Construction and Environmental Management Plan

Cleanrath Wind Farm Development at Cloontycarthy, Cleanrath North, Cleanrath South, Derrineanig, Derreennacarton & adjacent townlands, Co. Cork

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1 INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been developed by McCarthy Keville O' Sullivan Ltd (MKO) on behalf of Cleanrath Windfarm Ltd. The CEMP provides the environmental management framework to be adhered to during the pre-commencement, construction and operational phases of the development 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. This CEMP has been prepared in accordance with the mitigation measures and commitments made in the Environmental Impact Statement (EIS), Natura Impact Statement (NIS), Further Information Response (FIR), Grounds of Appeal (GOA) and the Condition Compliance Statement (CCS) of the permitted Cleanrath Wind Farm.

This CEMP identifies the key planning and environmental considerations that must be adhered to and delivered during site construction and operation. This report is intended as a single, amalgamated document that can be used during the future phases of the project, as a single consolidated point of reference relating to all construction, environmental and drainage requirements for the planning authority, developer and contractors alike.

The CEMP has been prepared in accordance with the planning permission conditions set by An Bord Pleanála under PL. 04/246742 which relates to the development of Cleanrath Wind Farm including junction accommodation works along the turbine delivery route and connection to the national grid including the revised grid connection route in the townland of Derrineanig permitted by Cork County Council under Pl Ref. 18/04458.

1.1 Scope of the Construction and Environmental Management Plan

This report is presented as a guidance document for the construction phase of the Cleanrath Wind Farm. It outlines clearly the mitigation measures and monitoring proposals that are required to be adhered to in order to construct the wind farm in an appropriate manner. The report is divided into ten 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 anticipated construction methodologies that will be adopted throughout the project.

Section 3 sets out details of the environmental controls on site which looks at noise and dust controls. Site drainage measures, peat management and a waste management plan are also included in this section.

Section 4 sets out the development drainage management plan which provides details of the various drainage infrastructure that will be installed to manage and control the quality of surface water runoff from the site.

Section 5 sets out a fully detailed implementation plan for the environmental management of the project outlining the roles and responsibilities of the project team

Section 6 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 7 consists of a summary table of all mitigation proposals to be adhered to during the implementation of the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 8 consists of a summary table of all monitoring requirements and proposals to be adhered to during the implementation of the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 9 sets out an anticipated programme for the timing of the works.

Section 10 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 of the wind farm development is located in the townlands of Cloontycarthy, Cleanrath North, Cleanrath South Derrineanig Derreennacarton and adjacent townlands in Co. Cork. The wind farm will comprise of the provision of a total of 11 No. wind turbines, with a maximum ground to top blade tip height of up to 150 metres and all associated infrastructure.

The wind farm study area measures approximately 524 hectares or 1,295 acres. The Grid Reference co-ordinates for the approximate centre of the site are E120,520 N69,583.

The electrical connection from the main wind farm site to the national grid will be via an underground cable which will run within the public road corridor through the townlands of Cleanrath South, Turnaspidogy, Derrineanig, Milmorane, Coomlibane, Rathgaskig, Derragh, Augeris, Gorteenakilla, Carrignadoura, Gurteenowen, Gurteenflugh, Lyrenageeha, Lackabaun, Co. Cork and Grousemount, Co. Kerry for c16.58km.

The town of Macroom is located approximately 12 kilometres south west of the permitted study area and Inchigeelagh is located approximately 2.5 kilometres to the south.

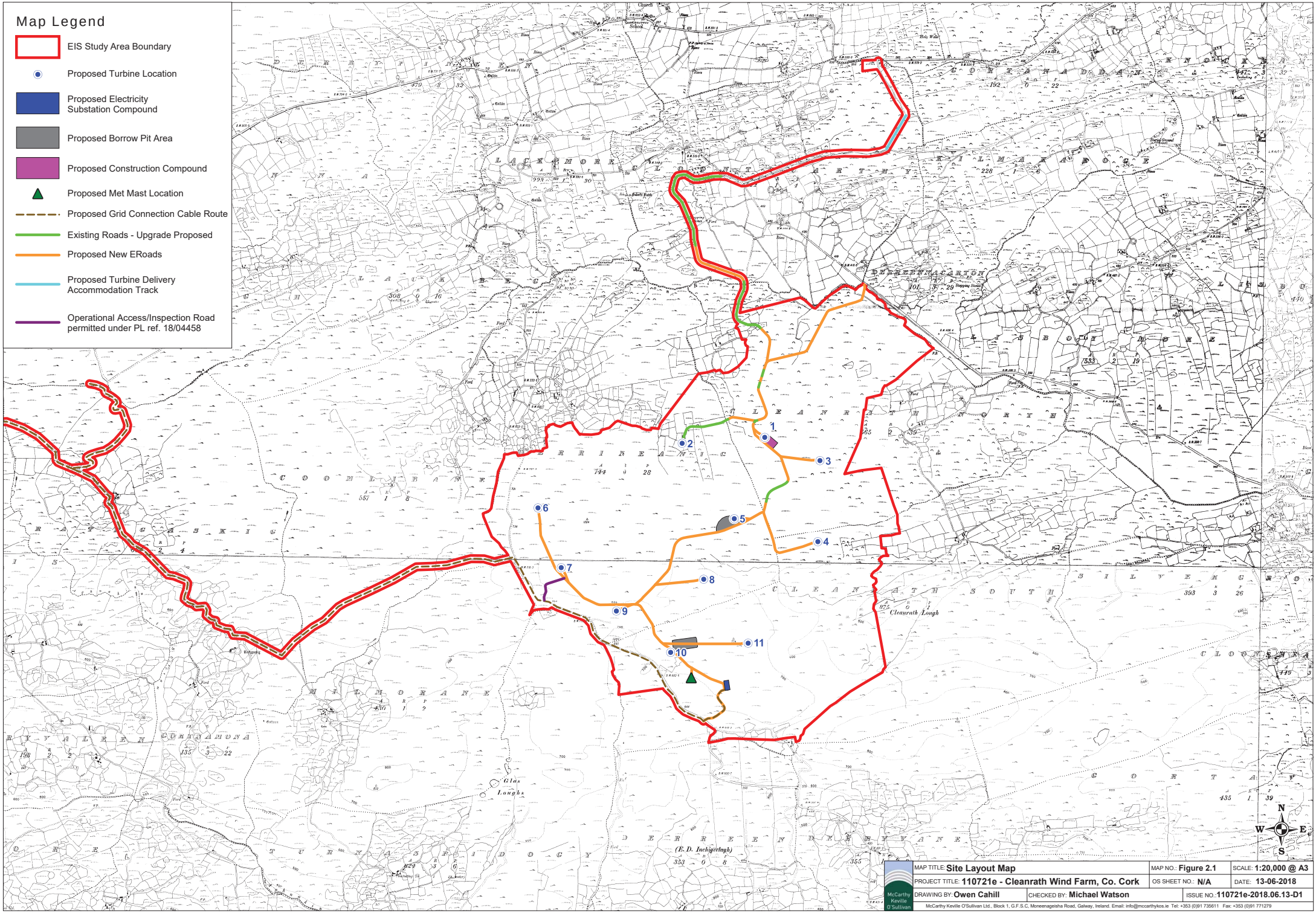
2.2 Description of the Development

During the construction phase of the project, civil works will include: constructing the reinforced concrete foundations; access road construction and widening of existing access roads; construction of a temporary compound; upgrading existing an installation of new watercourse crossings, construction of underground cabling; and a permanent meteorological mast.

The design life of the project is expected to be 25 years.

The key components of the wind farm include the following:

- 11 no. Wind Turbines with a maximum blade tip height of 150 metres;
- 11 no. Hardstand Areas to facilitate cranes for turbine erection and to act as construction material storage compounds;
- 1 no. Permanent Meteorological Mast;
- 1 no. temporary construction compounds for the location of the site office and staging facilities, on-site car-parking for site workers during the construction phase, material storage and construction refuse storage prior to its removal from the site;
- New and upgraded access tracks, including drainage;
- 2 no. borrow pits;
- Underground cabling to the national grid
- Junction accommodation and temporary works along the proposed turbine delivery route



MAP TITLE: **Site Layout Map** | MAP NO.: **Figure 2.1** | SCALE: **1:20,000 @ A3**

PROJECT TITLE: **110721e - Cleanrath Wind Farm, Co. Cork** | OS SHEET NO.: **N/A** | DATE: **13-06-2018**

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2.3 Targets and Objectives

In so far as they have been completed to date, or are to be further completed in future, the construction phase works are designed to approved standards, which include specified materials, standards, specifications and codes of practice. The design of the project has considered environmental issues and this is enhanced by the works proposals.

The key site targets are as follows;

- Ensure construction works and activities are completed in accordance with mitigation and best practice approach presented in the Environmental Impact Statement (EIS) and associated planning documentation;
- Ensure construction works and activities are completed in accordance with all planning conditions for the development;
- Ensure construction works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure construction works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to construction; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, *e.g.* excavated stone, clay and peat material;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the SuDS drainage design principles;
- Keep impact of construction to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented; and,
- Monitoring of the works and any adverse effects that it may have on the environment. Construction Methods and designs will be altered where it is found there is an adverse effect on the environment;
- Comply with all relevant water quality legislation;
- Ensure a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

2.4 Construction Methodologies Overview

2.4.1 Introduction

Mid Cork Electrical Ltd. have been appointed as the main contractors for the civil works of the construction phase. The main contractors will comply with this CEMP and any revisions made to this document throughout the construction phase. An overview of the anticipated Construction Methodologies is provided below.

2.4.2 Overview of Proposed Construction Methodology

The proposed anticipated construction methodology is summarised under the following main headings:

- Temporary Construction Compounds;
- Borrow Pits;
- Drainage System;
- Upgrade of Existing Roads;
- New Site Access Roads;
- Watercourse Crossing
- Crane Hardstands;
- Turbine Foundations;
- Peat Reinstatement Areas;
- Cable Trenching;
- Grid Connection;
- Turbine Delivery Route Accommodation Works; and,
- Site Reinstatement

2.4.2.1 Temporary Construction Compound

The site will consist of a temporary construction compound which will be located in the north of the site adjacent to Turbine No. 1. The construction compound will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors.

The compound will typically be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound will be established using a similar technique as the construction of the excavated site tracks as discussed below;
- Where required, a layer of geogrid will be installed and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc.;
- If necessary the compound will be fenced and secured with locked gates, although fencing would only be utilised where significant risk of danger to third parties or vandalism is envisaged;
- Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required;
- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor on a regular basis and will be removed from the site on completion of the construction phase;
- The water supply to the site will be from a temporary water storage tank which will be filled using a mobile water tank which will source water locally as required.

2.4.2.2 Borrow Pits

Two borrow pits are permitted within the development as outlined shown on Figure 2.1. Borrow Pit No. 1 located in the centre of the site adjacent to Turbine No. 5. Borrow Pit No. 2 is located in the south west of the site situated north of Turbine No. 10.

The borrow pits will typically be excavated and backfilled as follows:

- The areas to be used for both borrow pits will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The initial borrow pit excavation will involve removal of peat (if present) and mineral soil to the top of bedrock. These materials will be stored temporarily or placed around the borrow pits to form berms to prevent surface water inflow to the borrow pit excavations;
- Interceptor drainage ditches will be excavated on all sides of the borrow pit to catch surface water runoff, and direct it to downstream re-distribution locations;
- The bedrock material will be extracted from the borrow pits and stockpiled or used as required;
- The use of material won from the borrow pits will be sequential with new road construction or turbine base formations;
- Temporary stockpiling of aggregates will be required to accommodate the cut and fill operations within the borrow pits, and the progression of access roads and turbine excavations;
- As the borrow pit excavations progress and become deeper (not > 5 metres), surface water and groundwater ingress will be removed via pumping to settlement ponds, and re-distribution locally across natural vegetated areas. Where required, additional specialist treatment will be employed to ensure no deterioration in downstream water quality occurs;
- When extraction ceases within the borrow pit, the uphill face of the rock will be stepped and deposits of soil will be placed which will assist in the re-vegetation of the rock face;
- The extraction area of the borrow pit will have to be permanently secured and a stock-proof fence will be erected around the borrow pit to prevent access to these areas as well as the installation of appropriate health and safety signage.

Once the required volume of rock has been extracted from the borrow pit areas, it is intended to reinstate these areas with peat and overburden excavated from the works areas of the development. The total estimated volume of peat and spoil to be excavated and managed during the construction phase of the development is 25,372m^3. The borrow pit areas, within the site of the proposed development will undergo restoration with this peat and spoil material after all rock has been excavated from the borrow pit. The volume of excavated peat and overburden will be managed as outlined below:

- Excavators will remove the peat from the permanent development footprint areas i.e. excavated roads, hardstanding areas and turbine foundation areas.
- Temporary, sealed stockpiling areas, located adjacent to the hardstanding areas and turbine foundation areas, will be chosen following onsite discussions between the construction site manager, an ecologist, a geotechnical engineer and hydrologist.
- The excavators will move the excavated peat to the designated temporary stockpiling areas within the construction and soft levelled areas.
- The temporary stockpiling areas will be surrounded by silt fences to ensure sediment-laden run-off does not occur.

- The excavated peat will remain in these areas over a period of time until the volume of the peat has reduced as the water drains out of the mounded peat.
- The excavators will then load the peat directly into dump trucks, to transport the peat to the nearest borrow pit area.
- The material will be backfilled into the borrow areas and will be spread evenly across the area.
- The peat and subsoil will also be used for landscaping and reinstatement along access roads and turbine excavations.

This method of managing the volume of surplus peat and other overburden material will ensure that no excavated material will be left on-site, or stockpiled adjacent to access roads and turbine locations, following the completion of the construction works.

2.4.2.3 Drainage System

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 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 when sediment or other pollution may be a problem if upstream controls fail, and the final phase of maximum incoming flow.

The implementation of a Scheduling of Works Operating Record (SOWOR) prior to commencement will provide a series of pre-commencement triggers which set out specific conditions which will be met before the commencement of works particularly sensitive areas. These pre-commencement triggers will apply to the installation of any drainage infrastructure. An example of an SOWOR is included in Appendix 1.

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 hard standing construction. Drains will be excavated and settlement ponds constructed to eliminate any suspended solids within surface water running off the site. Surface water management and drainage design is dealt with in Section 3.2 and 4 below.

2.4.2.4 Upgrade of Existing Roads

It is proposed to utilise the existing road network as much as possible with approximately 1.89 kilometres of existing roadway requiring upgrade. These roads will require upgrading which will entail widening of the roadway to a total running width of approximately six metres, with wider sections at corners and on the approaches to turbine locations, and the laying of a new surface dressing on the existing section of roadway where necessary. The road widening will be undertaken as follows:

- If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed;
- Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer of rock and the spoil deposited in the peat reinstatement areas;
- Well-graded imported granular fill or material won from the borrow pits will be spread and compacted to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the

compaction plant to be used. These layers of granular fill will be brought to the same level as the top of the existing paved surface;

- A layer of geo-grid will be installed directly onto the top of the granular fill layer and the existing road surface where required and a layer of finer well graded stone for the running surface will be laid on the geo-grid and compacted.
- Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in Section 4 below.
- Where road widening is required in an area where the peat depth is greater than c2.0m, it will be necessary to complete the road upgrade using a floating road methodology as summarised in the Section 2.4.2.5 that follows.

2.4.2.5 New Site Access Roads

New roadway will be required in areas where existing roads are not already present, or where existing sections are too steep or otherwise unsuitable for the required purpose in the case of the development. There is 7.77 kilometres of new access roads to be installed at the site. In addition, the revised route for the grid connection cabling, will include a 220m operational access/inspection road which will be constructed west of Turbine no. 7

The new access roads will be constructed as follows:

- Establish alignment of the new site roads from the construction drawings and mark out the centre lines with ranging rods or timber posts;
- The road layout has been designed to avoid crossings of natural watercourses;
- Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be agreed with Inland Fisheries Ireland.
- The access tracks will be of single-track design with an overall width of 6m. There will be some local widening on the bends, junctions and around turbine bases for the safe passage of large vehicles;
- All peat and overburden excavated will be used as part of the borrow pit restoration or in reinstatement areas. Topsoil will be temporarily stockpiled locally for reuse for landscaping the backfill placed above the foundations.
- The subsoil will be excavated down to a suitable formation layer of either firm clay or bedrock;
- Where floating roads are to be constructed, the subsoil will not be excavated but a layer of geo-grid or layers of brash and lumber will be laid directly on to the peat surface.
- Well-graded granular fill 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 Construction Manager based on the characteristics of the material and the compaction plant to be used;
- All new roadways will be constructed with a camber to aid drainage of surface water;
- Batters will generally be sloped to between 1:1 and 1:2 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species. Design slopes will be informed by the Geotechnical Engineer;
- At bends or steep inclines from the roads, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the site road.
- All rock won from the borrow pit areas that are to be used in road construction on site will be tested to BS812-111:1990 “Ten percent fines value”.

2.4.2.6 Watercourse Crossing

A new watercourse crossing is required where the new access road traverses the Toon river in the North-eastern section of the site. The crossing will be completed using a clear span pre-cast concrete bridge structure and so avoid the requirement for an instream works during the installation. The culvert will be installed using the guidelines set out in the IFI's Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters so as to minimise impacts on the watercourse channel. The crossing will be the subject of a consent application to the Office of Public Works under Section 50 of the Arterial Drainage Act, 1945. The installation methodology is summarised as follows:

- The access road on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- The abutment will consist of concrete panels which will be installed on a concrete lean mix foundation to provide a suitable base. The base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the river for excavation and foundation installation will be via existing public roads or via temporary precast concrete crossing.
- All pre-cast concrete panels and slabs/beams will be installed using a crane which will be set up on the southern side of the stream and will be lifted into place from the stream back with no contact with the watercourse.
- A concrete deck will be poured over the beams/slabs which span across the river. This will be shuttered, sealed and water tested before concrete pouring can commence. The deck will be leak tested before concrete pouring can commence.
- Once the culvert is in position stone backfill will be placed and compacted against the culvert up to the required level above the foundations.

When the concrete beams are cured the filling and compaction of the road will be completed. The road finish level will be decided by the Project Engineer.

All other new crossing will be completed using piped culvert, the crossing will be installed as follows:

- The access road on the approach watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- The installation of the culvert will take place in low flow conditions.
- Where a flow exists, the water running through the watercourse channel will be pumped around the water crossing location and back into the watercourse channel downstream of the works area.
- Where over pumping is required, measures will be taken to ensure that the pumped water discharge does not disturb the stream bed with the force of water from the discharge. A steel plate to reduce the force of the flow will be used where appropriate.
- The project engineer will determine the required gradient of the culvert. The pipe must be laid at a gradient that will ensure water is contained within the

pipe at all times. Where necessary a rock armour dam will be installed within the stream to reduce flow and ensure an acceptable depth of water remains within the pipe. Where a gradient of 1 – 1.5% is identified, the use of a baffle has been recommended.

- The bed of the watercourse channel will be excavated, if necessary, to achieve the correct line and to allow the pipe to be embedded 300mm into the base of the existing drain.
- The embedded section will be allowed to fill naturally with existing material within the base of the drain or with suitable drainage material such as gravel or round shingle where deemed applicable.
- The culvert will be lowered into place using an excavator with a lifting mechanism.
- Large stone boulders (approx. 400mm), sourced from the on-site borrow pits, will be placed over the culvert to create a headwall for the culvert and a suitable sub-base for road construction.
- Smaller 50mm stone, sourced on site will be placed upon the sub-base to construct the road over the water crossing.

All of the above works will be supervised by the Environmental Clerk of Works or the Project Hydrologist.

2.4.2.7 Crane Hardstands

All crane pads will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads and will measure approximately to the turbine manufacturer's requirements. The position of the crane pads varies between turbine locations depending on topography, position of the site access road, and the permitted turbine position.

2.4.2.8 Turbine and Anemometry Mast Foundations

The wind turbines and anemometry mast foundations will be a reinforced concrete base designed to Eurocode 2/BS8110. Foundation loads will be provided by wind turbine and mast supplier, and factors of safety will be applied to these in accordance with European design regulations. The turbine will be anchored to the foundation using a bolt assembly which shall be cast into the concrete. The anemometry mast is a free-standing structure which is also anchored to the reinforced concrete foundation. It is anticipated that the foundations for both the turbines and the anemometry mast will be either ground bearing foundations and that the formation level of the turbine foundations will be on the lower mineral subsoil or bedrock. Bases will measure approximately 20 metres in diameter. They will likely be formed one metre below the base of the peat layer on stiff subsoil material or bedrock, or at a suitable level directed by the Geotechnical Engineer/Designer. The foundations will be constructed as follows:

- The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;
- No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system and treated in settlement ponds, and/or specialist treatment systems, prior to discharge from the works area; and,

- Soil excavation shall be observed by a qualified archaeologist in accordance with a scheme of archaeological monitoring, in order to identify any significant remains as they come to light.

Ground bearing reinforced concrete bases will be completed as follows:

- A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete should be protected from rainfall during curing and all surface water runoff from the curing concrete should be prevented from entering surface water drainage directly;
- High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools;
- Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required;
- 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 turbine manufacturer for their approval;
- Concrete will be placed using a concrete pump and compacted when in the forms using vibrating pokers to the levels and profile indicated on the drawings. Upon completion of the concreting works the foundation base will be covered and allowed to cure;
- Steel shutters will be used to pour the circular chimney section;
- Earth wires will be placed around the base; and,
- The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the vegetable soil set aside during the excavation. A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.
- Soil, rock and other materials excavated during construction shall not be left stockpiled on site following completion of works. Excavated areas shall be appropriately restored within three months of the date of commissioning of the wind farm

2.4.2.9 Electricity Substation and Control Buildings

An electricity substation and associated control building will be constructed within the site, as shown in Figure 2.1. The control building will be located within the substation compound which will be located south of Turbines No. 10 & 11.

The substation will be constructed by the following methodology:

- The area of the substation will be marked out using ranging rods or wooden posts and the soil stripped and removed to a temporary placement area for later use in landscaping. No material will be removed from site and the temporary placement areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- Wind farm control buildings will also be built within the substation compound;
- All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system and treated in settlement ponds, and/or specialist treatment systems, prior to discharge from site; and,
- The foundations will be excavated down to the level indicated by the project engineer. The foundations will be shuttered and poured with reinforced concrete. An anti-bleeding admixture will be included in the concrete mix;

- The substation will be constructed with masonry blockwork. The block work walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation;
- Concrete roof slabs will be lifted into position using an adequately sized mobile crane;
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.
- A rainwater harvesting system will be installed to provide the small volume of water required for the operation of the proposed substation and control building.
- The electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected around the substation and control building compound area.
- All wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank which will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying.

2.4.2.10Cable Trenching

The transformer in each turbine is connected to the substation through a network of buried electrical cables. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the substation compound. The ground is trenched typically using a mechanical digging machine. The top layer of soil is removed and saved so that it is replaced on completion. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The depth of the cables is to meet all national and international requirements, and will generally be up to 1.3m below ground level depending on the ground conditions that are encountered. A suitable marking tape is installed between the cables and the surface. On completion the ground will be reinstated as previously described above. The route of the cables will generally follow the access tracks to each turbine location.

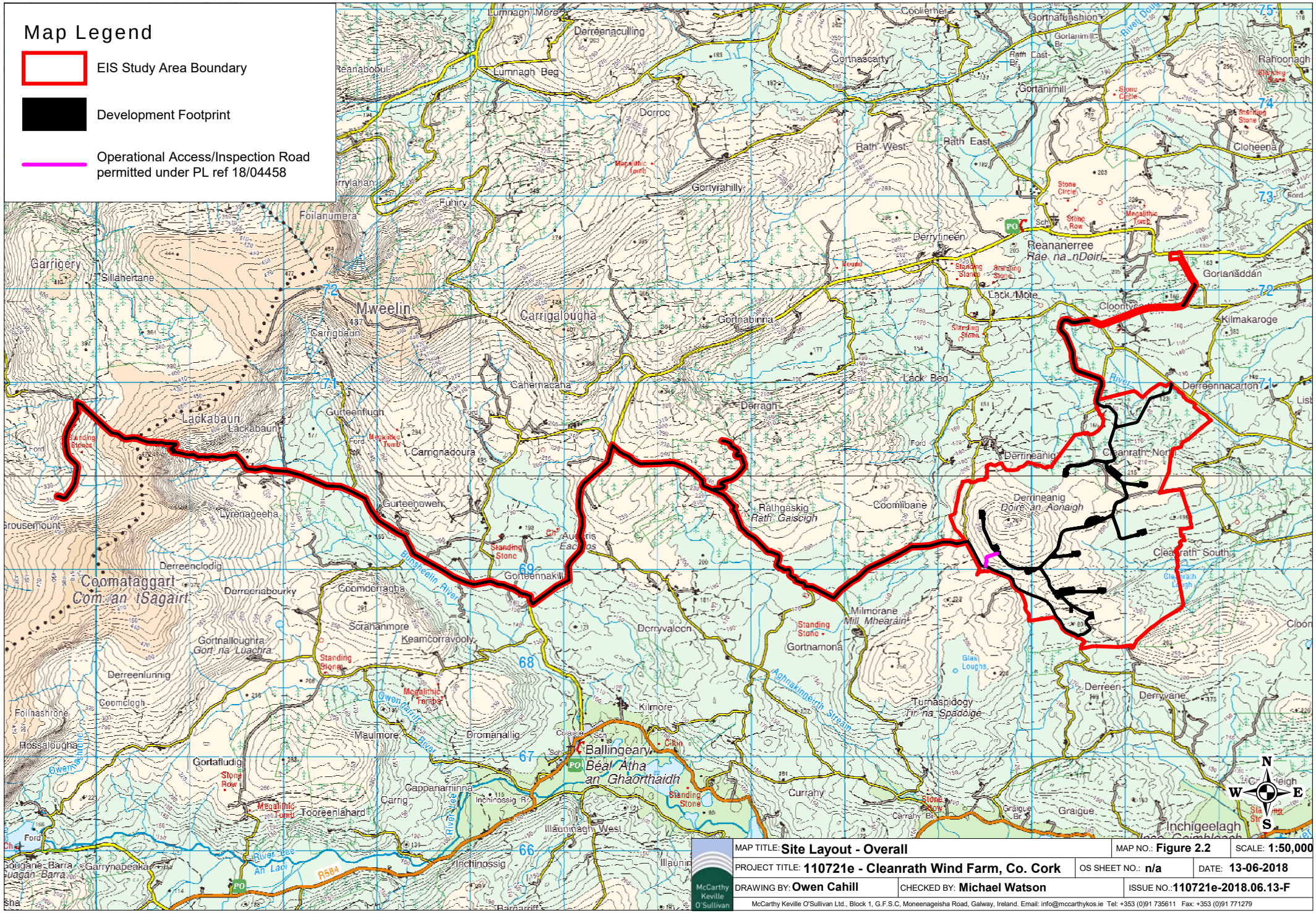
2.4.2.11 Grid Connection

A connection to the national electricity grid will be made by an underground electricity cable originating from the Cleanrath wind farm at Turbine no. 7 utilising the revised cable route and will run to an ESB Networks substation located at Coomataggart in the townland of Grousemount, Co. Kerry (Figure 2.2). The installation of the underground electrical cable will be completed using the following construction methodologies.

2.4.2.11.1 *Parallel Road Excavations inroad & in Grass margin*

The grid connection route generally follows the existing road corridor. The cabling is works are summarised as follows:

- The area where excavations are planned will be surveyed and all existing services will be identified.
- All relevant bodies i.e. ESB, Cork County Council etc. will be contacted and all drawings for all existing services sought.
- A traffic management plan will be set up prior to any works commencing.
- A road opening license will be obtained where required and all plant operators and general operatives will be inducted and informed as to the location of any services.



MAP TITLE: **Site Layout - Overall**		MAP NO.: **Figure 2.2**	SCALE: **1:50,000**
PROJECT TITLE: **110721e - Cleanrath Wind Farm, Co. Cork**		OS SHEET NO.: **n/a**	DATE: **13-06-2018**
DRAWING BY: **Owen Cahill**	CHECKED BY: **Michael Watson**		ISSUE NO.: **110721e-2018.06.13-F**

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- A rubber tracked 360-degree excavator will be used to excavate the trench to the dimensions specified in the ESB Networks *"Specification for the Installation of Ducts and Structures for Underground Power Cables and Communications Cables"*.
- All excavated material not used for backfilling will be removed to the on-site peat disposal areas or to an approved tip or if suitable stock piled and reused where appropriate.
- All excavated material not used for backfilling will be removed from site using trucks.
- The trench depth is specified at 1220mm and trench support will not be required, however where depths exceed 1250mm trench support will be installed or the trench sides will be benched or battered back where appropriate.
- Any ingress of ground water will be removed from the trench using submersible pumps.
- A silt filtration system will be used to prevent contamination of any watercourse.
- Once the trench has been excavated a base layer of 15 N CBM4 concrete will be installed and compacted. All concrete will be offloaded directly from the concrete truck directly into the trench.
- Ducting will then be placed in the trench as per specification, approved cable ties will be used where required to secure the trefoil ducts together (at 3 metre centres).
- Once the trefoil ducts have been installed couplers will be fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions the end of the trefoil ducts will be shimmed up off of the bed of the trench to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected.
- Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- The as built location of the ducting will be surveyed using a total station/GPS.
- 15 N CBM4 concrete will be carefully installed so as not to displace the ducting to the underside of the communications duct and compacted as per approved detail. See Plate 2.1.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the trefoil ducting.
- ESB marker board will be fitted above the trefoil ducting.
- The Communication duct will be fitted and kept to one side of the trench ensuring that the minimum cover is achieved and 15N CBM4 concrete will be placed to the specified cover and compacted, see Plate 2.1.
- ESB red marker board will be installed and the remainder of trench will be backfilled in two compacted layers with approved material (lean mix concrete/clause 804).
- Yellow marker tape will be installed as per approved detail specifications, 300 mm maximum below finished road/ground level.
- Topsoil will be permanently reinstated where required or Clause 804 stone used to finish the trench on grass margins where appropriate to give a more trafficable surface.
- Road finish: Where the cable route runs within the carriageway of a road the excavated area will be resurfaced and finished to the requirements of the Roads Authority.

Plate 2.1 Cable Trench View

2.4.2.11.2 *Existing Underground Services*

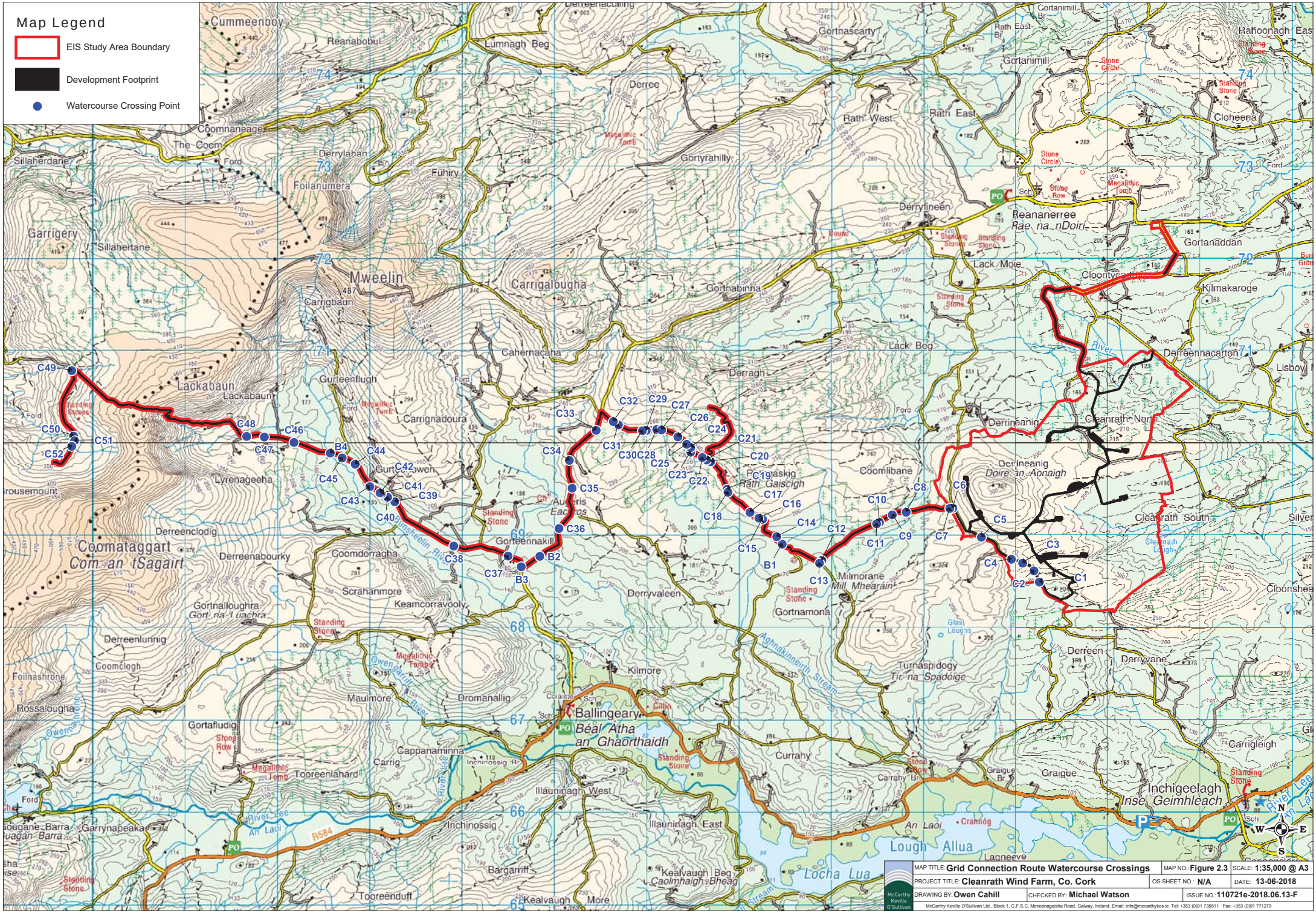
Any underground services encountered along the route will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300mm will be required between the bottom of the ducts and the service in question. If the clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. In deeper excavations, an additional layer of marker tape will be installed between the communications layer and yellow top level marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the ESB ducts where adjacent services are within 600mm, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate. All excavations will be kept within the roadway boundaries, i.e. in road or grass margin.

2.4.2.11.3 *Joint Bays*

Joint bays are pre-cast concrete chambers where lengths of cable ducting will be connected. They will be located at various points along the ducting route approximately every 600-1200 meters. Where possible joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. During construction, the joint bay locations will be completely fenced off and will be incorporated into the traffic management system. Once they have been constructed they will be backfilled temporarily until cables are being installed.

2.4.2.11.4 *Watercourse/Culvert Crossing*

A total of 13 no. watercourse crossings and 39 no. minor culvert crossings were identified along the cable route. The locations are mapped in Figure 2.3. The proposed methodologies for crossing watercourses and culverts ensures that instream works are not required at any location along the cable route.



MAP TITLE: **Grid Connection Route Watercourse Crossings**		MAP NO.: **Figure 2.3**	SCALE: **1:35,000 @ A3**
PROJECT TITLE: **Cleanrath Wind Farm, Co. Cork**		OS SHEET NO.: **N/A**	DATE: **13-06-2018**
DRAWING BY: **Owen Cahill**	CHECKED BY: **Michael Watson**		ISSUE NO.: **110721e-2018.06.13-F**

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The preferred methodologies for watercourse and culvert crossing points are outlined in Table 2.1 which provides examples of watercourse crossing types and a description of the works for each crossing methodology. One of the preferred methodologies will be chosen for any watercourse crossings or culverts encountered during the construction phase.

Crossings over Culverts using Standard Trefoil Arrangement – Option 1
In the majority of watercourse crossings, the watercourse will not have to be disturbed because no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a culvert, the standard ESB approved trefoil arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench as outlined in Figure 2.4

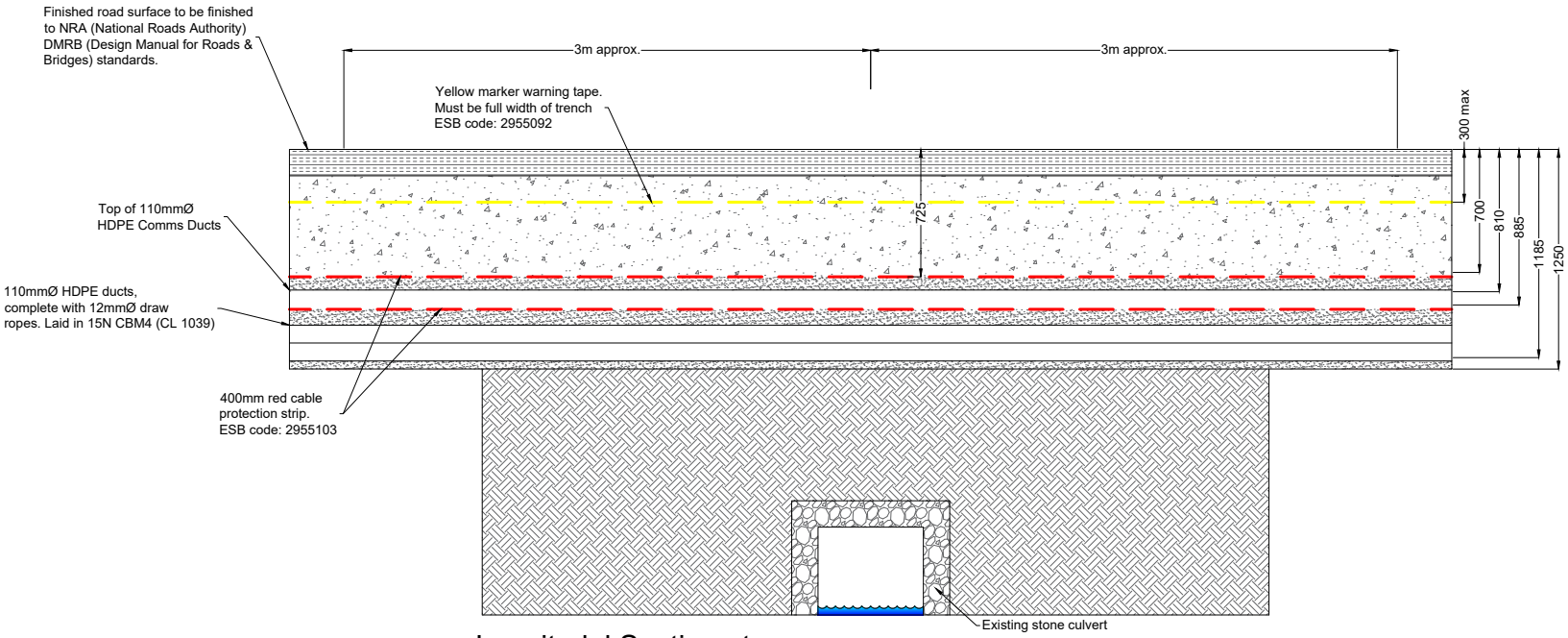
Trefoil Formation under Piped Culvert Crossings – Option 2
In the majority of watercourse crossings, the watercourse will not have to be disturbed because no instream works or bridge/culvert alterations are proposed. Where the culvert consists of a socketed concrete or sealed plastic pipe, a trench will then be excavated beneath the culvert and cable ducts will be passed under the sealed pipe as outlined in Figure 2.5. Works to replace any existing culverts, thereby giving rise to the requirement for in-stream works, will only be undertaken at the Local Authority's direction.

If this duct installation method cannot be achieved due to the invert level of the existing culvert or due to the composition of the culvert e.g. stone culverts, the ducts will be installed by alternative means as set out in the following sections.

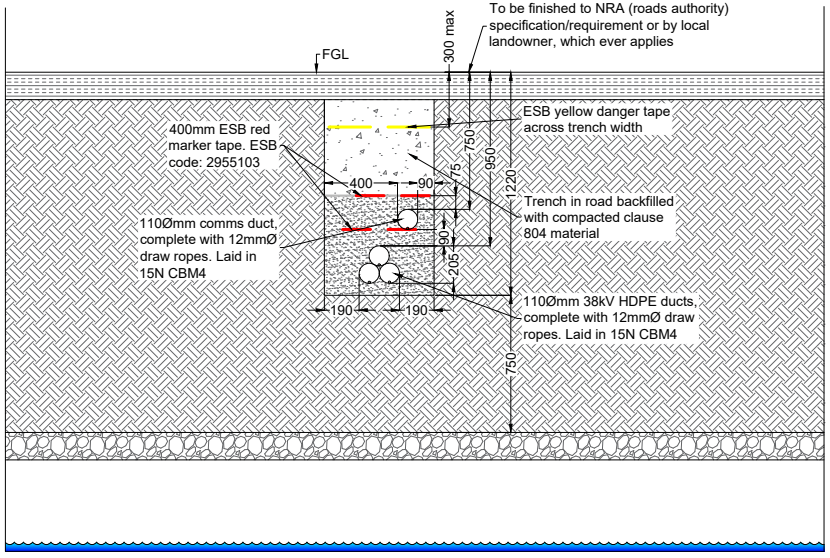
Flatbed Formation over Culverts or at Road Level– Option 3
Where cable ducts are to be installed over an existing culvert where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be incased in 6mm thick steel galvanized plate with a 30N concrete surround as per ESB Networks specification. This method of duct installation is further detailed in Figure 2.6.

Where a bridge or culvert has insufficient deck cover to fully accommodate the required ducts, the ducts can be laid in a flatbed formation partially within the existing road surface. Where this option is to be employed, the ducts will also be incased in steel with a concrete surround as per Eirgrid and/or ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of the road, it may be necessary to locally raise the pavement level to fully cover the ducts. The increase road level will be achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench. This method of duct installation is further detailed in Figure 2.7.

The flatbed formation methodology will also be used at bridge structures where there is an existing footpath. The cables will be installed in the same flatbed arrangement where the existing footpath will be excavated to allow for the installation of the cables. The footpath will be reinstated after cable ducts have been installed. Where there is no existing footpath, it is proposed to install a footpath to encase the cable ducts after they have been laid in the flatbed formation.



Longitudal Section at Watercourse Crossing



Cross Section at Watercourse Crossing

DRAWING TITLE:
Typical Cable Trench Over Culvert in Trefoil Arrangement - Option 1

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.4
SCALE: 1:30 @ A3	DATE: 14.06.2018

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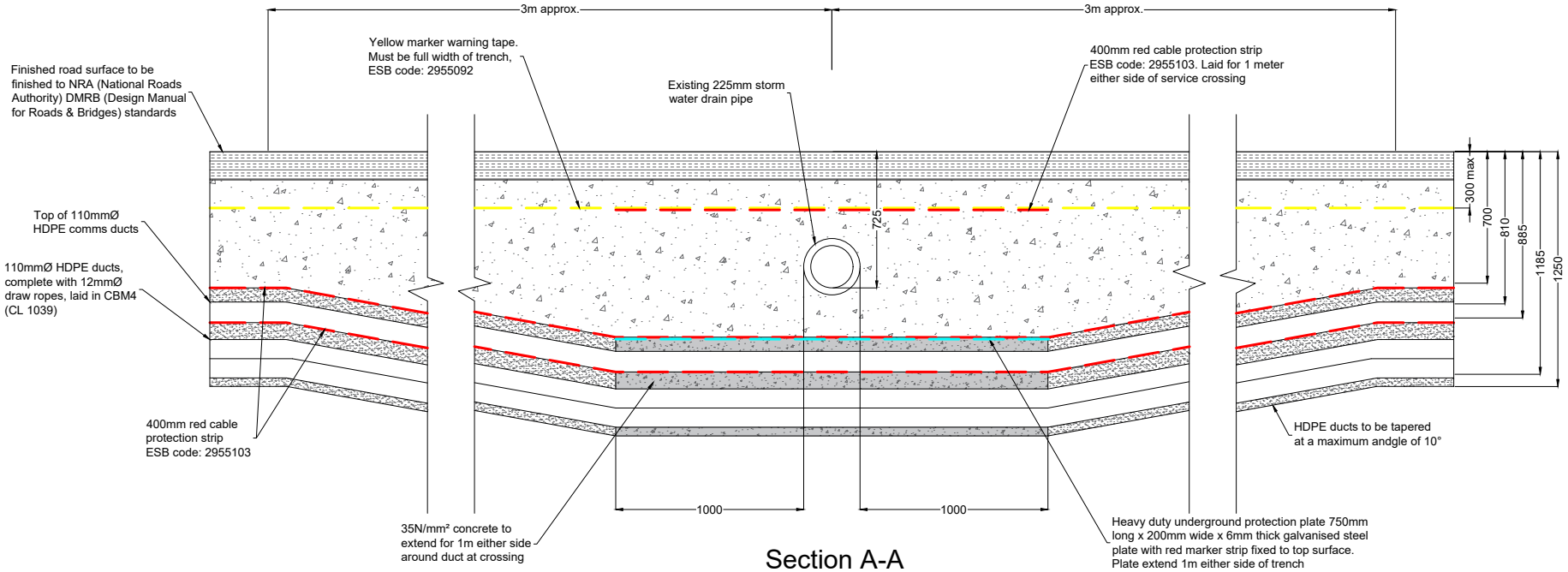
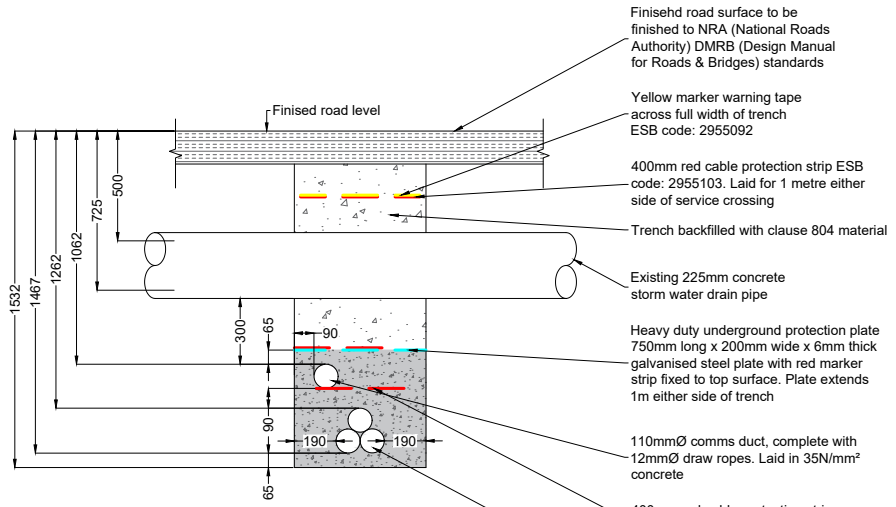


Section A-A



Section B-B

DRAWING TITLE:
Typical Cable Trench under Piped Culvert - Option 2

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.5
SCALE: 1:25 @ A3	DATE: 14.06.2018

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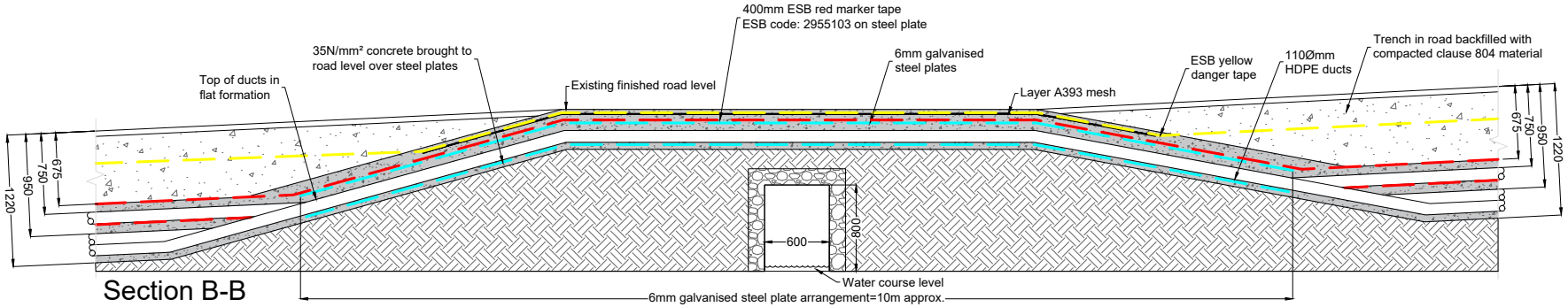

Section B-B

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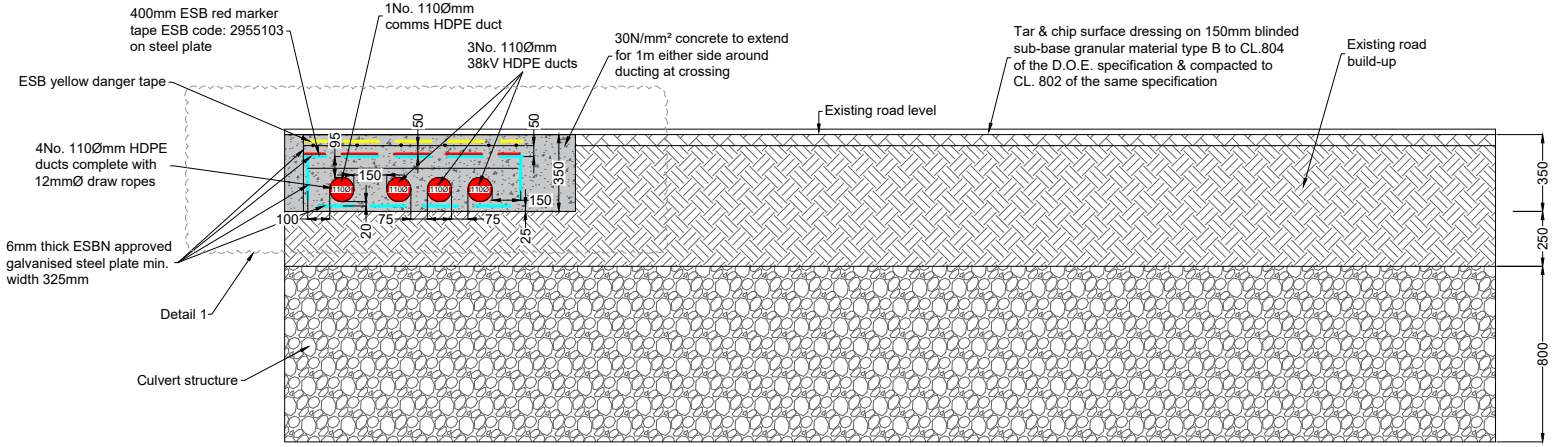

Section A-A

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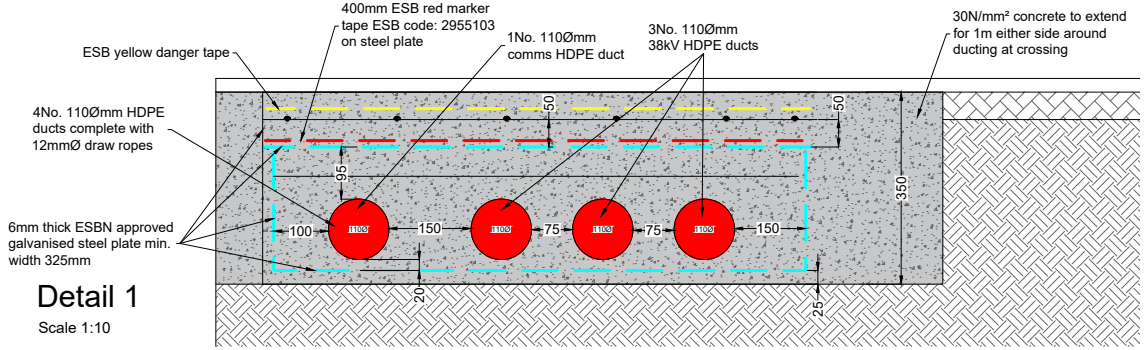

Detail 1

Scale 1:10

DRAWING TITLE:
Typical Cable Trench Flatbed Formation over Culvert - Option 3

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.6
SCALE: As Shown @ A3	DATE: 14.06.2018

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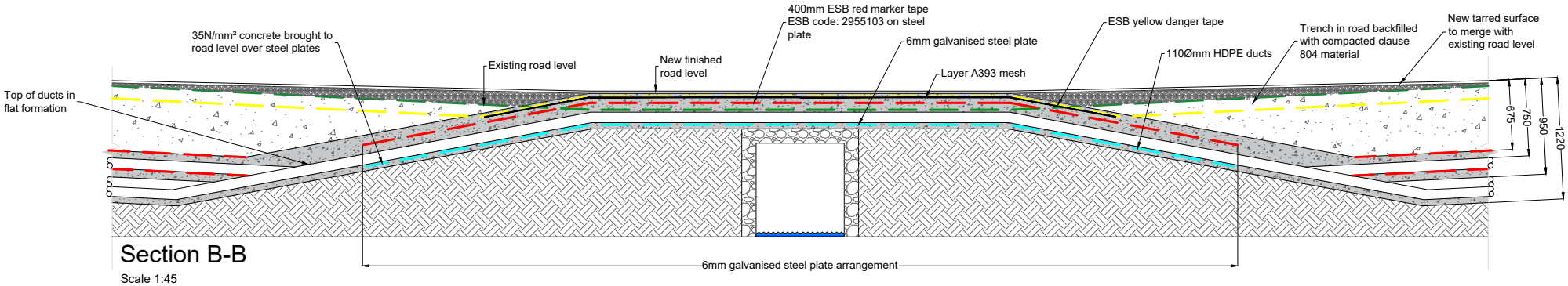
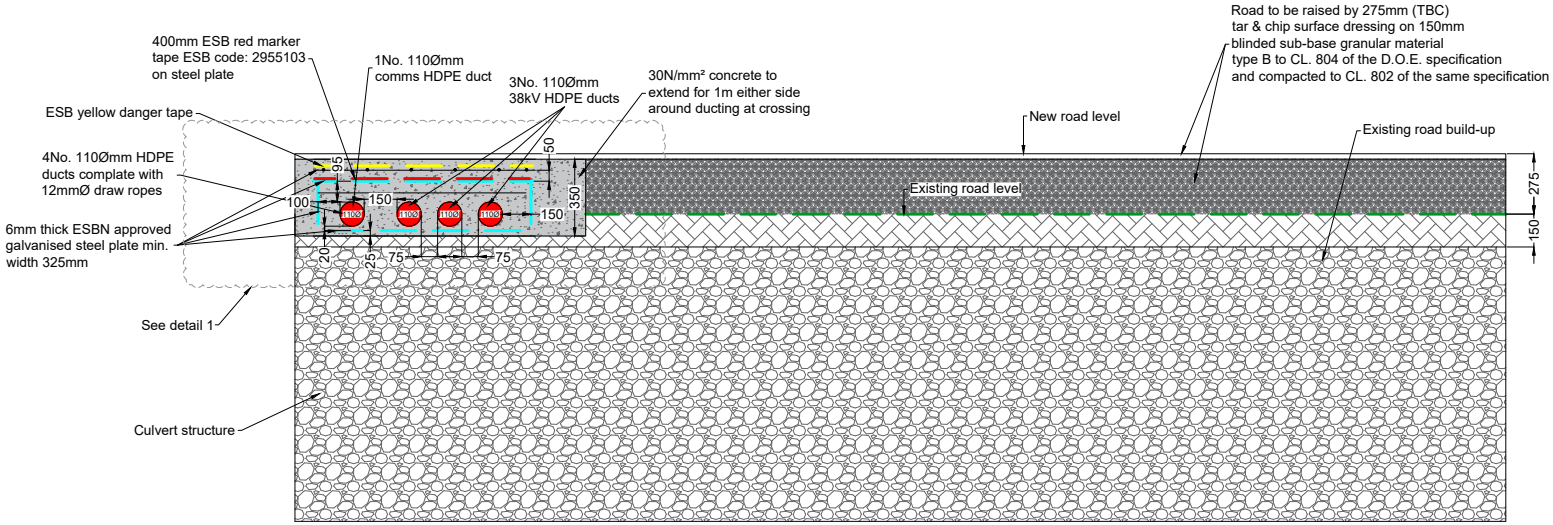


Section B-B

Scale 1:45



Section A-A

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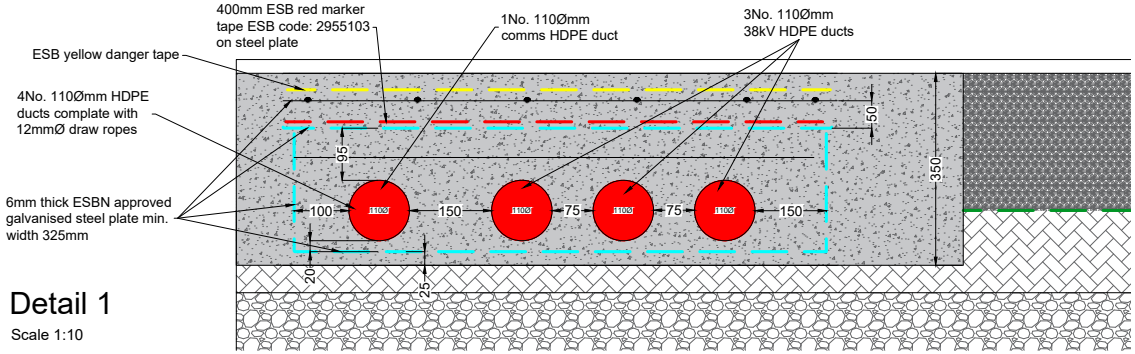

Detail 1

Scale 1:10

Cable Trench Flatbed at Road Surface Level - Option 3

PROJECT TITLE: **Cleanrath Wind Farm, Co. Cork**

DRAWING BY:	CHECKED BY:
Joseph O Brien	Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.7
SCALE: As Shown @ A3	DATE: 14.06.2018

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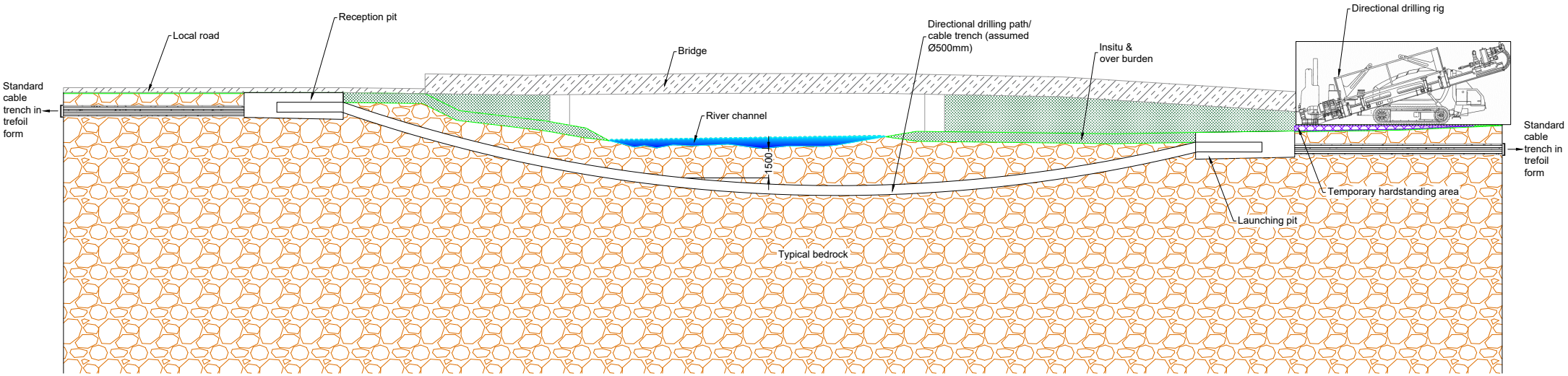
Directional Drilling – Option 4
In the event that none of the above methods are appropriate, directional drilling will be utilised.

The directional drilling method of duct installation will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, will be utilised for the horizontal directional drilling at watercourse/culvert crossings listed above. The launch and reception pits will be approximately 0.55m wide, 2.5m long and 1.5m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3.0m long drill rods, mechanically loaded and connected into position.
During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as *Clear Bore*™ and water is pumped through the centre of the drill rods to the reamer head and is forced into void and enables the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as *Clear Bore*™ is intended to negate any adverse impacts arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to an approved disposal site.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. The directional drilling methodology is further detailed in Figure 2.8.



Typical Directional Drilling Rig

Typical Drilling Rig and Launch Pit

DRAWING TITLE:
Typical Directional Drilling - Option 4

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.8
SCALE: 1:200 @ A3	DATE: 14.06.2018

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Table 2.1 Culvert Survey Summary and Preferred Crossing Methodology

Option No.	Example Culvert type and size	Cover from road level to top of culvert	Maximum depth of trench from road level under culvert	Description	Extent of Proposed Instream Works
1	600x600mm stone culvert	1900mm	n/a	Due to the depth of covering over the existing culvert, the cable ducts will be laid over the culvert in the standard trefoil arrangement. Therefore, no contact will be made with the watercourse during the works.	None. No in-stream works required.
2	225mm internal Ø corrugated plastic pipe	500mm	1500mm	No in-stream works required at this culvert crossing. The culvert consists of a sealed corrugated pipe under which the trench for the cable duct will be excavated. Therefore, no contact will be made with the watercourse during the works.	None. No in-stream works required.
3	800x600mm stone culvert	600mm	n/a	No in-stream works required at this culvert crossing. It is proposed to lay the cable ducts in a flatbed formation over the culvert. Therefore, no contact will be made with the watercourse during the works.	None. No in-stream works required.
4	600x600mm stone culvert	300mm	2400mm (directional drilling core)	As the top of the culvert is 300mm below the road surface, laying the duct over the culvert will not provide the necessary cover over the cable duct as well as the integrity of the stone culvert would be compromised by the excavation. Laying the ducts under the culvert is not an option as the structure of the stone culvert could not accommodate the excavation. Therefore, the cable duct will pass under the culvert by means of directional drilling 1500mm below the base of the culvert with no contact with the watercourse.	None. No in-stream works required.

2.4.2.11.5 *General Construction Measures*

Prior to any works commencing a dilapidation survey will be conducted of the entire route, photographing and noting any existing damage or defects to structure or road surfaces. A copy of this survey will be submitted to Cork County Council prior to works commencing.

Communication with the public, local residences and businesses along the route will be an important responsibility of the project supervisor. Keeping all affected parties up to date and informed both shortly prior and during the construction period at all times. Two to three weeks before any work commencing reasonable efforts will be made to inform all affected parties of the oncoming works.

Signage will be erected in the weeks prior to any works commencing along and on adjacent roads to the route notifying the public of the forthcoming construction. Contact details for the contractor and details of license will also be posted along the cable route during construction.

Every effort will be made to minimise the impact of the above works on local residences and traffic. Consideration will also be given to the agricultural community and works will be organised and sequenced so as not to inconvenience any such activities.

- All personnel will be inducted and made familiar with the method statements, risk assessments and traffic management plans involved.
- All site-specific safety rules will be adhered to.
- All plant operators will have appropriate CSCS training.
- All personnel will have FÁS Safe Pass training
- Fire extinguishers and first aid supplies will be available in the work area.
- The road way will be maintained in clean condition at all times.
- Helmets, High Visibility clothing and safety footwear will be worn at all times.
- A competent foreman will be on site at all times.
- Excavations are back filled at the end of each working day.
- The trench will not be over crowded.
- Unauthorised access will be monitored and prevented.
- Pipe work will be lifted into position manually.
- Hand dig will be used to expose any services detected during the survey.

2.4.2.12 Transport Route Accommodation Works

A turbine delivery accommodation roadway will be constructed as part development in the townland of Cloontycarthy. The roadway will eliminate the requirement for additional junction accommodation works other than those described in this Section. The location of the roadway is illustrated in Figure 2.2.
The construction methodology of the turbine delivery accommodation works is outlined as follows:

- Overburden within the required areas for the accommodation works will be excavated and temporarily stockpiled adjacent to the works area, where possible, until a competent stratum is reached.
- Any excess excavated overburden will be removed from the works area to the on-site peat management areas or a licensed tip or, if suitable, stockpiled and reused for backfilling where appropriate.
- A layer of geogrid/geotextile may be required at the surface of the competent stratum to provide further structural formation, if required.

- The competent stratum will be overlain with granular fill sourced from the on-site borrow pit or local quarries.
- A final surface running layer will be placed over the granular fill to provide a suitable surface to accommodate the turbine delivery/abnormal load vehicles.
- The temporary accommodation works along the turbine delivery route will only be used by the turbine delivery/abnormal load vehicles and other vehicles associated with the delivery process.
- The temporary accommodation works when not in use will be cordoned off from the public road, using bollards, where boundary walls, hedgerows or ditches have been removed.
- Upon completion of the turbine delivery phase of the proposed wind farm the granular surface of the accommodation works location will remain in place. All kerbing, barriers and boundary fencing will be reinstated.

Leaving the granular fill and final surface running layer in place within the accommodation areas will allow these to be used again in the future should it become necessary (i.e. at decommissioning stage for turbine removal, or in the unlikely event of having to swap out a blade component during the operational phase). Should this be required the boundary treatments will again be temporarily removed and managed as set out above.

2.4.2.13 Decommissioning

The design life of the wind farm is 25 years after which time decommissioning will occur unless planning permission is granted to extend the duration of operation. At the end of the design life of the wind farm, or if the operations at the wind farm cease for a period of greater than one year, the turbines, met mast and all their associated above ground components will be dismantled and removed from site. The turbine foundations will be covered with soil to facilitate re-vegetation. The management of waste materials arising from the decommissioning of the development is outlined in the Waste Management Plan (Section 3 below).

Site roadways could be in use for other purposes other than the wind operation of the wind farm by the time the decommissioning of the project is to be considered, and therefore it may be more appropriate to leave the site roads in situ for future use. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed

Underground cables will be removed and the ducting left in place.

A full reinstatement plan will be submitted to Cork County Council three months prior to decommissioning.

3 ENVIRONMENTAL MANAGEMENT

3.1 Introduction

This CEMP has been prepared and presented as a standalone document and includes all drainage measures required to construct the wind farm. The drainage proposals will be developed further prior to the commencement of construction however, any such improvements will be in line with the principles set out here, and will also be in full compliance with the planning consent and mitigation presented in the EIS, NIS, FIR, GOA and CCS documents. The following sections give an overview of the drainage design, dust and noise control measures and a waste management plan for the site.

3.2 Protecting Water Quality

3.2.1 Environmental Management in the Construction Phase

Timing of road works can strongly influence the potential for damaging the freshwater environment. Operations during wetter periods of the year pose a significantly greater risk of causing erosion and siltation, which can be particularly severe following major rainfall or snowmelt events. Traditionally, wind farm construction undertaken during the drier summer months would result in significantly less erosion and siltation. Construction activities in the hydrological buffer zones shall be avoided during or after prolonged rainfall or an intense rainfall event and work will cease entirely near watercourses when it is evident that pollution is occurring. Given that this site has an established road network and existing watercourse crossing points, there will be minimal impacts on watercourses.

3.2.2 Site Drainage Design

The site drainage features for this site have previously been outlined in the EIS and are further developed in Section 4 of this CEMP. The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the permitted development. No routes of any natural drainage features will be altered as part of the permitted development as new watercourse crossings are kept to a minimum to facilitate the permitted development. Turbine locations and associated roadways were originally selected to avoid natural watercourses and existing roads are to be used wherever possible. The permitted development has where possible, been kept a minimum of 50 metres from natural watercourses. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. Buffer zones around the existing natural drainage features have informed the layout of the permitted development.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial 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. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

3.2.3 Legislation and Best Practice Guidance

The drainage design has been prepared based on experience of the project team of other wind farm sites in peat-dominated environments, and the number of best practice guidance documents.

There is no one guidance document that deals with drainage management and water quality controls for wind farm developments. However, a selection of good practice approaches have been adopted in preparation of this CEMP, and these are taken from the various best practice guidance documents listed below. These relate to infrastructure and operational works on forested sites, forest road design, water quality controls for linear projects, forestry road drainage and management of geotechnical risks. To achieve best practice in terms of water protection through construction management all drainage management is prepared in accordance with guidance contained in the following:

- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Service (Draft): 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;
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- COFORD (2004): Forest Road Manual – Guidelines for the design, construction and management of forest roads;
- MacCulloch (2006): Guidelines for risk management of peat slips on the construction of low volume low cost roads over peat (Frank MacCulloch Forestry Civil Engineering Forestry Commission, Scotland);
- Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Wind Farm Development Guidelines for Planning Authorities (September 1996);
- Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board;
- Good Practice During Wind Farm Construction (Scottish Natural Heritage, 2010);
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- Control of water pollution from construction sites - Guidance for consultants and contractors. CIRIA C532. London, 2001; and,
- Control of water pollution from linear construction projects -Technical guidance. CIRIA C648 London, 2006.

3.2.4 Site and Drainage Management

3.2.4.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures outlined above will be brought on-site in advance of any works commencing.

An adequate quantity of straw bales, clean stone, terram, stakes, etc. will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

3.2.4.2 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the project will also take account of weather forecasts, and predicted rainfall in particular. Large excavations, large movements of overburden or large-scale overburden 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.

3.2.4.3 Reactive Site Drainage Management

The final drainage design prepared for the site has provided for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the Environmental Clerk of Works (ECoW) on-site. The ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

In the event that works are giving rise to siltation of watercourses, the ECoW or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

3.3 Refuelling, Fuel and Hazardous Materials Storage

The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling should occur at a controlled fuelling station;
- On-site refuelling will take place 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. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the wind farm. 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. 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.
- Fuels volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction. The bunded area will be roofed to prevent the ingress of rainwater and fitted with a storm drainage system and an appropriate oil interceptor;
- The electrical substation should 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;

- The plant used should be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with and accidental spillage in and outside the refuelling area.

3.4 Cement Based Products Control Measures

The following mitigation measures are proposed to avoid release of cement leachate from the site:

- No batching of wet-cement products will occur on site;
- Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the chute need 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.
- Use weather forecasting to plan dry days for pouring concrete;
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event;
- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a concrete washout area, typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 3.1 and 3.2 below. The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste. 1.

The 50m wide river buffer zone and 20 m existing artificial drainage buffer will be emplaced for the duration of the construction phase. No construction activity will occur within the buffer zone with the exception of bridge and culvert construction. The buffer zone will:

- Prevent any cement based products accidentally entrained in the construction phase drainage system entering directly into watercourses, achieved in part by ending drain discharge outside the 50m buffer zone and allowing percolation across the vegetation of the buffer zone;
- Provide a buffer against accidental direct pollution of surface waters by any pollutants, or by pollutants entrained in surface water run-off.

Plate 3.1 Concrete washout area

Plate 3.2 Concrete washout area

3.5 Peat Management

The total estimated volume of peat and overburden to be excavated during the construction phase of the development of peat and other subsoils is 25,372m^3. This includes a reduction of 30% for drying out of peat as well as reuse of material for backfilling and landscaping. A detailed Peat Management Plan is included in the EIS which outlines the methodology by which peat will be handled and stored at the site. A summary of the good construction practices which will be employed include:

- Avoidance of placing arisings from excavations and local concentrated loads on peat slopes without first establishing adequacy of the ground to support the load.
- Avoidance of uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge. All water discharged from excavations during work shall be piped over areas specifically assessed as being unsuitable and hence directed into suitable drainage lines.
- Avoidance of unstable excavations. All excavation shall be suitably supported to prevent collapse and development of tension cracks.
- Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope.
- Installation and regular monitoring of geotechnical instrumentation, as appropriate, during construction in areas of possible poor ground, such as deeper peat deposits
- Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be assessed by suitably experienced geotechnical engineer.
- Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions.
- Routine inspection of wind farm site by contractor to include an assessment of ground stability conditions (e.g. cracking, excessive floating road settlement, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).

3.5.1 Peat Stability Management

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that could occur below an access road, creep movement or erosion type events. In the absence of appropriate mitigation, the consequence of peat failure at the study area may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of access tracks;
- Drainage disrupted;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by sediment particulates; and,
- Degradation of the environment.

3.5.2 General Recommendations for Good Construction Practice

The peat stability assessment indicates that there is insignificant risk of peat failure, although drainage mitigation measures would be required to prevent the buildup of water in the peat and reduce the risk of failure (AGEC, 2015).

The following issues incorporated into the construction phase of the project will assist in the management of the risks for this site (AGEC, 2015):

- Appointment of experienced and competent contractors;
- The site should be supervised by experienced and qualified personnel;
- Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Maintain a managed robust drainage system;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report readings from peat stability monitoring systems;
- Ensure construction method statements are followed or where agreed modified/ developed; and,
- Revise and amend the Geotechnical Risk Register as construction progresses.

3.6 Traffic Management

A Traffic Management Plan for the construction phase of the wind farm is included in Appendix 2. The Traffic Management Plan has been prepared to consider the wind farm as a standalone project.

Where grid connection works relating to the Cleanrath Wind Farm are ongoing, the contractor will schedule and phase these works accordingly to ensure that these works do not coincide with intensive periods of construction on the wind farm development and thus reduce the impact of concurrent construction specific to the wind farm.

3.6.1 Turbine and Materials Transport Route

Material such as concrete will be sourced from a local quarry and will access the site using the haul routes outlined in Figure 2.9 via the N22. All other materials deliveries will access the site using these same routes via the N22. All deliveries of construction materials to the site will take place within the defined working hours of 7am – 7pm. It may be necessary on occasion, to commence works before 7am where concrete pours will be required to start earlier due to the volume of concrete required and the location of the concrete pour relative to the concrete supplier's batching plant. Main pours will be planned days and weeks in advance and will ensure disruption to work and school related traffic is avoided. The locations of all turbine foundations where large concrete pours will take place are off the public road and will be accessed by the internal site roads and will therefore eliminate the potential for queuing of trucks on the adjoining public road network. The typical vehicle type for delivery of construction materials to site with the exception of the wind turbines will be with standard heavy goods vehicles

(HGV). The proposed construction will run from August 2018 – January 2020 as summarised in Section 9 below. This is the timescale within which it is intended to use the public road network as outlined in Figures 2.1 & 2.9 to facilitate construction of the development.

A detailed traffic and transport management plan for turbine delivery will be prepared by the haulage company, when appointed and will be submitted to Cork County Council for approval. The plan will include:

- A delivery schedule.
- A schedule of control measures for exceptional wide and heavy loads.
- Details of temporary works or any other minor alteration identified.
- A dry run of the route using vehicles with similar dimensions.

The turbine transport route from the N22 National Secondary Road to the development sites are shown on Figure 2.9 also. The deliveries of turbine components to the site will be made in convoys of three to four vehicles at a time, and mostly at night when roads are quietest. Convoys will be accompanied by escorts at the front and rear operating a "stop and go" system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users. It is not anticipated that any section of the local road network will be closed during transport of turbines, although there will be some delays to local traffic at pinch points. During these periods it may be necessary to operate local diversions for through traffic. All deliveries comprising abnormally large loads will be made outside the normal peak traffic periods to avoid disruption to work and school-related traffic.

Prior to the Traffic Management Plan for turbine delivery being finalised, a full dry run of the transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the wind turbine transportation vehicles. This dry run will inform the final traffic management plan. All turbine deliveries will be provided for in a transport management plan which will have to be prepared in advance of the turbine delivery stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a transport management plan is typically submitted to the Planning Authority for agreement in advance of any abnormal loads using the local roads, and 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 roads and bridges along the haul route will be subject to a condition survey by a suitably qualified engineer both before and after construction. Protection measures for such infrastructure as specified by the appointed engineers report will be implemented in full prior to construction.

In the event of construction damage arising on any roads or bridges along the haul route it will be rectified immediately by the developer under consultation with the relevant roads engineer.

Prior to the delivery of oversized loads, the developer will engage with the local community to provided information on the scale, time and duration of such deliveries. This information will be informed by pre-delivery surveys which will be completed by

the suppliers. This information will be relayed to the local community by information leaflet and a website if deemed necessary.

3.7 Dust/Debris Control

Construction dust can be generated from many on-site activities such as excavation and backfilling. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, *i.e.* soil, sand, peat, etc and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route. The Measures below will also prevent construction debris arising on the public road network.

Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Environmental Clerk of Works (ECoW) for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All construction related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,
- All vehicles leaving the construction areas of the site will pass through a wheel cleansing area prior to entering the local road network.

3.8 Noise & Vibration Control

The operation of plant and machinery, including construction vehicles, is a source of potential impact that will require mitigation at all locations within the wind farm. Proposed measures 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 construction plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations;
- Plant with the potential of generating noise or vibration will be placed as far away from sensitive properties as permitted by site constraints.
- Regular maintenance of plant will be carried out in order to minimise noise emissions. In 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 Environmental Clerk of Works/appointed contractor's health and safety officer to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation; and,
- Local areas of the haul route will be condition monitored and maintained if necessary.

3.8.1 Monitoring of Blast Operations

Where blasting is employed as a means of rock extraction from the on-site borrow pits, it will be carried out between 10:00 hours and 17:00 hours, Monday to Friday only. All blast events will be the subject of independent monitoring to ensure the blasting operations are carried out within acceptable levels of vibration. The monitoring programme will be carried out by Irish Industrial Explosives Ltd. and will include for the assessment ground borne vibration and air overpressure. Condition no. 9 of the decision to grant planning permission for Cleanrath Wind Farm has set an emissions limit value (ELV) of 12mm/sec for vibration levels at sensitive locations during a blast event. The monitoring programme will also include the assessment of air overpressure to ensure that no individual air overpressure event exceeds an ELV of 125 dBL by more than 5dBL.

Monitoring will be carried out for each blast event. It is not anticipated that blasting will occur any more than once in seven days therefore the reduced vibration limit of 8mm/sec will not apply. The results of the monitoring of each blast will submitted to the local authority with two weeks of the event

3.9 Invasive Species Management

A baseline invasive species survey will be carried out at the wind farm site, grid connection route, haul route including all locations where accommodation works are required to accommodate turbine delivery to identify the presence and location of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) by a suitably qualified ecologist. If the presence of such species is found at or adjacent to the site, particularly in areas where its excavation may be required, an invasive species management plan will be prepared for the site to prevent the introduction or spread of any invasive species within the footprint of the works. An invasive species management plan, if required, will set out best practice control methods as summarised in the following sections.

3.9.1 General Best Practice Control Methods

The following general best practice guidelines in the treatment and control of invasive species during construction works are outlined below having regard to guidance document issued by the National Roads Authority (2010) Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads.

3.9.2 Good Practice on Site Management

Careful preparation of the site and planning of the works is crucial to successful treatment of invasive species. The following list of guidelines, which is not exhaustive, shall be followed by all on-site personnel. Only those who have been inducted into biosecurity measures on-site may enter the contaminated zones within the works areas. Should any risk of contaminated material escaping be observed by the site supervisor, the management plan for the site must be amended by an appropriately qualified person to mitigate against the risk.

3.9.3 Establishing Good Site Hygiene

The following measures are proposed to establish good site hygiene to ensure the control of any potential spread of invasive species during construction works:

- A risk assessment and method statement must be provided by the Contractor prior to commencing works.
- Fences will be erected around areas of infestation, as confirmed by test pits, and warning signs shall be erected.
- A designated wash-down area will be created, where power-washed material from machinery can be contained, collected and disposed of with other contaminated material. This area will contain a washable membrane or hard surface.
- Stockpile areas will be chosen to minimise movement of contaminated soil.
- Stockpiles will be marked and isolated.
- Contaminated areas which will not be excavated will be protected by a root barrier membrane if they are likely to be disturbed by machinery. Root barrier membranes will be protected by a layer of sand above and below and topped with a layer of hardcore.
- The use of vehicles with caterpillar tracks within contaminated areas will be avoided to minimise the risk of spreading contaminated material.
- An environmental clerk of works/suitably qualified ecologist will be on site to monitor and oversee the implementation of invasive species management plans.

The decontamination of vehicles will be undertaken as follows:

- Personnel may only clean down if they are familiar with the plant and rhizome material, and can readily identify it.
- Decontamination will only occur within designated wash-down areas.
- Vehicles will be cleaned using stiff-haired brush and pressure washers, paying special attention to any areas that might retain rhizomes e.g. wheel treads and arches.
- All run-off will be isolated and treated as contaminated material. This will be disposed of in already contaminated areas.

3.10 Waste Management

This section of the CEMP provides a Waste Management Plan (WMP) which outlines the best practice procedures during the excavation and construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage. Disposal of waste will be seen as a last resort.

This WMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the development.

3.10.1 Legislation

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act 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 development 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.

The Department of the Environment provides a document entitled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects.

3.10.2 Preliminary Plan

The Department of the Environment guidelines state that, at the design stage of the project, only a preliminary WMP is required,

> *"Formal production and presentation of the Plan may be at a later stage but a clear 'waste management philosophy' needs to be adopted…at the initial conceptual stage of the Project…"'*

This preliminary WMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the development.

3.10.3 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing in the following order:

Prevention and Minimisation:
The primary aim of the WMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

Reuse of Waste:
Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

Recycling of Waste:

There are a number of established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

At all times during the implementation of the WMP, disposal of waste to landfill will be considered only as a last resort.

3.10.4 Construction Phase Waste Management Plan

3.10.4.1 Description of the Works

The construction of the development will involve the construction of wind turbines, associated new site roads and upgrade of some existing roads and anemometry mast.

The wind turbines will be manufactured off site and delivered to site where on site assembly will occur.

The turbine and anemometry mast foundations will consist of stone excavated from the onsite borrow pits and a concrete base which will contain reinforcing steel. These concrete foundations will be shuttered with steel formwork specifically designed for the works and re-usable off site on similar projects.

The site roads will be constructed with rock won from the onsite borrow pits.

The waste types arising from the construction phase of the development are outlined in Table 3.1 below.

Table 3.1 Expected waste types arising during the Construction Phase

Materials type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Cardboard	Boxes, cartons	15 01 01
Composite packaging	Containers	15 01 05
Metals	Copper, aluminium, lead, iron and steel	17 04 07
Inert materials	Sand, stones, rock,	17 01 07
Mixed municipal waste	Daily canteen waste from construction workers, miscellaneous	20 03 01
Plastic	PVC frames, electrical fittings	17 02 03
Plastic packaging	Packaging with new materials	15 01 02
Wooden packaging	Boxes, pallets	15 01 03

Hazardous wastes that may occur on site during the construction phase of the development may include oil, diesel fuel, chemicals, paints, preservatives etc. All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. As mentioned above, hazardous wastes will be kept separate from non-hazardous wastes that contamination does not occur.

3.10.4.2 Waste Arisings and Proposals for Minimisation, Reuse and Recycling of Construction Waste

Construction waste will arise on the project mainly from excavation and unavoidable construction waste including material surpluses and damaged materials and packaging waste.

Appropriate measures should be taken to ensure excess waste is not generated during construction, including;

- Ordering of materials should be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock.
- Purchase of materials pre-cut to length to avoid excess scrap waste generated on site.
- Request that suppliers use least amount of packaging possible on materials delivered to the site.
- Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal
- Ensuring correct sequencing of operations.
- Use reclaimed materials in the construction works.

Hazardous waste will be kept separate from all other construction waste to prevent contamination and removed appropriately.

3.10.4.3 Waste Arising from Construction Activities

All waste generated on site that will be contained in waste skips at a waste storage area on site. This waste storage area will be kept relatively tidy with a waste skip clearly labelled to indicate the allowable material to be disposed of therein.

The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation. Therefore, all wastes streams generated on site will be deposited into a single skip. This waste material will be transferred to a MRF by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.

The waste generated from the turbine erection will be limited to the associated protective covers which are generally reusable. Considering the specialist nature of this packaging material the majority will be taken back by suppliers for their own reuse. Any other packaging waste generated from the turbine supply will be deposited in the on-site skip and subsequently transferred to the MRF.

It is not envisaged that there will be any waste material arising from the materials used to construct the road as only the quantity of stone necessary will be excavated from the borrow pits on an 'as needed' basis.

Site personnel will be instructed at induction that no under no circumstances can waste be brought to site for disposal in the on-site waste skip. It will also be made clear that the burning of waste material on site is forbidden.

3.10.4.4 Waste Arising from Decommissioning

The lengthy time frame between the completion of the construction phase and decommissioning will result in the only materials remaining on site at that time are

likely to be turbines and associated cabling and crushed stone used in construction of roads, hardstand, foundations etc.
The waste types arising from the decommissioning of the development are outlined in Table 3.2 below.

Table 3.2 Expected waste types arising during Decommissioning

Materials type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead, iron and rebar	17 04 07
Inert materials	Crushed stone,	17 01 07

3.10.4.5 Reuse

Many construction materials can be reused a number of times before they have to be disposed of:

- Concrete can be reused as aggregate for roads cable trench backfilling material.
- Plastic packaging etc. can be used to cover materials on site or reused for the delivery of other materials.
- Excavated peat can be reused for reinstatement of the areas around turbine foundations and adjacent to site roads.

3.10.4.6 Recycling

If a certain type of construction material cannot be reused on site then recycling is the most suitable option. The opportunity for recycling on site will be restricted to the associated packaging from the wind turbines.

All waste that is produced during the construction phase including dry recyclables will be deposited in the on-site skip initially and sent for subsequent segregation at a remote facility. The low volume of such material that is anticipated to be generated at the development is the justification for adopting this method of waste management.

3.10.4.7 Implementation

3.10.4.7.1 Roles and Responsibilities for Waste Management

Prior to the commencement of the development a Construction Waste manager will be appointed by the project team. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the development adheres to the management plan.

3.10.4.8 Training

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working on site during the construction phase of the project will be trained in materials management and thereby, should 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; and

- Identify and liaise with waste contractors and waste facility operators.

3.10.4.9 Record Keeping

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractor employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

3.10.4.10 Waste Management Plan Conclusion

The WMP will be properly adhered to by all staff involved in the project which will be outlined within the induction process for all site personnel. The waste hierarchy will always be employed to ensure that the least possible amount of waste is produced during the construction phase. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

4 DRAINAGE MANAGEMENT PLAN

The drainage management plan is essential to ensure that the details submitted as part of the environmental impact statement and as part of the further information response are fully implemented on site during the construction of the development. This report incorporates a detailed silt management plan and pollution prevention plan, and including appropriately drainage infrastructure including interceptor & collector drains, check dams and settlement ponds as required. A programme for drainage maintenance has been provided to ensure the drainage system operates effectively and within its capacity.

4.1 Wind Farm Drainage

The drainage management plan is essential to ensure that the details submitted as part of the environmental impact statement and as part of the further information response are fully implemented on site during the construction of the development. This report incorporates a detailed silt management plan and pollution prevention plan, and including appropriately-sized silt traps and/or settlement ponds as required.

4.1.1 Statement of Experience

McCarthy Keville O'Sullivan (MKO) has extensive wind farm drainage and general peatland drainage experience relevant to this project. MKO conducts, monitors and implements wind farm environmental impact assessment in respect of geology, hydrology and hydrogeology. The design interactions on wind farm developments between the site layout designer, the geotechnical engineer, and the civil engineer/hydrologist are seen as a key element to a successful and safe wind farm development. MKO has routinely fulfilled the role of Environmental Clerk of Works on many wind farm developments across Ireland over the past 5 years, including developments in Counties Cork, Clare, Galway & Mayo.

MKO's experience also covers the key area of water quality and drainage controls and mitigation during construction phase of wind farm developments. MKO work at EIS/planning stage in the development of the optimal site layout (which involves development of hydrological constraints maps and interaction with the overall design team), MKO follow-on with detailed drainage design and construction management for drainage during wind farm development/construction stage. This practical on-site experience is invaluable as it has led to development of improved preliminary and detailed drainage layouts and also many improvements/optimisations to standard peatland drainage mitigation measures.

MKO have been involved in the construction of the following wind farm projects over the past 6 years:

- Lettergunnet wind farm, Co. Galway; 17 No. Enercon E82 turbines.
- Knockduff Wind Farm, Co. Cork; 26 No. Nordex N90 turbines.
- Slievecallan Wind Farm, Co. Clare; 29 No. Nordex N90 turbines.
- Knockalough Wind Farm, Co. Galway; 10 No. Siemens S101 turbines
- MCB Wind Farm, Co. Mayo; 18 No. turbines (type to be confirmed)

In addition, the developer for the wind farm, PWWP Developments Ltd is part of the Enerco Energy group of companies which has over 300 MW operational installed capacity with a further 400MW, that is currently within planning or under construction.

4.2 Site Drainage

4.2.1 Introduction

The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the development. The development's drainage design has therefore been designed specifically with the intention of having no negative impact on the water quality of the site and its associated natural watercourses, and consequently no impact on downstream catchments and ecological ecosystems. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows or directly into artificial drainage ditches following the installation of silt traps, check dams and/or settlement ponds to these ditches. Any discharges over land, from the works areas will be made over vegetation filters maintaining a 50 metre distance from natural watercourses. Buffer zones around the existing natural drainage features have informed, wherever possible, the layout of the permitted development.

4.2.2 Existing Drainage Features

The routes of natural drainage features will not be altered as part of the development. Turbine locations have been selected to avoid natural watercourses. The development has also been designed to require only one new watercourse crossings. Some extensions to existing culverts may be required under existing roadways to manage drainage waters where road widening and upgrade is required These will be sufficiently sized to accommodate peak flows from storm events.

There will be no direct discharges to natural watercourses. Discharges from the works areas or from interceptor drains will be made over vegetated ground at a minimum of 50 metres distance from natural watercourses in the majority of cases. There are exceptions to this where existing or new roadways traverse, or run alongside, natural watercourses and it is necessary to provide drainage measures along such sections of roadway. Discharges will be made at a minimum distance of 20 metres from artificial drainage ditches unless otherwise specified in future revisions of the drainage design. Buffer zones around the existing natural drainage features have informed the layout of the development, and are indicated on the drainage design drawings.

Where artificial drains are currently in place in the vicinity of works areas, these drains may have to be diverted around the 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 an alternative drainage system to handle the same water has been put in place.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial 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. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

4.2.3 Drainage Design Principles

Drainage water from any works areas of the site will not be directed to any natural watercourses within the site. Two distinct methods will be employed to manage

drainage water within the site. 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 and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release.

The drainage design is intended to maximise erosion control, which is more effective than having to control sediment during high rainfall. Such a system also requires less maintenance. The area of exposed ground will be minimised. The drainage measures will prevent runoff from entering the works areas of the site from adjacent ground, to minimise the volume of sediment-laden water that has to be managed. Discoloured run-off from any construction area will be isolated from natural clean run-off.

A schematic line drawing of the proposed drainage design is presented in Figure 4.1 below.

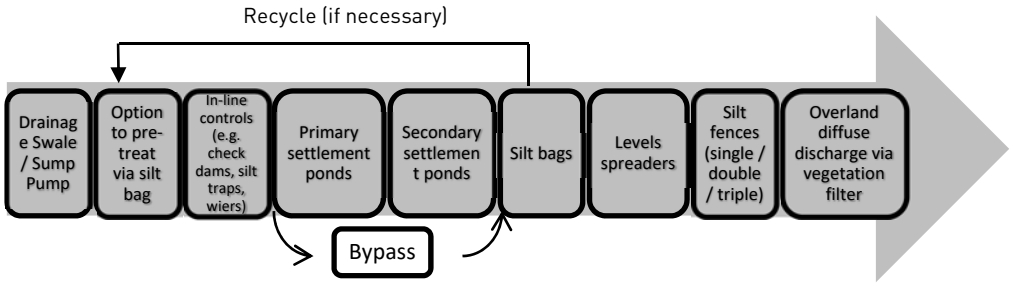


Figure 4.1 Schematic drawing of proposed drainage design

4.2.4 Silt Management & Pollution Prevention

The drainage management plan takes into account the principles of erosion and sediment control. Erosion control where runoff is prevented from flowing across exposed ground and sediment control where runoff is slowed to allow suspended sediment to settle are important elements in a drainage management plan. The drainage management plan has been prepared to provide erosion and sediment control to prevent sediment and potentially pollutant runoff entering watercourses during the construction phase. The drainage management plan will ensure the following:

- Implement erosion control to prevent runoff flowing across exposed ground and become polluted by sediments;
- Intercept and divert clean water runoff away from construction site runoff to avoid cross contamination of clean water with soiled water;
- Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads and hardstanding areas;
- Implement the erosion and sediment controls before starting site clearance works;
- Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the wind park infrastructure and keeping excavated areas to a minimum;
- Delay clearing of peat before construction begins rather than stripping the entire site months in advance particularly during road construction;
- Designate temporary stockpiling areas located away from drains and watercourses that are protected by silt trapping apparatus such as a geo-textile silt fence to prevent contaminated runoff where necessary; it is not envisaged that the stock piling areas will affect the drainage measures on site.

- Avoid working near watercourses during or after prolonged rainfall or an intense rainfall event and cease work entirely near watercourses when it is evident that pollution is occurring;
- Install a series of silt fences or other appropriate silt retention measure where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event;
- Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water;
- Install appropriate silt control measures such as silt-traps, check dams and settlement ponds;
- Provide recommendations for road cleaning where needed particularly in the vicinity of watercourses; and
- Controls need to be regularly inspected and maintained otherwise a failure may result, such as a build-up of silt or tear in a fence, which could lead to water pollution. Controls must work effectively until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.

4.2.5 Pre-Construction Drainage Management

There are existing drainage features across the site, and due to the agricultural nature of the area as well as the ongoing commercial forestry operations, runoff drains relatively freely to local drains. This existing drainage system will continue to function as it is during the pre-construction phase. Prior to commencement of works in sub-catchments across the site main drain inspections will be competed to ensure ditches and streams are free from debris and blockages that may impede drainage.

The Project Hydrologist/Design Engineer will attend the site before construction commences and will assist with micro siting of drainage controls as outlined in Section 5 of this CEMP. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated and settlement ponds constructed to eliminate any suspended solids within surface water running off the site.

4.2.6 Construction Phase Drainage Management Plan

A drainage management plan is presented in this section of the CEMP to provide an overview for planning compliance and tendering purposes. This includes descriptions of the various drainage controls to be employed during the construction phase and operational phase of the wind farm development in addition to the proposals outlined in Sections 3 & 7 of the EIS.

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 for drainage controls. The construction of the drainage system will start from the downstream sections and progress upstream, connecting conveyance systems with other drainage features as each development phase of the site 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 when sediment or other pollution may be a problem if upstream controls perform poorly, and the final phase of maximum incoming flows within the various catchments.

The implementation of a Schedule of Works Operation Record (SOWOR) will continue through the construction phase of the project. The SOWOR provides number of abandonment triggers which will ensure that site management are well informed as to the level of incident that will require the abandonment of works. The various triggers both pre-commencement and abandonment ensure best practice in terms of water quality management is maintained prior to commencement and during the various felling and construction phases.

Best practice and practical experience on other similar projects suggests that in addition to the drainage plans that are included in this CEMP, there are additional site based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. The mechanisms for interaction between these are outlined within Section 5 of this CEMP.

In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures outlined in Section 7 below, and to ensure protection of all watercourses.

4.2.6.1 Drainage Design

Detailed drainage design measures are included in the site layout drawings of the development included in Appendix 3 of this report. The drainage design employs the various measures further described below.

4.2.6.1.1 *Interceptor Drains*

Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains may have to be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting as conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains would be maintained in localised areas along the roadway with culverts under the roadway, which would allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. Similarly, in localised hollows where water is likely to be

funnelled at greater concentrations than on broader slopes, interceptor drains and culverts may be left in situ following construction.

Figure 4.2 shows an illustrative drawing of an interceptor drain.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.2.6.1.3 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a level spreader (see Section 4.2.6.1.4 below). Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader.

4.2.6.1.2 *Swales*

Drainage swales are shallow drains that will be used to intercept and collect run off from construction areas of the site during the construction phase. Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the development during the operational phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above. Figure 4.2 shows an illustrative example of a drainage swale.

Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.

Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.

4.2.6.1.3 *Check Dams*

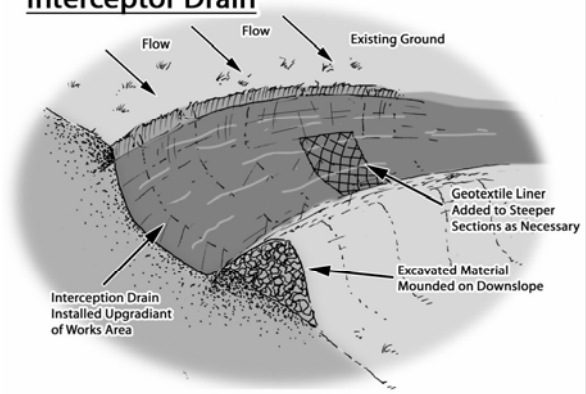
The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.

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 are being excavated. Check dams may also be installed in some of the existing artificial drainage channels on the site, downstream of where drainage swales connect in.

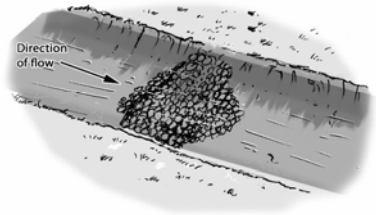
The check dams will be made up of straw bales or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales

Drainage Design Measures

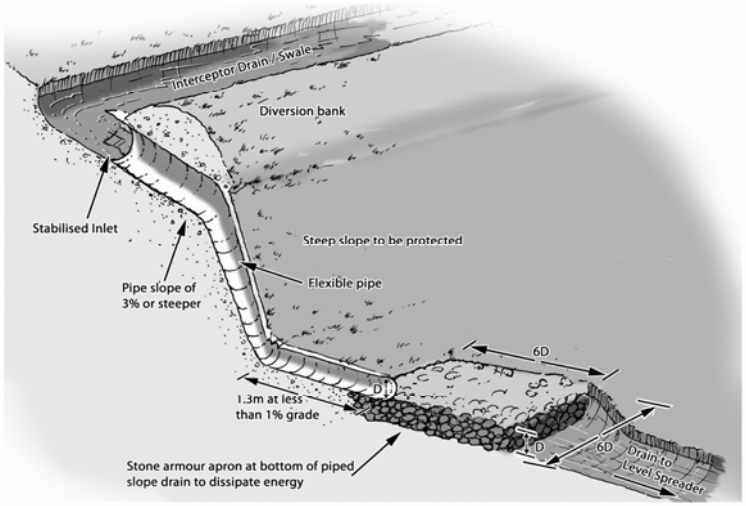
Interceptor Drain



Check Dam (Stone Dam in Drain)

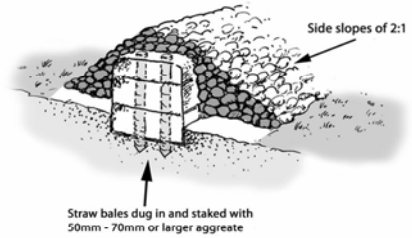


Slope Pipe Drain

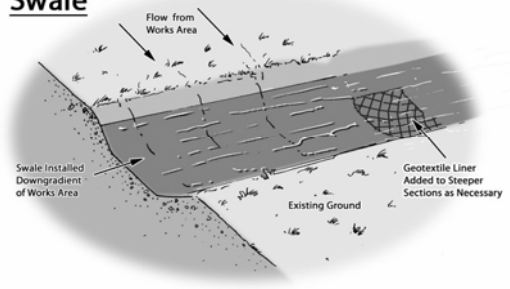


Check Dam

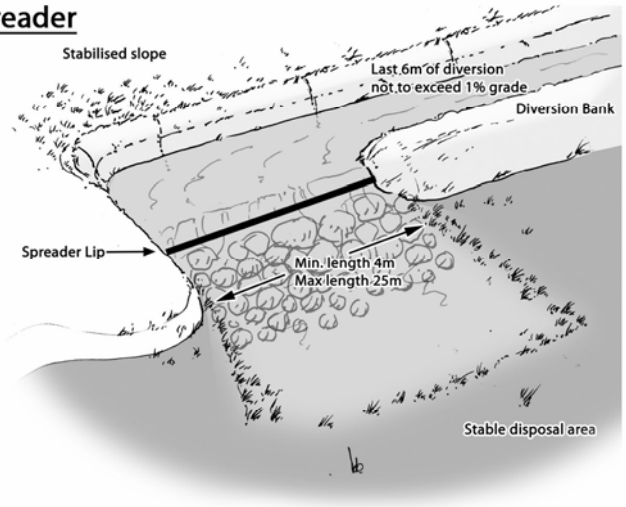
(Straw Bale & Stone Dam - Cross Section)



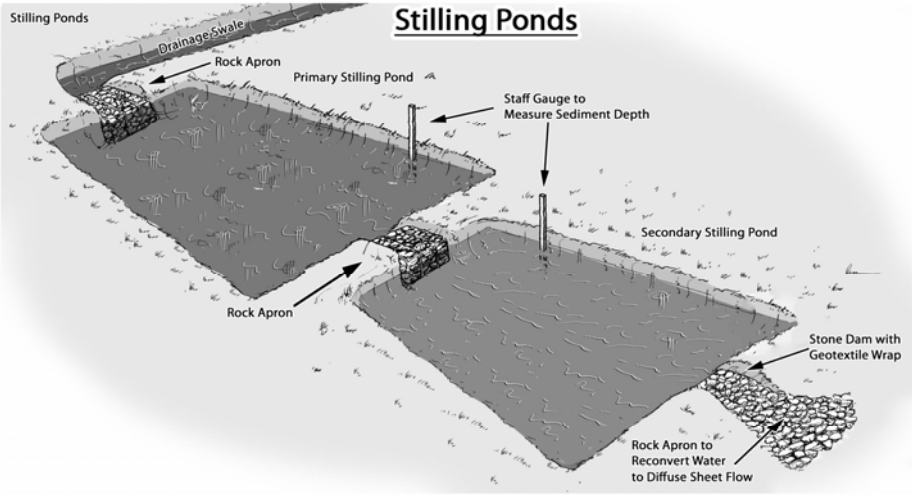
Swale



Level Spreader



Stilling Ponds



MAP TITLE: **Drainage Design Mesures**		MAP NO.: **Figure 4.2**	SCALE: **n/a**
PROJECT TITLE: **Cleanrath Wind Farm**			DATE: **13-06-2018**
DRAWING BY: **Owen Cahill**	CHECKED BY: **Michael Watson**	ISSUE NO.: **110721e-2018.06.14-F**	

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are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4-6 inch stone will be built up on either side and over the straw bale to a maximum height of 600mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator.

The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams.

Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

4.2.6.1.4 *Level Spreaders*

A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site.
The water carried in interceptor drains will not have come in contact with works areas of the site, and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be reconcentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion. Figure 4.2 shows an illustrative example of a level spreader.

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain (see Section 4.2.6.1.5 below) will be used to transfer the water to a suitable location.

The spreader lip over which the water will spill will 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 or ponding occurring behind the spreader. The top of the spreader lip will be 150mm above the ground behind it. The length of the spreader will be a minimum of four metres and a maximum length of 25 metres, with

the actual length of each spreader to be determined by the size of the contributing catchment, slope and ground conditions.

Clean four-inch stone can be placed on the outside of the spreader lip, and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area.

4.2.6.1.5 *Piped Slope Drains*

Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.

The piped slope drains will be semi-rigid corrugated pipes with a stabilised entrance and a rock apron at the outlet to trap sediment and dissipate the energy of the water. The base of drains leading into the top of the piped slope drain will be compacted and concavely formed to channel the water into the corrugated pipe. The entrance at the top of the pipe will be stabilised with sandbags if necessary. The pipe will be anchored in place by staking at approximately 3-4 metre intervals or by weighing down with compacted soil. The bottom of the pipe will be placed on a slope with a grade of less than 1% for a length of 1.5 metres, before outflowing onto a rock apron.

The rock apron at the outlet will consist of 6-inch stone to a depth equal to the diameter of the pipe, a length six times the diameter of the pipe. The width of the rock apron will be three times the diameter of the pipe where the pipe opens onto the apron and will fan out to six times the diameter of the pipe over its length. Figure 4.2 shows a diagrammatic example of a piped slope drain and rock apron.

Piped slope drains will only remain in place for the duration of the construction phase of the project. On completion of the works, the pipes and rock aprons will be removed and all channels backfilled with the material that was originally excavated from them.

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked for settlement, cracking and stability. Any seepage holes where pipe emerges from drain at the top of the pipe will be repaired promptly.

4.2.6.1.6 *Vegetation Filters*

Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.

Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration.

Vegetation filters will not be used in isolation for waters that are likely to have higher silt loadings. In such cases, silt-bearing water will already have passed through settlement ponds prior to diffuse discharge to the vegetation filters via a level spreader.

4.2.6.1.7 *Settlement Ponds*

Settlement ponds will be used to attenuate runoff from works areas of the site during the construction phase, and will remain in place to handle runoff from roads and hardstanding areas of the development 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 downgradient of any works areas.

Settlement ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond. 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 metres per second 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 metres per second. 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. Figure 4.2 shows an illustrative example of a settlement pond system.

Water will flow by gravity through the settlement pond system. The settlement ponds will be sized according to the size of the area they will be receiving water from, but will be sufficiently large to accommodate peak flows storm events. The settlement ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, settlement ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each settlement pond will be a minimum of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.

The embankment that forms the sloped sides of the settlement ponds will be stabilised with vegetated turves, which will have been removed during the excavation of the settlement ponds area, or will be seeded after installation.

Settlement ponds will be located towards the end of swales, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the settlement pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if there is adequate space and ground conditions allow. Otherwise, a swale will be used to carry water exiting the settlement pond system to a level spreader to reconvert the flow to diffuse sheet flow.

A water level indicator such as a staff gauge will be installed in each settlement pond with marks to identify when sediment is at 10% of the settlement pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity. Settlement ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

4.2.6.1.8 *Dewatering Silt Bags*

Dewatering silt bags are made of a high quality geotextile fabric which allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site.

Dewatering silt bags are an additional drainage measure that can be used downgradient of the settlement ponds at the end of the drainage swale channels and will be located, wherever it is deemed appropriate, throughout the site. The water will flow, via a pipe, from the settlement ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of peaty silt into any watercourse.

The dewatering silt bags that will be used will be approximately three metres in width by 4.5 metres (see Plate 4.1 and Plate 4.2 below) in length and will be capable of trapping approximately four tonnes of silt.

Plate 4.1 Silt Bag with water being pumped through

Plate 4.2 Silt bag under inspection

4.2.6.1.9 *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. Figure 4.3 below shows an illustrative diagram of the Siltbuster.

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.

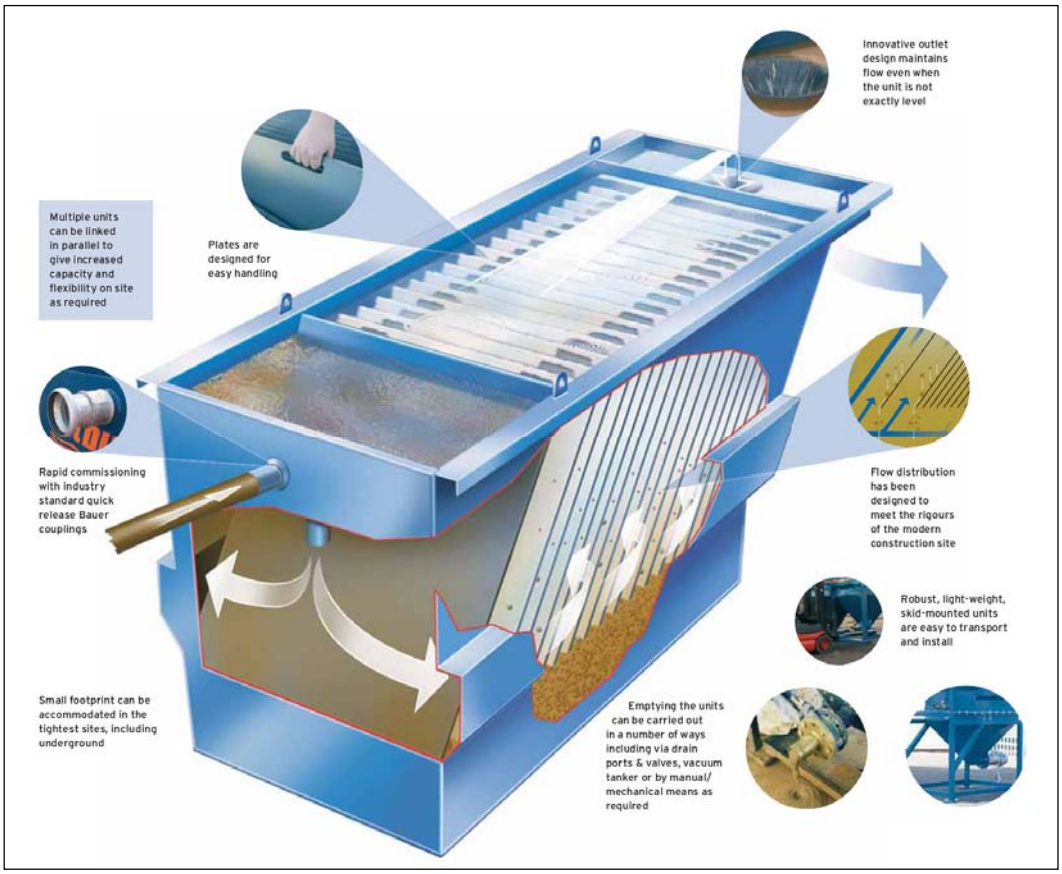


Figure 4.3 Siltbuster

4.2.6.1.10 *Culverts*

Where any new culverts of existing watercourses crossing are proposed, they will be the subject of consent applications to the Office of Public Works under Section 50 of the Arterial Drainage Act, 1945. Some culverts may be installed to manage drainage waters from works areas of the development, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge. The size of culverts will be influenced by the depth of the track or road 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 crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road 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.

4.2.6.1.11 *Silt Fences*

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone from natural watercourses, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the development. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the site layout drawings included in Appendix 3.

Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. The silt fence designs follow the technical guidance document *'Control of Water Pollution from Linear Construction Projects'* published by CIRIA (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series as outlined in Figure 4.4.

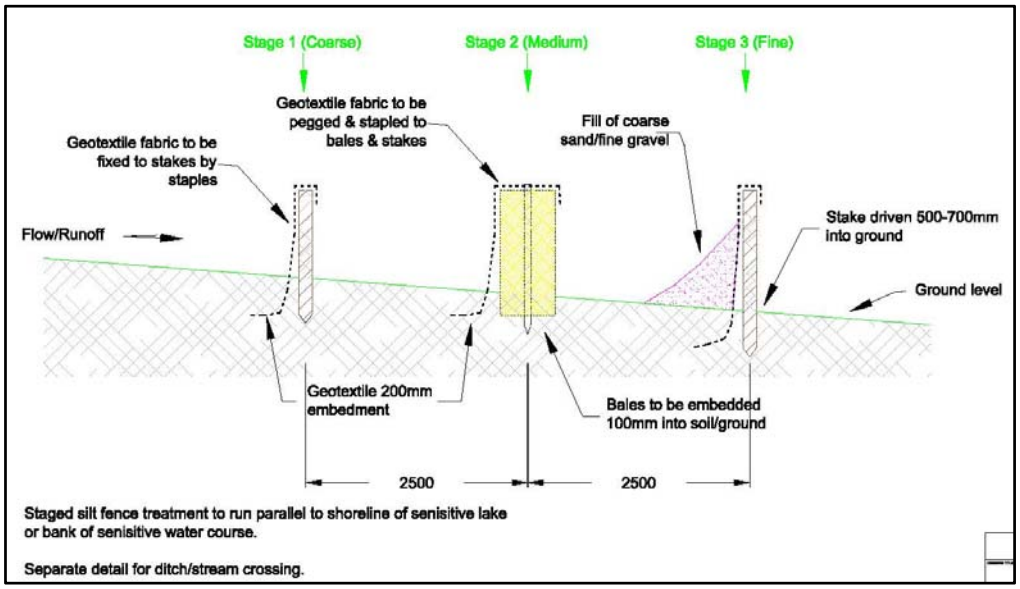


Figure 4.4 Silt Fence Detail

The Stage 1 (Coarse) silt fence will consist of a geotextile fabric such as Terram 1000 attached by staples to fixed stakes. The Terram sheets will be folded in an L shape with one metre extending horizontally in towards the works area. This horizontal section will be buried at a distance of approximately 150mm beneath a clean stone surface. Terram 1000 is a permeable fabric through which water can pass, but through which sediment particles cannot. It does however, impede water flow and can lead to the backing up of water and sediment, which reduce its effectiveness.

The Stage 2 (Medium) silt fence will consist of straw bales, embedded 100mm into the soil/ground and fixed in place with stakes. A geotextile fabric will be pegged and stapled to the straw bales and stakes.

The Stage 3 (Fine) silt fence will be similar to the Stage 1 fence, with the addition of a course sand and/or fine gravel at the base of the geotextile.

In the case of all three types of fence, the geotextile fabric will be embedded at least 150mm below the ground surface.

In a small number of locations around the site where space between the works areas and watercourses may be limited, silt fence designs will be combined to increase their effectiveness. For example, a straw bale silt fence (Stage 2) may be double wrapped with geotextile fabric (Stage 1) and course sand/fine gravel added on the upgradient side (Stage 3). See Figure 4.4. The most suitable type, number or combination of silt fences will be determined on a location specific basis for the various parts of the site. Site fences will be inspected regularly to ensure water is continuing to flow through the Terram, and the fence is not coming under strain from water backing up behind it.

4.2.6.2 Floating Road Drainage

In localised areas across the site, it may be necessary to construct some floating roads over peat. As outlined in the EIS, the floating road design will be used typically in areas with 2.0 metres of peat depth or greater. The most suitable type of road construction will be selected at the detailed design stage based on shear strength, slope, peat depth and factor of safety of the peat over which the road must traverse.

There will be no clean and dirty water drains constructed adjacent to floating roads as the additional loads imposed through the track could lead to underlying soft materials migrating to fill the created void, and potentially causing a weak point to be developed in the track. The drainage requirements are met by developing existing drains as clean water and dirty water drains and associated in line treatments.

Where sections of floating road are to be installed instead of excavated roads, cross drains will be installed beneath the road construction corridor to maintain existing clean water drainage paths. Large surface water drainage pipes will be placed at these locations below the level of the road sub-base. These drainage pipes will be extended each side of the road and cable trench construction corridor, along the paths of the existing drains.

With the exception of the installation of cross drains under the floating road corridor, minimal additional drainage will be installed to run parallel to the roads, in order to maintain the natural hydrology of the peatland areas over which the roads will be floated.

Floating roads minimise impact on the peat, particularly peat hydrology, and significantly reduce the volumes of peat requiring management as there is no excavation required and no peat arisings are generated.

4.2.6.3 Construction Compound Drainage

The principles of the drainage requirements in proximity to the construction compound are very similar to the principles adopted for access road and turbine base drainage.

Run-off from the construction compound will be controlled via a single outlet that will be installed at the edge of the compound. The single outfall point will be constructed to handle runoff from the compound and its immediate surrounds. Interceptor drains will already have been installed upgradient of the compound area before any excavation begins.

Run off from the single outlet point will be diverted via a drainage swale and on to a settlement pond prior to discharge over an area of vegetated ground.

4.2.6.4 Borrow Pit Drainage

While surface water will be contained in the borrow pit area, the design proposal is to control the level of water in the borrow pit area by creating a single point outlet from the basin-like area that will ensure the water does not overtop the pit area. Run-off from the borrow pit areas will be controlled via a single outlet that will be installed at the edge of the borrow pit. The single outfall point will be constructed to handle runoff from the borrow pit and its immediate surrounds. Interceptor drains will already have been installed upgradient of the borrow pit area before any extraction begins.
Run off from the single outlet point will be diverted via a drainage swale to a series of settlement ponds and onwards to a level spreader, which will convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The management of surface runoff from the peat disposal area by converting it to diffuse sheet flow removes the risk of contamination of surface water drains and removes the requirement for silt traps leading from this particular area.

During the construction phase of the project, it will be necessary to keep the borrow pit area free of standing water while rock is still being extracted. This will be achieved by using a mobile pump, which will pump water into the same series of drains, settlement ponds and level spreader, which will receive the water from the single outlet.

4.2.6.5 Tree Felling Drainage Controls

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling and to minimise soils disturbance;
- Use of buffer zones for aquatic zones (see Table 4.1 below);
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Ditches which drain from the area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps should be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour;
- Sediment traps will be sited outside of buffer zones and will have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of

away from all aquatic zones. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;

- In areas, particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction;
- All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimised and controlled;
- Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction should be suspended during periods of high rainfall;
- Timber should be stacked in dry areas, and outside a local 50m stream buffer zone. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works should be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Checking and maintenance of roads and culverts will be on-going through the felling operation;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone. Dedicated refuelling areas will be used during the felling works; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Table 4.1 Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very steep	(>30%)	20 m	25 m

The majority of the felling will be within and around the development footprint of turbine bases and access roads.

Best practice methods related to water incorporated into the forestry management and water quality protection measures will be derived from:

- Forestry Commission (2003) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009) Forest Operations & Water Protection Guidelines;
- Coillte (2009) Methodology for Clear Felling Harvesting Operations;

- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford; and,
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;

4.2.6.6 Cable Trench Drainage

Cable trenches are typically developed in short sections, thereby minimising the amount of ground disturbed at any one time, and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the upgradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the development, would be transported to one of the on-site borrow pit disposal areas or used for landscaping and reinstatements of other areas elsewhere on site.

On steeper slopes, silt fences, as detailed in Section 4.2.6.1.11 above will be installed temporarily downgradient of the cable trench works area, or on the downhill slope below where excavated material is being temporarily stored to control run-off.

4.2.7 Drainage 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 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 as summarised in Section 5.2 below) by the ECoW and/or the Project Hydrologist. The ECoW 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.

The abandonment triggers as set out in the SOWOR will be adopted as part of drainage inspections to ensure that any of the conditions prescribed under any abandonment trigger does not exist at the locations under inspection.

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 that may decrease the effectiveness of the drainage feature, will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the project to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected weekly during the construction phase of the project and following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified by reinforcement of the check dam. Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed

to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

A water level indicator such as a simple staff gauge or level marker will be installed in each settlement pond with marks to identify when sediment is at 50% of the pond's capacity. Sediment will be cleaned out of the settlement pond when it exceeds 50% of capacity. Settlement ponds will be inspected weekly during the construction phase of the project and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

On completion of the civil and excavations works at the site, the frequency of inspections and monitoring of the drainage infrastructure will reduce to monthly as deemed appropriate by the ECoW

4.2.8 Operational Phase Drainage Management

The project hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This operational phase drainage system will have been installed during the construction phase in conjunction with the road and hardstanding construction work as described below:

- Interceptor drains will be maintained up-gradient of all infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed through a series of in-line treatments prior to discharge.
- Swales/road side drains will be maintained to intercept and collect runoff from access roads and hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- Check dams will be maintained at regular intervals along interceptor drains and swales/roadside drains in order to reduce flow velocities and therefore minimise erosion within the system during storm rainfall events; and,
- Settlement ponds, emplaced downstream of swales and roadside drains, 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.

In operational phase of the wind farm, the reliance on the drainage system summarised above will become reduced as areas naturally revegetate. Once areas revegetate, this will result in a resumption of the natural drainage management that will have existed prior to any construction.

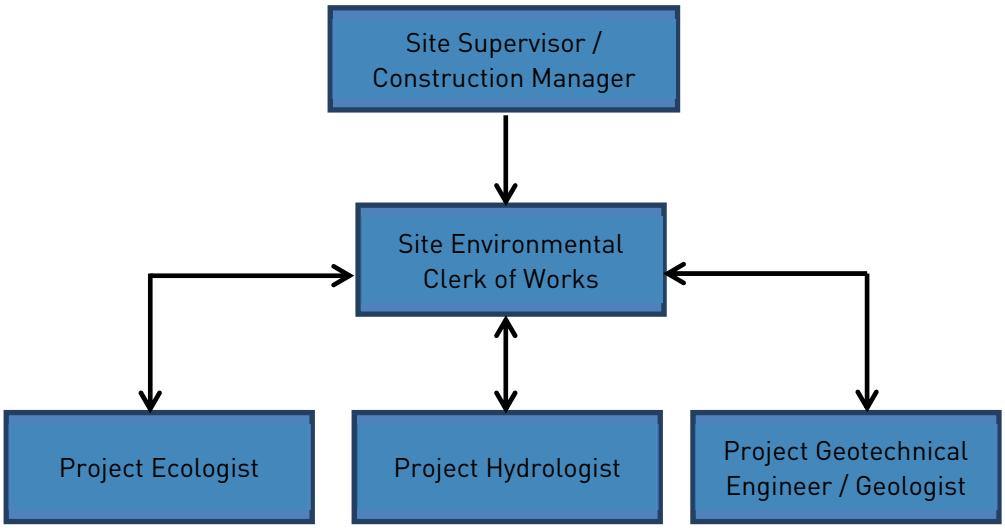
5 ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

5.1 Roles and Responsibilities

The Site Supervisor/Construction Manager and/or Environmental Clerk of Works (ECoW) are the project focal point relating to construction-related environmental issues.

In general, the ECoW will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters by reporting to and liaising with Cork County Council and other statutory bodies as required.

The ECoW will report directly to the Site Supervisor/Wind Farm Construction Manager. A Project Ecologist, Project Hydrologist and Project Geotechnical engineer will visit the site regularly and report to the Site Environmental Office. This structure provides a "triple lock" review/interaction by external specialists. An organogram structure for the construction stage is as follows:



Any requirement of the granted permission, for the works to be supervised by an engineer with professional indemnity insurance, who upon completion of the works, including site stability, shall certify the said works, will be adhered to. Such an engineer will be appointed to oversee and supervise the construction phase of the project.

5.1.1 Wind Farm Construction Manager/Site Supervisor

The Site Supervisor/Construction Manager will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements. The duties and responsibilities of the Site Supervisor/Construction Manager will include:

- Ensure that all works are completed safely and with minimal environmental risk;
- Approve and implement the Project CEMP and supporting environmental documentation, and ensure that all environmental standards are achieved during the construction phase of the project;

- Take advice from the ECoW on legislation, codes of practice, guidance notes and good environmental working practice relevant to their work;
- Ensure compliance through audits and management site visits;
- Ensure timely notification of environmental incidents; and,
- Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

5.1.2 Environmental Clerk of Works

The main contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Environmental Clerk of Works (ECoW), and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

The ECoW will report to the Site Supervisor/Construction Manager and will be responsible for the following:

- Preparation of the CEMP and supporting environmental documentation and review/approval of contractor method statements;
- Undertake inspections and reviews to ensure the works are carried out in compliance with the CEMP;
- Monitor the implementation of the CEMP, particularly all proposed/required Environmental Monitoring;
- Generate environmental reports as required to show environmental data trends and incidents and ensure environmental records are maintained throughout the construction period;
- Advise site management/contractor/sub-contractors on:
    - Prevention of environmental pollution and improvement to existing working methods;
    - Changes in legislation and legal requirements affecting the environment;
    - Suitability and use of plant, equipment and materials to prevent pollution;
    - Environmentally sound methods of working and systems to identify environmental hazards;
- Ensure proper mitigation measures are initiated and adhered to during the construction phase;
- Liaise with Project Ecologist, Project Hydrologist and Project Geotechnical Engineer to ensure regular site visits and audits/inspections are completed;
- Ensure adequate arrangements are in place for site personnel to identify potential environmental incidents;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities, initially by phone and followed up as soon as is practicable by e-mail;
- Support the investigation of incidents of significant, potential or actual environmental damage, and ensure corrective actions are carried out, recommend means to prevent recurrence and communicate incident findings to relevant parties; and,
- Identify environmental training requirements, and arrange relevant training for all levels of site based staff/workers.
- The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of

construction, and may be further adjusted as required during the course of the project.

5.1.3 Project Ecologist

The Project Ecologist will report to the ECoW and is responsible for the protection of sensitive habitats and species encountered during the construction phase of the wind farm. The Project Ecologist will not be full time on site but will visit the site as required during construction.

The responsibilities and duties of the Project Ecologist will include the following:

- Review and input to the final construction phase CEMP in respect of ecological matters;
- In liaison with ECoW, oversee and provide advice on all relevant ecology mitigation measures set out in EIS and planning permission conditions;
- Regular inspection and monitoring of the development, through all phases of construction/operation and provide ecological advice as required;
- Oversee the implementation of the Hen Harrier Conservation & Habitat Enhancement Plan in liaison with ECoW, developer and landowners; and,
- Carry out ecological monitoring and survey work as may be required by the planning authority.

5.1.4 Project Hydrologist

The Project Hydrologist will report to the ECoW and is responsible for inspection and review of drainage and water quality aspects associated with construction of the wind farm. The Project Hydrologist will not be full time on site but will visit the site at least once a month during construction.

The responsibilities and duties of the Project Hydrologist will include the following:

- Assist in compiling a detailed drainage design before construction commences and attend the site to set out and assist with micro siting of proposed drainage controls. This will be completed over several site visits at the start of the construction phase;
- Review and input to the final construction phase CEMP in respect of drainage and water quality management;
- Following the initial stage of drainage construction regular site visits will be required, at least once a month, to complete hydrological and water quality audits and reviews and report any issues noted to the Site Supervisor/Construction Manager; and,
- Complete ongoing inspection and monitoring of the development, particularly in areas of drainage control, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIS, and in relevant planning conditions.

5.1.5 Project Geotechnical Engineer / Geologist

The Geotechnical Engineer or Project Geologist will report to the ECoW and is responsible for inspection and review of geotechnical aspects associated with construction of the wind farm. The Geotechnical Engineer will not be full time on site but will visit site at least once a month during construction phase.
The responsibilities and duties of the Geotechnical Engineer or Geologist will include the following:

- Visit site regularly, or at least once a month during the construction phase, to complete geotechnical audits and reviews and report any issues to the Site Supervisor/Construction Manager;
- Ensuring that identified hazards are listed in the Geotechnical Risk Register and that these are subject to ongoing monitoring; and,
- Ongoing inspection and monitoring of the development, particularly in areas of peatland and at borrow pits, and peat repository areas, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIS, and in relevant planning conditions.

5.2 Water Quality and Monitoring

The water monitoring programme was prepared in accordance with the following legislation:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001), S.I. No. 30 of 2000, the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/373/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- S.I. No. 600 of 2001 Planning and Development Regulations, 2001;
- S.I. No. 94 of 1997 European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293 of 1988 Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC). Since 2000 water management in the EU has been directed by the Water Framework Directive (WDF). The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by 2015. Water bodies comprise both surface and groundwater bodies and the achievement of 'Good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programmes of measures to achieve the objectives of the WFD have either been completed or are ongoing. In 2015 it will fully replace a number of existing water related directives, which are successively being repealed, while implementation of other Directives (such as the Habitats Directive 92/43/EEC) will form part of the achievement of implementation of the objectives of the WFD;
- S.I. No. 41 of 1999 Protection of Groundwater Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 249 of 1989 Quality of Surface Water Intended for Abstraction (Drinking Water), resulting from EU Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (repealed by 2000/60/EC in 2007);

- S.I. No. 439 of 2000 Quality of Water intended for Human Consumption Regulations and S.I. No. 278 of 2007 European Communities (Drinking Water No. 2) Regulations, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and WFD 2000/60/EC (the Water Framework Directive);
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations;
- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010; and,
- European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

The water quality programme combines the use of laboratory analysis, water quality instrumentation and visual inspection to develop a comprehensive schedule of monitoring of all watercourse that exist both at the site and the surrounding area. The information collected by this schedule of water monitoring, particularly the continuous turbidity monitoring will inform the pre-commencement triggers in the SOWOR before works commence in an area. The use of continuous turbidity monitors both upstream and downstream of the site will provide instant data on the quality of water in which they are deployed and will be equipped with an alarm system to alert site management if a peak in turbidity occurs as set out in the SOWOR.

This water monitoring programme will be the subject of independent review by the supervising hydrologist who will provide the necessary guidance on the monitoring requirements. The water monitoring programme is outlined in the following sections.

5.2.1 Pre-Construction Drainage Inspection and Monitoring

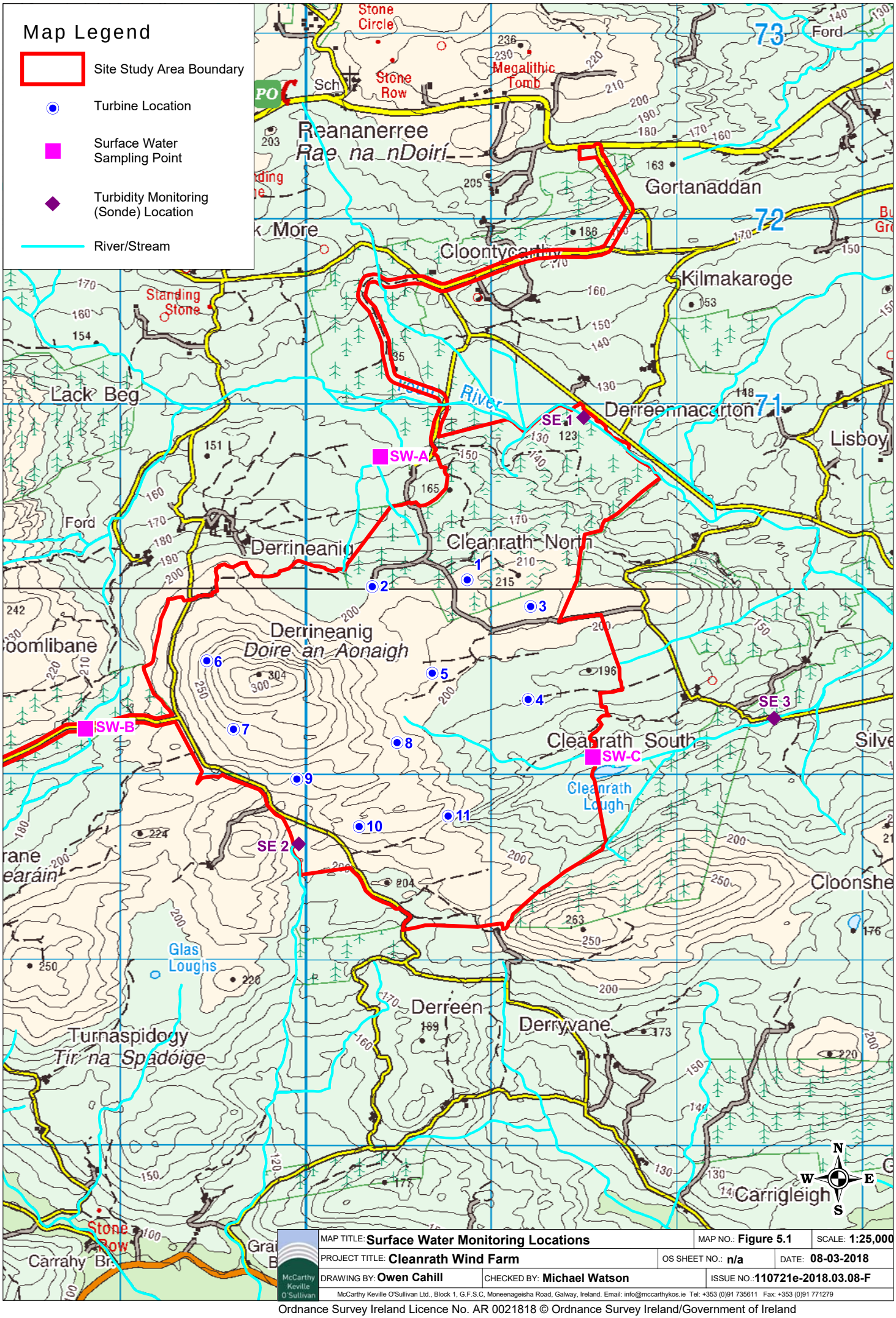
There is an existing drainage network across the site and runoff drains relatively freely to local watercourses and streams. This existing drainage system will continue to function as it is during the pre-construction phase.

However, prior to commencement of works in sub-catchments across the site main drain inspections will be competed to ensure ditches and streams are free from debris and blockages that may impede drainage. These inspections will be done on a catchment by catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously.

Monthly Laboratory Analysis Sampling: Baseline laboratory analysis for the parameters listed below with relevant regulatory limits and Environmental Quality Standards (EQSs) will be undertaken for each watercourse *e.g.* at SW1 – SW3 as outlined in Figure 5.1. This will not be restricted to just these three locations and further sampling points will be added as deemed necessary by the ECoW in consultation with the project hydrologist.

5.2.2 Construction Phase Drainage Inspection and Monitoring:

Inspection sheets and photographic records will be kept on site. Inspection points will include the in-situ field monitoring point locations and the laboratory analysis sampling points. Inspection points will depend on works being completed within the catchment upstream of the identified monitoring locations. Visual inspections will also be completed after major rainfall events, *i.e.* after events of >25mm rainfall in any 24-hour period and data including photographs will be collected by visual inspections and independently assessed by the supervising hydrologist who will monitor and advise on the records being received.



MAP TITLE: **Surface Water Monitoring Locations**		MAP NO.: **Figure 5.1**	SCALE: **1:25,000**
PROJECT TITLE: **Cleanrath Wind Farm**		OS SHEET NO.: **n/a**	DATE: **08-03-2018**
DRAWING BY: **Owen Cahill**	CHECKED BY: **Michael Watson**		ISSUE NO.: **110721e-2018.03.08-F**

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The following periodic inspection regime will be implemented:

- Daily general visual inspections of site operations and inspections of all watercourses within the site and in the surrounding area by the ECoW or a suitably qualified and competent person as delegated by the ECoW;
- Inspections to include all elements of drainage infrastructure to ensure the system is operating correctly and to identify and 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 daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement;
- Event based inspections by the ECoW as follows:
    - >10 mm/hr (*i.e.* high intensity localised rainfall event);
    - >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
    - Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week).
- Monthly site inspections by the Project Hydrologist/ ECoW during construction phase; and,
- Quarterly site inspections by the Project Hydrologist/ ECoW after construction for a period of one year following the construction phase.
- A written record will be maintained or available on-site within this Construction Environmental Management Plan (CEMP) which will be maintained on-site during the construction phase.

5.2.2.1 In-situ field monitoring:

Field chemistry measurements of unstable parameters, (pH, conductivity, dissolved oxygen and temperature) will be taken at all monitoring locations outlined in Figure 5.1. These analyses will be carried out by either the ECoW or the Project Hydrologist. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The supervising hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

5.2.2.2 Monthly Laboratory Analysis Sampling

Laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will continue throughout the construction phase for each watercourse *e.g.* at SW-A – SW-C as outlined in Figure 5.1. All samples will be sent for analysis to an independent laboratory. This sampling will also be completed on an event based basis, *i.e.* after major rainfall events (>25mm rainfall in any 24-hour period). The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

5.2.2.3 Continuous Turbidity Monitoring

Turbidity monitors or sondes will be installed at locations surrounding the wind farm site as outlined in Figure 5.1. The sondes will provide continuous readings for turbidity levels in the watercourse. This equipment will be supplemented by daily visual monitoring at their locations as outlined in the sections below.

5.2.2.4 Monitoring Parameters

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European

Communities Environmental Objectives (Surface Waters) Regulations, S.I. No. 722 of 2003 European Communities (Water Policy) Regulations and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The likely suite of determinants will include:

- pH (field measured)
- Electrical Conductivity (field measured)
- Temperature (field measured)
- Dissolved Oxygen (field measured)
- Turbidity (NTU) (sonde measured)
- Flow (m/s)
- Total Suspended Solids (mg/l)
- Ammoniacal Nitrogen as NH3 (mg/l)
- Ammoniacal Nitrogen as NH4 (mg/l)
- Nitrite (NO2) (mg/l)
- Ortho-Phosphate (P) (mg/l)
- Nitrate (NO3) (mg/l)
- Phosphorus (unfiltered) (mg/l)
- Chloride (mg/l)
- BOD

5.2.3 Flow Monitoring

Condition 14 of the decision to grant planning permission for the development requires hydrological monitoring (water level and flow volume) within the Toon and the Lee catchments downstream of the Cleanrath Wind Farm site. The monitoring programme, which has been prepared by Hydro Environmental Services, a specialist hydrological, hydrogeological and environmental practice, has identified 6 no. monitoring points within both the Toon and Lee catchments. The location of the monitoring points will comprise of 3 no. existing and 3 no. additional monitoring points.
There are existing hydrological monitoring stations already in place at stations 19014, 19023, and 19043 within these catchments (Figure 5.2). Station 19014 is a gauged station, and the other two monitoring points are staff gauges. Eight of the eleven turbines for the Cleanrath Wind Farm are located in the Toon catchment, and the remaining 3 turbines are located within a sub-catchment of the River Lee, and also drains into Lough Allua. This lake in itself is a considerable buffer to flows and is a major attenuation feature within the overall Lee catchment upstream of the Gearagh Special Area of Conservation (SAC).

The existing hydrological monitoring on the catchments will provide historical data (at and in excess of 12 months) and it is proposed to use this data and supplement it with the 3 new stations as set out in Section 5.2.3.1 below. At least 12 flow monitoring records at each new gauge location will be taken by Hydro Environmental Services in the 3 months prior to construction in order to develop stage-discharge relationships at the monitoring locations. This will allow for a significant and appropriate level of flow and volume records to be compiled pre-construction. It is also proposed to continue the monitoring for 5 years post construction as required by the planning condition.

5.2.3.1 Proposed Hydrological Flow Monitoring

Three new locations are proposed (SW 1, SW 2, and SW 3). These will supplement the existing stations within the Lee and Toon catchments. The location of the proposed water level gauges stations may be the subject of micro siting of the locations shown on Figure 5.2 in order the best possible results. The monitoring devices will be OTT Orpheus mini probes (or equivalent) that record water level at selected/pre-

programmed time intervals (15 minutes intervals). Brochures for this device, which is commonly used by OPW) are attached as Appendix 4. Example photographs of installed OTT monitoring device are included here as Plate 5.1 & 5.2

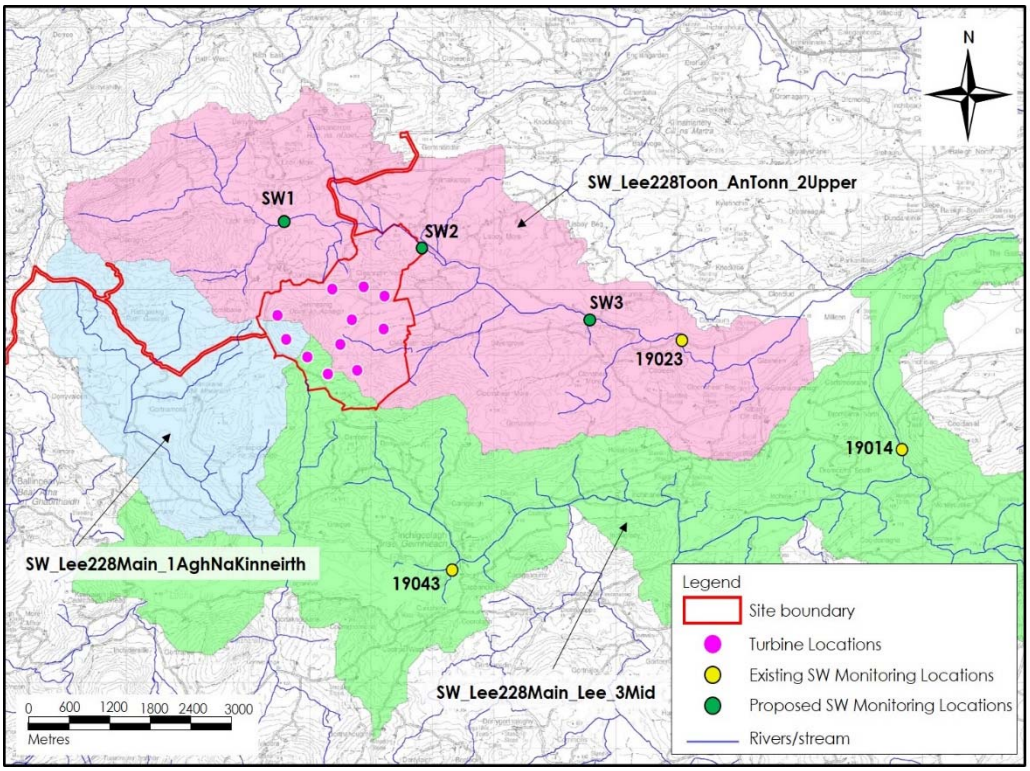

Figure 5.2 Proposed Gauging Station Locations

Plate 5.1 Example of Gauging Stations

Plate 5.2 Example of Gauging Stations

It is proposed to develop stage-discharge relationships at the monitoring locations by completing at least 12 flow monitoring records at each new gauge location in the first 3 months, and then supplementing these initial flow measurements with further monitoring when each future download is completed. The flow monitoring events will seek to provide a broad range of flows from low flow to high flow events, the latter being subject to health & safety restrictions.

It is proposed to download the devices every 3 months over the duration of the monitoring period. Once downloads are completed the data will be QA/QC checked, converted to flow volumes using the stage-discharge relationships, and a detailed monitoring report will be compiled. These reports will then be submitted to the Planning Authority.

5.2.3.2 Stage-Discharge Relationship

A stage-discharge relationship (or rating curve) is a curve, created using a number of individual measurements, which expresses the relationship between the stage (water level) and discharge (the flow) in an open channel at a given cross-section. In order to establish a rating curve, measurements are required over a range of flows. An example of a stage-discharge relationship is shown as Figure 5.3. A stage-discharge relationship allows continuous water level measurement to be converted to discharge (flow) volumes.

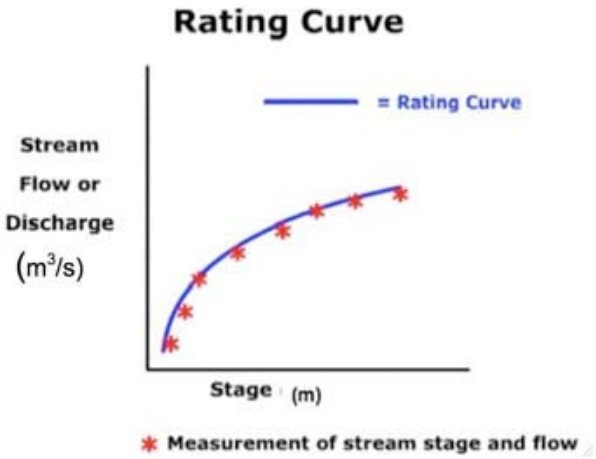

Figure 5.3 Example Rating Curve

5.2.3.3 Pre-commencement Monitoring Period

The proposed hydrological monitoring programme is considered extensive and far greater in scale and scope to those of other traditional wind farm or other projects. The proposal includes for a pre-construction monitoring period of 12 months data from the existing stations augmented with data from the proposed new monitoring stations of at least 3 months.

In order to provide a suitable level of pre-construction data, it is proposed to complete an initial intensive period of spot measurements (to develop stage-discharge relationships) and continuous water level monitoring over an initial period of 3 months. All data will then be collated and assessed at that time, and it is proposed to use the existing hydrological dataset from gauge 19014 (as a donor site) to supplement and extend (backwards for 12 months or in excess of 12 months as required) the data from the new gauge locations (SW 1, SW 2 and SW 3).
Flow monitoring will continue for a period of five years post commissioning of the wind farm and monitoring reports will continue to be made available to the Council for public inspection.
All pre-construction, construction phase, and 5 years post-construction, hydrological monitoring data collected data will be provided to Cork County Council in hard copy and digital formats. All final QA/QC verified digital data, from each phase of monitoring, will be provided on DVD and via a publicly accessible cloud-based database system/website.

5.2.4 Surface Water Monitoring Reporting

Visual inspection and laboratory analysis results of water quality monitoring shall assist in determining requirements for any necessary improvements in drainage controls and pollution prevention measures implemented on site.

It will be the responsibility of the Environmental Clerk of Works to present the ongoing results of water quality and weather monitoring at or in advance of regular site meetings.

Reports on water quality will consider all field monitoring and visual inspections, and results of laboratory analysis completed for 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 that has been observed, whether any effects are attributable to construction activities and what remedial measures or corrective actions have been implemented.

All water monitoring reports will be available to Cork County Council on request at any stage during the construction phase

5.2.5 Post-Construction Monitoring

Monthly sampling for laboratory analysis for a range of parameters as adopted during pre-commencement and construction phases will continue for 6 months after construction is complete. Flow monitoring will continue for a period of five years post commissioning of the wind farm. The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

5.3 Environmental Awareness and Training

5.3.1 Environmental Induction

The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site. Where necessary, the Environmental Induction will as a minimum include:

- A copy of the Environmental Management Site Plans and discussion of the key environmental risks and constraints;
- An outline of the CEMP structure;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the environmental Incident Management Procedure.

5.3.2 Toolbox Talks

Tool box talks would be held by the ECoW/Construction Manager at the commencement of each day, or at the commencement of new activities. The aims of the tool box talks are to identify the specific proposed work activities that are scheduled for that day. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the day's activities. The toolbox talks will include training and awareness on:

- Ecological Sensitivities on site
- Buffers to be upheld – watercourses, archaeology, ecology
- Sediment and Erosion Control

- Good site practice
- On-site Traffic Routes and Rules
- Keeping to tracks – vehicle rules
- Strictly adhering to the development footprint
- Fuel Storage
- Materials and waste procedures

Site meetings would be held on a regular basis involving all site personnel. The objectives of a site meeting is to discuss the coming weeks proposed activities and identify the relevant work method statements and sub plans that will be relevant to that week's activities. Additionally, any non-compliance identified during the previous week would also be discussed with the aim to reduce the potential of the same non-compliance reoccurring.

6 EMERGENCY RESPONSE PLAN

An Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

6.1 Emergency Response Procedure

The Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency. The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP will require updating and submissions from the contractor/PSCS and suppliers as the project progresses. Where sub-contractors that are contracted on site are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's ERP within this within this document.

This is a working document that requires updating throughout the various stages of the project.

6.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The Site 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 6.1. In a situation where the Site Manager is unavailable or incapable of coordinating the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in Figure 6.1. This will be updated throughout the various stages of the project.

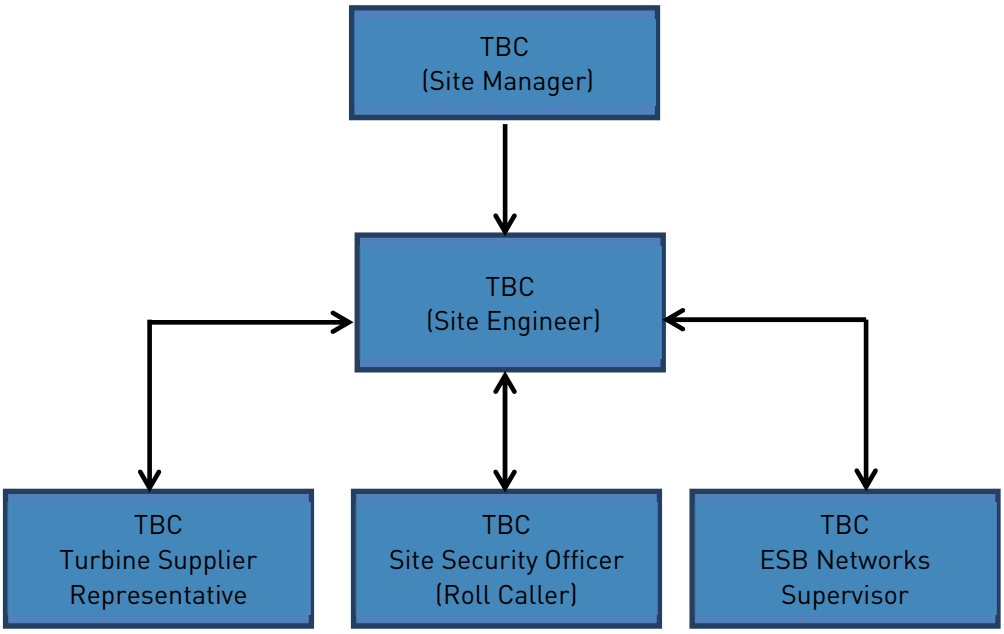

Figure 6.1 Emergency Response Procedure Chain of Command

6.1.2 Initial Steps

In order to establish the type and scale of potential emergencies that may occur, the following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

Table 6.1 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, and ladders	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

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 6.1 the Site Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/fog horn that activates an emergency evacuation on the site. The site evacuation procedure is outlined in Section 6.1.3.
- Make safe the area if possible and ensure that there is 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 he is unable to do so. If delegating the task, ensure that they follow the procedures for contacting the emergency services as set out in Section 6.2.1.
- 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 as provided in Section 6.2.2.
- Contact the next of kin of any injured personnel where appropriate. The procedure for this is outlined in Section 6.2.3.

6.1.3 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 fog horn 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 Manager when all personnel have been accounted for. At this time, the Site Manager will decide the next course of action which be determined by the situation that exists at that time. The Site Manager 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.

6.1.4 Excessive Peat Movement

Where there is excessive peat movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

1. All construction activities shall cease within the affected area.
2. Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
3. Re-commencement of limited construction activity shall only start following a cessation of movement and the completion of a geotechnical risk assessment by a geotechnical engineer.

6.1.5 Onset of Peat Slide

Where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out.

1. On alert of a peat slide incident, all construction activities will cease and all available resources will be diverted to assist in the required mitigation procedures.
2. Where considered possible action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain, the possible short run-out length to watercourses, speed of movement and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.
3. For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

6.1.6 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction and operational phase of the project. Oil/Fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of

such an incident occurring cannot be over emphasised. 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 possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The ECoW 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 ECoW will notify the appropriate regulatory body such as Cork County Council, Department of Communication, Energy and Natural Resources (DCENR) and Department of Environment, Community and Local Government (DECLG), if deemed necessary.

Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The ECoW must be immediately notified.
- If necessary, the ECoW will inform the appropriate regulatory authority. The appropriate 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 an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site (pSPA or cSAC), the ECoW will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor. These records will be made available to the relevant authorities such as Cork County Council, DCENR and DECLG if required.

The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Main Contractor as appropriate.

6.2 Contacting the Emergency Services

6.2.1 Emergency Communications Procedure

In the event of requiring the assistance of the emergency services the following steps should be taken:

Stay calm. It's important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, is an emergency. The dispatcher or call-taker knows that and will try to move things along quickly, but under control.

Know the location of the emergency and the number you are calling from. This may be asked and answered a couple of times but don't get frustrated. Even though many emergency call centres have enhanced capabilities meaning they are able to see your location on the computer screen they are still required to confirm the information. If for any reason you are disconnected, at least emergency crews will know where to go and how to call you back.

Wait for the call-taker to ask questions, then answer clearly and calmly. If you are in danger of assault, the dispatcher or call-taker will still need you to answer quietly, mostly "yes" and "no" questions.

If you reach a recording, listen to what it says. If the recording says your call cannot be completed, hang up and try again. If the recording says all call takers are busy, *WAIT*. When the next call-taker or dispatcher is available to take the call, it will transfer you.

Let the call-taker guide the conversation. He or she is typing the information into a computer and may seem to be taking forever. There's a good chance, however, that emergency services are already being sent while you are still on the line.

Follow all directions. In some cases, the call-taker will give you directions. Listen carefully, follow each step exactly, and *ask for clarification* if you don't understand.

Keep your eyes open. You may be asked to describe victims, suspects, vehicles, or other parts of the scene.

Do not hang up the call until directed to do so by the call taker.

Due to the remoteness of the site it may be necessary to liaise with the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

6.2.2 Contact Details

A list of emergency contacts is presented in Table 6.2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 6.2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – Macroom Health Centre	026 20650
Hospital – Cork University Hospital	021 492 2000
ESB Emergency Services	1850 372 999
Bord Gáis Emergency	1850 20 50 50
Gardaí –Local Garda Station. Ballingeary	026 47002
Health and Safety Co-ordinator – Chris Murnane Mid-Cork Electrical Ltd	021 7336034
Health and Safety Authority	1890 289 389
Project Supervisor Construction Stage (PSCS): Mid-Cork Electrical Ltd	021 7336034
Project Supervisor Design Stage (PSDP): Ionic Consulting	01 8455031
Client. Cleanrath Windfarm Ltd	021 7336034

6.2.3 Procedure for Personnel Tracking

All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.
In the event of a site operative becoming in an emergency situation where serious injury has occurred and hospitalisation has taken place, it will be the responsibility of the Site Manager or next in command if unavailable to contact the next of kin to inform them of the situation that exists.

6.3 Induction Checklist

Table 6.3 provides a list of items highlighted in this ERP which must be included or obtained during the mandatory site induction of all personnel that will work on the site. This will be updated throughout the various stages of the project.

Table 6.3 Emergency Response Plan Items Applicable to the Site Induction Process

ERP Items to be included in Site Induction	Status
All personnel will be made aware of the evacuation procedure during site induction	
Due to the remoteness of the site it may be necessary to liaise with and assist the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.	
All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.	

7 MITIGATION PROPOSALS

All mitigation measures relating to the pre-commencement, construction and operational phases of the permitted development were set out in the relevant chapters of the EIS and all other relevant documents submitted as part of the planning permission application issued to Cork County Council.

This section of the CEMP groups together the mitigation measures presented in the EIS as well as Further Information submitted to Cork County Council and An Bord Pleanála. The Mitigation Measures are presented in the following pages.

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 future phases of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits

Table 7.1 Mitigation Measures

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
Pre-Commencement Phase				
MM1	EIS Chapter 3	The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIS and the CEMP. Their implementation will be overseen by supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation.		
MM2	EIS Chapter 3	The removal and disposal of wastewater from the site will be carried out by a fully permitted waste collector holding valid Waste Collection Permits as issued under the Waste Management (Collection Permit) Regulations, 2007. Information on the appointed permitted contractor and evidence of a maintenance contract will be submitted to the Planning Authority prior to any construction works taking place.		
MM3	EIS Chapter 3, CEMP	All site activities will be provided for in an Construction Environmental Management Plan, prepared prior to the commencement of any operations onsite. The CEMP will set out all measures necessary to ensure works are carried out in accordance with the mitigation measures set out in the EIS, and will set out the monitoring and inspections procedures and frequencies.		
MM4	EIS Chapter 3	All materials and equipment necessary to implement the drainage measures outlined above, will be brought on-site in advance of any works commencing.		
MM5	EIS Chapter 3	The works programme for the groundworks part of the construction phase of the project will also take account of weather forecasts, and predicted rainfall in particular. Large excavations, large movements of overburden or large-scale overburden 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.		
MM6	EIS Chapter 3	Any underground services encountered along the cable route will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum		

		clearance of 300mm will be required between the bottom of the ducts and the service in question.		
MM7	EIS Chapter 5	A Habitat Restoration and Enhancement Plan will be prepared to restore and enhance areas of degraded blanket bog and acid flush habitat within the windfarm site. This will include restorations of areas of these habitats that are affected by temporary construction impacts.		
MM8	EIS Chapter 5	Even though works required for development are exempt from the condition stipulated in the Wildlife Acts, no felling of conifers, individual trees or bushes will be carried out during the general bird breeding season (the 1st of March to the 31st of August inclusive). In this way, disturbance to birds that have may have started to nest in any affected trees or bushes will be avoided. Any mature trees that are required to be felled will be assessed for the possible presence of roosting bats and felling plans will be adjusted to mitigate for any negative impacts that are identified. Although no Badger setts were identified during surveys of the footprint of the proposed development, pre-commencement surveys will be carried out at the sites of the turbines, road widening and construction routes, substation, borrow pits etc. If Badger sets are identified, Badger will be excluded using best practice under licence.		
MM9	EIS Chapter 5	The proposed development will not have significant impacts on Kerry Slug. However, in view of its conservation status, the Habitat Restoration and Enhancement Plan will include measures to create/enhance suitable habitat for Kerry Slug.		
MM10	EIS Chapter 11	▪ A structural engineer will assess bridges CH2 and CH8 along the proposed grid connection route prior to the commencement of development. ▪ The stepping stones in the river bed at CH8 will be preserved in situ. ▪ The remains of the stone structure at Grousemount (CH20) will be preserved in situ. This structure should be highlighted in the CEMP and will be fenced off from works prior to the commencement of development.		
MM11	EIS Chapter 11	The house structure (CH20) at Grousemount will be avoided as part of the construction works along the cable route and fenced off prior to development thus avoiding any potential direct impact.		

MM12	EIS Chapter 12	In the event of further scoping responses being received from telecoms operators, the comments of the consultees and any proposed mitigation measures will be considered in the construction and operation of the proposed development		
MM13	CEMP	Prior to the commencement of the proposed development a Construction Waste manager will be appointed by the project team. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the proposed development adheres to the management plan.		
MM14	CCS	The wind farm developer has entered into a protocol agreement which will ensure that should any impacts or interference on radio or television or other telecommunications reception in the area arise it will be adequately dealt with.		
MM15	CEMP	To protect breeding birds, construction will not commence during the breeding bird season from April to July inclusive. Construction may commence at any stage from August onwards to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around, and can continue throughout the next breeding season.		
MM16	CEMP	An ECoW will oversee the site works and implementation of the Environmental Management Plan, and provide on-site advice on the mitigation measures as necessary to ensure the project proceeds as intended. The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of construction, and may be further adjusted as required during the course of the project		
MM17	CEMP	The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site.		
MM18	CCS	As part of the noise monitoring programme to be agreed with the Planning Authority prior to commencement, the details are set out as follows: ▪ Continuous noise monitoring will be required at three locations in the vicinity of the site.		

		▪ Baseline noise monitoring will be conducted using unattended noise logging instrumentation for a period of some 4 weeks or until a sufficient data set is collected. ▪ Measurements will be taken externally at three locations. ▪ All measurements will be conducted in line with the requirements imposed by Condition no. 7. ▪ All measurements will be will conducted using Type 1 Precision Digital Sound Level Meters and associated hardware, for example: ▪ - Bruel & Kjaer Type 2238 Sound Level Meter's (or similar) with environmental enclosure and proprietary double wind screens. ▪ The instrument will have the following characteristics and features: ▪ - Continuous noise monitoring in 10-minute sample durations. ▪ - Each individual sample will consist of LA90 and LAeq parameters. ▪ A rain gauge (in the form of a 0.2mm tipper bucket system) will be installed at one of the location for the duration of the noise monitoring period.		
Construction Phase				
Construction Management				
MM19	EIS Chapter 3	Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.		
MM20	EIS Chapter 3	The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit (http://www.siltbuster.com/sheets/RCW.pdf) or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and		

		solids can be disposed of off-site at an appropriate waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane.		
MM21	EIS Chapter 3, EIS Chapter 7	▪ The risks of pollution arising from concrete deliveries will be reduced by the following: ▪ Concrete trucks will not be washed out on the site, but will be directed back to their batching plant for washout. ▪ Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed. ▪ The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout and discussing emergency procedures ▪ Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.		
MM22	EIS Chapter 3	Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution including. ▪ Using weather forecasting to assist in planning large concrete pours, and avoiding large pours where prolonged periods of heavy rain is forecast. ▪ Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete. ▪ Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.		

		▪ Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain. ▪ Disposing of surplus concrete after completion of a pour in agreed suitable locations away from any watercourse or sensitive habitats.		
MM23	EIS Chapter 3	On-site refuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the proposed wind farm. 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.		
MM24	EIS Chapter 3	Temporary port-a-loo toilets located within a staff portakabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.		
MM25	OCWMP	All hazardous wastes will be stored in a roofed area in bunded containers before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. Hazardous wastes will be kept separate from non-hazardous wastes so that contamination does not occur.		
MM26	OCWMP	Appropriate measures will be taken to ensure excess waste is not generated during construction, including; ▪ Ordering of materials should be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock. ▪ Purchase of materials pre-cut to length to avoid excess scrap waste generated on site. ▪ Request that suppliers use least amount of packaging possible on materials delivered to the site. ▪ Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal		

		▪ Ensuring correct sequencing of operations. ▪ Use reclaimed materials in the construction works.		
MM27	CEMP	A detailed Waste Management Plan is included in Section 3.10 of the CEMP which outlines the best practice procedures during the excavation and construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage. Disposal of waste will be seen as a last resort.		
Drainage Design and Management				
MM28	EIS Chapter 7	Measures are to be incorporated into the design and construction of the access roads and turbine bases to prevent hydrological impacts to acid flush habitats outside the direct footprint of the proposed developed. These measures are as follows: ▪ Where flushes intersect access tracks there will be a requirement to form a drainage pathway within the stone fill make-up of the access track so that flush flows can be maintained. This can be achieved by making a section of the installed access track porous (free draining). Use of clean 4" - 6" crushed stone in a 300 mm to 400 mm layer at the base of access track will be sufficient to prevent flow impediment. A schematic of this arrangement is shown in Plate 7.3 and 7.4 in Chapter 7. ▪ An impermeable membrane will be installed above the porous fill within the track base to prevent vertical migration of surface water into the stone fill, and also to prevent finer material from the track surface layer being washed down and blocking the porous layer. ▪ There will be no discharge of surface water runoff from the wind farm construction areas, or hardstanding areas, directly into flush areas. ▪ All surface water runoff from the wind farm construction areas will be released onto natural vegetated surfaces away from flushes. ▪ Construction of access tracks in the area of flushes will be undertaken during dry periods, if possible.		
MM29	EIS Chapter 3	There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows or directly into artificial drainage ditches following the installation of silt traps, check dams and/or stilling ponds to these ditches. All		

		discharges, over land, from the proposed works areas will be made over vegetation filters at a minimum of 50 metres distance from natural watercourses. Where there is infrastructure proposed within 50 metres of a natural watercourse, stringent drainage measures will be put in place to ensure the protection of the water quality of the natural watercourse.		
MM30	EIS Chapter 3	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 potentially 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 an alternative drainage system to handle the same water has been put in place.		
MM31	EIS Chapter 3	Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.		
MM32	EIS Chapter 3	A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site.		
MM33	EIS Chapter 3	Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.		
MM34	EIS Chapter 3	Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.		

MM35	EIS Chapter 3	Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.		
MM36	EIS Chapter 3	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 regular intervals along the drains to ensure flow in the swale is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.		
MM37	EIS Chapter 3	Stilling ponds will be used to attenuate runoff from works areas of the site during the construction phase, and will remain in place to handle runoff from roads and hardstanding areas of the proposed development during the operational phase. The purpose of the stilling 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 stilling ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.		
MM38	EIS Chapter 3	Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone from natural watercourses, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the proposed development.		
MM39	EIS Chapter 3	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.		
MM40	EIS Chapter 3, CEMP	Dewatering silt bags are made of a high quality geotextile fabric which allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site		
MM41	EIS Chapter 3	Where sections of floating road are to be installed instead of excavated roads, cross drains will be installed beneath the road construction corridor to maintain existing clean water drainage paths. Large surface water drainage pipes will be placed at these locations		

		below the level of the proposed road sub-base. These drainage pipes will be extended each side of the proposed road and cable trench construction corridor, along the paths of the existing drains.		
MM42	EIS Chapter 3	To efficiently control drainage runoff from cable trench works areas, excavated material will be stored on the upgradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the proposed development, would be transported to one of the on-site borrow pit disposal areas or used for landscaping and reinstatements of other areas elsewhere on site.		
MM43	EIS Chapter 3, CEMP	In the event that works are giving rise to siltation of watercourses, the environmental clerk of works or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.		
MM44	EIS Chapter 7, CEMP	Best practice methods related to water incorporated into the forestry management and mitigation measures have been derived from: ▪ Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh; ▪ Coillte (2009): Forest Operations and Water Protection Guidelines; ▪ Coillte (2009): Methodology for Clear Felling Harvesting Operations; ▪ Forest Service (Draft): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures; and, ▪ Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.		
MM45	EIS Chapter 7	During the wind farm construction phase a self-imposed buffer zone of 50m will be maintained for all streams.		
MM46		Where tree felling is required in the vicinity of streams, the following additional mitigation measures will be employed.		

		▪ Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance; ▪ Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works; ▪ Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour; ▪ Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground; ▪ In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction; ▪ All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;		

		▪ Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled; ▪ Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction should be suspended during periods of high rainfall; ▪ Timber will be stacked in dry areas, and outside a local 50m watercourse buffer. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites; ▪ Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off; ▪ Checking and maintenance of roads and culverts will be on-going through the felling operation; ▪ Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and, ▪ Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.		
MM47	EIS Chapter 7	The following items shall be carried out during inspection pre-felling and after: ▪ Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines; ▪ Inspection of all areas reported as having unusual ground conditions;		

		▪ Inspection of main drainage ditches and outfalls. During pre-felling inspection the main drainage ditches shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall; ▪ Following tree felling all main drains shall be inspected to ensure that they are functioning; ▪ Extraction tracks nears drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; ▪ Culverts on drains exiting the site will be unblocked; and, ▪ All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.		
MM48	EIS Chapter 7	The works programme for the initial construction stage of the development will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of peat/subsoil or vegetation 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.		
MM49	EIS Chapter 7	Management of excavation 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 should immediately be stopped and a geotechnical assessment undertaken; and, ▪ A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site 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.		
MM50	EIS Chapter 7	An emergency plan for the construction phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with accidental spillages.		
MM51	EIS Chapter 7	▪ A self-contained port-a-loo with an integrated waste holding tank will be used at each of the site compounds, maintained by the providing contractor, and removed from 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 from the site to be discharged at a suitable off-site treatment location; and, ▪ No water will be sourced on the site, or discharged to the site.		
Flora and Fauna				
MM52	EIS Chapter 5	Detailed specifications for measures to be incorporated into the design and construction of the access roads and turbine bases will be used to prevent hydrological impacts to acid flush habitats outside the direct footprint of the proposed developed. These measures are as follows:		

		▪ Where flushes intersect access tracks there will be a requirement to form a drainage pathway within the stone fill make-up of the access track so that flush flows can be maintained. This can be achieved by making a section of the installed access track porous (free draining). Use of clean 4" - 6" crushed stone in a 300 mm to 400 mm layer at the base of access track will be sufficient to prevent flow impediment. A schematic of this arrangement is shown in Plate 7.3 and 7.4 in Chapter 7. ▪ An impermeable membrane will be installed above the porous fill within the track base to prevent vertical migration of surface water into the stone fill, and also to prevent finer material from the track surface layer being washed down and blocking the porous layer. ▪ There will be no discharge of surface water runoff from the wind farm construction areas, or hardstanding areas, directly into flush areas. ▪ All surface water runoff from the wind farm construction areas will be released onto natural vegetated surfaces away from flushes. ▪ Construction of access tracks in the area of flushes will be undertaken during dry periods, if possible.		
MM53	EIS Chapter 5	Felling will be carried out to ensure that the distance from the rotating blade tip of the turbine to the nearest part of the nearest trees will be a minimum of 50 m. This will require a horizontal felling distance from the edge of the remaining forestry to base of the turbine monopole of 70 m, even if the conifers present at the time of construction have not yet reached their final harvesting height. This mitigation measure is designed to avoid bats foraging in or close to planted conifers from coming into the close proximity of rotating turbines blades and is based on practice from the UK. Trees will not be replanted in the future within the felled areas. In areas of felling close to turbine bases brash will be removed from the site, where not required for the upgrade of existing roads and to prevent rutting of the ground surface during felling operations, and management will be put in place to keep the growth of regenerating scrubby/bushy vegetation down. This is intended to avoid the use of such areas by small prey species (i.e. of raptors like Hen Harrier), avoid the use of such areas for nesting by Hen Harrier, and avoid attracting bats to the areas close to wind turbines.		

MM54	EIS Chapter 7	Best guidance in relation to protection of freshwater pear mussel (FPM) sites will be followed from guidance document *Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Draft).*		
MM55	Response to FI item 2	All mitigation measures as specified by the survey report and derogation licence will be implemented by the client. Compensation habitat will be provided to replace the relatively small area of habitat affected by the proposed development and no significant impact on Kerry slug populations is predicted to occur as a result of this development.		
MM56	CEMP	A baseline invasive species survey will be carried out at the wind farm site, grid connection route, haul route including all locations where accommodation works are required to accommodate turbine delivery to identify the presence and location of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) by a suitably qualified ecologist. If the presence of such species is found at or adjacent to the site, particularly in areas where its excavation may be required, an invasive species management plan will be prepared for the site to prevent the introduction or spread of any invasive species within the footprint of the works. An invasive species management plan, if required, will set out best practice control methods as summarised in section 3.9 of the CEMP.		
Peat, Subsoils and Bedrock				
MM57	EIS Chapter 6	Revise and amend the Geotechnical Risk Register as construction progresses.		
MM58	EIS Chapter 6	Once the required volume of rock has been extracted from the borrow pit areas, it is proposed to reinstate these areas with peat and overburden excavated from the works areas of the proposed development.		
MM59	EIS Chapter 6	Where possible, the acrotelm peat and / or top soil that has been excavated and not retained for reinstatement and landscaping works will be stored with the vegetated side facing up so as to promote the growth of vegetation across the surface of the stored peat within the borrow pit area.		
MM60	EIS Chapter 6	Where possible to mitigate impact on peat within the development.		

		▪ Placement of turbines and associated infrastructure in areas with shallower peat where possible; ▪ Use of the existing forestry road network to reduce peat excavation and borrow pit volumes; ▪ Use of floating roads (where geotechnically acceptable to do so) to reduce peat excavation volumes; ▪ The peat and subsoil which will be removed during the construction phase will be localised to the turbine location and access roads; ▪ No turbines or related infrastructure will be constructed in any designated sites such as NHAs or SACs; ▪ A minimal volume of peat and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume present on the site due to optimisation of the layout by mitigation by design; ▪ Construction of settlement ponds will be volume neutral, and all excess material will be used locally to form pond bunds and surrounding landscaping.		
MM61	EIS Chapter 6	Where possible to mitigate impact on soils within the development. ▪ Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling will occur at a controlled fuelling station; ▪ On site re-fuelling will be undertaken using a double skinned bowser with spill kits on the ready for accidental leakages or spillages; ▪ Fuels stored on site will be minimised. Storage areas where required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor; ▪ The electrical control building 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;		

		▪ 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 will be contained within Environmental Management Plan. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area. ▪ No refuelling will take place within watercourse buffers along the proposed grid connection cable route.		
MM62	EIS Chapter 6	Peat removed from turbine locations and access roads will be used for landscaping, cast aside and used for restoring the 2 no. proposed borrow pits. Where possible, the upper vegetative layer will 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 peat used for reinstatement of the borrow pits. Re-seeding and spreading/planting of heather and moss cuttings will also be carried out in these areas. These measures will prevent erosion of stored peat in the long term. A full Peat Management Plan for the development is shown as Appendix 6.1.		
MM63	EIS Chapter 6	Any excess temporary mounded peat in storage for long periods will be covered by a polyethylene sheets or seeded at the earliest opportunity. This will prevent erosion of soil. Silt fences will be installed around stockpiles to limit movement of entrained sediment in surface water runoff. The use of bunds around earthworks and mounds will prevent egress of water from the works		
MM64	EIS Chapter 6	In order to minimize erosion of mineral subsoils stripping of peat will not take place during extremely wet periods (to prevent increased silt rich runoff). Temporary drainage systems will be required to limit runoff impacts during the construction phase.		
MM65	EIS Chapter 6	Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.		

MM66	CEMP	Borrow pits shall be excavated **to a depth not exceeding five metres** below existing ground level. Rock from the borrow pits shall be won only for the purposes of road/hardstand construction on the site, and shall not be sold or transported off site without a prior grant of planning permission.		
MM67	CEMP	A detailed Peat Management Plan is included in Section 3.4 of the CEMP which outlines the methodology by which peat will be handled and stored at the site. It includes a summary of the good construction practices which will be employed.		
MM68	CEMP	The following issues incorporated into the construction phase of the project will assist in the management of the risks for this site (AGEC, 2015): ▪ Appointment of experienced and competent contractors; ▪ The site should be supervised by experienced and qualified personnel; ▪ Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a peat movement); ▪ Prevent undercutting of slopes and unsupported excavations; ▪ Maintain a managed robust drainage system; ▪ Prevent placement of loads/overburden on marginal ground; ▪ Set up, maintain and report readings from peat stability monitoring systems; ▪ Ensure construction method statements are followed or where agreed modified/ developed; and, ▪ Revise and amend the Geotechnical Risk Register as construction progresses.		
Air Quality/Dust				
MM69	EIS Chapter 3	Aggregate material for the construction of roads and turbine bases will be sourced onsite; therefore, there will be no need to transport this material to the site. Truck wheels will be washed to remove mud and dirt before leaving the site. All plant and materials vehicles shall be stored in the dedicated compound area. Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and		

		compaction. Construction traffic will be restricted to defined routes and a speed limit will be implemented.		
MM70	EIS Chapter 3, EIS Chapter 8	In periods of extended dry weather, dust suppression may be necessary along haul roads and around the borrow pit area to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system, and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.		
MM71	EIS Chapter 8	The wind farm development will utilise existing roads where possible to gain access to the proposed turbine locations and minimise the construction of additional roads through peat-based habitats.		
MM72	CEMP	A detailed plan for dust control is included in Section 3.7 of the CEMP which outlines the methodology by which dust levels will be controlled on site. It includes a summary of the good construction practices which will be employed.		
Noise				
MM73	EIS Chapter 4	Best practice measures for noise control will be adhered to onsite during the construction phase of the proposed development in order to mitigate the slight short-term negative impact associated with this phase of the development. The measures include: ▪ Sensitive location of equipment, taking account of local topography and natural screening. ▪ Working methods: construction noise will be controlled by prescribing that standard construction work will be restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that will not generate noise of a level that may cause a nuisance. The phasing of works has also been designed with regard to avoidance of noise impacts.		

		▪ Plant will be selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with E.U. and Irish legislation in relation to noise emissions. The timing of on- and off-site movements of plant near occupied properties will be controlled. ▪ Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents 'BS 5338: Code of Practice for Noise Control on Construction and Demolition Sites' and 'BS5228: Part 1: 1997: Noise & Vibration Control on Construction and Open Sites'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible effects on noise-sensitive locations will be employed. ▪ Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels, if appropriate.		
MM74	EIS Chapter 9	The contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of *British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.* These measures will ensure that: ▪ No plant used on site will be permitted to cause an on-going public nuisance due to noise. ▪ The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. ▪ All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. ▪ Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines		

		are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. ▪ Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use. ▪ Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen. ▪ During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 9.1 using methods outlined in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.		
MM75	EIS Chapter 9	The methods used to minimise complaints on air overpressure could consist of some or all of the following: ▪ Restriction of hours within which blasting can be conducted (e.g. 09:00 – 18:00hrs). ▪ A publicity campaign undertaken before any work and blasting starts (e.g. 24 hour written notification). ▪ The firing of blasts at similar times to reduce the 'startle' effect. ▪ On-going circulars informing people of the progress of the works. ▪ The implementation of an onsite documented complaints procedure. ▪ The use of independent monitoring by external bodies for verification of results. ▪ Trial blasts in less sensitive areas to assist in blast designs and identify potential zones of influence.		
MM76	EIS Chapter 9	Specific to blasting the following mitigation measures will be employed to control the vibration impact during blasts: ▪ Trial blasts will be undertaken to obtain scaled distance analysis;		

		▪ Ensuring appropriate burden to avoid over or under confinement of the charge; ▪ Accurate setting out and drilling; ▪ Appropriate charging; ▪ Appropriate stemming with appropriate material such as sized gravel or stone chipping; ▪ Delay detonation to ensure small maximum instantaneous charges; ▪ Decked charges and in-hole delays; ▪ Blast monitoring to enable adjustment of subsequent charges; ▪ Good blast design to maximise efficiency and reduce vibration; ▪ Avoid using exposed detonating cord on the surface.		
MM77	CEMP	A detailed plan for noise control is included in Section 3.8 of the CEMP which outlines the methodology by which noise levels will be controlled on site. It includes a summary of the good construction practices which will be employed.		
Cultural Heritage				
MM78	EIS Chapter 11	▪ If archaeological features or finds are encountered during site works the archaeologist shall report the findings to the relevant authorities to discuss a suitable means of preservation of the features (preservation by record or *in situ* may be required). A report on the monitoring will be submitted to the Local Authorities and DAHG. The archaeologist should be licensed by the DAHG to allow any uncovered features to be dealt with appropriately.		
MM79	EIS Chapter 11	▪ The buffer zones and fencing should be established by an archaeologist prior to the commencement of site works.		
Traffic				
MM80	EIS Chapter 12	Prior to the construction stage a detailed traffic management plan will be prepared by the haulage company and submitted to Cork County Council for approval. The plan will include:		

		▪ A delivery schedule, ▪ Details of the alterations required to the infrastructure identified in this report and any other minor alteration identified (hedge rows etc), ▪ A dry run of the route using vehicles with similar dimensions.		
MM81	EIS Chapter 12	All of the deliveries comprising abnormally large loads will be made outside the normal peak traffic periods to avoid disruption to work and school related traffic.		
MM82	EIS Chapter 12	At locations where the grid connection crosses rivers/local steams by means of culverts/small bridges, the cable will be set under the river bed and on the days that directional drilling takes place these locations may be closed to traffic. Where required, the closure will take place for a maximum of 1 day at each location with local diversions and associated signing implemented on these days.		
MM83	EIS Chapter 4	Aggregate materials for the construction of any additional site tracks will be obtained from the permitted and proposed borrow pits on the site of the proposed development. This will significantly reduce the number of delivery vehicles required to access the site.		
MM84	EIS Chapter 3	Due to the volume of concrete required for each turbine foundations, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are complete in a single day per turbine.		
MM85	EIS Chapter 3	Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. It is not anticipated that vehicle or wheel washing will be required as part of the construction phase of the proposed development because site roads will be already formed using on-site materials before other road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt. A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the proposed development.		

Operational Phase				
MM86	CEMP	The project hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This operational phase drainage system will have been installed during the construction phase in conjunction with the road and hardstanding construction work and is described in Section 4.2. of the CEMP.		

8 MONITORING PROPOSALS

All monitoring proposals relating to the pre-commencement, construction and operational phases of the permitted development were set out in the relevant chapters of the Environmental Impact Statement (EIS) submitted as part of the original planning permission application, and subsequent responses to further information request issued by Cork County Council.

This section of the Construction and Environment Management Plan groups together all of the monitoring proposals presented in the EIS as well Further Information submitted to Cork County Council and An Bord Pleanála. The monitoring proposals are presented in the following pages.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits.

Table 8.1 Schedule of Monitoring Measures

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
Pre-Commencement Phase					
MX1	EIS Chapter 7	An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.	Once	Monthly	ECoW
MX2	EIS Chapter 7	Sampling will be completed before, during (if the operation is conducted over a protracted time) and after any felling activity. The 'before' sampling should be conducted within 4 weeks of any felling activity, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (*i.e.* where an impact has been shown).	As required	Monthly	ECoW
MX3	Response to FI item 3	Otter surveys to be undertaken at all locations where the proposed construction footprint occurs in close proximity or crosses watercourses. Watercourses will be searched for a distance of 150m adjacent to any works or crossing point. Survey reports will be sent to the planning authority and to the NPWS for review.	Once, Pre-commencement	On Completion	Project Ecologist
MX4	Ecological Monitoring Plan	All proposed works areas will be walked for signs of badger or badger setts, including a 150m buffer around each turbine.			

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
MX5	Ecological Monitoring Plan	Pre-commencement bird surveys will be undertaken immediately prior to the initiation of works at the wind farm site and will comprise one round of thorough walkover surveys to cover the entire development footprint and 500m buffer thereof. Surveys will aim to establish the presence of any hen harrier or merlin at the site or any evidence of usage by these species during the breeding season. Reporting will be undertaken following the completion of each field season and issued to the planning authority and the National Parks and Wildlife Service (NPWS) as per Condition 12.	As required	As required	Project Ornithologist
MX6	Ecological Monitoring Plan	A Kerry Slug Management Plan was provided as part of the application documentation and will be implemented in full. The licence requires that the following actions are undertaken: ▪ Pre-construction walkover surveys of areas of suitable habitat within the construction footprint as identified in previous surveys for the species. ▪ Pre-construction removal of slugs from areas of suitable habitat and translocation to areas of suitable habitat.	Once, Pre-commencement	On Completion	Project Ecologist
Construction Phase					
MX7	EIS Chapter 7	During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse, and specifically following heavy rainfall events (*i.e.* weekly, monthly and event based).	As required	Monthly	ECoW
MX8	EIS Chapter 7	Sampling will be done before, during (if the operation is conducted over a protracted time) and after the construction works. The 'before' sampling should be conducted within 4 weeks prior to the construction work beginning, preferably in medium to high water flow conditions. The "during" sampling will	As required	Monthly	ECoW

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
		be undertaken once a week or after rainfall events. The 'after' sampling should comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (*i.e.* where an impact has been shown). Criteria for the selection of water sampling points include the following: • Avoid man-made drains and watercourses without all-year flow; • Select sampling points upstream and downstream of the works; • It is advantageous if the upstream location is outside/above the site in order to evaluate the impact of land-uses other than the development works; and, • Where possible, three downstream locations should be selected: one immediately below the working area, the second at exit from the site boundary, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location).			
MX9	Response to FI item 18, CEMP	A detailed water quality monitoring programme will be monitored independently by the supervising hydrologist who will provide the necessary guidance on the monitoring requirements.	On going	Monthly	ECoW
MX10	CEMP	Daily and weekly inspections by the Site Environmental Clerk of Works (ECoW) or a suitably qualified and competent person as delegated by the ECoW will be recorded for review as part of the environmental auditing process detailed in Section 9.2 of the CEMP.	On going	Monthly	ECoW

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
MX11	CEMP	The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the ECoW	On going	Monthly	ECoW
MX12	EIS Chapter 4	Check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.	As Required	As Necessary	ECoW
MX13	EIS Chapter 4	Inspection and maintenance of all stilling ponds will be ongoing through the construction period. A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the settlement pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity.	As Required	As Necessary	ECoW
MX14	EIS Chapter 4	All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.	Weekly / Monthly	As Necessary	ECoW
MX15	EIS Chapter 9	Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.	Weekly Monthly	As Necessary	ECoW
MX16	EIS Chapter 11	Pre-development archaeological testing of proposed roads, turbine bases, hardstands, borrow pits, substation, compound etc should be undertaken where areas are not located in forestry. A report on the results should be submitted to the Planning Authority and DAHG prior to commencement of development. This excludes T6 and associated road as this was already tested under licence in 2011 by the same author.	As Required	On Completion	Project Archaeologist

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
MX17	EIS Chapter 8, 9 CEMP	The plant used should be regularly inspected for leaks and fitness for purpose.	Daily	As Necessary	Plant Operators / ECoW
MX18	EIS Chapter 11	Archaeological monitoring of all ground works (to include site investigations, access roads, substation, turbine hardstands and bases and proposed cable route should be undertaken at the construction stage of the development.	As Required	On Completion	Project Archaeologist
MX19	EIS Chapter 11	If archaeological features or finds are encountered during site works the archaeologist shall report the findings to the relevant authorities to discuss a suitable means of preservation of the features (preservation by record or in situ may be required). A report on the monitoring will be submitted to the Local Authorities and DAHG. The archaeologist should be licensed by the DAHG to allow any uncovered features to be dealt with appropriately.	As Required	On Completion	Project Archaeologist
MX20	EIS Chapter 11	Archaeological testing in unforested areas is recommended followed by archaeological monitoring at the construction stage of the development (to include the cable route, in particular in the vicinity of the two nearest Recorded Monuments along the cable route CO069-072 and CO069-084).	As Required	On Completion	Project Archaeologist
MX21	EIS Chapter 11	It is recommended however, that any walls identified during archaeological monitoring of the site should be recorded prior to removal, if necessary.	As Required	On Completion	Project Archaeologist
MX22	EIS Chapter 11	• Given the proximity of the monuments CO069-072 and CO069-084 to the roadside it is recommended that the proposed grid cable route to Coomataggart substation will not extend down the west side of the public road where it extends past the aforementioned recorded monuments. • The presence of recorded monuments CO069-072 and CO069-084 along the roadside boundary of the proposed grid connection route to Coomataggart substation should be highlighted and included in the CEMP and all operatives informed of the presence of the monuments.	As Required	On Completion	Project Archaeologist

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
		• Archaeological Monitoring in the vicinity of the aforementioned monuments should be undertaken at the construction stage of the project to ensure their continued preservation.			
Operational Phase					
MX23	EIS Chapter 5	Post-construction bird monitoring will commence in the year of completion/commissioning of the permitted development and will be undertaken between April to August period. Monitoring will consist of breeding hen harrier and merlin surveys including winter hen harrier roost surveys between October -March inclusive (as per national monitoring methods).	Monthly (April-August)	Annually	Project Ornithologist
MX24	Ecological Monitoring Plan	Breeding raptor surveys (birds of prey/owls) will be completed in April, May, June and July for each year of operational monitoring.	Monthly (April-July)	Annually	Project Ornithologist
MX25	Ecological Monitoring Plan	Winter roost surveys, focusing on hen harrier will be undertaken on six occasions (one survey per month) between October and March during each of the five years of post-construction surveys.	Monthly (October-March)	Annually	Project Ornithologist
MX26	Ecological Monitoring Plan	Post-construction surveys for badger and otter will be completed on the site for for five years. These surveys will be undertaken following the same scope and methodology as proposed for the pre-construction surveys. All results will be sent to the Planning Authority and to the NPWS.	Annually for 5 years	Annually	Project Ecologist
MX27	Ecological Monitoring Plan	The Kerry Slug Management Plan will be implemented in full, as will the conditions of the derogation licence. This provides for post-construction surveys that cover the five year period as required by Condition 12 of the grant of planning permission.	Annually for 5 years	Annually	Project Ecologist
MX28	CEMP	Pre-construction and post-construction monitoring and reporting programmes for birds (particularly Hen Harrier and Merlin), otter, badger and Kerry slug shall be submitted to, and agreed in writing with, the planning authority prior to	As required	As required	Project Ornithologist

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
		commencement of development. The surveys shall be undertaken by suitably qualified and experienced specialists. Surveys shall be completed annually for a period of five years following commissioning of the wind farm and copies of the reports to the planning authority shall also be submitted to the National Parks and Wildlife Service.			
MX29	EIS Chapter 9	Post commissioning of the proposed turbine units it is recommended that the noise monitoring detailed in the relevant section of this report is repeated with a view to confirming that the operational units are compliant with the relevant day and night time noise criteria curves as presented in the body of this assessment. If this study work identifies any exceedances of the appropriate criteria relevant corrective actions will be taken/implemented.	Once	As required	ECoW

9 PROGRAMME OF WORKS

It is estimated that the construction phase will take approximately 18 months from starting on site to the commissioning of the electrical system. In the interest of breeding birds, construction will not commence during the breeding bird season from April to July inclusive. Construction may commence at any stage from August onwards to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around, and can continue throughout the next breeding season.

Works during the construction phase of the development, including delivery of construction materials will generally take place between 7 a.m. and 7 p.m. daily Monday to Saturday with large concrete pours requiring an earlier start when deemed necessary. Delivery of abnormal loads such as turbine tower sections and blades will take place at night outside of peak traffic hours.

The anticipated phasing and scheduling main construction task items are outlined in Figure 9.1 below.

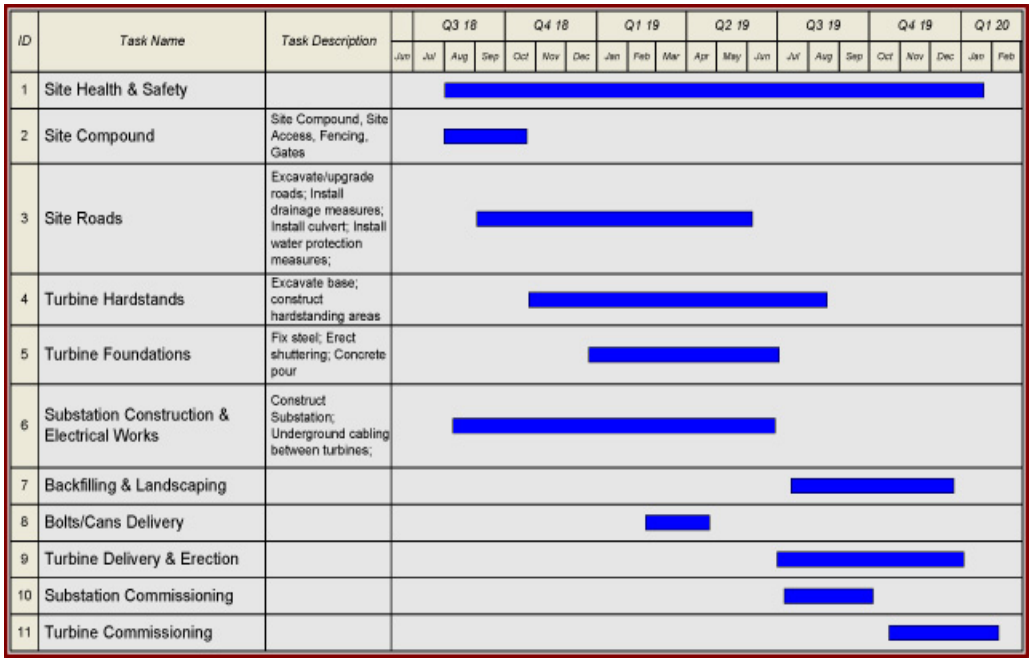

Figure 9.1 Indicative Construction Schedule

10 COMPLIANCE AND REVIEW

10.1 Site Inspections and Environmental Audits

Routine inspections of construction activities will be carried out on a daily and weekly basis by the Site Environmental Clerk of Works (ECoW) and the Construction Manager to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this CEMP and any subsequent updates to this document. Environmental site inspections will be carried out by suitably trained staff.

10.2 Auditing

Environmental audits will be carried out during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by contractor staff or alternatively by external personnel acting on their behalf. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the CEMP is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

10.3 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 environmental parameter (as indicated in the Environmental Monitoring Programme) has 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.

10.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Construction 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 Construction Manager and the Site 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.

10.5 Construction Phase Plan Review

This CEMP will be updated and reviewed prior to commencement of construction, and also every six months thereafter during the construction phase of the project.

Appendix 1

Schedule of Works Operation Record

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
1	Enabling works including felling, site compound establishment welfare facilities, site office and fencing	2 months	Schedule 2	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Determined by the proximity of the planned sonde location to the works and if readings will be of benefit *i.e.* if sonde is upstream of the works.	Schedule 2 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 2 rainfall figures (see below)
2	Borrow pit establishment. Preliminary enabling works and rock excavation operations	6 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sonde must be operational with alarm and data analysed before works commence	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
3	Site Roads (Stage 1). Excavate new roads, upgrade/widen existing	3-4 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)
4	Turbine foundation excavation and installation	6 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
5	Substation construction and connection to the grid	6 months	Schedule 2	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 2 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 2 rainfall figures (see below)
6	Duct installation between turbines and substation and cabling	4 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
7	Site Roads (Stage 2). Further upgrade/maintenance and final surfacing prior to turbine delivery	4 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)
8	Crane delivery and mobilisation	1 month	Schedule 3	Activity not dependent on drainage treatment infrastructure	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 3 rainfall figures (see below) utilising reliable forecasting source	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent
9	Turbine delivery	3 months	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
10	Turbine erection	2-3 months	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not determined by rainfall	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent
11	Commissioning and testing of operational turbines	2 months	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent

Trigger 4: activities should not begin or should cease if the following rainfall amounts are forecasted:	
Schedule 1 – Very high-risk activities	>10 mm/hr (*i.e.* high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	No overland flow or pathway for water movement
	Conditions on the ground match the forecast
Schedule 2 – High risk activities	>10 mm/hr (*i.e.* high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	Conditions on the ground match the forecast
Schedule 3 – Intermediate risk	>10 mm/hr (*i.e.* high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	Conditions on the ground match the forecast

Appendix 2

Traffic Management Plan

MCE Ltd.

Civil Engineering

Traffic Management Plan:

Cleanrath WF Ducting to Coomataggart

110 kV Substation

May 2018

Telephone: +353 (0) 21 733 6034, Fax: +353 (0) 21 733 6145
Web: www.mceengineering.ie, Email: office@mceengineering.ie
Lissarda Industrial Estate, Lissarda, Cork, Ireland.

MCE Ltd

Civil & Electrical Engineering Specialists

MCE – Cleanrath Cable Route Traffic Management Plan

Contractor: MCE ltd.

Project name: Cleanrath Windfarm

Address: Cleanrath, Co. Cork.

Name : James Crowley – 021-2066947
Chris Murnane – Tel: 086 -7955083

Email: james.crowley@turnkeydev.com
chris.murnane@gmail.com

Site supervisor: TBC

Safety officer: TBC

Description of task: Traffic Management Plan for Cleanrath WF Cable Route

Key plant: 360 excavators
8 tonne dumper
Lorries
Roller
Submersible Pumps
Plate compactor
Generator
Spill Kit
Diesel Bowser
Drip Trays

Specific Training: FAS safe pass
CSCS plant ticket
Site induction

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MCE – Cleanrath Cable Route Traffic Management Plan

Method of Access and Egress to the work Area	All operatives must complete pre works MCE Ltd. site induction before commencing work on the ducting route.
Fall Protection Measures: (Where work at height cannot be eliminated)	No persons are permitted within 2 meters of excavation. Trench support will be utilized if required. Open trenches will be fenced off or backfilled every evening to ensure the areas are safe for workers and local traffic. No persons allowed in trench when exclusion zone is not achievable for passing vehicles or when deemed unsafe.
Hazardous Substances: Applicable:	 No No No No No Yes No
Storage Arrangements:	No material will be used or generated during the course of this task
Mandatory and Additional PPE as Required:	
Emergency Procedures:	MCE Emergency Procedures (All employees informed at site inductions) All employees to be made aware of the nearest exit routes from site. All personnel to be in possession of the site coordinates at all times in case of need to contact emergency services for any reasons.
First Aid Facilities:	On-Site First Aider: Chris Murnane / TBC First Aid Box Location: Site Vehicle & Site Office Nearest Hospital: Macroom Community Hospital – (026) 41002 Other Hospital: Cork University Hospital – (021) 4922000
Welfare Facilities:	Site office, canteen and toilet supplied by Mid Cork Electrical at site compound across from substation and assembly point.

MCE – Cleanrath Cable Route Traffic Management Plan

Introduction:

This traffic management plan outlines the affected roadways for an underground cable grid connection between Cleanrath WF and Coomataggart 110kV substation (Grousemount). A detailed Traffic Management Plan to follow as part of a Road Opening Licence Application This is to be read in conjunction with the works method statement in order to provide a safe system of work.

The total length of roadway affected is approximately 12.1km along points indicated on the drawings submitted. The proposed works will involve a ROAD CLOSURE system in some sections and STOP/GO in the remainder of the sections, see attached map Fig. 2.1. In situations where the road narrows and a STOP/GO system is not feasible, an ALL-STOP system will be used. Access will be prioritized to emergency vehicles and to local householders. Traffic calming measures will be utilized to slow down vehicles and ensure works can be carried out safely.

The total length of roadway affected by ROAD CLOSURE is approximately 2,893 metres along the L-34024-0. It is proposed that the road will be closed during the works, see Section 4 (1629 metres -Drawing No.610-612) and Section 5 (1264 metres - See Drawing No.613-615). Access will limited to emergency vehicles and to local householders who are unable otherwise to access their homes. Traffic calming measures will be utilized to slow down vehicles and ensure ducting can be carried out safely.

Prior to any works commencing a dilapidation survey will be completed of the entire route, photographing and noting any existing damage or defects to property or road surfaces. A copy of this will be submitted to Cork County Council prior to work commencing.

MCE – Cleanrath Cable Route Traffic Management Plan

Local Access for Residents

As part of the traffic management plan local residents affected by the road works will be alerted to the works by signage along the route.

Every effort will be made to limit the effect on local residents and any residents who require special provisions to be made will be accommodated (i.e. Home carer, etc.). Traffic management plans will be reviewed on a daily basis and take into account all local parameter in the area where work is being carried out. All required traffic management calculation forms will be completed and kept on site.

Pedestrian & Cyclist Management

Pedestrians and cyclists will be accommodated through the works. Operatives will be made aware to watch out for oncoming pedestrians / cyclists and to advise them accordingly.

Dealing With Emergency Services

Gardai will be advised of the intended works to be carried out prior to commencement on the Gardai Consultation form. Emergency services using the local roads will be made priority and areas where the works are being carried out will be covered immediately with road plates so as to allow access.

Signage Plan

All works will be signed in accordance with the "Guidance for the Control and Management of Traffic at Road Works" (Second Edition 2010). The Routine Works Traffic Management Design, including the layout parameters is illustrated on attachment.

MCE – Cleanrath Cable Route Traffic Management Plan

All traffic management will comply with guidance given in Chapter 8, Traffic Signs Manual, Department of Transport November 2010 and Control and management of Traffic at Road Work November 2007.

A fully certified and competent 'Signing Lighting & Guarding ' officer will sign off on the works before commencement and carry out routine monitoring. A qualified supervisor will be onsite at all times.

✓See attached traffic management design sheet for signage etc.

✓The entire traffic management system will be set up prior to any works commencing.

✓Only approved signs will be used along the works area.

✓All signs will be clean and clearly visible.

✓Once signs are in place the route will be assessed to ensure adequate visibility for drivers and pedestrians.

✓All signs will be secured and weighted down where appropriate.

✓Traffic will be reduced to single flow during all excavations on the roadside along sections which do not require a closure.

✓ At the end of each day the excavation is back filled and all materials will be removed from the roadside.

✓Contractor vehicles will be parked with consideration given to traffic management plan.

✓Where flag men are required, both flag men, the foreman and guarding officer will all communicate via two-way radios.

MCE – Cleanrath WF Traffic Management Plan

Road Closure / Road Opening Licence Drawings:

The following drawings are included at the end of this document:

- ✓ Figure 2.1– Road Works – Overall Layout View
- ✓ Figure 2.2 - TM (A) – Traffic Calming Measures – Stop & Go (Floating Works)
- ✓ 0040 – 610 – Road Closure Section 4 – Overall Layout View
- ✓ 0040 – 611 - Sheet 1 of 4 - Location 1 Layout
- ✓ 0040 – 611 - Sheet 2 of 4 – Locations 2 Layout
- ✓ 0040 – 611 - Sheet 3 of 4 – Locations 3 Layout
- ✓ 0040 – 611 - Sheet 4 of 4 – Locations 4&5 Layout
- ✓ 0040 – 612 – Traffic Calming Measures – Typical Works Area Layout
- ✓ 0040 – 613 – Road Closure Section 5 – Overall Layout View
- ✓ 0040– 614 - Sheet 1 of 4 - Location 1 Layout
- ✓ 0040 – 614 - Sheet 2 of 4 – Locations 2 Layout
- ✓ 0040 – 614 - Sheet 3 of 4 – Locations 3 Layout
- ✓ 0040 – 614 - Sheet 4 of 4 – Locations 4&5 Layout
- ✓ 0040 – 615 – Traffic Calming Measures – Typical Works Area Layout

MCE – Cleanrath Cable Route Traffic Management Plan

Signage Layout

The following is the layout for signage that will be in place on the approach to the road works. See attached drawings showing signage layout for the road closure and traffic calming measures which will be occurring .

✓Sign no 1: WK 001 (man with shovel) 600m before road works

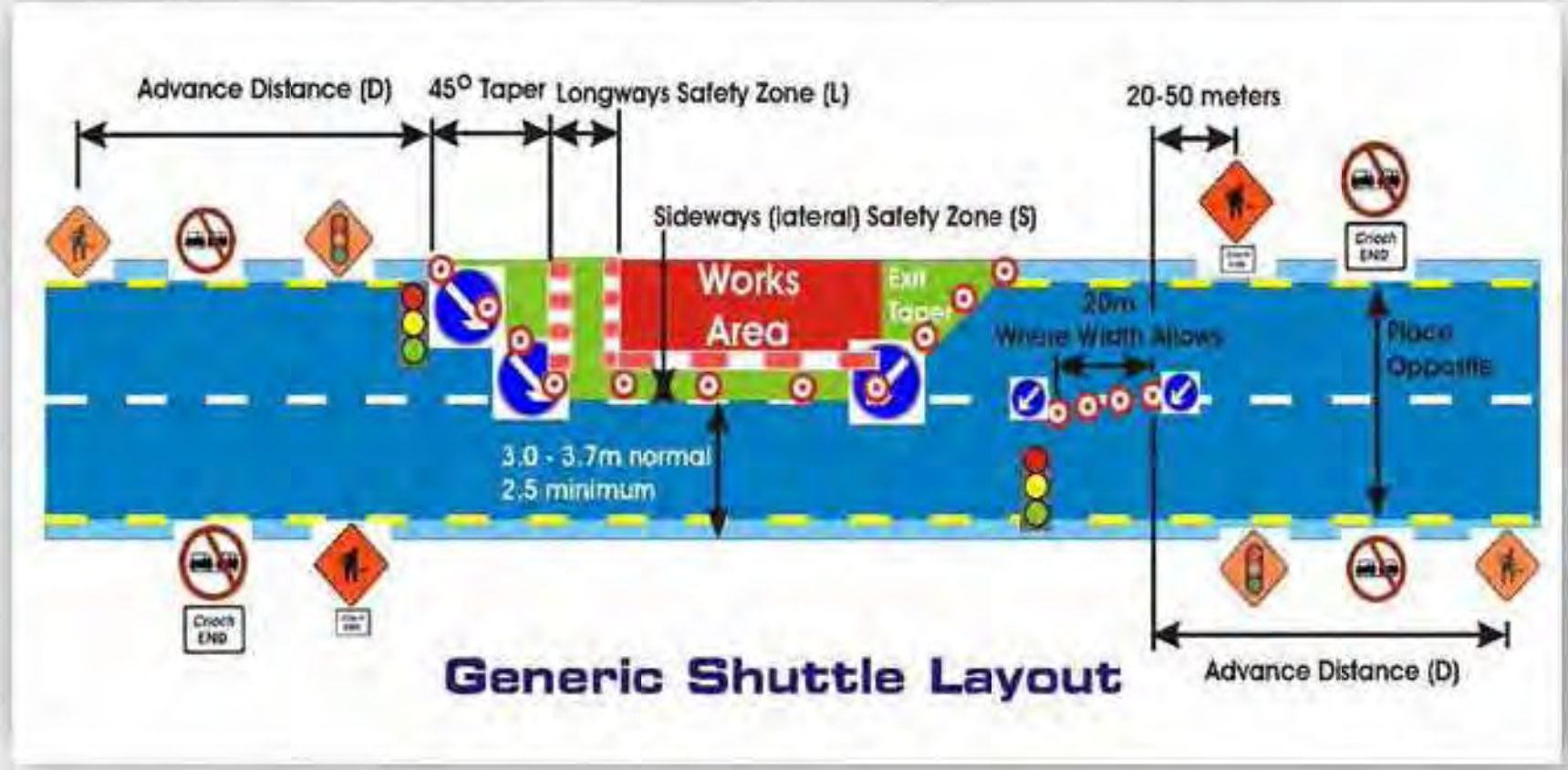
✓Sign no 2: (do not pass) 400m before road works

✓Cones with reflectors start 50m before works location.

✓ Signage after road words will indicate 'No Overtaking Ends' and ' End of Road Works'.

✓ Traffic entering and exiting existing secondary road will continue as normal with construction traffic kept to a minimum.

✓ See attached generic shuttle layout system for one-way stop and go. This shuttle layout ✓will be set up onsite by the qualified signing lighting and guarding officer.



Generic Shuttle Layout

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ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max Speed Limit (km/h)	Length of Works (m)	Max Traffic (veh/hr)	3 Min Count	Notes
All Stop	100	n/a	300	15	5-10 mins max
Give and Take	50	50	400	20	Clear visibility required from both directions
Priority	100	80	640	32	Speed Limit / Distance: 50 km/h 60m; 80 km/h 70m; 90 km/h 80m; 100 km/h 100m. These Distances indicate the clear visibility distance from before an obstruction to a point an equal distance beyond the obstruction. If used at night, will require a different design.
Stop/Go	100	20	500	25	Can be Single Main/Single Sign
	100	100	1400	70	Can be single Main/Auto Sign
	100	200	1250	63	Can be single Main/Auto Sign
	100	300	1050	53	Has to be Two Main/Two Sign
	100	400	950	48	Has to be Two Main/Two Sign
	100	500	850	43	Has to be Two Main/Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated

NOTE: WHEN USING SHUTTLE CONTROL, TAPERS ARE AT 45 DEGREE

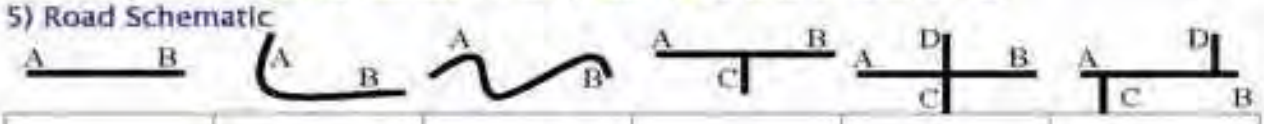
LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance Sign Distance (D) (m)	Min No. & Type Of Advance Signs In Sequence	Min clear visibility of Signs (m)	Min size of signs (mm)	Min height of cones (mm)	Long. Safety Zone (L) (m)	Side Safety Zone (S) (m)	Long. Cone Space	Long. Lamp Space	Lane Taper Multiply Factor	Taper Cone Spacing	Taper Lamp Spacing	Lead-in cone tapers (See Notes below) Recommended lengths.	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED				Hard Shoulder Taper Multiply Factor
														1 m	2 m	3 m	4 m	
Single Carriageway road 50km/h	50	1 (T.W.A.) 1 (I.m.)	50	600	450	5	0.5	4	12	6	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 60km/h	60	1 (T.W.A.) 1 (I.m.)	50	600	450	5	0.5	5	12	6	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 80km/h	500	1 (T.W.A.) 1 (W.D.) 1 (I.m.)	90	750 / 900*	750	45	1.2	12	24	35	2.5	9	Length of taper (T) in (m)	35	70	105	140	20
													Minimum No. of Cones	16	30	44	58	
													Minimum No. of Lamps	5	9	13	17	
Single Carriageway 100 km/h	800	1 (T.W.A.) 1 (W.D.) 2 (I.m.)	120	750 / 900*	750	60	1.2	12	24	60	1	9	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	42	82	122	162	
													Minimum No. of Lamps	6	10	15	19	
Dual Carriageway 60 km/h	600	1 (T.W.A.) 2 (I.m.) X 2	50	900	450	5	0.5	6	12	6	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Dual Carriageway 80 km/h	600	1 (T.W.A.) 2 (I.m.) X 2	90	900	750	45	0.75	12	24	35	3	9	Length of taper (T) in (m)	35	70	105	140	10
													Minimum No. of Cones	13	25	37	48	
													Minimum No. of Lamps	5	9	13	17	
Dual Carriageway 100 km/h	1000	2 (T.W.A.) 3 (I.m.) X 2	120	1200	750	45	1.2	12	24	40	1	9	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	42	82	122	162	
													Minimum No. of Lamps	6	10	15	19	

* Use 750mm signs where Vehicles Per Day < 5,000. Use 900mm signs where Vehicles Per Day > 5,000

TRAFFIC MANAGEMENT PLAN FOR ROUTINE WORKS

5) Road Schematic



6) Traffic Management Selection

6.1) Classification	Road Type	Road Width	Speed Limit	Urban/Rural	Traffic
					Heavy/ Light

6.2) Selection	All Stop	Give & Take	Priority	Stop/ Go	Lights	Tapers

6.3) Semi-Static	Will Semi-Static Management be used?	Yes		No	

7) Signage (Warn / Inform / Direct / End)

No	Sign	Dir	No	Sign	Dir	No	Sign	Dir	No	Sign	Dir
1		A B C D	6		A B C D	11		A B C D	16	Pedestrian Barrier	A B C D
1 + 2 ARE SEMI-STATIC	SELECT PLATE BELOW		7		A B C D	12		A B C D	17		A B C D
		A B C D	8		A B C D	13		A B C D	18		A B C D
3		A B C D	9	YIELD (Priority)	A B C D	14	Barrier Board	A B C D	19		A B C D
5		A B C D	10		A B C D	15		A B C D	20		A B C D

If Using Traffic Lights/ Stop-Go, Have Gardai Been Notified?	YES		NO
Are All Required Cones /(Lamps & Beacons) In Place (and operating)?	YES		NO

8) Workforce Induction & Communication

8.1) Has this Plan been Communicated to the workforce and does everyone know their role? Operatives to Sign Below	Yes		No	

8.2) Supervisor	

NOTIFICATION OF POSITIVE TRAFFIC CONTROL

Under the following Road Traffic Acts/Regulations

- Section 37 of the Road Traffic Act, 1994
- Road Traffic (Signs) Regulations 2006 (S.I. No. 637 of 2006)
- Road Traffic (Control of Traffic) Regulations 2006 (S.I. No. 638 of 2006)

The Roads Authority of

Hereby notifies

Of the use of

TEMPORARY TRAFFIC LIGHTS ☐

STOP-GO BOARD(s) ☐

at the following location:

Road

From a point

To a point

ON/ BETWEEN (delete as appropriate) the following dates

	and	

Observations (if any) should be faxed to: _____

Signed: _____

On behalf of the Roads Authority

PLANNED WORKS TRAFFIC MANAGEMENT SITE INSPECTION SHEET					
PROJECT NAME:			Phase:		
Date:		Time:	1):	2):	
1) TRAFFIC MANAGEMENT SET-UP/ MODIFICATION, INSPECTIONS					
1-1) Installation Checks					
Does the Traffic Management conform to the Design Layout and Parameters?					
Have all hazards been addressed in the Traffic Management Plan?					
Has allowance been made for the delivery and removal of materials?					
Have Gardai been informed of any Traffic Lights/ Stop-Go Boards in use?					
Have Gardai been informed of Roadworks Speed limits being introduced?					
2) TRAFFIC MANAGEMENT OPERATION INSPECTIONS					
2-1) Operation Checks				1	2
Are Safety Zones being kept clear of operatives, plant and materials?					
Are all the signs in good condition/ are all cones in good condition with sleeves?					
Are sign vision lines free from bends, hills/dips in the road, parked vehicles, hedges etc?					
Will the site be safe at night or in wind, fog, snow or rain? (delete as appropriate)					
Are all misleading permanent signs and road markings covered?					
Is the carriageway/footway being kept clear of mud and surplus equipment?					
Are materials/ plant that are left on verges or lay-bys being properly guarded and lit?					
2-2) Traffic Checks					
Is there safe access to adjacent premises?					
Does Signing and Guarding meet the (changing) conditions?					
Are traffic control arrangements working at the optimum level to reduce traffic delays?					
If present, are the needs of cyclists or horse riders incorporated into the layout?					
2-3) Pedestrian & Vulnerable Road User Checks					
Have the needs of pedestrians & vulnerable road users been addressed in the layout?					
If pedestrian route blocked, has a suitable alternative route been provided?					
Are pedestrian routes clearly evident/ indicated?					
If a footway in the road is to be used, are ramps to the kerb provided?					
Are pedestrian hazards sufficiently GUARDED at night?					
3) TRAFFIC MANAGEMENT CESSATION INPECTIONS					
3-1) Works Complete Checks					
Have all signs, cones, barriers, and lamps been removed?					
Have any covered permanent signs been restored?					
Have Gardaí been informed that Speedlimits/ Traffic Signals/ Stop-Go removed?					
4) EXCEPTIONS REPORT (Append attachments as necessary)					
Check Completed By:					

PROJECT CLOSEOUT SHEET	
PROJECT NAME:	

1) Procedures	
The extents of construction have been completed per the plans	
Pavement Surface has been visually inspected and deemed satisfactory (incl. sweeping of surfaces that have been surface dressed)	
Temporary Traffic Management arrangements (incl. Orders) have been removed	
Any Permanent Road Markings, Road Studs, and Signs have been installed	
2) Works Extents	
The length of work completed was (m)	
The average width of work completed was (m)	
3) Appointments	
PSDP appointment terminated	
Designer appointment terminated	
PSCS appointment terminated	
Contractor given completion certificate	
4) Records	
The safety file is complete and will be stored	
5) Site Inspection	
The site has been inspected by (print name) and deemed to be satisfactory:	
Signature:	
Date of inspection:	
6) Procedure Monitoring (to be completed by supervisor of person listed in 5 above)	
I recommend that the Project be deemed complete (print name)	
Signature:	
Date:	

INCIDENT/ ACCIDENT REPORT FORM

1) Job Details

1.1) Job Name	
1.2) Job Location	

2) Incident

2.1) Date of Incident				2.2) Time of Incident				
2.3) Incident Involves	Public	Layout	Operatives	Plant	Materials	Hired	Contractor	Environment
2.4) Incident Classification	Class 1			Class 2		Class3	Class 4	
	Long Traffic Delays	Pedestrian Danger		Near Miss	Minor Injury	3 Day Injury	Road Traffic Accident	Serious Injury or Death

2.5) Weather Conditions	Light:	Sunny	Cloudy	Fog	Dawn/Dusk	Night	Floodlit
	Rain:	Dry	Light Rain	Heavy Rain	Hailstones	Snow	
	Wind:	No Wind	Breeze	Windy	Gale		
	Temperature:	Warm	Cold	Freezing			

2.6) Locus	Carriageway	Footpath	Safety Zone	Working Space

2.7) Pavement Condition	Clean	Dirty	Dry	Wet	Granular	Wearing	Base	Chips	Markings

2.8) Number involved (Class 2 or greater)	

3) Traffic Management

	N/A	Yes	No
3.1) Were the appropriate signs in their correct place?			
3.2) Were the signs in a good condition?			
3.3) Were all cones in place and in good condition?			
3.4) Were all TM Lamps in place and operating?			
3.5) Were all TM Beacons in place and operating?			
3.6) Were Plant Hazard Beacons operating?			

4) Site Health and Safety

	N/A	Yes	No
4.1) Had operative appropriate CSCS card?			
4.2) Had plant/ equipment been checked for suitability?			
4.3) Were Safety Guards in place and in good condition?			
4.4) Were correct operating procedures/ guidelines used?			
4.5) Were operatives wearing appropriate PPE?			
4.6) Was there good housekeeping on site?			

5) Emergency Procedure

5.1) Services	None	First Aid	Driven to Aid	Ambulance	Fire Brigade	Gardai

5.2) Procedure	Good	Bad	None
Training			
Equipment			

6) Operatives (List operatives on site at time of incident)

7) Incident Description

8) Suggested Control Measures to Prevent Re-Occurance

9) Incident Sketch

10) Report Completed By:		11) Report Noted By:	

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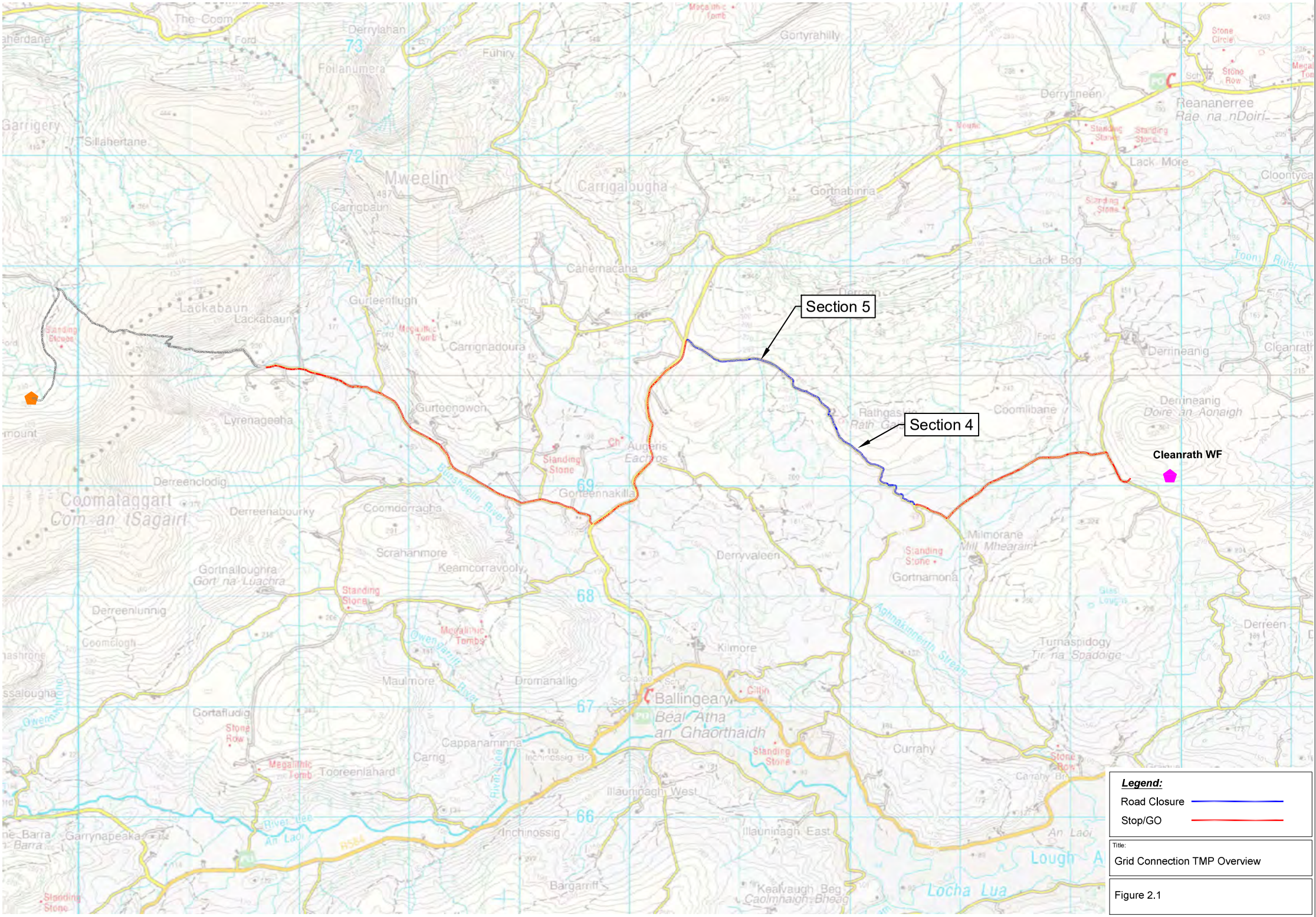
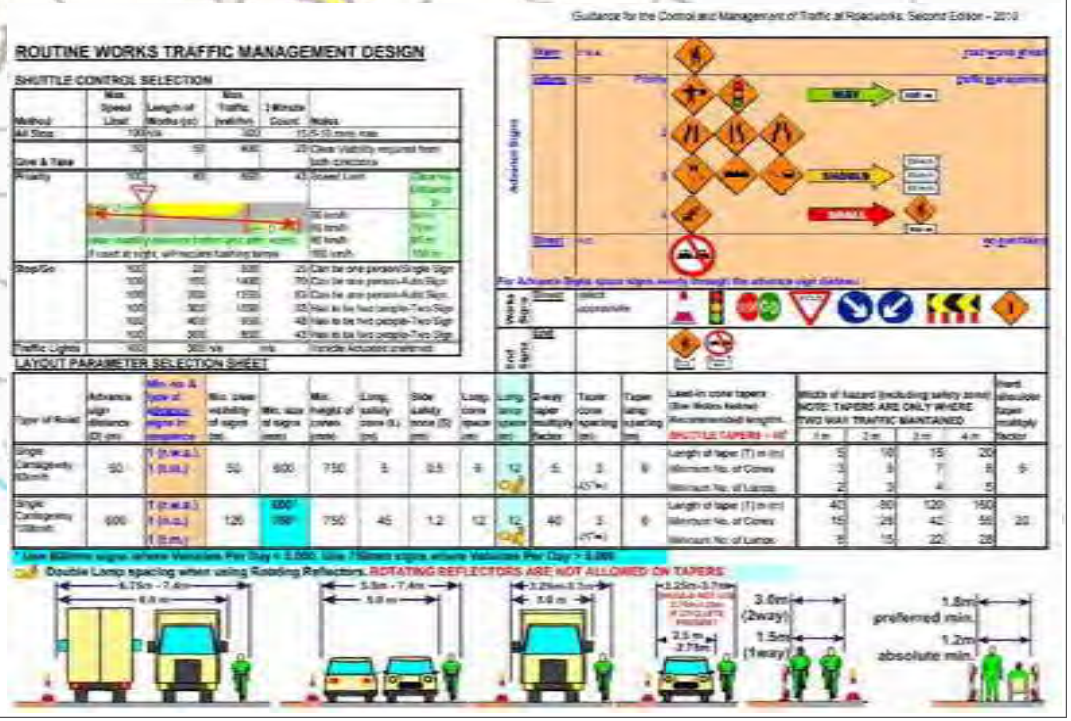
MCE – Cleanrath Cable Route Traffic Management Plan

	Name (Print)	Signature	I understand the details in the traffic management plan and agree to sign off (tick)	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				


Section 5
Section 4
Cleanrath WF
Legend:
Road Closure
Stop/GO
Title:
Grid Connection TMP Overview
Figure 2.1



TM (A) Traffic Lights OR Flagman

Date: 25/05/2018 **Author:** James Crowley

Project: Cleanrath Wind Farm **Example:** Typical Scenario

Works Type: Type A **Visibility:** 200m

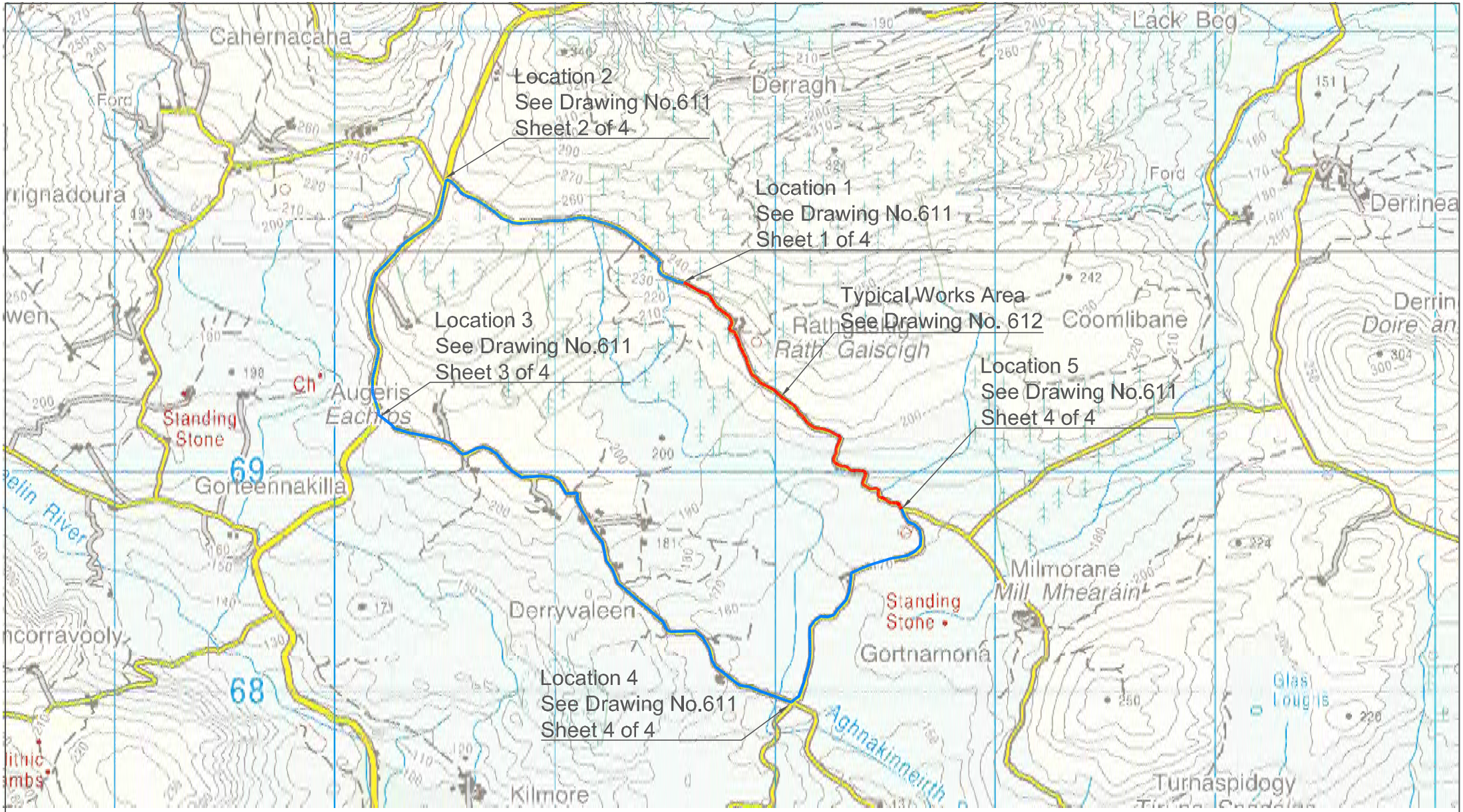
Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

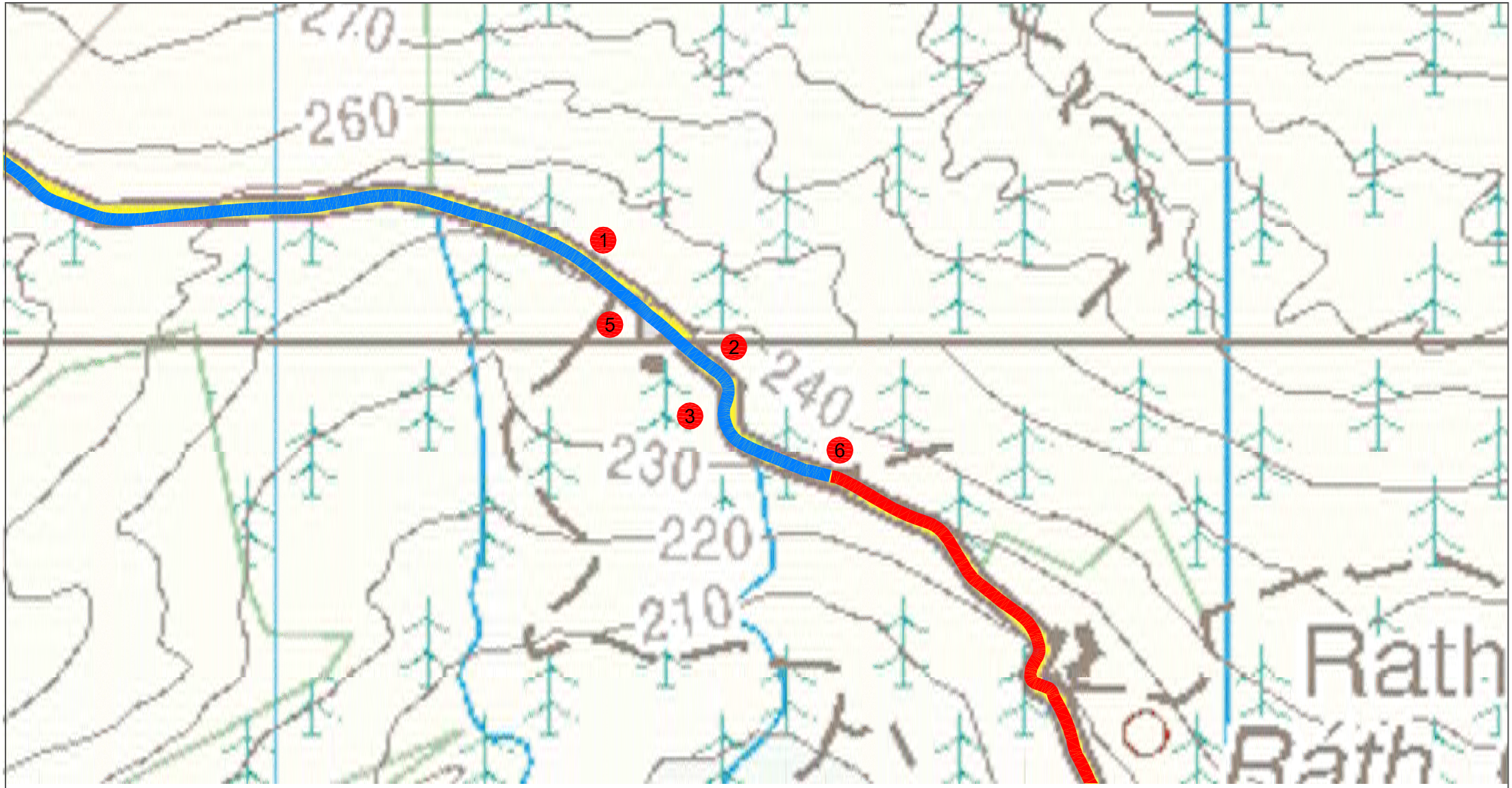
Figure 2.2 - Typical Stop / Go Scenario

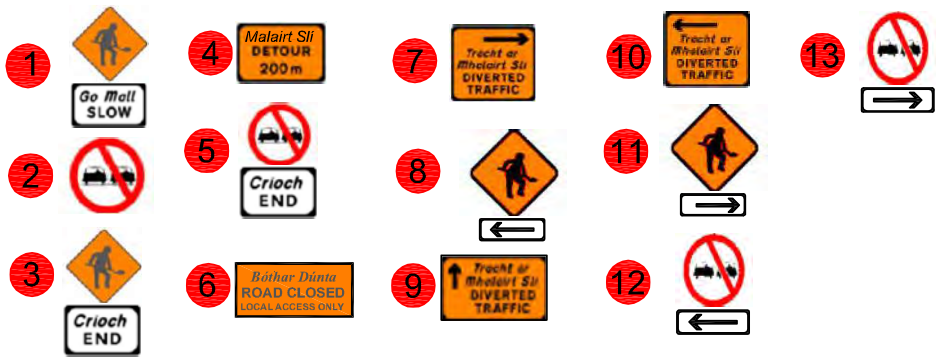


Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable
Drawing Title:	Section 4 - Road Closure Overall Layout View

Date: 07.12.17	Prepared by: JOC	DRG No.	610
Scale: NTS	Rev: 001	Job Ref:	0040





N

LEGEND:

1,629m ROAD CLOSURE

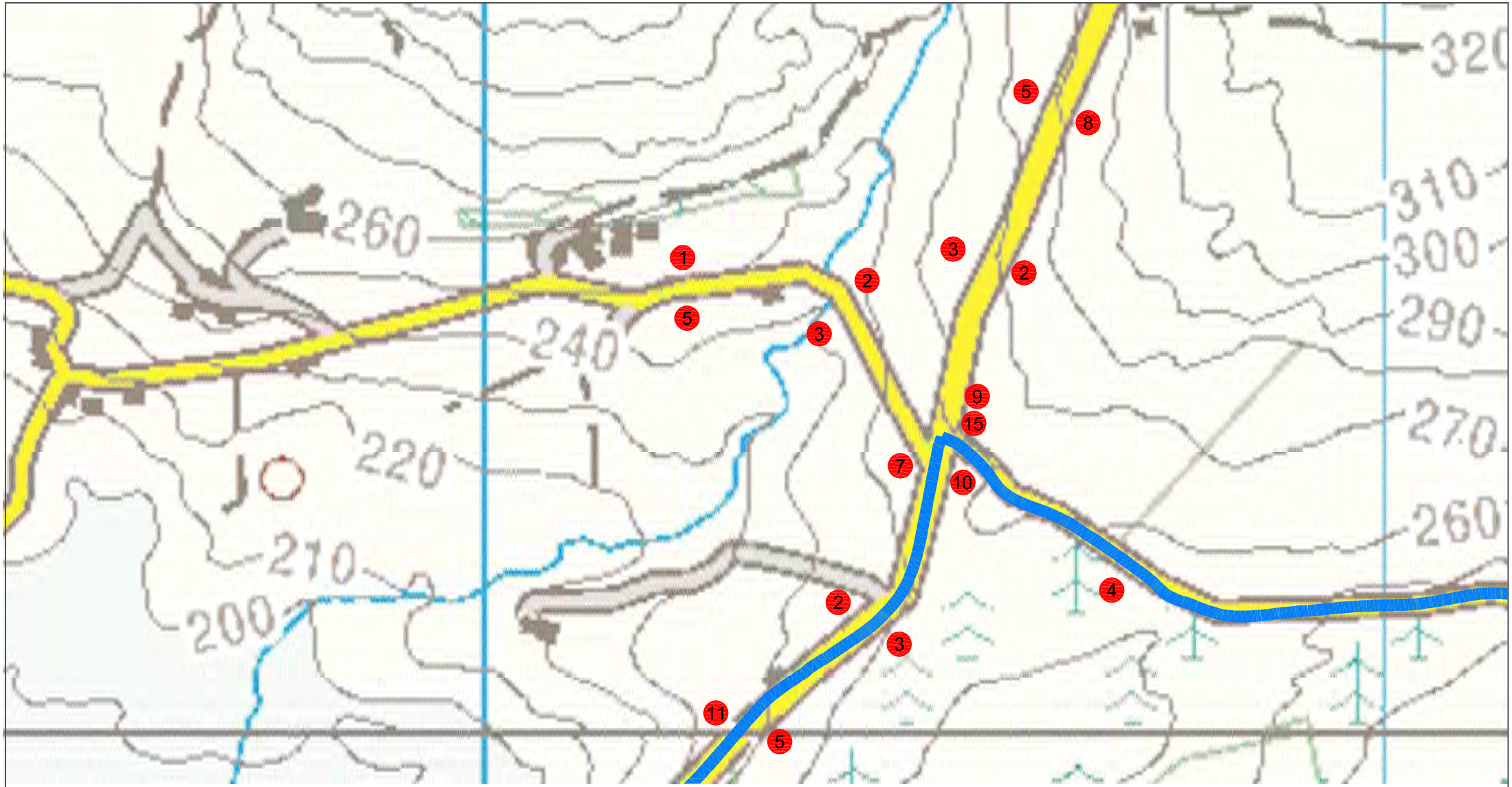
6,264m DIVERSION ROUTE

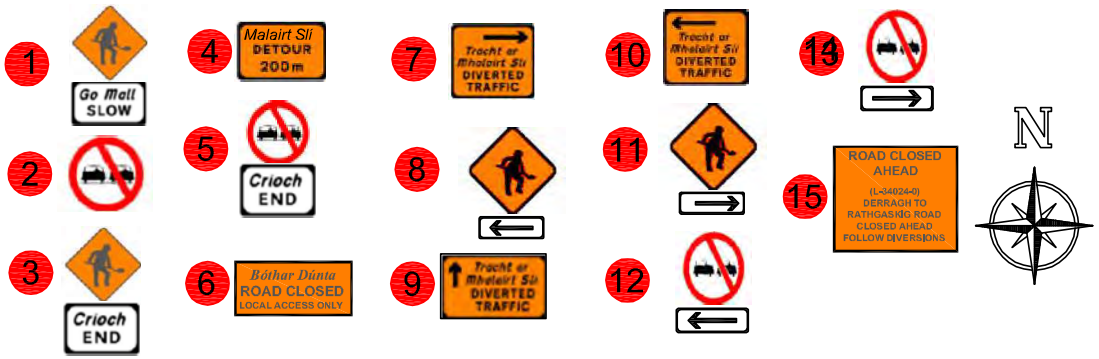
Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Section 4 - Road Closure Location 1- Layout Sheet 1of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.	611-1
Scale:	NTS	Rev:	001	Job Ref:	0040





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LEGEND:

1,629m ROAD CLOSURE

6,264m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Section 4 - Road Closure Location 2- Layout Sheet 2 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.	611-2
Scale:	NTS	Rev:	001	Job Ref:	0040

1 Go Mall SLOW

2

3 Crioch END

4 Malairt Sli DETOUR 200m

5 Crioch END

6 Bóthar Dúnta ROAD CLOSED LOCAL ACCESS ONLY

7 Tracht ar Mhalairt Sli DIVERTED TRAFFIC

8

9 Tracht ar Mhalairt Sli DIVERTED TRAFFIC

10 Tracht ar Mhalairt Sli DIVERTED TRAFFIC

11

12

13

N

LEGEND:

1,629m ROAD CLOSURE

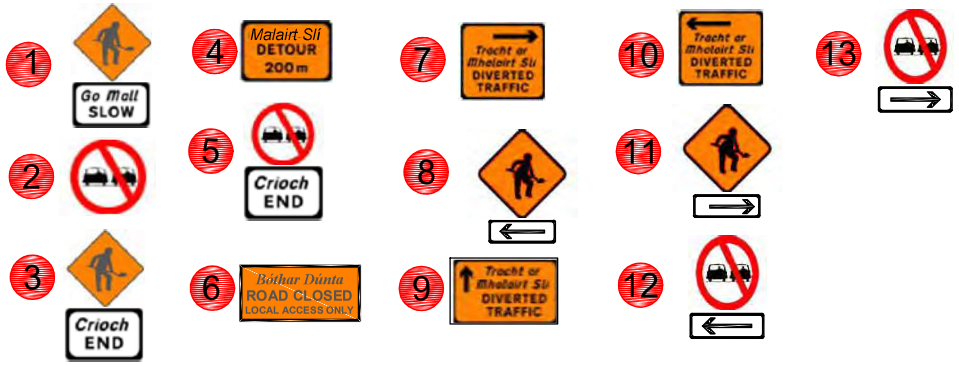
6,264m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Section 4 - Road Closure Location 3 - Layout Sheet 3 of 4

Date: 07.12.17	Prepared by: JOC	DRG No.	611-3
Scale: NTS	Rev: 001	Job Ref:	0040



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LEGEND:

1,629m ROAD CLOSURE

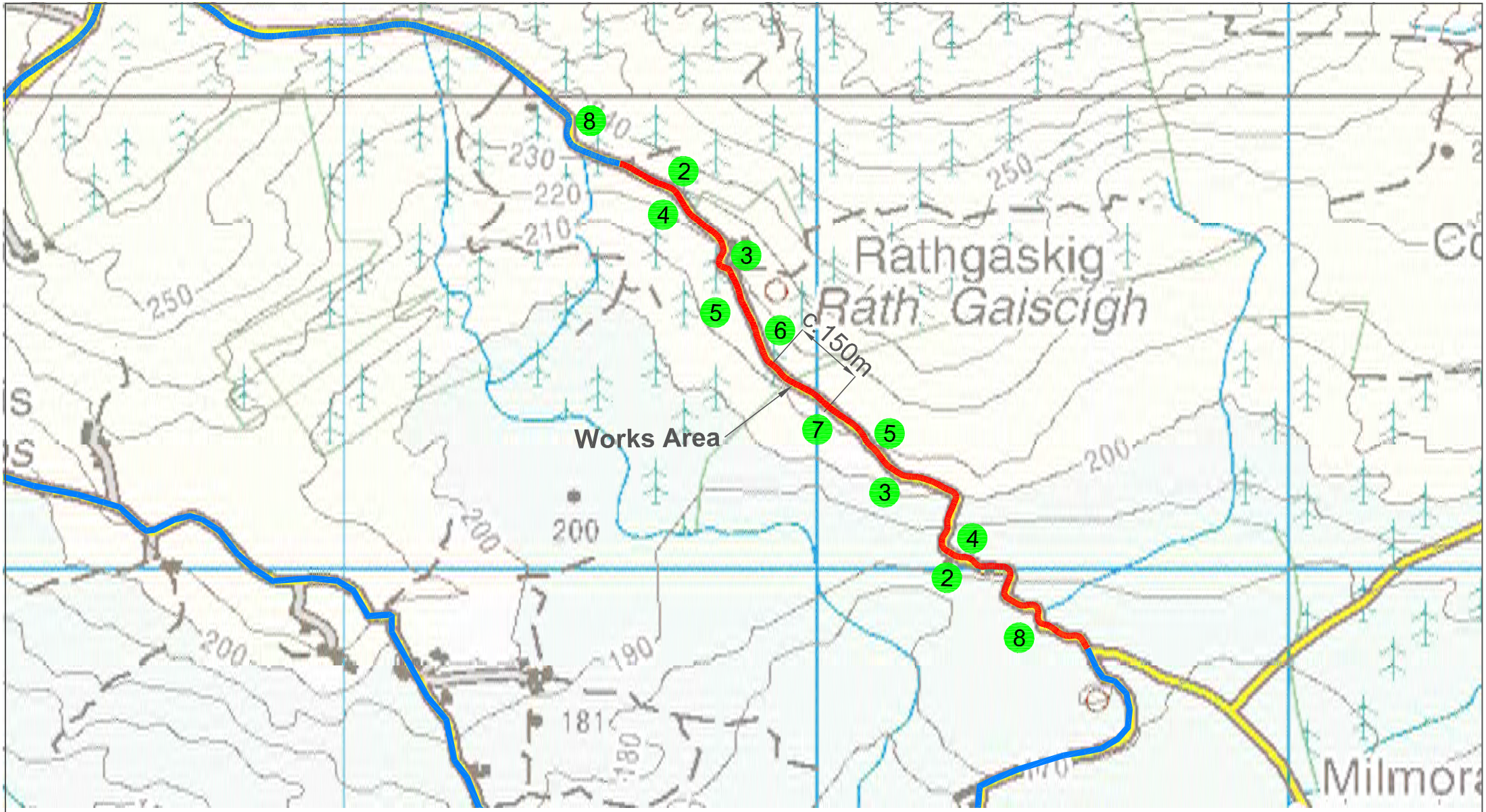
6,264m DIVERSION ROUTE

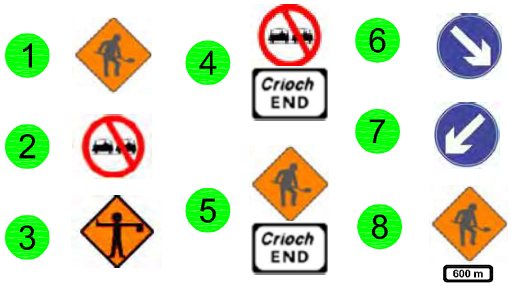
Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Section 4 - Road Closure
Location 4&5 - Layout Sheet 4 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.	611-4
Scale:	NTS	Rev:	001	Job Ref:	0040





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LEGEND:

1,629m ROAD CLOSURE

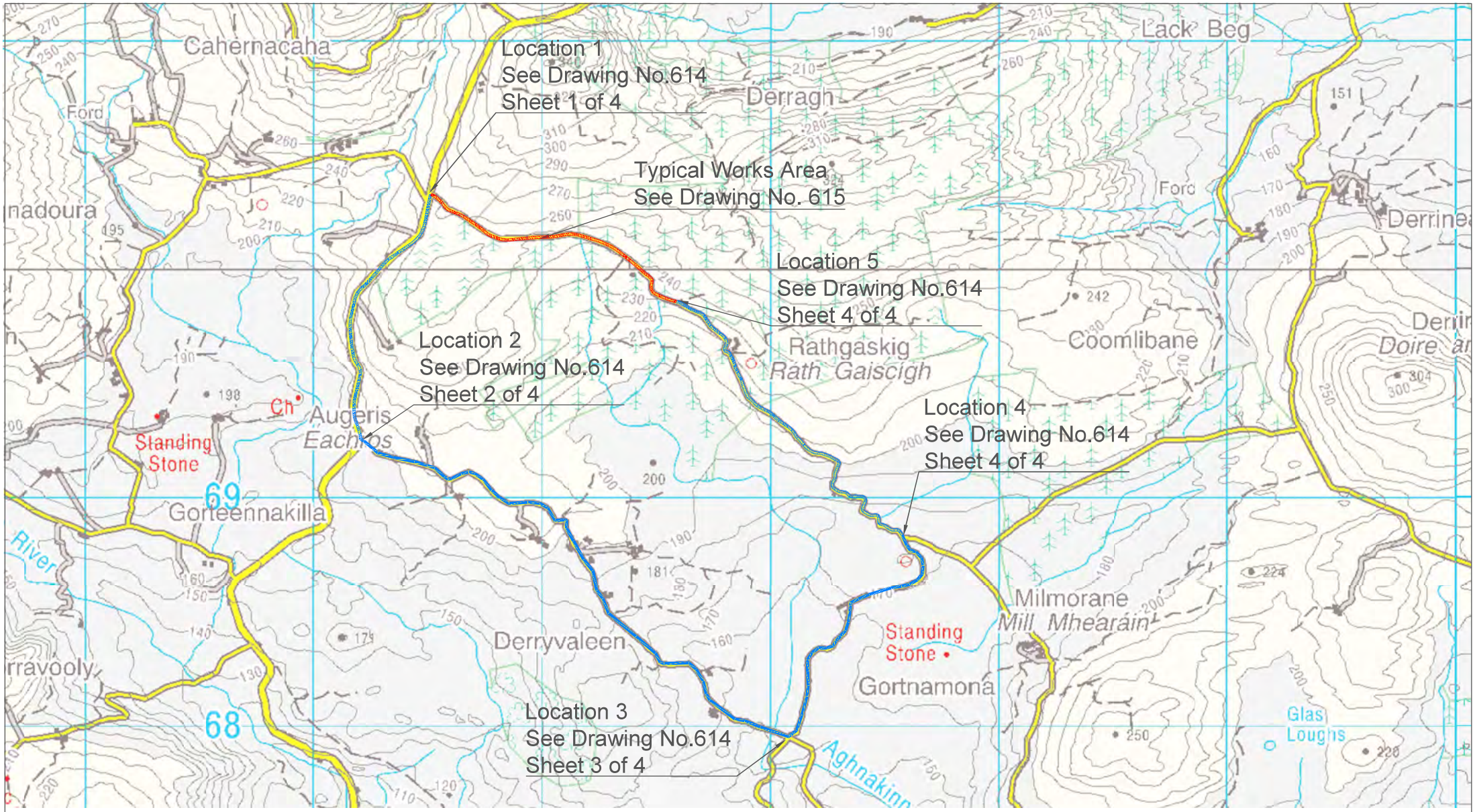
6,265m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Typical Works Area - Section 4
Traffic Calming Measures
Floating Road Works

Date:	07.12.17	Prepared by:	JOC	DRG No.	612
Scale:	NTS	Rev:	001	Job Ref:	0040



N

LEGEND:

1,264m ROAD CLOSURE

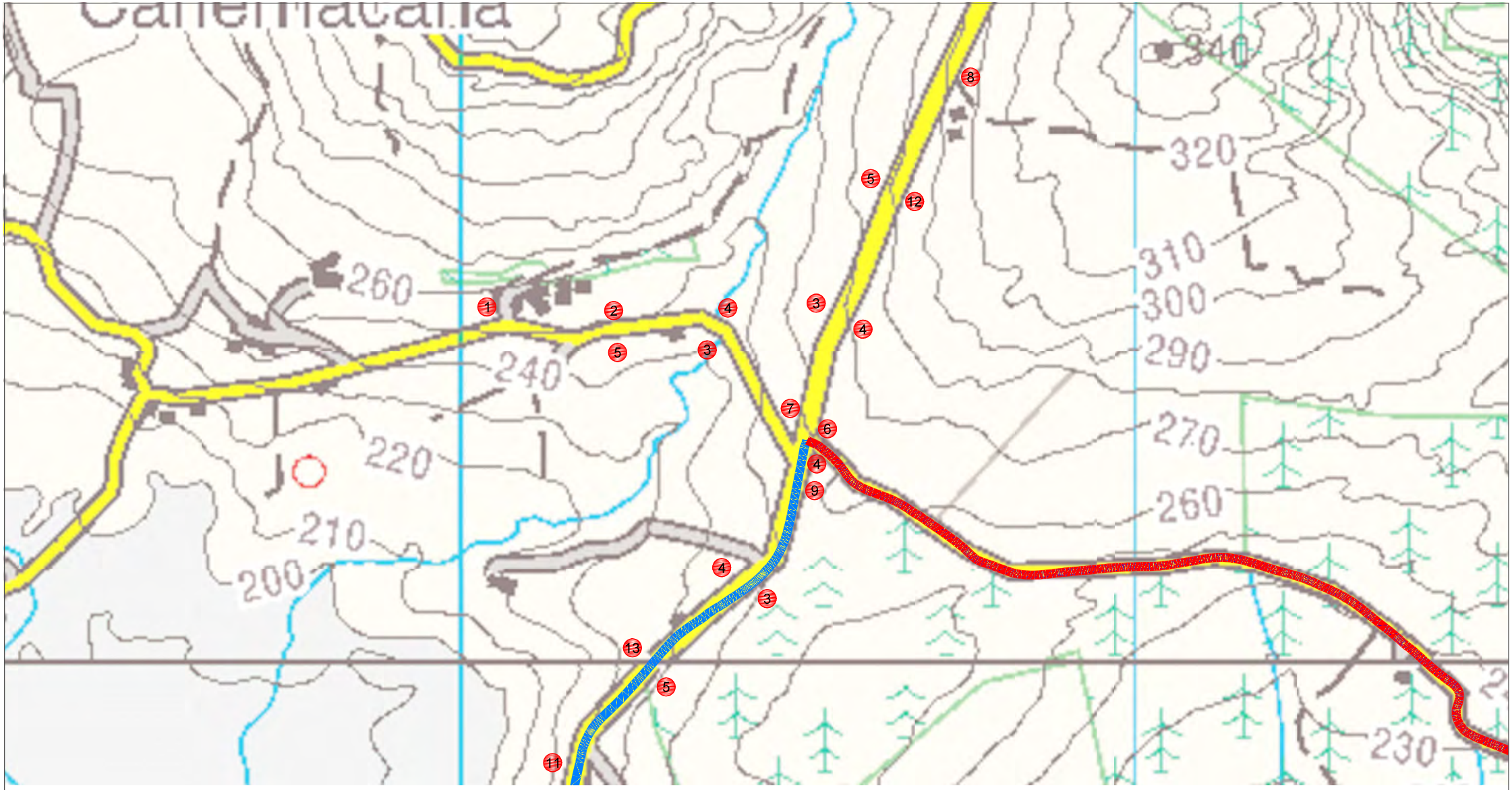
6,628m DIVERSION ROUTE

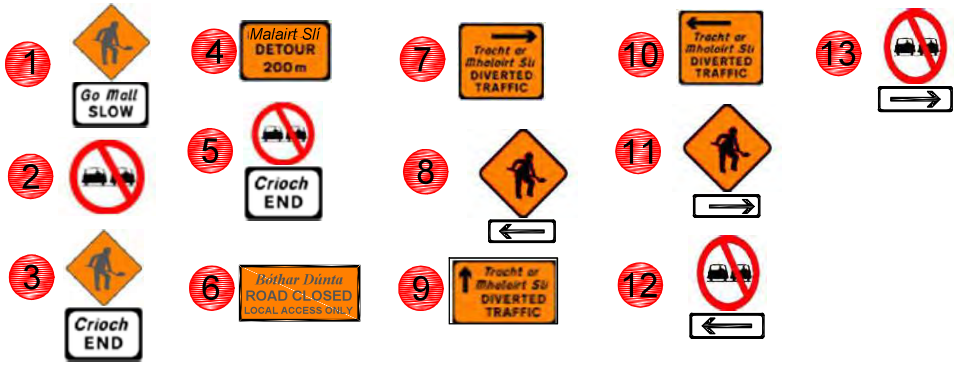
Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Road Opening Application Section 5 Overview Layout

Date:	07.12.17	Prepared by:	JOC	DRG No.	613
Scale:	NTS	Rev:	001	Job Ref:	0040





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LEGEND:

1,264m ROAD CLOSURE

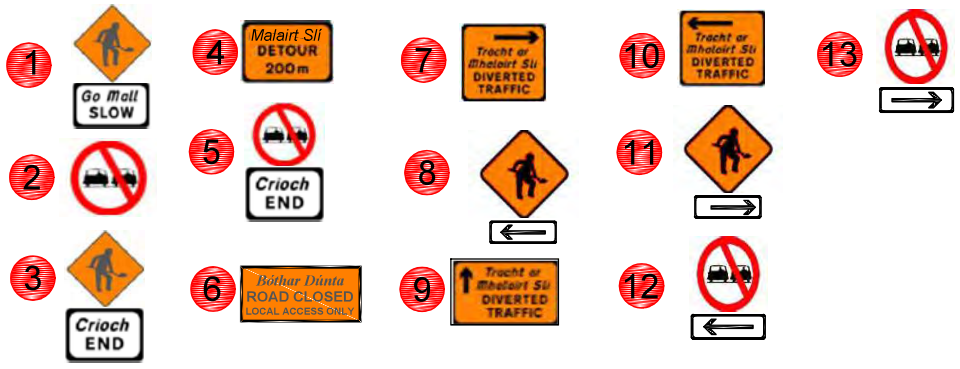
6,628m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Road Calming Measures Section 5 - Location 1 Layouts Sheet 1 of 4

Date: 07.12.17	Prepared by: JOC	DRG No.	614-1
Scale: NTS	Rev: 001	Job Ref.	0040



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LEGEND:

1,264m ROAD CLOSURE

6,628m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Road Calming Measures Section 5 - Location 2 Layouts Sheet 2 of 4

Date: 07.12.17	Prepared by: JOC	DRG No.	614-2
Scale: NTS	Rev: 001	Job Ref.	0040

1 Go Mall SLOW

2

3 Crioch END

4 Malairt Slí DETOUR 200m

5 Crioch END

6 Bóthar Dúnta ROAD CLOSED LOCAL ACCESS ONLY

7 Tracht ar Mhalairt Slí DIVERTED TRAFFIC

8

9 Tracht ar Mhalairt Slí DIVERTED TRAFFIC

10 Tracht ar Mhalairt Slí DIVERTED TRAFFIC

11

12

13

N

LEGEND:

1,264m ROAD CLOSURE

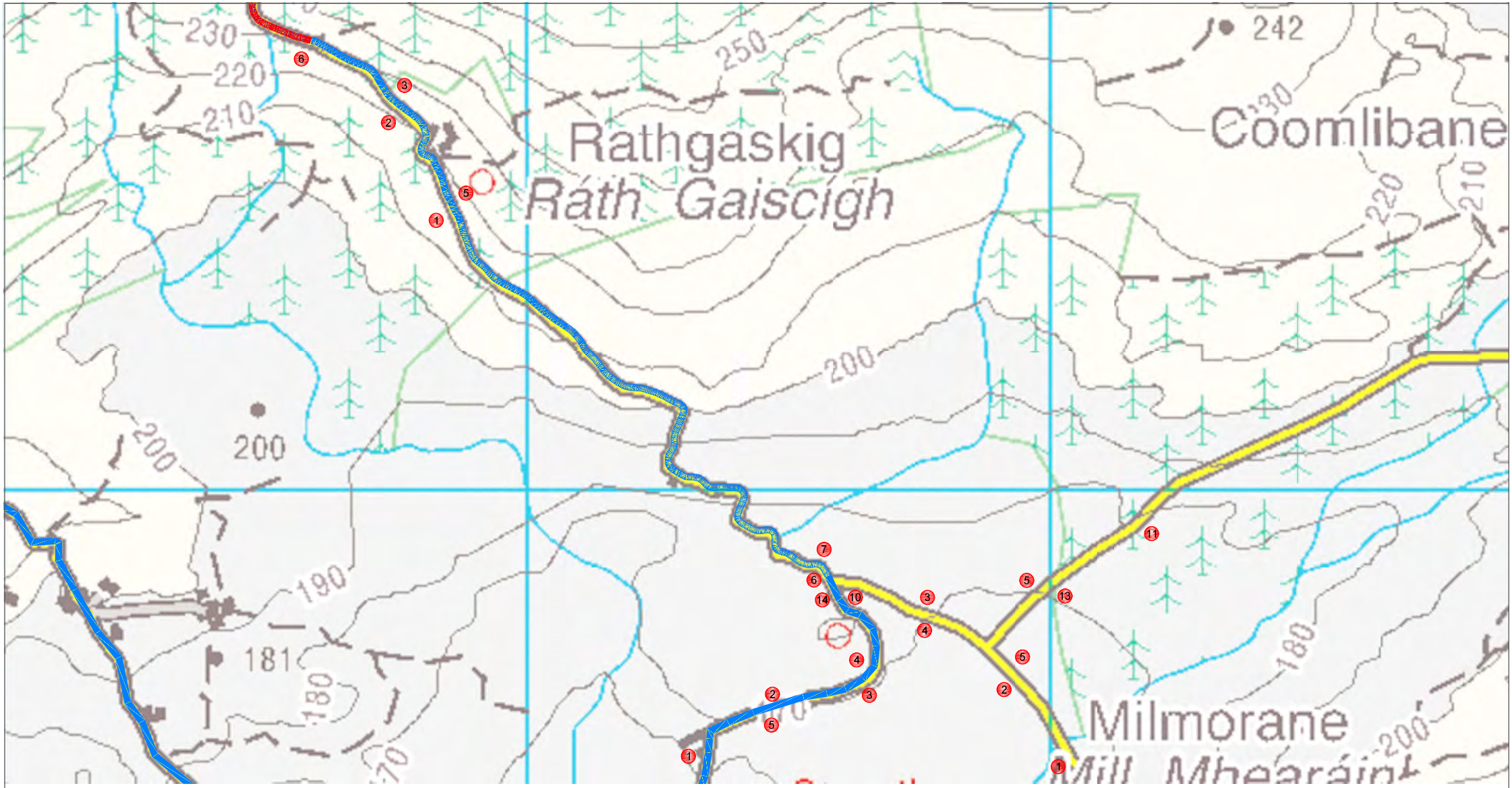
6,628m DIVERSION ROUTE

Rev.	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Road Calming Measures Section 5 - Location 3 Layouts Sheet 3 of 4

Date: 07.12.17	Prepared by: JOC	DRG No.	614-3
Scale: NTS	Rev: 001	Job Ref.	0040



1 Go Mall SLOW

2

3 Crioch END

4 Malairt Slí DETOUR 200m

5 Crioch END

6 Bóthar Dúnta ROAD CLOSED LOCAL ACCESS ONLY

7 Tracht ar Mhalairt Slí DIVERTED TRAFFIC

8

9 Tracht ar Mhalairt Slí DIVERTED TRAFFIC

10 Tracht ar Mhalairt Slí DIVERTED TRAFFIC

11

12

13

14 ROAD CLOSED AHEAD (L-34024-0) AUGERIS TO DERRAGH ROAD CLOSED AHEAD FOLLOW DIVERSIONS

N

LEGEND:

1,264m ROAD CLOSURE

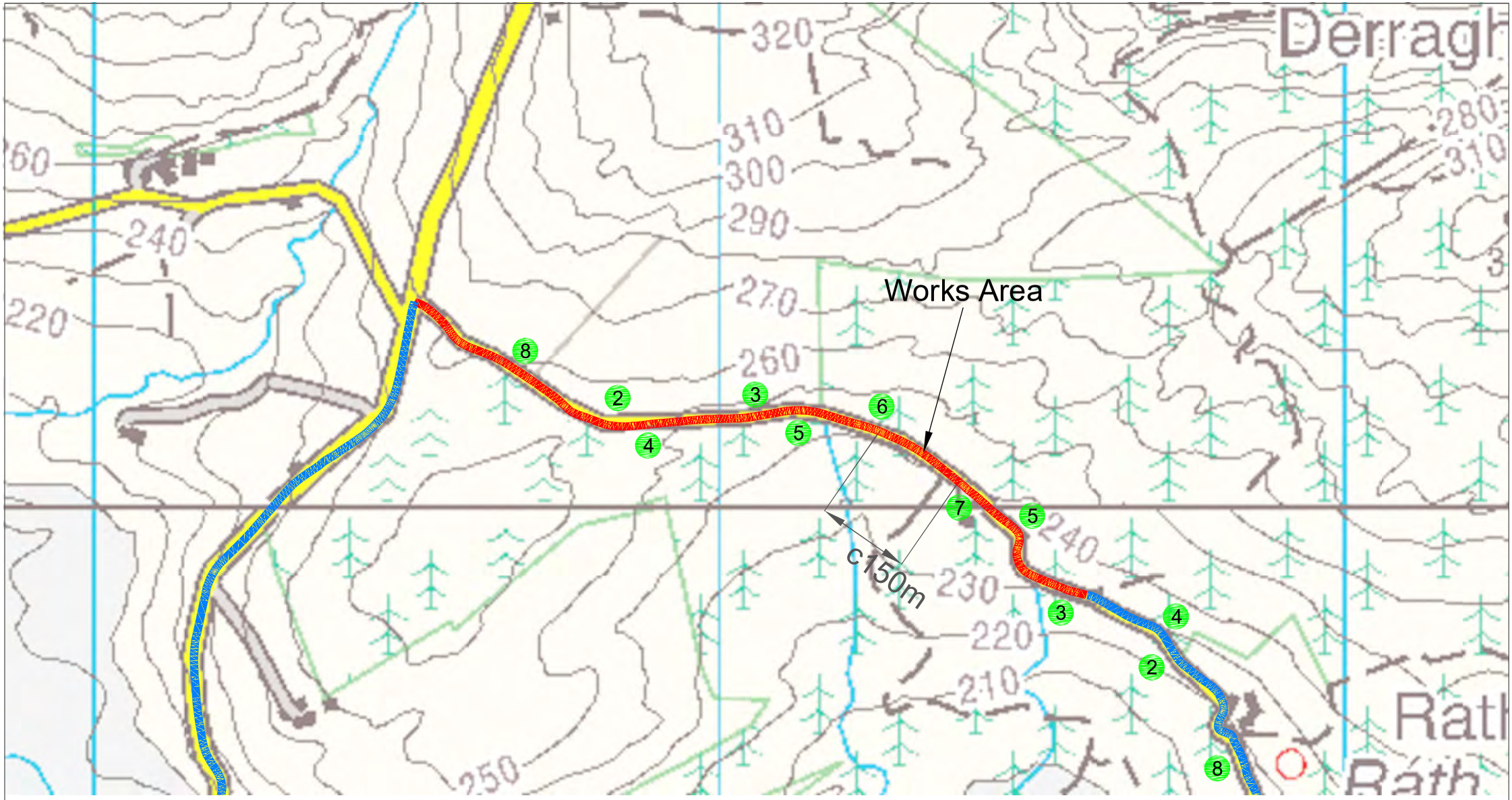
6,628m DIVERSION ROUTE

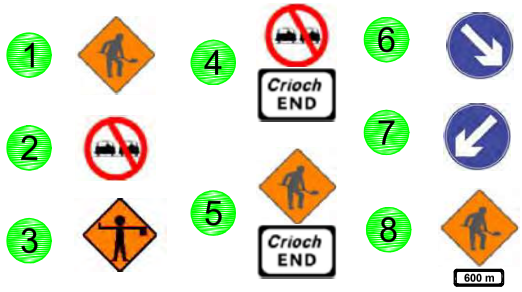
Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Road Calming Measures Section 5 - Location 5&6 Layouts Sheet 4 of 4

Date: 07.12.17	Prepared by: JOC	DRG No.	614-4
Scale: NTS	Rev: 001	Job Ref.	0040





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LEGEND:

1,264m ROAD CLOSURE

6,628m DIVERSION ROUTE

Rev.	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Typical Works Area - Section 5 Traffic Calming Measures Floating Road Works

Date: 07.12.17	Prepared by: JOC	DRG No.	615
Scale: NTS	Rev: 001	Job Ref.	0040

MCE Ltd.

Civil Engineering

Traffic Management Plan: Cleanrath WF Haul Route

May 2018

Telephone: +353 (0) 21 733 6034, Fax: +353 (0) 21 733 6145
Web: www.mceengineering.ie, Email: office@mceengineering.ie
Lissarda Industrial Estate, Lissarda, Cork, Ireland.

MCE Ltd.

Civil & Electrical Engineering Specialists

MCE – Cleanrath WF's Traffic Management Plan

Contractor: MCE ltd.

Project name: Cleanrath Wind Farm

Address: Cleanrath, Co. Cork.

Name : James Crowley – Tel: 021-2066947
Chris Murnane – Tel: 086 -7955083

Email: james.crowley@turnkeydev.com
chris.murnane@gmail.com

Site supervisor: TBC

Safety officer: TBC

Description of task: Traffic Management Plan for Cleanrath WF Haul Route

Key plant: Construction Traffic e.g.
Lorries,
Excavator transport vehicles
Site vehicles
Tractors & trailers

Specific Training: FAS safe pass
CSCS plant ticket
Site induction

MCE – Cleanrath WF's Traffic Management Plan

Introduction:

This traffic management plan outlines the haul route from the N22 and roadways around the wind farm main entrance for the construction stage process. All traffic management will comply with guidance given in Chapter 8, Traffic Signs Manual, Department of Transport November 2006 and Control and management of Traffic at Road Work October 2007.

Local Access for Residents

As part of the traffic management plan local residents will be alerted to the works through the use of letter drops and prior consultation, if required.

Every effort will be made to limit the effect on local residents and any residents who require special provisions to be made will be accommodated (i.e. Home carer, etc.). Traffic management plans will be reviewed on a daily basis and take into account all local parameter in the area. All required Roadwork Temporary Traffic Management Design Sheets will be completed and kept on site.

Pedestrian & Cyclist Management

Construction traffic & operatives will be made aware to watch out for oncoming pedestrians / cyclists.

MCE – Cleanrath WF's Traffic Management Plan

Dealing With Emergency Services

Gardaí will be advised of the intended works prior to commencement on the Gardaí Consultation form. Emergency services using the local roads will be given priority.

Signage Plan

All works will be signed in accordance with the "Guidance for the Control and Management of Traffic at Road Works" (Second Edition 2010). The Routine Works Traffic Management Design, including the layout parameters is illustrated on attachment.
A fully certified and competent 'Signing Lighting & Guarding' officer will sign off on the works before commencement and carry out routine monitoring. A qualified supervisor will be on site at all times.

✓See attached traffic management design sheet for signage etc.

✓The entire traffic management system will be set up prior to any works commencing.

✓Only approved signs will be used on approach to the wind farm entrances.

✓All signs will be clean and clearly visible.

✓Once signs are in place the route will be assessed to ensure adequate visibility for drivers and pedestrians.

✓All signs will be secured and weighted down where appropriate.

✓Contractor vehicles will be parked with consideration given to traffic management plan.

MCE – Cleanrath WF's Traffic Management Plan

Haul Route Overview Drawings:

The following drawings are included at the end of this document:

✓Figure 1.1 – Construction Stage Overall Layout View
✓Figure 1.2 – Sheet 1 of 5 – Location 1, 2, 3 & 4 Layouts
✓Figure 1.3 – Sheet 2 of 5 – Location 5 & 6 Layouts
✓Figure 1.4 – Sheet 3 of 5 – Location 6 & 7 Layouts
✓Figure 1.5 – Sheet 4 of 5 – Location 8 Layout
✓Figure 1.6 – Sheet 5 of 5 – Location 9 Layout

Signage Layout On Approach To The Wind Farm Entrances

The following is the layout for signage that will be in place on the approach to the wind farm entrances. See attached Figure 1.1 showing signage layout from N22 to the WF entrances:

✓Sign no 1: WK001 / P011D indicates sign 600m before entrance "Man with Shovel" & "55km/h".

✓Sign no 2: RUS014 indicates sign 400m before entrance "No Overtaking".

✓Signage after road words will indicate 'No Overtaking Ends' and ' End of Road Works'.

✓All other signs as shown in Figure 1.1 to Figure 1.6 indicates specific site directions to site.

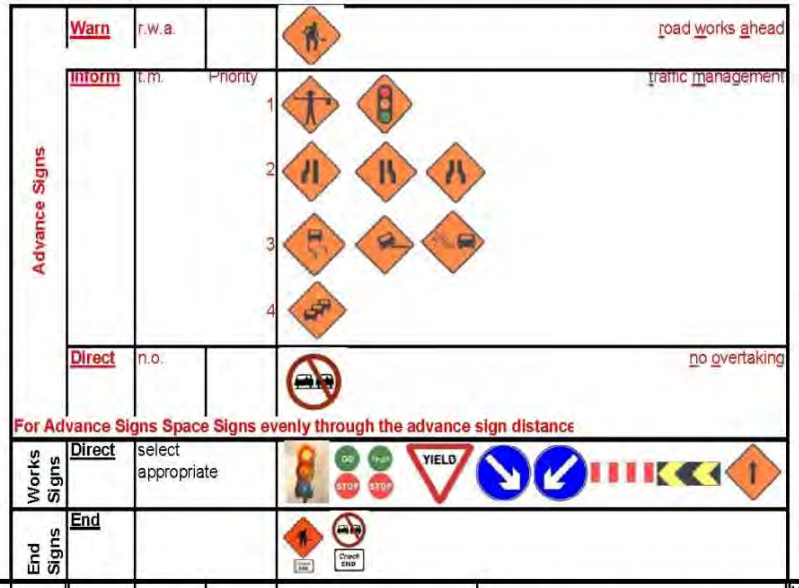
Traffic entering and exiting existing secondary road will continue as normal with construction traffic kept to a minimum.

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max Speed Limit (km/h)	Length of Works (m)	Max Traffic (veh/hr)	3 Min Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give and Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	840	42	Speed Limit	Distance
	These Distances indicate the clear visibility distance from before an obstruction to a point an equal distance beyond the obstruction. If used at night, will require a warning beacon				50 km/h	60m
					60 km/h	70m
					80 km/h	80m
					100 km/h	100m
Stop/Go	100	20	500	25	Can be Single Man/Single Sign	
	100	100	1400	70	Can be single Man-Auto Sign	
	100	200	1250	63	Can be single Man-Auto Sign	
	100	300	1050	53	Has to be Two Man-Two Sign	
	100	400	950	48	Has to be Two Man-Two Sign	
	100	500	850	43	Has to be Two Man-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated	

NOTE: WHEN USING SHUTTLE CONTROL, TAPERS ARE AT 45 DEGREES



LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance Sign Distance (D) (m)	Min No. & Type Of Advance Signs In Sequence	Min clear visibility of Signs (m)	Min size of signs (mm)	Min height of cones (mm)	Long. Safety Zone (L) (m)	Side. Safety Zone (S) (m)	Long. Cone Space	Long. Lamp Space	Lane Taper Multiply factor	Taper Cone Spacing	Taper Lamp Spacing	Lead-in cone tapers (See Notes below) Recommended lengths	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard Shoulder Taper Multiply factor
Single carriageway road, 30km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	8 4 2	16 7 3	24 10 4	32 12 5	4
Single carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	8 4 2	16 7 3	24 10 4	32 12 5	4
Single Carriageway 80km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	90	750* 900*	750	45	1.2	12	24	35	2.5	9	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	35 16 5	70 30 9	105 44 13	140 58 17	20
Single Carriageway 100 km/h	800	1 (r.w.a.) 1 (n.o.) 2 (t.m.)	120	750* 900*	750	60	1.2	12	24	40	1	9	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	40 42 6	80 82 10	120 122 15	160 162 19	20
Dual Carriageway 60 km/h	600	1 (r.w.a.) 2 (t.m.) X 2	50	900	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	8 4 2	16 7 3	24 10 4	32 12 5	4
Dual Carriageway 80 km/h	600	1 (r.w.a.) 2 (t.m.) X 2	90	900	750	45	0.75	12	24	35	3	9	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	35 13 5	70 25 9	105 37 13	140 48 17	10
Dual Carriageway 100 km/h	1000	2 (r.w.a.) 3 (t.m.) X 2	120	1200	750	45	1.2	12	24	40	1	9	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	40 42 6	80 82 10	120 122 15	160 162 19	20

* Use 750mm signs where Vehicles Per Day < 5,000. Use 900mm signs where Vehicles Per Day > 5,000

TRAFFIC MANAGEMENT PLAN FOR ROUTINE WORKS

5) Road Schematic

A B	A B	A B	A B C	A D B C	A D C B

6) Traffic Management Selection

6.1) Classification	Road Type	Road Width	Speed Limit	Urban/Rural	Traffic
					Heavy/ Light

6.2) Selection	All Stop	Give & Take	Priority	Stop/ Go	Lights	Tapers

6.3) Semi-Static	Will Semi-Static Management be used?	Yes		No	

7) Signage (Warn / Inform / Direct / End)

No	Sign	Dir	No	Sign	Dir	No	Sign	Dir	No	Sign	Dir
1		A B C D	6		A B C D	11		A B C D	16	Pedestrian Barrier	A B C D
1 + 2 ARE SEMI-STATIC	SELECT PLATE BELOW Deisiú Bóthair ROAD REPAIRS Oibreacha Draeinàil DRAINAGE WORKS Bearradh Fàil HEDGE CUTTING		7		A B C D	12		A B C D	17		A B C D
2	2 km ar fad FOR 2 km	A B C D	8		A B C D	13		A B C D	18		A B C D
3		A B C D	9	YIELD (Priority)	A B C D	14	Barrier Board	A B C D	19	Críoch END	A B C D
5		A B C D	10		A B C D	15		A B C D	20	Críoch END	A B C D

If Using Traffic Lights/ Stop-Go, Have Gardaí Been Notified?	YES		NO	
Are All Required Cones /(Lamps & Beacons) In Place (and operating)?	YES		NO	

8) Workforce Induction & Communication

8.1) Has this Plan been Communicated to the workforce and does everyone know their role? Operatives to Sign Below	Yes		No	

8.2) Supervisor		

NOTIFICATION OF POSITIVE TRAFFIC CONTROL

Under the following Road Traffic Acts/Regulations

- Section 37 of the Road Traffic Act, 1994
- Road Traffic (Signs) Regulations 2006 (S.I. No. 637 of 2006)
- Road Traffic (Control of Traffic) Regulations 2006 (S.I. No. 638 of 2006)

The Roads Authority of

Hereby notifies

Of the use of

TEMPORARY TRAFFIC LIGHTS ☐

STOP–GO BOARD(s) ☐

at the following location:

Road

From a point

To a point

ON/ BETWEEN (delete as appropriate) the following dates

and

Observations (if any) should be faxed to:

Signed: _____

On behalf of the Roads Authority

PLANNED WORKS TRAFFIC MANAGEMENT SITE INSPECTION SHEET					
PROJECT NAME:			Phase:		
Date:		Time:	1).	2).	
1) TRAFFIC MANAGEMENT SET-UP/ MODIFICATION, INSPECTIONS					
1-1) Installation Checks					
Does the Traffic Management conform to the Design Layout and Parameters?					
Have all hazards been addressed in the Traffic Management Plan?					
Has allowance been made for the delivery and removal of materials?					
Have Gardaí been informed of any Traffic Lights/ Stop-Go Boards in use?					
Have Gardaí been informed of Roadworks Speed limits being introduced?					
2) TRAFFIC MANAGEMENT OPERATION INSPECTIONS					
2-1) Operation Checks				1	2
Are Safety Zones being kept clear of operatives, plant and materials?					
Are all the signs in good condition/ are all cones in good condition with sleeves?					
Are sign vision lines free from bends, hills/dips in the road, parked vehicles, hedges etc?					
Will the site be safe at night or in wind, fog, snow or rain? (delete as appropriate)					
Are all misleading permanent signs and road markings covered?					
Is the carriageway/footway being kept clear of mud and surplus equipment?					
Are materials/ plant that are left on verges or lay-bys being properly guarded and lit?					
2-2) Traffic Checks					
Is there safe access to adjacent premises?					
Does Signing and Guarding meet the (changing) conditions?					
Are traffic control arrangements working at the optimum level to reduce traffic delays?					
If present, are the needs of cyclists or horse riders incorporated into the layout?					
2-3) Pedestrian & Vulnerable Road User Checks					
Have the needs of pedestrians & vulnerable road users been addressed in the layout?					
If pedestrian route blocked, has a suitable alternative route been provided?					
Are pedestrian routes clearly evident/ indicated?					
If a footway in the road is to be used, are ramps to the kerb provided?					
Are pedestrian hazards sufficiently GUARDED at night?					
3) TRAFFIC MANAGEMENT CESSATION INPECTIONS					
3-1) Works Complete Checks					
Have all signs, cones, barriers, and lamps been removed?					
Have any covered permanent signs been restored?					
Have Gardaí been informed that Speedlimits/ Traffic Signals/ Stop-Go removed?					
4) EXCEPTIONS REPORT					
(Append attachments as necessary)					
Check Completed By:					

PROJECT CLOSEOUT SHEET	
PROJECT NAME:	

1) Procedures	
The extents of construction have been completed per the plans	
Pavement Surface has been visually inspected and deemed satisfactory (incl. sweeping of surfaces that have been surface dressed)	
Temporary Traffic Management arrangements (incl. Orders) have been removed	
Any Permanent Road Markings, Road Studs, and Signs have been installed	
2) Works Extents	
The length of work completed was (m)	
The average width of work completed was (m)	
3) Appointments	
PSDP appointment terminated	
Designer appointment terminated	
PSCS appointment terminated	
Contractor given completion certificate	
4) Records	
The safety file is complete and will be stored	
5) Site Inspection	
The site has been inspected by (print name) and deemed to be satisfactory:	
Signature:	
Date of inspection:	
6) Procedure Monitoring (to be completed by supervisor of person listed in 5 above)	
I recommend that the Project be deemed complete (print name)	
Signature:	
Date:	

INCIDENT/ ACCIDENT REPORT FORM

1) Job Details

1.1) Job Name	
1.2) Job Location	

2) Incident

2.1) Date of Incident				2.2) Time of Incident				
2.3) Incident Involves	Public	Layout	Operatives	Plant	Materials	Hired	Contractor	Environment
2.4) Incident Classification	Class 1			Class 2		Class3	Class 4	
	Long Traffic Delays	Pedestrian Danger		Near Miss	Minor Injury	3 Day Injury	Road Traffic Accident	Serious Injury or Death

2.5) Weather Conditions	Light:	Sunny	Cloudy	Fog	Dawn/Dusk	Night	Floodlit
	Rain:	Dry	Light Rain	Heavy Rain	Hailstones	Snow	
	Wind:	No Wind	Breeze	Windy	Gale		
	Temperature:	Warm	Cold	Freezing			
2.6) Locus	Carriageway	Footpath	Safety Zone	Working Space			

2.7) Pavement Condition	Clean	Dirty	Dry	Wet	Granular	Wearing	Base	Chips	Markings

2.8) Number involved (Class 2 or greater)	

3) Traffic Management	N/A	Yes	No
3.1) Were the appropriate signs in their correct place?			
3.2) Were the signs in a good condition?			
3.3) Were all cones in place and in good condition?			
3.4) Were all TM Lamps in place and operating?			
3.5) Were all TM Beacons in place and operating?			
3.6) Were Plant Hazard Beacons operating?			

4) Site Health and Safety	N/A	Yes	No
4.1) Had operative appropriate CSCS card?			
4.2) Had plant/ equipment been checked for suitability?			
4.3) Were Safety Guards in place and in good condition?			
4.4) Were correct operating procedures/ guidelines used?			
4.5) Were operatives wearing appropriate PPE?			
4.6) Was there good housekeeping on site?			

5) Emergency Procedure

5.1) Services	None	First Aid	Driven to Aid	Ambulance	Fire Brigade	Gardaí

5.2) Procedure	Good	Bad	None
Training			
Equipment			

6) Operatives (List operatives on site at time of incident)

7) Incident Description

8) Suggested Control Measures to Prevent Re-Occurance

9) Incident Sketch

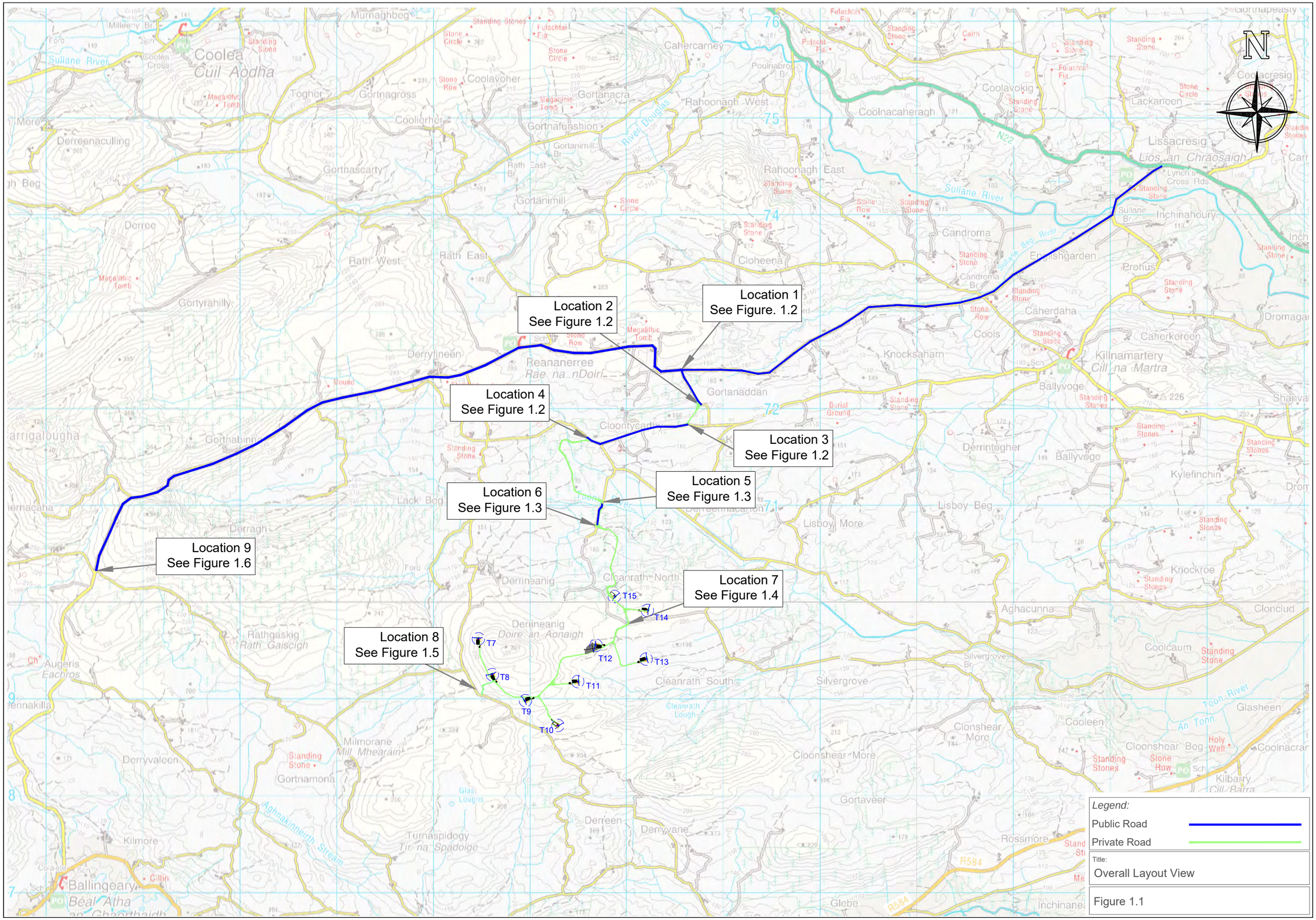
10) Report Completed By:		**11) Report Noted By:**	

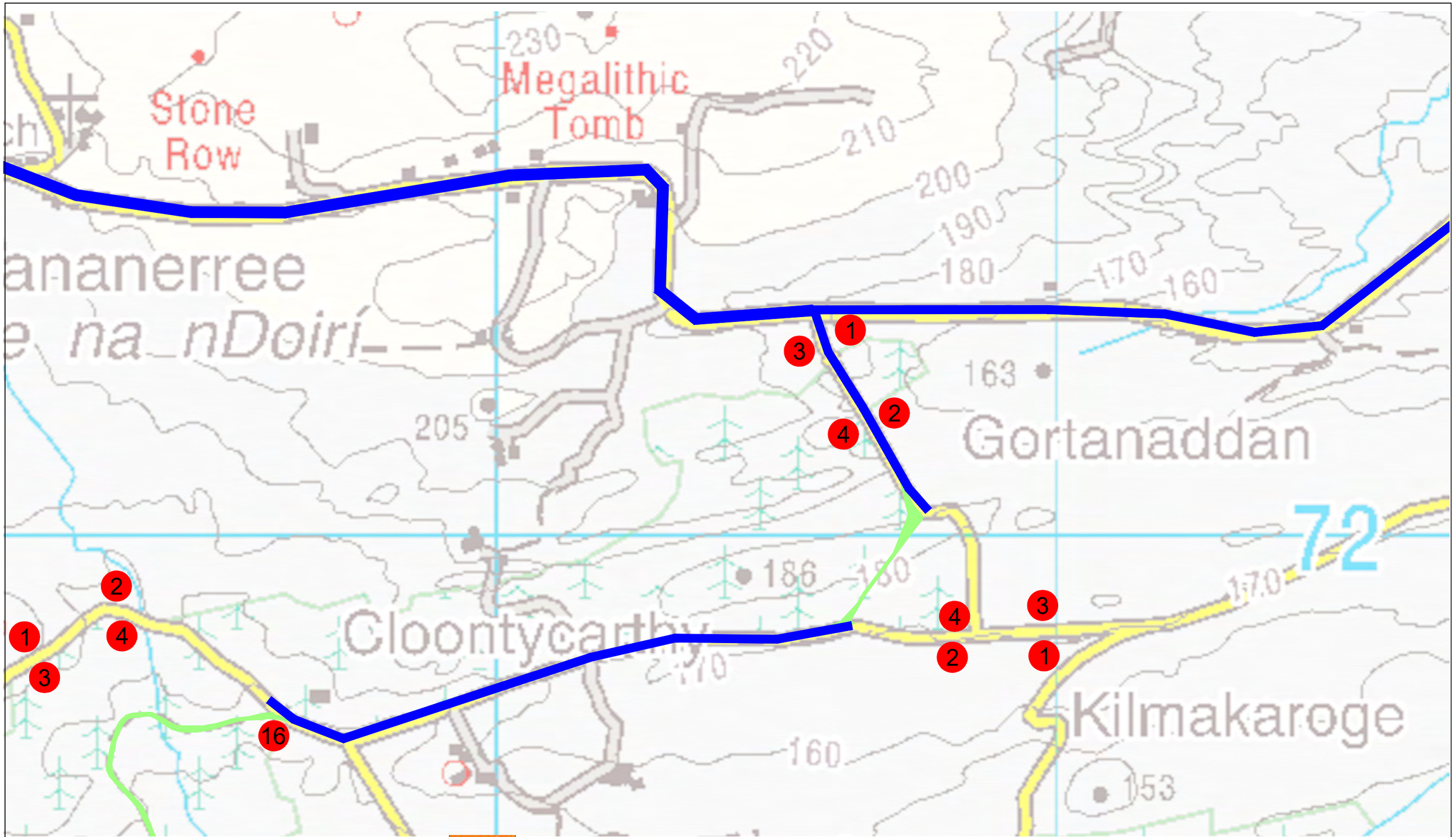
MCE Ltd.

Civil & Electrical Engineering Specialists

MCE – Cleanrath WF's Traffic Management Plan

	Name (Print)	Signature	I understand the details in the traffic management plan and agree to sign off (tick)	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				


Location 1
See Figure. 1.2
Location 2
See Figure 1.2
Location 3
See Figure 1.2
Location 4
See Figure 1.2
Location 5
See Figure 1.3
Location 6
See Figure 1.3
Location 7
See Figure 1.4
Location 8
See Figure 1.5
Location 9
See Figure 1.6
T7
T8
T9
T10
T11
T12
T13
T14
T15
N
Legend:
Public Road
Private Road
Title:
Overall Layout View
Figure 1.1



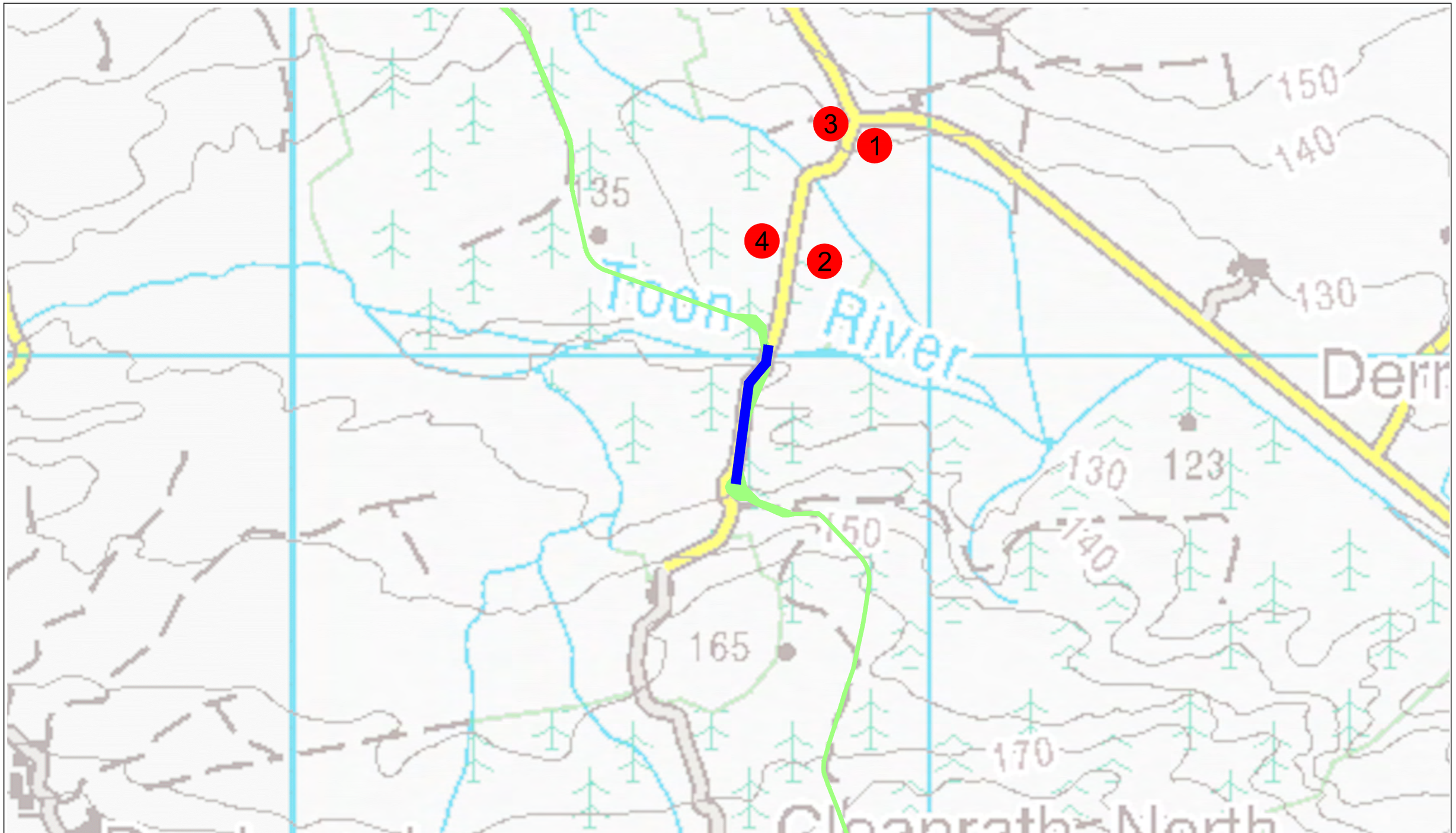
Legend:

Public Road

Private Road

Title:
Location 1, 2, 3 & 4 Layout
Sheet 1 of 5

Figure 1.2



1 

2 

3 

4 

5 

6 

7 

Legend:

Public Road

Private Road

Title:

Location 5 & 6 Layout - Sheet 2 of 5

Figure 1.3

Derrineanig

Cleanrath North

Derrineanig

Doire an Aonaigh

Cleanrath South

170

210

200

200

196

304

300

T15

T14

T12

T13

T11

T8

1

2

3

4

5

6

7

55km/h

Crioch E D

Crioch END

o Construction Traffic Beyond This Point

CAUTION Construction Site Entrance

Legend:

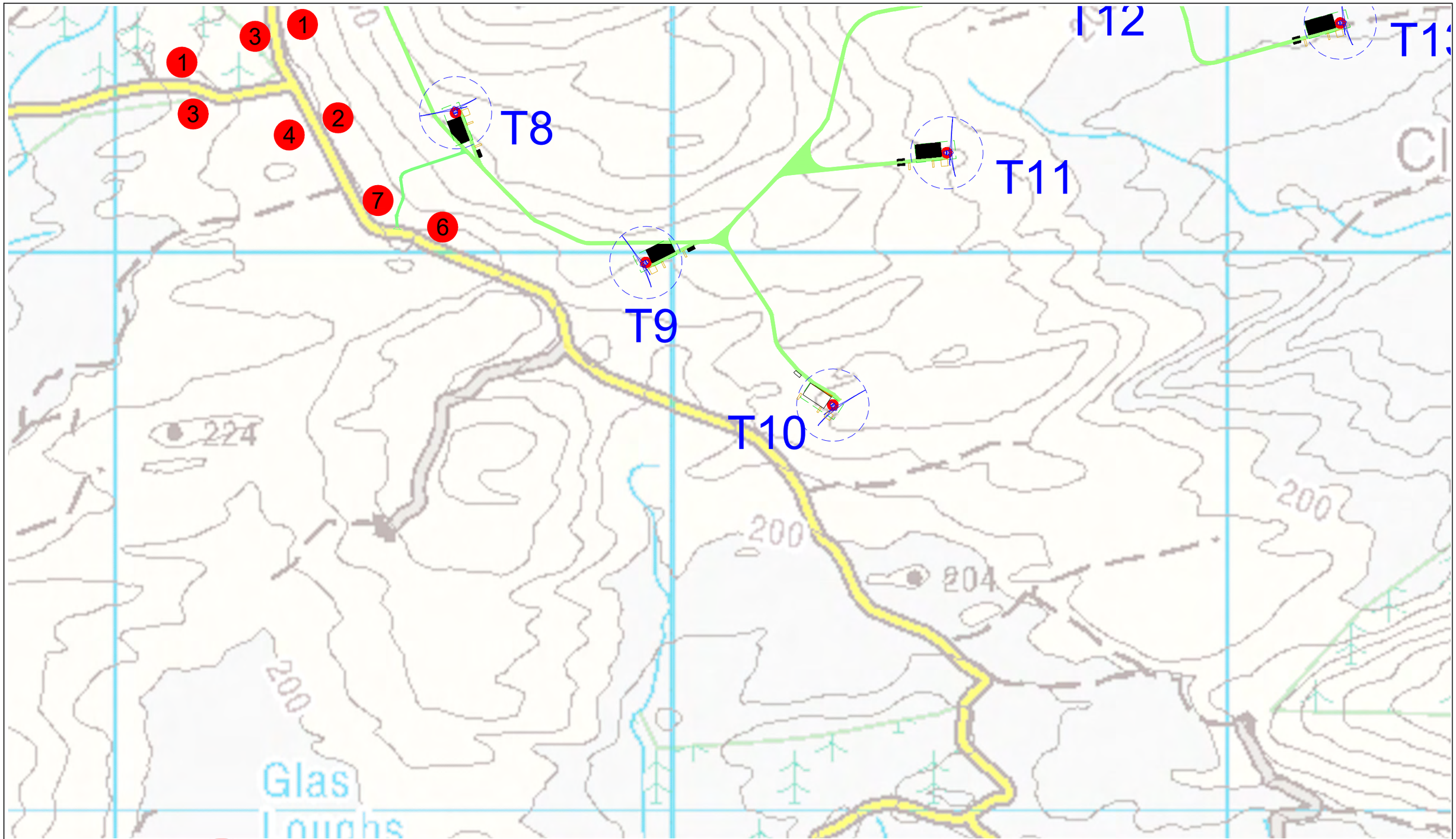
Public Road

Private Road

Title:

Location 6 & 7 Layout - Sheet 3 of 5

Figure 1.4



1 

2 

3 

4 

5 

6 

7 

Legend:

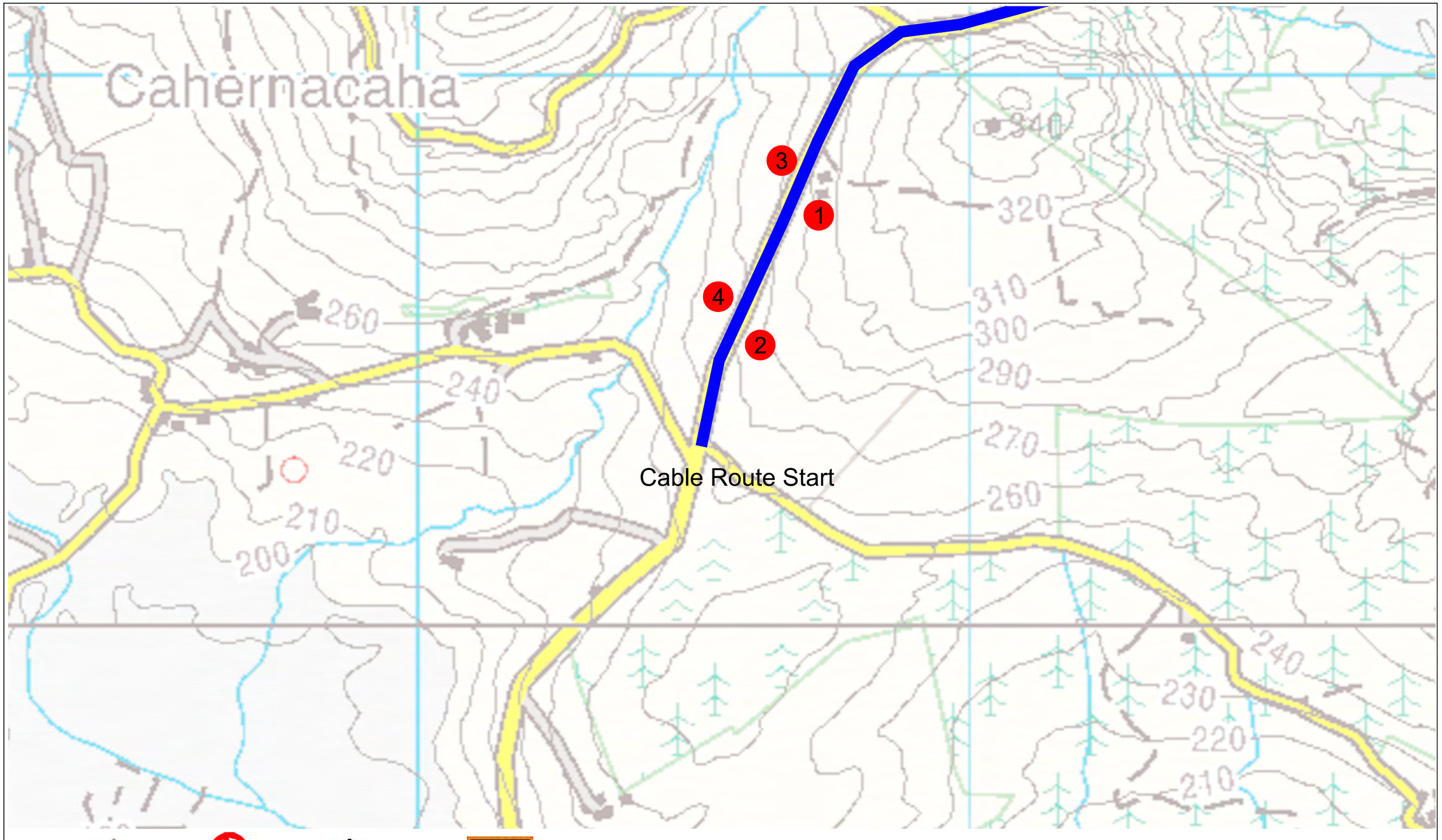
Public Road

Private Road

Title:

Location 8 Layout - Sheet 4 of 5

Figure 1.5



1 

2 

3 

4 

5 

6 

7 

Legend:

Public Road

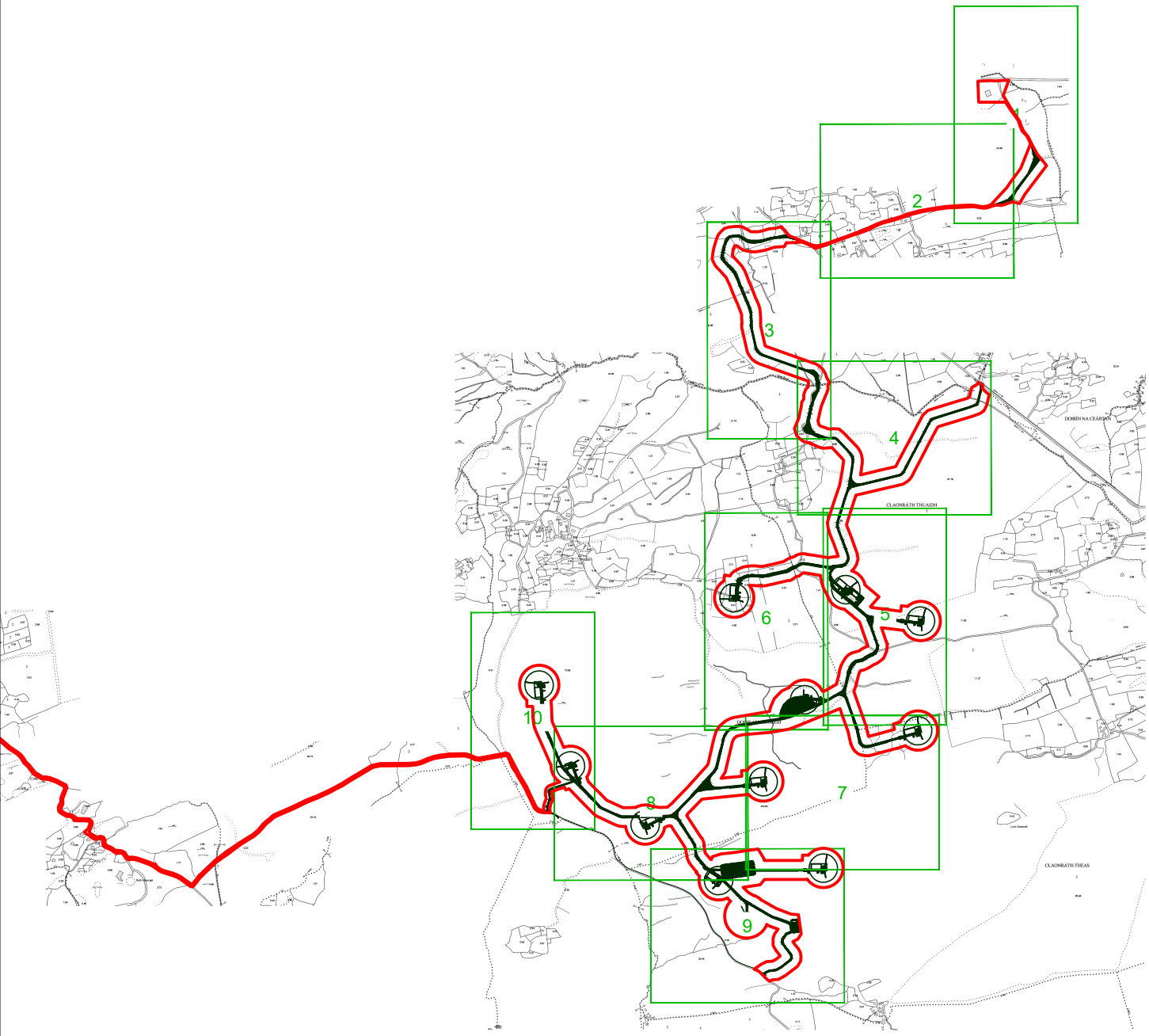
Private Road

Title:
Location 9 Layout - Sheet 5 of 5

Figure 1.6

Appendix 3

Site Layout Drawings



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Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742& 18/04458
- Existing Fence

N

DRAWING TITLE:
Site Layout Map Key Plan

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 03
SCALE: 1:20,000 @ A3	DATE: 06.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

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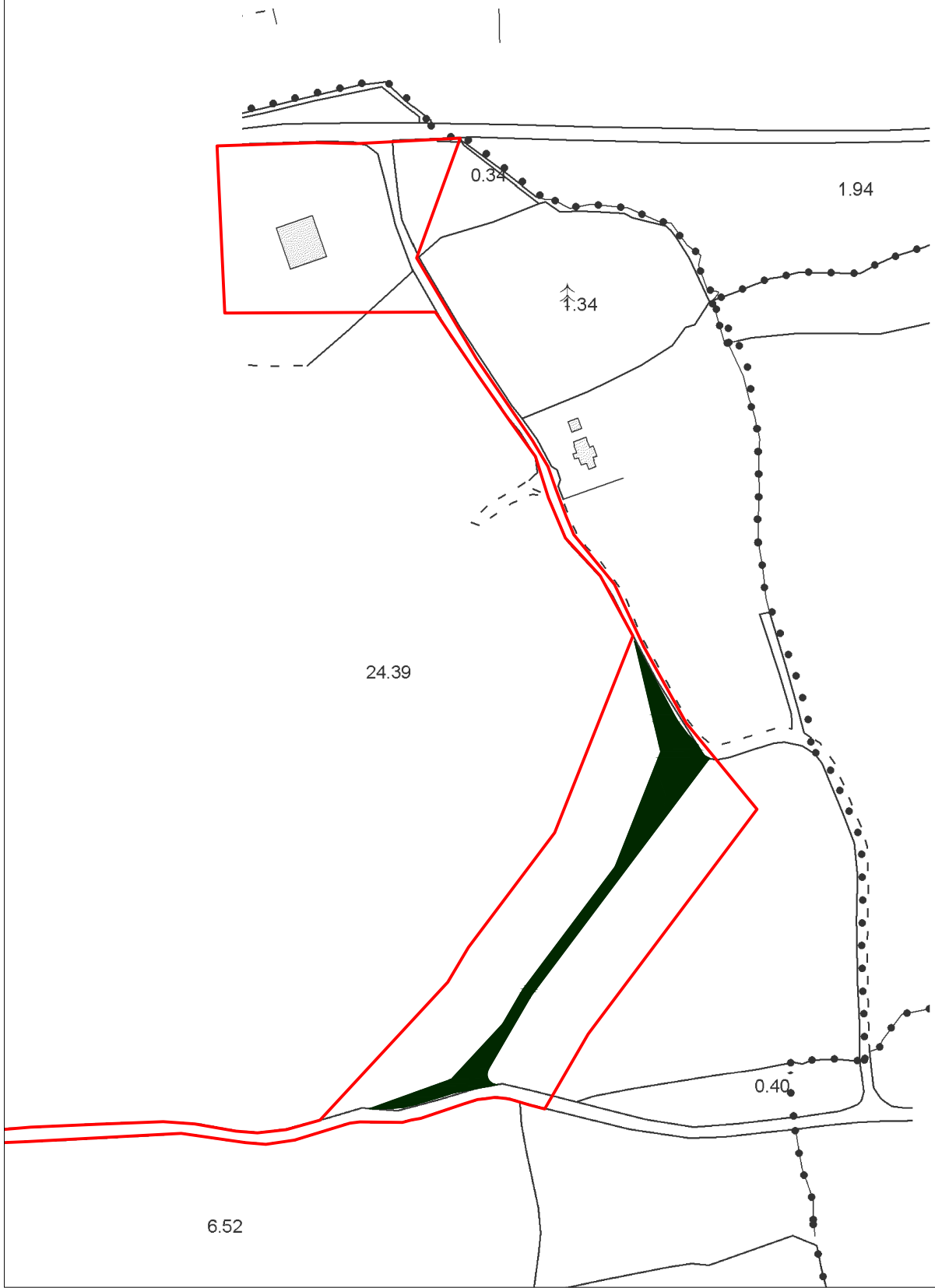

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- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:

Site Layout
Sheet 1 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Colm Harte
PROJECT No: 110721e	DRAWING No: 0721 - 04
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742& 18/04458

N

DRAWING TITLE:

Site Layout
Sheet 2 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
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PROJECT No.: 110721e	DRAWING No.: 0721 - 05
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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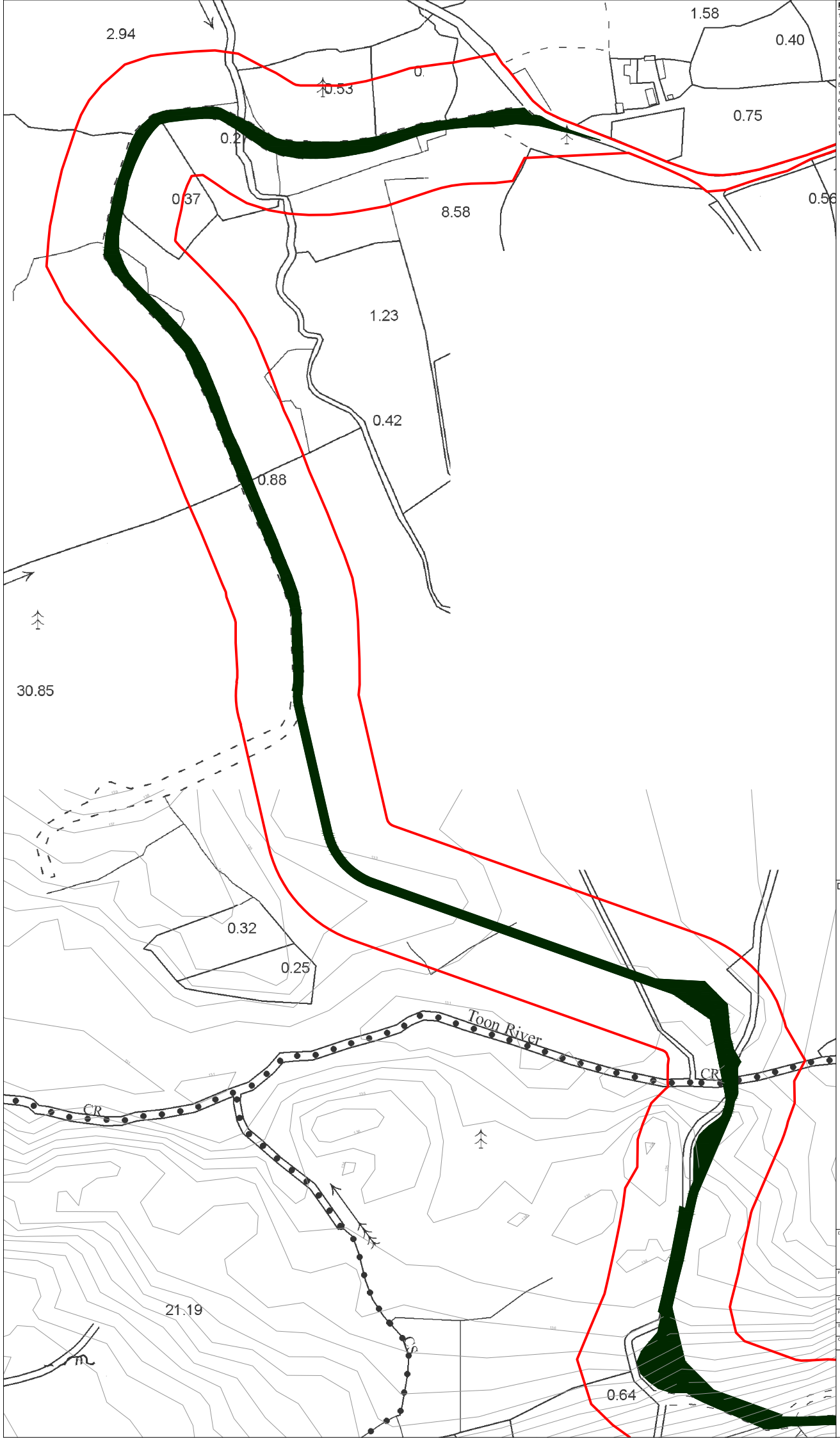

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Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:

Site Layout Sheet 3 of 10

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Colm Harte
PROJECT No: 110721e	DRAWING No: 0721 - 06
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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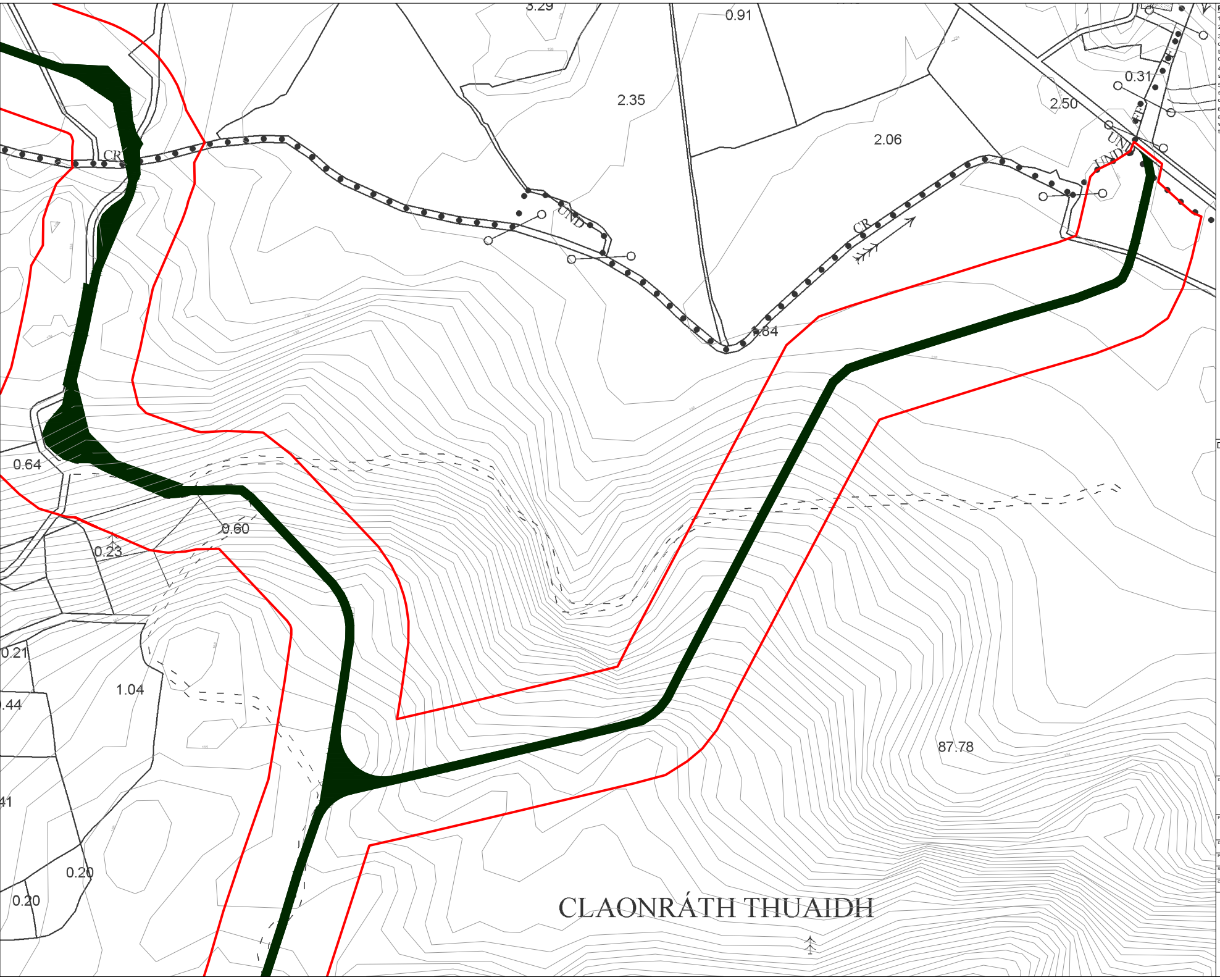

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- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742& 18/04458

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DRAWING TITLE:

Site Layout
Sheet 4 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 07
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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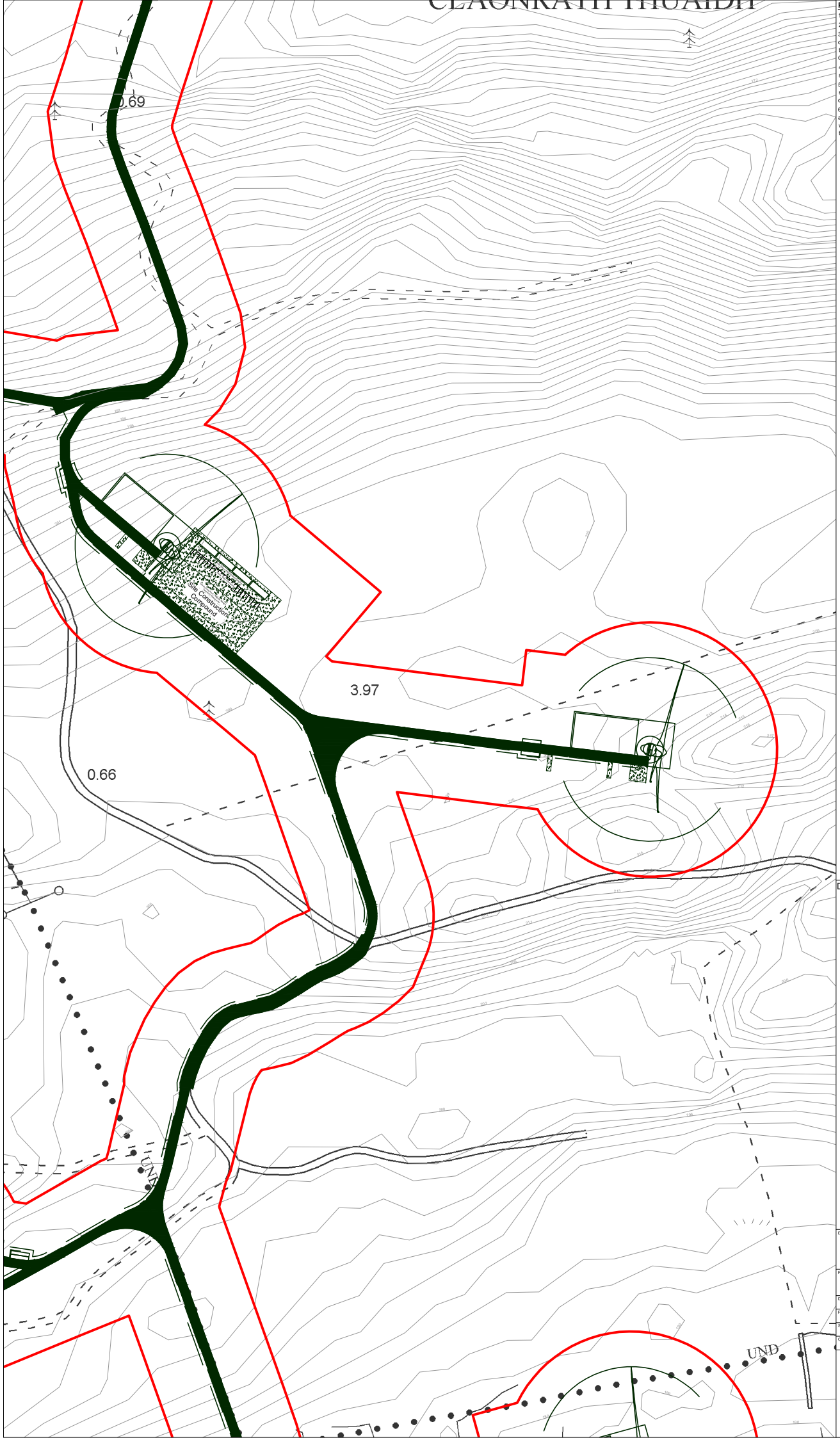

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- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

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DRAWING TITLE:

Site Layout
Sheet 5 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
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PROJECT No: 110721e	DRAWING No: 0721 - 08
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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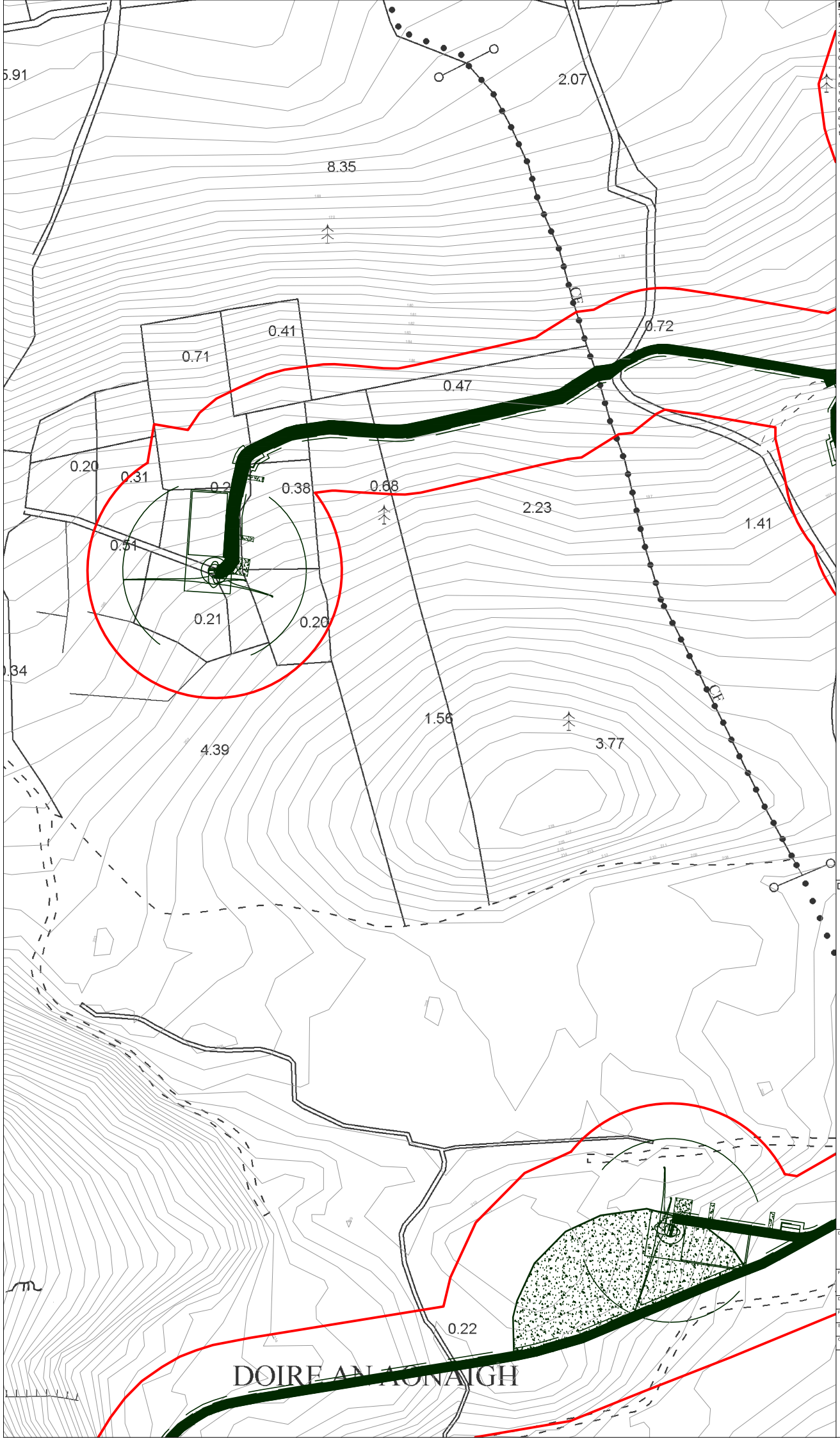

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DRAWING TITLE:

Site Layout
Sheet 6 of 10

PROJECT TITLE:
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PROJECT No: 110721e	DRAWING No: 0721 - 09
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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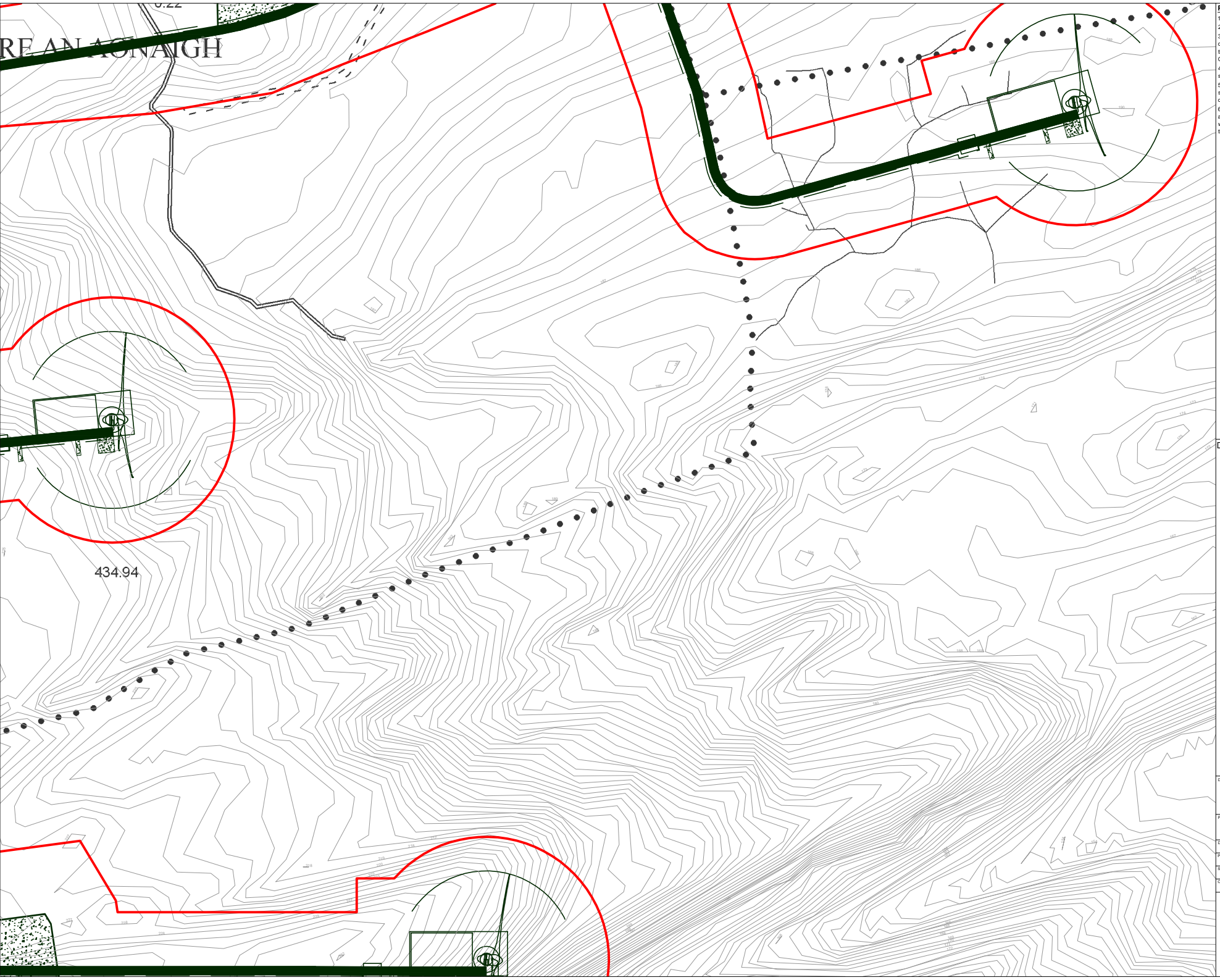

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DRAWING TITLE:

Site Layout
Sheet 7 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
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PROJECT No.: 110721e	DRAWING No.: 0721 - 10
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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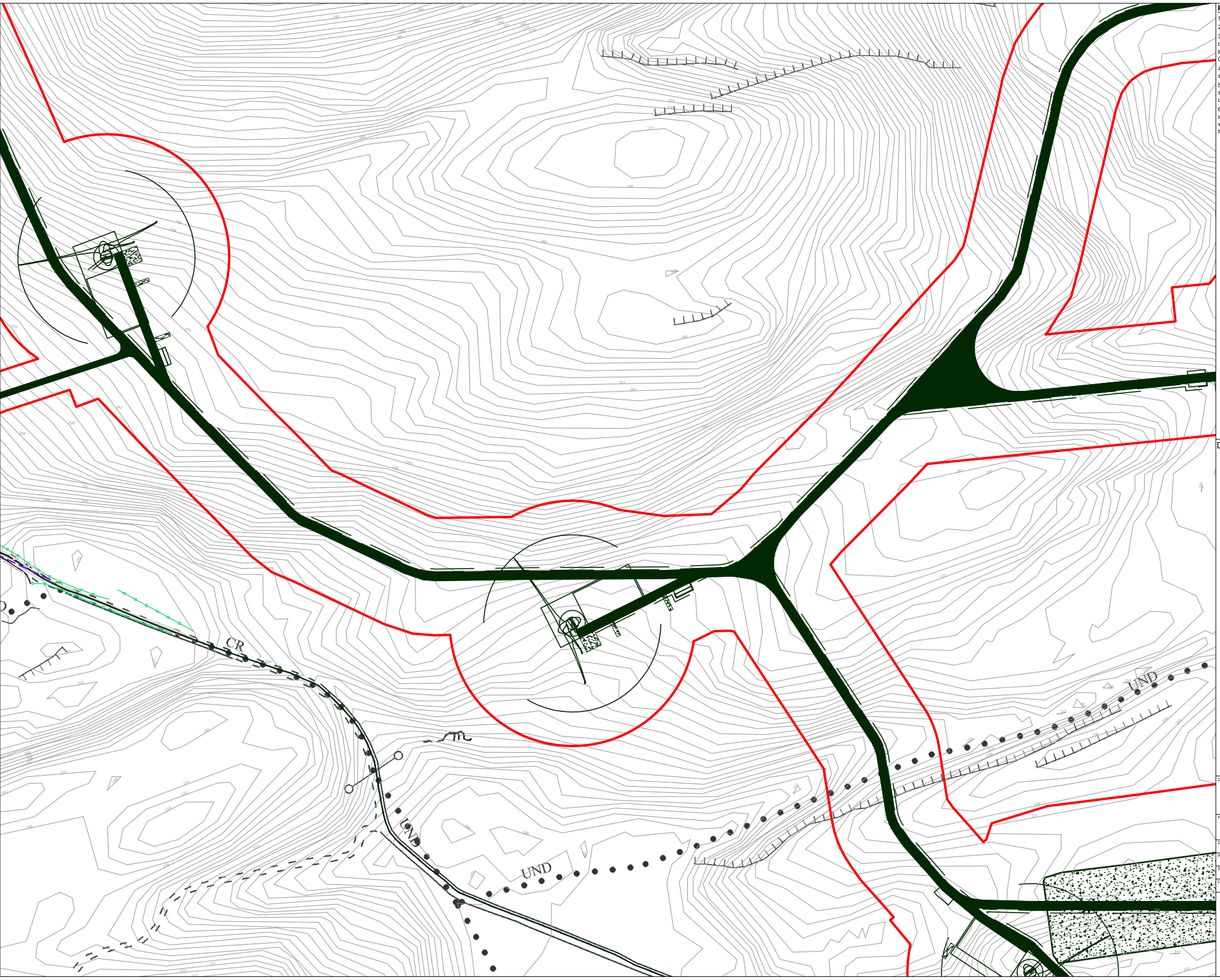

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Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL REF 15/6966 ABP PL. 04.246742& 18/04458

N

DRAWING TITLE:

Site Layout
Sheet 8 of 10

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
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PROJECT No.: 110721e	DRAWING No.: 0721 - 11
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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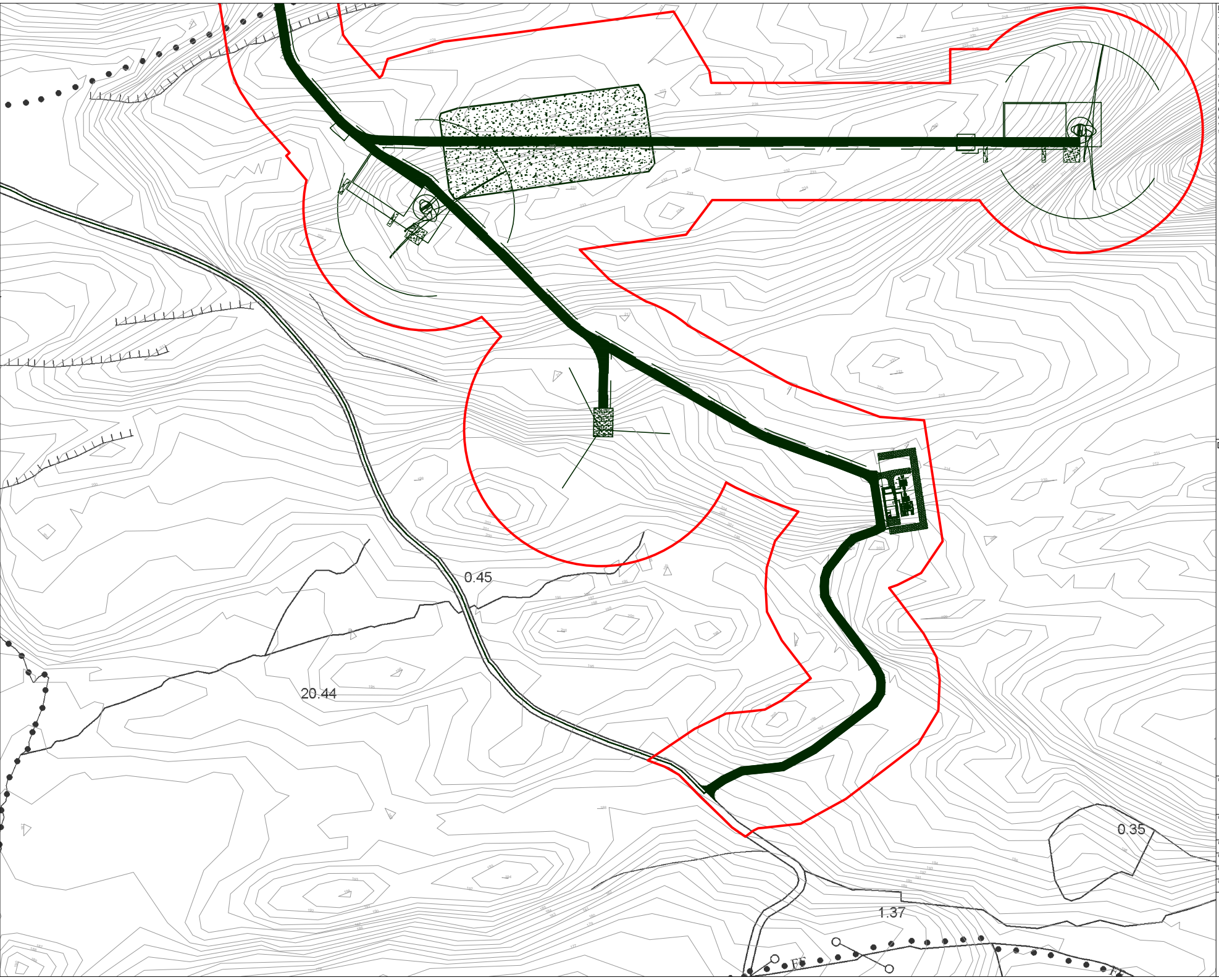

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Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742& 18/04458

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DRAWING TITLE:

Site Layout
Sheet 9 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 12
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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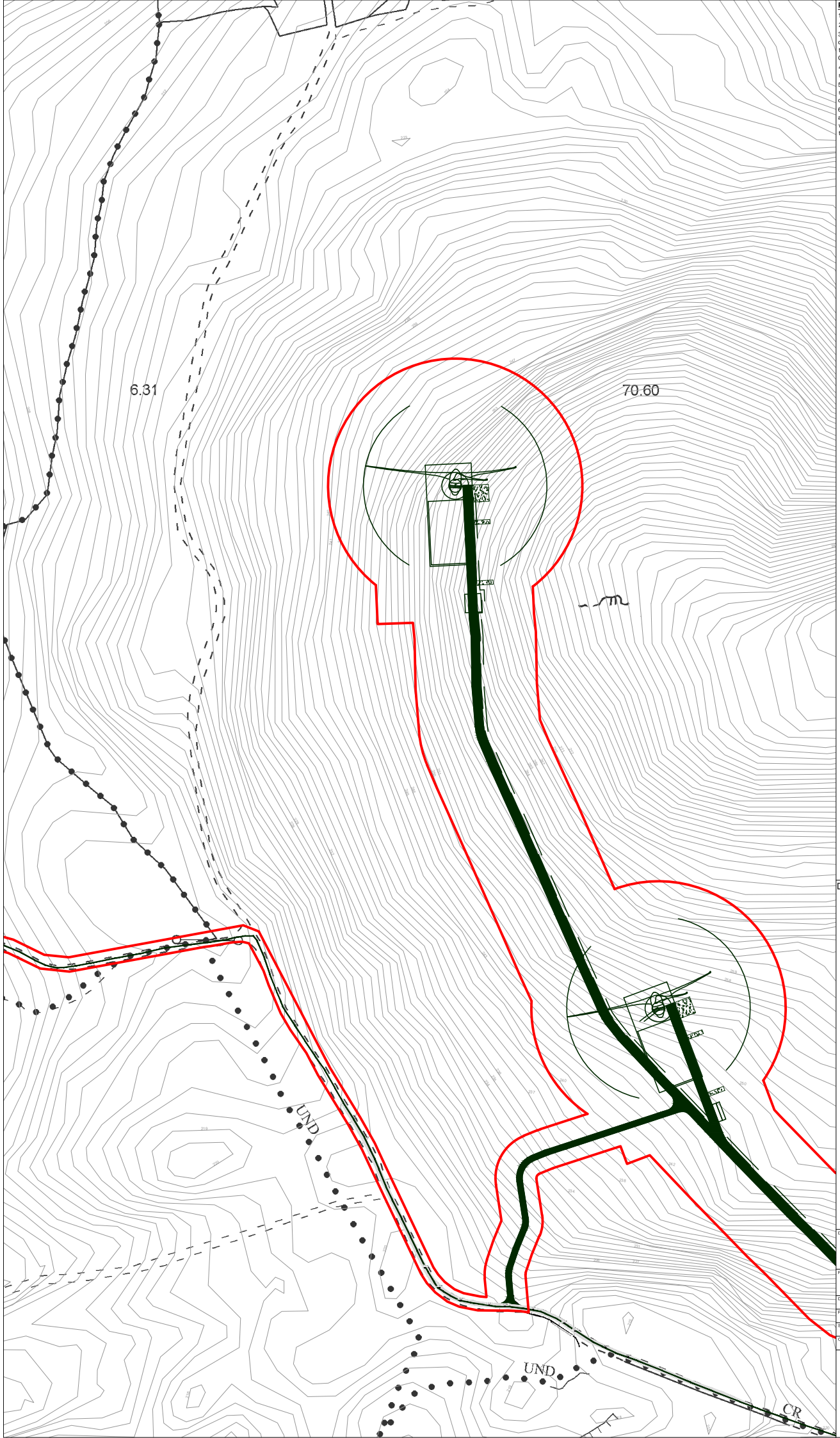

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Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:

Site Layout
Sheet 10 of 10

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Colm Harte
PROJECT No: 110721e	DRAWING No: 0721 - 13
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

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Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:

Temporary Construction Compound

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY:	CHECKED BY:
Joseph O Brien	Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 14
SCALE: 1:500 @ A3	DATE: 06.08.2020

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Appendix 4

OTT Orpheus Mini Probe Brochure

Water level sensor with built-in datalogger for surface and groundwater applications

- **Application**
  Surface water, Groundwater
- **Measurement technology**
  Vented pressure cell
- **Parameters measured**
  Waterlevel/Pressure, Water temperature
- **Product Highlights**
  Measures, stores, and transmits water level and temperature data
- **Accuracy**
  ± 0.05% FS
- **Internal data logger**
  Yes

The OTT ecoLog 500 is a complete system for water level and temperature measurement. Designed for full deployment inside groundwater wells as well as surface water applications, the OTT ecoLog 500 offers data and alarm message transmission options via SMS, HTTP, FTP and e-mail, giving users flexible remote data access from their office.

Water level measurement	
Measuring ranges	0 ... 4 m, 10 m, 20 m, 40 m, 100 m

Pressure resolution	0.01 % FS
Pressure accuracy	±0.05 % FS
Long-term stability	±0.1 % / year FS

Temperature measurement	
Measuring range	-25 °C ... +70 °C
Temperature resolution	0.1 °C
Temperature accuracy	± 0.5 °C; higher accuracy optionally available

Electrical data	
Power supply	2 x 1.5 V C Alkaline cells (only for version with GSM/GPRS-Modem) Lithium cells, 3.6 V/13 Ah or Lithium cells, 3.6 V/26 Ah

Battery life @ 1 h measurement interval & one transmission per week	
Lithium-battery, DD	approx. 10 years
Alkaline batteries, CC (only for version with GSM/GPRS-Modem)	> 1 year

Modem	GSM/GPRS 900/1800, 850/1900 MHz GSM/GPRS; UMTS/HSPA+ 900/1800, 850/1900 MHz; 800/850, 900, AWS 1700, 1900, 2100 MHz
Antenna	Built-in, weather-proof, external antenna optionally available
Interface at site	Infrared (IrDA)

Memory	4 MB, approx. 500,000 measured values
Sampling/storage interval	5 seconds ... 24 hours

Installation	≥ 2"

Environmental conditions	
Operating temperature	-30 °C ... + 85 °C
Storage temperature	-40 °C ... + 85 °C

Dimensions L x Ø	
Communication unit	520 mm x 50 mm
Probe	195 mm x 22 mm
System length	2 ... 200 m ±1 % ±5 cm (Cable length incl. communication unit and pressure probe)

Material	
Communication unit	Aluminium, PA-GF

Sonde	Stainless steel (DIN 1.4539, 904 L)

Weight	
Communication unit (w/o. batteries)	approx. 0.920 kg
Probe	approx. 0.300 kg

Type of protection	
Communication unit	IP67
Probe	IP68

EMC limits	According to EG 204/108/EG, ETSI EN 301 486-1/-7, EN 61326-1 EN 60950-1:2006 + A11:2009 + A1:2010

Pressure level transducer with datalogger for longterm groundwater monitoring

- **Application**
  Surface water, Groundwater
- **Measurement technology**
  Vented pressure cell
- **Parameters measured**
  Waterlevel/Pressure, Water temperature
- **Product Highlights**
  Measures and stores water level and temperature data
- **Measurement range**
  0 ... 4, 10, 20, 40, and 100 m
- **Accuracy**
  ± 0.05% FS
- **Internal data logger**
  Yes

The OTT Orpheus Mini is an integrated pressure sensor and datalogger for level measurement in surface and groundwater applications. It features a robust ceramic measuring cell for long term accuracy and its built in datalogger manages and stores all measurements at user-programmable intervals. The Orpheus mini can be paired with the

OTT ITC for remote data transmission.

Waterlevel measurement	
Measuring ranges	0 ... 4 m, 10 m, 20 m, 40 m, 100 m
Accuracy, pressure sensor	± 0.05 % FS
Resolution, pressure sensor	0.01 % FS

Temperature measurement	
Measuring range temperature	-25 °C ... +70 °C (ice-free)
Accuracy temperature	± 0.5 °C
Resolution temperature	0.1 °C

Electrical data	

Power supply	3 x 1.5 V LR6-cells Alkaline- or Lithium-type

Lifetime (at 1 h reading interval)	
with Lithium batteries	min. 5 years
with Alkaline batteries	min. 1.5 years (high quality battery types)

Interface	Infrared (IrDA)

Data Logger	
Memory	4 MB non-volatile
Number of measured values	approx. 500,000
Reading interval	1 second ... 24 hours
Storage interval	1 second ... 24 hours

Logging type - selectable	linear, logarithmic - free progammable (logging table) for pumping tests , event triggered delta data logging

Installable in well pipes	≥ 1"

System length	1.5 ... 200 m ±1% ±5 cm (cable length incl. communication unit/pressure probe)

Material	ABS, POM, 904 L (DIN 1.4539)

Weight	
Communication unit (incl. batteries)	approx. 0.410 kg
Pressure probe	approx. 0.300 kg

Dimensions	
Communication unit L x Ø	400 mm x 22 mm
Pressure probe L x Ø	195 mm x 22 mm

Operating Conditions	
Temperature-compensated working range	-5 °C ... +45 °C (ice-free)
Storage temperature	-40 °C ... +85 °C
Operating Temperature	-20 °C ... +70 °C
Humidity	100 %

Type of protection	
Communication unit	IP67 (immersion depth max. 2 m duration of immersion max. 24 h)
Pressure probe	IP68

EMV limits	IEC61326/EN61326 are compliant with EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 550222 class B