ponds, or any other drainage features within the Site, or at silt fences/bags along the Grid Connection, that may decrease the effectiveness of the drainage feature, will be removed.

The following periodic inspection regime will be completed and recorded:

- Daily general visual inspections by site Environmental Manager within the Site and during the construction of the substation and Grid Connection cabling;
- Weekly (existing & new drains) inspections by site Construction Manager;
- All inspection to include all elements of drainage systems and all monitoring. Inspections required to ensure that drainage systems are operating correctly and to identify any maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter should be noted and corrective action should be implemented. High risk locations such as settlement ponds will be inspected on a daily basis. Daily inspections checks will be completed on plant and equipment, and whether materials such as silt fencing or oil absorbent materials need replacement;
- Event based inspections by the site Environmental Manager following Orange Weather Warning rainfall events; and,
- Monthly inspections by the Project Hydrologist during construction phase.

5.2 SURFACE WATER QUALITY MONITORING

5.2.1 Field Monitoring

Field monitoring of water quality parameters and collection of samples within the Site will be undertaken by the site Environmental Manager. He/she will be appropriately trained on the required monitoring methods and the use, calibration and maintenance of all monitoring equipment used.

5.2.2 Sampling Locations

Surface water quality will be monitored during the construction phase and this monitoring will also extend into the post construction phase for the wind farm site. Grab sampling will be completed at monitoring points SW3, SW4 and SW5 and at 2 no. locations within the WF site in man-made drains (refer to **Figure 2** for the location of SW3-SW5).

All proposed locations of the surface water monitoring points will be agreed with Inland Fisheries Ireland and Limerick City and County Council in advance of the construction phase.

Coordination of the flow monitoring and continuous monitoring (maintenance and downloading and data management) will be undertaken by the site Environmental Manager.

5.2.3 Laboratory Analysis

Laboratory analysis of water samples will also be undertaken as part of the monitoring programme by an independent and appropriately certified laboratory.

Coordination of the laboratory sampling and analytical programme will be undertaken by the site Environmental Manager. Samples will be dispatched for analysis under chain of custody procedures. Laboratory analytical results will be sent to the site Environmental Manager who will relay data onto the Project Hydrologist and Project Ecologist for their independent review.

Interpretation and reporting of both the field and laboratory data will be the responsibility of the site Environmental Manager.

Proposed parameter suite for hydrochemistry analysis at the monitoring locations is shown in **Table C** below.

Table C: Proposed Parameter Suite for Surface Water Monitoring

• pH (field measured)	• Sulphate • Chloride
• Electrical Conductivity (field measured)	• Ammonia as N • Nitrate as N • Nitrite as N
• Temperature (field measured)	• Total Petroleum Hydrocarbons
• Ortho-phosphate	• Total Suspended Solids
• Biological Oxygen Demand	• Turbidity

5.2.4 Monitoring Frequency

Monitoring frequency will be specified and agreed with Inland Fisheries Ireland and Limerick City and County Council prior to commencement of construction.

As a minimum, the monitoring programme will include:

- Daily visual checks across the construction works area;
- Weekly grab sampling for suspended solids, and on-site measurement of turbidity, pH and electrical conductivity at 2 no. locations within the WF site in man-made drains, and at SW3 and SW4.;
- Monthly grab sampling by the site EM at surface water monitoring locations SW3, SW4 and SW5. The analysis suite will include suspended solids, BOD, nitrite, nitrate, ammonia, orthophosphate and chloride.
- Event based sampling, e.g. after heavy rainfall (at least 4 no. event-based monitoring rounds per year);
- Additional sampling in the event of trigger level exceedance, e.g. after heavy rainfall;,
- Post construction sampling programme (monthly sampling for 3 months); and,
- Annual upstream and downstream biological Q-value sampling and reporting, including 1 no. post construction event.

5.2.5 Surface Water Monitoring Reporting

Results of water quality monitoring shall assist in determining requirements for improvements in drainage and pollution prevention measures implemented at the Site and during the works along the Grid Connection.

It will be the responsibility of the site Environmental Manager to present the ongoing results of water quality and weather monitoring at regular site meetings. There will also be regular meetings between the Environmental Manager and construction staff which will include a look ahead for upcoming works and any required environmental management required to facilitate ongoing construction works.

Reports on water quality will consider all field monitoring and results of laboratory analysis completed that period. Reports will describe how the results compare with baseline data as well as previous reports on water quality. The reports will also describe whether any deterioration or improvement in water quality has been observed, whether any effects are attributable to construction activities and what remedial measures or corrective actions have been implemented. The reports will be made available to Limerick City and County Council and Inland Fisheries Ireland on request.

5.3 COMPLIANCE AND EMERGENCY RESPONSE

5.3.1 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during construction of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident. Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the Site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular water quality parameter have been exceeded. An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary. Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the EMP.

5.3.2 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Environmental Manager, as advised by the Site ECoW. Corrective actions may be required as a result of the following:

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Environmental Manager and the ECoW will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

5.3.3 General Emergency Response Procedure

In the unlikely event of a significant pollution occurrence in local surface waters relating to the works then the following protocol will be adopted:

- Water quality monitoring will be undertaken visually, and the Construction Manager will have informed the Environmental Manager of any observed issues; and,
- If the source is from the works then the Environmental Manager will notify appropriate personnel in Limerick City and County Council, the EPA and Inland Fisheries Ireland.

Work will not continue again until the source of the pollution is identified and eliminated.

5.3.4 Construction Phase – Flood Event Emergency Response Procedure

A key element of the site layout design has been to design for flood events and flood resilience. For example:

- Excavation works and infill are minimised in flood zones;
- Construction compounds and soil/subsoil storage areas are located outside of mapped flood zones;
- The proposed substation is located on land above the 0.01% AEP flood elevation, i.e. the Substation is located in flood zone C;
- Turbines within the flood zones will be constructed using piled foundations which will reduce ground disturbance within the flood zone and will also reduce spoil volumes and earthworks within the flood zones;
- During the construction phase, turbine hardstands (T4, T5, T6, T7 and T8) located within the modelled flood zones will be constructed as close to ground level as possible, depending on the grade from the nearest river crossing;
- As per Section 50 requirements, the main river crossings will be located at a height which includes a 300mm freeboard above the 1 in 100-year flood event plus climate change. Additional culverts will be constructed on the access roads on approach to the river crossings to minimise flow disruption during flood events;
- All access roads within the floodplain during the construction phase will be constructed as close to existing ground level as possible, depending on the grade from the nearest river crossing. Turbine cabling and access track infrastructure can be submerged temporarily without any impact on their function; and,
- Site roads located within mapped flood zones are designed to have shallow flood depths and be accessible by emergency response vehicles should that be required. All site trackways will be demarked by reflective marker poles. No turbine maintenance will occur during flood events, so the requirement for emergency vehicle access will be limited to fire or turbine failure.

A potential fluvial flooding event at the Site would likely be identified ~5-7 days in advance, with more accurate forecasts of severity within 24-48 hours of occurrence. Weather warnings will be issued from Met Eireann at least 60 hours before an event, but there will likely be indications from a week out that a likely significant event might occur. Preparation for a significant event will begin from the initial indications of the pending flood event. This will allow time for preparation and the implementation of additional emergency mitigation measures outlined below if there were to be a pending risk of an extreme flooding event. A forecast red weather warning (combining high river levels and heavy rainfall) is the defined trigger for the Managed Retreat described below.

The first point of mitigation is ongoing monitoring of weather forecasts, weather warnings, wind direction, and rainfall depths. The project Environmental Manager or the site ECoW will be responsible for monitoring weather forecasts during the construction phase.

When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4-hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken.

- Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.
- Exposed soils/subsoils (exposed temporary stockpiles) will be covered with plastic sheeting during all relatively heavy rainfall events and during periods where works have temporarily ceased before completion at a particular area (e.g., overnight and weekends).

With regards to the fluvial flood zones at the Site, a **Managed Retreat** from the fluvial flood zones will be implemented in the event of a high intensity rainfall event and/or red weather warning related to rainfall. This will include the following:

- Any areas where soil/subsoil is exposed at the surface will be compacted firmly with a digger bucket of a suitably sized excavator.
- Open trenches will be backfilled and compacted.
- All oils, fuels and waste material will be removed from the flood zones.
- Existing sediment control measures will be removed, as these may be washed away and deposited elsewhere by the floodwaters.
- Site access tracks will be scraped, and any excess soft material will be removed from the flood zones.
- All plant, machinery and equipment will be removed from the flood zones.

5.3.5 Operational Phase – Flood Event Emergency Response Procedure

During the operational phase, access to the Site will be infrequent, and will be only done for scheduled maintenance works. In advance of scheduled site visits review of weather and river water levels will be completed and works will be postponed, and thereafter rescheduled to avoid high risk periods and weather warning events.

A key element of the site layout design has been to design for flood events and flood resilience during the operational phase. For example:

- As per Section 50 requirements, the main river crossings will be located at a height which includes a 300mm freeboard above the 1 in 100-year flood event plus climate change. Additional culverts will be constructed on the access roads on approach to the river crossings to minimise flow disruption during flood events;
- During the operational phase, the roads will be set to the 1 in 20-year flood level. In the event of a flood event, the maximum flooded depth along access roads will be between 200 and 400mm. Access tracks will be marked with snow poles to allow for emergency vehicular access. The proposed access point for emergency access is from the southern end of the Site which is unlikely to be affected during flood events.
- The turbine plinths within the flood zone will be located at a height which includes a 150mm freeboard above the 1 in 1,000-year flood event plus climate change.
- During the operational phase, turbine hardstand areas will be reduced, with the reduced hardstand area being built up to the 1 in 20-year flood level. The reinstatement of these hardstand areas post construction will reduce the hardstand area in the flood zone and will reduce the downstream flood risk.
- In the unlikely event that a key component of a turbine fails during the operational phase, the hardstand will need to be built back again, and will be built up to the 1 in

20-year flood level. Once works are complete, the hardstand will be reinstated once again.

- Culverts constructed beneath the site access track within the flood zones will allow flood waters to pass through should a flooding event occur, maintaining hydrological flowpaths in a flood event.

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Management Plan 4

Spoil Management Plan

GARRANE GREEN ENERGY LIMITED

GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

MANAGEMENT PLAN 4

SPOIL MANAGEMENT PLAN

AUGUST 2025

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DOCUMENT APPROVAL

PROJECT	Garrane Green Energy Project	
CLIENT / JOB NO	Garrane Green Energy Limited	6839
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Spoil Management Plan (SMP)	

	Prepared by	**Reviewed / Approved by**
Document Final	Name Sarah Moore	Name David Kiely
Date August 2025	Signature Sal Moore	Signature David Kiely

CONTENTS

1 INTRODUCTION

1.1 General

This plan provides an assessment of the issue of handling surplus excavated material at the proposed Garrane Green Energy Project. The measures outlined in the plan will be monitored on Site by the appointed Ecological Clerk of Works (ECoW) and will be agreed with the contractor before works commence on Site. This plan should be read in conjunction with the Construction Environmental Management Plan (CEMP) and associated management plans.

1.2 Site Investigations

Field inspections were carried out of the Site by Whiteford Geoservices Limited during August 2022, September 2022 and August 2024. These works consisted of the following:

- Site visit and visual walkover assessment of the main wind farm infrastructure and grid connection route. (September 2022)
- Review of bedrock outcrops, along with sub-soils and soil characterisation at proposed turbine locations. (September 2022)
- Excavation of 6 Nr trial holes to assess ground conditions and their variation across the Site, to a maximum depth of 3.60m below existing ground level. (September 2022)
- 20 Nr. Electrical Resistivity Tomography (ERT) profiles undertake, at the specific location of wind turbine infrastructure for T1, T2, T3, T4, T5, T6, T7, T8, T9 & Met Mast to a maximum depth of 20m below existing ground level. (August 2024)
- 4 Nr. machine excavated trial holes to assess ground conditions at the Substation, to a maximum depth of 3.80m below existing ground level (August 2024)
- Screening for the presence of peat soils at the main infrastructure, together with determination of soil and peat (if present) characteristics at each turbine. These works consisted of peat thickness probing (using “depthing” rods) and gouge auguring to confirm soil / peat thickness, in-situ shear vane testing to determine undrained soil shear strength and an assessment of peat decomposition, according to Von Post. (August 2024)
- Walkover Survey reconnaissance to identify sensitive receptors with respect to effects relating to soils and geology (Initially in September 2022 and then again in August 2024). At this time, the site was also assessed for general stability, with a search undertaken for potential pre-failure indicators, failure preconditions and potential

triggering mechanisms in relation to soil movement/failure evident at the Site. (September 2022 and August 2024).

1.3 General Aims and Principals of the Spoil Management Plan

The purpose of this Spoil Management Plan is:

- To outline the proposals in relation to the management of excavated materials;
- Reduction in bare soil exposure and release of sediment;
- To make sure that the landscape is not adversely impacted as a result of the Project; and
- To promote good site management practices for the construction stage.
- Maintain existing ground levels within the flood zone.

Any reinstatement and reprofiling proposals will consider and mitigate against all identified significant risks to environmental receptors.

Topsoil and surface vegetation excavated during the construction of the wind farm infrastructure will be used to finish reinstated surfaces around Turbine Foundations and Turbine Hardstands. Reinstatement and reprofiling of, and around, infrastructure will be carried out during the construction phase.

Landscaping will allow for sympathetic restoration of the ground surface and ground profile to reduce the visual impact of new infrastructure, facilitate vegetation regrowth and reduce scour and erosion of bare surfaces prior to vegetation establishment. Reinstatement will be undertaken as work progresses. This work will be completed only by experienced personnel under guidance from the appointed ECoW, and they will conduct regular inspections of the work to ensure it is completed in an appropriate manner.

Following construction, the footprint of the hardstands within the floodplain will be reduced, the material removed, and area reinstated to existing ground level.

All areas subjected to reinstatement will be fenced with stock-proof fencing to prevent livestock disturbance until vegetation has become established.

1.4 Management of Excavated Material

Through the design process, the volume of soil to be excavated has been minimised on Site by avoiding areas of sensitive or soft soils and by avoiding excessive cut and fill during construction. However, soil will be excavated at the site entrance, Access Tracks, Turbine

Hardstand locations, Turbine Foundations, the Electrical Substation and for the Wind Farm Internal Cabling circuits as detailed in **Section 2.9**.

Excavated material will be stored at temporary stockpile locations as shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0200** to **0209**. It will then be reutilised for infill, berm and landscaping purposes. Any material that cannot be reused will be stored in the permanent spoil storage berm located beside the Substation shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0207**. There will be no spoil moved off-site. Once reinstatement is complete the temporary storage sites will be re-vegetated with the "top mat". This refers to the use of topsoil intended for use in the farmland topsoil spread, to prioritise areas where construction activities were carried out and providing a suitable soil condition for the landowners.

1.5 Reinstatement

Reinstatement works will commence at a late stage of construction. However, part of the reinstatement works, such as the completion of a turbine foundation or hardstand can be carried out following the completion of individual sections of work. Ongoing restorative programming facilitates the immediate relocation of material from one turbine base excavation to another completed area and in doing so can limit the requirement for temporary storage of material on site. Excess stone and spoil which is unsuitable as a vegetation layer shall be placed in the temporary spoil storage areas. Suitable material of sufficient density excavated during the works will be reused in various methods during the construction works. This includes the use of excavated materials in the construction of track side and hardstand surround berms and in finishing off the turbine hardstand areas after construction works, and the use of excavated subsoil for the backfilling of internal grid routes and the turbine foundations.

1.6 Control Measures

At the commencement of works, the required work footprint will be identified and the area will be marked by a rope fence (using range poles or similar) and with appropriate signage. No activities will be allowed outside of this agreed work area. The Environmental Manager will inspect the area regularly. Excavated spoil will be removed to the approved temporary storage areas as shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0200** to **0209**.

On commencement of the Works, drainage works will include blocking of dry drains downgradient of construction areas, installation of silt traps and check dams, and implementation of a double silt fence system where work occurs within the 50m buffer zone of watercourses.

Where the construction footprint for the Project coincides with the Floodplain of the River Maigue, no storage of spoil will be undertaken. Temporary storage will be limited to the period of construction only.

To prevent sediment transport from spoil storage, temporary stockpiles will be covered or stabilised, and weather forecasts will be used to schedule works, with large-scale soil disturbance avoided during heavy rainfall events. The site team will monitor real-time rainfall data using Met Éireann resources and adjust activities accordingly.

Earthworks will be suspended in the event of an orange warning for rainfall. Prior to earthworks being suspended the following further control measures will be completed:

- All open spoil excavations will be secured and sealed.
- Temporary or emergency drainage will be created to prevent back-up of surface runoff.
- Working during heavy rainfall and for up to 24 hours after heavy events will not be allowed to ensure drainage systems are not overloaded.

There will be no storage of spoil (temporary or permanent) within the flood plain of the River Maigue.

Temporary stockpiles (not exceeding 2m in height) of separated soil material types will be placed adjacent to the excavation areas prior to reinstatement, but outside the Floodplain of the River Maigue. These stockpiles will be shaped and sealed to prevent the ingress of water from rainfall.

Excavated spoil will not be deposited on the down slope or up slope edges of the adjacent topsoil. This spoil will instead be deposited on the two flanks either side of the excavation (where gradient is least) and spread in such a way as to limit the surcharge pressure on sensitive topsoils.

Spoil types will be treated separately. Mineral soils and topsoils / organic soils will be separated during excavation and these two types of spoil will be disposed of generally as follows:

A *Till soils will be deposited directly on top of other mineral soils. This will require the removal of peat where present to facilitate the process.*

B *Topsoils / Organic Soils will be stored separately, protected from the environment to maintain their integrity and used to reinstate the minerals soil surfaces following completion of construction works. No topsoil will be disposed of as part of the Project.*

1. Mineral soil spoil disposal will take place at various locations within the wind farmland holding where low surface gradients combine with minimal peat depth and sufficient distance from sensitive receptors. **Drawing No. 6839-JOD-GGE-XX-DR-C-0200** to **0209**.
2. It is intended that spoil movements will be minimised by disposing of the material within or immediately adjacent to the construction footprint of the structure from whence it was excavated. No Spoil disposal will take place with the Floodplain of the River Maigue.
3. Preparation of the Spoil Disposal sites will involve the removal of the topsoil which will be transferred to a specific location to be stockpiled and maintained for re-use during restoration operations.
4. Spoil will be deposited, in layers of 0.50m and will not exceed a total thickness of 2.00m, unless contained by suitably designed and constrained berms.
5. Spoil will only be deposited on slopes of < 5 degrees to the horizontal and greater than 10m from the top of a cutting. The exact location of these deposition areas has been determined in consultation with the construction phase geotechnical specialist.
6. Spoil Disposal sites will have a regular weekly assessment, made by the construction manager or other suitably qualified individual, to ensure that stability and good condition is maintained.
7. Once disposal is complete the deposition areas will be re-vegetated with the existing upper vegetated layer removed at the commencement of disposal operations. Upon commencement of the decommissioning / restoration phase guidance from a suitably qualified ecologist will be sought to provide a suitable methodology and programme of maintenance for the restored areas.

2 RE-USE OF EXCAVATED MATERIAL

The excavated topsoil is intended to be permanently deposited on the site. It will be used for surface reinstatement of excavated areas infilled following construction and coverage of trackside berms. Any balance will be spread on farmland within the Project Site at a depth of up to 150mm. This will ensure no loss of topsoil material for the landowners. Prior to the use of areas for storage, clean water drain will first be excavated upslope, to intercept existing greenfield flow. Runoff from storage areas will be picked up by dirty water drain and discharged into a river via stilling ponds. Dirty water arising from construction phase will be conveyed and transferred into a settlement ponds prior to discharge via a buffered outfall.

Inspections of the storage areas will be made by a geotechnical engineer through regular monitoring of the works. The appointed contractor will review work practices at spoil temporary spoil storage areas when periods of heavy rainfall are expected so as to prevent excessive dirty water runoff from being generated. The surface of the deposited spoil will be profiled to a gradient not exceeding 1 in 5 and vegetated naturally.

It is currently estimated that the quantity of excavated material, when bulked up, due to site clearance and preparation of foundations, access tracks and substation will be approximately **25,635**m³ of topsoil and **20,770**m^3 of subsoil. Therefore, there will be a total of 46,405m^3 of spoil to be managed on Site.

All of topsoil excavated material will be reused (**25,635**m^3) used as Type 5A, 5B or 5C material, utilised in the vicinity of turbines locations, finishing areas and at turbine hardstand areas. It will also be used for landscaping, access track berms and land spreading.

Same as for topsoil excavated material, excavated subsoil material will also be reused (**20,770**m^3). 20% of the subsoil **4,155**m^3 can be processed and incorporated into the road and hardstand construction. **16,615**m^3 will be utilised as Type 4 material for Access Trackside berms and hardstand areas, for landscaping and backfill for internal grid routes. This material can also be used at wind turbine foundations (optional, subject to satisfactory ground conditions).

Where Rock aggregate is excavated it will be reused at hardstanding areas, predominantly to support access track foundations. The surplus spoil material is proposed to be stored at 6 No. temporary spoil storage locations during construction. The 6 No. spoil storage areas have a capacity of (**20,600m^2 *2m = 41,200m^3**). The balance of surplus material will used on site

for landscaping purposes. The location of the temporary spoil storage areas, permanent and the reinstatement / landscaping areas are shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0200** to **0209** and **6839-JOD-GGE-XX-DR-C-0212 to 0215**.

There is 1no permanent spoil storage (berm) area located on Site beside the Substation. It is 4,050m^2 and will be 2m in height with a storage capacity of 8,100m^3. It is estimated that c. 8,100m^3 of excess material (topsoil and subsoil material) will be stored in the permanent spoil storage area.

3 MONITORING

The appointed civil contractor will be responsible for implementing, managing, and monitoring the Plan throughout the construction stage to ensure that it conforms to the requirements herein. The appointed ECoW and geo-technical engineer shall also monitor all works associated with this Plan, and the civil contractor will be obliged to act immediately on any instruction relating to this Plan given by either the ECoW or the geo-technical engineer. The civil contractor shall appoint an on-site Environmental Manager in order to effectively manage and monitor the Plan. A Stability Register will be set up for the Spoil Storage Area and regular weekly assessment will be made by the Geotechnical Engineer.

The ECoW shall report on compliance with the relevant mitigation measures as outlined in this Plan. The ECoW shall also be empowered to halt works where he/she considers that continuation of the works are likely to result in a significant pollution or siltation incident.

Management Plan 5

Waste Management Plan

GARRANE GREEN ENERGY LIMITED

GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

MANAGEMENT PLAN 5

WASTE MANGEMENT PLAN

AUGUST 2025

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DOCUMENT APPROVAL

PROJECT	Garrane Green Energy Project	
CLIENT / JOB NO	Garrane Green Energy Limited	6839
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Waste Management Plan (WMP)	

	Prepared by	**Reviewed/Approved by**
Document Final	Name Sarah Moore	Name David Kiely
Date August 2025	Signature 	Signature 

CONTENTS

1 INTRODUCTION

1.1 Scope and Requirements

This Management Plan is a 'live' document that can be reviewed and updated at regular intervals throughout the Project life cycle. The Contractor is required to develop and adapt this document in line with the activities of the project being undertaken for the Project. The contractor will approve this Plan (and any future amendments of the document) with the Ecological Clerk of Works prior to any work commencing.

The information in this document forms part of the Construction Environmental Management Plan (CEMP) and is the Site Waste Management Plan for the Project.

The CEMP and the measures detailed in this Waste Management Plan are part of the main requirements for consents for planning permissions. As such, the contractor (and all sub-contractors) onsite are obligated to incorporate these waste requirements (contained herein) in all operations.

The general methods and principles detailed within this document will be adhered to by the contractor as they are committed to reduce the resources it uses in the construction work of the Project.

1.2 Waste Prevention & Waste Regulations:

1.2.1 A Circular Economy

On a global level, the linear consumption model of increasing extraction of natural resources and disposal of waste is a major contributor to habitat and biodiversity loss and contributes to global warming. According to the circularity gap report 2020[1], material consumption has trebled from 26.7 billion tonnes in 1970 to 92 billion tonnes in 2017. A primary driver of global habitat loss and deforestation is the extraction of resources, the majority of which are wasted.

Half of total greenhouse gas (GHG) emissions and more than 90% of biodiversity loss and water stress come from resource extraction and processing. A transition to a circular economy offers the possibility of a sustainable alternative future and is a fundamental step towards achieving climate targets and United Nations Sustainable Development Goals (SDGs).

[1] https://www.circularity-gap.world/2020 [Accessed online 05/08/2025]

The Waste Action Plan for a Circular Economy (Department of Environment, Climate and Communications, 2020) is Ireland's National Waste Policy 2020 – 2025 and is the new roadmap for waste planning and management. This Plan shifts focus away from waste disposal and looks instead to how we can preserve resources by creating a circular economy.

The Plan outlines the contribution of the sector to the achievement of a number of other national plans and policies including the Climate Action Plan[2]. It also matches the level of ambition being shown across the European Union through the European Green Deal[3], which encompasses a range of actions supporting circularity and sustainability. To support the policy, regulation is already being used (Circular Economy Legislative Package), or in the pipeline (Single Use Plastics Directive).

Goals of the Waste Action Plan for household and business include:

- Recycling targets for waste collectors
- Standardised bin colours across the State: green for recycling, black for residual and Brown for organic waste.
- Waste recovery levy to encourage recycling
- Waste oversight body to manage consumer rights
- Education and awareness campaign to improve segregation

Government leadership on Circular Economy goals include:

- High level all of government circular economy strategy
- Inclusion of green criteria and circular economy principles in all public procurement
- Develop circular economy sectoral roadmaps
- Explore how Ireland's digital sector can accelerate transition to a circular economy

1.2.2 A Resource Opportunity

In 2020, the Government published the Waste Action Plan for A Circular Economy: Ireland's Waste Policy 2020-2025. One of its guiding principles is to minimise waste.

[2] Climate Action Plan 2025 CAP25 Changing, Dept of the Environment, Climate and Communications, 2025. https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/climate-action-plan-2025/ [Accessed online 05/08/2025]
[3] A European Green Deal, Striving to be the first climate-neutral continent, European Commission. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en [Accessed 05/08/2025]

The Waste Hierarchy which contractors are obligated to apply: (Source: EC[4]):

The waste management hierarchy applies to all waste, including hazardous waste. The top of the hierarchy indicates that the priority should be in preventing waste being produced in the first place.

The Contractor will:

- Ensure that the disposal and recovery of waste does not present a risk to water, air, soil, plants and animals
- Not allow waste disposal to constitute a public nuisance through excessive noise levels or unpleasant odours, or to degrade places of special natural interest
- Prohibit the dumping or uncontrolled disposal of waste
- Prepare Waste Management Plans
- Ensure that waste treatment operations are licensed
- Require waste collectors to have special authorization and to keep records
- Ensure that the waste which cannot be prevented or recovered is disposed of without causing environmental pollution.

The EU Integrated Pollution Prevention and Control Directive (Directive 96/61/EC) provides for a permit system for activities including waste management. In adherence with this Directive the Contractor must:

[4] European Commission
https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en [Accessed Online 05/08/2025]

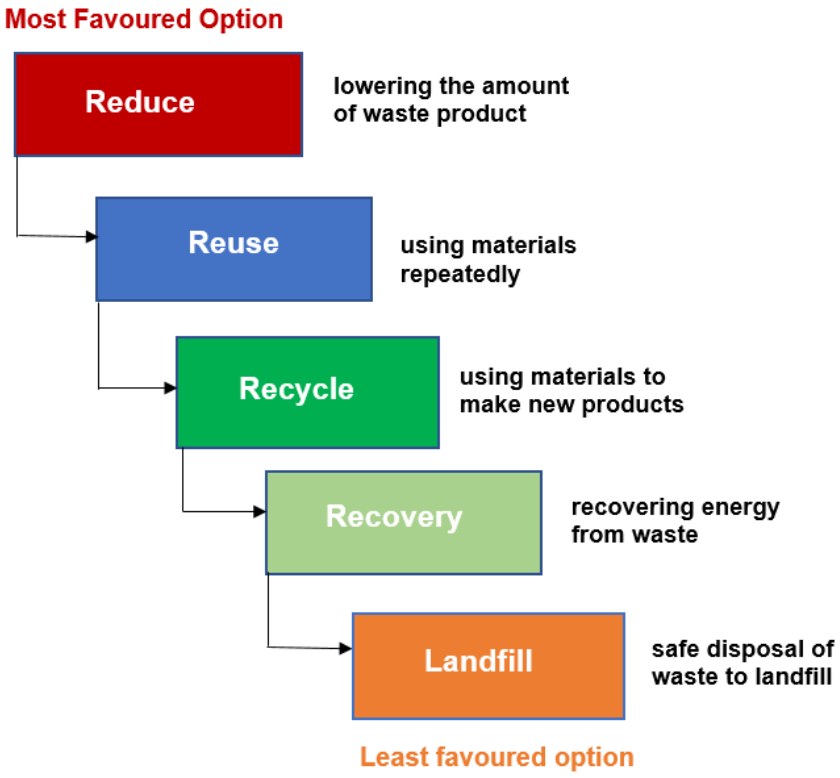
- Be in possession of a waste permit for waste disposal and
- Be prepared at all times for inspection regarding monitoring of waste activities.

1.3 Benefits of Waste Prevention

The contractor will prevent waste through implementing reduction and effectively managing resources from the design stage of construction to the completion of the construction of the Project. This will ensure that:

- Legal obligations are met
- Waste production is minimised
- Build costs are minimised
- A framework for continuous assessment and best practice is implemented
- Carbon emissions and negative environmental impacts of and from waste materials are reduced

The following image explains this in more detail. The least favoured option is to dispose of waste to landfill where embodied energy is not recovered. The Waste Hierarchy (EU Waste Framework Directive, 2008) is outlined below:



1.4 Reference Documentation

As well as the Waste Management Act 1996 (as amended), other guidance documents have been used to develop this plan. These include:

Pollution Prevention Guidelines:

Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, Environmental Protection Agency, 2021.

EU Directive:

Article 4 of Waste Framework Directive (Directive 2008/98/EC)

This sets out the five steps for dealing with waste (waste hierarchy).

2 WASTE MANAGEMENT PLAN MINIMUM REQUIREMENTS

A Site Waste Management Plan involves the following stages:

- Planning
- Implementation
- Monitor
- Review

2.1 Planning

The planning stage of the Project has taken into account the nature of the site, design of the wind farm, environmental considerations and construction methods to minimise the quantity of waste produced onsite during its construction.

2.2 Implementation

This Waste Management Plan will include:

1. An inventory of waste type expected to be produced in the course of the Project.
2. Estimates of each type of waste that will be produced in the construction of this wind farm.
3. A statement showing how the contractor will minimise each type of waste to be produced prior to any activity generating this waste.
4. Procedures for identification of the waste management actions proposed for each different waste type, including re-using, recycling, recovery and disposal (in accordance with the waste hierarchy priorities).

2.3 Monitoring

2.3.1 Checks and Records

All stores onsite of oil, fuel, chemicals etc will be regularly checked (in particular in extreme weather conditions) for evidence of leaks or spills. The timing of each of these checks is detailed in Section 3. These checks will be visual inspections to look for evidence of contamination.

Records of all visual checks will be maintained and be available for inspection on request. Waste Management will be a regular item on team meetings as required by the CEMP. Waste Management Practices will be revised at these meetings. A waste audit will be carried out every six months (**Section 2.3.3**).

2.3.2 Waste Inventory

A waste inventory will be maintained and kept up to date. It will include an inventory of all waste materials leaving the site for disposal and the name of the licensed operator and intended disposal facility. A Waste Inventory Spreadsheet will be added to this plan by the Contractor.

2.3.3 Monitoring of Site Waste Management Plan

The contractor will appoint a person to implement and monitor the Waste Management Plan. This will be the Environmental Manager.

As stated, the Waste Management Plan will include an inventory of the types and estimates of the waste to be produced onsite. The appointed person will ensure that a Site Waste Audit is carried out every six months.

2.4 Completion, Audit and Review

Upon completion of construction works but before the end of the defects correction period, a Waste Management Review will be undertaken. The aim of this is to identify project progress, measure compliance with licenses and to consider lessons learnt.
A Waste Management Review will be carried out at the end of construction.

2.5 Site Waste Management as Part of Site Induction process

All workers onsite at the Project will be fully briefed with the Waste Management Plan. All site visitors will be briefed on appropriate waste storage and disposal units. Littering

onsite will not be tolerated. All personnel have a Duty of Care to challenge others noted littering onsite.

3 GENERAL WASTE MANAGEMENT PRINCIPLES

- The Contractors will avoid or minimise the volume of waste generated.
- All construction and operation waste materials will be correctly sorted, recycled or disposed of accordance with good site practice and in accordance with the Site Waste Management Plan. A policy of Reduce, Reuse and Recycle will apply.
- Waste will be stored a minimum of 50 m from nearby watercourses or drains at the Site.
- Waste storage and disposal will be carried out in a way which prevents pollution in compliance with legislation.
- All waste to be transported offsite to a licensed facility will be documented in accordance with the European Union (Waste Directive) Regulations 2020. An adequate description of the waste and where it came from will be given and an appropriate European Waste Catalogue Code and Standard Industrial Classification Code will be provided. The quantity and nature of the waste will be described and how it is contained. Personal details of the waste transferor and transferee at Garrane Wind Farm will be documented. Waste will only be transferred by registered/licensed and competent person(s).
- All oil storage facilities will have secondary containment facilities of 110% storage capacity (e.g., bund, enclosure, drip tray). All of these will be regularly inspected for visual signs of leaks or something that would impact on their capacity – e.g., a drip tray full of rainwater.
- Waste storage areas will be clearly located and signed. Key waste streams will be separated.
- All waste will be transported from site at appropriate frequency by a registered waste contractor to prevent over-filling of waste containers.
- Provide toolbox talks, environmental training and awareness of sensitive receptors and waste management within the Wind Farm Site for all project personnel.
- Use of waste materials during construction will be minimised by good site practices and waste management plans.
- Frequency of Checks. The contractor will ensure that all storage facilities are checked on a weekly basis. The checklist for completion is attached below.

VISUAL WASTE STORAGE CHECKLIST		
Waste Area Checked	**Date Checked**	**Initials of Checker**
GENERAL OFFICE WASTE		
BOWSER		
PORTALOO		
EXCAVATED SOIL		
WASHINGS		
CONCRETE		
OIL		
HAZARDOUS WASTE e.g., 17 05 03* soil and stones containing hazardous substances 5		

4 ANTICIPATED CONSTRUCTION WASTE STREAMS

As stated previously, the Contractors will outline prior to commencement of construction all anticipated waste streams to be produced during the construction phase of the Project.

4.1 Waste from Staff Facilities

4.1.1 General Waste Generate at Staff facilities

There will be the typical waste generated in an office such as left-over food and sandwich wrappers. This is a non-hazardous waste. All such waste will be stored appropriately and safely from wind, rain and wild animals that often tear apart rubbish bags. Provision for separation of waste streams will be provided so that e.g., paper and cardboard waste and bottles may be recycled.

[5] https://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/2019--FULL-template.pdf [Accessed Online 05/08/2025]

4.1.1 Sewage

Onsite Substation Building/Compound

During the construction phase, water will be supplied by water bowser. The maximum wastewater production is estimated to be the same as the maximum water consumption 2,000 litres per day[6] . The Project will include an enclosed wastewater management system at each temporary construction compound onsite at peak. A holding tank is proposed for wastewater management. Wastewater will be removed offsite weekly, by a licensed wastewater disposal company and disposed at an appropriate licensed facility.

Self-contained port-a-loo units will be used, which will be managed and serviced regularly (by removal of the contents by tanker to a designated sewage treatment plant. The waste will be removed off site on completion of construction. Toilet waste is a non-hazardous waste.

4.2 Concrete

4.2.1 Concrete Waste and wash-out water

- Precast concrete will be used wherever possible i.e., formed offsite. Elements of the Project where precast concrete will be used have been identified and are indicated in the CEMP. Elements of the Project where the use of precast concrete will be used include structural elements of watercourse crossings (single span / closed culverts) as well as Cable Joint Bays. Elements of the Project where the use of precast concrete is not possible includes turbine foundations and joint bay pit excavations. Where the use of precast concrete is not possible the following mitigation measures will apply.
- The acquisition, transport and use of any cement or concrete onsite will be planned fully in advance and supervised at all times.
- Vehicles transporting such material will be relatively clean upon arrival onsite, that is; vehicles will be washed/rinsed removing cementitious material leaving the source location of the material. There will be no excess cementitious material on the vehicle which could be deposited on trackways or anywhere else onsite. To this end, vehicles will undergo a visual inspection prior to being permitted to

[6] Table 3 EPA WW Treatment Manual https://www.epa.ie/publications/compliance--enforcement/waste-water/waste-water-treatment-manual-.php [Accessed Online 05/08/2025]

drive onto the proposed site or progress beyond the contractor's yard. Vehicles will also be in good working order.

- Any shuttering installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting or other sealing products at joints.
- Concrete will be poured during metrological dry periods/seasons. This will reduce the potential for surface water run off being significantly affected by freshly poured concrete. This will require limiting these works to dry meteorological conditions i.e. avoid foreseen sustained rainfall (any foreseen rainfall event longer than 4-hour duration) and/or any foreseen intense rainfall event (>3mm/hour, yellow on Met Eireann rain forecast maps), and do not proceed during any yellow (or worse) rainfall warning issued by Met Eireann. This also will avoid such conditions while concrete is curing, in so far as practical.
- Ground crew will have a spill kit readily available, and any spillages or deposits will be cleaned/removed as soon as possible and disposed of appropriately.
- Pouring of concrete into standing water within excavations will be avoided. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place.
- Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g., using sandbags and geotextile sheeting or silt fencing to contain any solids in run-off.
- No surplus concrete will be stored or deposited anywhere onsite. Such material will be returned to the source location or disposed of off-site appropriately.

4.3 Chemicals, Fuel and Oils

All storage containers of over 200 litres will have a secondary containment of 110% capacity to ensure that any leaking oil is contained and does not enter the aquatic environment. Oil waste is classified as hazardous.

A **Chemical and Waste Inventory will be kept**. This inventory will include:

- List of all substances stored onsite (volume and description).
- Procedures and location details for storage of all materials listed.

- Waste disposal records, including copies of all Waste Transfer Notes detailing disposal routes and waste carriers used.
- Any tap or valve permanently fixed to the mobile unit through which oil can be discharged to the open or when delivered through a flexible pipe which is fitted permanently to the mobile unit, will be fitted with a lock and locked shut when not in use.
- Sight gauges will be fitted with a valve or tap, which will be shut when not in use. Sight gauge tubes, if used will be well supported and fitted with a valve.
- Mobile units must have secondary containment when in use/out onsite.

Where mobile bowsers are used, on site guidelines will be followed so that:

- Any flexible pipe, tap or valve will be fitted with a lock where it leaves the container and be locked shut when not in use.
- Flexible delivery pipes will be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use. Where possible, a nozzle designed to dispense oil is used.
- The pump or valve will have a lock and be locked shut when not in use.

4.3.1 Transport of Diesel/Oils to the site

Diesel is classified as a dangerous substance. Under the EU Directive 95/55/EC all such dangerous substances will be conveyed in a container that compiles with the ADR[7]. As such the manufacturer of each bowser will provide certification to contractors that the following:

- A leak-proof test certificate
- A copy of the IBC approval certificate
- An identification plate attached to the container

For loads in excess of 1000 litres (220 gallons), the bowser vehicle driver will have undergone training and hold a special license.

4.3.2 Refuelling onsite

Where possible refuelling onsite will be within the temporary construction compounds within the re-fuelling area (see **Planning Drawing 6839-JOD-GGE-XX-DR-C-0801**). Only essential refuelling (e.g., cranes) will be carried out, outside of this area, but not

[7] Agreement Concerning the International Carriage of Dangerous Goods by Road

within 50m of any watercourse. In such cases a non-permeable High-density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. This membrane will be inspected and if there is any sign of oil contamination, it will be removed from site by a specialist licensed waste contractor.

All vehicles will be well maintained and free from oil or hydraulic fuel leaks.

4.4 Packaging

Packaging will be brought onsite during the construction phase and can include cardboard, wood and plastics used to package turbine components. Packaging waste will be dealt with in accordance with the European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014). This waste is non-hazardous, and the effects of this waste are not significant. This is on account of the fact the packaging waste will be low quality and will be removed from the Site and recycled and/or disposed of at licensed waste facility.

4.5 Waste Metals

Waste metals from concrete reinforcing etc., will have commercial value and will be re-used or recycled with the appropriate licensed waste contractor. This waste is non-hazardous.

5 EXCAVATED MATERIALS

Excavated materials will be required for habitat and ecological restoration, reprofiling and backfilling in accordance with the **Spoil Management Plan** of the CEMP. As such, excavated materials will not be classified as waste except along the Grid Connection Route and at locations within the site boundary where the widening of public roads occurs.

5.1 Anticipated materials to be excavated onsite.

No excavated material will be removed from within the Redline Boundary.

It is estimated that the amount of spoil predicted to be generated during construction of the wind farm is 46,405m^3 of spoil. This is detailed further in MP4 Spoil Management Plan. It is envisaged that spoil generated can be used as structural fill in Access Tracks,

turbine hardstands, turbine foundation construction, reinstatement, roadside berms and landscaping.

Where excess topsoil or subsoil material is generated which cannot be utilised for reinstatement or landscaping purposes, it is proposed to develop a permanent spoil storage area (berm) where excess soil and subsoil will be stored permanently. The permanent spoil area (berm) is 4,050m^2 and will be 2m in height with a storage capacity of 8,100m^3. It is estimated that c. 8,100m^3 of excess material (topsoil and subsoil material) will be generated and will be stored in the storage areas.

The contents of these repositories will be reused during the Decommissioning phase to reinstate the Project at the end of its lifetime.

5.1.1 Classification and Plan for Excavated Materials on site

The contractor will liaise with the Local Authority on all aspects of waste management relating to excavated soil to ensure compliance during construction. The Ecological Clerk of Works will ensure all mitigation measures outlined are adhered to. All excavated materials are to be reused onsite except that which is excavated along the Grid Connection Route. A list of potential Local Authority licenced facilities in the vicinity of the Site is included in **Appendix I**.

5.2 Estimated Volumes of Soil

Volumes are outlined in a **Spoil Management Plan** provided in **MP4** of this CEMP. Whilst there will be significant volumes of soil to be excavated onsite during the construction of the Project, excavated material will be used for reinstatement and restoration works. Where this is not possible, e.g., along the Grid Connection Route and Turbine Delivery Route where some soils contain hydrocarbons (hazardous material), the waste materials will be taken to a licenced facility by an authorised permit holder.

The **Spoil Management Plan** outlines the re-use proposals for excavated materials.

5.3 Waste or Not Waste

Any excavated materials which are not intended to be disposed of, or discarded, will NOT be considered as waste. It will not be regulated under waste management controls where the following six criteria are ALL met:

i) Use is a necessary part of the planned works
ii) Material is suitable for that use
iii) Material does not require any processing or treatment before it is reused
iv) No more than the quantity necessary is used
v) Use of the material is not a mere possibility but a certainty and
vi) Use of the soil will not result in pollution of the environment or harm to human health

Where excavated soil onsite does not meet all of the six criteria listed above, for the purposes of waste description, it would fall under chapter 17 of the European Waste Catalogue (EWC) Construction and Demolition wastes. The EWC code '17 05 04 soil and stones (non-hazardous) waste or 17 05 03* soil and stones containing hazardous substances would apply. This will occur on along the Grid Connection Route and parts of the Turbine Delivery Route.

The principles of the waste hierarchy will be strictly adhered to avoid and minimise production of excavated soil, and to ensure that all materials are recovered and reused on site.

6 PEST CONTROL

Responsible rodenticide use will be practiced onsite. Incorrect use and management of rodenticide can indirectly have a negative impact on wildlife. Best practice use includes:

- Pest control onsite will be undertaken by a trained professional.
- Rodenticide baits will only be used for as long as is necessary to achieve satisfactory control.
- Good house-keeping and proper waste management practices will ensure there are no flood sources available to vermin.
- A record of all bait points and the amount of bait laid will be maintained during the treatment. Activity will be noted at each bait point, including any missing or disturbed baits, as the treatment progresses.
- By carefully recording the sites of all bait points, responsible users of rodenticides will return to these sites at the end of the treatment and remove uneaten bait so that it does not become available to wildlife.
- The bodies of dead rodents may carry residues of rodenticides and, if eaten by predators or scavengers, may be a source of wildlife exposure to rodenticides.

- Regular searches for rodent bodies will be carried out, both during and after the treatment period. Bodies may be found for several days after rats have eaten the bait and rats may die up to 100 metres or more away from the baited site.
- Any rodent bodies will be removed from the Site and disposed of safely using the methods recommended on the label.
- Bait will be sufficiently protected to avoid accidentally poisoning other mammals and birds. Natural materials will be used where possible.
- Bait stations will be appropriate to the prevailing circumstances. They will provide access to the bait by rodents, while reducing the risks of non-target access and interference by unauthorised persons. They will protect the bait from contamination by dust or rain. Their design, construction and placement will be such that interference is minimised.
- On completion of the treatment, records will be updated to signify that the infestation is controlled and that, as far as reasonably practical, all steps have been taken to ensure that the site is now free of rodenticide bait.

7 WASTE INVENTORY

The contractor will prepare and update regularly a waste inventory for inclusion in the waste management plan.

Management Plan 6

Decommissioning Plan

GARRANE GREEN ENERGY LIMITED

GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

MANAGEMENT PLAN 6

DECOMMISSIONING PLAN

AUGUST 2025

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DOCUMENT APPROVAL

PROJECT	Garrane Green Energy Project	
CLIENT / JOB NO	Garrane Green Energy Limited	6839
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Decommissioning Plan (DP)	

	Prepared by	**Reviewed /Approved by**
Document Final	Name Sarah Moore	Name David Kiely
Date August 2025	Signature 	Signature 

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

This Decommissioning Plan has been prepared by Jennings O'Donovan & Partners Limited on behalf of Garrane Green Energy Limited for the decommissioning of the Garrane Green Energy Project and relevant infrastructure which is hereafter referred to as the Project. This document is being prepared, alongside an Environmental Impact Assessment Report (EIAR), as part of an application for planning permission for the proposed Project to An Coimisiún Pleanála.

Decommissioning of the Project will be scheduled to take place after the proposed 35-year lifespan of the Project.

This report provides the environmental management framework to be adhered to during the decommissioning phase of the Project and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur.

As noted in the Scottish Natural Heritage report Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm. Due to the efficiency of modern-day turbines, it is estimated that their lifespan will be 35-years. The technological advances and preferred approaches to reinstatement are likely to change in the intervening decades.

In this regard, this Decommissioning Plan will be reviewed and updated for the written agreement of the Planning Authority prior to commencement of a decommissioning works. It will take account of the relevant conditions of the planning permission and current health and safety standards in accordance with the approach set out and the principles established in this document.

1.1 Scope of the Decommissioning Plan

This plan for the decommissioning of the Project includes its connection to the national grid. Where the term ‘Site’ is used in the Decommissioning Plan it refers to the Site of the Project and all works associated with the Project including enabling works. The Decommissioning Plan clearly outlines the mitigation measures and monitoring proposals that are required to be adhered to in order to complete the works in an appropriate manner.

The report is divided into eight sections, as outlined below:

Section 1: Provides a brief introduction as to the scope of the report.

Section 2: Outlines the Site and Project details, detailing the targets and objectives of this plan along with providing an overview of works methodologies that will be adopted throughout decommissioning.

Section 3: Sets out details of the environmental controls to be implemented onsite including the mechanisms for implementation. A waste management plan is also included in this section.

Section 4: Outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

Section 5: Sets out a programme for the timing of the works.

Section 6: Consists of a summary table of all mitigation measures to be adhered to during the decommissioning-phase.

Section 7: Outlines the proposals for reviewing compliance with the provisions of this report.

2 SITE AND PROJECT DETAILS

2.1 Site Location and Description

The Site extends to approximately 158.75 hectares (ha) (392acres) which is owned by private third-party landowners. The general area is comprised of agricultural pasture grazing, farmland. The Site is located approximately 2.5 kilometres (km) (closest turbine) north of Charleville Co. Cork, 23.1km south of Limerick City and 47.8km north of Cork City.

The Site is located on relatively level ground, at elevations ranging from 58-61m above ordnance datum (AOD) in the northern side of the Site, to 63-73m AOD in the southern portion of the Site. A Site Location Map showing the Redline Boundary is appended as **Figure 1.1** and a map which comprises of all elements of the Project is outlined as **Figure 1.2.**

There are 166 sensitive receptors within 2km of the proposed turbines. This includes 3 No. commercial properties, 6 No. derelict houses and 157 No. residential receptors of which 5 No. are involved in the Project. The closest inhabited dwelling not involved in the Project is (H33) located 702m from the nearest turbine (T8). The closest dwelling involved in the Project is H28 located 529m from T3. All sensitive receptors located within 2km of the proposed turbines are shown on **EIAR Figure 1.3**. The nearest settlement is Charleville which is located approximately 2.5km (closest turbine) south of the Site.

A full description of the Project is provided in **Chapter 2: Project Description**.

2.2 Description of the Decommissioning

- Removal of 9 No. wind turbines
- Removal of concrete plinths for turbines outside the flood plain T1, T2, T3 & T9.
- Removal of concrete plinth above existing ground level for turbines within the floodplain T4, T5, T6, T7 & T8.
- Removal of 1 no. permanent meteorological mast.
- Removal of all associated underground electrical and communications cabling connecting the wind turbines to the wind farm substation. Ducting is to remain *in-situ.*
- The Turbine Hardstands within the floodplain, T4 T5, T6, T7 and T8 will be fully removed and reinstated to existing ground level, covered in topsoil and allowed to revegetate naturally.
- Turbine Hardstands outside the floodplain T1, T2, T3 & T9 will be covered in topsoil and allowed to revegetate naturally.

All other elements of the Project will remain in-situ. The Site Access Tracks and associated drainage systems will serve ongoing agriculture activity in the area. All other hard surfaced areas will be allowed to revegetate naturally. Based on the experience of the project team monitoring operational wind farm sites throughout the country, the approach of allowing these areas to revegetate naturally has proven to be very successful.

Cranes of similar size to those used for construction will disassemble each turbine using the same crane hardstands. The towers, blades and all above ground components will be removed from site and reused, recycled, or disposed of in a suitably licenced facility. (The financial costs of decommissioning, at current material values, will be more than met by the recycling value of the turbine components).

Where necessary, turbine components will be cut onsite so as to fit on articulated trucks, therefore allowing the use of the civil construction delivery route for removal. The bridge crossings will be used during the decommissioning phase and it is proposed to leave these in-situ post the decommissioning phase. It is considered that their removal will be the least preferred option in terms of potential effects on the environment.

The following elements are included in the decommissioning phase:

- Decommissioning works will be limited to action necessary to remove the wind farm structures, i.e., removal of turbines, cabling and the monitoring masts.
- Existing Hardstands will be utilised to act as a temporary compound for the appointed Contractor.
- Site Access Tracks and associated drainage systems will remain in place to serve ongoing agriculture activity[1]. Hardstanding areas for T1, T2, T3 & T9 will be covered in topsoil and allowed to revegetate naturally.
- The following Turbine Hardstands, T4 T5 T6 T7 and T8 will be fully removed and reinstated to existing ground level.
- Turbine plinths will be removed, and the hardcore covering turbine foundations will be allowed to revegetate naturally[2].
- Soil disturbance will be avoided.

[1] For a wind farm where the roads are not to be retained, natural revegetation is preferred to reprofiling, or the importation of soil.
[2] The covering of turbine foundations with soil material was discussed, and discounted. Instead, the possibility was discussed of roughening the surface of the concrete foundation, to assist in the initiation and subsequent growth and coalescence of flora. However, the foundations will in fact be covered with hardcore, so this step is unnecessary.

2.3 Targets and Objectives

This Decommissioning Plan has considered environmental issues as listed in **Section 3.**

The key targets are as follows:

- Ensure decommissioning works and activities are completed in accordance with mitigation and best practice approach presented in the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation. A Schedule of Mitigation Measures has been included in **Appendix 18.1** of the EIAR.
- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community. This will relate to transport, particularly of material offsite with noise and dust also impacting on receptors at time of decommissioning to a lesser extent.
- Ensure decommissioning works and activities have minimal impact on the natural environment. Disturbance to habitats will be avoided and the use of existing infrastructure and drainage will ensure silt does not enter waterways.
- Adopt a sustainable approach to decommissioning. This means comparing alternative methods for turbine disassembly and taking the approach with the least impact on the natural environment.
- Provide toolbox talks, environmental training and awareness of sensitive receptors and waste management within the proposed Project for all project personnel.

The key site objectives are as follows:

- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and have emergency measures in place, in accordance with the **Management Plan 2 Water Quality Management Plan**. Similar mitigation measures to the construction phase will be implemented. Please **Section 3** for more details.
- Keeping all watercourses free from obstruction and debris.
- Sustainable drainage system /drainage design principles will be maintained and monitored to ensure efficiency.
- Keep impact of decommissioning works to a minimum on the local environment, namely watercourses, and wildlife through the use of defences such as buffers and silt fences.
- Correct fuel storage and refuelling procedures to be followed.
- Good waste management and housekeeping to be implemented.
- Air and noise pollution prevention to be implemented.
- Monitoring of the works and any adverse effects that it may have on the environment.
- Avoidance of vandalism.

Section 3 discusses the above in more detail.

2.4 Decommissioning Methodologies Overview

2.4.1 Introduction

An experienced main contractor will be appointed to undertake the decommissioning of the proposed Project. The main contractors will comply with the mitigation measures of the Construction Environmental Management Plan (CEMP) prepared for the construction phase. An overview of the decommissioning methodologies is provided below.

2.4.2 Decommissioning Methodology

The proposed decommissioning methodology is summarised under the following main headings:

- Wind turbines
- Turbine Foundations.
- Underground Cabling.

2.4.2.1 Wind Turbines

Prior to any works being undertaken on wind turbines, they will be disconnected from the grid by the site operator in conjunction with ESB Networks and EirGrid. The dismantling and removal of wind turbines of this scale is a specialist operation which will be undertaken by the turbine supplier or competent subcontractor. Turbine dismantling will be undertaken in reverse order to methodology employed during their construction. Hardstands will be constructed to the specifications at construction stage to facilitate crane disassembly works. Cranes will be brought back to site utilising the hard stand areas. The dismantling of turbines will be bound by the same safety considerations as will be the case during construction in terms of weather conditions. Works will not be undertaken during adverse weather conditions and in particular not during high winds.

The turbine blades will be cut onsite and removed in articulated trucks, the details of which are assessed in **Chapter 17: Traffic & Transportation** of the EIAR which accompany this application.

The transport of disassembled turbines from the Site will be undertaken in accordance with a **Traffic Management Plan** (**Appendix 17.2** of the EIAR). The Traffic Management 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.

The 1 no. Met Mast will also be removed as its purpose will cease once the turbines have been dismantle and removed. The Met Mast is solely a requirement of the operational phase to satisfy EirGrid's requirements.

2.4.2.2 Turbine Foundations

On the dismantling of turbines, it is not intended to remove the concrete foundations from the ground. It is considered that their removal will be the least preferred options in terms of potential effects on the environment. Turbine plinths will be removed and covered in topsoil and will be allowed to revegetate naturally. The following Turbine Hardstands T4 T5, T6, T7 and T8 will be fully removed and reinstated to existing ground level due to their location in the floodplain.

2.4.2.3 Underground Cabling

The cabling onsite will be pulled from the cable duct using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at each of the joint bays/pull pits along the cable. The ground above original pulling pits/joint bays will be excavated to access the cable ducts using a mechanical excavator and will be fully re-instated once the cables are removed. Excavated material will be temporarily stored adjacent to the site of excavation at a height of less than 1m and at 25m distance from any watercourse.

The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible with no environmental impact.

The onsite substation and associated grid connection will remain in place as it will be under the ownership of the ESB and will form a permanent part of the national electricity grid.

2.4.2.4 Transport Route Accommodation Works

Where necessary, turbine components will be cut at the hardstand locations onsite so as to fit on articulated trucks, therefore allowing the use of the civil construction delivery route for removal. There will be no need for additional temporary works on Access Tracks for the removal of turbines.

3 ENVIRONMENTAL CONTROLS

The following sections give an overview of the drainage design, dust and noise control measures, a **Waste Management Plan** for the site and the implementation of the environmental management procedures for the site. Based on the nature and extent of the decommissioning works these are the key onsite controls that are applicable at decommissioning. (Associated mitigation measures are described in **Section 6**).

3.1 Site Drainage

The site drainage features for this site during its construction and operation are outlined in the EIAR and **Management Plan 3: Surface Water Management Plan** which accompany this application. This document has been prepared on a preliminary (outline) basis and will be further developed and expanded following the appointment of the Contractors for the main construction/decommissioning works. Some items of this CEMP can only be finalised with appropriate input from the Contractors who will carry out the main construction and decommissioning works. This CEMP identifies, for the incoming Contractors, the key planning, environmental and contract document constraints that must be adhered to in order to deliver optimum environmental reassurance for the site. As stated in **Section 2.2**, the drainage system will serve ongoing activity on the area.

When the final Decommissioning Plan is prepared prior to decommissioning and presented as a standalone document, all drainage management measures, which will include maintenance of the operational drainage measures, will be included in that document. However, it should be noted that by the time decommissioning is undertaken after the planned 35-year lifespan of the Project, the areas within the Site will have revegetated substantially resulting in a drainage pattern that is similar to what existed prior to any construction. It is not anticipated that the decommissioning phase will interrupt this drainage regime in any way with the works proposed. As an additional measure, areas where freshly placed soil material as part of excavation works will be surrounded by silt fencing if deemed necessary until the area has naturally revegetated e.g., near joint bays.

3.2 Refuelling; Fuel and Hazardous Materials Storage

The plant and equipment used during decommissioning will require refuelling during the works. Appropriate management of fuels will be required to ensure that incidents relating to refuelling are avoided. The following mitigation measures, which are the same as those proposed for the construction phase, are proposed to avoid release of hydrocarbons at the Site:

- Where possible, all refuelling on site will be within the temporary compound within the dedicated re-fuelling area.
- All plant will be inspected and certified to ensure they are leak free and in good working order prior to use onsite.
- Site vehicles will be refuelled offsite where possible.
- Only essential refuelling will be completed outside of the dedicated re-fuelling area but not within 50m of any watercourses. Onsite re-fuelling of plant and machinery will be carried out using a mobile double skinned fuel bowser:
    - The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located;
    - The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages.
    - The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site.
    - Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
    - A non-permeable High-Density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. These membrane will be inspected and if there is any sign of oil contamination will be removed from the site by a specialist waste contractor.
- Onsite refuelling will be carried out by trained personnel only;
- A permit to fuel system will be put in place;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- All fuel storage areas will be bunded appropriately for the duration of the construction phase. Fuels will be stored in the Temporary Construction Compound and bunded to at least 110% of the storage capacity of fuels to be stored. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The electrical control building (at the substation) will be bunded appropriately to 110% of the volume of oils that will be stored, and to prevent leakage of any associated

chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;

- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management. Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.

3.3 Dust Control

Dust is unlikely to be generated in significant amounts from onsite activities during decommissioning. The extent of dust generation will depend on the type of activity undertaken, the proximity of activities to receptors and the nature of the dust, i.e., soil, and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Site traffic movements also have the potential to generate dust as they travel along the haul route.

Proposed measures, which are the same as those proposed for the construction phase, to control dust include:

- Approach roads and construction areas will be cleaned on a regular basis to prevent build-up of mud and prevent it from migrating around the Site and onto the public road network.

- Wheel wash facilities will be provided near the Site entrance to prevent mud/dirt being transferred from the site to the public road network. The Wheel wash will be located outside the 50m watercourse buffer zone.

- Public roads along the construction haul routes will be inspected and cleaned daily. In the unlikely event that dirt/mud is identified on public roads, the roads will be cleaned. The wheel wash facility will be investigated and the problem fixed to prevent this from happening again.

- During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network. This requires wetting material and ensuring water is supplied at the correct levels for the duration of the work activity. The weather will be monitored so that the need for damping down activities can be predicted. Water bowsers will be available to spray work areas (Turbine

Hardstand areas and Grid Connection route) and construction haul route roads to suppress dust migration from the Site.

- Speed restrictions of 15km/h on Site access tracks will be implemented to reduce the likelihood of dust becoming airborne. Consideration will be given to how Site speed limits are policed by the Contractor and referred to in the toolbox talks.

3.4 Noise Control

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the Site. Proposed measures, which are the same as those proposed for the construction phase, to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts.
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All plant and equipment to be used onsite will be modern equipment and will comply with the S.I. No. 359/1996 - European Communities (Construction Plant and Equipment) (Permissible Noise Levels) (Amendment) Regulations.
- Regular maintenance of plant will be carried out in order to minimise noise emissions. Particular attention will be paid to the lubrication of bearings and the integrity of silencers.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works.
- Compressors will be of the “sound reduced” models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machines, which are used intermittently, will be shut down during those periods when they are not in use.
- Training will be provided by the Site Manager to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation.
- Local areas of the haul route will be condition monitored and maintained, if necessary.

3.5 Invasive Species Management

Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the Site to identify invasive species where any excavation will be required. An Invasive Species Management Plan will be implemented if invasive species are identified.

3.6 Traffic Management

A Traffic Management Plan will be prepared in advance of any decommissioning works. The traffic management arrangements for the removal of turbines although similar to those that will be implemented for construction materials delivery (to a lesser extent) as outlined in the EIAR, will be agreed in advance of decommissioning with the competent authority.

The Traffic Management Plan for the decommissioning phase will also include provision for the removal of underground cables from the underground ducts within the Site. Cables in public roads will be left in-situ as they will be the responsibility of the ESB.

3.7 Waste Management Plan

The Waste Management Plan outlines the best practice procedures during the decommissioning of the proposed Project. The Waste Management Plan outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of decommissioning. Disposal of waste will be a last resort.

3.7.1 Legislation

The Waste Management Act 1996 as amended requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the Garrane Green Energy Project to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations. Waste removal-related traffic volumes during the decommissioning phase, will be similar or less than those anticipated and assessed for the construction phase.

The Department of the Environment provides a document entitled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006). No demolition will take place at this site.

3.7.2 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing waste in the following order:

1. Prevention and Minimisation:

The primary aim of the Waste Management Plan will be to prevent and thereby reduce the amount of waste generated.

2. Reuse of Waste:

No material is likely to be reused onsite during the Decommissioning phase. Materials such as cabling will be reused offsite.

3. Recycling of Waste:

There are several established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

4. Disposal of Waste to Landfill:

At all times during the implementation of the Waste Management Plan, disposal of waste to landfill will be considered only as a last resort.

3.7.3 Waste Arising from Decommissioning

The relevant components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are not suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the Proposed Development are outlined in **Table 3.1** below.

Table 3.1: Waste Types Arising during the Decommissioning Phase

Material Type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead and iron	17 04 07
Fibreglass	Turbine blade component	10 11 03
Hydrocarbons	Oils and lubricants drained from the turbines	13 01 01,13 02 04

3.7.3.1 Reuse

Many construction materials can be reused several times before they need to be disposed of:

- Electrical wiring can be reused on similar wind energy projects

- Elements of the turbine components can be reused but this will be determined by the condition that they are in.

3.7.3.2 Recycling

If a certain type of material cannot be reused, then recycling is the most suitable option. The opportunity for recycling during decommissioning will be limited and restricted to components of the wind turbines and met masts.

All wastes will be sorted and segregated onsite during the time of decommissioning. The anticipated volume of all waste material to be generated at the Garrane Green Energy Project is low which provides the justification for adopting small containers as a method of waste storage.

3.7.3.3 Implementation

3.7.3.3.1 Roles and Responsibilities

The Ecological Clerk of Works will have responsibility for overseeing and the implementation of the objectives of the Decommissioning Plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated will have sufficient authority so that they can ensure everyone working on the decommissioning adheres to the management plan.

3.7.3.3.2 Training

It is important for the Decommissioning Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working onsite during the decommissioning phase of the proposed Project will be trained in materials management and thereby, will be able to:

- Distinguish reusable materials from those suitable for recycling.
- Ensure maximum segregation at source.
- Co-operate with site manager on the best locations for stockpiling reusable materials.
- Separate materials for recovery.
- Identify and liaise with waste contractors and waste facility operators.

3.7.3.3.3 Record Keeping

The Waste Management Plan will provide systems that will enable all arisings and movements of construction waste to be recorded. This system will enable the contractor to

measure and record the quantity of waste being generated. The Waste Management Plan can then be adapted with changes that are seen through record keeping.

3.7.3.4 Waste Management Plan Conclusion

The Waste Management Plan will be properly adhered to by all staff involved in the proposed Project and will be outlined within the induction process for all site personnel. Reuse of certain types of decommissioning wastes will cut down on the cost and requirement of raw materials at other sites therefore further minimising waste levels going to landfill. This Waste Management Plan outlines the main objectives that are to be adhered to.

3.8 Environmental Management Implementation

3.8.1 Roles and Responsibilities

The Site Manager and/or Environmental Clerk of Works will be key members of the Contractors team.

In general, the Ecological Clerk of Works will maintain responsibility for monitoring the decommissioning works and Contractors/Sub-contractors from an environmental perspective. The Ecological Clerk of Works will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with Limerick City and Country Council and other statutory bodies as required.

A suitably qualified and experienced ecologist and any other suitably qualified and experienced professionals such as engineers and geotechnical experts will further advise the Ecological Clerk of Works and Site Manager. This will ensure there is no negative impact on the environment as a result of the decommissioning of the proposed Project.

4 EMERGENCY RESPONSE PLAN

An Emergency Response Plan provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

4.1 Emergency Response Procedure

The site **Management Plan 1: Emergency Response Plan** which accompanies this application includes details the response required and the responsibilities of all personnel in the event of an emergency. The Emergency Response Plan will require updating and submissions from the Contractor/Project Supervisor Decommissioning Stage (appointed to manage and co-ordinate health and safety matters during the construction stage) and sub-contractors as decommissioning progresses. Where sub-contractors are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's Emergency Response Plan within this document.

4.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The Site Supervisor/Construction Manager will lead the emergency response which makes him responsible for activating and coordinating the emergency response procedure. The other site personnel who can be identified at this time who will be delegated responsibilities during the emergency response are presented in **Figure 4.1.** In a situation where the Site Supervisor/ Construction Manager is to coordinate the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in **Figure 4.1**. This will be updated throughout the various stages of the proposed Project

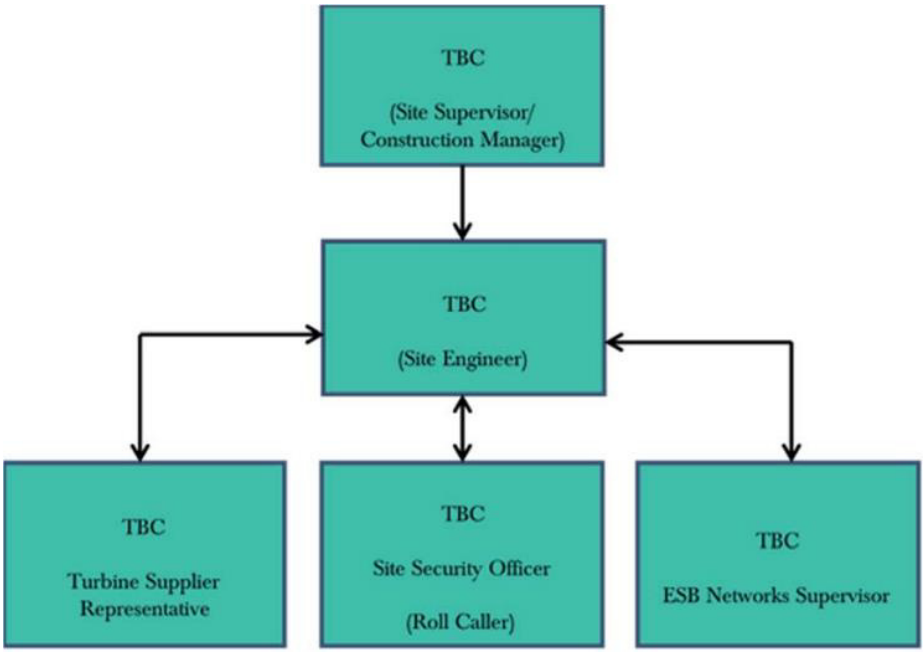

Figure 4.1 Emergency Response Procedure Chain of Command

4.1.2 Initial Steps

The following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

Table 4.1 Hazards Associated with Potential Emergency Situations

Hazard	Emergency Situation
Construction Vehicles: Dump trucks, tractors, excavators, cranes etc.	Collision or overturn which has resulted in operator or third-party injury.
Abrasive wheels/Portable Tools	Entanglement, amputation or electrical shock associated with portable tools
Contact with services	Electrical shock or gas leak associated with an accidental breach of underground services
Fire	Injury to operative through exposure to fire
Falls from heights including falls from scaffold towers, scissor lifts, ladders, roofs and turbines	Injury to operative after a fall from a height
Sickness	Illness unrelated to site activities of an operative e.g. heart attack, loss of consciousness, seizure
Turbine Specific Incident	This will be included the turbine manufacturers' emergency response plan.

In the event of an emergency situation such as the hazards outlined in **Table 4.1** the Site Supervisor/Construction Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, who have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/foghorn that activates an emergency evacuation on the site. The Site Supervisor/Construction Manager must proceed to the assembly point if the emergency poses any significant threat to their welfare and if there are no injured personnel at the scene that require assistance. The Site Supervisor/ Construction Manager will be required to use their own discretion at that point. In the case of fire, the emergency evacuation of the turbines and substation should proceed, without exception. The site evacuation procedure is outlined in **Section 4.1.3**.
- Make safe the area, if possible, and ensure that no identifiable risk exists with regard to dealing with the situation e.g., if a machine has turned over, ensure that it is in a safe position so as not to endanger others before assisting the injured.
- Contact the required emergency services or delegate the task to someone. If delegating the task, ensure that the procedures for contacting the emergency services as set out in **Section 4.2** is followed.
- Take any further steps that are deemed necessary to make safe or contain the emergency incident e.g., cordon off an area where an incident associated with electrical issues has occurred.
- Contact any regulatory body or service provider as required e.g., ESB Networks the numbers for which are provided in **Section 4.3**.
- Contact the next of kin of any injured personnel where appropriate.

4.1.3 Site evacuation/Fire Drill

A site evacuation/fire drill procedure will provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or foghorn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Supervisor/Construction Manager when all personnel have been accounted for. The Site Supervisor/Construction Manager will decide the next course of action, which be determined by the situation that exists at that time and will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills.

4.1.4 Spill Control Measures

Every effort will be made to prevent an environmental incident during the decommissioning phase of the proposed Project. Oil/fuel spillages if arising, are likely to be small and localised. The importance of a swift and effective response in the event of a spill is important. The following steps provide the procedure to be followed in the event of such an incident:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If necessary, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- Clean up as much as possible using the spill control materials.
- Contain any used spill control material. Dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the Ecological Clerk of Works immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The Ecological Clerk of Works will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The Ecological Clerk of Works will notify the appropriate regulatory body such as Limerick City and County Council, and the Environmental Protection Agency, if deemed necessary.

4.1.5 Environmental Investigation

Any environmental incident must be investigated in accordance with the following steps:

- The Ecological Clerk of Works will be immediately notified.
- If necessary, the Ecological Clerk of Works will inform the appropriate regulatory authority. The regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.

- If the incident has impacted on a sensitive receptor such as an archaeological feature the Ecological Clerk of Works will halt work and will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the Ecological Clerk of Works and the Main Contractor. These records will be made available to the relevant authorities such as Limerick City and County Council, Environmental Protection Agency if required.

The Ecological Clerk of Works will be responsible for any corrective actions required as a result of the incident e.g., an investigative report, formulation of alternative works methodologies or environmental sampling, and will advise the Main Contractor as appropriate.

4.2 Contact the Emergency Services

In the event of requiring the assistance of the emergency services the following steps will be taken:

- Ring 999 **or** 112.
- Clearly state the situation and the location.
- Await further instructions from Emergency Services.

Table 4.2: Emergency Contacts

Contact	Telephone no.
Client – Garrane Green Energy Limited	061 953600
Doctor – Charleville Primary Care Centre	063 89454
Emergency Services – Ambulance, Fire, Gardaí	999/112
ESB Emergency Services	1850 372 999
Hospital – Mallow General hospital	022 21251
Gas Networks Ireland Emergency	1850 20 50 50
Gardaí – Charleville Garda Station	063 21770
Health and Safety Co-ordinator - Health & Safety Services	TBC
Health and Safety Authority	1890 289 389
Inland Fisheries Ireland (IFI)	0818 34 74 24

Contact	Telephone no.
Project Supervisor Construction Stage (PSCS): TBC	TBC
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* Oversees the coordination of the design with the design team, architects' engineers etc.

5 PROGRAMME OF WORKS

5.1 Decommissioning Schedule

The decommissioning phase will take approximately 3 – 6 months to complete from commencing the removal of turbines to the final reinstatement of the site.

The decommissioning of the proposed Project will take place after the 35-year operational period of the planning permission period has elapsed.

The phasing and scheduling of the main decommissioning task items are outlined in **Figure 5.1** below, where the 1st of January has been shown as an indicative start date for decommissioning to commence.

ID	Task Name	Task Description	Q1			Q2			Q3			
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
1	Site Health and Safety											
2	Turbine Decommissioning	Disconnect Power Output										
3	Turbine and Met Mast Dismantling	Disassemble turbine components and met mast										
4	Turbine Removal	Transport of all turbine components off site										
5	Cable Removal	Remove underground cables form ducting										
6	Turbine Foundations Backfill	Reinstate foundation areas by covering with soil material										

Figure 5.1: Indicative Decommissioning Schedule

6 MITIGATION PROPOSALS

The decommissioning Mitigation Measures are presented in Table 6.1. Appendix 18.1 of the EIAR it provides a full list of pre-construction, construction and decommissioning mitigation measures.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the decommissioning phase of the proposed Project.

Table 6.1: Mitigation Measures

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
MM1	EIAR Chapter 2 Development Description	Prior to the decommissioning works, a plan will be submitted to the planning authority for written agreement. The plan will take account of contemporary best practice.		
MM2	Decommissioning Plan Section 3	A suitably qualified and experienced ecologist and any other suitably qualified and experienced professionals such as engineers and geotechnical experts will further advise the Ecological Clerk of Works and Site Manager on works and mitigation measures associated with the Decommissioning phase. This will ensure there is no negative impact on the environment as a result of the decommissioning of the proposed Project.		
MM3	Decommissioning Plan Section 3	Prior to decommissioning, a suitably qualified (CIEEM accredited) ecologist will complete an invasive species survey of the material proposed for turbine foundation backfilling. The invasive species survey will also be undertaken along the cable route to identify invasive species at joint bay locations where excavation to expose the cabling for removal will be required.		
MM4	EIAR Chapter 2 Development Description Decommissioning Plan Section 2	The approach proposed for decommissioning is one of minimal intervention. • Removal of 9 no. wind turbines and concrete plinths. Concrete plinth for turbines within the flood plain T4, T5, 6, T7, & T8 will be removed to existing ground level. • Removal of 1 no. permanent meteorological mast.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		• Removal of all associated underground electrical and communications cabling connecting the wind turbines to the Wind Farm substation. Ducting is remaining in-situ. • Removal and reinstation of Turbine Hardstands within the floodplain, T4 T5, T6, T7 and T8 to existing ground level. • Access Tracks within the flood plain will be brought back to existing ground level. All other elements of the proposed Project will remain in-situ. The Site Access Tracks and associated drainage systems will serve ongoing agricultural activity in the area. All other hard surfaced areas will be allowed to revegetate naturally has proven to be very successful. Cranes of similar size to those used for construction will disassemble each turbine using the same crane hardstands. The towers, blades and all above ground components will then be removed from site and reused, recycled, or disposed of in a suitably licenced facility. (The financial costs of decommissioning, at current material values, will be more than met by the recycling value of turbine components). Where necessary, turbine components will be cut onsite so as to fit on articulated trucks, therefore allowing the use of the civil construction delivery route for removal. The bridge crossings will be used during the		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		decommissioning phase and it is proposed to leave these in-situ post the decommissioning phase. It is considered that their removal will be the least preferred option in terms of potential effects on the environment.. Potential impacts will be similar to that of the construction phase, albeit to a lesser extent.		
MM5	EIAR Chapter 10 Hydrology & Hydrology Mitigation to avoid accidental fuel leakage	During decommissioning, where possible, all refuelling on site will be within the temporary compound within the dedicated re-fuelling area. • All plant will be inspected and certified to ensure they are leak free and in good working order prior to use onsite. • Site vehicles will be refuelled offsite where possible. • Only essential refuelling will be completed outside of the dedicated re-fuelling area but not within 50m of any watercourses. Onsite re-fuelling of plant and machinery will be carried out using a mobile double skinned fuel bowser: o The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located; o The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. o The fuel bowser will be parked on a level area in the construction compound when not in use and only		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		designated trained and competent operatives will be authorised to refuel plant on site. ○ Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. ○ A non-permeable High-Density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. These membrane will be inspected and if there is any sign of oil contamination will be removed from the site by a specialist waste contractor. • Onsite refuelling will be carried out by trained personnel only; • A permit to fuel system will be put in place; • Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system; • All fuel storage areas will be bunded appropriately for the duration of the construction phase. Fuels will be stored in the Temporary Construction Compound and bunded to at least 110% of the storage capacity of fuels to be stored. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area; • Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		• The electrical control building (at the substation) will be bunded appropriately to 110% of the volume of oils that will be stored, and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor; • The plant used during construction will be regularly inspected for leaks and fitness for purpose; and, • An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management. Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.		
MM6	EIAR Chapter 10 Air and Climate DP Section 3	Proposed measures to control dust, the same as those proposed for the construction phase, include: • Approach roads and construction areas will be cleaned on a regular basis to prevent build-up of mud and prevent it from migrating around the Site and onto the public road network. • Wheel wash facilities will be provided at site entrance 2. • Public roads along the Construction Haul Route will be inspected daily and cleaned when required. In the unlikely event that dirt/mud is identified on public roads, the roads will be cleaned. The wheel wash facility will be investigated, and the problem fixed to prevent this from happening again. • During periods of dry and windy weather, there is potential for dust to		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		become friable and cause nuisance to nearby residences and users of the local road network. This requires wetting material and ensuring water is supplied at the correct levels for the duration of the work activity. The weather will be monitored so that the need for damping down activities can be predicted. Water bowsers will be available to spray work areas (wind turbine area and grid connection route) and haul roads to suppress dust migration from the Site. • Vehicles delivering materials to the Site will be covered appropriately when transporting materials that could result in dust, e.g., crushed rock or sand. • Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery. • All machinery when not in use will be turned off. • Ready-mix concrete will be delivered to the Wind Farm Site and no batching of concrete will take place on the Site. Only washing out of chutes will take place on Site and this will be undertaken at a designated concrete washout facility at the contractor's Temporary Construction Compound. The concrete wash water will be disposed of at a license facility. • Speed restrictions of 15km/h on Site Access Tracks will be implemented to reduce the likelihood of dust becoming airborne.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		Consideration will be given to how onsite speed limits are policed by the Contractor and referred to in the toolbox talks. • Stockpiling of materials will be carried out in such a way as to minimise their exposure to wind. Stockpiles will be covered with geotextiles layering and damping down will be carried out when weather conditions require it. • Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable. • An independent, qualified Geotechnical Engineer will be contracted for the detailed design stage of the project and geotechnical services and will be retained throughout the construction phase, including monitoring and supervision of construction activities on a regular basis. The methodology statement will be signed off by a suitably qualified Geotechnical Engineer. • A complaints procedure will be implemented on the Wind Farm Site where complaints will be reported, logged and appropriate action taken.		
MM7	EIAR Chapter 11 Noise Decommissioning Plan Section 3	Proposed measures to control noise, the same as those proposed for the construction phase, include: • General guidance for controlling construction noise through the use of good practice given in BS 5228 will be followed. • Construction and Decommissioning of the proposed Project shall be		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		limited to working times given and any controls incorporated in any planning permission. • Any legislation, guidance or best practice relevant at the time of decommissioning will be complied with. During the Decommissioning phase of the proposed Project, noise levels are likely be no more than predicted in **Chapter 11 Noise**, **Table 11.14** of the **EIAR**, however, it is envisaged that decommissioning will be of shorter duration. Any legislation, guidance or best practice relevant at the time of decommissioning will be complied with. Construction and decommissioning are temporary day time activities.		
MM8	EIAR Chapter 17 Traffic and Transportation Decommissioning Plan Section 3	• Prior to the decommissioning work, a comprehensive plan will be drawn up and submitted to the relevant planning authority for written agreement. The plan will take account of the findings of this EIAR and the contemporary best practice at that time, to manage and control the component removal and ground reinstatement. • If these alternatives are not viable then the process equipment would be decommissioned; all plant, machinery and equipment will be emptied and dismantled to be sold or recycled or, where these are not possible, disposed of through a licensed waste contractor. If required, all machinery will be cleaned prior to removal and all necessary measures implemented to prevent the release of contaminants. All waste will be removed from the facility and recycled		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		wherever possible; disposal operations will be controlled by licensed waste contractors. The buildings and infrastructure would be retained and repurposed.		
MM9	Decommissioning Plan Section 3	Waste Management is detailed in **Section 3.7** of the Decommissioning Plan. A Waste Management Plan detailing the best practice procedures during the decommissioning of the Project will be prepared. The Waste Management Plan will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of decommissioning. Disposal of waste will be a last resort.		
MM10	Decommissioning Plan Section 3	Ecological Clerk of Works will maintain responsibility for monitoring the decommissioning works and Contractors/Sub-contractors from an environmental perspective. The Ecological Clerk of Works will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with Limerick City and County Council and other statutory bodies as required.		
MM11	EIAR Chapter 6 Biodiversity	Prior to the decommissioning work, a comprehensive plan will be drawn up and submitted to An Coimisiún Pleanála (or equivalent planning agency at the time) for written agreement. The plan will take account of the findings of the EIAR for the present project and the contemporary best practice at that time, to manage and control the component removal and ground reinstatement.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		Particular care will be taken to ensure that the Decommissioning works do not cause disturbance to animal species occurring on the Site at the time. Pre-construction confirmatory surveys will be carried out for species identified of conservation importance during the 2022-24 baseline surveys, as well as for further species of importance which may be present at the time of the works. Relevant legislation relating to flora and fauna in force at the time will be strictly adhered to. Mitigation measures described in the present report to avoid or minimise disturbance to protected fauna species will be implemented as necessary: o a confirmatory survey for otter breeding sites will take place at the crossing locations (upstream and downstream on both banks) prior to the commencement of works on site to ensure that otter holts have not been established since the baseline survey o a pre-construction confirmatory survey will be undertaken in accordance with NRA Guidance (NRA 2006; NRA 2009b). This will focus on the areas of the site where works will take place (to a distance of approximately 100 m). o Should an active sett be located within a 50 m distance of the works area, mitigation will require the closure of the sett (in consultation with NPWS) or the enforcement of a restrictive zone to prevent disturbance to underground tunnels. The		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		ecologist would advise on the appropriate mitigation taking into account the type of sett (i.e. main, secondary, outlier) and the proximity of any works. This procedure would be carried out in strict accordance with relevant legislation and guidance. The common frog is widespread within the Wind Farm Site occurring in drains and wet fields. Areas where decommissioning works are due to commence during the period February to August will be checked by the ECoW for the presence of frog spawn, tadpoles and adult frogs. If present, these will be removed under licence from NPWS and transferred to suitable ponds, drains or wetlands in the vicinity and away from the construction footprint.		
MM12	EIAR Chapter 7 Ornithology	• As the decommissioning works will involve works similar to those involved at construction stage, these could result in similar effects on birds. Hence, the mitigation that will be undertaken during construction will also be applied during the decommissioning phase (taking into account changes in bird populations and distributions that may have occurred locally during the operational life of the proposed Project).		
MM13	EIAR Chapter 8 Soils and Geology	• Following the permitted lifespan of the Project, decommissioning of the infrastructure will occur or the Site may be repowered with more modern turbines, subject to a separate planning application.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		• The Met Mast, internal cable network and other ancillary structures, will be removed and the areas reinstated using materials stored on site. The turbines, transformers and associated "above-ground" elements will be removed, but the foundations will be left in-situ and reinstated. • Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant. • Grid connection infrastructure including the Substation, GC and ancillary electrical equipment shall form part of the national electricity grid network and will be left in situ.		
MM14	EIAR Chapter 9 Hydrology and Hydrogeology	• Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by onsite plant will be implemented as per the construction phase mitigation measures.		
MM15	EIAR Chapter 12 Landscape and Visual Amenity	The decommissioning phase will see a similar nature of effects to the construction stage due to the movement of heavy machinery within the Wind Farm Site and to and from the Wind Farm Site removing turbine components. However, such effects will be temporary in duration and decreasing in scale as turbines are removed from view and the landscape is substantially reinstated to former uses.		
MM16	EIAR Chapter 14 Cultural Heritage	No direct impacts on known elements of the cultural heritage resource are predicted during the decommissioning phase as any recorded Cultural Heritage assets located within the footprint, or close environs of the		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
		proposed Project will be resolved by mitigation at construction phase. Any previously unrecorded archaeological remains that could potentially be identified during the site investigations will either be preserved by avoidance within the Site or preserved by record (excavation).		

7 COMPLIANCE AND REVIEW

7.1 Site Inspections and Environmental Audits

Routine inspections of decommissioning activities will be carried out on a daily and weekly basis by the Ecological Clerk of Works and the Site Supervisor/Construction Manager to ensure all controls are in place to prevent environmental impacts, relevant to the decommissioning activities taking place at the time.

Environmental inspections will ensure that the works are undertaken in compliance with this Decommissioning Plan and all other planning application documents. Only suitably trained staff will undertake environmental site inspections. These staff will have undergone third level educational training and will have experience in a similar role.

7.2 Auditing

An Environmental audit will first be carried out prior to the decommissioning phase of the Project to ensure the implementation of mitigation measures. Further environmental audits will be carried on a monthly basis during the construction phase of the proposed Project and again after the decommissioning of the wind turbines.

Environmental audits will be carried out by the Ecological Clerk of Works. An impartial and objective approach will be taken. Environmental audits will be conducted at monthly to determine to determine whether the Decommissioning Plan is being properly implemented and maintained. The results of environmental audits will be provided to the contractor.

An audit of compliance with the decommissioning mitigation measures will be completed by the Ecological Clerk of Works during the decommissioning phase of the proposed Project. The findings of each audit will be documented by the Ecological Clerk of Works (ECoW) in an audit report within the Decommissioning Plan for the Site. The audit report will be made available to Mayo County Council on request.

7.3 Environmental Compliance

The following definitions will apply in relation to the classification of Environmental Occurrences during decommissioning of the proposed Project:

- **Environmental Near Miss:** An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

- **Environmental Incident:** Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the immediate area of the incident.
- **Environmental Exceedance Event:** An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

Any of these events will immediately trigger an investigation into the reason for the incident and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter e.g. 25mg/L total suspended solids in waters (Inland Fisheries Ireland, 2016).

7.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Supervisor/Construction Manager, as advised by the Site Environmental Clerk of Works. Corrective actions may be required as a result of the following:

- Environmental Audits
- Environmental Inspections and Reviews
- Environmental Monitoring
- Environmental Incidents
- Environmental Complaints

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem onsite and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Site supervisor/Construction Manager and the Ecological Clerk of Works will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

7.5 Decommissioning Plan Review

This Decommissioning Plan will be reviewed and confirmed prior to commencement of decommissioning works. Further details will be added to the plan during decommissioning works to adapt to specific situations or site conditions that are encountered that need to be considered by the Plan.

Management Plan 7

Method Statement for Crossing Industrial Pipeline

GARRANE GREEN ENERGY LIMITED

GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

MANAGEMENT PLAN 7
METHOD STATEMENT FOR CROSSING INDUSTRIAL PIPELINE

AUGUST 2025

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DOCUMENT APPROVAL

PROJECT	Garrane Green Energy Project	
CLIENT / JOB NO	Garrane Green Energy Limited	6839
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Method Statement for Crossing Industrial Pipeline	

	Prepared by	**Reviewed /Approved by**
Document Final	Name Sarah Moore	Name David Kiely
Date August 2025	Signature 	Signature 

GARRANE GREEN ENERGY PROJECT

EXISTING INDUSTRIAL OUTFALL PIPELINE CROSSING METHOD STATEMENT FOR CROSSINGS		
Ref	**Activity**	**Notes**
1	Confirm location of existing pipeline. Diameter is 355mm OD.	Pipeline centreline will be demarcated by the Contractor before any other work commences.
2	Check for any other existing services	To be carried out by Contractor using Cable Avoidance Tools and Signal Generator. Any and all other apparatus/service/utility in the vicinity or buried in the ground are the sole responsibility of the Contractor carrying out the excavation.
3.	Establish Depth of Pipeline	Ground level and hence depth of cover to crown of pipeline to be confirmed on site by Contractor by hand excavation of a trial hole to confirm depth of cover, particularly at Crossing No. 2 where cover is relatively shallow. Trial Hole to be carried out by Contractor under supervision of Resident Engineer and by Kerry Group Personnel.
4.	Removal of topsoil to be carried out to a total depth of 250mm over the slabbing area (approx. 3500mmx5375mm) using an excavator with a toothless (ditching) bucket.	To be carried out under supervision of Resident Engineer and invitation to Kerry Group Personnel to attend.
5.	Hand excavation to be undertaken to 300mm above pipeline over the slabbing area (approx. 3000mmx5375mm). Note: Exact depth of excavation for concrete slabs is to be confirmed on site with Resident Engineer.	To be carried out under supervision of Resident Engineer and invitation to Kerry Group Personnel to attend.
6.	Hand excavation then to a total depth of 100mm from original ground level to insert the inert fill material eg 100 thick structural polystyrene 700mmx5375mm.	To be carried out under supervision of Resident Engineer and invitation to Kerry Group Personnel to attend.
7.	Place precast concrete slabs (5 no.) on top of inert fill material per Drawing No. 6839-JOD-GGE-XX-DR-C-0404, Rev P01 to provide a total track width of 5375mm and backfill/compact Clause 804 fill material in 250mm layers to underside of road level.	To be carried out under supervision of Resident Engineer and invitation to Kerry Group Personnel to attend.

EXISTING INDUSTRIAL OUTFALL PIPELINE CROSSING METHOD STATEMENT FOR CROSSINGS		
Ref	**Activity**	**Notes**
8.	Place Clause 804 fill running surface so as to tie in with finished road levels each side of pipeline crossing.	To be carried out under supervision of Resident Engineer and invitation to Kerry Group Personnel to attend.
9.	On completion of backfill, the pipeline crossing to be delineated with suitable and robust edge markers to ensure that all site traffic is routed to cross at the designated slabbed point. Suitable notices to alert users of proximity to Pipeline shall also be installed.	To be carried out under supervision of Resident Engineer and invitation to Kerry Group Personnel to attend.
10.	All construction staff must be briefed re designated crossing point and no other access may be made across the pipeline.	To be carried out as part of Induction for all construction personnel.