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30 YEARS

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 3.1

Construction and Environmental Management Plan (CEMP)

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CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

COOM GREEN ENERGY PARK LTD.

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

COOM GREEN ENERGY PARK

Prepared for: Coom Green Energy Park Limited

coom green energy

Date: December 2020

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TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 General Introduction and Purpose 1
1.2 The Applicant 2
1.3 The Site 2
1.4 The Project 2

2. EXISTING ENVIRONMENT 10

2.1 Energy Park Site 10
2.2 Turbine Delivery Route (TDR) 10
2.3 Grid Connection 10
2.4 Biodiversity 24
2.4.1 European Sites of Importance 24
2.4.2 Existing Habitats 26
2.4.3 Invasive Species Records 27
2.5 Soils, Geology and Hydrogeology 28
2.6 Hydrology & Water Quality 29
2.7 Archaeological, Architectural and Cultural Heritage 38

3. OVERVIEW OF CONSTRUCTION WORKS 39

3.1 Description of the Proposed Project 39
3.1.1 Overall Project 39
3.1.2 Main Energy Park Site Layout 40
3.1.3 Turbine Delivery Route 41
3.1.4 Grid Connection 43
3.1.5 Watercourse Crossings 45
3.2 Construction Period 49
3.3 Overview of the Construction Sequence (Preliminary Only) 49
3.3.1 Overview of the Construction Methodology (Preliminary Only) 49
3.4 Construction Working Hours 71

4. ENVIRONMENTAL MANAGEMENT PLAN 73

4.1 Introduction 73
4.2 Project Obligations 73

4.2.1 EIA Obligations 73
4.2.2 Planning Permission Obligations 74
4.2.3 Felling Licence 74
4.2.4 Other Obligations 74
4.3 Environmental Management Programme 75
4.3.1 Air Quality 75
4.3.2 Dust Management Plan 76
4.3.3 Noise and Vibration 78
4.3.4 Biodiversity / Flora and Fauna Management Plan 79
4.3.5 Soil Management Plan 113
4.3.6 Surface Water Management Plan 117
4.3.7 Waste Management Plan 117
4.3.8 Traffic Management Plan 120
4.3.9 Decommissioning Phase 124
4.4 Environmental Management Team - Structure and Responsibility 131
4.5 Training, Awareness and Competence 132
4.6 Environmental Policy 133
4.7 Register of Environmental Aspects 133
4.8 Register of Legislation 133
4.9 Objectives and Targets 133
4.10 Non-Conformance, Corrective and Preventative Action 134
4.11 EMS Documentation 134
4.12 Control of Documents 135
5. SAFETY & HEALTH MANAGEMENT PLAN 136
5.1 Introduction 136
5.2 Project Obligations 136
5.2.1 EIA Obligations 136
5.2.2 Planning Permission Obligations 136
5.2.3 Statutory Obligations 137
5.2.4 The Management of Health and Safety during the Design Process 139
5.2.5 The Preliminary Safety and Health Plan 140
5.2.6 The Management of Health and Safety during the Construction Phase 142
5.2.7 The Construction Stage Safety and Health Plan 142

6. EMERGENCY RESPONSE PLAN 145

6.1 Introduction 145

6.2 Emergency Response Plan 146

6.2.1 Emergency Response Liaison 146

6.2.2 Reporting Emergencies 146

6.2.3 Designated Responder 146

6.2.4 Emergency Alarm 147

6.2.5 Emergency Reporting 147

6.2.6 Medical Protocol 147

6.2.7 Emergency Response 147

6.2.8 Escape and Evacuation Procedure 148

6.2.9 Tower Rescue Procedure 149

6.2.10 Prevention of Illness/Injury Due to Weather/Elements 149

6.2.11 Environmental Emergency Procedure 149

6.2.12 Emergency Response Plan – Haul Routes 150

6.2.13 Catastrophic Events – Wind Turbines and Battery Energy Storage Systems 150

LIST OF APPENDICES

Appendix 1: Surface Water Management Plan (SWMP)

Appendix 2: Turbine Delivery Route Report

Appendix 3: Referenced Drawings

Appendix 4: Sample Public Complaints / Observations Procedure

LIST OF FIGURES

Page

FIGURE 1-1: SITE LOCATION 4
FIGURE 1-2: SITE LAYOUT 5
FIGURE 2-1: TURBINE DELIVERY ROUTE 12
FIGURE 2-2: GRID CONNECTION ROUTE 23
FIGURE 2-3: OPW FLOOD DATA MAP 31
FIGURE 2-4: HYDROLOGICAL FEATURES 37
FIGURE 3-1: HAUL ROUTES 72
FIGURE 4-1: PROJECT MANAGEMENT TEAM ORGANOGRAM 132

LIST OF TABLES

TABLE 2-1: EUROPEAN DESIGNATED SITES (SAC AND SPA) SITES WITHIN 15KM OF CGEP AND GRID CONNECTION ROUTE 24
TABLE 2-2: EUROPEAN DESIGNATED SITES (SAC AND SPA) SITES WITHIN 15KM OF THE TURBINE DELIVERY ROUTE 25
TABLE 2-3: INVASIVE SPECIES RECORDS FROM DESKTOP REVIEW (SOURCE: NBDC) 27
TABLE 2-4: WFD RIVER STATUS AND RIVER WATERBODY RISK 30
TABLE 3-1: PROPOSED COOM GREEN ENERGY PARK TURBINE COORDINATES 40
TABLE 3-2: ONSITE ACCESS WATERCOURSE CROSSINGS 46
TABLE 3-3: SUMMARY OF WATERCOURSE AND BURIED SERVICE CROSSINGS ALONG GCR 47
TABLE 3-4: TDR EXISTING WATERCOURSE CROSSINGS 48
TABLE 4-1: SPECIES-SPECIFIC INVASIVE SPECIES 102
TABLE 4-2: MITIGATION MEASURES FOR THE PROTECTION OF WATERCOURSES 111
TABLE 4-3: SITE SPECIFIC GROUND HAZARDS – SOIL MANAGEMENT 114
TABLE 4-4: NEARBY LICENSED WASTE FACILITIES 119

LIST OF PLATES

PLATE 3-1: BOTTLEHILL AND MULLENABOREE SITE ACCESS: PROPOSED GATE LOCATION 51
PLATE 3-2: TYPICAL INSTALLATION AND TEMPORARY REINSTATEMENT OF JOINT BAY 66
PLATE 3-3: TYPICAL EXISTING CULVERT CROSSING PROFILE 68
PLATE 3-4: TYPICAL EXISTING CULVERT CROSSING SECTION 68
PLATE 3-5: TOWABLE SPRAYER FOR TEMPORARY REINSTATEMENT 69
PLATE 3-6: TYPICAL HDD ACTIVITY PROFILE 71
PLATE 4-1: LAUNCH AND EXIT LOCATIONS FOR HDD OPERATIONS UNDER M8 MOTORWAY 123

1. INTRODUCTION

1.1 General Introduction and Purpose

This document is the Construction and Environmental Management Plan (CEMP) for the proposed Coom Green Energy Park and has been prepared by Fehily Timoney and Company (FT) on behalf of Coom Green Energy Park Limited (CGEP).

The CEMP will be updated prior to construction to take account of any amendments arising during the consenting process and relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the project. The CEMP will be a live document and will be reviewed and updated as required. For the avoidance of doubt, that all measures stipulated in this CEMP will be implemented in full.

The CEMP sets out the key construction and environmental management issues associated with the proposed project and will be developed further at the post-planning and construction stages by the client and on the appointment of the main contractor to the project. Any adjustments to the CEMP will be carried out on the basis that they do not increase the impacts as addressed in the EIAR.

In the case of any ambiguity or contradiction between this CEMP and the EIAR, the EIAR shall take precedence.

This CEMP sets out the key environmental management issues associated with the construction, operation and decommissioning of the proposed project, to ensure that during these phases of the project, the environment is protected and impacts on the environment are minimised.

The document is divided into six sections:

Section 1: *Introduction* provides an overview of the existing site and the proposed project

Section 2: *Existing Site Environmental Conditions* provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions are to be considered by the contractor in the construction, operation and decommissioning of this proposed project.

Section 3: *Overview of Construction Works*, this section provides an overview of the construction works proposed, including drainage and sediment controls to be installed.

Section 4: *Environmental Management Plan (EMP)*, this section outlines the main requirements of the EMP and outlines operational controls for the protection of the environment including soil management, habitat and species, site drainage control, archaeology, construction traffic, site reinstatement and decommissioning, waste management.

Section 5: *Safety & Health Management Plan,* this section defines the work practices, procedures and management responsibilities relating to the management of safety and health during the design, construction and operation of the Coom Green Energy Park.

Section 6: *Emergency Response Plan* contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Coom Green Energy Park.

1.2 The Applicant

The applicant for the proposed project is Coom Green Energy Park Limited.

1.3 The Site

The proposed energy park is located south of the Nagle Mountains. The main towns and villages within the vicinity of the proposed project include Mallow, Fermoy, Castletownroche, Rathcormac, Watergrasshill, Glenville, Carrignavar, Grenagh, Drommahane. Other settlements in the vicinity are Killavullen, Monanimy, Ballyhooly, Bottlehill, Glashaboy, Burnfort, Ballyknockane, Grange, Kilworth, Glanworth, Castlelyons / Bridebridge.

The site spans across the southern and southwestern extents of the Nagle Mountains, south of the Blackwater River Valley. Both the Nagle Mountains and the Blackwater River valley are the most prominent landscape features within the central study area and its wider surrounds with the Nagle Mountains reaching a height of approximately 420m AOD.

The site is located in a predominantly agricultural area, with elevations within the site ranging from 190m to 390m above sea level. The landcover is classified in Corine as pastures; coniferous forest, transitional woodland shrub and mineral extraction sites.

The energy park site is divided into three distinct areas identified as Bottlehill, Mullanboree and Knockdoorty.

The location of the project is shown on Figure 1-1.

1.4 The Project

The proposed project consists of three main elements:

- The Main Energy Park site;
- Turbine delivery route (TDR);
- Grid connection (GCR).

The proposed project will primarily consist of a wind farm of up to 22 no. wind turbine generators (WTG's), 2 no. meteorological masts, opening of 3 no. onsite borrow pits and up to 2 no. substation compounds with battery storage units along with ancillary civil and electrical infrastructure.

The 110kV grid connection cable will consist of underground cable and will connect the on-site substations to an existing substation at Barrymore, within the townland of Farran South near Rathcormac. The Grid connection route will be ca.24.4km in length and will run for the most part along the public road. Horizontal directional drilling (HDD) will be used at 4 no. locations to cross existing watercourse crossings and the M8 motorway. Sections of the cable at the energy park site will run through private lands.

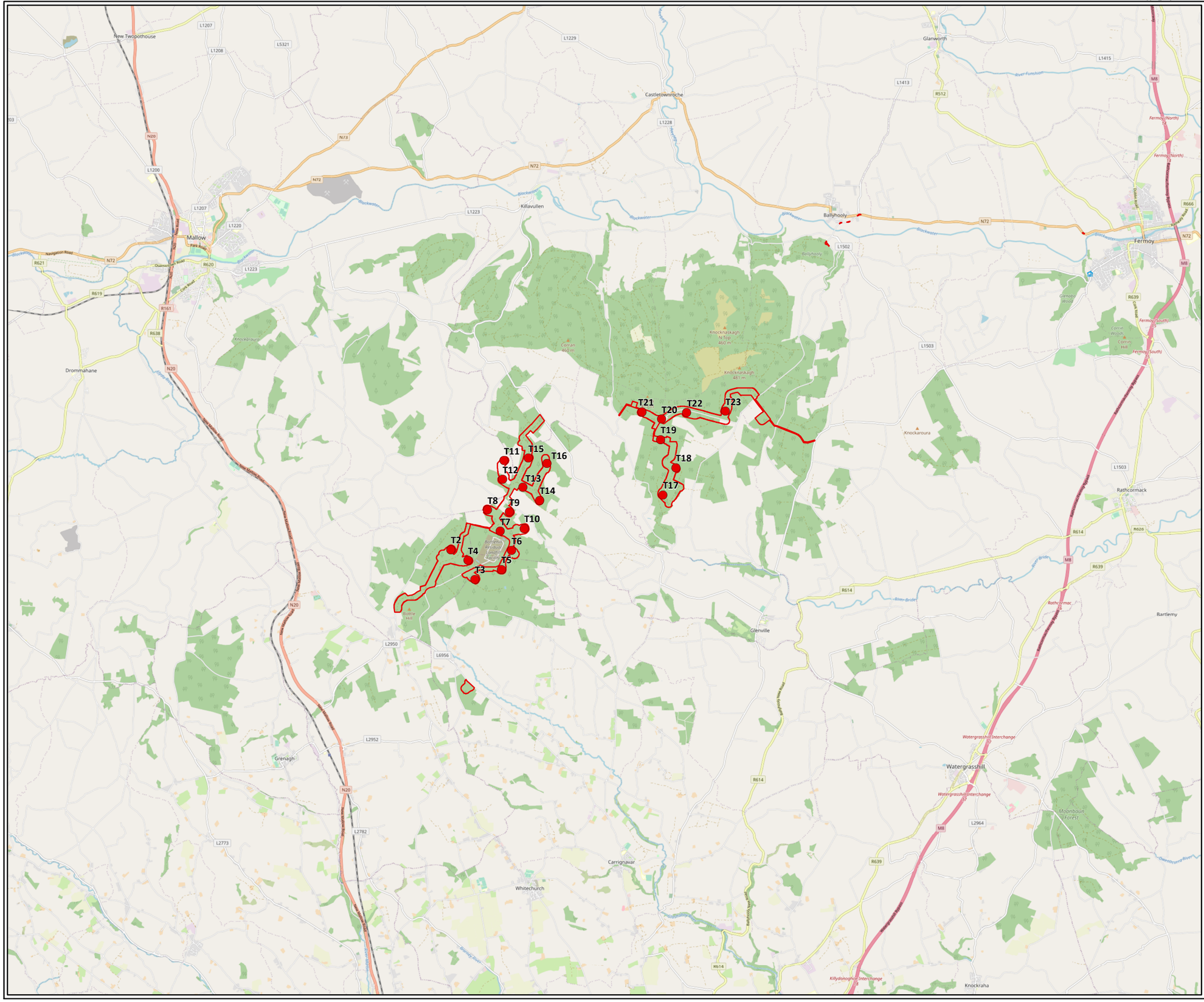
It is expected that large components associated with the wind farm construction will be transported to site via two separate turbine delivery routes (TDR's), approaching from the east and west of the site.

A detailed description of the proposed project is provided in Section 3.1.A detailed description of the proposed construction works is outlined in Section 4.

A site layout plan of the proposed project is shown in Figure 1-2.

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Proposed Turbine Layout

Proposed Development Boundary

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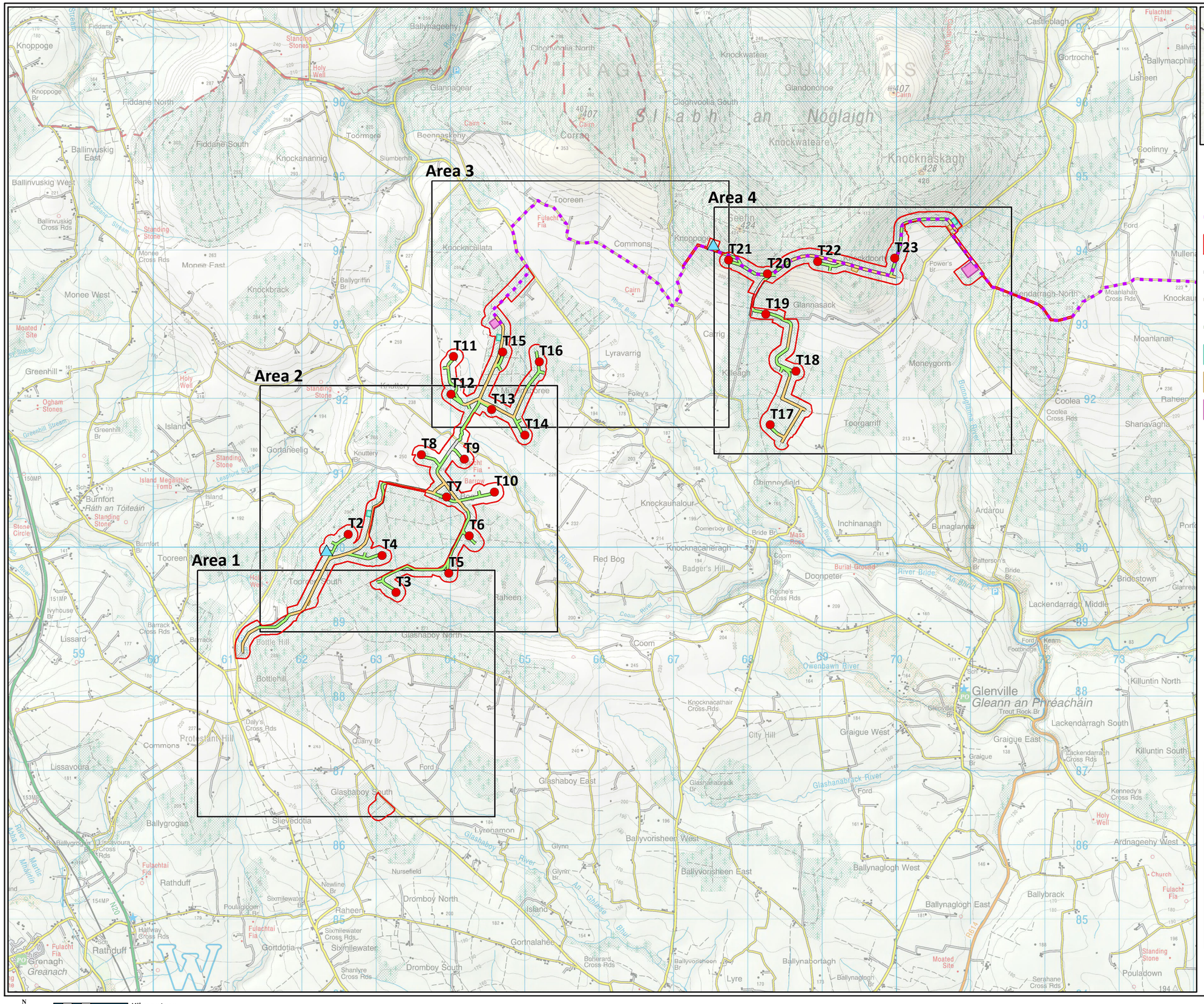
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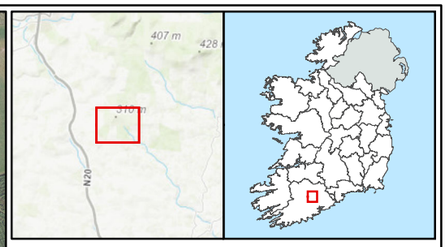
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Area 1
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Area 3
Area 4
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T23
NAGLES MOUNTAINS
Sliabh an Nóglaigh
Knocknaskagh
Cloghvoolia North
Cloghvoolia South
Knockwatear
Knockwateare
Glandononoe
Glannagear
Fiddane North
Fiddane South
Fiddane Br
Knoppoge
Knoppoge Br
Ballinvuskig East
Ballinvuskig West
Ballinvuskig Cross Rds
Knockanannig
Toormore
Beennaskehy
Slumberhill
Corran
Tooreen
Fulachtai Fia
Commons
Knockacullata
Knoppoge
Coolin
Knockadoorty
Power's Br
Knockaunbrack
Glannasack
Carrig
Kileagh
Lyravarrig
Foley's Br
Moneygorm
Toorgarriff
Monee West
Monee East
Monee Cross Rds
Knockbrack
Ballygriffin Br
Moated Site
Greenhill
Holy Well
Ogham Stones
Greenhill Br
Island
Gortaneelig
Knuttery
Knuttery Br
Standing Stone
Island Megalithic Tomb
Burnfort
Ráth an Tóiteáin
Stone Circle
Tooreen South
Barrack
Barrack Cross Rds
Bottle Hill
Bottlehill
Daly's Cross Rds
Protestant Hill
Quarry Br
Ford
Lissard
Lissavoura
Lissavoura Cross Rds
Ballygrogan
Rathduff
Halfway Cross Rds
Fulachtai Fia
Grenagh
Greanach
Nursefield
Newline Br
Sixmilewater
Sixmilewater Cross Rds
Poulagloger Br
Raheen
Dromboy North
Dromboy South
Shanlyre Cross Rds
Gortnalahee
Gortdotia
Boherard Cross Rds
Slievedotia
Lyrenamon
Glynn
Glynn Br
Ballyvorisheen West
Ballyvorisheen East
Ballyvorisheen Br
Ballynaglogh West
Ballynaglogh East
Ballynabortagh
Lyre
Ballynaglogh Br
Ballybrack
Chimneyfield
Knockaunalour
Comerboy Br
Bride Br
Mass Rock
Inchinanagh
Knocknacaheragh
Badger's Hill
Red Bog
Coom Br
Doonpeter
Burial Ground
Roche's Cross Rds
Patterson's Br
Bunaglanna
Ardarou
Prap
Bridestown
Lackendarragh Middle
Lackendarragh South
Lackendarragh Cross Rds
Killuntin North
Killuntin South
Kennedy's Cross Rds
Graigue West
Graigue East
Graigue Br
Trout Rock Br
Glenville
Gleann an Fhreacháin
Knocknacathair Cross Rds
City Hill
Coom
Owenbawn River
Glashaboy East
Glashaboy South
Glashaboy North
Glashanabrack River
Glashanabrack Br
Ardnageehy West
Church
Fulacht Fia
Pouladown
Standing Stone
Serahane Cross Rds
Castleblagh
Gortroche
Ballymacphilip
Lisheen
Coolinny
Ford
Mullen
Moanlahan Cross Rds
Knockaun
Moanlahan
Coolea
Coolea Cross Rds
Raheen
Shanavagha
Ballyhoura Hills
Ballyhoura Br
Ballyhoura Cross Rds
Ballyhoura Mountains
Ballyhoura Mountains Br
Ballyhoura Mountains Cross Rds
Ballyhoura Mountains Ford
Ballyhoura Mountains Standing Stone
Ballyhoura Mountains Fulacht Fia
Ballyhoura Mountains Holy Well
Ballyhoura Mountains Cairn
Ballyhoura Mountains Barrow
Ballyhoura Mountains Mass Rock
Ballyhoura Mountains Burial Ground
Ballyhoura Mountains Footbridge
Ballyhoura Mountains Keam Br
Ballyhoura Mountains Trout Rock Br
Ballyhoura Mountains Graigue Br
Ballyhoura Mountains Glenville Br
Ballyhoura Mountains Glashanabrack Br
Ballyhoura Mountains Glynn Br
Ballyhoura Mountains Ballyvorisheen Br
Ballyhoura Mountains Ballynaglogh Br
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- Proposed Turbine Layout
- Proposed Development Boundary
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Turning Heads and Passing Bays
- Proposed Turbine Hardstanding Area
- Proposed Temporary Compound

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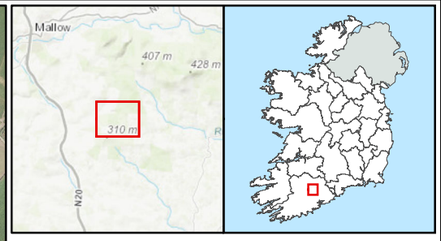
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- Proposed Borrow Pit
- Proposed Temporary Compound

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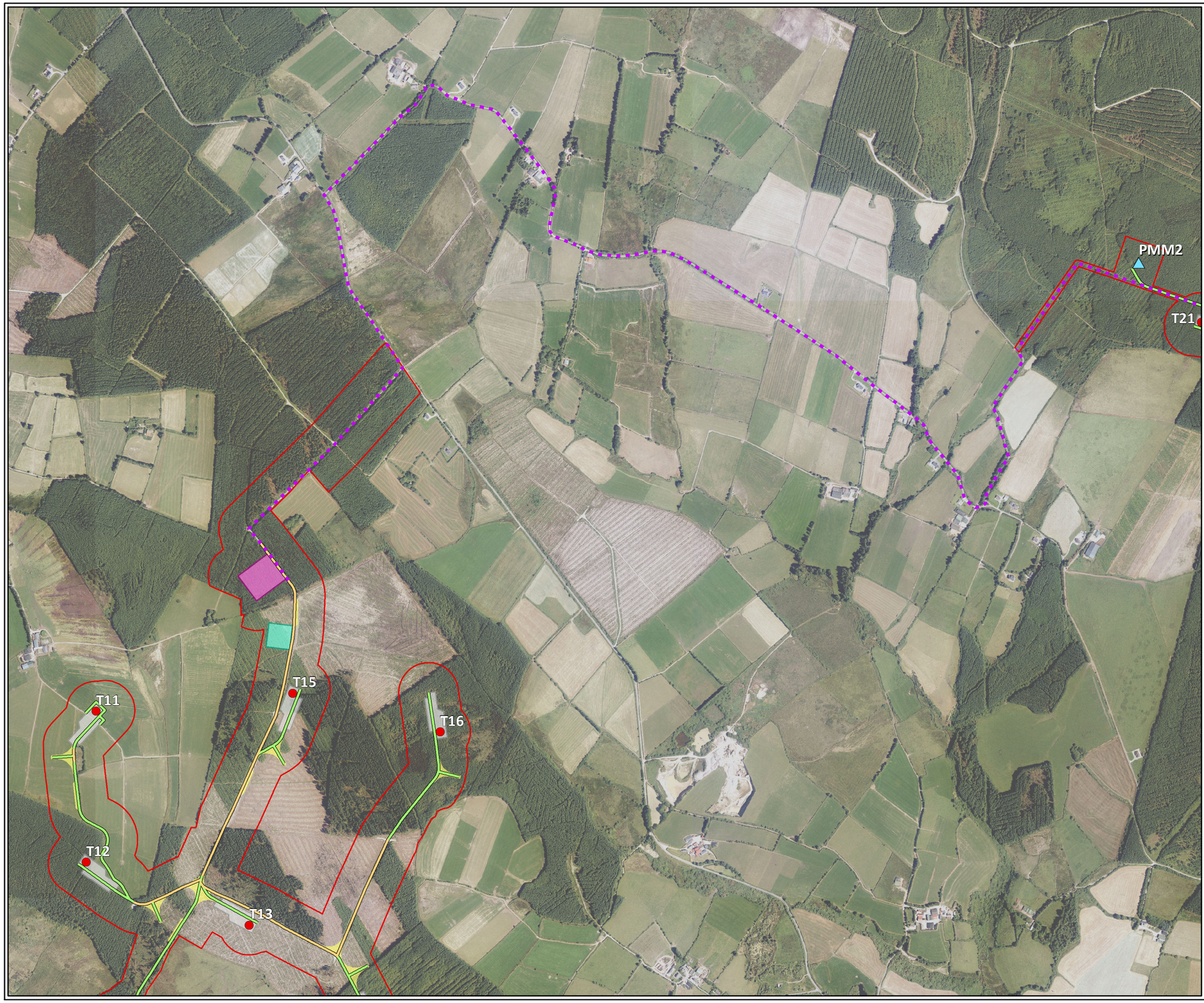
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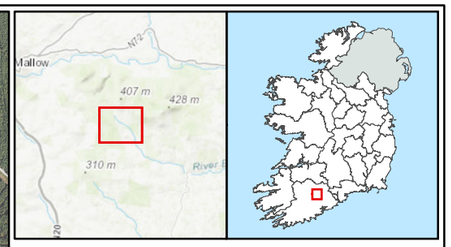
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- Proposed Borrow Pit
- Proposed Substation

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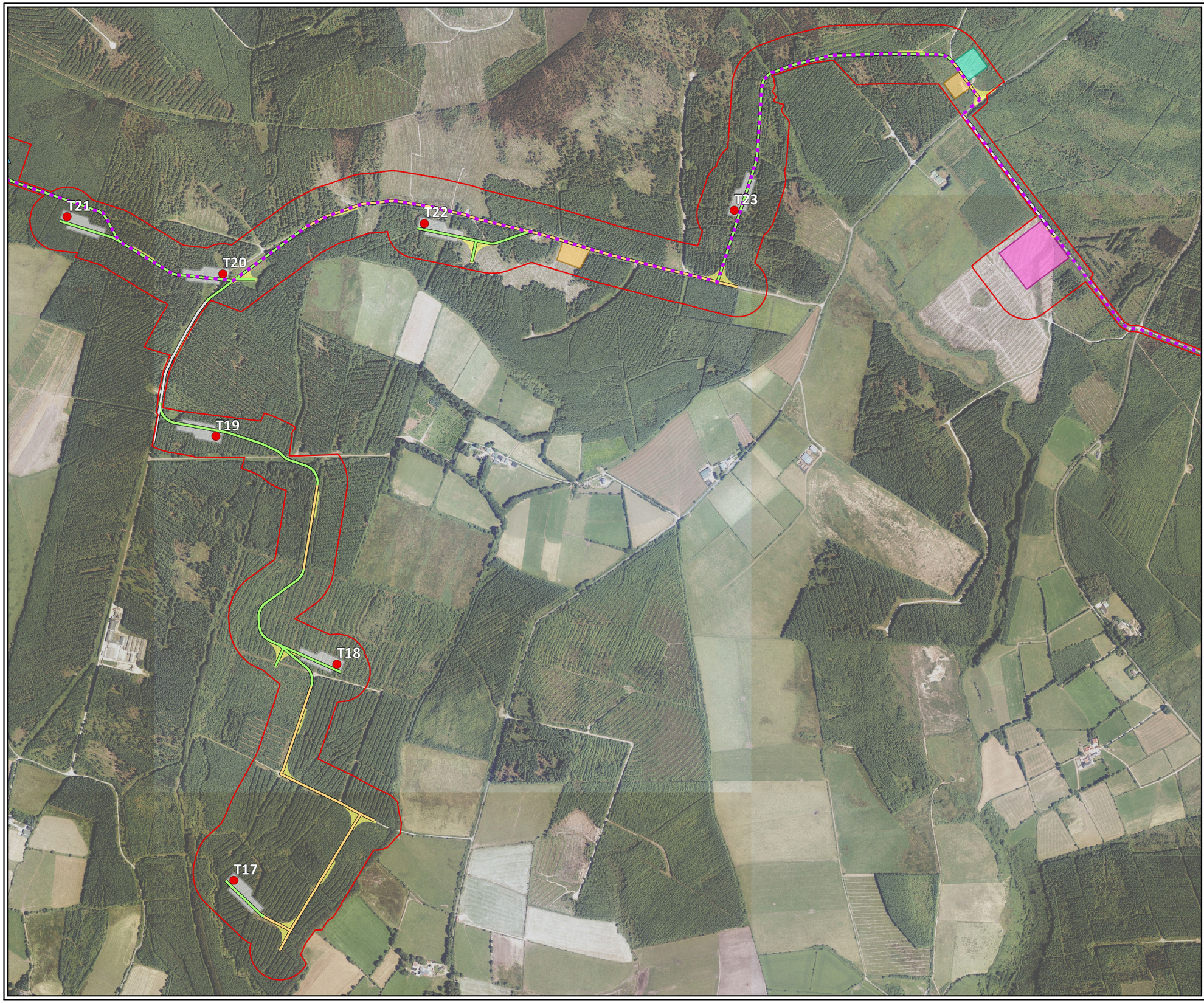
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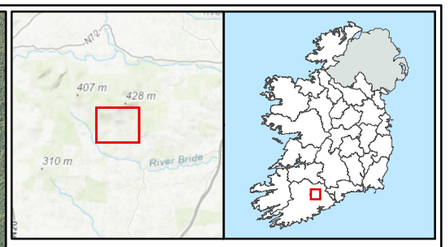
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- Proposed Temporary Compound
- Proposed Substation

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FIGURE NO:	1.2.5		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:12500	**REVISION:**	0
DATE:	03/10/2020	**PAGE SIZE:**	A3

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2. EXISTING ENVIRONMENT

2.1 Energy Park Site

The proposed CGEP site includes lands contained within the following townlands: Glashaboy North, Coom (Hudson), Tooreen South, Killeagh, Coom (Fitzgerald) , Knuttery, Mullenaboree, Knockacullata, Knoppoge, Carrig, Glensack, Glannasack, Knockdoorty, Lackendarragh North, Glashaboy South and Toorgarrif, County Cork.

The energy park site is divided into three distinct areas identified as Bottlehill, Mullanboree and Knockdoorty.

The site is accessed from both the east and west via the N72 and N20 national roads respectively and local road network. From the east the site is accessed is via the M8 motorway and N72 national road through the village of Ballyhooly, with the route then travelling along the local road network for approximately 9.0 km. From the east, the site is accessed via the N20 and a local road which travels to the entrance of the Bottlehill Landfill Facility.

The site is located in a predominantly agricultural area, with elevations within the site ranging from 190m to 390m above sea level. The landcover is classified in Corine as pastures; coniferous forest, transitional woodland shrub and mineral extraction sites (landfill facility).

Surface runoff from the site drains to the Toor River, Coom River, Inchinanagh and Bunnaglanna watercourses, and the Bride River. The Toor River is a tributary of the Coom River. The Coom River and Inchinanagh and Bunnaglanna watercourses are tributaries of the Bride River.

A detailed description of the existing site environment can be found in Chapter 3 of the EIAR.

2.2 Turbine Delivery Route (TDR)

Turbines will be delivered to Ringaskiddy Port. From there they will be delivered to the site along two distinct routes. One route to the west of the site, servicing the Bottlehill and Mullenaboree areas and a second route servicing the eastern site at Knockdoorty.

Temporary accommodation works to facilitate turbine deliveries are proposed at lands contained within the following townlands: Grange West, Ballyhooly South, Glashaboy South and Castleblagh, Shanacloon, Grange east, Castlehyde, Gortroche, Ballygrogan, Slievedotia, Tooreen South and Carrignagohera, Co. Cork.

The turbine delivery routes are illustrated in Figure 2-1. Further details on the proposed turbine delivery routes can be found in Section 3.

2.3 Grid Connection

It is anticipated that the project will connect via underground cable to Barrymore 110kV substation in the townland of Farran South.

The cable will be installed along the public road and shall feature horizontal directional drilling at up to 4 no. locations to cross existing watercourse crossings and the M8 Motorway. No overhead lines are required for this connection.

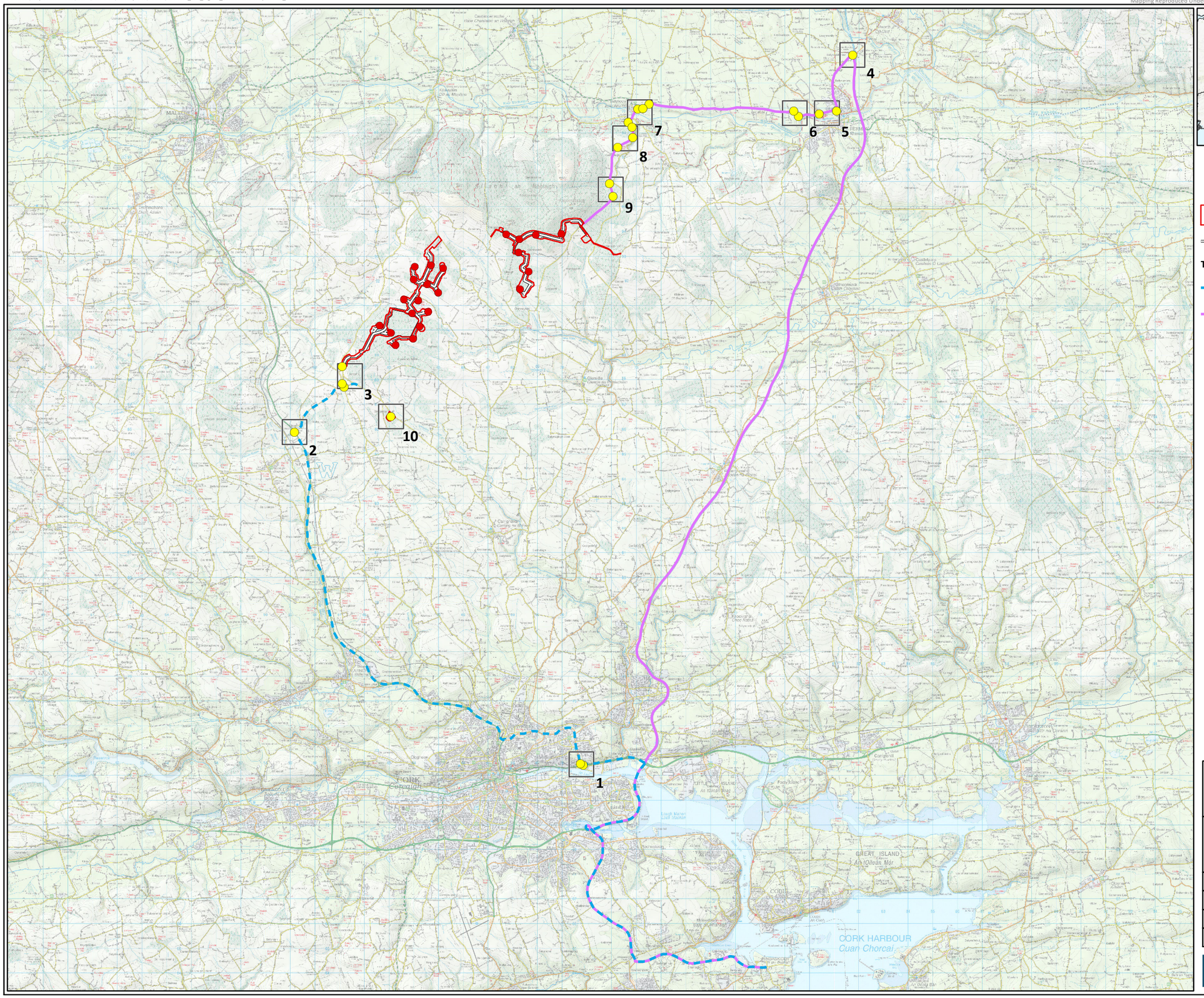
The proposed grid connection route will cross agricultural lands and will follow the existing road to the substation at Barrymore.

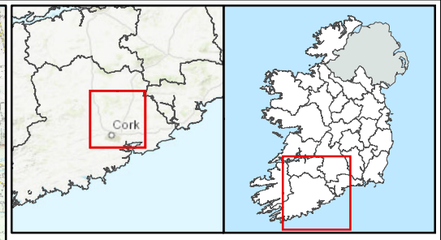
The underground grid route connecting the wind farm to the national grid at Barrymore substation traverses the following townlands; Knockacullata, Tooreen, Commons, Knoppoge, Carrig, Killeagh, Glannasack, Knockdoorty, Lackendarragh North, Moanlahan, Knockauncorrin, Mullentaura, Glanakip, Rathcormack-mountain, Coolnakilla, Knockananig, Coolmucky, Ballynahina, Corrin, Farran North, Farran South, Kill-Saint-Anne-North, Co. Cork..

The proposed grid connection route is shown on Figure 2-2.

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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TDR Nodes

Proposed Turbine Layout

Proposed Development Boundary

Proposed Access Roads

Turbine Delivery Route Options

Route 1

Route 2

N W E S

0 2.5 5 10 Kilometers

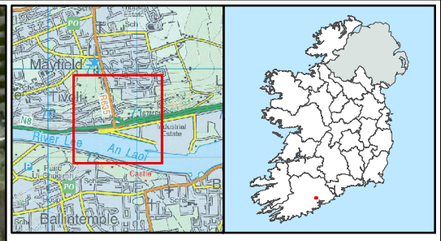
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 1

N
W E
S

0 50 100 200 Meters

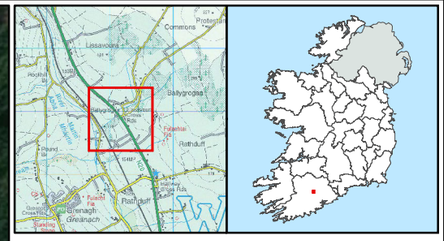
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 1

N
W E
S

0 50 100 200 Meters

TITLE:	Turbine Delivery Routes Submap 2		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	2.1.3		
CLIENT:	Coom Green Energy Park Ltd.		
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TDR Nodes

Proposed Development Boundary

Proposed Nodes Upgrade Areas

Proposed Access Roads

Turbine Delivery Route Options

Route 1

N
W E
S

0 50 100 200 Meters

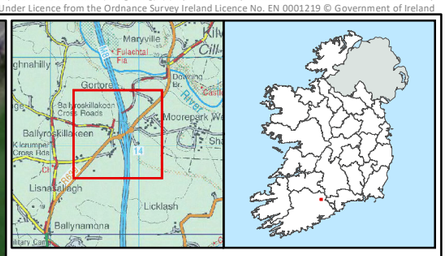
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

N
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0 50 100 200 Meters

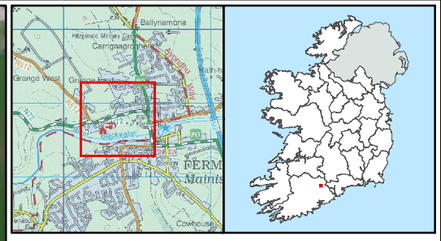
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

N
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0 50 100 200 Meters

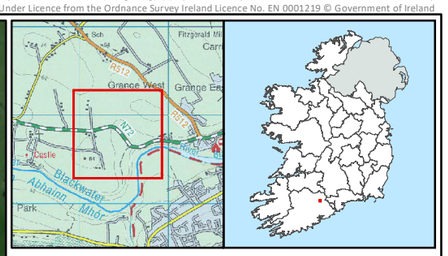
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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0 50 100 200 Meters

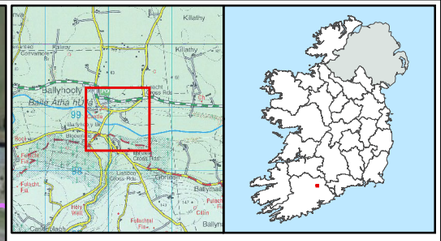
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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0 50 100 200 Meters

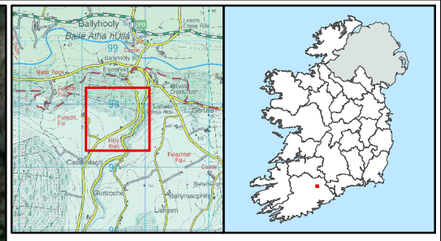
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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0 50 100 200 Meters

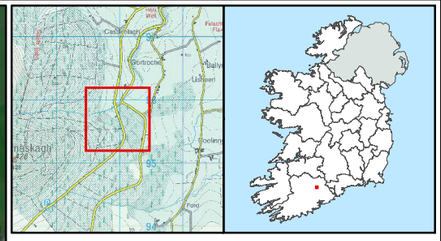
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TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

N
W E
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0 50 100 200 Meters

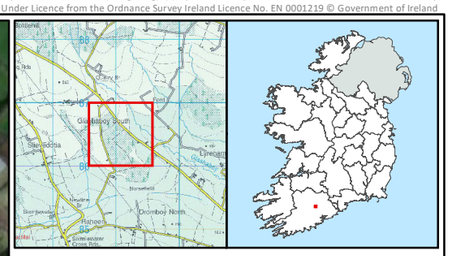
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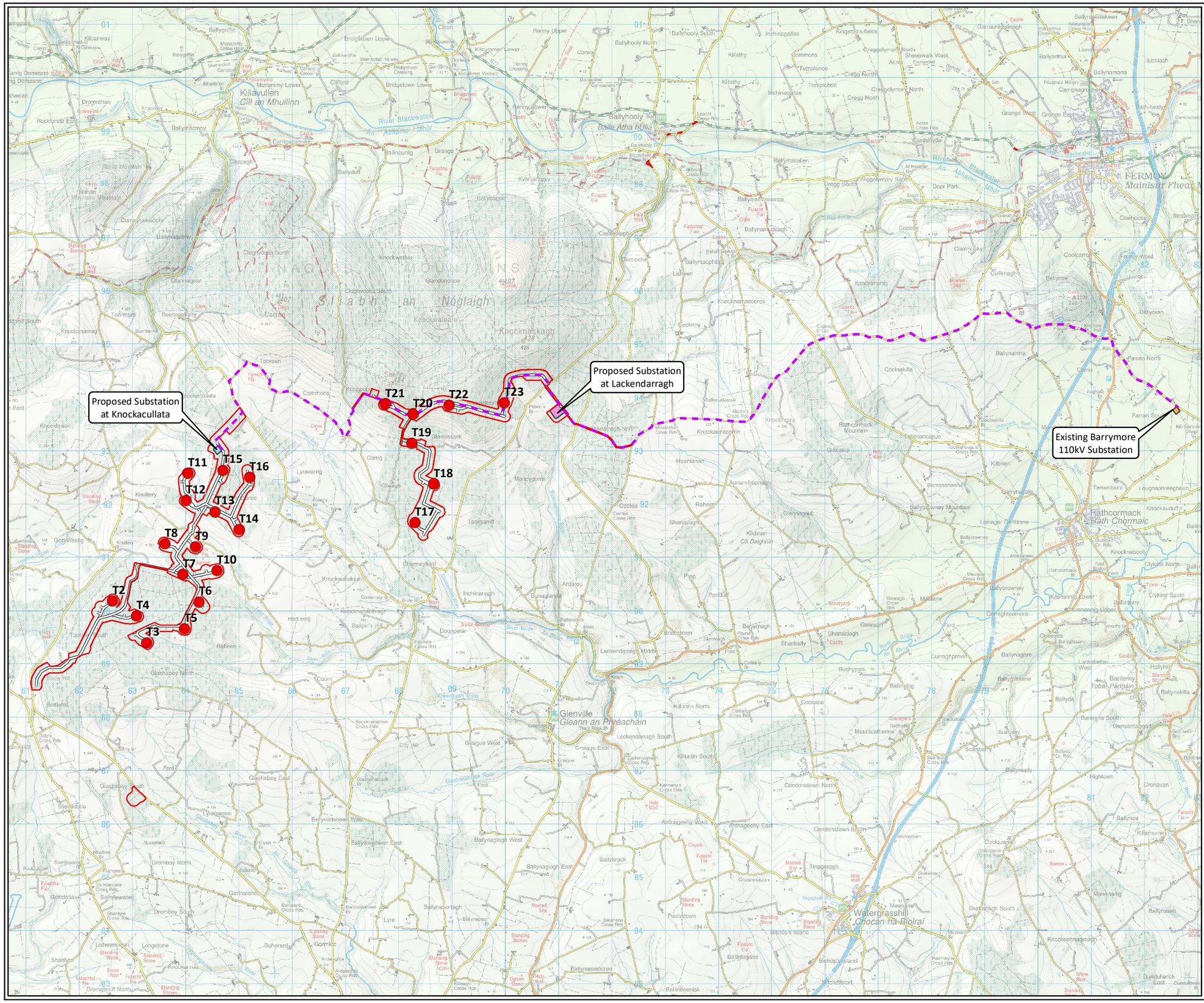
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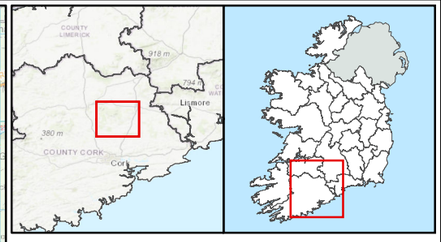



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- Proposed Turbine Layout
- Proposed Cable Route
- Proposed Development Boundary
- Proposed Access Roads
- Existing Barrymore 110kV Substation
- Proposed Substation at Knockacullata
- Proposed Substation at Lackendarragh

TITLE:	Grid Connection General Arrangement
PROJECT:	Coom Green Energy Park, Co. Cork
FIGURE NO:	2.2
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2.4 Biodiversity

2.4.1 European Sites of Importance

European designated sites can be sensitive to hydrological changes to groundwater and surface water quality which may affect water dependant ecosystems. Within individual Designated Sites (both SAC's and SPA's), specific species may be sensitive to disturbance, displacement, habitat loss or accidental mortality, which could reduce their favourable conservation status. Designated sites are also sensitive to encroachment by invasive species.

European Designated Sites (SAC and SPA) sites within 15km of CGEP and Grid Connection Route are described in Table 2-1.

Table 2-1: European Designated Sites (SAC and SPA) sites within 15km of CGEP and Grid Connection Route

Site	Code	Summary Description	Distance (CGEP development boundary or GCR nearest works location)
Blackwater Callows SPA	004094	Contains a stretch of the River Blackwater, running west to east for a 25km distance between Fermoy, Co. Cork and Lismore, Co. Waterford. Site is comprised of the river channel and a flood plain containing areas of seasonally-flooded grassland.	4.17km
Blackwater River (Cork/Waterford) SAC	002170	One of Ireland's largest rivers, the River Blackwater drains a major part of Co. Cork and five mountain ranges. The river's surrounding peaty terrain give it a distinctively dark appearance. The river is surrounded by areas of hollows, wetlands, species-rich wet grasslands and woodlands.	0.6km
Cork Harbour SPA	004030	The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Mallard, Pintail, Shoveler, Redbreasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Blackheaded Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.	19.2km

Site	Code	Summary Description	Distance (CGEP development boundary or GCR nearest works location)
Great Island Channel SAC	001058	The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest.	20.4km

Table 2-2: European Designated Sites (SAC and SPA) sites within 15km of the Turbine Delivery Route

Site	Code	Summary Description	Distance (nearest works or activity location)
Blackwater Callows SPA	004094	Contains a stretch of the River Blackwater, running west to east for a 25km distance between Fermoy, Co. Cork and Lismore, Co. Waterford. Site is comprised of the river channel and a flood plain containing areas of seasonally-flooded grassland.	within 15km of Nodes [2.0 - 2.14] (closest 1.3 km)
Blackwater River (Cork/Waterford) SAC	002170	One of Ireland's largest rivers, the River Blackwater drains a major part of Co. Cork and five mountain ranges. The river's surrounding peaty terrain give it a distinctively dark appearance. The river is surrounded by areas of hollows, wetlands, species-rich wet grasslands and woodlands.	within 15km of [all] Nodes (closest 10m)
Cork Harbour SPA	004030	The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Mallard, Pintail, Shoveler, Redbreasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Blackheaded Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.	Within 15km of Nodes [1.3 & 1.4] (closest 1.6 km)

Site	Code	Summary Description	Distance (nearest works or activity location)
Great Island Channel SAC	001058	The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest.	within 15km of Nodes [1.3 & 1.4] (closest 5.6 km)
Lower River Suir SAC	002137	The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitats alluvial forest and Yew woodland. The site also supports populations of several important animals species, some listed on Annex II of the Habitats Directive or listed in the Irish Red Data Book. The presence of two legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the site adds further to the ecological interest and importance.	within 15km of Node [2.0] (14 km)

2.4.2 Existing Habitats

Nineteen habitats were recorded within the CGEP study area. Conifer plantation (WD4) is the dominant habitat type covering 74.6% of the total 364.3ha study area. This is followed, in order of abundance, by Recently felled woodland (WS5) at 9.1%, Improved agricultural grassland (GA1) at 5.5%, Scrub (WS1) at 3.9%, Spoil and bare ground (ED2) at 3.9%, and Wet grassland at 1.2% of the wind farm study area. Other habitats detailed in Table 8-26 make up less than 3.5% of the study area i.e. are very minor in extent.

Seven linear habitat types were identified within CGEP study area. The dominant linear habitat (7159m) has no ecological value and consists of existing hard surfaces (BL2/ ED2) i.e. tracks, hardcore surfaces etc. Other linear habitats within the windfarm study area with some ecological value comprise; 299m of Hedgerows (WL1), 633m linear scrub (WS1), 570m of Eroding/upland rivers (FW1), 340m of Earth banks (BL2), 755m of recolonising bare ground (ED3) and 249m of Treelines (WL2) occur.

Twenty-six non-linear habitat types (or habitat mosaics) make up the 244.6ha grid connection study area (i.e. the 50m buffer of the ca.17km of grid connection outside the subject development planning application boundary). The most abundant habitat is Improved agricultural grassland (39.7%). Buildings and artificial surfaces (BL3) occupy 8.5% of the study area, followed by GS4 (2.8%), GA2 (1.7%), WS5 (1.5%), WS1 (1.5%), BL3/GA2 (1.3%), ED2 (1.1%). The remaining 18 habitats, each covering less than 1% individually make up the remaining 4.7% of the total study area.

Terrestrial Habitats are sensitive to direct land take, pollution, and environmental changes resulting from modification such as increased drainage. Groundwater dependant habitats such wetlands and peatland habitats may be sensitive to changes in groundwater regimes or changes in ground water quality. The diversity of habitats is particularly sensitive to encroachment from invasive species which may out-compete local native species. Habitats are also sensitive to Human activities such as burning and recreational use.

See Chapter 8 of the EIAR for more information on the existing ecological environment.

2.4.3 Invasive Species Records

Table 2-3, outlines the records of Invasive species found during the Desktop study within the 10km grid squares within which the development is located. The CGEP and CGEP grid connection route study area occupies four 10km grid squares comprising W69, W79, W89 and W68.

Table 2-3: Invasive Species records from Desktop Review (Source: NBDC)

Common Name	Scientific Name	Year of Last Record	Location of Record (10km Grid Square)	Invasive Impact
Blackcurrant	*Ribes nigrum*	2007	W69	Medium
Himalayan Knotweed	*Persicaria wallichii*	2018	W69	High
Indian Balsam	*Impatiens glandulifera*	2009	W69	High
Japanese Knotweed	*Fallopia japonica*	2007	W69	High
Rhododendron	*Rhododendron ponticum*	2018	W69	High
Sycamore	*Acer pseudoplatanus*	2005	W69	Medium
Douglas Fir	*Pseuotsuga menziesii*	2006	W79	Medium
American Skunk-cabbage	*Lysichiton americanus*	2017	W79	Medium
Blackcurrant	*Ribes nigrum*	2006	W79	Medium
Cherry Laurel	*Prunus laurocerasus*	2006	W79	High
Indian Balsam	*Impatiens glandulifera*	2009	W79	High
Japanese Knotweed	*Fallopia japonica*	2006	W79	High
Rhododendron	*Rhododendron ponticum*	2019	W79	High
Sycamore	*Acer pseudoplatanus*	2009	W79	Medium
Canadian Waterweed	*Elodea canadensis*	2009	W89	High
Cherry Laurel	*Prunus laurocerasus*	2004	W89	High
Giant Hogweed	*Heracleum mantegazzianum*	2018	W89	High
Indian Balsam	*Impatiens glandulifera*	2017	W89	High
Japanese Knotweed	*Fallopia japonica*	2018	W89	High
Rhododendron	*Rhododendron ponticum*	1997	W89	High
Sycamore	*Acer pseudoplatanus*	2009	W89	Medium
Traveller's-joy	*Clematis vitalba*	2015	W89	Medium
Butterfly-bush	*Buddleja davidii*	2017	W68	Medium

Common Name	Scientific Name	Year of Last Record	Location of Record (10km Grid Square)	Invasive Impact
Cherry Laurel	*Prunus laurocerasus*	2017	W68	High
Japanese Knotweed hybrid	*Fallopia japonica* x *sachalinensis* = *F.* x *bohemica*	2017	W68	High
Himalayan Knotweed	*Persicaria wallichii*	2015	W68	Medium
Indian Balsam	*Impatiens glandulifera*	2015	W68	High
Japanese Knotweed	*Fallopia japonica*	2018	W68	High
Nuttall's Waterweed	*Elodea nuttallii*	2008	W68	High
Sycamore	*Acer pseudoplatanus*	2017	W68	Medium
Three-cornered Garlic	*Allium triquetrum*	2017	W68	Medium

Terrestrial Habitats are sensitive to direct land take, pollution, and environmental changes resulting from modification such as increased drainage. Groundwater dependant habitats such wetlands and peatland habitats may be sensitive to changes in groundwater regimes or changes in ground water quality. The diversity of habitats is particularly sensitive to encroachment from invasive species which may out-compete local native species. Habitats are also sensitive to Human activities such as burning and recreational use.

2.5 Soils, Geology and Hydrogeology

The land use across the site is predominantly made up of agricultural lands and coniferous forestry at various stages of their lifecycle.

The subsoils across the site comprise predominantly glacial till derived from Devonian sandstones, bedrock outcrop or subcrop, and a limited extent of blanket peat.

The slopes of the southern portion of the proposed energy park site (Bottlehill) is characterised by elevated lands with typical elevations of between 270m to 290m AOD with steep to moderate slopes to the west of the site boundary. Slopes within the proposed energy park site and at proposed infrastructure locations generally comprise gentle slopes of between 1.7 to 3.4 degrees.

The central portion of the site (Mullenaboree) is also characterised by elevated lands with gentle slopes within the proposed energy park site boundary of between 1.7 to 3.4 degrees.at turbine locations T11 to T16. Elevations at this portion of the proposed energy park site are generally lower than those at the south with typical elevations of between 220m to 260m AOD.

The northern portion of the proposed energy park site (Knockdoorty) which includes turbine locations T17 to T23, proposed borrow pit BP03 and the proposed Lackendarragh North sub-station comprises elevated lands sloping steeply to the south. A ridge feature at the extreme northern boundary of the proposed energy park site trends east-west and reaches maximum elevations of between 424m and 428m AOD to the north of turbines T21 and T23 respectively.

Slopes at proposed turbine locations in this portion of the energy park site range from gentle (3.4 degrees) to moderate to steep where maximum slope angles of 10.2 degrees at turbines T20 and T22 to 14.5 degrees at T21. These turbines are located along the east-west ridge at the north of the proposed energy park site .Slopes at the proposed borrow pit BP03 are typically in the order of 6 degrees sloping the south-east.

The Groundwater Vulnerability within the proposed wind farm site boundary and the majority of the proposed grid connection route is classified by the GSI as ranging from 'High' to 'Extreme' with areas of exposed bedrock also present in these areas. At the eastern extent of the proposed grid connection the vulnerability classification is reduced to 'Moderate'.

Based on the GSI aquifer vulnerability mapping, overburden deposits are generally between 3 and 10 m deep in the central portion of the site; generally, 3 to 5 m deep in the north, east and south-east of the site; and <3m deep in the extreme west and north east of the site.

From a review of the GSI Landslide Susceptibility database, the proposed energy park site is generally located in areas of 'Low' susceptibility to landslides. The exceptions are T20 and T21 (Moderately High) and T22 (Low to Moderately Low). However, no evidence of slope instability was observed at the site following investigation and there are no historical records of landslide activity within or close to the site.

Detailed information on soils, land and geology is provided in Chapter 9 of EIAR.

2.6 Hydrology & Water Quality

Coom Energy Green Park is located within Hydrometric Area No. HA 18, Blackwater (Munster), of the Irish River Network System. It is situated in the South Western River Basin District (SWRBD). The average annual rainfall in period 1981-2010 in the area of energy park site is 1,437 mm.

CGEP is situated within eight sub-basins as defined by the Water Framework Directive (WFD). These waterbodies are known as:

- Clyda_030-IE_SW_18C020300
- Coom_010 - IE_SW_18C030400
- Bride (Blackwater)_010 - IE_SW_18B050050
- Bride (Blackwater)_020 – IE_SW_18B050320
- Ross (Killavullen)_010 – IE_SW_18R020500
- Bride (Blackwater)_180 – IE_SW_18B022100
- Blackwater (Munster)_190-IE_SW_18B022300
- Bride (Blackwater)_030 – IE_SW_18B050400

Surface runoff from turbines T2, T3, T4 and T5 drains to the Coom River. The Coom River rises to an elevation of 270 m OD approximately 90 m west of the turbine T4. The river flows in an easterly direction for approximately 6.4 km, where it joins the Bride River.

Surface runoff from turbines T6, T7, T8, T9, T10, T11, T12, T13 and T14 drains to the Toor River. The Toor River rises to an elevation of 245 m OD approximately 110 m east of the turbine T11.

From there it flows to the south for approximately 0.85 km before Mullenaboree stream joins, it then flows south-easterly for approximately 3.4 km, where it joins the Coom River.

The runoff from turbines T15 and T16 drain to the Lyravarrig stream which is a tributary of the Bride River. The Lyravarrig stream rises to an elevation of 190 m OD approximately 0.70 km south east of the turbine T16. The Lyravarrig stream flows in an easterly direction for 1.3 km, before joining Bride River.

The surface runoff from turbines T17, T18, T19, T20, T21 and T22 drain to the Bride River which is a tributary of the Blackwater River. The Bride River rises to an elevation of 240 m OD approximately 2.60 km west of the turbine T21. The river flows in a south-easterly direction for 5.1 km before Coom river joins it. Bride River continues to flow in easterly direction for approximately 41.7 km where it joins Blackwater River.

The runoff from turbine T23 drains to the Bunnaglanna River which is also a tributary of the Bride River. The river rises to an elevation of 260 m OD approximately 0.4 km south east of the turbine T23. The river flows in a southerly direction for 4.1 km before joining the Bride River.

The site entrance for TDR-West is in the sub-basin Clyda_030. The existing access road connecting the site entrance and CGEP will be widened. Approximately 465m of a new road will be constructed in the sub-basin Clyda_030. A temporary compound and a met-masts are planned in this sub-basin.

The OPW has produced indicative flood mapping to assist in a preliminary flood risk assessment (PFRA). The indicative flood mapping for Coom Green Energy Park is shown on Figure 2-3. The national flood hazard mapping (available at www.floodmaps.ie), does not indicate any record of historical flooding along the tributaries of the Bride River running through the site.

According to flood mapping the proposed turbines, hardstanding areas and substations are not within flood zone. However, the access road between turbine T9 and T13 and grid route approximately 740 m northwest of the existing 110kV Barrymore substation crosses indicative floodplain 'Flood Zone A'

Existing hydrological features recorded within the site area shown on Figure 2-4.

WFD water quality status and river waterbody risk within the study area is provided in Table 2-4:

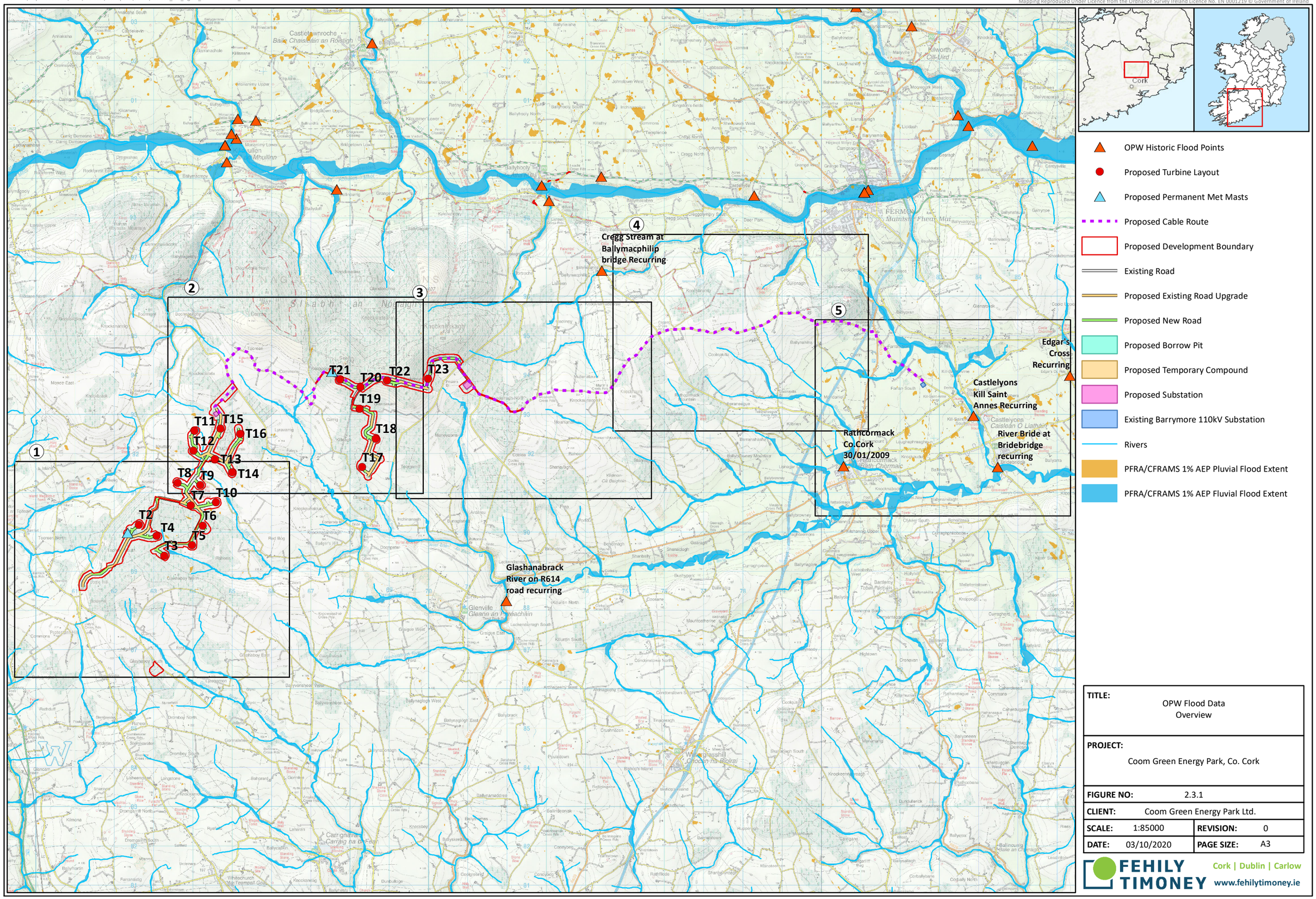
Table 2-4: WFD River Status and River Waterbody Risk[1]

Waterbody	EPA CODE	River Status	Waterbody Risk
Tooreen North	18T33	Good	Not at Risk
Coom_010	18C03	Good	Not at Risk
Toor River	18T51	Good	Not at Risk
Lyravarrig	18L66	Good	Not at Risk
Bride (Waterford)	18B05	Good	Not at Risk
Bunnaglanna	18B07	Good	Review
Inchinanagh	18I16	Good	Review

Detailed information on hydrology and water quality is provided in Chapter 10 of EIAR.

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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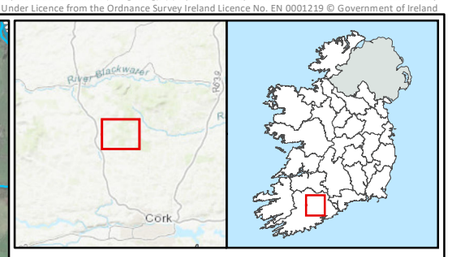
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- Proposed Turbine Layout
- Proposed Permanent Met Masts
- Proposed Development Boundary
- Existing Road
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Borrow Pit
- Proposed Temporary Compound
- Rivers
- PFRA/CFRAMS 1% AEP Pluvial Flood Extent
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent

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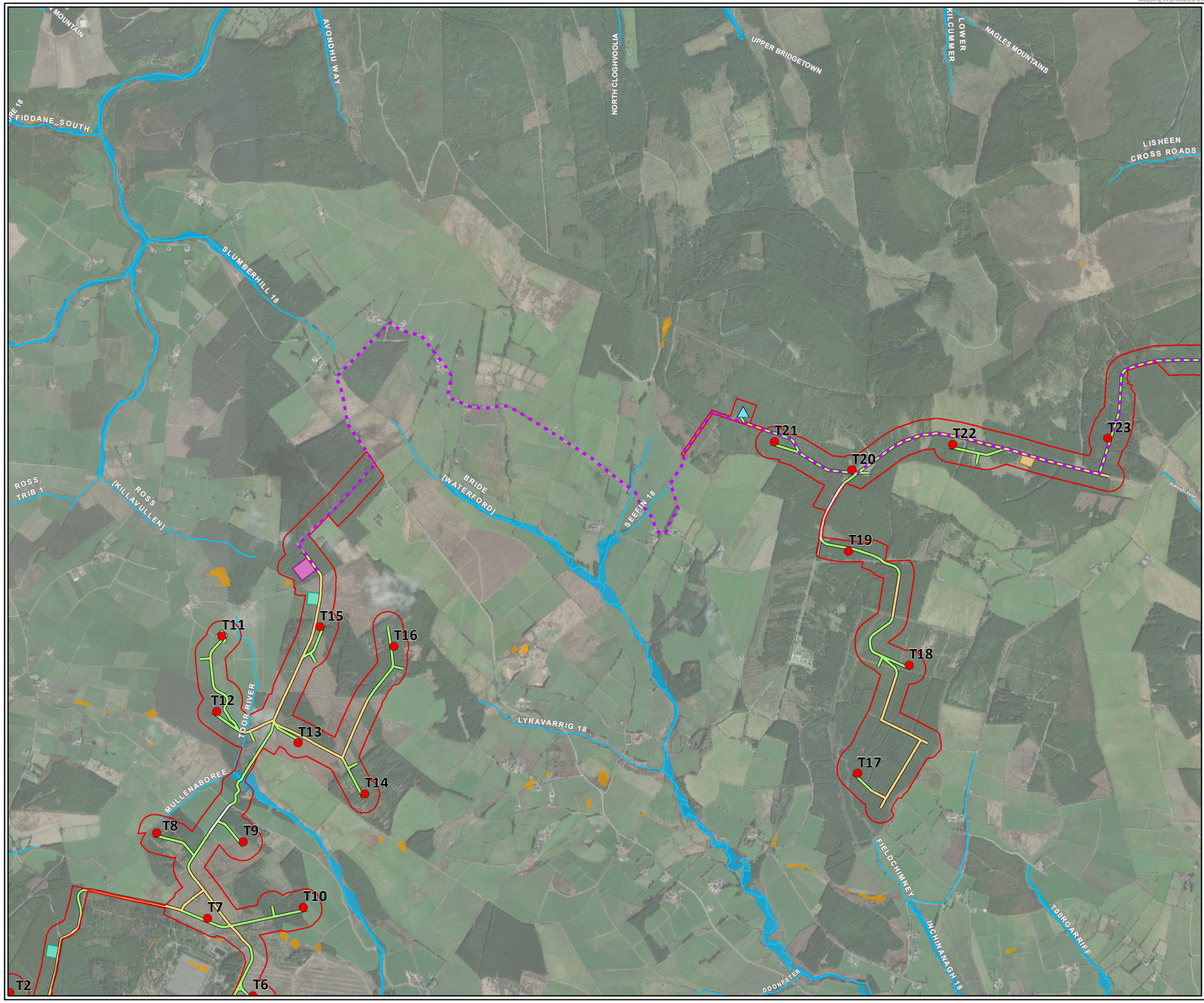
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- Proposed Turbine Layout
- Proposed Permanent Met Masts
- Proposed Cable Route
- Proposed Development Boundary
- Existing Road
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Borrow Pit
- Proposed Temporary Compound
- Proposed Substation
- Rivers
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent

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- OPW Historic Flood Points
- Proposed Turbine Layout
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- Proposed Existing Road Upgrade
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- Rivers
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent
- PFRA/CFRAMS 1% AEP Fluvial Flood Extent

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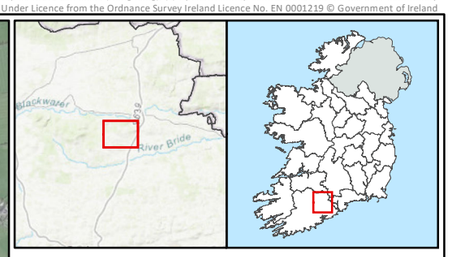
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OPW Historic Flood Points

Proposed Cable Route

Rivers

PFRA/CFRAMS 1% AEP Pluvial Flood Extent

PFRA/CFRAMS 1% AEP Fluvial Flood Extent

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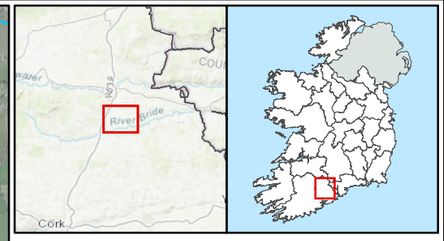
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OPW Historic Flood Points

Proposed Cable Route

Existing Barrymore 110kV Substation

Rivers

PFRA/CFRAMS 1% AEP Pluvial Flood Extent

PFRA/CFRAMS 1% AEP Fluvial Flood Extent

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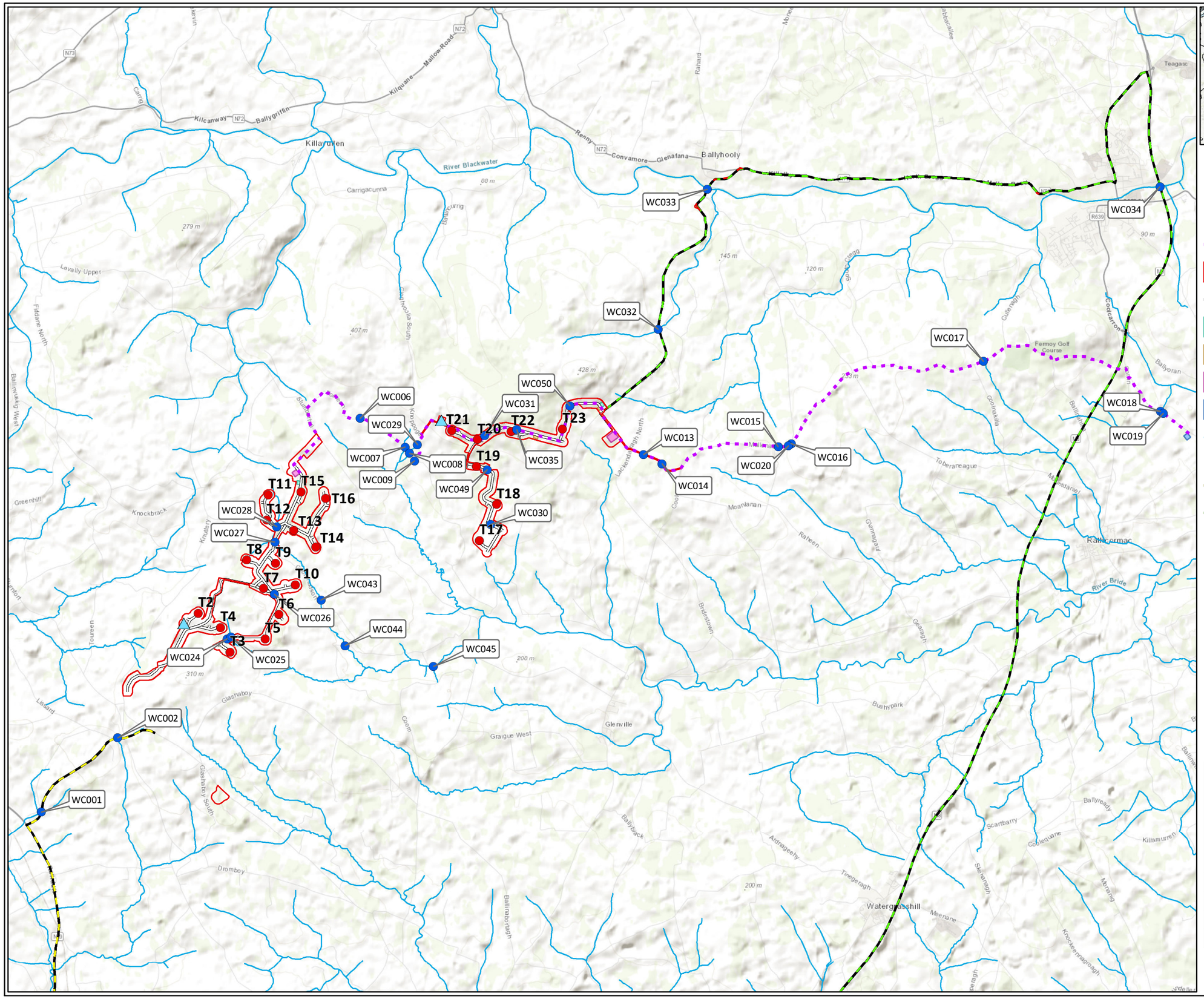
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2.7 Archaeological, Architectural and Cultural Heritage

There are no recorded archaeological sites located on the footprint of the proposed energy park site while there are six examples ranging from the late prehistoric to post-medieval periods located within the surrounding 1km study area (Table 14-4 in Chapter 14 of the EIAR). The Sites and Monuments Record does not indicate any unlocated archaeological sites within the townlands in this study area. There are no designated architectural heritage structures located within the 1km study area.

The proposed CGEP will have no impact on any UNESCO World Heritage sites or candidate sites. It is anticipated that there will be a slight low negative impact on 1no. National Monument, Island wedge tomb (CO042-056001-) which is situated 2.4km to the west of Turbine 2. The monument is included in the Record of Monuments and Places.

There is one existing recorded archaeological site located within the 100m wide corridor centred on the grid connection route. This comprises a levelled enclosure (CO035-042----) within a forestry plantation in Glanakip townland. Its recorded location is 30m to the east of the section of road that will carry the cable. No visible surface traces of the enclosure were observed during the inspection. There were no potential unrecorded archaeological sites noted during the inspection of the road margins. There are no designated architectural heritage structures located within the 100m study area centred on the grid route connection and it does not extend into any Architectural Conservation Areas.

Various archaeological sites and designated architectural structures are located in proximity to the turbine delivery routes. No impacts on these cultural heritage assets are predicted through the use of the existing roads.

3. OVERVIEW OF CONSTRUCTION WORKS

3.1 Description of the Proposed Project

3.1.1 Overall Project

The proposed project consists of three main elements:

- Main energy park;
- Turbine delivery route (TDR);
- Grid connection;

In summary the proposed project will consist of the following:

- Erection of up to 22 no. wind turbines with a tip height of up to 169m;
- Construction of turbine foundations and crane pad hardstanding areas;
- Construction of approximately 15 km of new site tracks and associated drainage infrastructure;
- Upgrading of approximately 10 km of existing tracks and associated drainage infrastructure where necessary;
- 3no. on site borrow pits and associated ancillary infrastructure. (New access tracks serving borrow pits shall be reinstated following completion of construction);
- All associated drainage and sediment control;
- Installation of new watercourse or drain crossings consisting of pre-cast concrete box culverts.
- Re-use or upgrading of existing internal watercourse and drain crossings;
- Construction of up to 2 no. onsite electrical substations and associated compounds including:
    - Welfare facilities;
    - Electrical infrastructure;
    - Parking;
    - Waste water holding tanks;
    - Rainwater harvesting
    - All associated infrastructure, services and site works including landscaping;
- 20 no. of Battery storage units and associated compound;
- Temporary accommodation works associated with the Turbine Delivery Routes to facilitate the delivery of turbine components;
- 3 no. Temporary construction site compounds and associated ancillary infrastructure including parking;
- Tree felling and associated replanting;
- Installation of approximately 30 km of medium voltage (20/33kV) underground cabling between the proposed turbines and the proposed on-site substations and associated ancillary works;

- Installation of approximately 7.7km of high voltage (up to 110kV) underground cabling between the proposed 2no. on site substations and ancillary works within private lands and public roads including up to 7 no. pre-cast joint bays;
- Installation of approximately 16.7km of high voltage (up to 110kV) underground cabling between the proposed on-site substations and the existing Barrymore substation and associated ancillary works within private lands and public roads. The proposed grid connection cable works will include 14 no. existing watercourse and drain crossings and the installation of up to 17 no. pre-cast joint bays.
- Communication cables and associated infrastructure;
- Erection of 2 no. permanent meteorological masts;

The proposed WTG's will have a maximum tip height of up to 169m above existing ground level, and a maximum rotor diameter of up to 138m.

The project shall include the opening of 3no. borrow pits on site. The locations of the proposed extraction pits are shown in Figure 1-2. There are no groundwater supply wells recorded in the immediate vicinity of the proposed borrow pit locations, therefore any dewatering of excavations is not likely to impact on water supplies.

3.1.2 Main Energy Park Site Layout

The proposed energy park site layout is shown in Figure 1-2. The co-ordinates of each turbine are detailed in Table 3-1 in Irish Transverse Mercator (ITM).

Table 3-1: Proposed Coom Green Energy Park Turbine Coordinates

TURBINE ID	X_(ITM)	Y_(ITM)
T2	562583	590234
T3	563227	589449
T4	563039	589951
T5	563936	589713
T6	564212	590214
T7	563907	590734
T8	563567	591306
T9	564146	591247
T10	564550	590806
T11	564002	592625
T12	563969	592119
T13	564515	591909
T14	564961	591567

TURBINE ID	X_(ITM)	Y_(ITM)
T15	564661	592686
T16	565156	592556
T17	568267	591705
T18	568612	592430
T19	568206	593193
T20	568229	593738
T21	567708	593928
T22	568905	593906
T23	569943	593950

3.1.3 Turbine Delivery Route

Large components associated with the wind farm construction will be transported to site via two separate turbine delivery routes (TDR's).

3.1.3.1 Turbine Delivery to the West

The port of entry is Ringaskiddy where the turbine components will be offloaded and transported to the site, via the N28 and the N40 to the Dunkettle Interchange. At the Dunkettle Interchange, the components will take the N8 to Silversprings and then take the R635 (north ring road) around the north side of Cork City. At Blackpool, the components will join the N20 and turn off at the junction with the L-1217 towards Bottlehill Landfill.

In order to access the site via the existing Coillte entrance point on the L-1219-0, turbine delivery vehicles shall pass the final junction to the site entrance between the L-1217 and L-1219-0, turn at a temporary hard standing in Coillte land at Glashaboy South which is located approximately 2km south-east of the proposed site entrance and make their final approach to the site from the east and south. At the temporary turning area, wind turbine blade components shall be transferred via crane from standard extendable trailers to 'Superwing' blade lifting trailers which will allow them to negotiate the L-1217/L-1219-0 junction.

3.1.3.2 Turbine Delivery to the East

The port of entry is the same as above and the turbine components will take the same route to Dunkettle Interchange. At the Dunkettle Interchange, the turbine components will travel north along the M8 motorway. At Junction 14 on the M8, the turbine components will exit the motorway and travel south into Fermoy. Once the turbines reach Fermoy, they will travel west along the N72 and turning south just east of Ballyhooley. From there they will follow local roads across the Blackwater River and to the site entrance at Lackendarragh North.

3.1.3.3 Site Entrances

The Coom Green Energy Park will be served by four site entrances. Two entrances are required to the west to access the Bottlehill and Mullenaboree areas of the proposed development.

Two site entrances will be required to the east. One of these is required for access to the turbines and associated infrastructure in the Knockdoorty area and the other is required for access to construct the substation at Lackendarragh North.

One of the western (Bottlehill) access points is located at the Bottlehill Landfill site (off the L-1217 local road) and is already constructed to TII guidelines (DN-GEO03060). The site entrance here will accommodate access to the Bottlehill part of the site for standard construction vehicles. Vehicles entering the site at this point shall only have the right to access turbines T2 – T7.

Access to the remaining turbines in the Bottlehill and Mullenaboree parts of the site shall be via the main site access off the L-1219-0. The main site access serving the Bottlehill and Mullenaboree parts of the site is an existing Coillte forestry access located on the L-1219-0 which will be upgraded to facilitate oversize loads associated with wind turbine component deliveries. All oversize turbine delivery vehicles for the Bottlehill and Mullenaboree areas of the site shall use this entrance.

The existing forestry access from the L-1504 local road at Mullenaboree shall not be used during the construction phase but shall remain as an access point for forestry operations and operational access to the proposed substation at Knockacullata.

The main Knockdoorty site entrance to the east is an existing Coillte forestry entrance which will be upgraded to facilitate the wind farm construction and operations in the Knockdoorty area. This will be a dedicated site entrance located along the L-1501 Ballyhooly to Chimneyfield road. This site entrance has been designed in accordance with TII guidelines and shall be upgraded to achieve sightlines of 160m in both directions at a setback distance of 3m. The Cork County Council requirements for local roads here are 90m sight lines in both directions.

A new entrance will also be located near the Knockdoorty site entrance to facilitate access for the construction of the proposed Lackendarragh North substation off the L-1501 local road. The new site entrance to the proposed Lackendarragh North substation will be constructed in line with Cork County Council requirements.

3.1.3.4 Temporary Accommodation Works

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. Any accommodation works will be carried out in advance of the turbine deliveries, following further consultation and agreement with the local authority.

5 no. locations have been identified where more extensive works will be required and are described below. The full extent of accommodation works are identified in Appendix 2. The locations requiring additional works are as follows:

- Local widening near Castlehyde along the N72 between Fermoy and Ballyhooly in the townlands of Grange West and Castlehyde (Node 2.3);
- Local widening at the junction of the N72 and the Ballyhooly North Road east of Ballyhooly in the townland of Ballyhooly South (Node 2.5);
- Local widening at the approach road to the Blackwater Bridge south of Ballyhooly in the townland of Ballyhooly South (Nodes 2.6 & 2.7);

- Removal of trees and construction of an aggregate hard standing at Castleblagh south of Ballyhooly in the townlands of Castleblagh (Node 2.8);
- Widening of existing forestry access, tree felling and construction of an off-site turning area at Glashaboy South (Temporary turning and transfer area).

The general location of accommodation works identified as “TDR Nodes”.

3.1.4 Grid Connection

Electricity generated from wind turbines at the Bottlehill and Mullenaboree parts of the site shall be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at a proposed onsite substation at Knockacullata in the Mullanboree part of the site. The power from this western part of the site shall be transferred to the onsite substation at Lackendarragh via a buried 110kV cable through private lands and a section of public road as shown on Figure 3-4. Electricity generated from wind turbines at the Knockdoorty part of the site shall also be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks and terminated directly into the on-site substation at Lackendarragh and exported to the grid via a 110kV buried cable to the existing Barrymore substation.

The proposed 110 kV grid connection route will cross private lands and will follow the existing road to the substation at Barrymore.

Connection works will involve the installation of ducting, joint bays, drainage and ancillary infrastructure and the subsequent running of cables along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches.

It is expected that full road closures will be put in place to facilitate cabling works rather than partial road closures or stop/go systems. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These would be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section.

3.1.4.1 Onsite Electricity Substations

It is proposed to construct 2 no. onsite electricity substations within the proposed development site as shown in Figure 3-1. These will provide a connection point between the wind farm and the proposed grid connection point at the existing Barrymore substation.

As described in Section 3.5.6, electricity generated from wind turbines at the Bottlehill and Mullenaboree parts of the site shall be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at a proposed onsite substation at Knockacullata in the Mullanboree part of the site. The power from this western part of the site shall be transferred to the onsite substation at Lackendarragh North via a buried 110kV cable through private lands and a section of public road as shown on Figure 3-4. Electricity generated from wind turbines at the Knockdoorty part of the site shall also be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks and terminate at the on-site substation at Lackendarragh North and transformed to 110 kV. Electricity from Bottlehill, Mullenaboree and Knockacullata circuits will be exported from Lackendarragh North substation to the existing grid via a 110kV buried cable to the existing Barrymore substation.

The dimensions of the proposed substation compounds will be approximately 178m x 153m and 124m x 104m at Lackendarragh North and Knockacullata respectively and will include a substation control building and electrical components necessary to export the electricity generated from the wind farm to the national grid. The substation compounds will be surrounded by a ca. 2.5 metre high steel palisade fence and internal fences will also be provided to segregate different areas within the main substation compound.

Lighting will be required on site and this will be provided by lighting poles located around the substation and exterior wall mounted lights on the control buildings.

At each of the locations, two control buildings will be located within the substation compound and will measure approximately 20m by 10m and approximately 6m in height. The control building will include the Independent Power Production (IPP) and grid operator control rooms, an office space and welfare facilities for staff during the operational phase of the wind farm. Due to the nature of the project there will be a small water requirement for occasional toilet flushing/hand washing with a rainwater harvesting tank adjacent to the control building.

A wastewater holding tank will be provided outside the substation compound fence line so that it can be maintained where required without requiring access to the substation compound. The wastewater holding tank will be a sealed storage tank with all wastewater tankered off site as required by an authorised waste collector to a wastewater treatment plant. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007, will be employed to transport wastewater away from the site. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. The wastewater storage tank alarm will be part of a continuous stream of data from the site's turbines, wind measurement devices and electricity substation that will be monitored remotely 24 hours a day, 7 days per week. This approach for managing wastewater on site has become standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment can be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal.

Battery energy storage system (BESS) units, to facilitate on site energy storage and to provide ancillary services to the electricity grid, will be situated next to the main onsite substation compound at Lackendarragh. They will be housed in glass reinforced plastic (GRP) units or modified shipping containers.

The units will be mounted on shallow concrete plinths within a gravel hard standing and shall be bounded in the same fashion as the substation compounds using a galvanised steel security palisade fencing.

3.1.4.2 Electrical Cabling

As described in Section 3.5.6, electricity generated from wind turbines at the Bottlehill and Mullenaboree parts of the site shall be collected at medium voltage by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at a proposed onsite substation at Knockacullata in the Mullanboree part of the site. The power from this western part of the site shall be transferred to the onsite substation at Lackendarragh via a buried 110kV cable through private lands and a section of public road as shown on Figure 3-4. Electricity generated from wind turbines at the Knockdoorty part of the site shall also be collected at medium voltage by an internal circuit of buried cables which will follow on-site access tracks and terminated directly into the on-site substation at Lackendarragh before being exported to the grid via a 110kV buried cable to the existing Barrymore substation. The proposed grid connection is shown in Figure 2-2.

Internal collector circuit cable routes are shown on the planning application drawings and will generally follow the alignment of the internal access tracks.

The electricity will be transmitted as a three-phase power supply so there will be three individual conductors (or individual cables) in each cable circuit. The three conductors will each be laid in separate ducts which will usually be laid in a trefoil formation but may also be laid in a flat formation. The specification for the cables and cable-laying will be in accordance with ESBN requirements.

The width of a cable trench with a trefoil formation will be 600mm, a flat formation would require a wider trench width. The depth of cover to the ducts carrying the cables will usually be 950mm cover to the top of the upper duct in public roadways and grassed areas. The depth of trench for the cables will be approximately 1220mm and the depth of cover for the cables will usually be 950mm. However, in certain instances, for example when crossing a bridge with shallow cover, a shallower depth of 450-950mm could be utilised. In those circumstances, the particular design will be agreed with Eirgrid and additional cable protection measures such as steel plates or reinforced concrete cover may be required. Cables laid within the site will be laid to a depth of up to 1100mm to the top of the upper duct in field locations.

The diameter of the ducting will be selected to suit the range of cross-sectional areas of electrical cables and is likely to fall between 100mm and 200mm diameter.

3.1.4.3 Crossing of the M8 Motorway

Where the grid connection route crosses the M8 motorway, horizontal directional drilling (HDD) will be used, namely a 110kV duct crossing at Corrin View Estate to the South of Junction 15 as shown on Plate 4-1..

The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage or surface of the motorway or associated embankments.

Consideration was given to trying to accommodate the cables in the over-bridge which spans the motorway at this location however following consultation with TII, Direct Route, and Cork County Council, it was deemed preferable to employ the proposed crossing technique.

There is sufficient room available to accommodate the necessary equipment. The cables will be laid at sufficient depth below the motorway to stay below the motorway drainage and without impacting on the road foundations. There will be a detailed consultation and agreement with TII and the PPP Company, Direct Route in advance of completing the works.

The locations of start and finish points for the HDD have been identified following desktop assessments, site visits and consultation with both the local authority, TII and Direct Route. Detailed designs for the motorway embankment and bridge crossing as well as site investigation records were reviewed by FT's geotechnical engineers to confirm the suitability of the proposed crossing method at this location.

3.1.5 Watercourse Crossings

3.1.5.1 Internal Access Track Watercourse Crossings

The proposed development layout will have 9 stream crossings within the site boundary. These crossings are listed in Table 3-2 and shown on
Figure 2-4.

Existing crossing WC028 will be replaced with box culvert of minimum 1200 mm width and 400 mm height, with additional height required for embedment and freeboard. There will be one new proposed watercourse crossing WC024 over the unnamed tributary of the Coom River and one new proposed crossings WC025 over the Coom River required as a result of the development. There will be one new proposed watercourse crossing WC027 over the Toor River required as a result of the development.

Table 3-2: Onsite Access Watercourse Crossings

Feature ID	ITM_X	ITM_Y	Existing/ Proposed	Feature/Activity	Proposed Method of Crossing
WC024	563175.65	589720.58	Pro	Grid cable crossing and proposed new access track crossing over the unknown tributary of the Coom River	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert
WC025	563250.25	589754.30	Pro	Grid cable crossing and proposed new access track crossing over the tributary of the Coom River	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert
WC027	564133.20	591667.40	Prop	Grid cable crossing and proposed new access track crossing over the Toor River	New Crossing. Box culvert 2000mmx1100mm + freeboard + embedment, cable over the culvert
WC028	564171.10	591981.30	Ext	Grid cable and proposed new access track crossing over the Toor River	Replace existing pipe with a box culvert of min 1200mmx400mm + freeboard + embedment, cable over the culvert
WC030	568492.90	592029.20	Ext	Grid cable and existing forestry track crossing over the forestry ditch, tributary of the Inchinanagh stream	Standard trench crossing above or below existing culvert.
WC031	568375.20	593820.90	Ext	Grid cable and existing forestry track crossing over the forestry ditch, in the proximity of the turbine T35	Standard trench crossing under existing service. Pipe to be extended to facilitate widening of existing access road or replaced with suitable pipe of same or greater diameter
WC035	569019.61	593940.22	Ext	Grid cable and existing forestry track crossing over the forestry ditch, in the proximity of turbine T20	Standard trench crossing under existing service. Pipe to be extended to facilitate widening of existing access road or

Feature ID	ITM_X	ITM_Y	Existing/ Proposed	Feature/Activity	Proposed Method of Crossing
					replaced with suitable pipe of same or greater diameter
WC049	568425.66	593132.46	Prop	Grid cable and proposed new access track crossing over drain east of turbine T19	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert
WC050	570093.25	594420.14	Prop	Grid cable and proposed new access track crossing over drain north of turbine T23	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert

A description of construction methodologies for watercourse crossings is presented in Section 3.3.

3.1.5.2 Watercourse Crossings Along the GCR

The following table summarises existing watercourse and service crossing locations and the proposed method for crossing same along the 110kV grid connection route.

Table 3-3: Summary of Watercourse and Buried Service Crossings Along GCR

Feature ID	ITM_X	ITM_Y	Feature Type	Proposed Crossing Method
WC006	565856.78	594166.05	Watercourse Crossing	HDD under structure within public road corridor. Alternative: Concrete bridge beam in road deck with ducts in flat profile. Reinstate bridge surface to same level as existing.
WC007	566767.03	593590.72	Watercourse Crossing	HDD under structure within public road corridor.
WC008	566855.33	593463.30	Watercourse Crossing	Trench in road above structure and reinstate road surface to existing levels.
WC009	566953.13	593308.63	Drain Crossing	Standard trench crossing under existing service
WC013	571579.31	593438.66	Drain Crossing	Standard trench crossing under existing service
WC014	571953.73	593251.56	Drain Crossing	Standard trench crossing under existing service
WC015	574302.28	593592.15	Drain Crossing	Standard trench crossing under existing service

Feature ID	ITM_X	ITM_Y	Feature Type	Proposed Crossing Method
WC016	574563.28	593659.12	Drain Crossing	Standard trench crossing under existing service
WC017	578448.83	595314.38	Watercourse Crossing	Standard trench crossing under existing service
WC018	582024.33	594307.32	Watercourse Crossing	Replace existing stone culvert with an RC box culvert and bring ducts underneath.
WC019	582076.81	594271.41	Watercourse Crossing	HDD under structure within public road corridor. Alternative: Concrete bridge beam in road deck with ducts in flat profile. Reinstate bridge surface to approximately 100mm above existing.
WC020	574506.00	593616.00	Drain Crossing	Standard trench crossing under existing service.
WC029	567015.50	593633.90	Drain Crossing	Standard trench crossing above or below existing culvert.

3.1.5.3 Turbine Delivery Route (TDR) Watercourse Crossings

There are 3no. existing watercourse crossings along the TDR between the M8 and the site at the locations shown in the table below. No works are expected to be required at any of these locations.

There are 2no. existing watercourse crossings between the N20 and Bottlehill Area site entrance. No works are expected to be required at either of these locations.

The locations of the above crossings are shown on Figure 2-4.

Table 3-4: TDR Existing Watercourse Crossings

Feature ID	ITM_X	ITM_Y	Route	Water Framework Directive (WFD) Waterbody Designation
WC001	559419.37	586219.49	TDR West	MARTIN_010
WC002	560960.04	587718.62	TDR West	MARTIN_020
WC032	571881.00	595965.50	TDR East	BLACKWATER (MUNSTER)_180
WC033	572870.50	598793.70	TDR East	BLACKWATER (MUNSTER)_170
WC034	582013.97	598842.80	TDR East	BLACKWATER (MUNSTER)_190

3.2 Construction Period

The construction period for the entire project is estimated to take between 18-24 months.

The layout of the site lends itself to clearly defined phases (civil construction, cables, turbines, on-site substation) where the various work elements can overlap without a significant increase in local traffic movements or congestion on site.

It is expected that the civil and electrical works will include the following;

- Temporary site compound;
- Site entrances;
- New stream crossings;
- New site roads & drainage;
- Upgrade to local roads;
- Turbine foundations and hardstands;
- Electrical compound and substation building;
- Cable trenching and ducting (internal cables only);
- Cable pulling (internal cables only);
- Turbine delivery and installation;
- Grid connection cable ducting;
- Grid connection cable pulling;
- Testing, commissioning and energisation.

3.3 Overview of the Construction Sequence (Preliminary Only)

The construction of a wind farm project is a major infrastructural project. The construction of this project will involve many inter-related, inter-dependent and overlapping elements of a complex nature.

The following section outlines the construction methodology for the proposed project. Upon mobilisation for the construction of the project, enabling earthworks and peat excavation (where required), upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. Typically, this will be followed by the construction of the turbine foundations and the provision of the hardstanding areas. In parallel with these works the on-site electrical works; sub-station and internal cable network are constructed. The proposed grid connection cable route works will take place in parallel with the main energy park construction works.

3.3.1 Overview of the Construction Methodology (Preliminary Only)

Method statements are presented below for the key elements of the construction process. Please note that the contractor for the main construction works will, following appointment, take ownership, expand upon and generally develop these method statements to the required detail.

The proposed construction methodology is summarised under the following headings:

- Site Entrance
- Temporary Site Compound
- Concrete Washout Area and Wheel Washing
- New Site Access Tracks
- Upgrade of Existing Internal Access Tracks
- Cable Works
- Borrow Pit Construction
- Crane Hardstands
- Turbine Foundations
- Substation Compound
- Electrical Works
- Turbine Erection
- Grid Connection works
- Horizontal Directional Drilling

3.4.1.1 Site Entrances

Prior to the commencement of any other works, the Site Entrance layouts will be constructed. The site entrances shall be designed in accordance with TII design standard DN-GEO-03060: Geometric Design of Junctions.

Site entrances will be secured and locked when not in use. Where required, the entrances will be controlled by flagmen to assist traffic movements. The locations of the site entrances are illustrated in Figure 2-1. It should be noted that the main site entrance for the Bottlehill/Mullenaboree part of the site shares an access with an existing residential property. Access to this property will be maintained at all times. Plate 3-1 below indicates the location of the proposed site access gate.

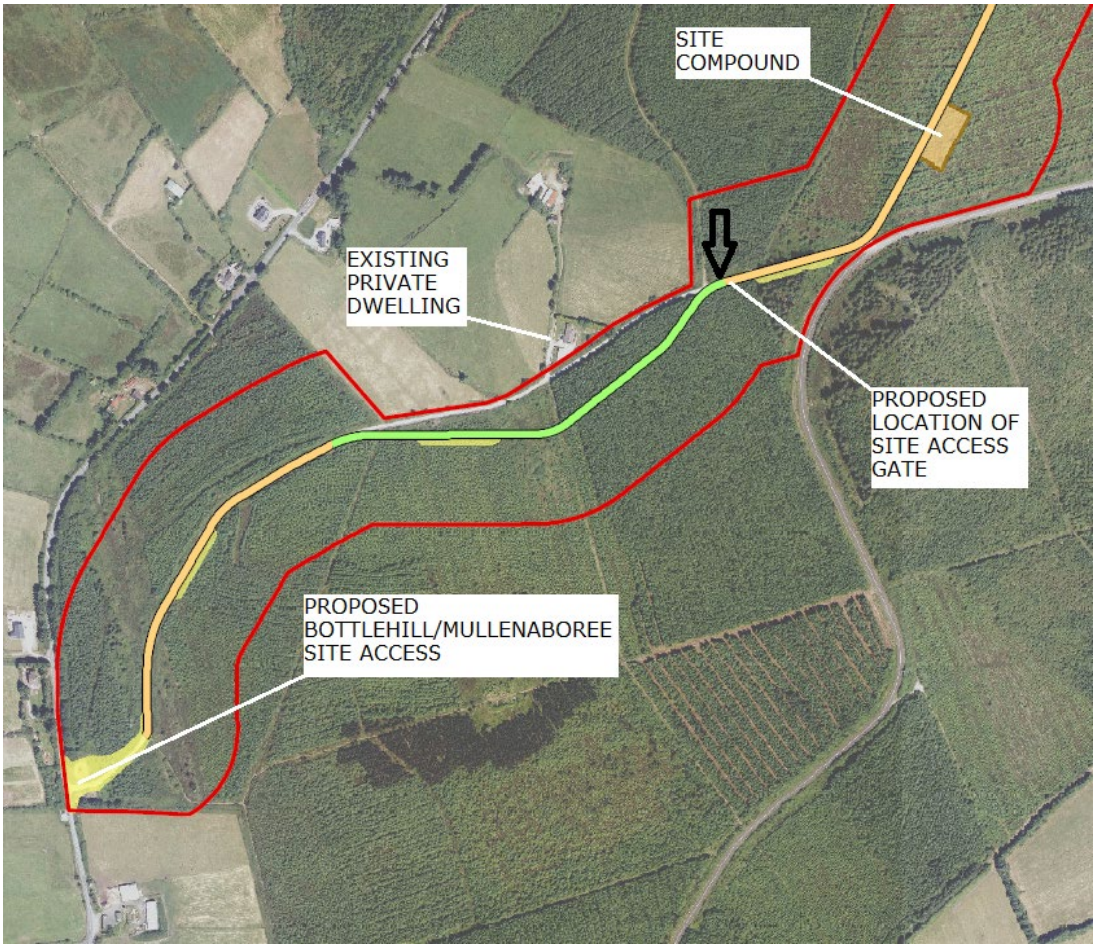


Plate 3-1: Bottlehill and Mullenaboree Site Access: Proposed Gate Location

3.4.1.2 Temporary Site Compounds

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compounds are illustrated in Figure 1-2. There are three temporary compounds. Two located at the eastern cluster and one located at the western cluster.

Facilities to be provided in the temporary site compound will include the following:

- Site office, of Portacabin type construction
- Portaloo
- Bottled water for potable supply
- A water tanker to supply water used for other purposes
- Employee parking
- Bunded fuel storage
- Contractor lock-up facility
- Diesel generator

The main compound will also include the following:

- Canteen facilities
- Aggregate stores
- Storage shed

During the construction of the grid connection, the contractor will utilise the CGEP Wind Farm site compound for the duration of the proposed works. The temporary facilities will be removed on completion of the construction phase.

The compound will 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.
- A layer of geo-grid will be installed, and layers of suitable material will be spread and compacted to provide a hard area to site offices and storage containers.
- Temporary, modular, containerised offices welfare units will be delivered to site using articulated lorry and lifted into place using a suitable crane.
- Waste water and sewage connections will be set up in such a way that they can be emptied regularly and removed from site under licence.
- A concrete bunded area with an associated oil interceptor will be provided within the main compound for the storage of lubricants, oils and site generators and coalescing media oil water separator will be installed to mitigate against any hydrocarbon spillages.
- The compound will be fenced all round and secured with locked gates.
- Self-contained portaloos with an integrated wastewater holding tank will be used maintained by the providing contractor and removed from site on completion of the construction works. These will be located in the temporary compound, as well as in several areas throughout the site due to the dispersed nature of the site.
- Potable water will be delivered to site in suitable canisters on a daily basis for drinking.

Upon completion of the project the compound will be decommissioned and material will be removed off-site for recovery or disposal by a licenced waste contractor. The hardcore stone and geo-grid will be removed from site and the area will be reinstated by backfilling with the material arising during excavation, landscaping with topsoil as required.

3.4.1.3 Concrete Washout Area and Wheel Washing

All concrete will be delivered to site via ready-mix trucks from a local supplier.

Concrete washout will be carried out in a dedicated area of the temporary compound or at a designated washout pit on site. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off.

The concrete wash-out area will be constructed as follows:

- The topsoil and subsoil, if necessary, will be stripped out and placed adjacent to the temporary compound area.

- An impermeable membrane will be installed directly onto the subsoil, and or subsoil, to form the impermeable concrete wash-out settlement lagoon.
- A designated truck wash-down concrete apron shall be constructed next to this settlement lagoon.
- Impermeable lined drains will direct the wash-out flow to the wash-out settlement lagoon.
- The residual liquids and solids will be disposed of off-site at an appropriate licenced waste facility.

Upon completion of the projects the concrete wash-out area and settlement lagoon will be decommissioned by removing the impermeable membrane and backfilling the area with the material arising during excavation. The removed material will be recovered or disposed of off-site at an appropriate facility.

Wheel wash facilities will be located at the site entrance to reduce construction traffic fouling public roads. Each wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed from each unit and from site by a proposed contractor.

3.4.1.4 New Site Access Tracks

All site tracks will be designed taking account of the loadings required by the turbine manufacturer and will consist of a compacted stone structure. Suitable granular fill material for the sub-base of the track will be sourced from the borrow pits within the site with suitable class 6 structural fill imported from a licensed quarry as required to meet the requirements of the detailed design. Class 6F2 and clause 804 granular material for track base course and running surface will be imported from a licensed quarry. All delivery truck movements from external sources will follow predefined haul routes as agreed with Cork County Council. The proposed haul routes are illustrated in Figure 3-1.

All tracks on the site will be constructed using the traditional track construction and best practice construction methods from suitable load bearing strata. This system will consist of either one or two layers of stone depending on the load bearing capacity of the base layer. Where the underlying layer is mineral subsoil, two layers of stone are used; a stone capping layer and running layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface. Drainage runs and associated settlement ponds will be installed.

Track construction shall be as follows:

- Establish alignment of the new site tracks from the construction drawings and mark out the centrelines with ranging rods or timber posts.
- The access tracks will be of single-track design with an overall width of approximately 4.5m. There will be some local widening on the bends, junctions and around Turbine Foundations for the safe passage of large vehicles. All bends have been designed to suit the requirements of the delivery vehicles.
- All machinery shall work within the construction corridors that will be indicated on the contract drawings. Vehicle movement will be restricted to site access tracks and agreed haul routes.
- Topsoil/subsoil will be stripped back to required levels. All material will be bunded and stored separately. Section 4.3.4 contains a Soil Management Plan which details the storage and movement of materials on site.
- The soil will be excavated down to a suitable formation layer of either firm subsoil or rock.

- 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 Site Manager based on the characteristics of the material and the compaction plant to be used.
- Batters will have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

3.4.1.5 Upgrade of Existing Internal Access Tracks

It is proposed to utilise the existing road and forestry track network as much as possible within the site, with some additional local widening at bends in the tracks. This will involve the slight re-location of existing roadside swales to allow for widening.

Existing agricultural and forestry drains will be retained along their existing routes and only slight diversions are anticipated to be required to provide for track widening.

Existing track upgrades shall follow the same outline methodology as for new access tracks.

The typical road construction details of new and upgrades to existing access tracks are detailed on drawing P20-099-0300-0025 which can be found in Appendix 3.

3.4.1.6 Watercourse Crossings

Culverts will be sized to take the 1 in 100 year flood flow with a 20% allowance for Climate Change. Concrete or HDPE pipes/boxes may be used depending on the size of the watercourse to be crossed.

For a typical drain/minor watercourse crossing using a culvert, the following outline methodology will be used.

- The access track construction will finish at least 10m from the nearside bank of the drain.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Pipe/box culvert installation will only take place during dry periods.
- The bed of the drain will be prepared using a mechanical digger and hand tools to the required levels accordance with the design.
- A bedding layer will be laid in the base of the watercourse using Class 6 aggregate material and blinding to the desired levels in accordance with the design.
- The pipe/box is laid in one lift or in sections using a crane in accordance with an approved lift plan.
- Bedding material is placed and compacted around the pipe/box to the desired levels in accordance with the design.
- Where appropriate an 500mm of suitable bedding material in the form of clean round gravel between 10-100mm diameter, shall be laid in the base of the pipe/box in accordance with the recommendations set out in *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses from* Inland Fisheries Ireland.
- The pipe/box is covered using compacted Class 6N fill material in accordance with the design up to the levels required by the access track sub formation.

- Rock armour headwalls will be constructed where necessary to protect pipe/box ends and the base of slope embankments on either side of the track.
- The access track construction continues over the crossing in accordance with the methodology outlined in Section 3.4.1.4.
- For small drain crossings, pipes/boxes of suitable diameter will be laid directly into the bed of the drain.

3.4.1.7 Cable Works

The specification for cable trenches will vary slightly depending on cable voltage, location and existing land use. Typical cable trench construction details can be found on drawing P20-099-0300-021 contained in Appendix 3, which shows typical construction details for electricity cables in public roads and beside internal site access tracks.

All electrical and fibre-optic cabling on site between the wind turbines and the substation building will be buried in trenches approximately 0.6m wide by 1m deep located directly adjacent to the internal tracks. Internal site cables will be direct buried or ducted as per the typical specification outlined in Appendix 3.

The following describes the outline construction methodology for cable installation works inside the wind farm site.

For direct buried cables, the following outline methodology shall apply:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- The line of the cable trench will run beside the site access tracks until it exits to the public road.
- The ground will be excavated using a mechanical digger. The top layer of soil will be removed and placed to one side. It will be used for landscaping the top of the backfilled cable trench following the laying of the cables. The remaining subsoil, excavated to the required depth, will be placed separately and used as backfill.
- Safe ladder access/egress to trenches will be provided into the trench.
- The cables will be laid directly onto a bed of suitable material, free from sharp stones and debris*****.
- A suitable material will be placed over the top of the cables to protect them during backfilling*****.
- Warning tape and plates will be installed by hand in accordance with the trench design and ESBN specifications and the engineer's design.
- On completion, the ground will be reinstated, and marker posts will be positioned at agreed centres to the side of the trench highlighting the presence of cables below.
- Trenches will vary in width depending on the number of cables in the circuit. Where there is more than one set of cables they will be separated as per cable manufacturers and ESB/ EirGrid requirements.
- Where cables need to cross access tracks, suitable cable ducts will be used to protect the cables. The typical method of construction involves the contractor initially excavating the trench to the specified depth and laying high density polyethylene (HDPE) ducting in the trench in a surround of CBM (cement bound material). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed at a specified distance above the ducts and the two communication ducts will also be laid.

An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled.

- Small jointing pits will be located along the route of the trench which will be left open until jointing takes place. A protective handrail/ barrier will be placed around each pit for health and safety reasons.
- Once the cables are joined and sealed the jointing container will be removed and the cables at the joint-bay locations will be back-filled in the same manner as the rest of the cable trench.
- The cables will be terminated on the switchgear terminals at each turbine location and at the substation switchboard. Ducts will be cast into each foundation to provide access for the cables into the turbine. Likewise, at the substation, ducts will be cast through the building foundation to provide access for the cables.
- There are no existing buried services expected within the site however the appointed contractor will be responsible for carrying out pre-construction survey ahead of construction.
  Prior to commencement of the works, records of services such as watermains, sewers, gas mains and other power cables will be obtained from the relevant service providers. Cable detection tools, ground penetrating radar and slit trenches will be used, as appropriate, to find the exact locations of existing services. The final locations of the cable trenches will be selected to minimise conflicts with other services.
- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected local to the works warning of the dangers.

Where ducting is required within the wind farm site, tasks marked by an asterisk (*) in the above methodology will be replaced by the following steps:

- Ducts will be placed into trench manually, having been delivered to road side embankment/verge areas by way of tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts and delivered straight from a concrete truck or by skid steer at tight points along the route.
- Approved fill material will be compacted at the base, again above the power cable ducting as per the engineer's design.
- Exposed duct ends will be capped.
- A 12mm Draw rope will be blown through the ducting at later date.

3.4.1.8 Borrow Pit Construction

3 no. onsite borrow pits will be used, where possible, to source suitable fill material for the construction of the various tracks, turbine bases and hardstanding areas. The location of the proposed borrow pits are shown on Figure 1.2.

The borrow pits will be developed in line with the following outline methodology, which may be subject to change following the appointment of the contractor for the main construction works:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.

- Traffic management measures will be implemented prior to works commencing in accordance with the construction stage TMP and measures outlined in Section 4 of this CEMP.
- The access tracks will be prepared to the borrow pit locations in line with the methodology described in Section 3.4.1.
- The extent of the works areas shall be accurately delineated using stakes and rope to prevent works being carried out outside the agreed areas.
- Stock proof fencing shall be installed around the borrow pits in advance of any works taking place.
- A bespoke method statement shall be drawn up by the contractor for the main construction works shortly before the works take place.
- After drainage and temporary dewatering infrastructure has been put in place, the main excavation works will commence by stripping the topsoil material.
- Topsoil will be stockpiled to be used for reinstatement of the borrow pits and used for local landscaping of the wind farm site.
- Excavation works will be carried out by the following means at the borrow pits:
    - Conventional excavators (using buckets) to excavate and load dumper trucks
    - Rippers mounted on conventional excavators to 'rip' the rock where appropriate
    - Rock breakers (where required)
- Excavated material will be processed by mechanical crusher and screened as necessary.
- Excavated rock will be loaded onto dumper trucks and transported to the required area for tipping and placement e.g. when building the access tracks.
- When the borrow pits have been exploited, they shall be closed and reinstated using surplus mineral soil or rock excavated from elsewhere on the site as described in accordance with an approved project reinstatement plan.
- Generally, the borrow pits, once reinstated, shall be covered with topsoil and allowed to re-vegetate naturally. However, appropriate measures will be taken if it is found that natural re-vegetation is too slow or if the area is being taken over by inappropriate species.
- Noise, dust and site drainage mitigation measures shall be implemented as described in Section 4 of this CEMP.

There are no groundwater supply wells recorded in the immediate vicinity of the proposed borrow pit locations, therefore any dewatering of excavations is not likely to impact on water supplies.

To monitor groundwater during the construction phase groundwater monitoring wells will be installed between areas of deeper excavations and sensitive groundwater receptors. The wells will be used to monitoring groundwater levels and quality to assess any potential impacts during the construction works.

3.3.1.1 Crane Hardstands

All crane pads and associated splays will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure in accordance with the detailed engineering designs and employer's requirements.

All crane pads will be formed from a suitably stiff layer and the finished crane pad surface will provide a minimum bearing capacity of up to 260kN/m^2. Where excavations beyond 5m below ground level are required to reach a suitable bearing, pile foundations may be required. Piles used for turbine foundations are either pre-cast driven piles or bored piles. Pile length is site-specific but tend to be approximately 12 m to 20 m long.

Crane pad and associated splay formation will consist of either 1 or 2 layers of suitable fill material depending on the properties of the underlying load bearing layer. Where the underlying layer is soft soil, 2 layers of suitable fill formation are used and the stone capping layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface however it is not likely this will be the case at this site.

The crane hardstands will be constructed in one of two following ways:

- Typical excavation method;
- Piled hardstand method.

It is highly unlikely based on site investigation information to date that a piled construction method will be required for the hard standings.

The typical excavation method can be summarised as follows:

Typical Excavation Method:

All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.

- Establish alignment of the hardstands from the construction drawings and mark out the corners with ranging rods or timber posts.
- Drainage runs and associated settlement ponds will be installed.
- The excavated material will be stored close to the hardstand or taken back to the borrow pit. Topsoil and subsoil stockpiles will be formed and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods.
- The soil will be excavated down to a suitable formation layer of either firm clay or rock.
- Suitable granular fill will be spread and compacted in layers to provide a homogeneous running surface.
- Batters to have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

Piled Hardstand Method:

This system involves:

- Construction of the founded hard standing as per the above methodology.
- Piles will be positioned to match the outrigger pads of the turbine crane and as agreed with the turbine supplier.

Geotechnical analysis of the site investigation information will dictate the type of pile to be used. There are several methods however the most likely will either be pre-cast driven piles and auger bored piles.

- A reinforced concrete pad will be constructed on top of the piles. Shuttering will be used lined with polythene and an antibleeding admixture used to prevent any concrete leachate.

3.4.1.9 Turbine Foundations

The wind turbine foundations will be constructed using standard reinforced concrete construction techniques and will be designed as either:

- Submerged foundation design.
- Non-Submerged Foundation design.

Turbine foundations will be designed to Eurocode Standards. Foundation loads will be provided by the wind turbine supplier, and factors of safety will be applied to these in accordance with European design regulations. The turbine will be anchored to the foundation as per the turbine manufacturer's guidelines which will be incorporated in the civil foundation design. The shape and size of the foundation can vary in size and shape to approximately 22m in diameter.

Ideally, a suitable bearing stratum is encountered within 3 m from ground surface so that the turbine foundation can be finished at / near existing ground level.

The turbine foundations will be constructed as follows:

Standard Excavated Reinforced Concrete Base:

a) 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.

b) The excavated material will be stored at agreed locations close to the base. Topsoil and subsoil stockpiles will be formed, and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods. The subsoil material will be used as backfill and the topsoil will be used for landscaping around the finished turbine post construction.

c) No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.

d) Around the perimeter of the foundation formation a shallow drain will be formed to catch ground water entering the excavation. The drain will direct the water to a sump if required where it will be pumped out to a settlement pond away from the excavation.

e) 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. If required, geogrid and soil replacement will be laid according to the foundation design, followed by placement of the concrete blinding layer.

f) If soil replacement is required, the aggregate used must be tested and approved by the project geotechnical engineer.

g) 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.

h) Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required.

i) The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base.

j) Concrete will be placed using a concrete pump and compacted using vibrating pokers to the levels and profile indicated on the construction drawings.

k) Upon completion of the concreting works the foundation base will be covered from the elements that could cause hydration cracking and or delay setting in any way.

l) Steel shutters will be used to pour the upper plinth section.

m) The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the top-soil set-aside during the excavation. The suitability of backfill material is to be approved by the project geotechnical engineer.

n) A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.

Reinforced Concrete Piled Foundations:

It is envisaged that an allowable ground bearing pressure to comply with the design and specification of the standard shallow turbine foundation design should be attained however, should piling be required the following will apply.

Follow Items (a) to (c) as above then for piled foundations:

Auger bored piles will be used for piled foundations.

- A piling platform for the piling rig will be constructed. This can be done in two ways depending on the bearing capacity of the underlying soil.
    - The first method is to lay geo-textile on the existing surface and a stone layer will then be placed on top of the geo-textile by an excavator and compacted in order to give the platform sufficient bearing capacity for the piling rig.
    - The second method is to excavate the soils to a suitable intermediate mineral subsoil and backfill to the formation level.
- The piling rig, fitted with an auger, will then bore through the soft material with a sleeve fitted around the auger to prevent the sidewalls of the peat from collapsing. The borehole is then extended to a suitable depth into the subsoil/bedrock.
- When the auger and the sleeve are removed high tensile steel cages will be lowered into the boreholes. These steel cages will extrude above the level of the top of the concrete pile.
- As the auger is removed concrete is pumped into the borehole.
- Reinforcing steel on the top of the pile will tie to the foundation base steel.

Base construction is then undertaken as per items (e) to (n) above.

3.4.1.10 Substation Compounds

Two substation compounds will be constructed within the CGEP site as indicated in Figure 1-2. A substation will be constructed at Knockacullata at the western section of the site, and at Lackendarragh North at the eastern section of the site. The substation compounds will measure 124m x 104m at Knockacullata and 178m x 153m at Lackendarragh North. The substation compounds are detailed in 0300 series planning drawings.

The compound will include a substation building which will be divided into the wind farm control building and the switchgear housing. The buildings main functions is to provide housing for switchgear, control equipment and monitoring equipment necessary for the proper functioning of the substation and wind farm. The buildings will be constructed by the following methodology:

- The area of the control buildings and compound will be marked out using ranging rods or wooden posts and the vegetable soil stripped and removed to the nearby storage area for later use in landscaping. No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.
- Drainage runs and associated settlement ponds will be installed
- The dimensions of the Building and Compound area will be set to meet the requirements of EirGrid/ ESB and the necessary equipment to safely and efficiently operate the wind farm.
- The foundations will be excavated down to the level indicated by the designer and concreted.
- The blockwork 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 blockwork 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.
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane.
- The wooden 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.

The remainder of the substation compounds will be brought up to the agreed formation and approved stone imported and graded to the correct level as per the detail design. Equipment plinths will be marked out, excavated and constructed using in-situ reinforced concrete or pre-cast concrete. Provision will be made in each plinth for earth connection.

Following the construction of the equipment plinths an earth mat will be installed throughout the compound. This will be connected to each plinth and the buildings as per the electrical earth protection design.

Battery Storage

Battery energy storage system (BESS) units, to facilitate on site energy storage and to provide ancillary services to the electricity grid, will be situated next to the main onsite substation compound at Lackendarragh North. They will be housed in glass reinforced plastic (GRP) units or modified shipping containers.

The units will be mounted on shallow concrete plinths within a gravel hard standing and shall be bounded in the same fashion as the substation compounds using a galvanised steel security palisade fencing. Battery containers, inverters, transformers and HVAC units will be lifted into place using a suitably sized crane, telehandler or HIAB. Any lifting operations will adhere to a specific lift plan, issued by the contractor responsible for the installation. Up to 20. No battery storage units will be installed at the Lackendarragh North Compound.

3.4.1.11 Electrical Works

Substation Fit Out and Switchgear Installation

The substations will have a domestic electrical system including lights, sockets, fire alarm and intruder alarm. The high voltage switchgear is typically installed through the following method.

- The switchboard units are delivered to site on a truck and unloaded using a forklift, front end loader or HIAB crane.
- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works.
- The switchgear will be unloaded on to a concrete plinth directly outside the substation building.
- The units will be moved inside the substation building using a hand driven forklift and positioned over the internal trench supports, prepared previously.
- The switchgear is then secured as per manufacturer's instructions, typically by bolting directly to steel support bars over the trench.
- The building is fitted out with small light and power and ancillary wind farm control equipment such as SCADA computer, remote telemetry units, metering etc.
- All equipment and fittings are then connected, wired tested and commissioned in accordance with the Electrical Contractor's commissioning plan.

The equipment will be decommissioned in the reverse of the above, removed from site, dismantled and disposed of in an approved manner.

Transformers

- The turbine transformers will be placed directly onto the turbine foundation upon delivery to site, prior to the installation of the turbine towers.
- The transformers will be of the sealed type and will be inspected for any damage prior to offloading. It is likely that the units will be installed using a small mobile all-terrain crane and will be tested, commissioned and energised by suitably trained and authorised persons.
- The accessible sections of the transformer will be protected within an enclosure which shall be locked at all times and displaying appropriate warning signs. The units will be decommissioned in the same manner, removed from site and disposed of by a company certified to handle such materials. This specialist company will also dispose of any oil or residual waste products.
- Transformers and ancillary plinth-mounted equipment required in the substation compound will be delivered to site and unloaded directly in place by HIAB crane or similar.

- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works and adequate hard standings will be provided prior to delivery to facilitate safe unloading.

3.4.1.12 Turbine Erection

A lift plan will be developed for each turbine location detailing the storage positions for each component, crane size and lifting sequence. It is anticipated that each turbine will take 3 to 4 days to erect with two cranes set up at each turbine. One main crane and a tailing/ support crane. The support crane will assist in the assembly of the main crane and also in the initial lift of the tower sections and hub and blade assembly. Components will be delivered using specially adapted heavy load trailers set up specific to the turbine supplier requirements. Upon completion of the erection, all sections will be tightened to the correct torque and the internal fit out of the turbine undertaken. Finally, the turbines will be commissioned and tested.

3.4.1.13 Grid Connection Works

The following describes the outline construction methodology for cable installation works along the grid connection route between the wind farm onsite substation and the Barrymore substation.

The proposed grid connection route is shown on Figure 2-2 and described in Section 2.1.3.

- Agreement will be sought from local authorities with respect to the location of trenches on roads to ensure no damage is caused to storm-water drains, water-mains or other services. All drain and culverts affected by the works are to be re-instated to the satisfaction of the Local Authorities. Particular care will be taken in order to minimise disruption to local residents and public road users.
- The location of the cable route will be set out by GPS (RTK enabled) equipment in accordance with the design drawings prepared for the site.
- Prior to any construction works commencing, a pre-commencement road survey will be carried out on the public roads in the vicinity of the works. The area where excavations are planned will be surveyed with a cable-avoiding scanning tool, by a person trained in Location of Underground Services. Location equipment to be calibrated within the previous 12 months.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Traffic management measures will be implemented prior to works commencing accordance with the construction stage TMP and measures outlined in Section 4 of this CEMP.
- Overhead lines will be identified and overhead clearance limiting measures will be put in place at the start of each day. Machinery will also include automatic limiters to safeguard against interaction with overhead lines.
- Underground services may be encountered during the trenching works the locations and depth of these underground services the locating of these services will include the reviewing of service drawings, investigations along the trenching route, and consultation with the various service providers.
- All environmental buffer zones shall be identified and set out prior to construction works advancing. Where necessary a stock proof timber post and wire fence shall be erected to establish these areas and thus prevent the entry of contractor's plant within these buffers during construction works. It is noted that given the presence of large sections of the cable route on public roads, extensive adherence to buffer zones is unlikely.

- The cable infrastructure will follow the existing road infrastructure where possible. Cables will be laid underground using standard trenches, with pre-excavation drainage works in place prior to trench excavation.
- Where possible, trenching will take place outside the carriageway in public road verges and private land. In areas where the cable trench route runs within a public road carriageway, temporary reinstatement of the road surface will be carried out at the end of the working day to allow safe re-opening of the road for public traffic. See below for sequence of works for temporary road reinstatement.
- A 360-degree excavator will first remove the top layer from the route along the roadside and load onto a haulage truck, this material will be recycled, then the excavation of trench will commence and a trained spotter will be used to assist machine operators while reversing or when their visibility becomes restricted.
- Trench to be dug to agreed drawing specifications. All plant and stored material will be kept a safe distance back from the trench edges.
- No open trench will be left unattended. Pedestrian barriers will be erected to prevent unintentional entry occurring by the open trench. Cones and or barriers will be used on rural roads to maintain a safety zone in proximity to the trench.
- Safe ladder access/egress to trenches will be provided into the trench.
- Ducts will be placed into trench manually, having been delivered to roadside embankment/verge areas by way of tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts and delivered straight from a concrete truck or by skid steer at tight points along the route.
- Approved fill material will be compacted at the base, again above the power cable ducting as per the engineer's design.
- Warning tape and plates will be installed by hand in accordance with the trench design and ESBN specifications.
- Backfill materials will be delivered to site in tipper trucks and offloaded at agreed designated set down areas where it will be either loaded into site dumpers or a stoning cart then brought to trench area that requires being backfilled. Main material deliveries such as ducting and pre-cast joint bay sections will be to the temporary site compound and moved to the work area as required.
- Backfill materials will be compacted using suitable compaction equipment to prevent future settlement as per NRA Specification for Roadworks.
- Hand digging will be used when within 500mm of any known existing services.
- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected local to the works warning of the dangers.
- Exposed duct ends will be capped.
- Spoil will be disposed of at a licenced facility
- Unauthorised access will be monitored and prevented.
- A 12mm draw rope will be blown through the ducting at a later date.
- The trench and the working strip will be reinstated to the satisfaction of the local authority and TII standards for public roads.

- Where the trench strip passes through agricultural land, the surface will be reinstated to the area's pre-existing condition.

Installation of Joint Bays and Link Box Chambers

- Setting out and location of services will be carried out in the same manner as for trench excavations.
- Traffic management to be set up as per the construction stage traffic management plan.
- A tracked excavator will be used for the excavation of the joint bay pits in accordance with detailed design drawings.
- Tractor/dump trailer and or tipper truck shall be used to remove excavated spoil from the work area. Spoil shall be removed to a licensed waste facility.
- A watchman will be used to assist machine operators while reversing or when their visibility is restricted.
- Where joint bays are located, the excavation shall be adequately protected with fencing with signage erected, warning of deep excavation.
- Safe ladder access/egress to excavation shall be in place, ladder to be footed at the base and tied at the top.
- Base materials will be placed by the excavator from a truck in the base of the excavation.
- Precast chamber sections will arrive on site via articulated lorries accompanied by a crane truck. The crane truck will load each unit separately from the articulated truck.
- The precast units will be transported to site and a flatbed trailer and a truck mounted crane will lift the section into position.
- A lift plan /DJSP will be required for all Joint Bay installations.
- When the joint bays are in place, the sections will be back filled using approved fill material and the road surface will be reinstated using cold tar/surface dressing.
- Unauthorised access will be monitored and prevented.

Further details of standard 110kV trenches can be found in standard 110kV cable drawings contained in Appendix 3.





Plate 3-2: Typical Installation and Temporary Reinstatement of Joint Bay

Watercourse Crossings

A detailed in section 3.4.1.6, the grid connection route will consist of 13 no. watercourse crossings. 3 no. watercourse crossings will be installed with horizontal directional drilling (HDD) as described in section 3.4.1.15. Crossing WC018 will consist of the replacement of an existing stone culvert with an RC box culvert. Crossing WC008 will be installed in the existing road and reinstated to the existing level. Standard trench crossings will be used at 8 no. crossings as detailed in Table 3-3.

The methodology for this watercourse crossing is set out as follows:

- Location of services will be carried out in the same manner as for trench excavations.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Traffic management measures will be implemented prior to works commencing accordance with the construction stage TMP and measures outlined in Section 4 of this CEMP.
- The road surface along the route will be milled by road plainer and skid steer.
- A 360-degree excavator will first remove the top layer from the route along the roadside and load onto a haulage truck. This material will be recycled, then the excavation of trench will commence and a trained spotter will be used to assist machine operators while reversing or when their visibility becomes restricted.
- Excavator to run at low revs to avoid damage by sudden movement.

- A banksman to dig trial holes after each layer of the road surface is removed. The maximum depth will be exposed to allow for the greatest cover to be achieved.
- Where necessary as per the engineer's design, protective steel plates will be placed at the base of the excavation such as over the top of bridge key stones.
- Ducts will be placed into trench manually, having been delivered to roadside embankment/verge areas by way of tractor and pipe trailer and then offloaded by hand.
- Concrete is then poured between and over the ducts maintaining the required spacing's as per the engineer's design.
- A protective steel plate is placed to the sides and over the newly laid ducts as per the engineer's design.
- Cable marker strips in accordance with ESBN requirements are placed on top of the steel plates.
- Additional concrete is then placed over the marker tape followed by steel reinforcing mesh.
- Additional concrete is then placed on top of the mesh to the required finished level.
- Depending on the finished levels, if the finish level is below ground level than the remaining depth will be filled with approved fill material the following day after the concrete has set.
- Warning tape will be placed above the concrete beam. The top level will be finished as per the Local Authority Requirements.
- If the beam detail is higher than the finished road level, than the beam will be finished as a footpath type/rubbing strip, with a design agreed with Cork County Council.

Further details of standard 110kV cable duct crossings can be found in standard 110kV cable drawings contained in Appendix 3.

Culvert Crossings

The installation of the grid connection will require the crossing of 8 no. streams and drains. For such crossings, the following outline methodology will apply:

- The general method of construction for these crossings will follow the procedure outlined above for Installation of cable ducting.
- Within 500mm of the top of the existing culvert, which will be located by a scanning tool, hand digging will be employed to uncover the pipe.
- It is desirable that a minimum separation distances in accordance with the detailed design will be maintained with existing services where the cables are to be laid near or crossing existing services. This is typically 300mm.
- Cable ducts will be laid below existing services where possible.

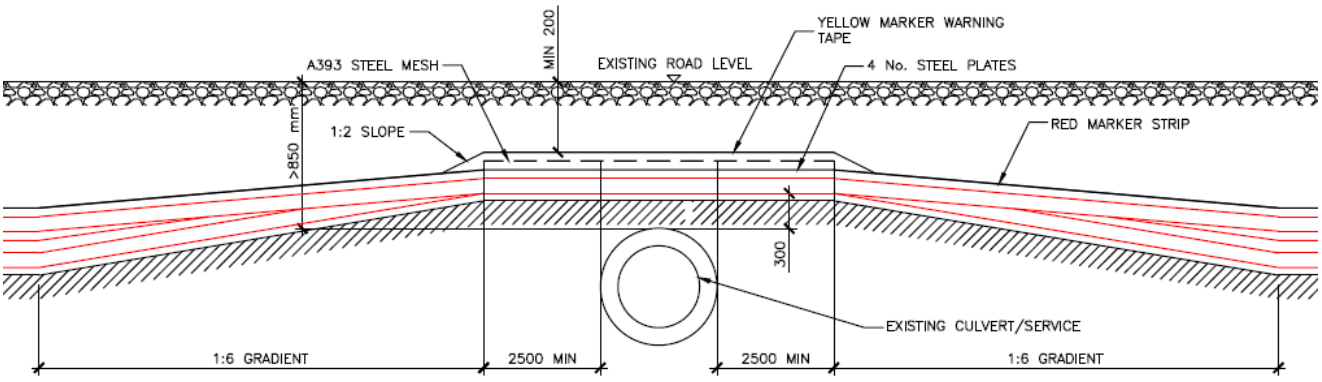


Plate 3-3: Typical Existing Culvert Crossing Profile

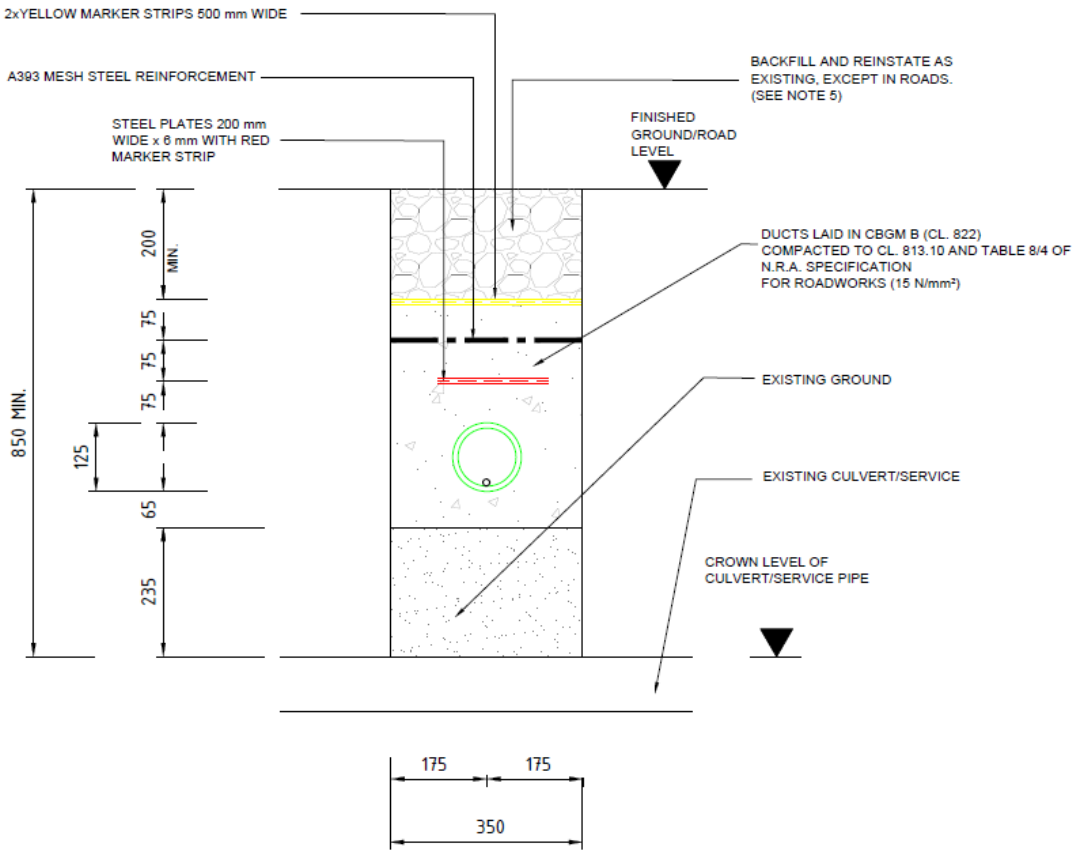


Plate 3-4: Typical Existing Culvert Crossing Section

Further details of standard 110kV cable duct crossings can be found in standard 110kV cable drawings contained in Appendix 3.

Temporary Reinstatement of Excavations

- Hot works permit to be issued for the area of works for the area to be reinstated.
- A grader (if required), Roller and mini-patch plainer will be delivered to site by low-loader, 2 - in - 1 Tar - and Chipper or patch sprayer will be driven to site.

- A mini patch plainer will be attached to a skid steer and will plane a fresh cut line along the verge of the trench.
- The trench fill material will be graded to shape the trench to match the existing camber of the carriageway and compacted using a drum roller.
- The Tar - and - Chipper will make first pass, of one meter wide.
- Once the bitumen emulsion and chips have been dispensed from the 2- in 1 Tar and chipper and the drivers cab is clear of the area, the roller will follow and compact the chips into the emulsion.
- If the 2 - in - 1 - Tar - and - Chipper is not been used, a towable emulsion sprayer will be used. This process involves the towable sprayer been towed by a pickup truck, and an operative spraying the trench area by means of a lance from the unit.
- The emulsion is heated up to 70°C, the operator will wear protective overalls, heat resistant gloves and eye protection.
- The emulsion is sprayed out to cover the existing trench fill where a follow up crew will spread surface dressing chips over the sprayed area at a safe distance of 5m from the lance.
- Compaction will then take place by a drum roller.
- Both the 2 - in - 1 - Tar - and - Chipper and towable sprayer will have internal diesel burners, with no exposed naked flame.
- Delay set macadam may also be required on busier roads, 75mm of delay set shall be placed within the trench at the end of each working day, by means of skid steer and trench reinstatement bucket and compacted.



Plate 3-5: Towable Sprayer for Temporary Reinstatement

3.4.1.14 Horizontal Directional Drilling (HDD)

Horizontal directional drilling (HDD) method of duct installation will be carried out at 4 no. locations. HDD will be carried out at 3 no. stream crossings including WC006, WC007 and WC019 as indicated in Table 3-3. The locations of these points are illustrated in Figure 2-4. HDD will also be carried out to install ducting beneath the M8 motorway.

HDD will be carried out using Vermeer D36 x 50 Directional Drill, or similar plant. The launch and reception pits will be approximately 0.55 m wide, 2.5 m long and 1.5 m deep. The pits will be excavated with a suitably sized excavator and shall employ the same mitigation measures outlined herein for trenching and joint bay excavations.

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 the excavation 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 3.0 m 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™ (environmentally friendly product (not toxic to aquatic organisms)) 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 effects 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 and joint bays.

In addition to the above, the following mitigation measures shall be implemented for HDD:

- HDD operations to be limited to daytime hours and conditions when low levels of rainfall are forecast.
- The depth of the bore shall be at least 3m below the bed of the watercourse.
- Visual inspection to take place at all times along the bore path of the alignment.
- On-site training shall be provided for all monitors, and names and phone numbers provided to site supervisors.
- Upon completion of each drill rod, the monitoring person/team will be provided with information in relation to position of entry and exit of drilling head, amount of fluid utilized or pumped, equipment breakdowns or repairs, any abnormal drilling pressures recorded and any change of drilling fluid contents.
- A field response plan to minimize loss of returns of drilling fluid (non-frac out) and actions to restore returns shall be provided.

- Prior to any works taking place near watercourse Inland Fisheries Ireland will be consulted.
- Equipment required to clean up and contain a frac out will be available at the work site or at an offsite location within 10 mins of the bore site.
- In the event of frac-out release; the directional boring will stop immediately. The bore stem shall be pulled back to relieve pressure and the site supervisor notified to ensure adequate actions are taken and notifications made. In addition, terrestrial releases shall be cleaned up using on site equipment and a terrestrial berm may be constructed around any terrestrial frac-out release.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- No refueling will take place within 50m of the stream zone or any sensitive habitats.
- A qualified biological monitor will be onsite for the duration of the drilling operation.
- During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid will be used.

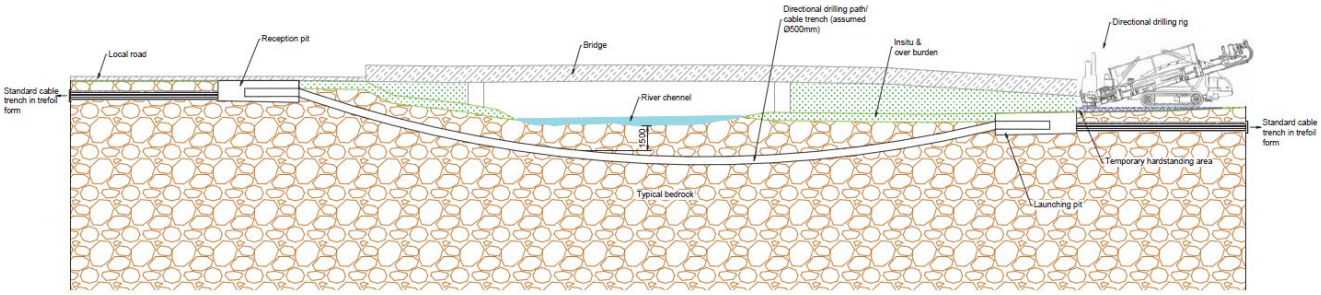


Plate 3-6: Typical HDD Activity Profile

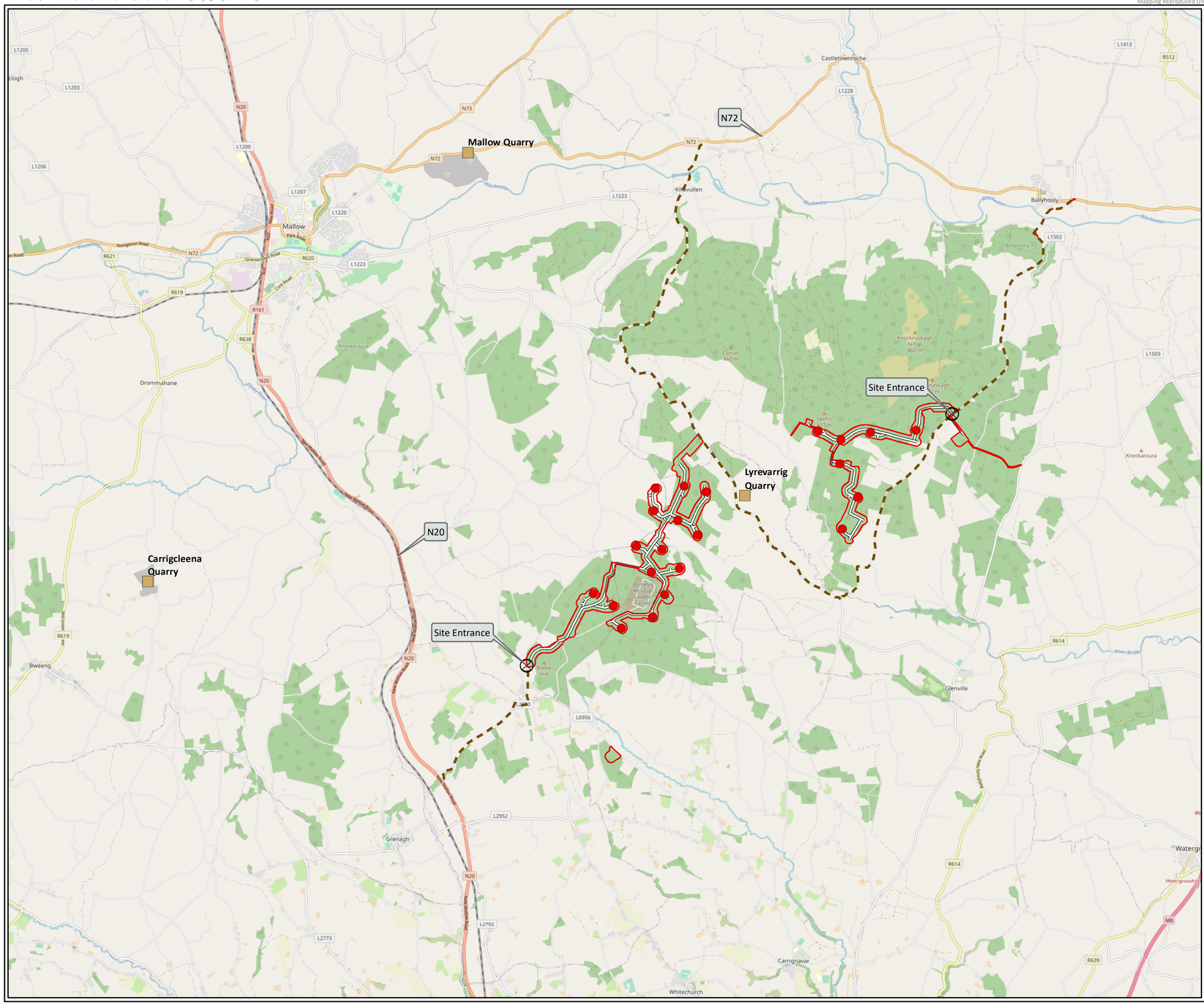
3.4 Construction Working Hours

The hours of construction activity will avoid unsociable hours and will be agreed with the planning authority in advance of site start. It is anticipated that this will restrict working hours at the site during the installation phase to be limited to 07:00 to 19:00 Monday to Saturday inclusive. Work on Sundays or public holidays will only be conducted in exceptional circumstances and subject to prior permission from the local authority and notification insofar as practicable of the local community.

Any complaints received relating to construction works will be entered into the site complaints log and the relevant site environmental officer will arrange to meet with those affected. A public complaints/observations procedure is included in Appendix 4 of this CEMP. The situation will be acted upon immediately and reviewed by the Project Manager. If nuisance is occurring, then the project manager will decide what action is necessary to reduce to acceptable levels or eliminate the disturbance.

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TITLE: Haul Routes			
PROJECT: Coom Green Energy Park, Co. Cork			
FIGURE NO:	3.1		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:85000	**REVISION:**	0
DATE:	05/10/2020	**PAGE SIZE:**	A3

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4. ENVIRONMENTAL MANAGEMENT PLAN

4.1 Introduction

This Environmental Management Plan (EMP) defines the work practices, environmental management procedures and management responsibilities relating to the construction of the proposed Coom Green Energy Park.

This EMP describes how the Contractor for the main construction works will implement a site Environmental Management System (EMS) on this project to meet the specified contractual, regulatory and statutory requirements and environmental impact statement mitigation measures. This plan will be further developed and expanded following the grant of planning permission and appointment of the Contractor for the main construction works. Please note that some items in this plan can only be finalised with appropriate input from the Contractor who will carry out the main construction works and once the planning conditions attached to any grant of planning are known. It is the Contractor's responsibility to implement an effective environmental management system to ensure that environmental requirements for the construction of this project are met.

All site personnel will be required to be familiar with the environmental management plan's requirements as related to their role on site. The plan describes the project organisation, sets out the environmental procedures that will be adopted on site and outlines the key performance indicators for the site.

- The EMP is a controlled document and will be reviewed and revised as necessary.
- A copy of the EMP will be located on the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of the EMP and its contents.

This section includes the mitigation measures to be employed by the contractor and client during the construction, operation and decommissioning of the proposed project as per the Environmental Impact Statement.

4.2 Project Obligations

In the construction of the proposed Coom Green Energy Park there are a number of environmental management obligations on the developer and the contractor. As well as statutory obligations, there are several specific obligations set out in the CGEP EIAR. These obligations are set out below. The final CEMP which will be produced by the main contractor following appointment will incorporate these obligations. The contractor and all of its sub-contractors are to be fully aware of and in compliance with these environmental obligations.

4.2.1 EIA Obligations

The EIAR identified mitigation measures that will be put in place to mitigate the potential environmental impacts arising from construction of the project.

4.2.2 Planning Permission Obligations

All planning conditions associated with the project's planning permission shall be adhered to. All pre-commencement planning conditions shall be discharged fully by the project owner prior to site start.

4.2.3 Felling Licence

Tree felling and vegetation clearance will be carried out outside of the bird nesting season (March 1st to August 31st inclusive). The estimated maximum area of coniferous tree felling required is ca. 62.8ha, which will be subject a felling licence application to the Forestry Service prior to construction. Felling will be in accordance with the conditions of such a licence.

A Limited Felling Licence will be in place prior to any felling works commencing on site. The licence will include the provision of relevant replant lands to be planted in lieu of the proposed tree felling on the site, which are proposed to be located at Moneygorm, Co. Cork and Ballard, Co. Wicklow.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Before any harvesting works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

To increase the diversity of woodland cover within this site some planting of native tree species is proposed. These species will, in time, form areas of low-growing scrubby woodland, which will add to the overall habitat diversity of the site. Planting along the well-drained margins of roads will ensure a relatively high level of soil fertility and better drainage which is most conducive to tree growth.

4.2.4 Other Obligations

The developer and/or contractor for the main construction works will liaise directly with the County Council and An Garda Síochána in relation to securing any necessary permits to allow the works to take place including for example (non-exhaustive list):

1. Commencement notice
2. Special Permits in relation to oversized vehicles on public roads
3. Temporary Road Closures (if required)
4. Road Opening Licence (if required)

The developer will also liaise closely with the local residents, especially homeowners and landowners along the local access routes in relation to works and all reasonable steps will be taken to minimise the impact of the project on such persons. Local farmers will be consulted should any of the works affect the integrity of fencing or other assets or practices, and appropriate and sensible mitigation measures will be agreed.

4.3 Environmental Management Programme

4.3.1 Air Quality

Construction Stage Impacts

The principal source of potential air emissions during the construction of the proposed wind farm will be dust arising from earthworks, tree felling activities, trench excavation along cable routes, construction of the new access tracks, excavation and backfill of the borrow pit, the temporary storage of excavated materials, the movement of construction vehicles, loading and unloading of aggregates/materials and the movement of material around the site.

Applying the NRA Assessment Criteria, the overall construction of the proposed energy park would be considered a major construction site. This would result in soiling effects which have the potential to occur up to 100m from the source, with PM_{10} deposition and vegetation effects occurring up to 25m from the source.

Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts of emissions from these units will be negligible.

Construction Stage Mitigation Measures

Construction stage mitigation measures to minimise dust and emissions are as follows:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate;
- A water bowser will be available to spray work areas (wind turbine area and grid connection route) and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Gravel will be used at the site exit point to remove any dirt from tyres and tracks before travelling along public roads;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided at the entrance/exit point of the proposed energy park site;

- Sensitive receptors within 100m of the proposed energy park and along haulage routes entering the site; and dwellings directly adjacent to the grid connection route construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling have taken place;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

4.3.2 Dust Management Plan

4.3.2.1 Introduction

This Dust Management Plan (DMP) for the construction and decommissioning works at the proposed Coom Green Energy Park outlines the sources of dust during the works, identifies measures to minimise dust during the works and the complaints procedure for dust.

4.3.2.2 Dust generation and control

4.3.2.2.1 Dust generation

The amount of dust generated and emitted from a working site and the potential impact on the surrounding areas varies according to:

- The type and quantity of material and working methods
- Distance between site activities and sensitive receptors
- Climate/local meteorology and topography.

Dust and particulate matter arising from construction works can affect nearby residents, land uses, soils and flora.

Dust emission is when dust and particulate matter become airborne mostly via windblow. Once dust becomes airborne, the air currents disperse it.

The prevailing wind in Ireland is from the south-west and so dust will most frequently disperse towards the north-east.

The proposed works associated with the proposed project that have the potential to cause dust include:

- Site clearance activities including felling of forestry
- Soil excavations
- Movement of dump trucks containing soils/subsoils within the site (use of berms)
- Stockpiling of soils.

The decommissioning works would have lower potential to generate dust, as the tracks are likely to remain in situ, upon agreement with landowners and Cork County Council. The turbines will be dismantled, however the foundations will remain in place and will be infilled and seeded.

During construction, the vegetation will be cleared from the site. For agricultural lands, this will include the removal of grasses and topsoil prior to the construction of the hardstanding for the turbines. Excavations will be required for the construction of the internal access tracks and hard standings which are expected to be founded. Excavations will be required also for the cabling within the site.

In areas of forestry, tree felling will be required. In total, 62.8ha of forestry will require felling. This activity also has the potential to release dust. However, the remaining forestry within the area will screen most of the dust and prevent fugitive dust from impacting on receptors.

Excavations for the 22no. turbine bases and hardstands also has the potential for the release of dust.

Soils being moved within the site on dumper trucks also has the potential to release dust as the travel across the site. Much of the soils excavated within the site will be used to form berms around the turbine hardstands and along access tracks.

Where soils are stockpiled for later use, the surfaces of the piles have the potential to release dust.

4.3.2.2.2 Dust control

The following dust control measures will be put in place during construction and decommissioning works:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate;
- A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Gravel surface will be used on the construction road at the site exit point to remove any dirt from tyres and tracks before travelling along public roads;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits, which shall be reduced in periods of dry, windy weather;
- Wheel washing facilities will be provided at the entrance/exit point of the proposed project site.

4.3.2.3 Complaints Procedure

At the main site entrance, the contact details for the site will be available so that local residents are encouraged to contact the site in the event of an off-site dust impact.

The contractor on site will need to be immediately informed of the incident so that fugitive dust complaints can be substantiated.

In all instances, a complaint will be logged by the environmental manager and each complaint should be assigned a discrete complaint number in the Environmental Log.

The environmental manager will maintain the complaints register and any complaints received will be investigated and the dust suppression methods employed will be reviewed. Suitable remedial action will be undertaken as necessary.

4.3.3 Noise and Vibration

Construction Stage Impacts

A detailed study of noise and vibration generated as a result of project activities has been carried out as part of the EIAR. The construction noise model assessed several tasks with the potential to generate noise. These tasks included: deliveries and/or removal of material to and from site, preparation of access roads, excavation of material from borrow pits, preparation of hardstands and drainage, pouring of foundations, installation of wind turbines and works associated with grid connection.

In relation to site traffic, the noise impact from construction personnel movements to and from the site is expected to be low. During turbine erection and foundation pours, an extension to the working day may be required, i.e. 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. Late night turbine deliveries are likely to occur and may cause noise impact on local roads.

The noise associated with the borrow pit activity is expected to have a slight impact and temporary in duration. The preparation of access roads, hardstands and drainage are expected to have a slight impact and temporary in duration. The construction works associated with the preparation of the turbine foundations are expected to have a slight impact and temporary in duration. The construction works associated with the installation of the wind turbines are expected to have a slight impact and temporary in duration. The works associated with the construction of the substation are expected to have a slight impact and temporary in duration. The predicted noise levels at the nearest noise sensitive location for each of these construction activities is below the daytime noise limit of 65 dB $L_{Aeq,1hr.}$

Elevated noise limits along the grid connection route may be above the noise limit of 65 dB $L_{Aeq,1hr}$. However, these elevated noise levels will only occur for short durations at a limited number of dwellings.

The potential for vibration at neighbouring sensitive locations was scoped out due to the low levels of vibration generated and the distant between construction activities and sensitive locations.

A detailed description of the potential construction stage impacts can be found in Chapter 7 of the EIAR.

Construction Stage Mitigation Measures

The predicted noise levels from onsite activity from the proposed main energy park site are generally below the noise limits in BS 5228-1. Nonetheless, several mitigation measures will be employed to minimise any potential impacts from the proposed project.

The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required, i.e. 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. If turbine deliveries are required at night it will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.

Consultation with the local community is important in minimising the impacts and therefore construction will be undertaken in consultation with the local authority as well as the local residents being informed of construction activities through the Community Liaison Officer.

The construction works on site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014. Proper maintenance of plant will be employed to minimise the noise produced by any 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 project. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 hours and 19:00 hours Monday to Saturday. However, to ensure that optimal use is made of fair-weather windows, or at critical periods within the programme, it could occasionally be necessary to work outside these hours. Any such out of hours working would be agreed in advance with the local planning authority.

With mitigation measures, the construction and decommissioning noise levels are likely to be below the relevant noise limit of 65 dB $L_{Aeq,1hr}$ for operations exceeding one month, and therefore construction noise impacts are not considered to be significant. However, there is potential for temporary elevated noise levels due to the grid connection works. However, the impact of these works at any particular receptor will be for a short duration (i.e. typically less than 3 days). where the works at elevated noise levels are required over an extended period, a temporary barrier or screen will be used to reduce noise levels below the noise limit where required. The noise impact will also be minimised by limiting the number of plant items operating simultaneously where reasonably practicable.

4.3.4 Biodiversity / Flora and Fauna Management Plan

This Biodiversity / Flora and Fauna Management Plan outlines the measures that will be put in place to protect species and natural and semi-natural habitats at the main energy park site and describes how these areas will be managed during the lifetime of the project. The management plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works. This plan should be read in conjunction with the EIAR.

4.3.4.1 Objectives

The primary objectives of the management plan over the construction, operation and reinstatement phases of the project are as follows:

- Promote the conservation of habitats on site through the establishment of management and/or mitigation;

- Provide management and mitigation for aquatic habitats and water quality;
- Provide management and mitigation for avifauna;
- Provide management and mitigation for bats and terrestrial mammals;
- Monitor the usage of the wind farm site by birds post construction;
- Monitor for any collision by birds at the wind farm site post construction;
- Monitor for any collision by bats at the wind farm site post construction.

4.3.4.2 Mitigation Measures – CGEP and GCR

4.3.4.2.1 Mitigation Measures during Construction

Project Ecologist and Monitoring

The implementation of all mitigation presented in this section will be overseen by a suitably qualified Project Ecologist during the construction stage of the proposed CGEP development. An onsite Ecological Clerk of Works (ECoW) will be present to oversee construction works where required, to ensure that all agreed mitigation measures are carried out by the appointed contractor(s). Ongoing monitoring of the efficacy of said mitigation measures will be carried out throughout the construction stage.

Invasive Species

Measures to control the spread of invasive species will follow as relevant the manual '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*' by NRA (2010); and Cognisance will be made of 'The Best Practice Management Guidelines' produced by Invasive Species Ireland (Maguire et al, 2008). This shall include measures as detailed in the guidance above to preclude the spread of invasive species through excavation of and/or backfilling of borrow pits.

Wheel washes draining to silt traps will be implemented at site entrances to prevent the possible spread of any invasive species.

Removal of Vegetation

All works on trees, scrub or hedgerows, including internal roads, entrances and the proposed Turbine Delivery Route shall adhere to NRA guidelines for the protection of trees, hedgerows and scrub prior to, during and post construction of national road scheme.

In accordance with Section 40 of the Wildlife Acts 1976-2012, woody vegetation removal will be conducted outside the bird breeding season which runs from the 1st of March to the 31st of August inclusive. It should be noted that the provisions of Section 40 do not relate solely to birds, but a range of biodiversity that contributes to food chains and wider ecosystems. Where sections of hedgerow/ treeline are removed, these will be reinstated with native hedge/ tree species which are indigenous to the local area.

General Site Remediation

- Where feasible the areas around the turbine bases and other disturbed areas should be allowed to re-vegetate naturally. Larger trees as they grow over time will be trimmed back on an ongoing basis (every 2 – 3 years outside bird breeding season) if required. Woody material will be left in situ (deadwood) as an ecological habitat for invertebrates.

- It is important to note that the proposed reinstatement and planting regime will have a long-term goal to ensure that recolonisation of disturbed ground in keeping with the existing on-site semi natural scrub/ heath type vegetation. Therefore, natural regeneration of onsite flora will be encouraged where appropriate. If this is deemed unsuccessful, further action will be taken in the form of reseeding with local species in keeping with the natural character of the surrounding environs.
- Replacement of harvested vegetated sod to disturbed bare areas post construction should encourage re-vegetation and avoid erosion in the vicinity of turbines, hardstands, access roads, drainage structures and all other associated infrastructure.
- Where applicable the harvested surface vegetation sods will be maintained in a moist state during construction in preparation for re-use at locations where the non-vegetative layer has been exposed.
- Harvested turves should be reused in the restoration of all bare/exposed surfaces around turbines, exposed peat/soil, borrow pits, and on peat berms adjacent to access tracks.
- Where applicable, excavated peat should not be spread on ecologically sensitive habitats or areas adjacent to watercourses;
- Some areas of bare/exposed surface may remain following the completion of construction works, however if these areas remain stable, natural re-colonisation should eventually occur. No action is needed from the contractor in this case.
- Bare surfaces on slopes greater than 2° should be stabilised or re-vegetated as soon as possible to minimise the risk of erosion which may result from sustained rainfall.
- Natural re-vegetation is the preferred method of recovery. However, where required (for example, where adequate quantities of vegetated peat are not available or natural re-vegetation processes are insufficient), bare material and/or reinstated peat should be secured using vegetation blankets such as Greenfix Embankment Mat, Geojute or similar approved product. An appropriately pre-seeded CoirMesh is also suitable, if required.

Access Track Reinstatement

- Soil and peat excavated during the course of the access track construction works should be reused on-site in the form of landscaping roadside peat berms in areas of minimal peat cover and as backfill at other locations on site (e.g. areas of exposed soil and bedrock, landscaping around turbine bases and hardstands etc).
- Harvested vegetative layers will be placed on the berms where required. This will provide resistance against rainfall events, and will minimise sediment and nutrient release until natural re-vegetation is established.
- As part of the appointed Ecological Clerk of Works recommendations, the re-vegetation of access tracks an berms will be monitored on an on-going basis.

Cable Trench Reinstatement

- Where trenching is to be carried out off-road, the excavated material will be laid alongside the trench for use in reinstatement following the laying of cables; vegetated surface layers will be stored separately.
- Once cable laying work has been completed the excavated material should be backfilled and compacted to a suitable standard.
- The refilled trenches should then be capped with harvested surface layers which will be encouraged to re-vegetate naturally.
- The appointed Ecological Clerk of Works will monitor the on-site reinstatement of trenches and will survey the progress of plant recolonisation on an on-going basis.

Borrow Pit Reinstatement

- The stored soil overburden will be replaced and graded to reflect the surrounding landscape.
- This will be capped with the surface layer of sod to encourage rapid re-establishment of indigenous vegetation.
- In all cases disturbed ground will be allowed to naturally re-vegetate initially and this progression will be assessed post construction by the appointed Ecological Clerk of Works.
- Should reinstatement result in a surface root-zone composed of a mix of subsoil and topsoil, it is possible that vegetation will quickly succeed to a European gorse cover within 10 years of restoration.
- Should this occur, alternative land management will be carried out in consultation (and monitored) by an ecologist to ensure maintenance as suitable forage habitat for Hen Harriers. The Site Ecologist will monitor this succession as part of the site management plan over the lifetime of the project.

Settlement Pond Reinstatement

- Settlement ponds will be in-filled, reinstated and managed as per borrow pit reinstatement.

Protection of Aquatic and groundwater dependant habitats

Material stockpiles will be kept to a minimum size, covered and located at least 10m from the drainage system

The main fuel stocks for, and chemical wastes arising from, construction activities will be stored in a designated location, away from main traffic activity, within the temporary site compounds. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse.

Works will be avoided during prolonged periods of very heavy rainfall. Refuelling of machinery shall be carried out at designated areas on the site. Safe-guards such as drip-trays for refuelling of machinery, machine servicing, concrete mixing, etc. shall be utilised.

Any existing pools or aquatic areas will be fenced off and protected from disturbance during the construction phase.

The use of wet concrete and cement in or close to any watercourses and semi-natural habitats will be carefully controlled, particularly from shuttered structures or the washing of equipment. The cleaning and wash-out of chutes of concrete batching plant or ready-mix lorries should be carried out in a dedicated, contained area as far from sensitive habitats and watercourses as practical. This will be for the wash-out of the chutes only— after the pour. Concrete trucks will then exit the site and return to the supply plant to wash out the mixer itself.

Project Component-Specific Mitigation Measures

Mitigation measures are outlined below specific to each/all identified potential significant effects which will avoid/reduce/offset to not significant.

Invasive Species

CGEP

Pheasant Berry

The 2 no invasions of Pheasant berry located along the existing access road to the Bottlehill Landfill facility will be resurveyed by an invasive species specialist 3-4 weeks prior to the commencement of works. If disturbance is required, than all Pheasant Berry plants will be dug out by hand and left in-situ to rot.

Digging out is the selected method of treatment for this species as stumps can re-sprout following cutting back and treatment with herbicide. Digging out will not be carried out during the fruiting period for this species (October and November) as Pheasant berry spreads primarily by seed dispersal.

Japanese Knotweed

Three Japanese knotweed infestations were recorded during habitat assessments on the CGEP Grid Connection, two of which occur within the CGEP Grid Connection study area. The two Knotweed infestations occurring within the study area are located within 7m of the proposed works and will therefore require treatment. The introduction and spread of these invasive plant species will be avoided during the construction phase of the project by ensuring that appropriate precautionary measures are in place. Guidelines produced by the NRA (2010) on 'The management of noxious weeds and non-native invasive plant species on national roads' will be adhered to. It is of particular importance that excavated material from the areas where Japanese Knotweed is known to be present be appropriately managed.

The two Japanese knotweed infestations are located on the grid connection route at roadside locations in the townland of Cullenagh adjacent to Fermoy Golf Course. As the installation of the UGC will require excavation at this location, there is potential for spread of viable plant material to other areas during construction. The following specific mitigation measures will be applied at these infestations:

- Pre-Construction confirmatory surveys will be completed by an invasive species specialist, 3 – 4 weeks before construction begins. Mapping, showing the most up to date distribution and extent of Knotweed at the previously identified infestation locations, and also for any potential new infestations within the zone of influence of the construction works;
- Based on the updated surveys a Biosecurity Management Plan will be prepared prior to the commencement of site works to minimise risk of spread of high impact invasive species. This will incorporate mitigation detailed herein.
- A toolbox talk will be provided by the invasive species specialist with the Contractors construction site engineers and general operatives to explain about all invasive species identified along the route and the restrictions that will apply for the full construction period. The toolbox talk will cover all pertinent topics including all relevant invasive species close to construction works and the biosecurity measures to be implemented while working The invasive species toolbox talk will cover the full lifecycle of every construction activity including, but not limited to, all onsite construction activities, mechanical excavation, transportation and disposal of all material from excavations, through to the backfilling of excavations, and reinstatement of the construction works area;
- Where works are being carried out within 7m of a Japanese Knotweed infestation, the covering of infestations will be completed on sections seven days in advance of works. The infestations will be covered so that their full extent plus 1 metre is covered entirely and no vegetation is visible;
- The covering of vegetative knotweed infestations will be carried out using high density polyethylene grass carpet terram at all identified locations prior to any works commencing. When taking the terram off an infestation area, the construction team will need to ensure that all adherent material has been removed and placed within the adjacent infestation i.e. it will be important not to spread the infestation;
- The covering of knotweed infestations will only be carried out by the invasive species specialist i.e. this work will not be carried out by any general construction staff. No posts will be used to secure the coverings i.e. there will be no uncontrolled ground interference within 7 meters of any infestation during any of these operations;
- Once each knotweed infestation has been covered, works can begin at that location, an invasive species specialist will be present to provide supervision of all works adjacent to infestations;
- The site Environmental Clerk of Works will ensure that the Contractor engages a suitable waste disposal company with the requisite license for handling any hazardous waste (i.e. invasive species material). The Contractor will maintain records of all wastes arising, and the documentation will include the waste contractors local authority license and proof of appropriate haulage license per individual haulage vehicle.

Himalayan Balsam

Himalayan Balsam is most invasive in damp habitats particularly along river corridors, where it out-competes native vegetation in summer and dies back in winter, exposing river banks to erosion. It spreads rapidly downstream in river catchments due to its prolific seed production. Himalayan Balsam was recorded at a single location at a proposed watercourse crossing on the CGEP grid connection, where it was found to be growing on the riverbank upstream and downstream of the crossing location.

Prior to the commencement of works at this location on the Grid Connection Route, the infestation will be re-surveyed by an appropriately qualified invasive species expert to establish the extent of the infestation. Should the proposed woks at this location come into contact with vegetative material, control measures will be required. A range of methods are recommended for the treatment of *I. glandulifera* (Invasive Species Ireland, 2015; Inland Fisheries Ireland, 2015; Cabi, 2015), one of which is manual control. Manual control is carried out by physically pulling the plants by hand. If deemed necessary, manual control will be carried in late spring/early summer when newly germinated plants are distinguishable from surrounding vegetation, but prior to plants setting seed. Vegetative material will be left in-situ to rot, and not removed from site to avoid spreading viable material in transport. All operators must be trained in biosecurity protocol, control methodology, and in the identification of Himalayan Balsam at all stages of growth. At least one successive visit is recommended as Himalyan Balsam can germinate throughout the growing season. Manual control has been applied successfully in Ireland e.g. within the River Allow catchment in Co. Cork (IRD Duhallow Ltd., 2015). Works at the watercourse crossing can only commence upon successful removal of Himalyan Balsam from the works area.

Habitat Loss

Habitat disturbance in areas of semi-natural habitat during construction work should be strictly confined to within the direct land-take of the proposed wind farm and associated infrastructure. A working corridor will be set out in advance of the works, identified by low impact markers. The extent of construction activities will be controlled to limit vegetation removal and the exposure and/or compaction of soils. The setting out of the corridor will be preceded by a site walkover by an appropriately qualified ecologist to ensure that the working area is reduced to the minimum required for the works, taking account of minimising rutting and compaction by vehicles. A suitably qualified Ecological Clerk of Works will be appointed to oversee environmental protection measures during the construction phase of the proposed site works to ensure full compliance with environmental protection measures which have been set out here. Excess peat or soil excavated to create the access road and other infrastructure shall not be side Cast or spread over existing habitats of local ecological value such as scrub, wet heath and wet grassland.

A total of 1.65ha of scrub will be permanently removed during the construction of the windfarm. This loss of scrub habitat will be compensated through allowing approximately 30.4ha of lands around turbines to develop a semi natural wet grassland / low scrub habitat as a result of mature tree clearance within a buffer around each turbine.

Hedgerow loss

During the construction of the project there will be a loss of 206m of hedgerow/ linear scrub habitat. Planting of a new hedgerow of equal length is proposed around the new substations using native woody species of local provenance only. Replanting should be carried out using native species only and species chosen should reflect the character of the locality and should consist of appropriate species for the receiving soil conditions.

CGEP and GCR

Water protection measures will prevent water pollution events and thus prevent negative impacts on Otter.

- The CEMP will be in place prior to the start of the construction phase.
- Machinery and materials will be parked/stored in the specified compound areas to minimise disturbance. Wherever possible, vehicles will be refuelled off-site in designated areas. This will be the case for regular, road-going vehicles.

- On-site refuelling of machinery will be carried out using a mobile double skinned fuel bowser at dedicated locations away from watercourses.
- The fuel bowser, a double-axle custom-built refuelling trailer will be towed around the site by a four-wheel drive 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 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.
- Refuelling operations will be carried out only by designated trained and competent operatives.
- Mobile anti-pollution measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
- Materials excavated (e.g. peat, soil, gravel or rock) during construction of the turbine bases, electrical sub-station, or during construction of new roadways or the upgrading works on existing roadways will be reused within the site.
- Re-use of these materials within the site will occur under conditions where there is no possibility of the material becoming mobile in the environment and entering into either surface or ground waters.
- The CEMP also provides for the appointment of a Site Supervisor/Construction Manager and/or Environmental Manager to maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. In addition, an Environmental Clerk of Works or Project Ecologist, Project Hydrologist, Project Geotechnical engineer will visit the site regularly and report to the Site Environmental Office. This structure will provide a “triple lock” review/interaction by external specialists during the construction phase.

Project Component-Specific Mitigation Measures

CGEP

Project design measures will involve conducting all construction work during daylight hours where possible. This will minimise the likelihood of disturbing and displacing mammal which are exclusively nocturnal or are most active at dawn and dusk, such as Badgers, Pine Marten, Otter and Stoat. In the event that lighting is required cowled lighting will be employed to minimise potential disturbance in mammals due to light-spill.

In accordance with NRA Guidance, to account for the passage of time between the aforementioned mammal surveys and the commencement of construction activities/ clear felling in suitable habitat confirmatory surveys will be undertaken pre-construction to re-confirm the presence/absence of Badger setts, Otter holts, Pine Marten resting places or Red squirrel drays. Should new resting/breeding places of protected mammals be discovered then appropriate mitigation will be undertaken in agreement with NPWS and following NRA Guidance where applicable to prevent significant negative effects of the species. For example, any identified Badger setts will be protected by following NRA guidance, which states that no heavy machinery should be used within 30m of badger setts outside of the breeding season, and 50m during the breeding season (unless carried out under licence).

Construction work will be supervised by an on-site ECoW with stop works authority. This will further reduce the likelihood of destruction of the resting places of protected mammals.

GCR

Confirmatory surveys of the grid route connection will be undertaken prior to commencement of construction works. Should any resting/breeding places of protected mammals be discovered then appropriate mitigation will be undertaken in agreement with NPWS and following NRA Guidance where applicable to prevent significant negative effects of the species. For example, any identified Badger setts will be protected by following NRA guidance such as no heavy machinery should be used within 30m of badger setts (unless carried out under licence). Therefore, any effects are evaluated as negligible.

Water protection measures will be used when works are within 50 metres of a water body, thus the impact on Otter as a result of water pollution is considered as imperceptible. Given the design of the development and the construction methodologies and best practice, disturbance/displacement related impacts are also considered to be Imperceptible.

Bats

Generic Mitigation Measures and Best Practice

It is anticipated that the majority of construction works will be carried out during daylight hours, but some works may be carried out at night. In these cases, all lighting will be cowled in order to prevent light spill. Lights will be operational when work is taking place, but will be switched off when no long required; no lighting will be left turned on overnight. In the site compound, lighting will be controlled by motion and time sensors to minimise the amount of time the lights are operational.

Project Component-Specific Mitigation Measures

The ground around turbine bases up to 92 M from Turbines will be cleared of mature conifer trees in order to reduce bat activity in the vicinity of turbines, and hence reduce risk of collision. Clearance works will be carried out in the construction phase, but the rationale for this measure is outlined in the operational section.

Avifauna

Generic Mitigation Measures and Best Practice

Ahead of any works to be undertaken, a confirmatory survey will be undertaken by the Project Ecologist, or experienced Ornithologist, to assess the presence of birds nests, irrespective of the time of the year. Beyond any clear felling works to be avoided until the end of the bird breeding season (i.e. March to August, inclusive), in the event of nests being found within the study area, works will cease. The survey findings will be reported to the competent authority and an application for a derogation license will be made to NPWS.

Pre construction monitoring surveys will be conducted from early March and prior to any site clearance, enabling or forest clearance works focussed on breeding status determination of Goshawk and hen harrier relative to proposed works areas. No works will take place where evidence of possible nesting is recorded and a minimum 500m buffer will be retained between all works areas and possible nest areas or subject to advice from a competent adequately experienced ornithologist (minimum 10 years' experience). In this regard a wider or possibly narrower buffers may be required/ appropriate. Given risks of disturbance to these specific bird species no licencing will be sought as no works will be conducted between March 1st and August 31st within buffers identified or as advised by the site ornithologist and depending on breeding status. NPWS will be informed of breeding status and monitoring audits will be conducted and full disclosure provided to NPWS.

Project Component-Specific Mitigation Measures

CGEP and GCR

In order to avoid the potential impacts to breeding birds , tree removal and clearance of any other vegetation likely to hold nesting birds will be undertaken outside of the bird breeding season, i.e. not during the period of March to August, inclusive. In the eventuality of this not being possible, these works/activities will not take place before a confirmatory survey of the affected area (i.e. aerial and ground-based nests) is undertaken by the Project Ecologist. This includes hedgerow and scrub removal in addition to hedgerow trimming along turbine delivery routes and proposed cable routes. In the event of any nests being found, the works will immediately cease, the survey findings will be reported to the competent authority and an application for a derogation license will be made to NPWS. Any license requirements shall be facilitated by a complete confirmatory re-survey prior to works commencing and all future works associated with the derogation license will be supervised by the Project Ecologist.

Any works to be undertaken on existing culverts or other types of water-crossings must be preceded by a confirmatory nest survey by the Project Ecologist or an experienced Ornithologist. The survey will determine presence or absence of nests of riparian birds (e.g. Kingfisher) or birds that can use these habitats to nest (e.g. Grey Wagtail, Dipper). In the event of any nests being found that may be at risk of disturbance, than works will immediately cease, the survey findings will be reported to the competent authority and an application for a derogation license will be made to NPWS. Any license requirements shall be facilitated by a complete confirmatory re-survey prior to works commencing and all future works associated with the derogation license will be supervised by the Project Ecologist.

Sections of hedgerow/ treelines scheduled for removal and/or trimming and containing mature trees suitable for nesting Barn Owls will be surveyed prior to construction for occupancy by Owls. Should Owls be present then minimum protection zones as outlined in published guidance will be adhered to for the period of construction (Shawyer, 2011).

Toolbox talks shall be held with construction staff on disturbance to key species during decommissioning. This will help minimise disturbance. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Any re-instated habitats will include native species where possible to enhance diversity of birds. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Other Species

CGEP and GCR

Reptiles and Amphibians

As Viviparous lizards are widespread in Ireland and can be found in a range of habitat types such as in bog, heath, the margins of coniferous woodlands, in addition to being common in a range of grassland habitats, particularly those not subject to heavy grazing pressure, a confirmatory survey will be conducted within these habitats prior to the commencement of construction activities to confirm the presence/absence of individuals. Capture and relocation operations for this species can be extremely labour-intensive and, in most cases, the most efficient approach is to cut down and rake-off vegetation during warm weather, with the intention of displacing the resident lizards prior to earthworks or other activities that could result in their incidental mortality (NRA, 2009). Whether or not reptile-proof fencing is then required to exclude the animals will need to be reviewed on a location-specific basis by the ECoW.

Should construction activities be proposed and scheduled for areas proximal to habitat suitable for breeding common frog or smooth newt during the species' respective breeding seasons (frogs: January-March and newts: March-May), confirmatory surveys following standardised methodologies will be required at those locations to confirm the presence/absence of breeding adults and/or spawn. If evidence of frog or newts is confirmed proximal to the work locations, it is essential the areas are fenced off with appropriate signage in order to protect these areas during construction activities.

Fisheries and Aquatic Ecology

Project Component-Specific Mitigation Measures

- **Instream works**
  - Instream works shall only take place during the period July to September (as required by IFI for instream works). However, as stated above, all instream works shall take place in written agreement with the IFI;
  - Operation of machinery in-stream should be kept to an absolute minimum. All construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery should be checked prior to commencement of in-stream works. Furthermore, machinery should be steam cleaned and appropriate measures for the spread of, amongst others, the crayfish plague shall be carried:
    - Before contact with water is made, any equipment or machinery that will be used in the water, including Personal Protective Equipment (e.g. footwear, gloves), will be sprayed and cleaned with a 1% solution of Virkon® Aquatic (or other proprietary disinfectant);
    - Upon completion of the work or moving the equipment or machinery from the water, these will be visually inspected for any possible sources of contamination and any attached plant or animal material or debris will be removed. The equipment and machinery will be further sprayed and cleaned with a 1% solution of Virkon® Aquatic (or other proprietary disinfectant); and
    - Any observations of mass mortality of Crayfish will be reported to the relevant authorities within 1 hour of evidence being found.
  - As the river water bodies hold fish species protected under the Wildlife Act and/or the EU Habitats Directive (e.g. Atlantic salmon, Brown trout, European eel), a pre-construction electrofishing survey will be conducted, in agreement with IFI, in the water bodies affected by the proposed CGEP Development watercourse crossings. This survey results, in addition with the results presented in the EIAR will inform about the significance of the fish abundances in relation to the local populations. If deemed significant by the IFI, dewatering of these water bodies will not be employed. If IFI considers the fish abundances not significant and authorises dewatering of the water body reach as part of the instream works, a fish salvage operation shall be undertaken. The fish salvage operation shall be authorised and licensed by the IFI and carried out by either the IFI or by fully qualified, licensed and authorised freshwater ecologists.
  - If temporary diversion channels are necessary as part of the instream works, they should provide for fish passage, be non-eroding, and be of similar width to the natural stream channel. The channel diversion should be compliant with the following 1) to 28) measures:
    - Diversion of water to and from temporary channels should only take place during the period July to September (as required by IFI for instream works) and in accordance with the IFI;
    - Consultation with the NPWS should also be carried out as species protected under the Wildlife Act, EU Habitats Directive and the EU Freshwater Fish Directive occur within the river water bodies affected by the instream works;
    - The works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
    - A minimum 10 meter vegetative buffer zone will be maintained between disturbed areas and the water body. There will be no storage of material/equipment, excavated material or overnight parking of machinery inside the 10m buffer zone;
    - Double silt fencing will be placed upslope of the buffer zone on each side of the water body. The silt fencing will have removable "gates" as required to allow access of excavator while maintaining ease of replacement overnight or during periods of heavy

rainfall. The silt fencing will be extended at least 10m upstream and downstream of the crossing location;

- Bog mats will be used underneath the excavator inside the 10 meter vegetative buffer zone to prevent soil erosion and potential water quality impacts from localised surface water runoff;
- Temporary storage of excavated overburden from the diversion channel will be undertaken outside of the 10m buffer on flat ground or within a local hollow. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;
- The water body dam (in the stream to be diverted) will be made of sand (clean) bags, cobbles or clean well-graded coarse gravel fill. Poorly sorted material will not be used as it would be a potential source of fine sediment (the dam will be installed once the diversion channel is in place);
- The banks and bottom of the diversion channel will be lined with impermeable geotextile to prevent erosion and surface water quality impacts. A layer of clean course gravel will be placed over the geotextile on the bed of the channel to keep it in place;
- An energy dissipater (such as clean rock fill or splash plates) will be placed on the water body bed and opposing bank of the receiving water body downstream of the diversion channel. This will prevent scouring and erosion of the water body bed and bank at the outfall during diversion;
- Water body bed trench excavation works will commence once stream flow is fully diverted from the crossing excavation area;
- Temporary storage of excavated material from the crossing trench will be undertaken separately to the material from the diversion channel. All storage areas will be outside the 10m buffer zone. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;
- Sediment laden water from trench dewatering will be discharged onto a well vegetated, dry, flat area at least 50m from a water body via a straw bale dewatering structure or geotextile filter bag. The outfall will also be surrounding by silt fencing;
- If there is no suitable area for discharge onto ground, settlement ponds will be used where necessary and will be put in place prior to commencement of preparation works;
- Any water from trench dewatering will not be discharged directly to a water body;
- Clay bunds will be placed within the trench backfill on either side of the water body to prevent the trench acting as a drain towards the stream, thus preventing potential water quality impacts;
- Once the lean mix concrete is in place in the trench, a layer of fine sand (5–10cm) will be over the cement prior to backfilling. This will prevent release of cement into the water body when flow is restored;
- Upon completion of the in-stream works, the stream crossing will be restored to its original configuration and stabilised to prevent bank erosion by means of timber stakes, timber planks and geotextiles as required (Project Design Measure);
- The diversion channel will be backfilled and reinstated to its original level and rock armour will be placed at the stream banks where the inflow and outflow of the diversion channel previously existed;
- The ground surface along the reinstated diversion channel will be re-seeded at the soonest opportunity to prevent soil erosion;
- The silt fencing on either side of the stream buffer will be left in place and maintained until the disturbed ground has re-vegetated;

- Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;
- Disturbance of bankside soils and stream sediments will be restricted to the minimum required for the cable laying process to avoid unnecessary impact on the stream morphology;
- There will be no batching or storage of cement allowed at the stream crossing;
- There will be no refuelling allowed within 100m of the stream crossing;
- All plant will be checked for purpose of use prior to mobilisation at the stream crossing;
- Works will not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted; and
- Once construction of the structure is completed, reconnection to the existing water body can be made and this should only occur within the approved operational window for in-stream works.

- **Culverts**
  - Construction/Replacing of culverts will only be done over a dry period between July and September (as required by IFI);
  - Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
  - Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
  - Where there is a requirement to disturb either the bed or bank as a result of the construction/replacement works, the watercourse will be dammed upstream and pumped prior to work commencing;
  - A temporary berm (i.e. sandbags and/or rectangular straw bales) will placed along the edge of the track/road to prevent loose material being dislodged or washed into the water body;
  - All culverts to be installed as part of the works, new and replacements, shall be of the open-bottomed type. These should be oversized, so that they can be set a minimum of 500 mm below bed-level, with a minimum diameter of 900mm regardless of the anticipated flood flow;
  - The culverts should be of similar width to that of the natural low-flow channel;
  - The culverts should be laid at a level and grade which allows the upstream invert to remain drowned (by back-watering) under low-flow conditions, to a depth suitable for the easy passage of the largest species frequenting the stream (150mm for salmon);
  - The effective slope of the culvert should not exceed 5%. If a higher slope is necessary, a site specific design is required;
  - Pools should be formed at each end of the culvert to provide for transition from the shape of the culvert to the shape of the river downstream;
  - Culvert screening shall not be adopted in any circumstance;
  - Where culvert widening has been completed, only clean, well-sorted fill or hardcore will be used to widen the road/track at the crossing location. Poorly sorted material will not be used as it would be a potential source of fine sediment;
  - Before the road/track surface layer is put in place, a layer of geotextile will be placed over the fill to prevent wash down of fines into the fill and potentially into the water body;
  - If high levels of silt or other contamination is noted in any local watercourse, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
  - All disturbed ground will be re-seeded at the soonest opportunity to prevent erosion;

- There will be no batching or storage of cement allowed at the watercourse crossing;
- There will be no refuelling allowed within 100m of the watercourse crossing; and
- All plant will be checked for purpose of use prior to mobilisation at the water body crossing.

Excavation works within the proximity (<50m) of surface water bodies

To prevent river water quality impacts from sediment runoff during excavation works within the proximity of surface water bodies (<50m), the following measures shall be put in place:

- Weather forecasting resources will be used, and works will be planned when a dry spell of weather is forecasted;
- Where the cable trench/access track/road/ works area is running within the 50m of a surface water body, a minimum 5m buffer will be maintained between the works area and the water body wetted width limit, except where works at existing culverts required, see above;
- Silt fencing will be placed down-gradient of the works during construction at all locations within the 50m water body buffer;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- In a case where only a 5 - 10m buffer is being maintained, double silt fencing will be put in place on the downslope side;
- Additional silt fencing or temporary straw bales (rectangular bales, pinned down firmly with stakes) will be placed across any natural surface depressions/channels that slope towards a local water body;
- Where the cable trench/access track/road route slopes down perpendicular towards a water body (i.e. base of stream valley), regularly spaced, temporary bunds or shallow swales will also be put in place perpendicular across the route corridor to dissipate surface water runoff from the works area and onto adjacent vegetated ground. Additional silt fencing will be put at the outfall location of the bunds/swales;
- Temporary check dams/silt fencing arrangements will be placed in any drainage ditches within 30m of the works corridor (this will also include existing road drains along the haul route works);
- The check dams/silt fencing arrangements will be placed every 10m;
- Bog mats will be used in wet/boggy areas zone to prevent ground rutting and soil erosion which could lead to potential water quality impacts. All ground rutted by vehicles/machinery will be levelled or backfilled to prevent their progression as preferential pathways for surface water runoff;
- If high levels of silt or other contaminants are noted in any local water body, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- Excavation work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
- All disturbed ground will be re-seeded at the soonest, practicable opportunity to prevent erosion;
- All temporary surface water control/protection measures, such as silt fencing and check dams, will be kept in place until disturbed ground has vegetated and stabilised. Regular daily checks will be undertaken;
- Where the cable trench route runs downslope for long distances (>50m) towards a water body or drainage ditch, regular spaced impermeable bunds will be placed within the trench backfill to prevent the trench acting as a drain towards the stream, thus preventing potential water quality impacts from surface water drainage within the trench;

- There will be no refuelling allowed within 100m of a water body/drainage ditch; and
- All plants will be checked for purpose of use prior to mobilisation.

Management of invasive alien species

To avoid the introduction, establishment and spread of invasive species in and to the proposed CGEP Development during the construction phase, the following measures shall be attended to:

- Prior to arrival of vehicles that will be kept on the site for extended periods e.g. earth moving machinery, the contractor's vehicles and equipment will be thoroughly cleaned and then dried using high-pressure steam cleaning, with water >65 °C, in addition to the removal of all vegetative material. Items difficult to soak/spray will be wiped down with a suitable disinfectant (e.g. solution of 1% Virkon® Aquatic);
- Evidence that all machinery has been cleaned will be required to be on file for review by the statutory authorities. The level of evidence required of the Contractor will be actual registration plates of vehicles onsite and a register of when, how and where each of these were cleaned before they arrived on site;
- The flagmen, which will be present at each active site access points, will be responsible for inspecting and cleaning delivery vehicles both entering and exiting the site, and will receive training in the correct techniques;
- Each flagman will be equipped with a 'disinfection box'. This will contain Virkon® Aquatic or another proprietary disinfectant, a spraying mechanism, cloths or sponges, a scrubbing brush and protective gloves. Protective gloves will be worn when using any disinfectant solution;
- Visual inspections will be carried out on all machinery and equipment (particularly for machinery and equipment exiting the site and which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the Temporary Compound at the end of the work day;
- No removed material or run-off will be allowed to enter a water body of any sort;
- Following cleaning, all equipment and vehicles will be visually inspected to ensure that all adherent material and debris has been removed manually;
- Records of supplies and cleaning of delivery vehicles will be kept by the flagmen and will be regularly inspected by the Environmental Clerk of Works; and
- Spot checks on the adequacy of cleaning will be carried out by the Project Ecologist.
- The above measures may not apply for vehicles that require regular on and offsite movements e.g. deliveries of cement during construction. These vehicles are highly unlikely to be at risk of contamination/ contact with aquatic habitats or invasive species. Before deliveries start the site EcoW/ Environmental Manager will review quarries supplying cement to confirm if the above disinfectant measure applies.

4.3.4.2.2 Mitigation Measures during Operation

Project Ecologist and Monitoring

A Project Ecologist will be appointed to oversee all works and mitigation measures during construction, operational and decommissioning phases.

Vegetation Clearance

Using the maximum potential dimensions of the proposed turbines and feature heights of 20m (based on the height of the forestry), it was calculated that buffer zones of up to 92 m are required around all turbines. During the site clearance phase, all trees and shrubs will be cleared within this radius. The buffer zone will be kept clear throughout the operational period of the proposed development.

Operational Curtailment

Turbines 11, 18 and 21 will be curtailed in April, May and June, throughout the night (starting 30 minutes prior to sunset, and ending 30 minutes after sunrise), when wind speeds are below 6 m/s, and when air temperatures are above 9°C. This will apply when all of the above conditions are met, but will not apply when one of the conditions is not met, i.e. turbines will operate as normal between April and June when wind speeds exceed 6 m/s. Similarly, turbines may operate as normal during daylight hours during these days, and in all other months of the year.

It is important to note that this is an initial curtailment strategy, based on pre-construction data. Spatial patterns of bat activity are likely to change after construction works (due to the felling of trees), which may affect the way that bats use the site. Therefore, post-construction monitoring will be undertaken, and based on the results, this curtailment strategy may be adapted.

Restrictions on Lighting

Where artificial lighting is required during the construction, operation and/or decommissioning phases, 'bat-sensitive' lighting techniques will be implemented. Site-specific advice will be given by the Ecological Clerk of Works, but the design principles will be in accordance with the Bats and Lighting guidelines (Stone 2013), as follows:

- Low-UV LEDs or low / high pressure sodium lamps will be the preferred bulb type, as they have least effect on bats. Mercury or metal halide bulbs will not be used.
- All outdoor lights will be fitted with directional hoods and/or luminaires to direct the light onto targeted areas and to prevent unnecessary light-spill.
- No lights will be directed towards any of the bat roosts, or towards any linear habitat features.
- Where lighting is required for staff safety (e.g. at site compounds), lights will be installed at a low level, e.g. on lighting poles of 1 - 2 metres height. Lux levels will be the minimum required for pedestrian safety.
- Where feasible, lights will be fitted with motion sensors and timers in order to provide light only when required. Constant, overnight lights will not be permitted.

Monitoring

Due to the clearance of forestry around wind turbines, it is highly likely that bat activity will change following the construction of the proposed development. The mitigation strategy outlined above adopts a precautionary approach based on pre-construction bat activity data, but post-construction monitoring will be required to confirm that it is effective.

The monitoring strategy will involve two components: surveys of bat activity using automated detectors (allowing comparison of activity with pre-construction levels), and searches for bat carcasses around the base of each turbine. This will be carried out during the first three years of operation, using standardised methods outlined in the SNH (2019) guidance, and/or other relevant guidelines available at the time.

The monitoring strategy will include the following:

- Monitoring of bat activity at ground level using automated detectors for periods of at least ten nights during spring (April, May), mid-summer (June, July) and autumn (August, September). Bat activity will be compared with the baseline levels.
- Searches for bat carcasses around the base of each turbine using trained search dogs, carried out twice per month between May and October (inclusive), i.e. a total of twelve occasions.
- Depending on the results of the monitoring, the initial mitigation strategy may be revised, for example by optimising curtailment parameters at some turbines, or by employing curtailment at additional locations. Annual monitoring reports will be provided to relevant statutory bodies (where required), and if significant bat fatalities are recorded, avoidance or mitigation measures will be proposed, such as the curtailment and feathering of turbines during periods of high bat activity, and/or other approaches that may be developed in the future.

Avifauna

Project Component-Specific Mitigation Measures

CGEP

A post construction monitoring programme is to be implemented at the subject site in order to confirm the efficacy of the bird diverters. The results of this programme are to be submitted annually to the competent authority and NPWS. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society (Drewitt & Langston, 2006) for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure.

In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring adapted to quantify collision, barrier and displacement to be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed:

1) Fatality Monitoring: A comprehensive fatality monitoring programme is to be undertaken following published best practice; the primary components are as follows:
    a. Initial carcass removal trials to establish levels of predator removal of possible fatalities. This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Smallwood, *et al*., 2010). No turbines which are used for carcass removal trials are to be used for subsequent fatality monitoring.
    b. Turbine searches for fatalities are to be undertaken following best practice (Fijn, Krijgsveld & Tijsen, 2012; Grunkorn, 2011) in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g. 2 per month). To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. Dependant on results, further monitoring to be agreed with NPWS.
    c. The large scale of the proposed wind development allows for a standardised approach with a possible control group of Turbines and/or variation in search techniques, such as straight line transects/ randomly selected spiral transects/ dog searches as a means of robustly estimating the post construction impact in terms of fatality.
    d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

An annual report will be submitted to the competent authority and copied to NPWS for each of the first three years of operation.

Following the first 7 years, a report shall be disseminated publicly via publication in a recognised journal. Although post-construction mortality is considered unlikely to be significant, in the event of significant fatalities during *post-construction monitoring*, the following adaptive management techniques shall be considered and an appropriate approach implemented. The approach implemented will be based on the survey findings and recommendations of an experienced ornithologist (>10 years relevant experience) in consultation with Bird Experts in NPWS:

- Curtailment or feathering of turbine blades at specific time periods dependent on target species affected[2].
- Use of Bird Deterrent Systems such as DTBird[3].
- Use of on the ground observers to determine feathering requirement during periods of peak bird activity[4].
- Use of DeTect MERLIN Avian Radar system or similar as a control mechanism for specific turbine operation[5].

2) Flight Activity Survey: A flight activity survey is to be undertaken during the to:
    a. Record any barrier effect, i.e. the degree of avoidance exhibited by species approaching or within the wind farm (Rees, 2012). Target species to be ...
    b. Record changes in flight heights of key receptors post construction.

An annual report will be submitted to the competent authority and copied to NPWS. To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. A review will be conducted after 4 years to determine if the level of survey is warranted. Dependant on results, further monitoring to be agreed with NPWS. Following the first 7 years, a report shall be disseminated publicly via publication in a recognised journal.

3) Breeding Hen Harrier and Goshawk survey: A breeding Hen Harrier and Goshawk survey, following methods used in the baseline survey to be repeated yearly March – July (inclusive). This aims to:
    a. Assess any displacement effects such as those recorded in the literature (Pearce-Higgins *et al*., 2009, 2012; Reichenbach & Steinborn, 2011). Overall density of these species to be annually recorded.
    b. To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. A review will be conducted after 4 years to determine if the level of survey is warranted. Dependant on results further monitoring to be agreed with NPWS. Following the first 7 years a report shall be disseminated publicly via publication in a recognised journal.

[2] An example would be feathering at dawn and dusk for a minimal period to avoid collision risk to roding woodcock during the summer months.

[3] DTbird is a self-working system that detects flying birds in real time and takes programmed actions such as dissuasion of birds in collision risk with turbines or controlled stopping of the turbine. It can also be used to monitor collisions if occurring.

[4] Studies in Spain, at an operational wind farm site, have found that controlled stopping of turbines based on observation reduced mortality of certain species by up to 48% (Munoz Gallejo *et al*., 2011).

[5] The DeTect MERLIN Avian Radar System can precisely track targets within avian size ranges and then provide deterrent techniques such as laser, or interface with the wind farm control system to curtail turbines.

Fisheries and Aquatic Ecology

Generic Mitigation Measures and Best Practice

The operation of the development will incorporate effective maintenance of the drainage system and the permanent mitigation measures detailed. The maintenance regime will include inspection and servicing of:

- Drains, cross-drains and culverts for any blockages
- Outfalls to existing field drains and watercourses
- Existing roadside swales for any obstructions
- Swales
- Progress of the re-establishment of vegetation.

Project Component-Specific Mitigation Measures

In order to prevent the spread of invasive alien species that are already established within the proposed CGEP Development or may become established, the following measures shall be conducted:

- Monitoring in the form of confirmatory surveys will be carried out by the Project Ecologist to accurately determine the current status of invasive species locations identified during baseline studies; and identify any other infestations close to the construction works areas or operational stage maintenance works areas;
- Surveying will be carried out each year of operation and this survey information will be used to inform any construction works/operational stage maintenance activities. Surveys will focus always on the works area plus 7m;
- The results of this will be made available to Project Team, and any bodies as agreed at the consenting stage; and
- The measures included in the Invasive Species Management Plan will be implemented.

4.3.4.2.3 Mitigation Measures during Decommissioning

Project Ecologist and Monitoring

A Project Ecologist will be appointed to oversee all works and mitigation measures during construction, operational and decommissioning phases. The project ecologist will monitor the baseline ecology prior to decommissioning and provide mitigation measures at this time based on what biodiversity receptors are relevant.

Habitats and Flora

Project Component-Specific Mitigation Measures

The introduction of invasive species has been identified as a significant potential impact during the decommissioning stage of the CGEP Development. To avoid the introduction, establishment and spread of invasive species in and to the proposed CGEP Development during the construction phase, the following measures shall be attended to:

- Prior to arrival of vehicles that will be kept on the site for extended periods e.g. earth moving machinery, the contractor's vehicles and equipment will be thoroughly cleaned and then dried using high-pressure steam cleaning, with water >65 °C, in addition to the removal of all

vegetative material. Items difficult to soak/spray will be wiped down with a suitable disinfectant (e.g. solution of 1% Virkon® Aquatic);

- Evidence that all machinery has been cleaned will be required to be on file for review by the statutory authorities. The level of evidence required of the Contractor will be actual registration plates of vehicles onsite and a register of when, how and where each of these were cleaned before they arrived on site;
- The flagmen, which will be present at each active site access points, will be responsible for inspecting and cleaning delivery vehicles both entering and exiting the site, and will receive training in the correct techniques;
- Each flagman will be equipped with a 'disinfection box'. This will contain Virkon® Aquatic or another proprietary disinfectant, a spraying mechanism, cloths or sponges, a scrubbing brush and protective gloves. Protective gloves will be worn when using any disinfectant solution;
- Visual inspections will be carried out on all machinery and equipment (particularly for machinery and equipment exiting the site and which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the Temporary Compound at the end of the work day;
- No removed material or run-off will be allowed to enter a water body/drainage ditch of any sort;
- Following cleaning, all equipment and vehicles will be visually inspected to ensure that all adherent material and debris has been removed manually; and
- Spot checks on the adequacy of cleaning will be carried out by the Project Ecologist.
- The above measures may not apply for vehicles that require regular on and offsite movements e.g. deliveries of cement during construction. These vehicles are highly unlikely to be at risk of contamination/ contact with aquatic habitats or invasive species. Before deliveries start the site EcoW/ Environmental Manager will review quarries supplying cement to confirm if the above disinfectant measure applies.

Terrestrial Mammals (excluding bats)

Generic Mitigation Measures and Best Practice

A project ecologist will be on site during the decommissioning phase.

Project Component-Specific Mitigation Measures

CGEP & Grid Connection Route

No significant impacts are likely on terrestrial mammals as no decommissioning is likely for the grid connection which will be operated by ESBN and EirGrid

Avifauna

Project Component-Specific Mitigation Measures

CGEP

Decommissioning operations will take place predominantly during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species.

This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006). Limited operations, such as turbine removal, may require night time operating hours.

Toolbox talks shall be held with construction staff on disturbance to key species during decommissioning. This will help minimise disturbance. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Any re-instated habitats will include native species where possible to enhance diversity of birds. This is line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Project Component-Specific Mitigation Measures

CGEP and GCR

During decommissioning phase, all mitigation measures indicated for the construction phase with regards to excavation works within the proximity (<50m) of surface water bodies and Management of alien invasive species shall be implemented, namely:

- Where the cable works or vehicle/machinery movement is within the 50m of a surface water body, a minimum 5m buffer will be maintained between the works area/access track and the water body wetted width limit;
- Silt fencing will be placed down-gradient of the works during construction at all locations within the 50m water body buffer;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- In a case where only a 5 - 10m buffer is being maintained, double silt fencing will be put in place on the downslope side;
- Additional silt fencing or temporary straw bales (rectangular bales, pinned down firmly with stakes) will be placed across any natural surface depressions/channels that slope towards a local water body;
- Where the access tracks/road routes slopes down perpendicular towards a water body (i.e. base of stream valley), regularly spaced, temporary bunds or shallow swales will also be put in place perpendicular across the route corridor to dissipate surface water runoff from the works area and onto adjacent vegetated ground. Additional silt fencing will be put at the outfall location of the bunds/swales;
- Temporary check dams/silt fencing arrangements will be placed in any drainage ditches within 30m of the works corridor (this will also include existing road drains along the haul route works);
- The check dams/silt fencing arrangements will be placed every 10m;
- Bog mats will be used in wet/boggy areas zone to prevent ground rutting and soil erosion which could lead to potential water quality impacts. All ground rutted by vehicles/machinery will be levelled or backfilled to prevent their progression as preferential pathways for surface water runoff;
- If high levels of silt or other contaminants are noted in any local water body, all works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;

- Excavation work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
- All disturbed ground will be re-seeded at the soonest, practicable opportunity to prevent erosion; and
- All temporary surface water control/protection measures, such as silt fencing and check dams, will be kept in place until disturbed ground has vegetated and stabilised. Regular daily checks will be undertaken.

Management of invasive alien species

To avoid the introduction, establishment and spread of invasive species in and to the proposed CGEP Development during the construction phase, the following measures shall be attended to:

- Prior to arrival of vehicles that will be kept on the site for extended periods e.g. earth moving machinery, the contractor's vehicles and equipment will be thoroughly cleaned and then dried using high-pressure steam cleaning, with water >65 °C, in addition to the removal of all vegetative material. Items difficult to soak/spray will be wiped down with a suitable disinfectant (e.g. solution of 1% Virkon® Aquatic);
- Evidence that all machinery has been cleaned will be required to be on file for review by the statutory authorities. The level of evidence required of the Contractor will be actual registration plates of vehicles onsite and a register of when, how and where each of these were cleaned before they arrived on site;
- The flagmen, which will be present at each active site access points, will be responsible for inspecting and cleaning delivery vehicles both entering and exiting the site, and will receive training in the correct techniques;
- Each flagman will be equipped with a 'disinfection box'. This will contain Virkon® Aquatic or another proprietary disinfectant, a spraying mechanism, cloths or sponges, a scrubbing brush and protective gloves. Protective gloves will be worn when using any disinfectant solution;
- Visual inspections will be carried out on all machinery and equipment (particularly for machinery and equipment exiting the site and which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the Temporary Compound at the end of the work day;
- No removed material or run-off will be allowed to enter a water body of any sort;
- Following cleaning, all equipment and vehicles will be visually inspected to ensure that all adherent material and debris has been removed manually;
- Records of supplies and cleaning of delivery vehicles will be kept by the flagmen and will be regularly inspected by the Environmental Clerk of Works; and
- Spot checks on the adequacy of cleaning will be carried out by the Project Ecologist.
- The above measures may not apply for vehicles that require regular on and offsite movements e.g. deliveries of cement during construction. These vehicles are highly unlikely to be at risk of contamination/ contact with aquatic habitats or invasive species. Before deliveries start the site EcoW/ Environmental Manager will review quarries supplying cement to confirm if the above disinfectant measure applies.

4.3.4.3 Mitigation Measures – TDR

Mitigation Measures for Invasive Species

Detailed mitigation measures to manage invasive species in particular Japanese Knotweed will follow similar approaches for minimising risk of invasive spread, as outlined above for CGEP and GCR.

Prior to the clearing of vegetation or trees, confirmatory surveys will be conducted to ensure that no resting/breeding places of protected mammals are within the area of clearance.

Sections of hedgerow scheduled for removal and/or trimming and containing mature trees suitable for nesting Barn Owls will be surveyed prior to construction for occupancy by Owls. Should Owls be present then minimum protection zones as outlined in published guidance will be adhered to for the period of construction (Shawyer, 2011).

The TDR will be used during the decommissioning phase, to remove the turbines from sites. Trees and vegetation may be required to be trimmed back or possibly removed in certain locations (nodes) similar to the construction phase.

The TDR may be used during the decommissioning phase, to remove the turbines from sites. Trees and vegetation may be required to be removed.

General Measures for Preventing the Spread of Non-Native Invasive Species

Communication

- Informing all site staff through toolbox talks as part of site inductions;
- Raising awareness of site workers through tool box talks given by a suitably qualified person as part of site introduction; informing workers what to look out for and the what procedure to follow if they observe an invasive species.

Advance planning and incorporation into works schedule

- Constraints and invasive species mapping will be consulted at the planning stage for works to be undertaken in each area, to ensure all parties are aware of the species present, their locations and extents and the measures required to eradicate, control and/or prevent the spread of each species as applicable.
- Treatment measures will be incorporated into the construction programme where treatment will progress in conjunction with works.
- Where treatment will progress independent of other works, the same consultation and advance planning will also be required.

Pre-works survey and establishment of exclusion zones

- A preconstruction/pre-treatment survey of each area will be undertaken prior to implementation of treatment measures and/or construction works to confirm the locations of invasive species and communicate these to supervisors and operatives involved in treatment and works.
- Exclusion zones will be established where necessary at this stage. Fencing, clear signage and good housekeeping within the site to prevent spread.

- No machinery or personnel will be allowed within exclusion zones, other than where necessary to undertake treatment measures. Similarly, there will be no storage of materials within or adjacent to exclusion zones.

Disposal of cut material

- Where mechanical control by cutting has been undertaken, it may be possible to mulch wood where re-growth from vegetative material will not take place.
- All other plant material arising from mechanical control may be stored in a controlled manner on-site, or disposed of appropriately off-site,
- If retention on-site is required, material will be kept in a secure area onsite for composting and herbicide treatment where necessary.
- This material will be monitored for re-growth, which will trigger targeted herbicide application where necessary. No vehicles or operatives other than those involved in invasive species management will enter this area and no other materials will be stored here.
- Where off-site disposal is used, material will be transported off site by an appropriately licensed waste contractor and disposed of properly at a suitably licenced facility.

Re-vegetation

- Where invasive species have been physically removed and disturbed soil, this soil will be seeded or replanted (including 5cm deep mulch) with native plant species. This will prevent the easy colonisation of bare soil by invasive species in the area.

Good hygiene

- Ensure good hygiene practices when working with invasive species:
  - Remove the build-up of soil on equipment
  - Keep equipment clean
  - Do not move fouled equipment from one site to another.
- Where necessary a pressure washer will be used to wash the build-up of soil, clean equipment and vehicles. The water arising from washing will be contained to avoid the further spread of species within the site.
- Biosecurity measures required for working near water (intertidal areas) and protected species within the site e.g. receptor sites for rare plants, the pNHA, etc.

Table 4-1: Species-specific invasive species

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
Japanese Knotweed (*Fallopia japonica*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. While the stand is >7m outside of the proposed works footprint and will not be interfered with, a buffer of 7m around the stand will be put in place to demarcate this and ensure there is no interference with the area. This will be put in place prior to construction. Roots 1-3 m deep and up to 7 m lateral spread.	By clearly marking the area to avoid, it will avoid accidental interference with the area, and the risk of spreading the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this buffer.
Winter Heliotrope (*Petasites fragrans*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. As this species spreads vegetatively via rhizomes, the risk of spread through unregulated soil movements is high. Where the infested area can be retained in situ, burial under minimum 1.5m of soil is sufficient. Areas which will be required to be excavated will require treatment with herbicide prior to movement. Following treatment, soil from these areas can be re-used, but not as topsoil and will be required to be buried at a depth of minimum 1.5m.	The species covers a bank at node 2.0 and 2.4 and is within the bank regrading footprint and load-bearing footprint of these nodes. Implementing this mitigation will prevent the spread of the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	Spraying will be carried out using glyphosate-based herbicide after flowering in February to March or midsummer or later but before the foliage begins to die back (NRA, 2010). The following general recommendations will be adhered to: • Establishment of a 1m buffer zone around all growths prior to operations; staff shall be made aware of this buffer zone when working within infested areas. • Construction works will not be allowed within exclusion zones until treatment procedures have been followed. • No treatment measures to take place in these areas without supervision and agreement by appointed ecologist/eradication specialist. • All machinery and vehicles operating within areas of infestation will be thoroughly checked and if necessary, cleaned prior to leaving the area to protect against further spreading of Winter Heliotrope. • No material shall be taken from areas of infestation except in accordance with the measures outlined above. All material will be either deep buried (1.5m) or transported by		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	an appropriately licensed waste contractor and received by an appropriately licensed facility. • Wheel washes shall be put in place at infected areas. Waste water from these facilities will need to be stored and treated to avoid further spread. • If operating within an area of known infestation all machinery, vehicles, equipment, foot ware and clothing will need to be cleaned thoroughly (if necessary using steam cleaners) in a contained area to avoid further contamination. • The contractor must appropriately dispose of winter heliotrope plant material and soil containing plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 1.5m, or by incineration (having regard to relevant		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.		
Old Man's Beard /Traveller's Joy (*Clematis vitalba*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. Two options for the treatment of Old Man's Beard at the site have been proposed. These options shall be used to eradicate Old Man's Beard from the site and avoid the spread of the species. The following general recommendations will be adhered to as part of the plan: ***Option 1*** – Physical removal Seedlings can be pulled out of the ground and larger plants can be cut to the stem (and foliage will die) and roots and stem removed. Roots can then be grubbed out with material stored above the ground, so plants cannot take root again. For more mature plants, the stem can be cut near ground level and herbicide	The species is present in a 5x2m patch within the load-bearing and vegetation clearance footprint at node 1.3, as well as within sections of hedge at node 2.3 adjacent to the vegetation clearance footprint. Implementing this mitigation will prevent the spread of the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	applied to the outer rim of the stem. The stem is likely to produce regrowth in the next growing season and herbicide will need to be applied to this growth. Glyphosate can be used in late spring and summer and Triclopyr can be applied in summer. This is the preferred option where plants infest the crowns of trees. ***Option 2*** – Chemical control Growths at ground level can be treated with herbicide, using spray application where native species are not present, or targeted application using a weed wiper where there is a risk of damage to non-target species. Re-survey to check for re-growth will be required in both cases. The contractor must appropriately dispose of Old Man's Beard plant material and soil containing plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	flower heads or seeds will be disposed of either by composting or burial at a depth of 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.		
Himalayan honeysuckle (*Leycesteria formosa*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. Two options for the treatment of Himalayan honeysuckle at the site are proposed. These options can be used to eradicate Himalayan honeysuckle from the site and avoid the spread of the species: **Option 1** – hand pulling of seedlings Seedlings and/or small plants can be pulled out of the ground along with the root system (BMCC, 2015). **Option 2** – cut to base and treated with herbicide. More established plants can be cut to near ground level and the freshly cut wound immediately painted with herbicide (BMCC, 2015).	There is a single plant growing on top of a wall at node 2.2. While the latest swept-path analysis shows it is unlikely to be interfered with, the aforementioned mitigation will be included to prevent the spread of the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
Cherry laurel (*Prunus laurocerasus*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. Cherry laurel is spread vegetatively only and a buffer of 1m will be left to prevent damage to the plant which can result in the production of new stems which can make the plant more difficult to treat. Staff shall be made aware of this buffer zone when working within areas of infestation. Where the plant cannot be avoided, one of the following methods will be implemented: **Option 1** – Cut to stump and digging out stump This method involves cutting the main stem of the plant down near ground level and digging out the stump and any visible roots. This option is not practical in areas where there are other invasive plants present as the disturbed soil can allow for the setting of seeds or the spread of rhizomes of adjacent species (ISI, 2012b). **Option 2** – Cut to stump and treat stump with herbicide This method involves cutting the main stem of the plant down near ground level and applying herbicide to the freshly cut wound.	There are three young bushes present within the vegetation-clearance footprint at node 1.7. The species spreads vegetatively by suckering, or by seed.	

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	The herbicide concentrations used, and timings of applications vary according to which chemical is used. When treating many stems, vegetable dye added to herbicide is useful for highlighting the stems that have and haven't been treated. The use of a brush or other such applicator will provide an accurate application and prevent damaging adjacent non-target plants via spray drift. Please see table below for best treatment time (ISI, 2012b). ***Option 3*** – Cut to main stem and inject stem with glyphosate This method involves the 'drill and drop' method where the main stem is cut, and a hole drilled into the cut. This provides a targeted application of glyphosate (25% solution). The main drawback to this technique is that the plant is left in place to rot away; which can take a decade or more. Please see table below for best treatment time (ISI, 2012b). ***Option 4*** – Cut back to stump and spray regrowth with chemicals This application involves cutting a main stem down near ground level and then treating the new stems with herbicide. This method is the least effective as some stems may be missed and not		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	treated. Also, the application of herbicide is generally via spraying which can result in adjacent non-target plants being killed off. The contractor must appropriately dispose of excavated waste, including soils containing cherry laurel plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.		

Mitigation measures for the protection of watercourses

The following mitigation measures are proposed for the protection of watercourses:

Table 4-2: Mitigation Measures for the Protection of Watercourses

Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
All personnel working on site will be trained in pollution incident control response. Emergency Silt Control and Spillage Response Procedures contained within the Construction Environmental Management Plan (CEMP) will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt.	Ensure site operatives are informed and equipped to deal pollution incidents such as spillages or silt containment failures.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
A regular review of weather forecasts of heavy rainfall will be undertaken, and a contingency plan will be prepared for before and after such events.	Ensure works are not carried out during periods of heavy rainfall and ensure potential sources of siltation are secured in advance of heavy rainfall.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.

Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
Silt traps and silt fencing will be put in place in advance of excavation works at each node.	Ensure erosion control and silt arrest measures are in place in advance of works.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Nodes requiring temporary hardcore shall be capped as soon as practicably possible.	Cover exposed subsoils, thereby reducing the concentration of suspended solids in any run-off.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.	Allow repair and strengthening of silt interception measures if and where necessary.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.

Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
Refuelling of plant & machinery during planting will only be carried out at designated refuelling station locations within the wind farm site. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site.	Prevent fuels, oils or other contaminants from entering the drainage network.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site.	Prevent fuels, oils or other contaminants from entering the drainage network.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.

4.3.5 Soil Management Plan

This Soil Management Plan has been prepared for the development of the proposed CGEP. This plan should be read in conjunction with the CGEP EIAR. The Soil Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works.

It is intended where possible, to maintain an earthworks balance on site, with all excavated material re-used within the site where possible and minimising the need for removal of any materials for off-site disposal. This will minimise the amount of construction traffic on local roads and reduce the need for off-site disposal. This will in turn lead to the reduction of noise and dust associated with construction traffic.

There are 3 proposed borrow pits within the site that will provide general fill for construction. Where aggregate (structural fill) required for construction cannot be sourced from the onsite borrow pits it shall be imported from a licensed quarry.

Site Risk Assessment

The preliminary site-specific hazards have been identified for this site in Table 4-3. The hazards should be re-assessed prior to the commencement of construction on the site and these hazards should be communicated to all personnel entering the site. No site personnel should enter lands outside the scope of the project. The construction areas must be secured from public access at all times.

Table 4-3: Site Specific Ground Hazards – Soil Management

Site Specific Hazards	
Coom Green Energy Park	• Excavations (risk of falling) • Ground stability • Materials storage

Daily Preparation during the Implementation of the Soil Management Plan

The Geotechnical Engineer appointed by the contractor should conduct regular meetings with the Construction Management Team to discuss the phasing of soil management as the work progresses. The focus of these meetings will be on establishing an operational drainage system in advance of the progression of the works.

Particular regard will be taken of daily weather conditions and long-range forecasts. The Drainage Engineer should have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of receiving watercourses. Mitigation measures to protect receiving watercourses will be put in place as directed by the Drainage Engineer in advance of extreme forecasts.

Personnel Qualifications and Key Contacts

All those carrying out work on site must have a Solas/FÁS Safe Pass Card. All works must be supervised by a competent supervisor. Workers must be adequately trained in the tasks they are required to carry out. The key contact names and contact details should be supplied to all personnel entering the site. All site staff should be informed of the emergency procedures for the site. The Geotechnical Engineer should be contacted if there are any issues with soil/rock stability or other materials management issues.

Construction Stage Impacts

The main characteristics of the proposed Coom Green Energy Park that could impact on land, soils and geology are:

- Construction of wind turbine foundations and hardstanding areas
- Construction of access tracks
- Construction of on-site substation
- Cable trench and grid connection construction
- Soil and rock excavation/reuse

- Borrow pits excavation
- Temporary Material storage areas
- Drainage
- Vehicular movement
- Construction of temporary site compound

Construction Stage Mitigation Measures

Long range weather forecasts should be examined, and the construction phases planned taking cognisance of expected weather conditions. Regular meetings should be held to re-assess construction phases with weather conditions as the project progresses.

The works areas will be set out by the contractor and excavation plant will stay within the works corridor – to minimise tramping and compaction.

Regular meetings should be held between the Geotechnical Engineer appointed by the contractor and the contractor's Project Manager. The planning of traffic routes through the site should be agreed in advance, in order to plan appropriate soil management. The following soil management elements are to be implemented in advance of construction:

- Materials excavated during the construction phase will preferably be use for landscaping on an ongoing basis. Soils excavated for turbine foundations will be stored adjacent to those excavations for reuse as ballast, berms and landscaping.
- The soils will be stored in an environmentally safe manner that will not result in the pollution of waters or the smothering of ecologically sensitive habitats.

The following measures will be implemented to ensure this occurs:

- All materials will be stockpiled at low angles (< 10°) to ensure their stability.
- If necessary, mineral soils will be covered while stored to minimise run-off.
- Sediment management systems, such as silt fencing, will be provided around the storage areas where necessary.
- Drainage systems will also be utilised in mineral storage areas where necessary.

Topsoil / peat will not be transported across land ownership boundaries – as a disease control measure.

Excavated material will be mostly used to reinstate the turbine foundations. The balance of excavated material will be used to reinstate the borrow pit and for general landscaping. Turbine foundations will be reinstated during and upon completion of the construction works.

Natural re-vegetation is the preferred method of restoration, however, if this is not possible, the re-vegetation process can be encouraged with the use of native grass seed or other suitable planting measures during the growing season. No spoil stockpiles will be left on site after construction is completed. Areas disturbed during construction will be landscaped using locally recovered topsoil to merge with the contours of the existing topography.

Excavations will be carried out from access tracks, where possible, in order to reduce the compaction of topsoil. All excavations will be constructed and backfilled as quickly as possible. Open excavations will be made safe with adequate signage and barriers where necessary and excavation work will not take place before, during and immediately after heavy rainfall.

Due to the possibility of soil-borne diseases, all topsoil excavated at a farm property will remain on the same property. Topsoil will be used for landscaping berms alongside existing and new access tracks where suitable and will also be used for reinstatement purposes around turbine bases and hardstandings. Where a property also includes a borrow pit, some of the topsoil will also be used to help in the reinstatement and revegetation of the borrow pit.

The contractor's project manager will be responsible for ensuring that the earthworks are done in accordance with the requirements of this plan. The temporary storage areas and the restoration of vegetative material will be inspected regularly from an ecological and water quality perspective.

With regard to slope stability issues, detailed design best practice will be implemented as follows:

- The works will be designed and supervised by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer.
- Drainage infrastructure will be put in place in advance of turbine excavations. Drains will divert surface water and groundwater away from excavations into the proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will be avoided.
- Loading or stockpiling on the surface of soft ground will be avoided. Loading or stockpiling on other deposits will not be undertaken without first establishing the adequacy of the ground to support loads by an appropriately qualified geotechnical engineer experienced in construction within upland conditions.
- Turbines located in areas adjacent to peat deposits will incorporate drainage measures such that surface water will be drained away from the peat and will not be allowed to collect adjacent to the peat mass.
- Excavation will be carried out from access roads or hardstanding areas to avoid tracking of construction plant across areas of soft ground/peat.
- A detailed assessment of the stability of conditions at proposed infrastructure locations will be undertaken by a suitably qualified and experienced geotechnical engineer prior to the commencement of all excavations to ensure these activities do not result in or contribute to slope failure.
- Blasting of rock will not be permitted.
- Excavations which could have the potential to undermine the up-slope component of an existing slope will be sufficiently supported to resist lateral slippage and careful attention will be given to the existing drainage.
- Where possible, earthworks will not be commenced when heavy or sustained rainfall is forecast. A rainfall gauge will be installed on site to provide a record of rainfall intensity. An inspection of site stability and drainage by the Geotechnical Engineer will be carried out on site when a daily rainfall of over 25mm is recorded on site, works will only recommence after heavy rain with the prior approval of the Geotechnical Engineer following their inspection.
- An emergency plan will be developed at pre-construction stage outlining the action plan which would be implemented in the unlikely event of a landslide/slope failure. Should a landslide/slope failure occur or if signs of instability/ground movement are observed, work will cease immediately.

4.3.6 Surface Water Management Plan

A Surface Water Management Plan (SWMP) has been prepared for the project and is contained in Appendix 1 of this CEMP.

The Surface Water Management Plan should be read in conjunction with the EIAR. The Surface Water Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works.

4.3.7 Waste Management Plan

It will be the objective of the Developer in conjunction with appointed contractor to prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy, as enshrined in the Waste Management Act 1996, as amended.

Any waste generated during the development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compound during construction.

This Construction Waste Management Plan has been prepared for the proposed CGEP in line with the ”Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects” (2006) as published by the Department of the Environment, Community and Local Government and supported by the Eastern-Midlands Region Waste Management Plan 2015-2021.

The Waste Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works and will take cognisance of the replacement plan for the Southern Region. This plan should be read in conjunction with the EIAR.

Assignment of Responsible Personnel

It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for the management of waste. The waste manager will have overall responsibility to instruct all site personnel including sub-contractors to comply with on-site requirements. They will ensure that at an operational level that each crew foreman is assigned direct responsibility.

Waste Generated

It is envisaged that the following categories of waste will be generated during the construction of the project:

- municipal solid waste (MSW) from the office and canteen
- construction and demolition waste
- waste oil/hydrocarbons
- paper/cardboard
- timber
- steel

A fully authorised waste management contractor will be appointed prior to construction works commencing. This contractor will provide appropriate receptacles for the collection of the various waste streams and will ensure the regular emptying/and or collection of these receptacles.

Waste Minimisation/Reduction

All efforts will be made by site management to minimise the creation of waste throughout the project. This will be done by:

- material ordering will be optimised to ensure only the necessary quantities of materials are delivered to site
- material storage areas will be of a suitable design and construction to adequately protect all sorted materials to ensure no unnecessary spoilage of materials occurs which would generate additional waste
- all plant will be serviced before arriving on site. This will reduce the risk of breakdown and the possible generation of waste oil/hydrocarbons on site
- all operators will be instructed in measures to cut back on the amount of wastage for trimming of materials etc. for example cutting of plywood, built into the amount ordered
- educating foremen and others to cut/use materials such as ply wisely for shutters etc.
- prefabrication of design elements will be used where suitable to eliminate waste generation on site
- where materials such as concrete are being ordered, great care will be practiced in the calculation of quantities to reduce wastage.

Waste Reuse

When possible, materials shall be re used onsite for other suitable purposes e.g.

- re-use of shuttering etc. where it is safe to do so
- re-use of rebar cut-offs where suitable
- re-use of excavate materials for screening, berms etc.
- re-use of excavated material etc. – where possible will be used as suitable fill elsewhere on site for the new site tracks, the hardstanding areas and embankments where possible.

Waste Recycling & Recovery

In accordance with national waste policy, source separation of recyclable material will take place. This will include the provision of receptacles for the separation and collection of dry recyclables (paper, cardboard, plastics etc.), biological waste (canteen waste) and residual waste.

Receptacles will be clearly labelled, signposted and stored in dedicated areas.

The following sourced segregated materials container will be made available on site at a suitable location:

- timber
- ferrous metals

- aluminium
- dry mixed recyclables
- packaging waste
- food waste.

The materials will be transported off-site by a licensed contractor to a proposed recovery centre and these materials will be processed through various recovery operations.

Waste Disposal

Residual waste generated on-site may require disposal. This waste will be deposited in dedicated receptacles and collected by the licensed waste management contractor and transported to an appropriate facility. All waste movements will be recorded, of which records will be held by the waste manager on-site. Nearby waste facilities and the types of waste they accept are listed in Table 4-4.

Table 4-4: Nearby Licensed Waste Facilities

Facility	Type of wasted accepted
McGill-Glenville	Compostable waste
Red Fox	Recyclables, non-recyclables, wood, metal, rubble, junk removal
Ashgrove recycling	Construction waste, metal, wood, soil, rubble, plastic
Munster waste management	Domestic, commercial, industrial, agricultural
Enva	Construction waste, general waste, hazardous waste
Raffeen civic amenity site dump	Paper, cardboard, metal, green waste, plastic, waste oil, glass, timber

Contaminated Material

Any contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste. In particular, the following measures will be implemented:

- Contaminated material will be left in-situ and covered, where possible until such time as WAC (Waste Acceptance Criteria) testing is undertaken in accordance with recommended standards and in-line with the acceptance criteria at a suitably licenced landfill or treatment facility. This will determine firstly the nature of the contamination and secondly the materials classification i.e. inert, non-hazardous or hazardous,

- If the material is deemed to be contaminated, consultation will take place with the respective local authority and/or EPA on the most appropriate measures.
  Such materials will be excavated, transported by a contractor with a valid waste collection permit and recovered/disposed of at an appropriate facility.

Training

Copies of the project waste management plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed about the objectives of the Plan and informed of the responsibilities that fall upon them as a consequence of its provisions.

It will be the responsibility of the contractors appointed (Waste Manager) to ensure that all personnel are made aware of their responsibilities under the plan via a toolbox talk or otherwise.

4.3.8 Traffic Management Plan

This document is the Construction Traffic Management Plan (TMP) for the proposed Coom Green Energy Park, Co. Cork. The Construction Traffic Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works and the turbine supply contract.

Please note that some items in this plan can only be finalised with appropriate input from the contractor who will actually carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

This plan should be read in conjunction with Chapter 13 of the EIAR.

The contractor is required to prepare the necessary Site-Specific Traffic Management Plans prior to the construction works commencing in accordance with Chapter 8 of the Traffic Signs Manual and subject to load permits.

The contractor will be responsible for the implementation of all agreements between the developer and the County Council with the objective that the transportation needs for the proposed project will have a minimal impact on the road network and local communities.

As with any construction development project, the transport of materials onto the site will give rise to increased traffic and associated impacts. However due to the very nature of construction these impacts will be temporary.

Construction traffic will require regular access to the site at varying times throughout the construction phase. The aim of this TMP is to put in place procedures to manage traffic effectively on site and in the immediate vicinity of the main energy park site, to ensure the continued movement of traffic on the public roads and to minimise disturbance during transportation of materials particularly oversize loads. The correct implementation of this TMP will ensure that appropriate procedures are in place to minimise any effects on the safety and movement of the general public.

Prior to the commencement of construction, the TMP will be reviewed by the main contractor (and any sub-contractors) and will be updated as necessary.

General Traffic Management Measures

General traffic management measures for the project are set out as follows:

1. **Traffic Management Coordinator** - A dedicated competent Traffic Management Coordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management on the project.
2. **Road to be used and not used** - The final TMP will clearly identify those roads that will be used to access this project and those roads that are not to be used. In some cases, the An Garda Síochána and the roads authority may direct/agree that certain roads cannot be used for laden HGV's but can be used for LGV's or unladen HGV's.
3. **Proposals for one way systems on local roads** – in acknowledgement of the fact that some of the local roads are relatively narrow and generally not conducive to 2-way construction traffic movements, a system of one way construction traffic movements will be implemented for sub-sections of the wind farm construction works which will temporarily use the local road network. Confirmatory details of these traffic plans will be agreed in advance of construction of these sub-sections of the wind farm with the roads authority.
4. **Road Pre-and Post-Construction Condition Survey** - A pre-condition survey will be carried out on all public roads that will be used in connection with the works to record the condition of the road before the works commence. A post construction survey will also be carried out after the works are completed. The specification and timing of the surveys will be agreed with the roads authority. Joint surveys shall be undertaken if the roads authority so requires/agrees.
5. **Road Reinstatement** – As agreed with Cork County Council, all roads will, upon completion of the construction works, be expeditiously reinstated to their pre-works condition or better and to the satisfaction of the relevant roads authority. If, during the course of the construction works, some of the roads used in connection with the development are damaged then these roads will be made good to the satisfaction of the roads authority without delay.
6. **Site Inductions** - All workers will receive a comprehensive site induction which will include, as appropriate, a section on traffic management and clear guidance on the routes to be used/not used.
7. **24 Hour Emergency Phone Number** - A 24-hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for cable works) and at t site entrance and borrow pit road crossing at a minimum.
8. **Orderly Traffic Management** - All necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual as published by the NRA/Department of Transport.
9. **Letter Drops** - Subject to agreement with the planning authority, a letter drop will be carried out to notify members of the public living near the proposed site/route/roadworks where necessary, to advise them of any particularly significant upcoming traffic related matters e.g. temporary lane/road closure (if required) or delivery of turbine components at night.
10. **Clear signage** - A system of clear signage relating to the project, both temporary and permanent will be agreed with the planning authority. These signs will also identify those roads to be used (and not to be used) for accessing the site in line with the objectives of the TMP.
11. **Wheel washing facilities** - temporary wheel washing facilities will be located at the site entrance, subject to agreement with the planning authority, to prevent soil/dirt from being transported onto the public road network.

12. **Road sweepers** will be utilised where required to maintain the public roads in a clear condition, and this will apply especially during the earthworks stages of the project.
13. **Site Entrances** will be secured and locked when not in use. Where required, the entrance will be controlled by flagmen to assist traffic movements.
14. **Temporary Road Crossing Points –** Where the internal wind farm track crosses the local road network, this junction will be managed appropriately to allow the safe passage of construction vehicles in, out and across these junctions. Priority at these crossings will be maintained for public traffic. These crossing points will be gated and locked each evening. Where access roads cross existing roads, a concrete apron will be provided during the construction phase, constructed 40mm below road level and overlaid with surface course material on completion of the works. Following the completion of the construction phase the crossing point will be removed i.e. through traffic will not be permitted. For the borrow pit haul road crossing, the above mitigation measures will apply however upon completion of the works the road verges and hedgerow breaks will be reinstated and permanently closed off.
15. **Abnormal Load Deliveries:** Abnormal loads will require an abnormal load permit prior to delivery and will be delivered at times and frequencies directed by An Garda Siochána.

Mitigation measures specific to grid connection works include:

Road Opening Licence: The road works associated with the grid connection cabling will be completed in line with the requirements of a road opening licence as agreed with the local authority.

Route Proofing: In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed. This will include slit trenching with the aim of minimising the construction impacts and avoiding existing services in the road.

Maintaining Local Access: reasonable access to local houses, farms and businesses will be maintained at all times during any road closures associated with the grid connection works. The details of this will be agreed with the roads authority in advance of the grid connection works commencing.

Road Cleanliness: Appropriate steps such as wheel washing and regular maintenance of internal access road surfaces will be taken to prevent soil/dirt generated during the works from being transported on the public road. Road sweeping vehicles will be used if necessary, to ensure that the public road network remains clean.

Temporary Trench Reinstatement: Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority.

Surface Overlay after Trench Reinstatement: following temporary reinstatement of trenches on public roads, sections of the public roads will receive a surface overlay. Details to be agreed with the roads authority At a minimum they will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

Haul Route Interface: aggregate imported to the wind farm site from local quarries will be managed to ensure they do not conflict with the grid connection works. Grid connection works will be planned to avoid conflicts with other major activities on the main construction site such as concrete foundation pours and large component deliveries. Measures contained within the construction stage CEMP and TMP will ensure no conflicts occur between felling and construction operations.

On the local road from Knockacullata to Knoppoge, it is anticipated that grid cable installation will involve short rolling temporary road closures over approximately 7km. A diversion route will be used via the Knockacullata to Slumberhill Road.

As described in Section 13.4 Horizontal directional drilling operations will be required at a number of locations along the grid connection route between Knockacullata and Barrymore. These activities are isolated and carried out in under a day at each location. It is expected that a temporary road closure will be required for 2 no. of these locations where the cable will cross existing watercourses by this method.

Where the grid connection route crosses the M8 motorway, horizontal directional drilling (HDD) will be used. The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage, foundations or surface of the motorway. Locations of proposed launch and reception pit locations are shown in Plate 4-1.



Plate 4-1: Launch and Exit Locations for HDD Operations under M8 Motorway

The existing structures will be protected, and adequate separation will be maintained from and under the existing structures. Traffic management and licensing will be required to install these ducts which will likely take place during one mobilisation ahead of the grid trenching work.

Mitigation measures proposed for the turbine delivery route include:

- **Programme of Deliveries**: a programme of deliveries will be submitted to the roads authority in advance of deliveries of turbine components to the site. The programme will include details of the dates and times of each component delivery along with the route to be taken.

- Turbine component deliveries will be carried out at night during off-peak times and will be done using a convoy and a specialist heavy haulage company.
- **Garda Escort**: Turbine deliveries will be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.
- **Reinstatement**: Any area affected by the works to facilitate turbine delivery will be fully reinstated to its original condition unless agreed otherwise.
- **Consultation**: Consultation with the local residents and Cork County Council are included in the traffic management plan to manage turbine component deliveries.

Decommissioning Phase

The traffic impact associated with the decommissioning phase will be significantly less than the construction phase.

All decommissioning works are to be carried out in accordance with a decommissioning plan to be agreed with the planning authority in advance of the decommissioning works. Traffic management measures identified will be included in the decommissioning plan for the wind farm.

Infrastructure associated with the grid connection will form part of the national transmission network and will be left in-situ. Therefore, no impacts are envisaged upon decommissioning of the main energy park development and no mitigation is required.

Traffic and transportation impact mitigation for decommissioning of the energy park will be the same as those identified here for construction stage works and will be tailored to suit the existing environment conditions of the day and technology available.

Construction Staging

The approximate period of construction for completion of the total scheme is estimated to take 24 months. Once the bulk civil works are completed, grid connection works will take place, followed by an element of testing and commissioning of the energy park and substation. It is anticipated that traffic associated with this element of the works will be minimal, with between 2 and 4 crew vans accommodating the movement of staff to and from the different sites within the Coom Green Energy Park.

The construction of Coom Green Energy Park will generally include a sequence of distinct construction activities:

- Construction of main road access and site entrances.
- Initial installation of on-site access tracks and fence lines.
- Development of the construction compounds and other temporary works.
- On-site tracks and drainage.
- Preparation of crane hard standings.
- Construction of foundations.
- Installation of cabling within the site
- Installation of Wind Turbine Generators (WTGs).
- Installation of cabling, substation and control building.

- Installation of cabling, substation and control building.
- Grid connection works.
- Land reinstatement.

Construction Plant and Vehicles

The typical construction plant and vehicles used as part of the construction of a green energy park are as follows (non-exhaustive):

- Hydraulic Excavators
- Dump Trucks
- General construction delivery vehicles (e.g. steel reinforcement bar, electrical components etc.)
- Concrete trucks and pumps
- Cranes of various lifting capacities (up to 1000 tonnes)
- Oversized articulated delivery vehicles (for turbine component transport)
- Site Jeeps (off-road 4x4 all purpose vehicles)
- Private vehicles of those employed on site for the construction phase.

It should be noted however that final selection of construction plant and vehicles may vary depending on suitability, availability, contractor's choice, etc.

Plant operators will be responsible for the upkeep and maintenance of construction plant and vehicles, ensuring good working order prior to use. Should emergency maintenance need to be carried out on site, this will be carried out at a designated area away from sensitive receptors and will ensure that a spill kit is nearby.

The hours of construction activity will be limited to avoid unsociable hours as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997. Construction operations shall generally be restricted to between 08:00 hours and 19:00 hours Monday to Saturday. It should be noted that it may be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Additional emergency works may also be required outside of normal working hours as quoted above.

Construction commencement dates are yet to be confirmed at this stage; these will be made known to the Planning Authority by way of formal Commencement Notice.

Construction Compound

The locations of the construction compounds are shown on the site layout, Figure 1-2.

Consultation and Notification

An Garda Síochána

Following the appointment of the successful contractor for this project, this Traffic Management Plan shall be finalised following the appointment of the contractor for the main construction works. The contractor will liaise directly with An Garda Síochána in relation to the plan and any concerns/requirements they have will be incorporated in to the plan. This may include details in relation to the escorting of oversized loads.

The necessary permits (including approved route permits) will be applied for and obtained from An Garda Síochána.

Cork County Council

The contractor will liaise directly with the County Council in relation to the plan and any concerns/requirements they have will be incorporated into the plan. The contractor will also liaise with other local authorities, as necessary, along the final turbine delivery route.

The necessary permits (including standard permits) will be applied for and obtained from the relevant local authorities.

Local Residents

The following measures will be used to communicate the necessary information to the households along the local road to be used as a haul road:

(a) Information signs will be erected in advance of the construction/transportation works.

(b) A flyer drop will be carried out to advise households along the local road leading to the site in relation to the programme of construction works and especially in relation to oversized load movements.

(c) Contact details for a Liaison Officer will be provided so that any concerns can be easily channelled to the Developer.

Complaints will be entered into the site complaints log and the relevant site environmental officer will arrange to meet with those affected. The situation will be acted upon immediately and reviewed by the Project Manager.

Key Personnel and Responsibility

Once prepared and agreed with the local County Council and An Garda Síochána the contractor will implement the project specific Traffic Management Plan (TMP).

Please note that some items in this plan can only be finalised with appropriate input from the contractor who will carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

Typically, the following members of the contractors' staff will have responsibility for adherence to the TMP as follows:

Traffic Management Coordinator

The Traffic Management Coordinator will be responsible for maintaining regular contact with An Garda Síochána, The local County Council, the statutory bodies and the client concerning traffic control, interference with services and co-ordination of crossings at roads, rivers and railways.

The Transport Officer will contact the relevant bodies in relation to method statements prior to the work taking place. The Transport Officer will be responsible for instructing the Construction Manager, Foreman and all other personnel on the information in the agreed method statement prior to the work commencing and ensuring that the method statement is adhered to.
The Transport Officer will be responsible for ensuring that the Traffic Management Plan will be implemented in full.

Safety Officer

The Safety Officer will be responsible for implementing all safety requirements detailed in the Project Safety Plan. Ensure that all operatives receive site safety induction prior to commencing work on site. He will ensure that all plant, particularly lifting equipment, on site has the relevant certification and are checked regularly by a competent person. The Safety Officer will carry out safety audits and checks on a regular basis and amend procedures where necessary.

Construction Manager

The Construction Manager will be responsible for overall supervision of the operations to ensure they are constructed in a safe and efficient manner. He will ensure that sufficient resources are available to meet the programme and that the necessary information is provided to the appropriate staff.

Foreman

The Foreman is responsible for ensuring that the crew carry out the work in accordance with the method statement and contract specifications and drawings using good working practices in a safe manner. He will supervise construction personnel ensuring their competence. He will check all plant and equipment on a regular basis ensuring it is maintained and in good working order.

Wind Turbine Generator Deliveries

The components of up to 22 no. Wind Turbine Generators (WTG's) will be transported by road to the main energy park site for on-site assembly, using the access route outlined in the above Turbine Delivery Route Assessment Report.

Wind turbine component deliveries, cranes and all large plant associated with turbine installations will use the turbine delivery route.

It is expected that the turbines will be delivered in sections to the site as follows:

- Foundation anchors x 1
- Towers x 3/4
- Blades x 3
- Hub x 1
- Nacelle x 1
- Switchgear Components x 1

Restricted Public Road Use by Construction Traffic

The local authority may impose restrictions on the use of some local roads. These will be agreed in liaison with Cork County Council prior to construction and will be outlined in this section, as well as specific signage requirements for construction works.

Some of the existing local roads are narrow, and to this effect, one-way delivery and access route systems may be employed to mitigate against unsuitable two-way construction traffic. Using local roads is unavoidable, however, introducing a one-way system where necessary and restricting construction traffic access to a small number of roads will minimise disruption to the local community.

Materials will be delivered to site via the haul routes shown in Figure 3-1.

Road Closures, Diversions and Safety Measures for Road Crossings

It is envisaged that road closures will be necessary for the carrying out portions of the cable trenching, with the majority of the proposed cable trenching taking place on existing local roads. The consent of Cork County Council will be required and the necessary road diversions together with the appropriate signage will be put in place. As there is a good network of local roads, it is anticipated that there are a number of options available for diverting traffic which will allow flexibility during this process of construction and maintain local access at all times during this element of the works.

It is proposed to maintain local access at all times during this element of the works. It is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions. Diversion signage should also be included.

Safety measures for road users adjacent to deep excavations, such as temporary concrete barriers should be detailed for Trenchless Road Crossings in advance of construction and agreed with Cork County Council.

Road Cleaning

Public roads shall be kept free of mud, dust, spillages and debris from the construction site, construction plant or haulage vehicles. Any necessary measures shall be put in place at the site entry/exit points.

Carriageway/ Road Reinstatement

It is anticipated that the proposed haul routes will be capable of accommodating the construction traffic associated with the project. After the main contractor is appointed and the haul routes are agreed with Cork County Council. In the event that there are concerns around the structural capacity of a road on a proposed haul route, a structural survey shall be carried out to determine suitability of the existing roads to carry the loading. Where the structural survey indicates that a proposed haul route is not in a suitable condition, details of any upgrading works required shall be submitted to Cork County Council for approval. The developer shall upgrade the road or junction in advance of haulage operations.

A pre-condition survey of haul routes, consisting of a video survey and photographs shall be carried out and a copy submitted to Cork County Council. Any damage caused to the road shall be repaired to its previous condition, to the satisfaction of Cork County Council. Any defects that appear during the haulage period shall be rectified by the project owner.

Additional Information and Mitigation Measures

There is potential that other developments could create cumulative traffic and transportation related impacts with CGEP if not adequately planned for. The above measures set out in this TMP will insure conflicts with these developments will be avoided.

Cumulative existing and proposed developments include the following:

Bottlehill Landfill

One of the western access points for CGEP is located at the Bottlehill Landfill site (off the L-1217 local road). The site entrance here will accommodate access to the Bottlehill part of the site for standard construction vehicles. Vehicles entering the site at this point shall only have the right to access turbines T2 – T7.

While the first phase of the landfill has been constructed, it is currently not operational. At the time of writing it is unknown when the landfill will begin receiving waste.

It is not expected that landfill operations would conflict with turbine deliveries or construction of the grid connection route as there would be insufficient interaction to create a cumulative impact.

Existing Forestry Activities

Existing forestry operations consist of low numbers of HGV's periodically entering and leaving the site with the average number of HGV trips associated with these activities amounting to approximately 32 loads per week or up to 13 HGV trips per day.

The following sawmills are located in the vicinity of the proposed development.

- Duhallow Sawmills Limited, Dromagh, Co. Cork;
- Walsh Sawmills, Kildorrery, Co. Cork;
- Sheehan Patrick Sawmills Ltd., Ballyporeen, Co. Tipperary;
- Graingers Sawmills .GP, Enniskeane, Ballymoney, Co. Cork;

- Enniskeane, Timber Products Ltd., Ballineen, Co. Cork;
- Glennon brothers Cork Ltd, Farran South, Fermoy Co. Cork;
- GP Wood, Lissarda, Co. Cork.

All of the above sawmills are located close to national routes and area easily accessible from the project haul main transport routes via the N20, N72 and M8.

Replant Lands

Replanting works will take place at Moneygorm which is located adjacent to the proposed wind farm site. Works associated with replanting are expected to be very low. HGV traffic associated with replanting works involve the mobilisation of an excavator for drainage works (if required) and delivery of tree saplings by truck. The works can be carried out by a small team.

M20 Motorway Project

The M20 motorway project from Limerick to Cork is currently at feasibility stage. In the highly unlikely scenario that this project commences during the construction phase of CGEP there is the potential for a direct cumulative negative effect on the receiving environment in the form of increased construction traffic and disruption, especially on local roads near the proposed CGEP development site during construction of the section of motorway near the turn off for Bottlehill Landfill. It should be noted that expected impacts associated with the M20 development would have a considerably greater adverse effect on the existing road network than CGEP and would form vast majority of the overall cumulative impact.

M28 Motorway Project

The M28 Cork to Ringaskiddy Project is the upgrade of approximately 12.5km of the N28 National Primary Route from the N40 South Ring Road, at Bloomfield Interchange, to Ringaskiddy, Co. Cork.

Transport Infrastructure Ireland is the proponent of this project and the project has been included in the government's Infrastructure and Capital Investment Plan 2016 – 2021.

Construction is expected to take between 30 and 36 months and traffic impacts associated with the M28 development would have a considerably greater adverse effect on the existing road network in comparison to CGEP.

This project is over 20km from the proposed CGEP site. In the highly unlikely scenario that this project commences during turbine delivery for CGEP, the proposed roads scheme may result in a cumulative impact due to its interaction with the proposed TDR between Ringaskiddy and Dunkettle where the scheme terminates.

Dunkettle Interchange Upgrade Project

Transport Infrastructure Ireland (TII) has developed proposals to improve the Dunkettle Interchange which is located approximately 6km to the east of Cork City, just north of the Jack Lynch Tunnel.

The Interchange is strategically important as it is the intersection of a number of key national routes:

- The M8/N8 Dublin to Cork Road;
- The N25 Cork to Waterford Road; and
- The N40 Southern Ring Road (through the Jack Lynch Tunnel).

Construction of preliminary phases of the project has already commenced and the total duration of the construction works is expected to be 2.5 years. The construction of the interchange project will be carried out over several phases with traffic management measures in place to ensure continuous traffic flows in all directions through the junction during the construction works. A review of proposed designs for the revised junction indicates that the turbine delivery route and proposed mitigations outlined here will not be impacted by the new layout.

This project is over 18km from the proposed CGEP site. In the unlikely scenario that this project commences during turbine delivery for CGEP, the proposed roads scheme may result in a cumulative impact due to its interaction with the proposed TDR between Ringaskiddy and Silversprings where the scheme extends.

Consented Wind Turbine at Glannasack

A planning consent exists for a single wind development 1km from the site near Glannasack (planning ref. 11/06168). This consists of a single wind turbine of a smaller scale to those proposed at CHEP.

4.4 Environmental Management Team - Structure and Responsibility

A preliminary organisation chart is included in Figure 4-1. Revisions to the project organisation chart shall be controlled independently of this plan following the appointment of the Contractor for the main construction works.

The Contractor's Project Manager will be responsible for the delivery of all elements of the Environmental Management Plan.

The Contractor's Project Manager will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan throughout.

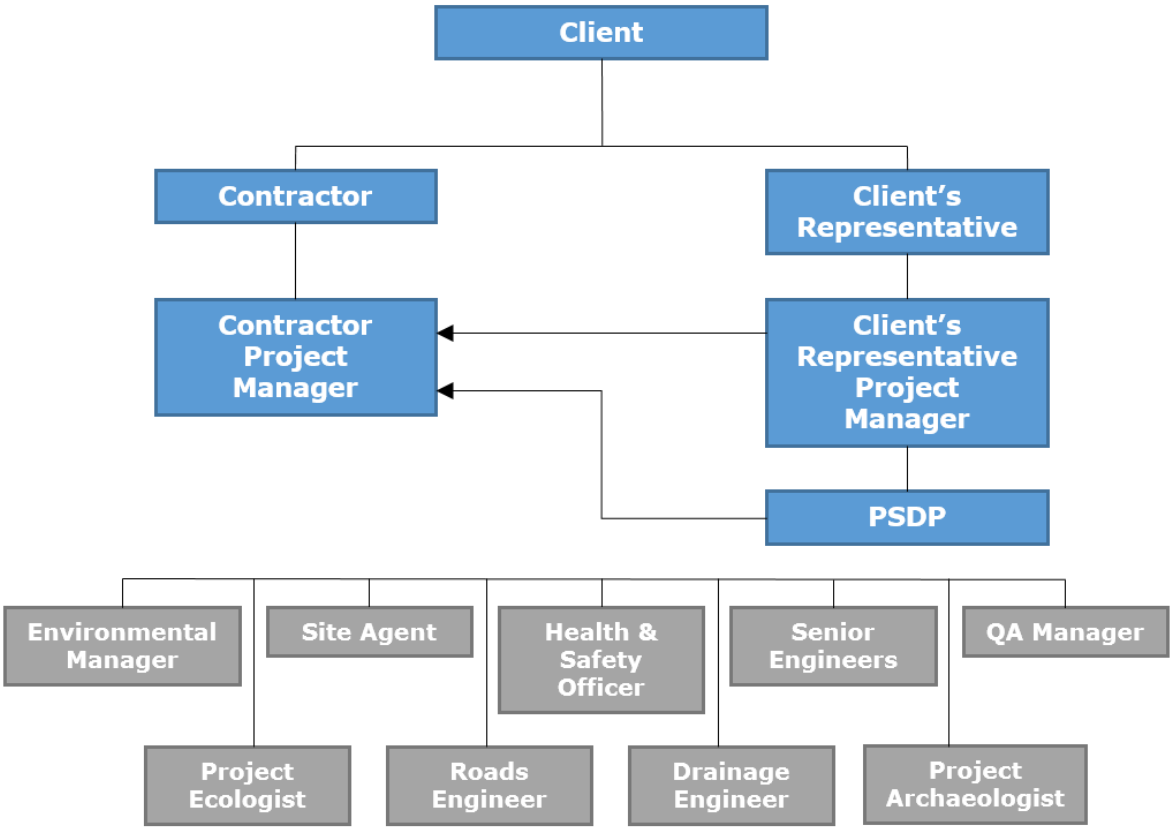


Figure 4-1: Project Management Team Organogram

4.5 Training, Awareness and Competence

All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information should be tailored to the scope of their work on site.

The contractor for the main construction works may decide to conduct the environmental awareness training at the same time as Health and Safety Training (often referred to as Site Inductions).

This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

The CEMP will be posted on the main site notice board during the project. The environmental performance at the site is on the agenda of the monthly project management meetings for the project.

Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the site.

4.6 Environmental Policy

The contractor is responsible for preparing and maintaining an Environmental Policy for the site. The policy should be appropriate to the project, commit to continuous improvement and compliance with legal requirements and provide a framework for objectives and targets. This will be communicated to all site personnel and will be available on site notice boards.

4.7 Register of Environmental Aspects

The contractor is responsible for preparing and maintaining a *Register of Environmental Aspects* pertaining to the site. This register will identify the environmental aspects associated with activities onsite and determine which aspects have or can have a significant impact on the environment.

4.8 Register of Legislation

The contractor is responsible for preparing and maintaining a register of key environmental legislation pertaining to the site. This register will reference all current environmental legislation and will be inspected, reviewed and updated regularly to ensure compliance.

4.9 Objectives and Targets

Objectives and targets are required to be set to ensure that the project can be constructed and operated in full accordance with the EIAR, planning conditions and legislative requirements, with minimal impact on the environment.

Environmental objectives are the broad goals that the contractor must set in order to improve environmental performance. Environmental targets are set performance measurements (key performance indicators or KPI's) that must be met in order to realise a given objective.

The contractor will set objectives based on each significant environmental impact. Key objectives are likely to include the following:

- To ensure that the rivers and streams are not negatively impacted by construction works.
- To ensure that humans are not negatively impacted by dust generated by construction works.
- To ensure that humans are not negatively impacted by noise or vibration generated by construction works.
- To ensure that impacts to habitats and wildlife are minimised during works.
- To ensure that a waste management plan for this site will be fully implemented.
- To ensure that the visual impact during the construction work is minimised.
- To ensure Coom Green Energy Park is constructed in compliance with the EIAR.

Performance in relation to each of these objectives will be reviewed on a regular basis by means of inspections, audits, monitoring programmes, etc.

4.10 Non-Conformance, Corrective and Preventative Action

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

Non-Conformance is the situation where essential components of the EMS are absent or dysfunctional, or where there is insufficient control of the activities and processes to the extent that the functionality of the EMS in terms of the policy, objectives and management programmes, is compromised. A Non-Conformance register should be controlled by the contractor.

The EMS and all its components must conform to the EMP, objectives and targets and the requirements of the ISO 14001 management standard.

In the event of non-conformance with any of the above, the following must be undertaken:

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

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

4.11 EMS Documentation

The Contractor is required to keep the following documentation in relation to the environmental management of the project (as a minimum):

- Construction Environmental Management Plan for Coom Green Energy Park
- Register of Environmental Impacts
- Register of Planning Conditions
- Monitoring Records
- Minutes of Meetings
- Training Records
- Audit and Review Records

All these documents and records are to be available for inspection in the site office. The documentation shall be to date and shall be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

4.12 Control of Documents

The Contractor will establish, implement and maintain a procedure to control CEMP documents and records so they are clearly identifiable, organised, current, easily located and revised when necessary.

5. SAFETY & HEALTH MANAGEMENT PLAN

5.1 Introduction

This Safety and Health Management Plan (SHMP) defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Coom Green Energy Park and shall be read in conjunction with the Preliminary Safety & Health Plan prepared for the project by the Project Supervisor for the Design Process. The Safety and Health Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works.

This SHMP describes how the contractor for the main construction works will implement a site safety management system (SMS) on this project to meet the specified contractual, regulatory and statutory requirements, environmental impact statement mitigation measures and planning conditions. It is the contractor's responsibility to implement an effective safety management system to ensure that the developer's safety requirements for the construction of this project are met.

All site personnel will be required to be familiar with the requirements of the safety management plan as related to their role on site. The plan describes the project organisation and sets out the health and safety procedures that will be adopted on site.

- The Safety and Health Plan is a controlled document and will be reviewed and revised as necessary.
- A copy of the Safety and Health Plan will be located on/near the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of the SHMP and its contents.

5.2 Project Obligations

The construction of the Coom Green Energy Park will impose numerous safety management obligations on the developer, designer and contractor. As well as statutory obligations, there are several specific obligations set out in the EIAR and in the planning conditions for the proposed wind farm. These obligations are set out below. The contractor for the main construction works and all its sub-contractors are to ensure that they are fully aware of and in compliance with these safety obligations.

5.2.1 EIA Obligations

EIAR obligations are described in Section 4.2.1.

5.2.2 Planning Permission Obligations

Planning permission obligations will be fully outlined in the Contractor's CEMP.

5.2.3 Statutory Obligations

The Safety, Health and Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (Construction) Regulations 2013 place a responsibility on the Developer as the "Client", the Designer, the Project Supervisors and the Contractor.

The Client must:

- Appoint a competent and adequately resourced Project Supervisor for the Design Phase (PSDP)
- Appoint a competent and adequately resourced Supervisor for the Construction Stage (PSCS)
- Be satisfied that each designer and contractor appointed has adequate training, knowledge, experience and resources for the work to be performed
- Co-operate with the project supervisor and supply necessary information
- Keep and make available the safety file for the completed structure
- Provide a copy of the safety and health plan prepared by the PSDP to every person tendering for the project
- Notify the Authority of the appointment of the PSDP.

Designers must:

- Identify any hazards that their design may present during construction and subsequent maintenance
- Eliminate the hazards or reduce the risk
- Communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the safety and health plan
- Co-operate with other designers and the PSDP or PSCP
- Take account of any existing safety and health plan or safety file
- Comply with directions issued by the PSDP or PSCS.

The PSDP must:

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project
- Where possible, eliminate the hazards or reduce the risks
- Communicate necessary control measure, design assumptions or remaining risks to the PSCS so they can be dealt with in the safety and health plan
- Ensure that the work of designers is coordinated to ensure safety
- Organise co-operation between designers
- Prepare a written safety and health plan for any project and deliver it to the client prior to tender
- Prepare a safety file for the completed structure and give it to the client.

The PSCS must:

- Co-ordinate the identification of hazards, the elimination of the hazards or the reduction of risks during construction
- Develop the Safety and Health Plan initially prepared by the PSDP before construction commences
- Co-ordinate the implementation of the construction regulations by contractors
- Organise cooperation between contractors and the provision of information
- Co-ordinate the reporting of accidents to the Authority
- Notify the Authority before construction commences
- Provide information to the site safety representative
- Co-ordinate the checking of sage working procedures
- Co-ordinate measures to restrict entry on to the site
- Co-ordinate the provision and maintenance of welfare facilities
- Co-ordinate arrangements to ensure that craft, general construction workers and security workers have a Safety Awareness card, e.g. Safe Pass and a Construction Skills card where required
- Co-ordinate the appointment of a site safety representative where there are more than 20 persons on site
- Appoint a safety adviser where there are more than 100 on site
- Provide all necessary safety file information to the PSDP
- Monitor the compliance of contractors and others and take corrective action where necessary;
- Notify the Authority and the client of non-compliance with any written directions issued.

The Contractor must:

- Co-operate with the PSCS
- Promptly provide the PSCS with information required for the safety file
- Comply with directions of the project supervisors
- Report accidents to the Authority and to the PSCS where an employee cannot perform their normal work for more than 3 days
- Comply with site rules and the safety and health plan and ensure that your employees comply
- Identify hazards, eliminate the hazards or reduce risks during construction
- Facilitate the site safety representative
- Ensure that relevant workers have a safety awareness card and a construction skills card where required
- Provide workers with site specific induction
- Appoint a safety officer where there are more than 20 on site or 30 employed
- Consult workers with site specific induction
- Monitor compliance and take corrective action.

Consequently, at all stages of the project there are statutory requirements for the management of safety, health and welfare of all involved in or affected by the development. As previously outlined this CEMP and specifically the Safety and Health Management Plan addresses key construction management issues associated with the proposed wind farm. This plan will be developed further at the construction stage, on the appointment of the Contractor for the main construction works.

5.2.4 The Management of Health and Safety during the Design Process

Fehily Timoney & Company (FTC) has been appointed Project Supervisor for the Design Process (to prepare the Environmental Impact Statement and planning application for the proposed Coom Green Energy Park development) and is competent to fulfil this role in accordance with the Safety, Health and Welfare at Work (Construction) Regulations, 2013. Health and safety are a major priority for FTC and FTC adopts health and safety practices that are an inherent part of a safe and sustainable business. FTC's objective is to provide a safe and healthy work environment for all and to meet our duties to clients, contractors and members of the public.

It is FTC's policy to comply fully with all health and safety legislation, in particular the Safety, Health and Welfare at Work Act, 2005, Safety, Health and Welfare at Work (General Application) Regulations 2007, and the Safety, Health and Welfare at Work (Construction) Regulations 2013.

FTC has developed in-house procedures to ensure, so far as is reasonably practicable, that all projects:

- are designed to be capable of being constructed to be safe/ without risk to health;
- can be operated and maintained safely and without risk to health during use; and
- comply in all respects, as appropriate, with the relevant statutory enactments and instruments.

These procedures include effective risk management procedures involving the identification and evaluation of risks and the development of mitigation measures to eliminate (where possible) or reduce those risks during the life-cycle of the project. The FTC team is committed to health and safety and shares responsibility for managing risk at all stages of a project.

All work by FTC is undertaken in a competent and efficient manner taking account of the general principles of prevention to safeguard the safety, health and welfare of construction & maintenance workers and other third parties.

The FTC procedures for the management of safety during the design process are outlined in the in-house procedure PP09 "Health and Safety Requirements in Design Projects" and is adhered to on all design projects.

The purpose of this procedure is to define the requirements for the management of health & safety during design projects, to ensure compliance with The Safety, Health and Welfare at Work (Construction) Regulations 2013.

The procedure includes standard forms which are used to communicate health and safety considerations within the design team and also guidelines which develop the company's health and safety procedure and outline the company's responsibilities for health and safety during the design process.

The procedure addresses health and safety issues at all stages of a project, from the preliminary design through to commissioning and operation.

By establishing a chain of responsibility each party is clear on their role and obligations from a health and safety perspective. Risk assessments are carried out, at preliminary and detailed design stages by every discipline involved in the design. Each risk assessment is prepared by the designers and reviewed by the Health and Safety Facilitator for the project.

Risk assessments are used to identify hazards and assess risk at all stages during the life of the project including the construction & maintenance stages.

A Health and Safety Facilitator for the Design Process (HSF) is appointed on all projects where FTC are the Project Supervisor for the Design Process (PSDP).

Health & Safety Facilitators are selected from the senior ranks of FTC design staff to ensure they have the required knowledge, experience and training to carry out the role.

Meetings will be held between the HSF and relevant design personnel to collate all the risk assessments and other pertinent information and to discuss any issues relating to health and safety and ensure the constructability of the designs. The minutes of these meetings are circulated to the entire design team complete with actions allocated to the designers as appropriate. At such a meeting a "Construction Risk Analysis" form is completed which forms the basis for the Preliminary Safety & Health Plan. This document outlines the particular, significant and residual risks and in addition specific construction methods or sequences assumed during the design. Special requirements for maintenance envisaged at design stage are also included.

A Designers Safety File shall be kept and maintained during the design. All design criteria adopted, and safety & health information required for the Safety File shall be kept in this file which is maintained by the HSF and is the pre-cursor to the Safety File. The information required from the Contractor/ PSCS for inclusion in the Safety File is specified at tender stage in the Preliminary Safety and Health Plan.

This information from the PSCS & Contractor(s) and the Designers Safety File is used to compile the Safety File in the latter stages of a contract and formally issued to the Client on completion of the contract.

FTC promotes a collaborative approach to health and safety on site where the Client, PSDP, Designers, Contractors and PSCS co-operate with each other and share information. Joint site safety audits and/or walk-downs are carried out as part of this collaboration and safety is monitored and addressed on site on an ongoing basis. The regular safety meetings are held to document this ongoing co-operation, get an over-view of works currently in hand onsite and about to commence and share information.

5.2.5 The Preliminary Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 a Preliminary Safety & Health Plan will be required as part of the design process. This plan will be further developed by the PSCS on appointment and maintained as a live document during construction and commissioning of the development.

The safety and health plan is required to include the following information:

- a general description of the project;
- details of other work activities taking place on site;
- works involving particular risks;

- the timescale for the project and the basis on which the time frame was established;
- conclusions drawn by designers and the PSDP having taken into account the General Principles of Prevention and any relevant Safety and Health Plan or Safety File;
- the location of electricity water and sewage connections so as to facilitate early establishment of welfare facilities.

In accordance with the PSDP's procedures the Preliminary Safety & Health Plan for the proposed Coom Green Energy Park development should include the following sections and subsections to ensure the PSCS is aware of the health and safety issues at tender stage and enable them to price accordingly:

Preamble:

1 General Project Information:
- 1.1 Title
- 1.2 Description of Project
- 1.3 Employer
- 1.4 Designers / Other Consultants
- 1.5 Project Supervisor Design Process
- 1.6 Drawings, Specifications and Other Documents
- 1.7 Intended Contract Commencement Date
- 1.8 Intended Contract Completion Date
- 1.9 Basis for Contract Duration
- 1.10 Restrictions on Working Hours
- 1.11 Notification of Project
- 1.12 Termination of the PSCS Appointment

2 The Existing Environment:
- 2.1 Site Location
- 2.2 Relevant Adjoining Land Uses
- 2.3 Site Restrictions
- 2.4 Restrictions on Access
- 2.5 Hazardous Area Classification
- 2.6 Existing Services
- 2.7 Ground Conditions
- 2.8 Existing Hazards
- 2.9 Liaison with Statutory Bodies

3 Other Work Activities:
- 3.1 Other Contracts Which May Affect Work
- 3.2 Occupation of Site
- 3.3 Building Activities
- 3.4 Other Work Activities
- 3.5 Emergency Procedures in Place on Site

4 Particular and Residual Risks:
- 4.1 Works Which Puts Persons at Work at risk
- 4.2 Work Which Puts Persons at Risk from Chemical or Biological Substances
- 4.3 Work with Ionising Radiation
- 4.4 Work near High Voltage Power Lines
- 4.5 Work Exposing Persons at Work to the Risk of Drowning
- 4.6 Work on Wells, Underground Earthworks and Tunnels
- 4.7 Work Carried Out by Divers at Work Having a System of Air Supply
- 4.8 Work Carried Out in a Caisson with a Compressed Air Atmosphere
- 4.9 Work Involving the Use of Explosives
- 4.10 Work Involving the Assembly or Dismantling of Heavy Prefabricated Components
- 4.11 Work Involving Hazardous Material
- 4.12 Residual Risks

5 Additional Information:
- 5.1 Existing Documents
- 5.2 Site Possession
- 5.3 Site Rules
- 5.4 Site Specific Safety Objectives
- 5.5 Phasing of Works
- 5.6 Permits / Authorisation Required
- 5.7 Maintenance
- 5.8 Continuing Liaison
- 5.9 Specific Recommendations

6 Information Required for Safety File:
- 6.1 Information Required for Safety File from PSCS

5.2.6 The Management of Health and Safety during the Construction Phase

The selection criteria for the Contractor for the works will be based on the ability to construct the works in a manner that will not endanger the safety, health and welfare of any parties and competence to fulfil the role of PSCS.

The contract will be awarded on the basis of assessment of the candidates against relevant health and safety criteria including experience of similar projects, knowledge of the construction processes involved and training of their management and staff who will be involved in carrying out the works.

5.2.7 The Construction Stage Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 the preliminary Safety & Health Plan prepared by the PSDP will be further developed by the PSCS before the commencement of the construction work and updated on a regular basis during the construction phase of the project.

The document will include the following sections and subsections to ensure the management of health and safety during the construction phase of the project:

1. Description of Project:
    - project description and programme details
    - details of client, PSDP and PSCS, designers
    - main contractor and other consultants
    - extent and location of existing records and plans
    - arrangements for communicating with Contractors, PSDP and others as appropriate

2. Communication and Management of the Work:
    - management structure and responsibilities
    - safety and health goals for the project and arrangements for monitoring and review of safety and health performance
    - arrangements for:
        - regular liaison between parties on site
        - consultation with the workforce
        - the exchange of design information between the Client, Designers, Project Supervisor for the Design Process, Project Supervisor Construction Stage and Contractors on site
        - handling design changes during the project
        - the selection and control of contractors
        - the exchange of safety and health information between contractors
        - security, site induction, and on-site training
        - welfare facilities and first aid
        - the production and approval of risk assessments and method statements
        - the reporting and investigation of accidents and other incidents (including near misses)
    - site rules
    - fire and emergency procedures

3. Arrangements for Controlling Significant Site Risks:
    - safety risks
        - services, including temporary electrical installations
        - preventing falls
        - work with or near fragile materials
        - control of lifting operations
        - dealing with services (water, electricity and gas)
        - the maintenance of plant and equipment
        - poor ground conditions
        - traffic routes and segregation of vehicles and pedestrians
        - storage of hazardous materials
        - dealing with existing unstable structures

- accommodating adjacent land use
- other significant safety risks

- Health risks:
  - removal of asbestos
  - dealing with contaminated land
  - manual handling
  - use of hazardous substances
  - reducing noise and vibration
  - other significant health risks

The construction stage safety and health plan will be maintained on site by the PSCS and will be communicated to all relevant parties on an ongoing basis through inductions, site safety meetings and tool box talks etc. as required.

6. EMERGENCY RESPONSE PLAN

6.1 Introduction

This chapter of the CEMP presents an Emergency Response Plan for the proposed project. The Emergency Response Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works and following detailed design development.

This Emergency Response Plan contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Coom Green Energy Park. This outlines the immediate response to an emergency or disaster situation and will be developed by the main construction works contractor and PSCS as part of their construction stage Safety and Health Plan.

An emergency is any disruptive or harmful event that endangers people, environment, property or assets. Emergencies can be small, as in a fire contained by employees using firefighting equipment or large, as in a disaster resulting from a storm.

In the context of the Coom Green Energy Park, examples of Emergency Response Plan emergency events are:

- medical emergency
- explosion
- overheated equipment
- chemical and fuel spill
- fire
- loss of power
- vehicle incidents

Example sources of emergency or disaster events are:

- unstable/inappropriate stockpiles on site
- faulty or incorrect use of equipment
- falls from height
- smoking
- storm/adverse weather
- power failure
- fuel spill
- road failure
- serious vehicle collisions or overturning

6.2 Emergency Response Plan

An emergency response plan deals with the immediate physical effects of a disaster and outlines the initial response.

6.2.1 Emergency Response Liaison

The contractor/PSCS will designate an individual to serve as the Emergency Response Liaison for this project. The emergency response liaison will coordinate the emergency response for the duration of any emergency at or nearby the project site.

The local County Council, An Garda Síochána and the HSE Ambulance Co-ordinator will be provided with the construction programme and the onsite contact information from the Emergency Response Liaison prior to construction.

The Emergency Response Liaison will be immediately reachable at all times during project construction. The Liaison will coordinate with the above agencies to establish emergency procedures for access to and within the site in the event of an emergency.

6.2.2 Reporting Emergencies

In the event of fire, storm, flood, serious injury or other emergency, contact:

ALL ON SITE EMERGENCIES DIAL 999

6.2.3 Designated Responder

A map depicting tower locations with the emergency meeting point will be furnished to Cork County Council Fire Department and HSE ambulance co-ordinators.

Upon arrival on the scene, the senior EMS Officer will set up the incident command structure. The Emergency Response Liaison and all contractor's personnel will cooperate with directions of the incident commander and assist as directed.

The nearest emergency services, ambulance and Accident & Emergency (A&E) facilities are:

Service:	Contact Details:	
Accident & Emergency (A&E)	Mallow General Hospital	(022) 21251
Accident & Emergency (A&E)	Cork University Hospital	(021) 492 2000
Ambulance Service	Dial 112 or 999	

Service:	Contact Details:	
Fire Services	Dial 112 or 999	
Garda Station	Glanmire Garda Station	+353 21 4821002
District HQ:	Mayfield Garda Station	+353 21 4558517
Divisional HQ:	Anglesea Street Garda Station	+353 21 4522011

Each member of the contractor's site team who are First-Aid and Cardiopulmonary Resuscitation (CPR) trained personnel will be identifiable with a hard hat sticker indicating their training.

6.2.4 Emergency Alarm

The emergency alarm will be raised on site as soon as an emergency situation is detected, the alarm will be identified (contractor to check those that apply):

	Air Horn		Radio		Voice		Hand Signals		Siren

6.2.5 Emergency Reporting

In the event of an emergency the nearest supervisor with radio equipment/mobile phone will be notified. The degree of emergency will be reported to the Emergency Response Liaison who will contact the Emergency Services and request the appropriate emergency service.

6.2.6 Medical Protocol

In the event of a major medical emergency, the emergency centre (999) will be notified and an ambulance and emergency medical team will respond to the scene. All major medical cases require professional (ambulance) transportation. In the event of a minor medical case, the affected employee can be transported via company vehicle in the escort of a foreman or site engineer (with first aid training).

6.2.7 Emergency Response

Upon notification, the Emergency Response Liaison will respond to the emergency scene and manage emergency operations:

1. Assess hazards and make the area safe – If you cannot enter the area without risking your safety, don't do it, call the Emergency Services immediately and wait for them. If you think you can safety enter the area, look around the emergency scene for anything that can be dangerous or hazardous to you, the casualty, or anyone else at the scene. Bystanders can help with making the area safe.

First aid kits will be available on site. Operators that have been first aid/CPR/AED trained will be listed on site and easily identifiable by a hard hat sticker.

2. Take charge of the situation – if you are the first-aid provider on the scene act fast. If someone is already in charge, briefly introduce yourself and see if that person needs any help. If there is any chance the casualty could have a head or spinal injury, tell them not to move.

3. Get Consent – always identify yourself as a first-aid provider and offer to help. Always ask for consent before touching a conscious adult casualty and always ask for consent from a parent or guardian before touching an unconscious or conscious child or infant. With an unconscious adult casualty consent is implied as it is generally accepted that most people want to live. Remember to protect yourself first by wearing gloves and eye protection.

4. Assess Responsiveness – is the casualty conscious or unconscious? Note their response while you are asking them for their consent. If they respond, continue with the primary survey, and if they don't respond, be aware that an unconscious casualty is or has the potential of being a breathing emergency.

5. Call out for help – this will attract bystanders. Help is always useful in an emergency situation. Someone can be called over to phone for medical help. Others can bring blankets if needed, get water, etc. a bystander can help with any of the following:

- Make the area safe.
- Find all the casualties.
- Find the first aid kit, or any useful medical supplies.
- Control the crowd.
- Call for medical help.
- Help give first aid, under your direction.
- Gather and protect the casualty's belongings.
- Take notes, gather information, be a witness.
- Reassure the casualty's relatives.
- Lead the ambulance attendants to the scene of the emergency.
- Notify Emergency Services as soon as you can. Either send a bystander or call yourself.

In the event of a major medical emergency the Emergency Response Liaison, as the person-in-charge of the emergency scene, will dispatch someone to the site access point nearest the emergency scene to direct and lead arriving outside responders to the emergency scene. The designated meeting point will be agreed prior to the commencement of construction. Emergency personnel will be met at this meeting point communicated by management during the 999 call. The emergency personnel escort will use the hazard lights on their vehicle so they are easily identified.

6.2.8 Escape and Evacuation Procedure

Dependent upon the degree of the emergency and if safe to do so, employees will evacuate to the designated assembly area where the designated wardens shall account for all employees and determine if anyone still remains within the emergency scene.

Should a wild land fire or peat slippage occur, and the designated assembly area is compromised other locations will be designated as secondary assembly areas.

6.2.9 Tower Rescue Procedure

In the event personnel are trapped or injured in an elevated tower position the following protocol will be initiated:

1. The Emergency protocol will be initiated
2. Emergency Response Liaison will be notified
3. Tower Rescue Team will be activated and respond to the scene
4. Outside medical and Rescue Teams will be notified and respond to the scene.

Tower Rescue Procedure:

1. Upon learning of an emergency, the on-scene foreman shall assess the emergency and ascertain its degree, location and the extent of any injuries.
2. Upon confirming that an emergency exists the on-scene foreman notifies the Emergency Response Liaison and the project Office.
3. Upon notification of the emergency the Emergency Response Liaison shall notify senior project supervision and the local emergency centre (999) of the emergency.
4. The Emergency Response Liaison shall inform the dispatcher of the location, tower number, the degree of the emergency and the extent of injuries.

6.2.10 Prevention of Illness/Injury Due to Weather/Elements

1. All employees will have access to shelter and heat in the event of inclement weather.
2. Employees will have access to at least a litre of water at all times.
3. High wind warnings and weather forecast will be discussed every morning with the crews. Weather conditions and forecast will be monitored regularly by management.
4. No Employee will work alone. A buddy system will be used so employees can contact a supervisor in case of an emergency.

6.2.11 Environmental Emergency Procedure

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Emergency Silt Control and Spillage Response Procedures are included in Section 4.3.3 of this CEMP.

Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site. In the event of pollution or potential risk of pollution the Local Authority should be informed immediately.

In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland should also be informed immediately.

6.2.12 Emergency Response Plan – Haul Routes

Emergency Response Procedure relating to transportation of plant, equipment and materials to site to be developed by the main contractor during the construction phase of the wind farm

6.2.13 Catastrophic Events – Wind Turbines and Battery Energy Storage Systems

Potential catastrophic events associated with operational wind turbines and battery energy storage systems include:

- Wind turbine toppling (due to foundation or tower failure);
- Wind turbine rotational failure in extreme wind conditions (due to control system or rotor break failure);
- Fire.

The primary mitigation against a catastrophic event that may endanger the health and safety of the public implemented at design stage through adequate siting of wind turbines which provide sufficient set back distances from occupied buildings and other infrastructure to avoid the risk of impact in the event of wind turbine collapse.

The maximum tip height for wind turbines at this site 169m. No wind turbine is located within 750m of a residential dwelling or 400m of the nearest commercial building No turbines have been located within 2 x tip height of the proposed on-site substations in accordance with Eirgrid general functional specifications. A minimum setback distance of 3.5 x rotor diameter has been imposed between wind turbines and existing HV overhead lines in accordance with Eirgrid general functional specifications.

Wind turbines shall be fitted with fire suppression systems and will have emergency escape procedures in place for operational staff in the event of fire in a wind turbine.

The proposed battery energy storage system units shall include the following minimum safety measures:

- A battery management system (BMS) shall be capable of detecting problems using cell and module voltage measurements and select temperature measurements within the batteries. Automatic disconnect of the batteries will occur if any unusual parameters are measured;
- The BMS shall maintain strict control of charging and discharging of the batteries. Voltage, current, temperature and state of charge are all measured and controlled to ensure safe charging and discharging to prevent electrical abuse of the system;
- Cells shall be kept at an optimal operating temperature and will not exceed safe temperature ranges. An automatic trigger system will be incorporated to foldback power if safe temperature ranges are exceeded;
- A fire suppression system shall be incorporated into the facility's design. The system shall include the following elements at a minimum:
    - Battery storage containers shall have dedicated fire detection and suppression system;
    - The system shall include ionization smoke sensors and a linear heat sensor cable to detect presence of a fire;

  - The system shall include strobe light/horn to provide indication of smoke and fire detection for personnel inside the container, and external warning lights for personnel outside the container;
  - The system shall use a gaseous, clean firefighting agent to suppress fire;
- Regular visual inspections and testing of battery system equipment shall be incorporated into the project's operation and maintenance schedule as per manufacturers requirements;
- Fire safety measures and equipment in the facility must be kept in effective working order. This includes all fixtures and fittings such as fire doors, staircases, corridors, fire detection and alarm systems, fire-fighting equipment, notices and emergency lighting. Regular checks, periodic servicing and maintenance must be carried out, whatever the size of the workplace. Any defects should be put right as quickly as possible;
- A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of fire-fighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will kept on site at all times;
- The system shall include an abort switch that can be operated at any time with overriding manual abort system.

FEHILY TIMONEY
30 YEARS

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 1

Surface Water Management Plan

FEHILY TIMONEY
30 YEARS

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

COOM GREEN ENERGY PARK

SURFACE WATER MANAGEMENT PLAN

Prepared for: Coom Green Energy Park Limited

coom green energy

Date: December 2020

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TABLE OF CONTENTS

1. SITE DRAINAGE MANAGEMENT PLAN 1

1.1 Daily Preparation during the Implementation of the Surface Water Management Plan 1

1.1.1 Personnel Qualifications and Key Contacts 1

1.2 Construction Stage Impacts 1

1.3 Operational Phase Impacts 2

1.4 Decommissioning Stage Impacts 2

1.5 Drainage of Wind Farm during the Construction and Operation Phases 2

1.6 Mitigation Measures for Flooding 10

1.7 Mitigation Measures for Pollution Control to Protect Water Quality in Downstream Receptors 11

1.8 Emergency Silt Control and Spillage Response Procedures 12

1.9 Maintenance of Site Drainage Systems 13

1.10 Construction Stage Mitigation Measures 14

1.11 Water Quality Monitoring Plan 14

1.12 Operational Phase Mitigation Measures 14

1.13 Decommissioning Stage and Mitigation Measures 15

LIST OF APPENDICES

Appendix 12.1: Shadow Flicker Modelling Input Data

Appendix 12.2: Detailed Shadow Flicker Listing

Appendix 12.3: Moneygorm Wind Farm Shadow Flicker Report

LIST OF FIGURES

Page

Figure 1: Grassed Swale along access track 3
Figure 2: Swale draining to Settlement pond 4
Figure 3: Check Dam Details 5
Figure 4: Silt Trap across Grassed Swale 6
Figure 5: Plan of Silt Trap in Swale 7
Figure 6: Silt Trap Details 7
Figure 7: Backfill over Cable Trench 8
Figure 8: Lined Settlement Lagoon for Concrete Washout Facility 10

1. SITE DRAINAGE MANAGEMENT PLAN

This Site Drainage Management Plan should be read in conjunction with the EIAR. The Site Drainage Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works.

1.1 Daily Preparation during the Implementation of the Surface Water Management Plan

The Drainage Engineer appointed by the contractor should conduct regular meetings with the Construction Management Team to discuss the phasing of construction and drainage as the work progresses. The focus of these meetings will be on establishing an operational drainage system in advance of the progression of the works. Particular regard will be taken of daily weather conditions and long-range forecasts.

The Drainage Engineer will have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of receiving watercourses. Mitigation measures to protect receiving watercourses will be put in place as directed by the Drainage Engineer in response to extreme forecasts.

1.1.1 Personnel Qualifications and Key Contacts

All those carrying out work on site must have a Fás/Solas Safe Pass Card. All works must be supervised by a competent supervisor. Workers must be adequately trained in the tasks they are required to carry out. The key contact names and contact details should be supplied to all personnel entering the site. All site staff should be informed of the emergency procedures for the site.

1.2 Construction Stage Impacts

During the construction period, the development has the potential to lead to impacts on hydrology and water quality unless appropriate mitigation is applied.

Tree felling, new site access roads, turbine hard-standing areas, the on-site sub-station and other new, hard surfaces have the potential to contribute to an increase in run-off and release of sediments in the watercourses.

No modifications are proposed at stream crossings to facilitate the turbine delivery route and therefore no potential hydrological impacts are expected from the Turbine Delivery Route.

Modifications along the TDR involves the temporary removal of street furniture and removal of some vegetation in addition to the temporary local widening at bends using hardcore material. Inappropriate management of the carrying out of these modifications could result in blockages of existing roadside drainage.

During construction, the transport of both dissolved and sediment-bound nutrients from soil to water could deleteriously affect water quality downstream, in the absence of mitigation measures. Nutrient transport from soil to water, may lead to eutrophication in waters receiving drainage from the site.

A detailed description of the potential construction stage impacts on hydrology and water quality can be found in Chapter 10 of the EIAR.

1.3 Operational Phase Impacts

The main hydrological impact of the development is the increase in runoff. Due to the insignificance of the increase in runoff from the development, the grassing over the drainage swales, and the non-intrusive nature of site operations, there is a negligible risk of sediment release to the watercourses during the operational stage.

1.4 Decommissioning Stage Impacts

The potential impacts associated with decommissioning will be similar in nature to those associated with construction of the Coom Green Energy park.

It is proposed that turbine foundations and hardstanding areas are left in place and covered with local topsoil and revegetated. Removal of this infrastructure would result in considerable disruption to the local environment in terms of an increased possibility of sedimentation. It is considered that leaving the turbine foundations hardstanding areas in-situ will cause less environmental damage than removing them.

Grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur.

It is proposed that the internal site access tracks will be left in place, subject to agreement with Cork County Council and the relevant landowners.

1.5 Drainage of Wind Farm during the Construction and Operation Phases

Sustainable Drainage Systems (SuDS)

Where possible, sustainable drainage systems, in the form of grassed swales will be used to drain the permitted development. The grassed swales will serve to slow down the velocities of flows draining the hardcore surfaces of the hardstanding areas and the access tracks. The proposed layout of the drainage system for CGEP is provided in Appendix 1.

The grassed swales will also treat the surface water run-off, removing some of the sediment borne contaminants. These grassed swales will serve to detain flows and reduce the velocities of surface water flows. The swales will be 0.3 m in depth with a bottom width of 0.5 m and side slopes of 1 in 3. A grassed swale is shown on Figure 1.

The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SUDS. Swale draining to settlement pond is shown on Figure 2.

76 settlement ponds will be put in place in advance as construction progresses across the site. Settlement ponds will have a diffuse stone filled outflow which will encourage the diffuse spread of flows overland and back into natural drains down slope of the settlement ponds. Drainage stone will be placed at the inlet to the ponds to filter the flows before they enter the ponds.

After passing through the settlement ponds, the concentration of suspended solids in the surface water run-off due to the excavations will be reduced to within acceptable levels in accordance with Directive 2006/44/EC – European Communities (Quality of Fresh Waters Needing Protection or Improvement to Support Fish Life).

In the event of an emergency, the settlement ponds will provide a temporary holding area for any accidental spills on site as it will be possible to block off the outflow from these ponds for a limited period. The settlement ponds will be fenced off for safety. Erosion control and retention facilities, including settlement ponds will be regularly maintained during the construction phase.



Figure 1: Grassed Swale along access track

The drainage system will remain operational and will be utilised for the decommissioning phase to treat any surface water from exposed areas as a result of decommissioning at the site. During the decommissioning of the turbine base, hardstanding areas and access tracks should remain in place and be covered with local soil/topsoil to minimise disturbance to soils. Removal of this infrastructure would result in considerable disruption to the local environment in terms of increased sedimentation, erosion, dust, noise, traffic and an increased possibility of contamination of the local water table. However, if removal is deemed to be required all infrastructure will be removed with mitigation measures in line to those during construction being employed.

The drainage system outlined below provides for a multi-stage treatment train of the discharges from the development, as recommended in the SUDS manual:

- grassed swales removing some of the sediment borne contaminants
- settlement ponds providing retention and treatment of discharges
- diffuse outflow from settlement ponds providing for further retention and settlement of suspended solids by reducing the velocities of flows and increasing the flow path of discharges
- continuation of flows by natural flow paths over vegetated areas before entering the watercourse, providing further retention and treatment of discharges.



Figure 2: Swale draining to Settlement pond

Drainage of Temporary Site Compound

The compound will be set back a minimum of 50m from streams. Drains around the hard-standing areas of the site compound will be in the form of shallow grassed swales to minimise the disturbance to sub-soils.

Filter drains may be used where trafficking by site staff is required to access the temporary site compound. The filter drains/swales will drain to a suitably designed settlement pond. The settlement pond will be backfilled at the temporary compound following the construction period and the vacation of the temporary site compound.

Refuelling of plant during construction will be carried out at the temporary compound. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In addition to the above, onsite re-fuelling of machinery will be carried out 100m from watercourses using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at the designated refuelling area and will be towed by a 4x4 jeep to designated re-fuelling areas near to where machinery is located but at distances of greater than 100m from watercourses. Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.

Concrete washout will be carried out in a dedicated area of the temporary compound or at a designated washout pit on site. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off.

Any diesel or fuel oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines).

Portaloos and/ or containerised toilets and welfare units with storage tanks will be used to provide toilet facilities for site personnel during construction. The sanitary waste will be removed from site by a licensed waste disposal contractor.

All portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions, and will be serviced under contract with the supplier. All such units will be removed off-site following completion of the construction phase.

Temporary petrol and oil interceptors will be installed at the site compound and at all locations dedicated for plant repairs/storage of fuel/temporary generator installation. Surface water run-off from the compound will be directed through a Class 1 Full Retention Oil Interceptor before discharge to the surface water drainage system for the site. This surface water drain flows to a settlement pond before final discharge over land. A trained and dedicated environmental and fuel spill emergency response team will be set up on site before commencement of construction on-site. An example of Oil Interceptor Class 1 is provided in the Appendix 2.

Drainage of Overland Flows

Existing overland flow channels will be maintained, and cross-drains provided in the access tracks to allow continuity of flow. Where required, on the upslope side of new sections of access track and hardstanding areas, overland flows will be intercepted in channels. The flow will then be discharged diffusely over vegetated areas. Cross-drains will be provided where required at a minimum of 200m intervals. The roadside drains will therefore only carry the site access track runoff. This will ensure that there will be no mixing of 'clean' and 'dirty' water and will avoid a large concentration of flows. Thus, erosion risks will be reduced and the quantity of water requiring treatment will be minimised.

Drainage of Site Access Tracks

The permitted new site access tracks will be drained via roadside grassed swales with settlement ponds at the end of the swale run. At slopes greater than 2%, check dams will be required in the swales and interceptor drains to slow down the velocities of flows and prevent erosion occurring, as shown in Figure 3. These check dams will be in stone of minimum size 37.5 mm and will be laid at a spacing of between 9 and 30 m dependent on the slope.

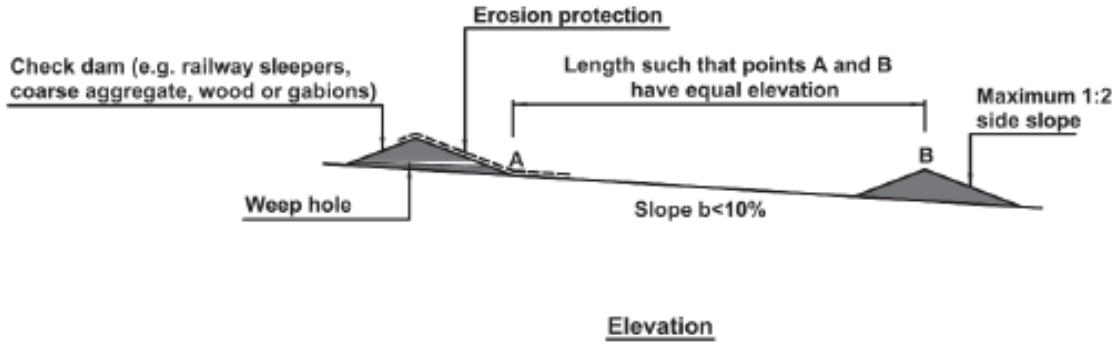


Figure 3: Check Dam Details

The roadside swales will drain to settlement ponds before discharging diffusely overland. The settlement ponds will remain in place following the construction period.

Silt traps will be provided in swales which will consist of geotextile staked across the swale at regular intervals. The geotextile will be weighed down on the upstream side with clean filter stone to provide further filtration and stability to the silt trap, as shown in Figure 4 to Figure 6.

Silt fencing will be kept on site and erected as required during construction to provide further protection to prevent the ingress of silt into the watercourses. The silt fencing will be kept in place until the natural vegetation has been re-established.

Site drainage, including silt traps and settlement ponds, will be put in place in parallel with or ahead of construction, such that excavation for new infrastructure will have a functioning drainage system in place.



Figure 4: Silt Trap across Grassed Swale

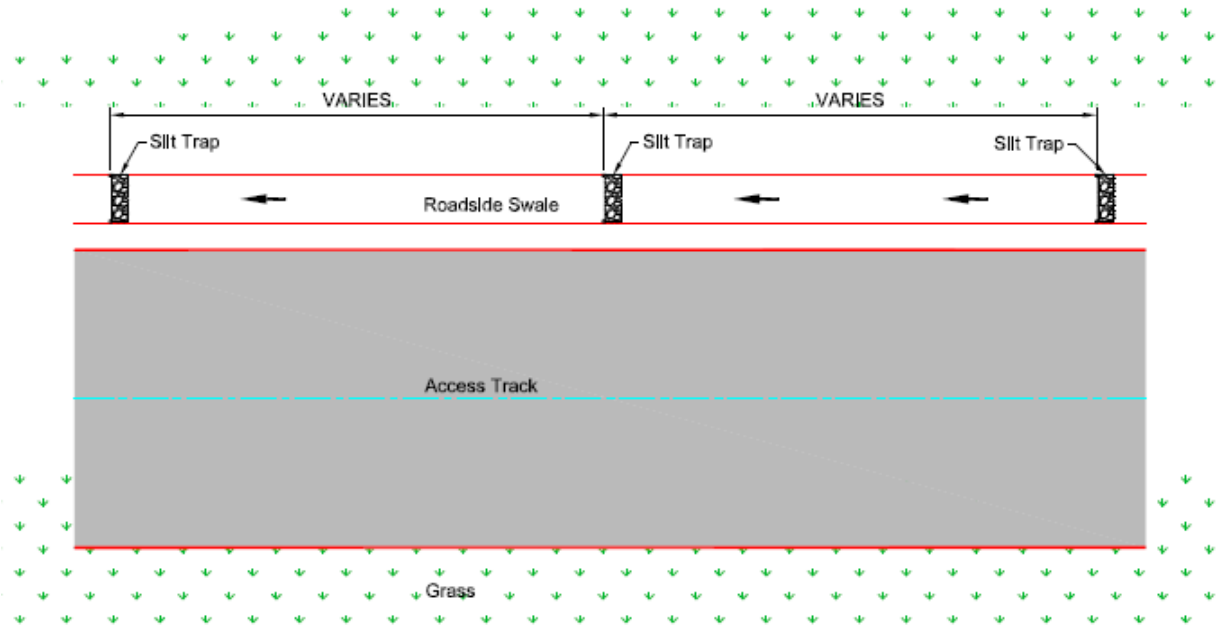


Figure 5: Plan of Silt Trap in Swale

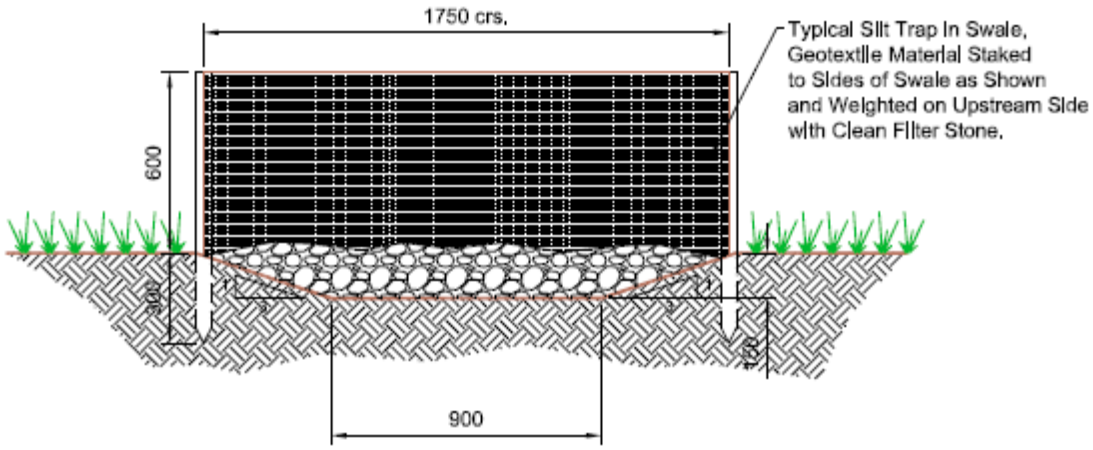


Figure 6: Silt Trap Details

Drainage of Turbine Bases and Hardstanding

The excavations for turbines will be pumped into the site drainage system (including settlement ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.

As discussed above, the new turbine hard-standing areas will be drained via shallow swales with suitably designed settlement ponds. The settlement ponds will remain in place following the construction period.

If cross-drains are required to convey the drainage across the hardstanding area, the diameters will be suitably designed in advance.

Drainage of Cable Trenches

Cables running throughout the wind farm site will be installed in trenches adjacent to site access tracks, where possible. Cable trenches will be excavated using a mechanical excavator and the excavated materials placed in small bunds adjacent to the trenches for back filling, as shown in Figure 7.

The seed bank is to be retained for placing back as the top layer of backfill to the trench, to aid successful restoration of vegetation in disturbed areas.

Cable trenches will be excavated during dry periods where possible, in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. Clay bunds will be constructed at up to 10m intervals within the cable trench.



Figure 7: Backfill over Cable Trench

Procedure for Dewatering of Excavations

Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. Water in the excavations for turbines will be pumped into the site drainage system which will be constructed at site clearance stage, in advance of excavations for the turbine bases.

Drainage of Substation

The permitted on-site substation will be drained using shallow swales, with a suitably designed settlement pond. The settlement pond will remain in place following the construction period. At the upslope side of the sub-station overland flows will be intercepted in channels and discharged diffusely over vegetated areas.

A suitable permanent petrol and oil interceptor shall be installed to deal with all substation surface water drainage.

Permanent sanitary facilities will be provided at the substation.

The runoff from roofs will be collected to water harvesting tanks. Waste water will drain to a tank which will be regularly emptied and maintained.

Drainage of Stockpiled Material

During the construction period, the excavated material will be used to reinstate the turbine bases.

All excavations shall be constructed and backfilled as quickly as possible. Excavation will stop during or immediately after heavy rainfall.

Excavation will precede the turbine base construction, cable trench and access track construction. Soil will be excavated and replaced with granular fill where required. Excavation will be carried out from access tracks where possible in order to reduce the compaction of topsoil.

During the construction period, spoil heaps from the excavations for the turbine bases will be stored temporarily. These temporary spoil heaps will be covered if required and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. The silt fences will be inspected regularly and after rainfall events by Environmental Clerk of Works (ECOW).

Surplus soil or rock excavated during the course of the works will be used on site in the form of landscaping including low berms, where appropriate. No spoil stockpiles will be left on site after construction is completed.

It should be noted that any stockpiling will be short-term and temporary and will occur only within the site boundary as the construction proceeds. The site drainage system will be put in place prior to excavation, therefore the discharge routes from any temporary stockpiling will be via the site drainage system. A minimum buffer of 50m will be provided between temporary stockpiles and the nearest watercourse.

Watercourse Crossings

Existing stream crossings will be protected using silt fencing.

Minor drains such as manmade agricultural and bog drains will be crossed using suitably designed pipe culverts.

Turbine delivery will not take place during extreme weather conditions.

Climate Change

To accommodate the effect of future climate change in Ireland, the 100-year peak flow values for stream crossing designs should be multiplied by 1.2 to obtain the design 100-year flood value for the crossing.

Wash Down from Concrete Trucks and Cement Mixers

Concrete washout will be carried out in a dedicated area of the temporary compound. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off.

An adequately designed settlement lagoon will be provided to receive all runoff from the concrete wash down area, similar to that shown in Figure 8. Regular inspections of the wash down areas and associated settlement lagoons shall be carried out and adequate records kept.

The settlement lagoon shall be lined using a 1mm LLDPE impermeable liner. A sump will be provided at this location which will collect the wash water from the concrete trucks. The excavated material will be kept on site for reinstatement following the construction period.



Figure 8: Lined Settlement Lagoon for Concrete Washout Facility

During construction, wash water and any solids in the sump will be removed periodically to an appropriate licensed facility. The sump can be emptied daily if required. Following construction, any solids, the liner, and any remaining wash water in the sump will all be removed to an appropriate licensed facility for disposal. The sump will then be reinstated.

1.6 Mitigation Measures for Flooding

Settlement ponds are to be provided as part of the drainage system for the development. The settlement ponds, together with the swales, will serve to reduce velocities in the surface water runoff draining from the access tracks and hardstanding areas and will provide retention of the flows. This will also mitigate any increase in the risk of flooding.

No construction personnel, operation or maintenance personnel will be permitted on site during extreme flood events. Landowners will carry on their normal activities in the vicinity of the development and will take the usual precautionary measures as far as practicable during flood events.

1.7 Mitigation Measures for Pollution Control to Protect Water Quality in Downstream Receptors

All personnel working on site will be trained in pollution incident control response. An emergency response procedure is prepared herein which will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt.

Silt Protection Controls (SPCs) are proposed at the location of watercourse crossings and where haul roads pass close to watercourses, silt fencing will be used to protect the streams.

Silt traps will also be provided at outfalls from roadside swales. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.

Settlement ponds will be put in place in advance as construction progresses across the site. The settlement ponds with a diffuse outflow detail will mitigate any increase in runoff and treat suspended solids in the surface water runoff. Erosion control and retention facilities, including settlement ponds will be regularly maintained during the construction phase.

All stockpile material will be bunded adequately and protected from heavy rainfall to reduce silt runoff, where necessary. Adequate security will be provided to prevent spillage as a result of vandalism.

Drains around hardstanding areas will be shallow to minimize the disturbance to sub-soils.

Suitably sized cross-drains will be provided for drainage crossings to convey flows from agricultural drains and forestry drains across the access tracks, to prevent a risk of clogging.

Tracks will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off.

All open water bodies adjacent to proposed construction areas will be protected by fencing, including the proposed settlement ponds.

Additional protection will be provided in the form of silt fencing downslope where required and at existing stream crossings during construction, to further ensure that there is no impact from the development to streams and rivers crossing the site.

Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Silt traps will also be provided at outfalls from roadside swales. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.

Refuelling of plant during construction will be carried out at the temporary compound, which will be located a minimum of 50m from any watercourse. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In addition to the above, onsite re-fuelling of machinery will be carried out 100m from watercourses using a mobile double skinned fuel bowser.

The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at the designated refuelling area and will be towed by a 4x4 jeep to designated re-fuelling areas near to where machinery is located but at distances of greater than 100m from watercourses. Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.

Concrete washout will be carried out in a dedicated area of the temporary compound. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off. During construction concrete will be kept out of all watercourses and drains.

Any diesel, fuel or hydraulic oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity.

Vehicles entering the site should be in good working order, free from leakage of fuel or hydraulic fluid.

A wheel wash will be provided at the site entrance draining to a silt trap to avoid any silt laden run-off flowing on to the public road and entering roadside drains.

Portaloos and/or containerised toilets and welfare units will be used to provide toilet facilities for site personnel during construction. Sanitary waste will be removed from site via a licenced waste disposal contractor.

Silt fencing will be erected at the location of stream crossings along the cable route.

1.8 Emergency Silt Control and Spillage Response Procedures

All personnel working on site will be trained in pollution incident control response. An emergency response plan will be prepared which will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. A regular review of forecasts of heavy rainfall is required and a contingency plan will be prepared for before and after such events. A record will be kept of daily visual examinations of watercourses which receive flows from the permitted development, during and for an agreed period after the construction phase. Procedures for particular accidental spillages, from leaking or damaged fuel lines or a break out of silt are outlined below.

Oils, Fuels and Site Vehicles

Refuelling of plant during construction will be carried out at the temporary compound. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In addition to the above, onsite re-fuelling of machinery will be carried out 100m from watercourses using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at the designated refuelling area and will be towed by a 4x4 jeep to designated re-fuelling areas near to where machinery is located but at distances of greater than 100m from watercourses.

Details of tests to be carried out on Storage tanks to a recognized standard together with a secondary containment system to provide at least 110% of the maximum tank capacity are as follows:

All tank and drum storage areas shall, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

a. 110% of the capacity of the largest tank or drum within the bunded area; or

b. 25% of the total volume of substance which could be stored within the bunded area.

Accidental spillage from leaking or damaged fuel lines

Emergency drip trays and spill kits will be kept available on site for use in emergencies to ensure that any spills from vehicles are contained and removed off site. Each refuelling station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site.

In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland should also be informed immediately.

In the event of an accidental spillage from leaking or damaged fuel lines, the spillage will be cleaned up with absorbent material e.g. sand or turf mould and placed in a designated bunded location while awaiting removal offsite to a licensed facility.

In the event of an emergency, the settlement ponds will provide a temporary holding area for any accidental spills on site as it will be possible to block off the outflow from these ponds for a limited period.

Accidental break out of silt

Following an accidental break out of silt, emergency measures will be put in place. During the construction period an emergency facility will be provided with sand bags to block off the outlet in the sedimentation ponds to prevent discharge from the sedimentation ponds in the event of a break out of the silt.

Additional silt fencing will be available on site for use in emergencies.

The drainage engineer should be contacted if there is an accidental spillage or break out of silt on the site.

1.9 Maintenance of Site Drainage Systems

The drainage system for the development should be maintained regularly to keep it operating effectively. The maintenance should include the following:

- inspection and maintenance of swales;
- inspecting cross-drains for any blockages;
- inspecting settlement ponds and outfalls;
- inspecting the stream crossings and piped crossings for obstructions;
- inspecting the progress of the re-establishment of vegetation;
- implementing appropriate remedial measures as required after the above inspections.

1.10 Construction Stage Mitigation Measures

Long range weather forecasts should be examined, and the construction phases planned taking cognisance of expected weather conditions. Regular meetings should be held to re-assess construction phases with weather conditions as the project progresses.

Regular meetings should be held between the Drainage Engineer appointed by the contractor and the contractor's Project Manager. The planning of traffic routes through the site should be agreed in advance, in order to plan appropriate construction drainage management.

The proposed mitigation measures are listed in Chapter 10 of EIAR.

A detailed water quality monitoring programme will be undertaken during the construction phase of the proposed development, in addition to the visual inspections outlined above, so as to ensure the effective implementation of the proposed mitigation measures. A water quality monitoring plan is detailed below.

1.11 Water Quality Monitoring Plan

A monitoring programme will be established to ensure that the water quality is maintained. This programme will ensure that designed measures are working to ensure water quality is not affected. The details of this programme are outlined below.

Daily visual inspections of drains and outfalls will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

Visual inspections will be continued during the operational period until vegetation is established on site at intervals to be agreed with Cork County Council/IFI.

A detailed water quality monitoring programme will be undertaken during the construction phase of the proposed development, in addition to the visual inspections outlined above, so as to ensure the effective implementation of the proposed mitigation measures. Field measurements and grab samples will be taken at suitable locations, which will be decided prior to the construction phase commencing. The field measurements will be recorded at the site and will include measurement of the following parameters, electrical conductivity (µs/cm), pH, temperature (ºC), suspended solids (mg/l) and dissolved oxygen (mg/l). The field measurements will be taken on a weekly basis during the site clearance and earthworks stage of the construction period. An ECOW will compare the results with the pre work levels and ensure that designed mitigation measures are working. An ECOW will propose new mitigation measures if results exceed pre work levels.

1.12 Operational Phase Mitigation Measures

It is not envisaged that the operation of the wind farm will result in significant impacts on the hydrological regime or water quality of the area, as there will be no further disturbance of soils post-construction, and only a minimum of traffic movement.

Oil used in transformers (at the substation and within each turbine) and storage of oils in tanks at the substation could leak during the operational phase and impact on groundwater quality. The substation transformer and oil storage tanks will be in a concrete bunded capable of holding 110% of the oil in the transformer and storage tanks. Turbine transformers are located within the turbines, so any leaks would be contained.

Visual inspections will be continued during the operational period until satisfactory vegetation is established on site at intervals to be agreed with Cork County Council/IFI.

It is not envisaged that the maintenance period will involve any significant impacts on the hydrological regime of the area. The maintenance of the development will incorporate effective maintenance of the drainage system. Visual inspections will be undertaken during the maintenance period in accordance with maintenance schedule in CIRIA C753. The maintenance regime will include inspecting the following:

- Drains, cross-drains and culverts for any blockages
- Outfalls to existing field drains and watercourses
- Existing roadside swales for any obstructions
- Swales
- Progress of the re-establishment of vegetation.

The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections and testing the water quality at the outfalls at appropriate intervals.

1.13 Decommissioning Stage and Mitigation Measures

As in the construction phase silt protection controls would again be put in place. The drainage system will remain operational during the decommissioning phase and will serve to treat any sediment laden surface water runoff due to a renewed disturbance of soils. Revegetation following the backfilling of hardstanding areas will be monitored. If it is deemed necessary, erosion control matting will be used to assist in the re-establishment of vegetation.

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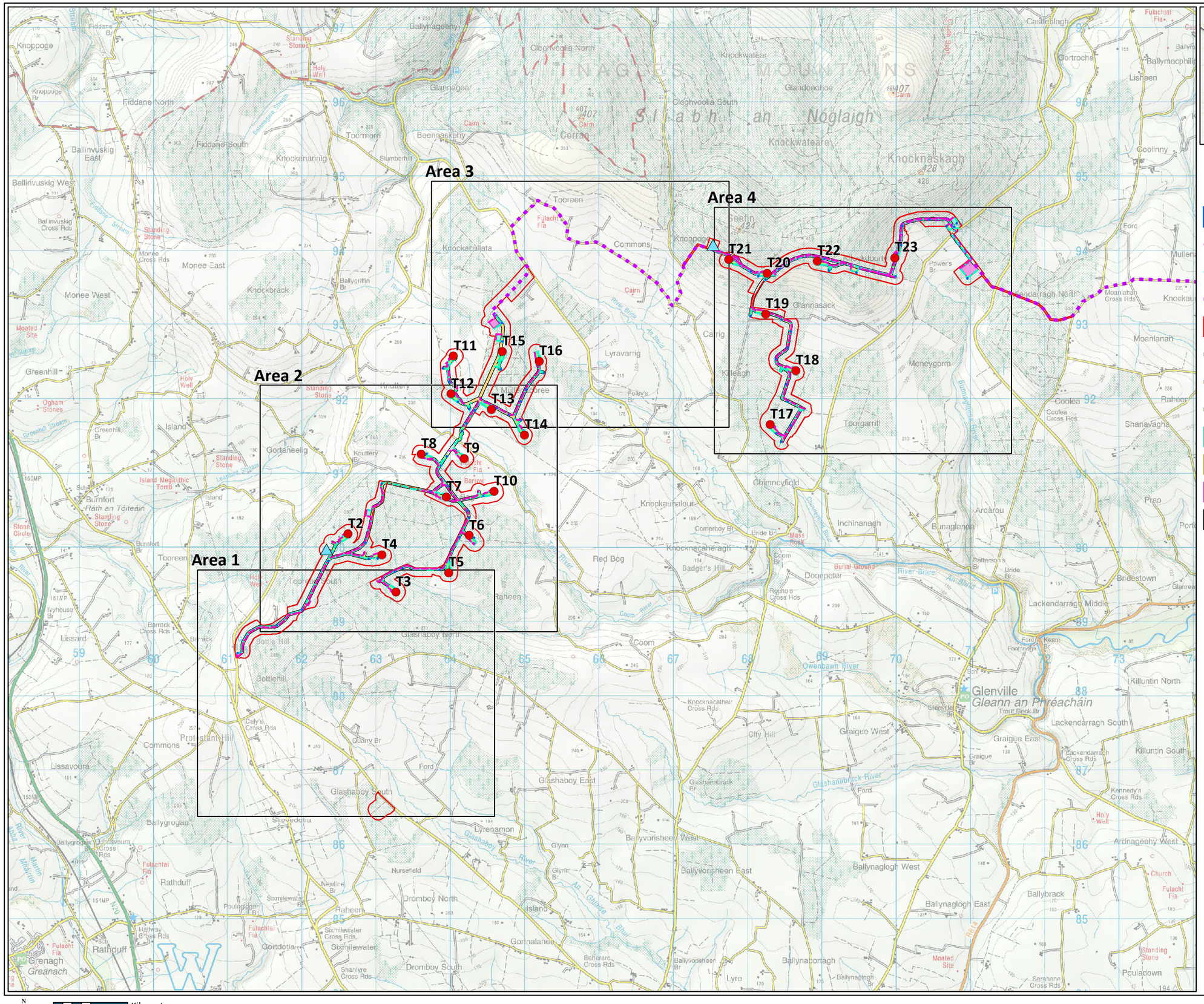
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APPENDIX 1

Proposed Drainage Layout

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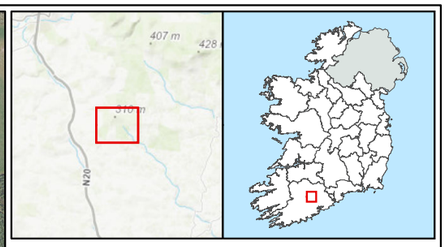
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- Proposed Turbine Layout
- Stilling Ponds
- Interceptor Ditch
- Swales
- Proposed Development Boundary
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Turning Heads and Passing Bays
- Proposed Turbine Hardstanding Area
- Proposed Temporary Compound

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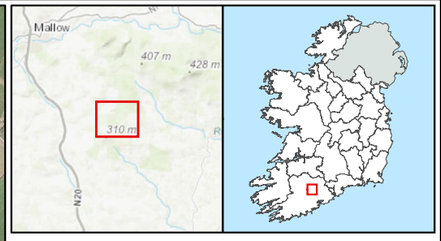
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- Proposed Borrow Pit
- Proposed Temporary Compound

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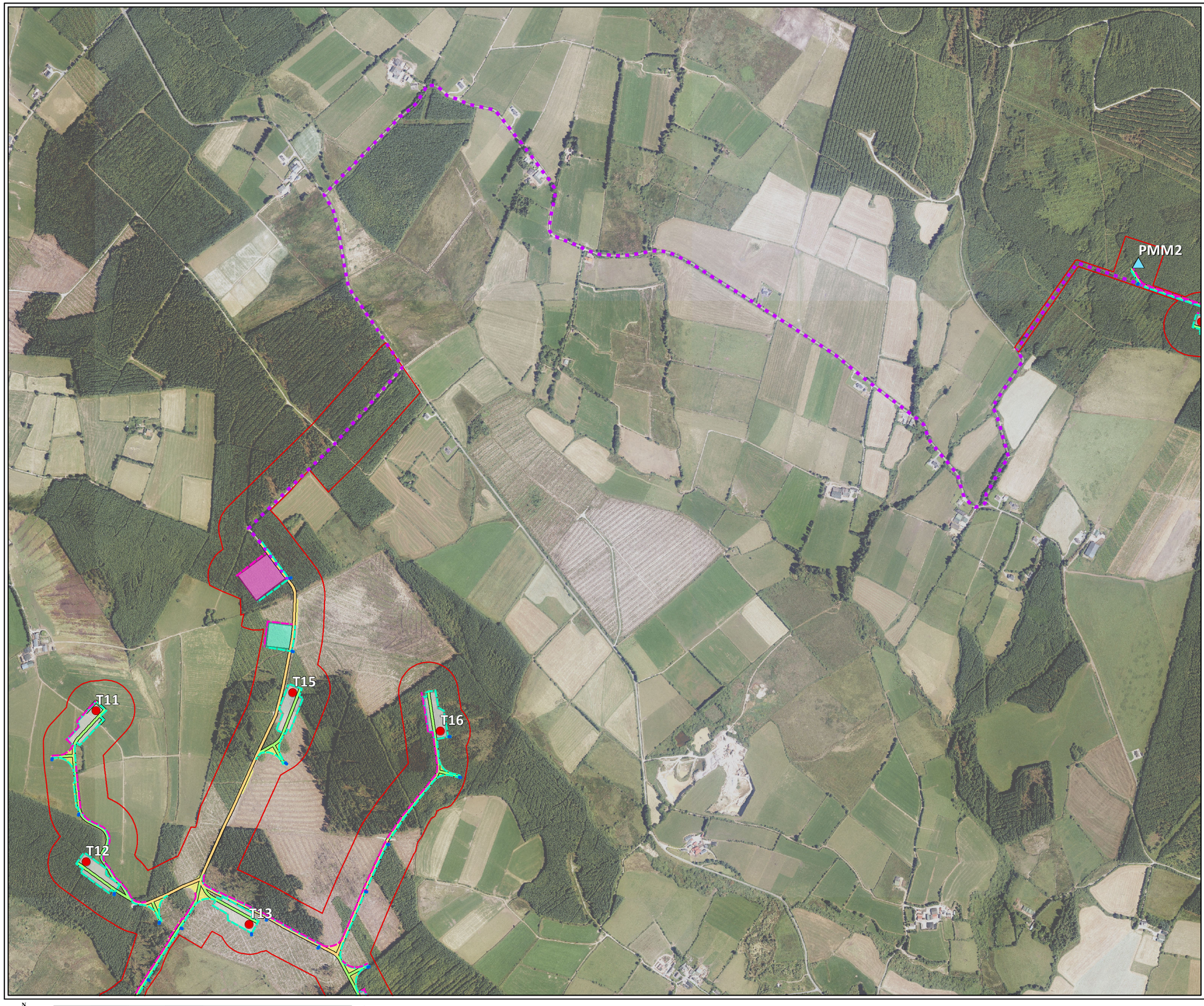
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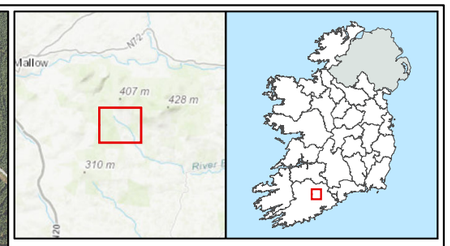
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- Proposed Borrow Pit
- Proposed Substation

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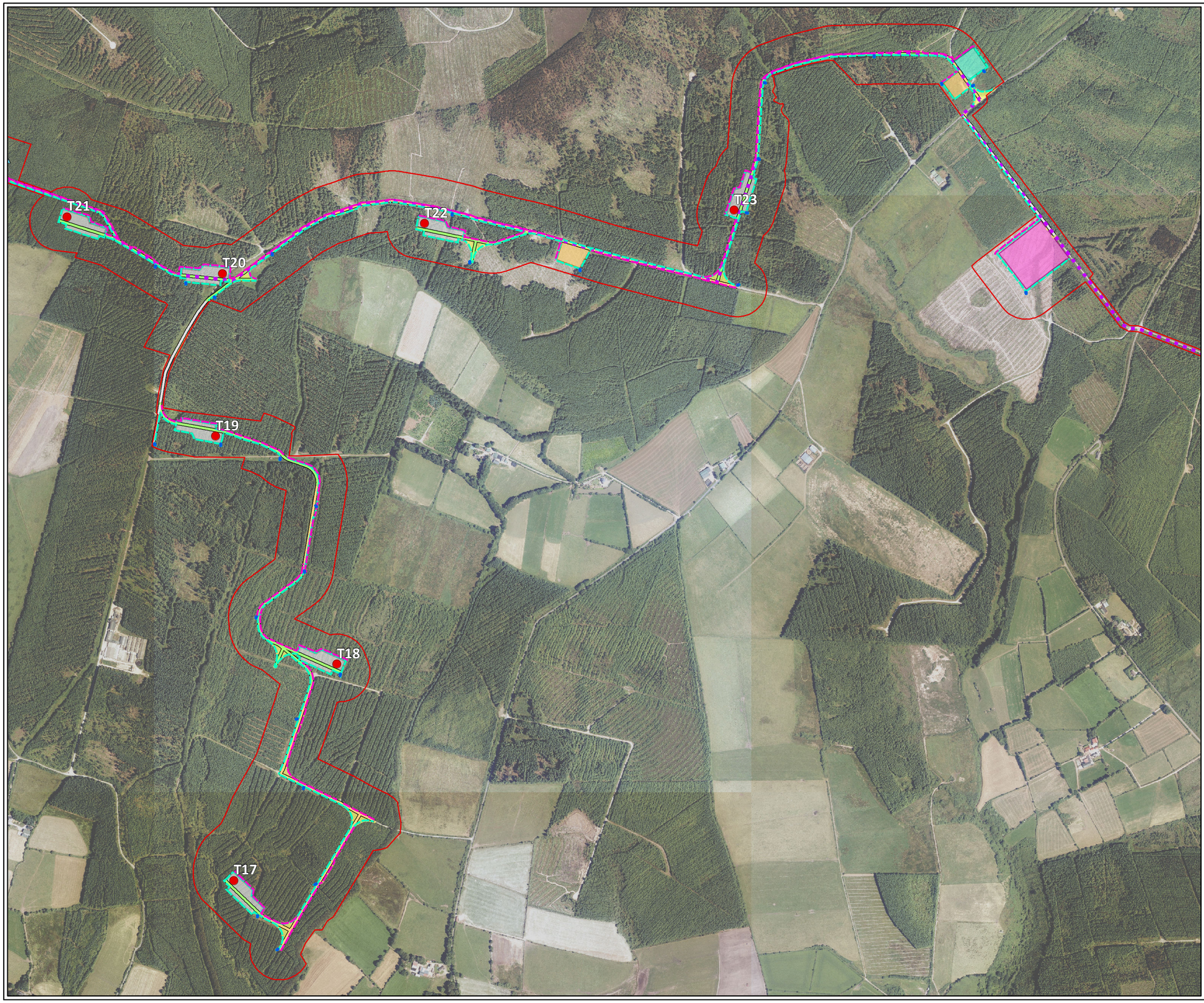
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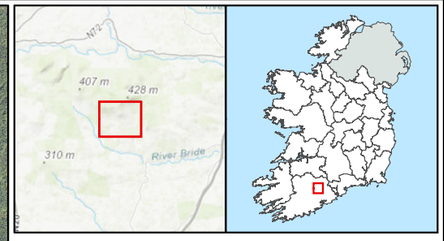
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- Proposed Temporary Compound
- Proposed Substation

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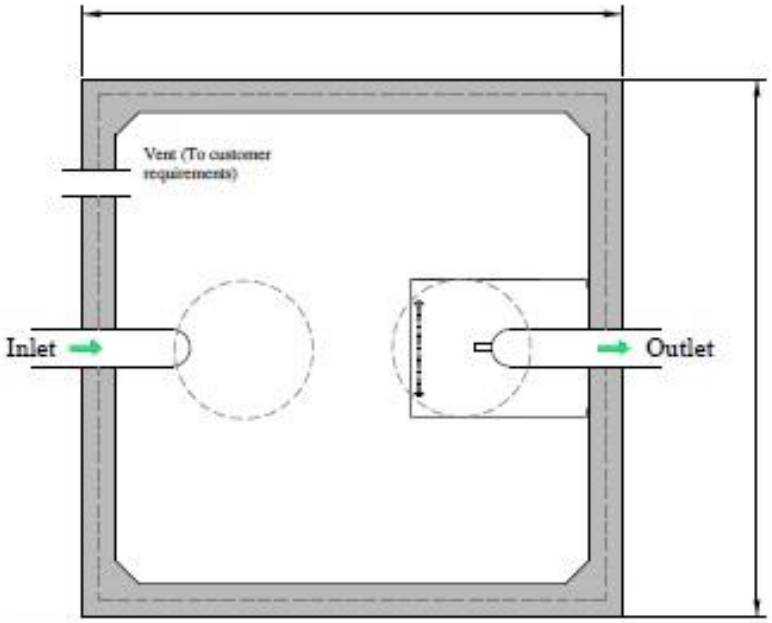
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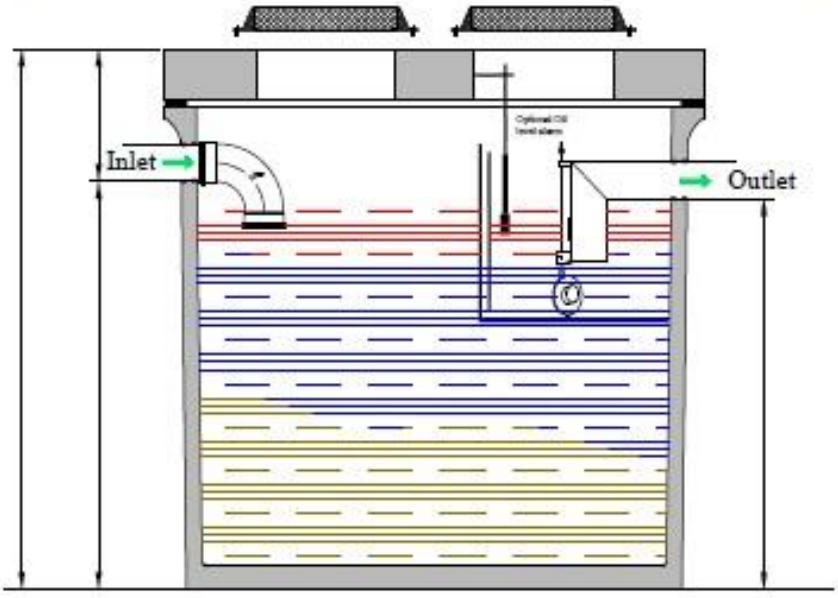
Class 1 Oil Interceptor – Example

Full Retention Interceptor Class 1



All the tanks must be placed on a perfectly level and firm suitable base.
Typical layout, variations as required per customer.

An anti-syphon vent is required for long run outflows



MOLLOY
PRECAST
Environmental Solutions
Clara Road, Tullamore, Co. Offaly, Ireland
Tel: 057 9326000 Info@molloyprecast.com
Fax: 057 9326060 www.molloyprecast.com

Note: Observe all safety regulations in regard to excavation and lifting requirements. Never leave opening uncovered or unattended at any time.
Note: Specify any specific requirements prior to ordering. All civil works by customer.
Note: Do not scale from this drawing. Only for illustration purposes.

Tank Type: C Full Retention Interceptor	**Title:**
Tank Size:	Full Retention Interceptors
Height:	**Date:**
Volume:	**Drg. No.:**
Weight:	**Drawn By:**

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APPENDIX 2

Turbine Delivery Route Report
(TDR Report)

Coom Green Energy Park

Route Survey Report



October 2018

Exceptional Load Services Ltd, Ballymoyle, Arklow, Co Wicklow, Ireland

T: +353-402-31229. E. permits@wide-loads.com

Customer	Fehily Timony & Company
Site Address	Coom Green Energy Park Bottlehill Co Cork
Survey Date	05/09/2018
Survey Personnel	Edwin Sunderland, ELS John Webb, ELS
Survey Criteria	To select most suitable route from Cork Harbour (Ringaskiddy) to site entrances. For the purpose of the survey the following route options were considered Site Entrance #1: Ringaskiddy – N28 – Bloomfield – N40 – Lynch Tunnel – N8 (Lower Glanmire Road) – Tivoli – R635 (Northlink) – Blackpool – N20 – L6955 – L6956. Site Entrance #2: No Workable route found. Site Entrance #3: Not Surveyed. Site Entrances #4,(5,6 & 7 included): Ringaskiddy – N28 – Bloomfield – N40 – M8 – (J14) – R639 – N72 – L1506 – L1507 – L1501.
Surveyed Dimensions	For this survey the following components were considered Blade: 65m It is assumed tower sections would be delivered on tower adaptors

Revision Record

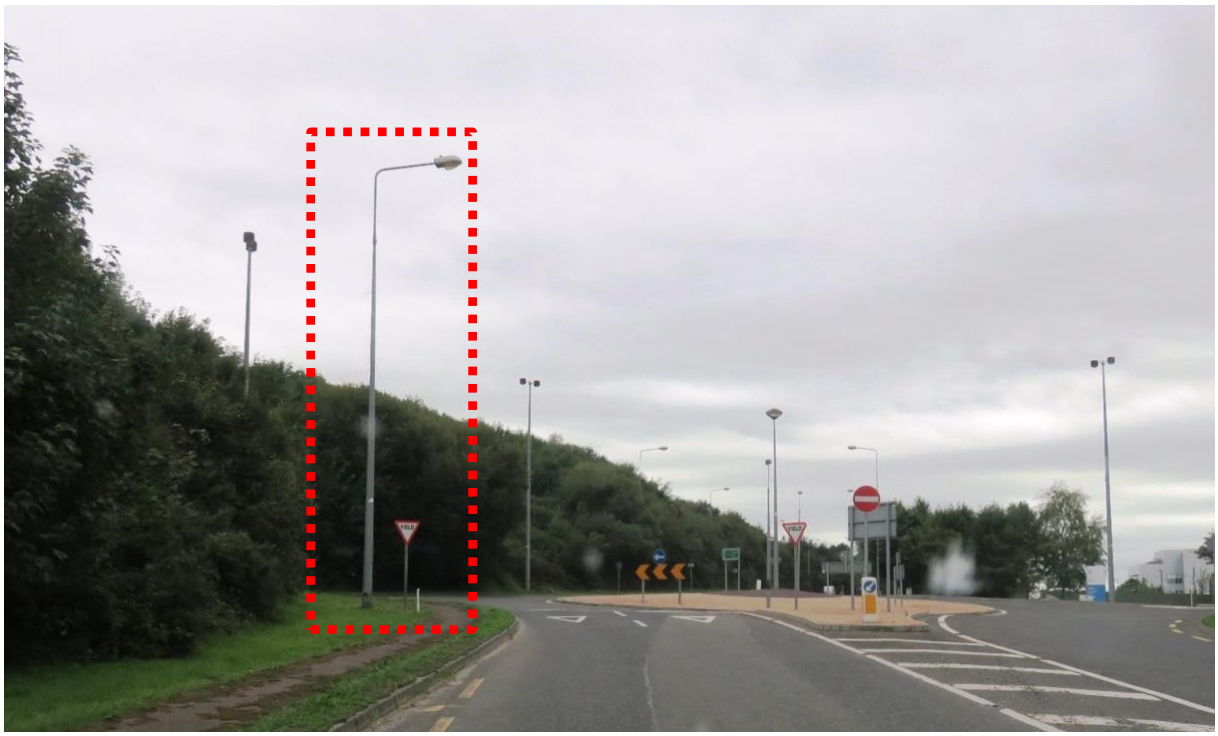
Revision/Version	Date	Author	Description
Issue R.0	03/12/18	Edwin Sunderland	Report.
Revision R1	18/07/19	Edwin Sunderland	Update for 70m blades

Location Map



Route Option 1 & 2

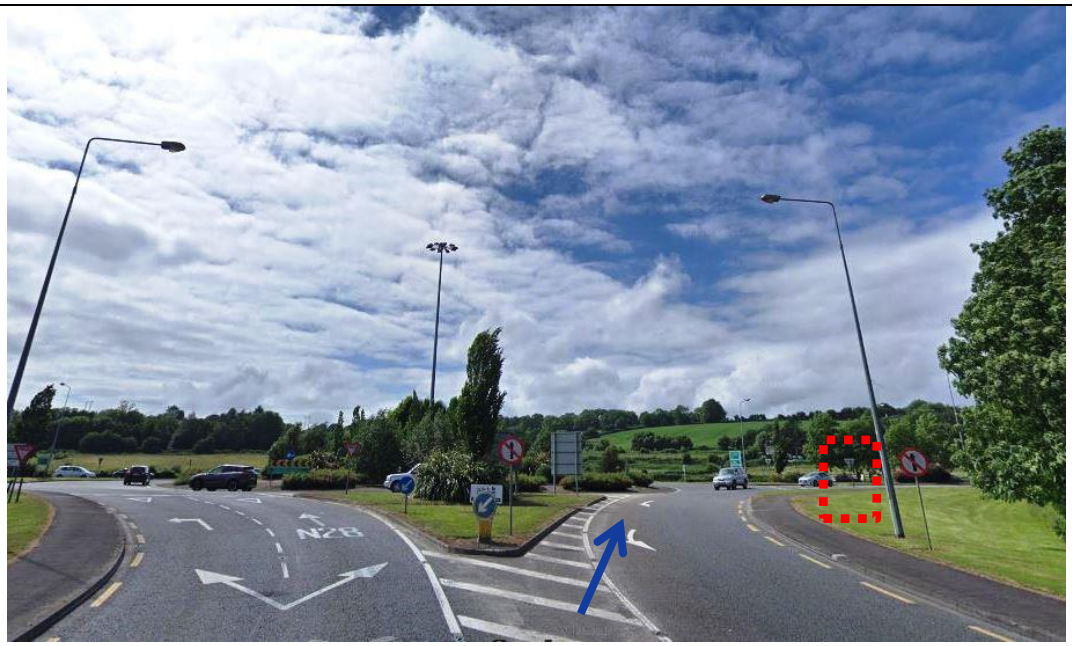
Node 1.0. (All Routes) Pfizer Roundabout
Street furniture should be removed to allow rear oversail



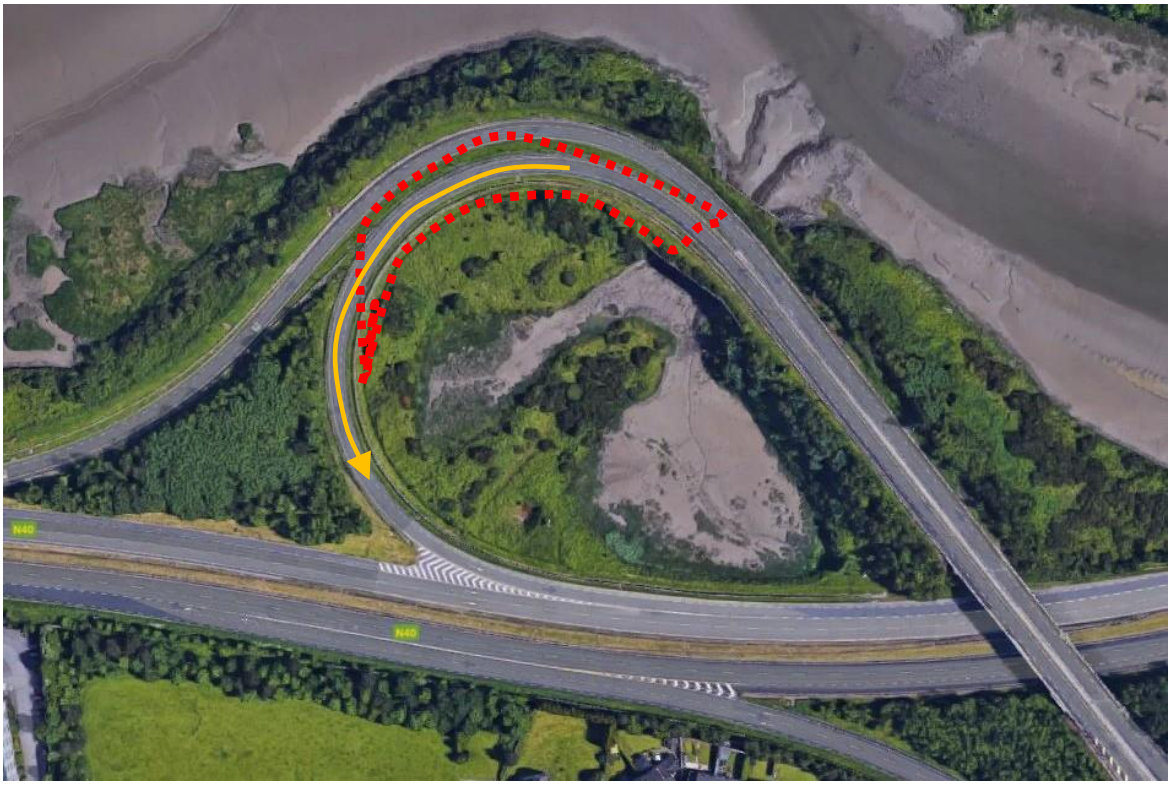
Node 1.1. (All Routes) Shanbally Roundabout
This roundabout will be travelled by contraflow. Upgrade works have been carried out on this roundabout and may require further investigation.

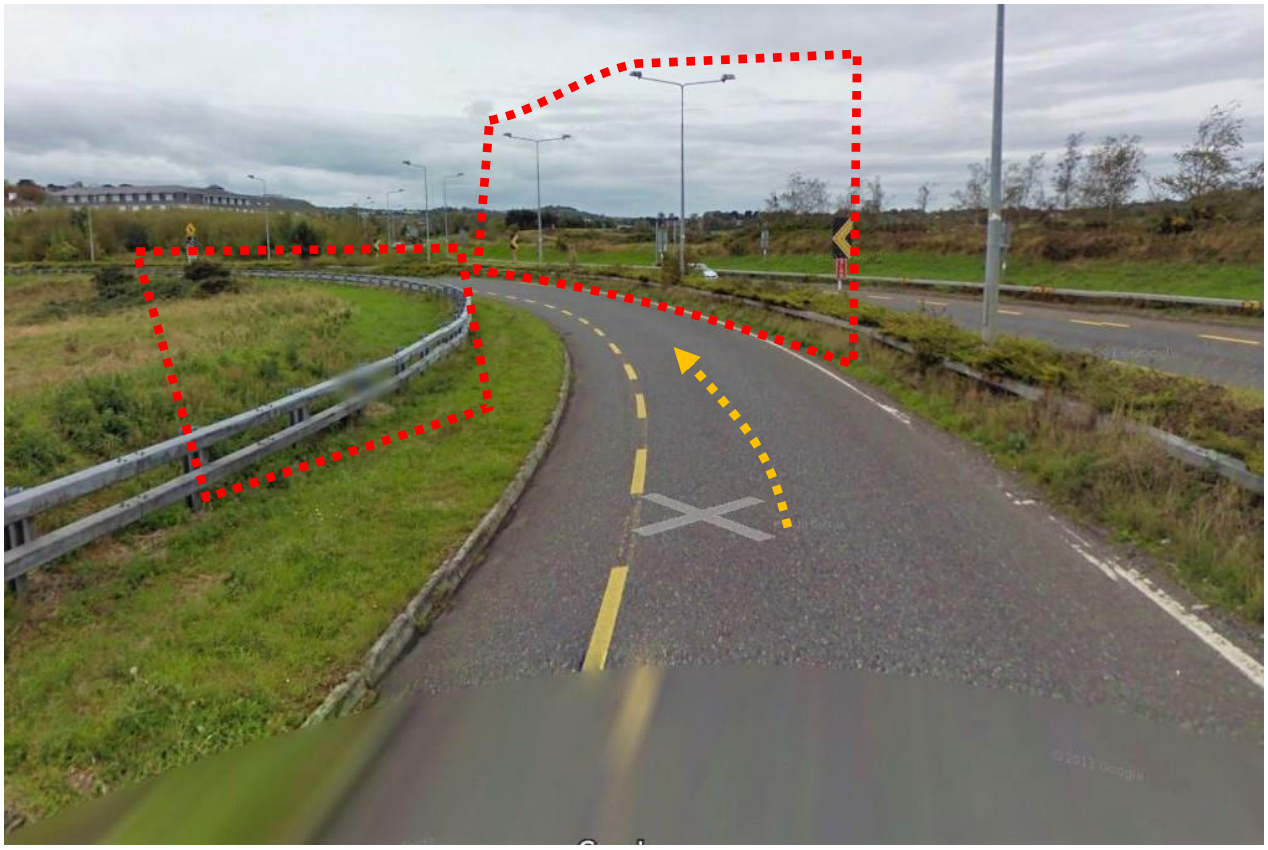


Node 1.2 Carrigaline Roundabout (Contra flow)
This roundabout will also be contra-flow and will require street furniture removal (YIELD sign)



Node 1.2.1 Bloomfield Interchange
This Ramp may need safety barrier on inside of curve (left side) to be removed. Also street lighting on right may need to be removed.

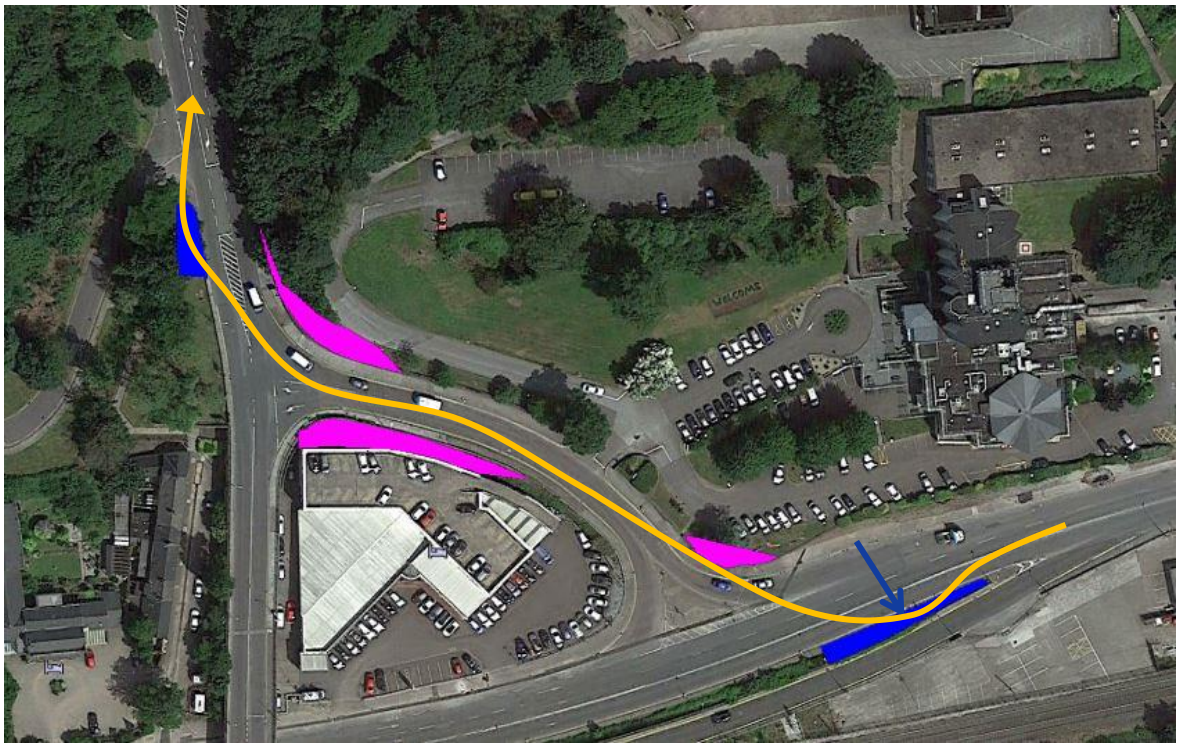




Node 1.3. Tivoli/Silversprings (Contraflow)

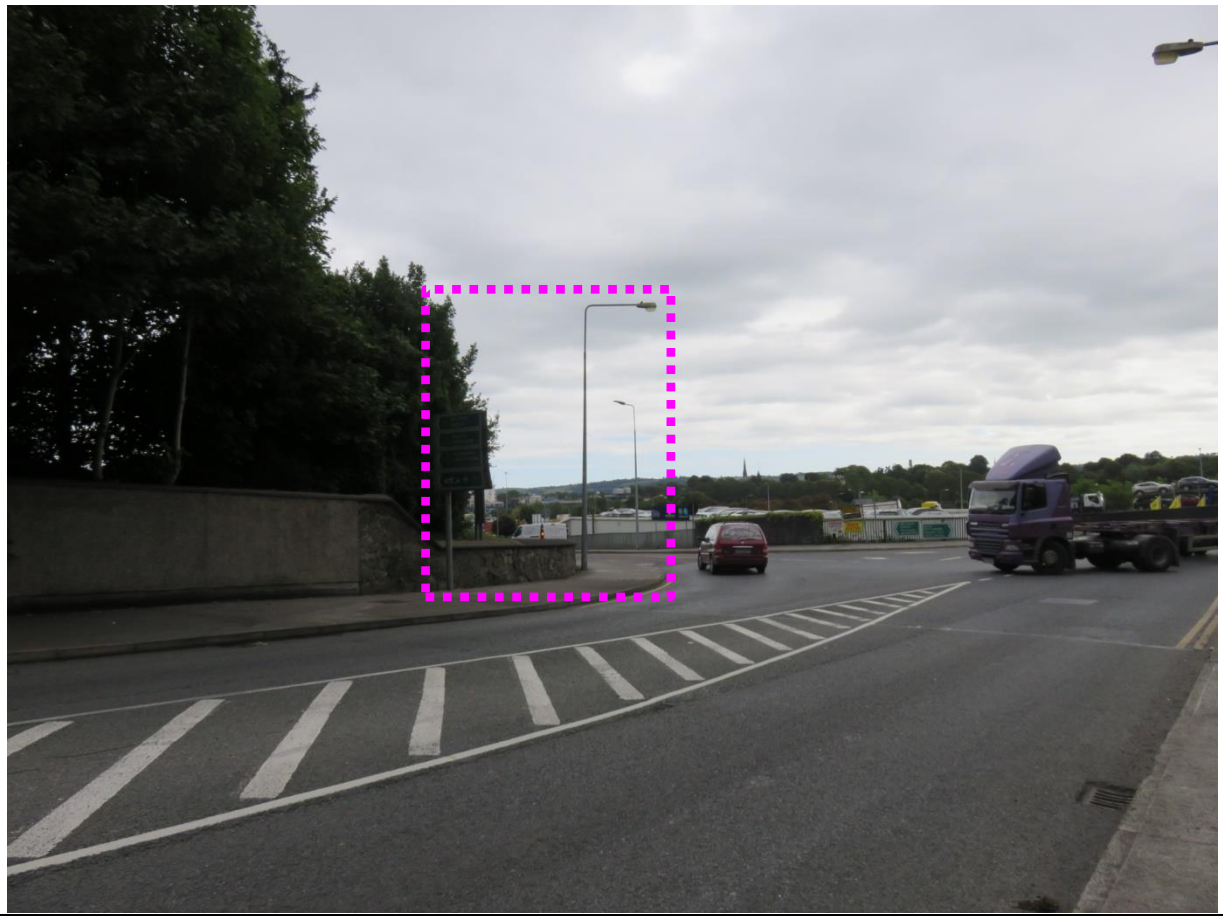
All towers, blades and nacelles will have to access the North Ring via the Silversprings slip road. Street furniture removal and tree/hedge trimming will be required. Land take and oversail will be required. Splitter island should be ramped and checked for load bearing capacity.

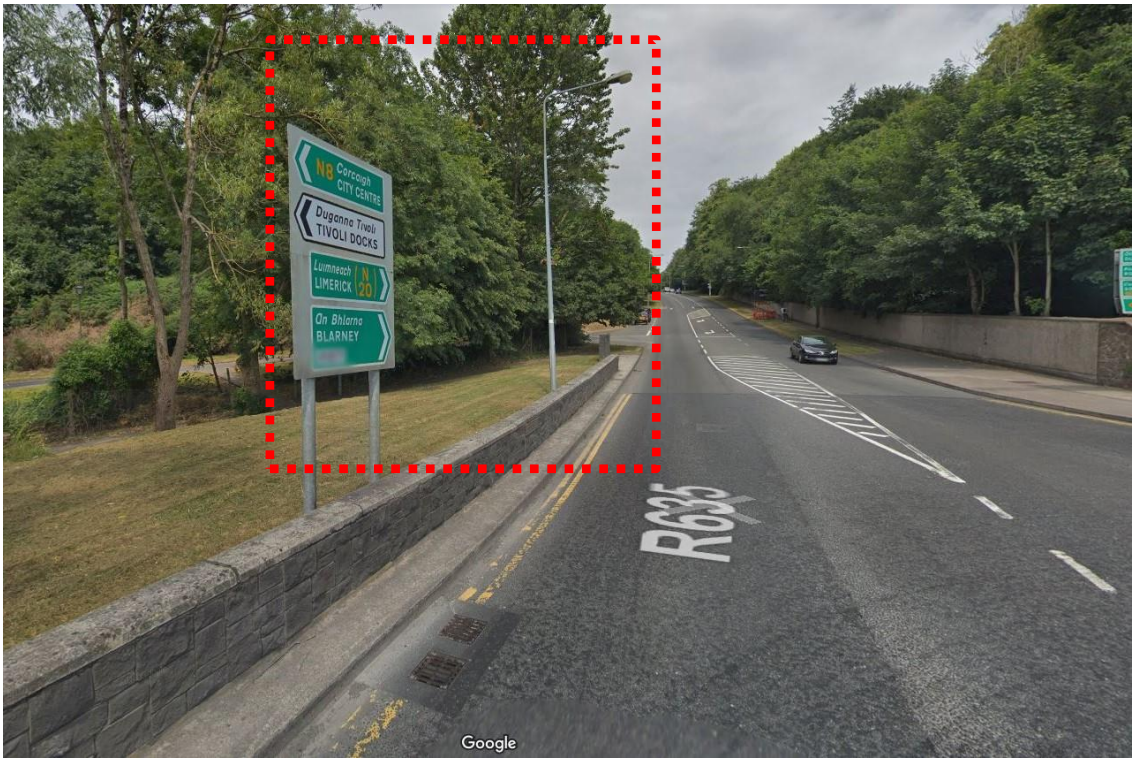
Blue areas are load bearing and Magenta are for mid or rear oversail .



Node 1.4 Tivoli - Contraflow

This junction (right turn) will require works for blade deliveries. Street light should be removed . Oversail will be required behind street light. Mid oversail will also be required on the right side. A segment of load bearing may also be required near the entrance to Tivoli Woods.

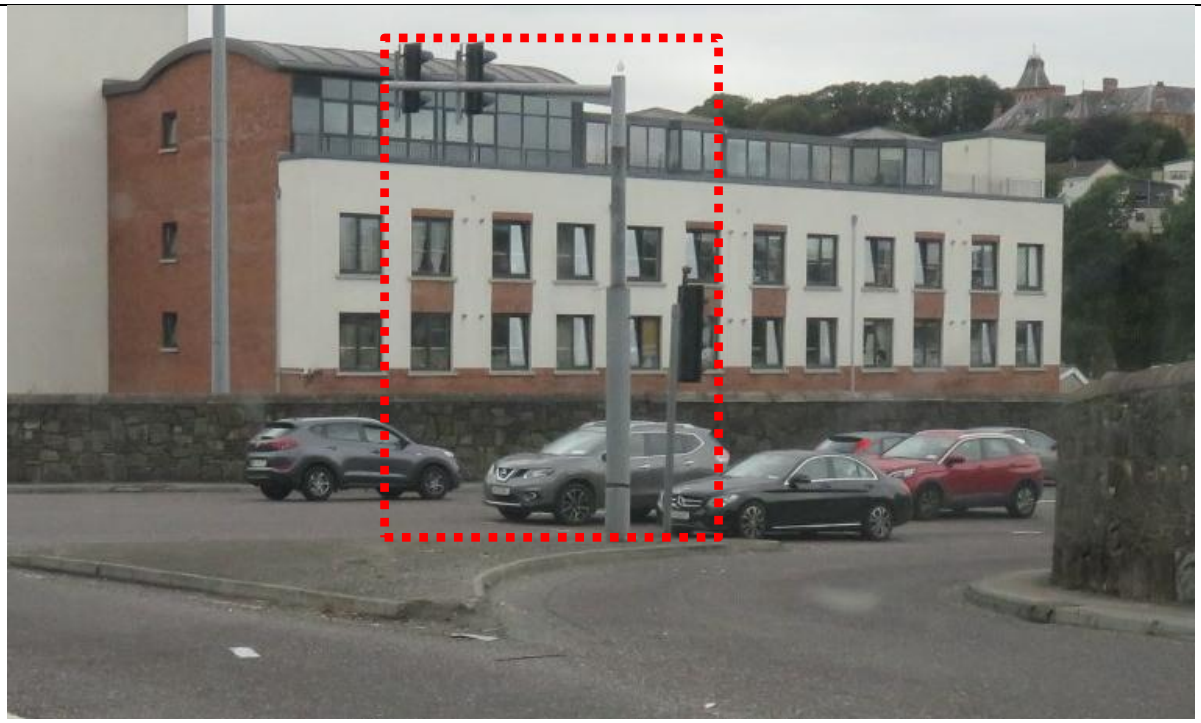


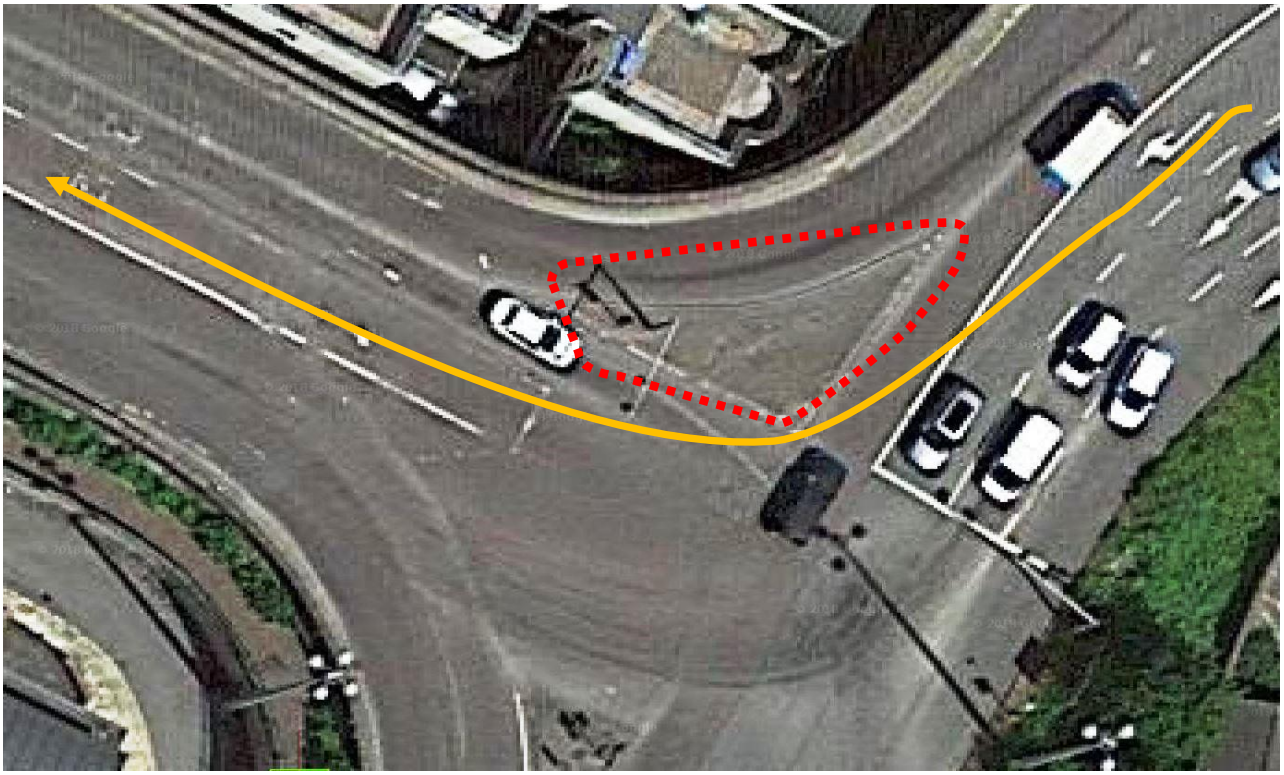


Node 1.5. Blackpool. N20 Junction - Contraflow

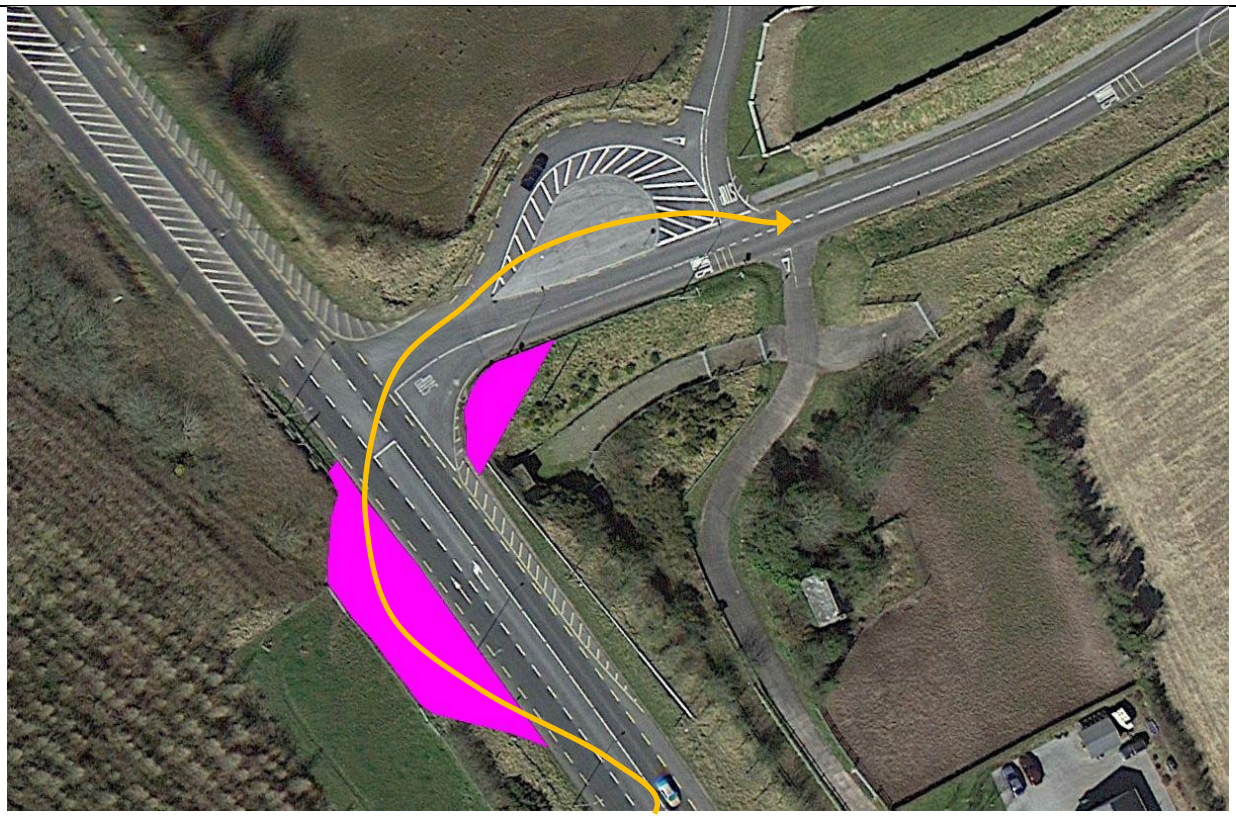
This right turn will require travelling in contra flow over the inbound splitter island. Traffic lights should be removed and all kerbing on the splitter island should be ramped with tarmac.

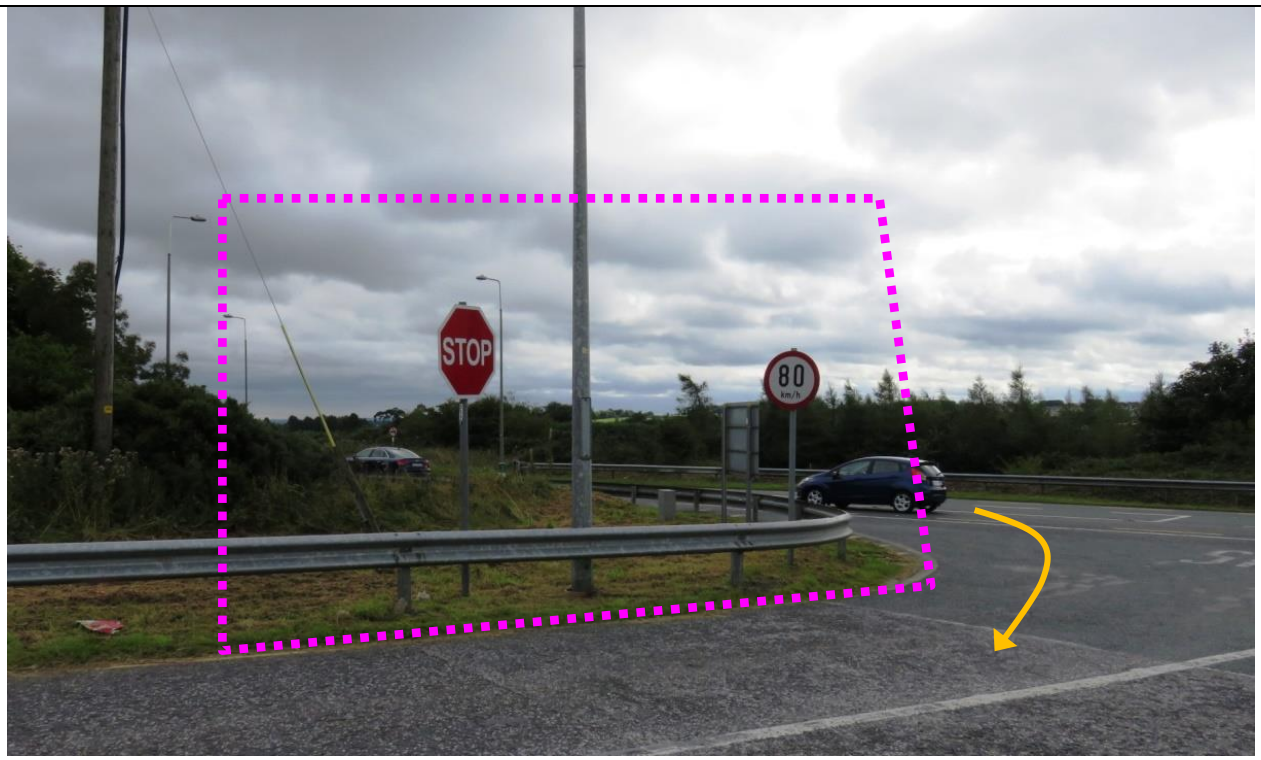






Node 1.6. N20/L6955
This right turn off the N20 will require land on left and right for overrsail and the removal of street furniture as marked.



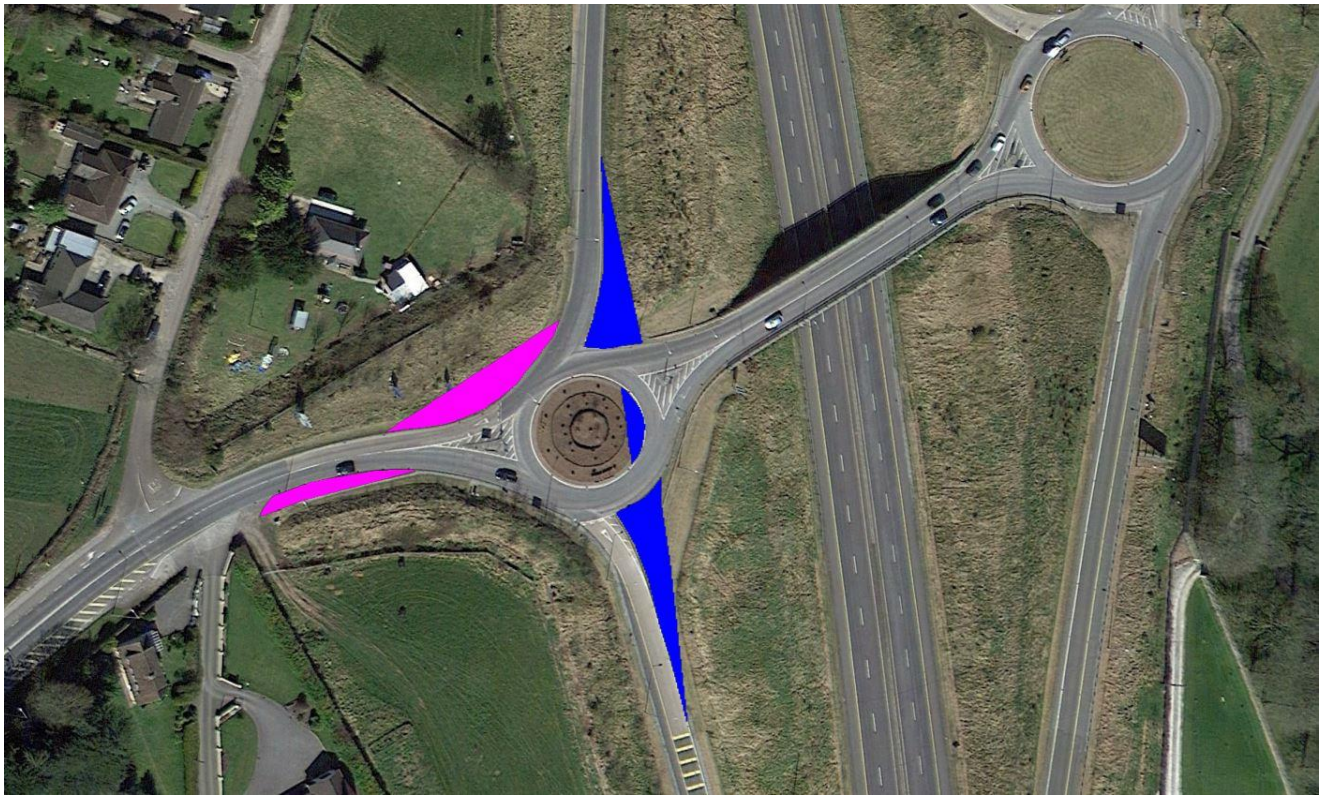


Node 1.7. L6955
This left turn onto site road will require land take for both load bearing and oversail.

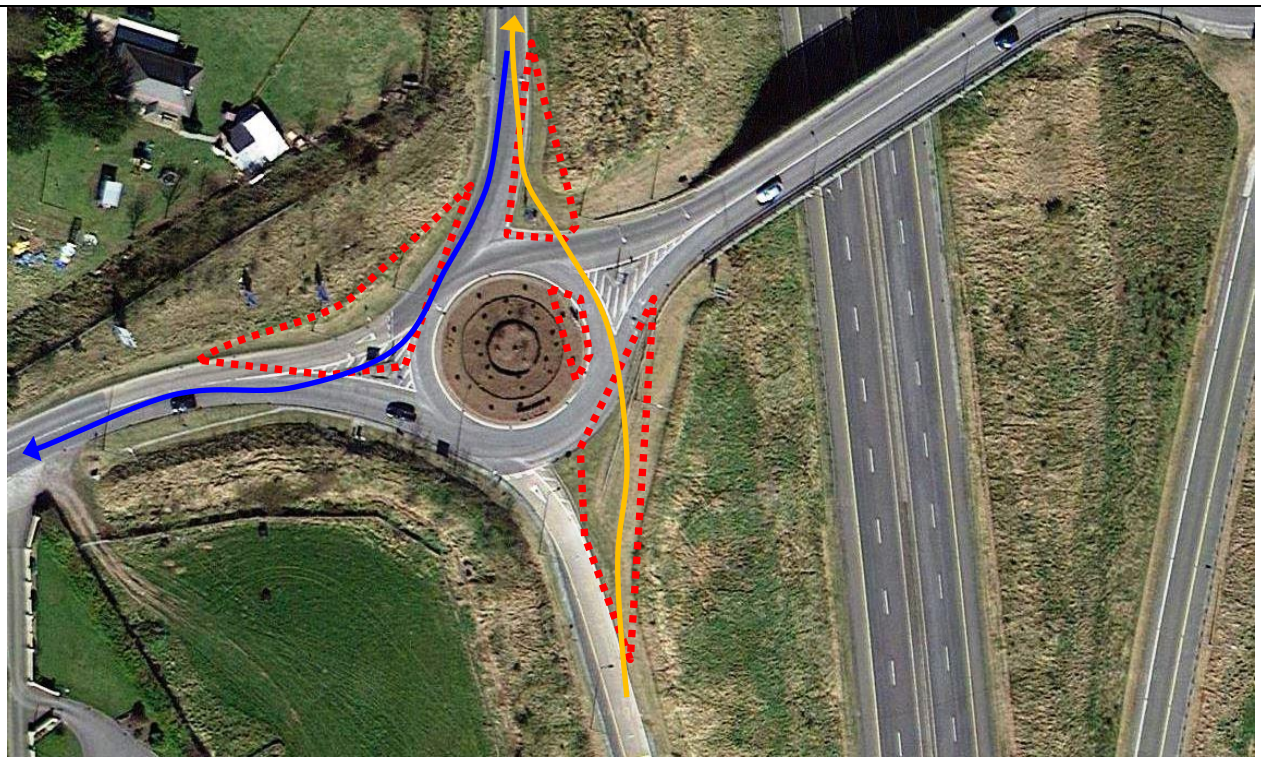


Node 2.0. M8 Junction 14.

As blades will not be able to make a direct turn onto the N72 in Fermoy town the loads will need to reverse from this point into the town. Travel is contraflow. There is a combination of load bearing and oversail requirements – all within road boundary. Enabling works on the R639 Splitter island will be sufficient to accommodate a direct turn for tower sections.



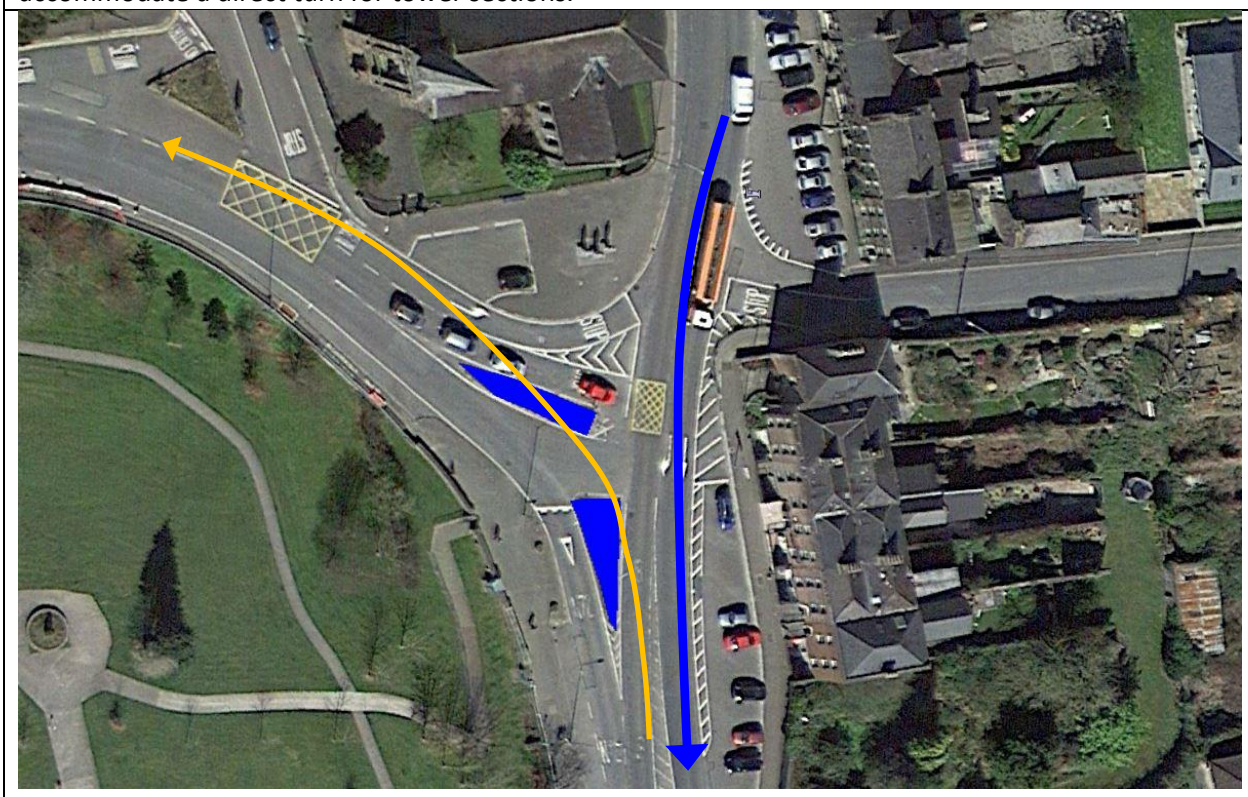




Node 2.1 Fermoy Town. R639/N72 Junction

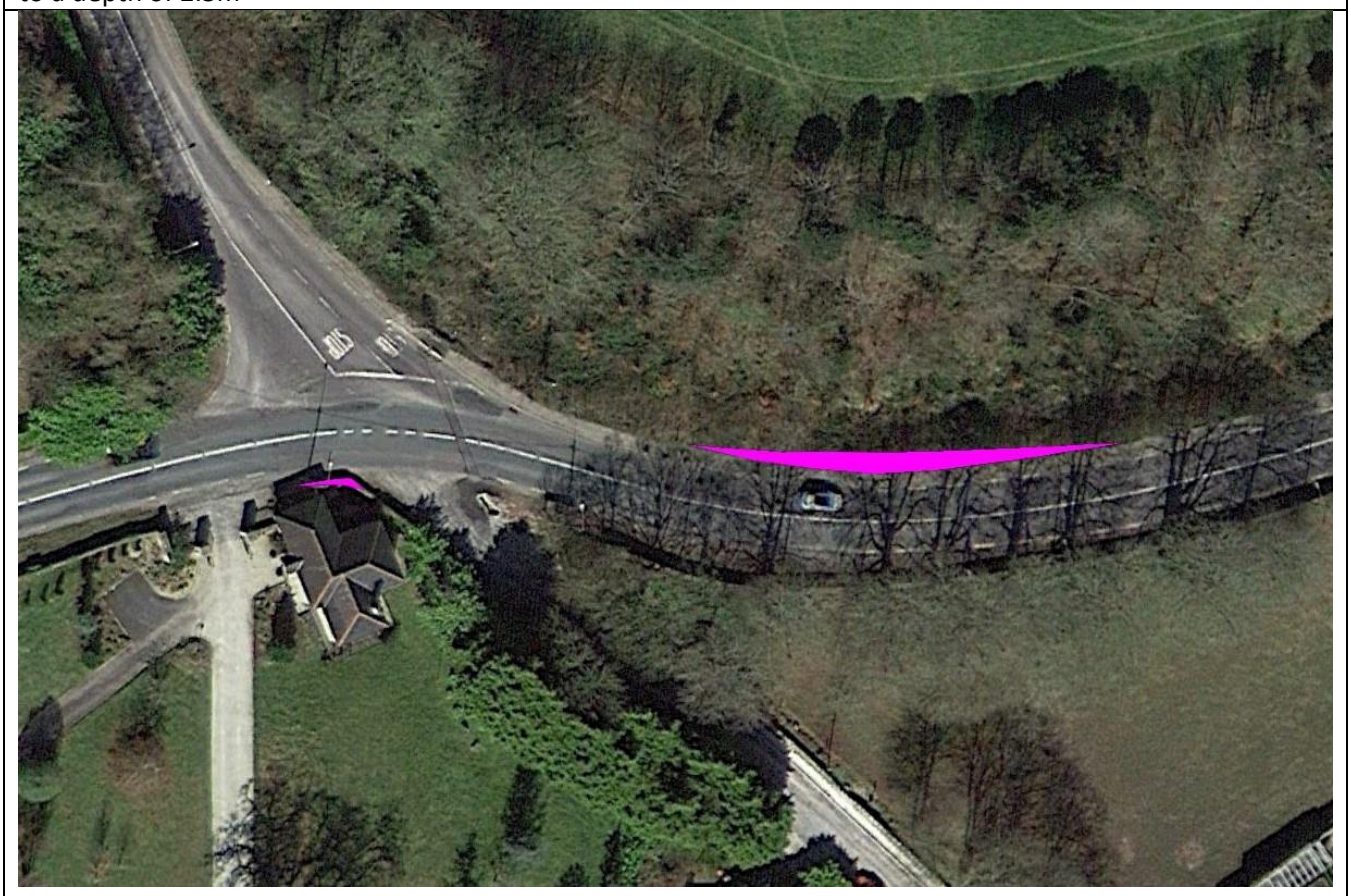
This junction will require removal of all street furniture on both splitter islands.

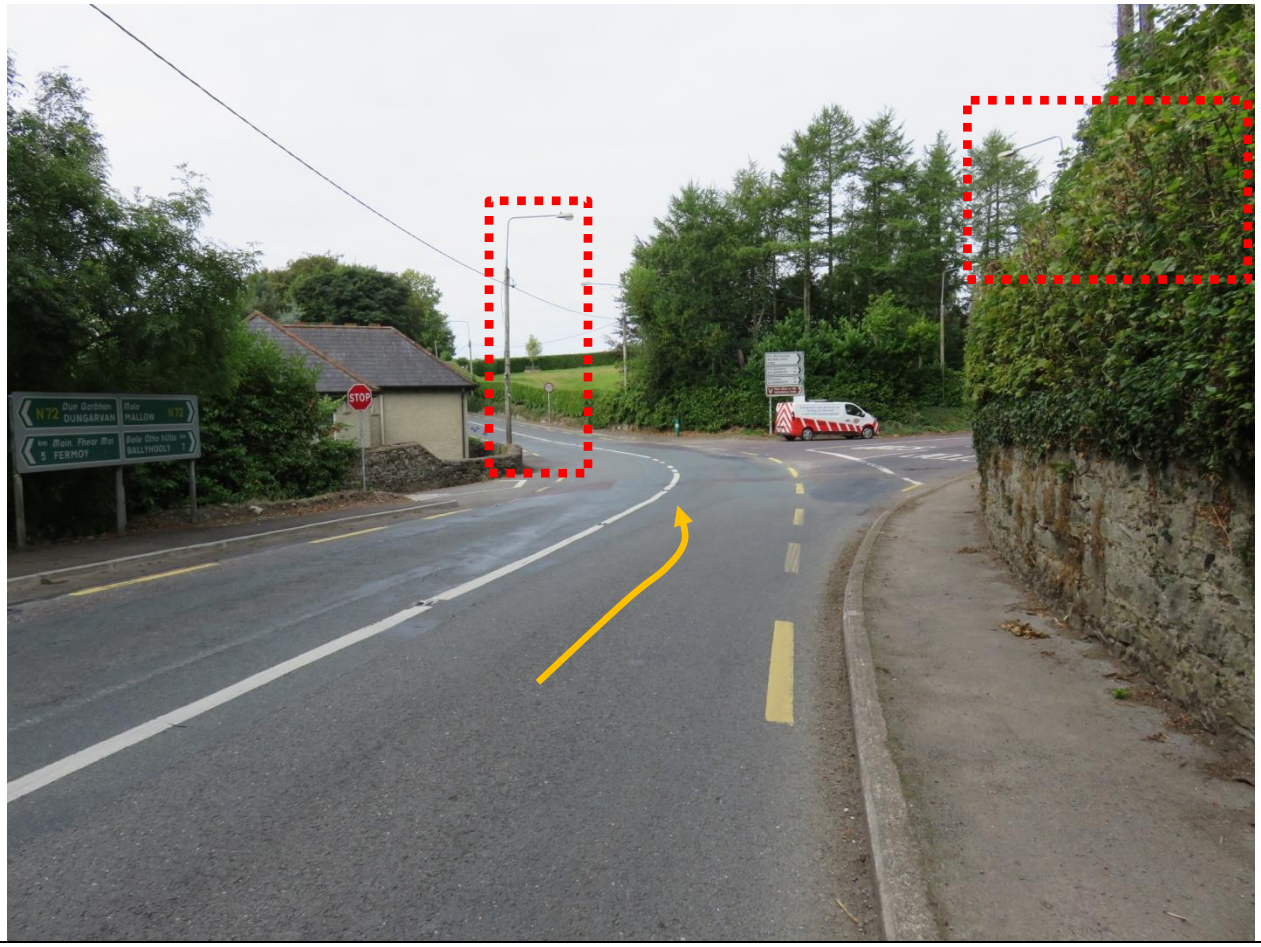
Both islands should be ramped with tarmac. Enabling works on the Splitter islands will be sufficient to accommodate a direct turn for tower sections.



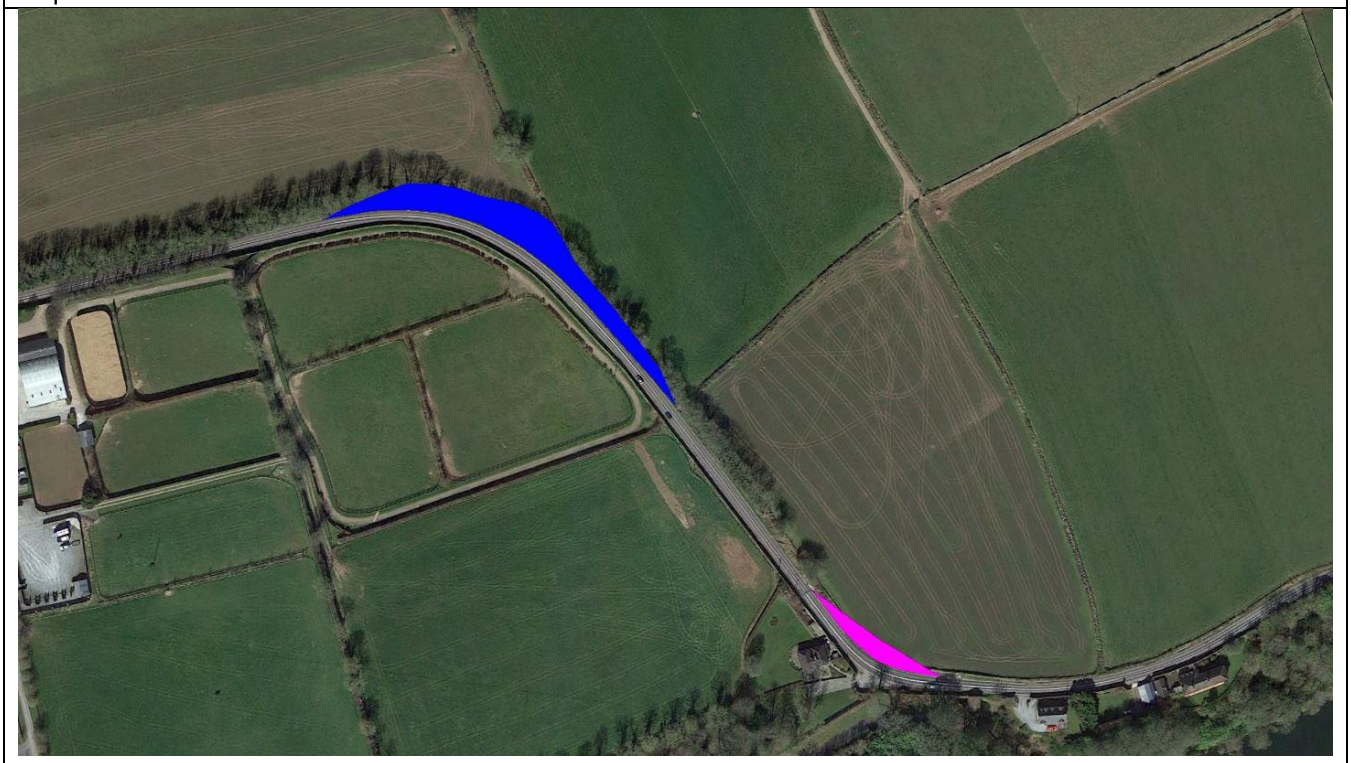


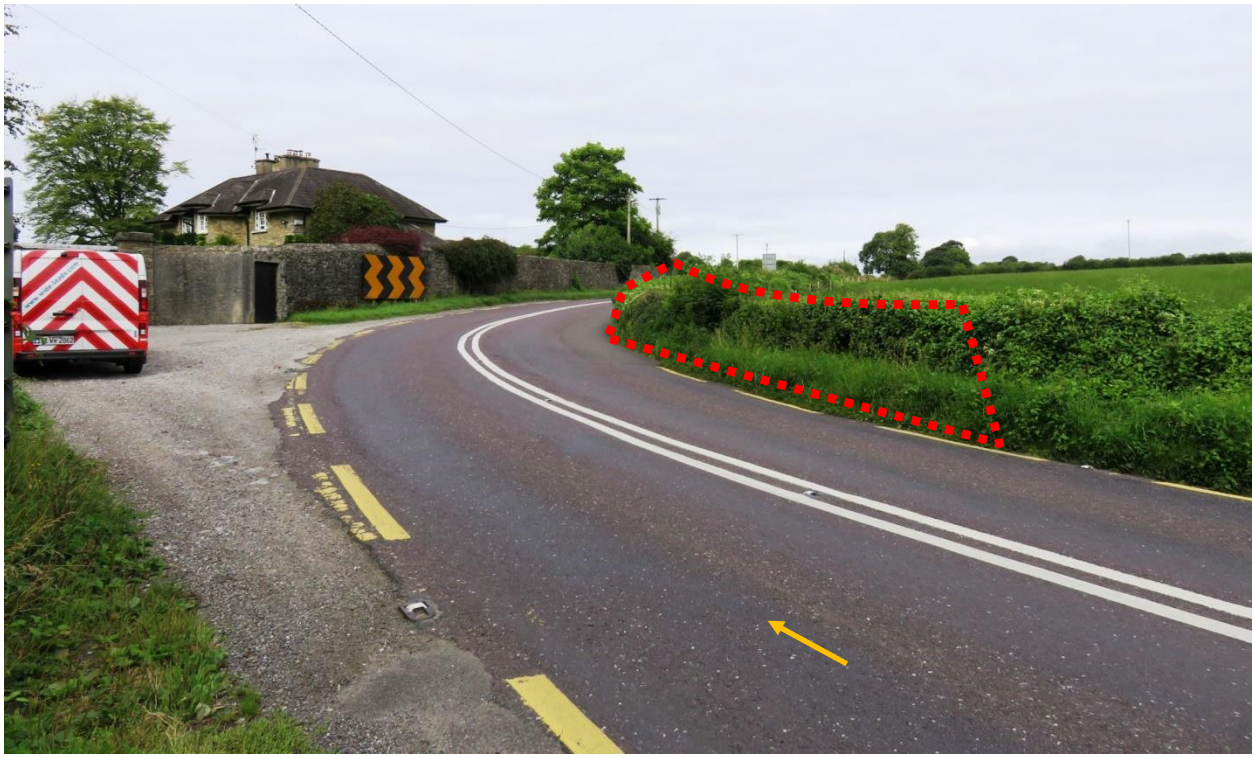
Node 2.2. N72/
Pole and street light should be removed/re-located. Hedge on right should be reduced to 3m over road level to a depth of 2.5m





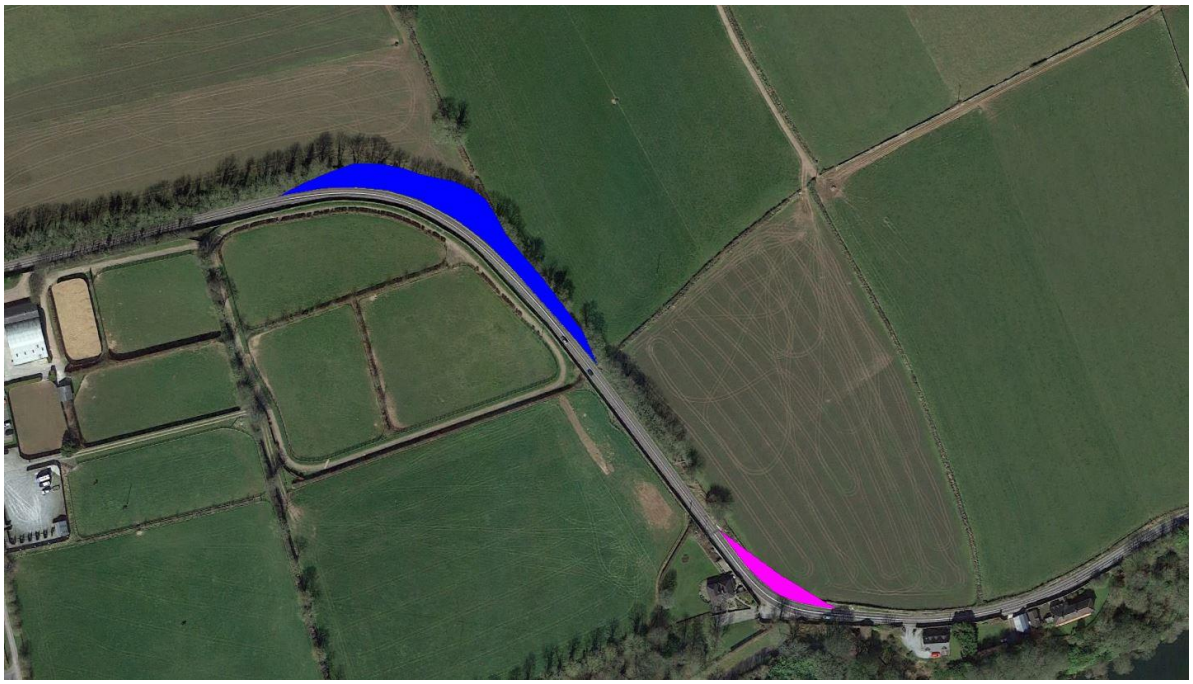
Node 2.3. N72 (579545, 598702)
Bank on right should be removed for mid oversail. Depending on rear overhang some load bearing may be required.

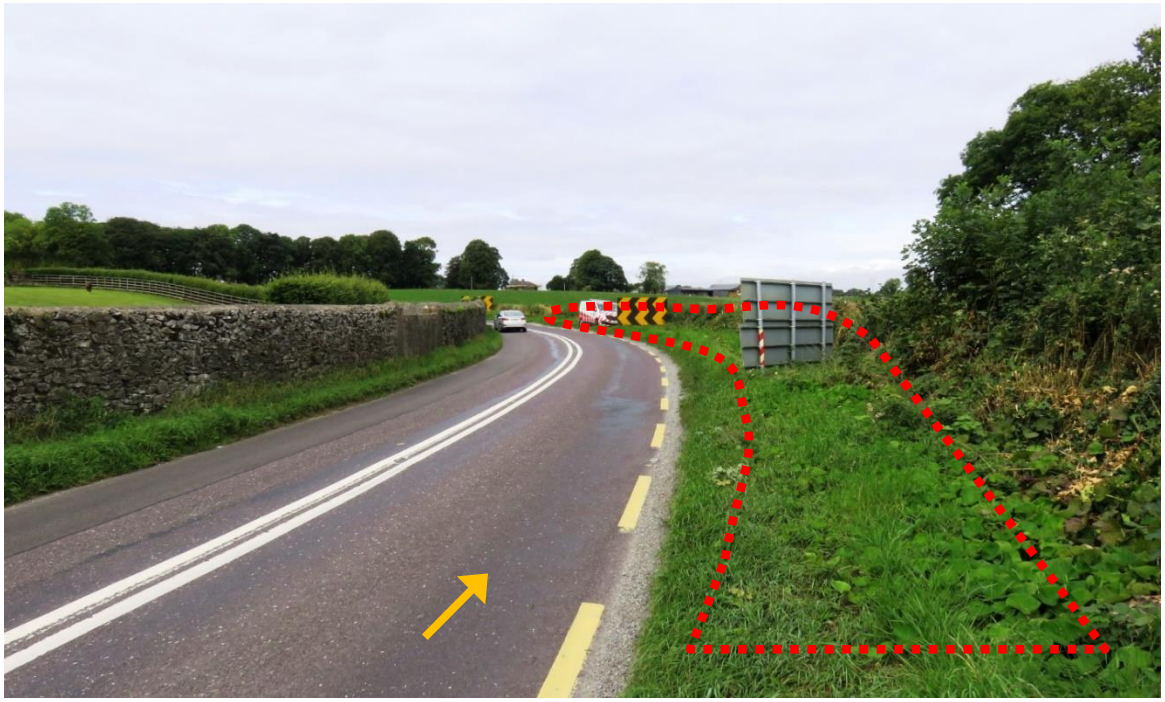




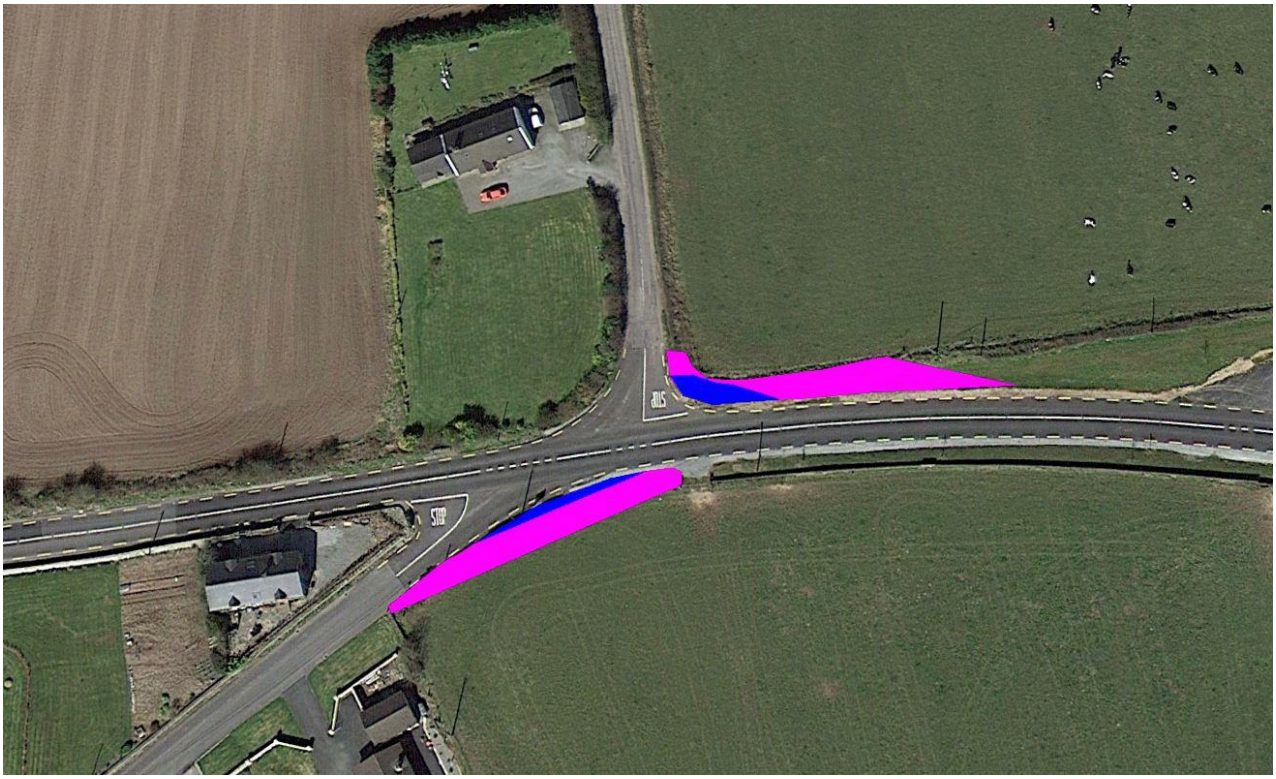
Node 2.4. N72 (579323, 598922)

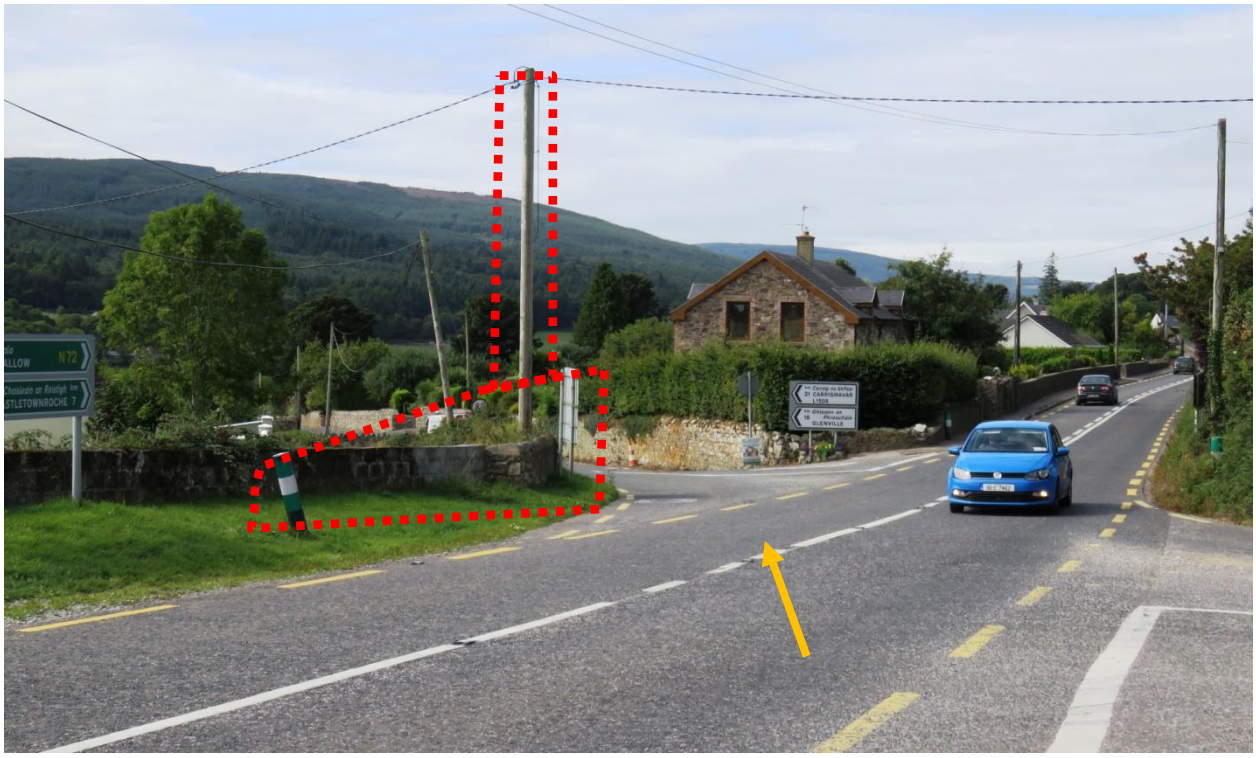
Road should be widened to load bearing up to boundary. 180m – 200m. All signs should be removed.

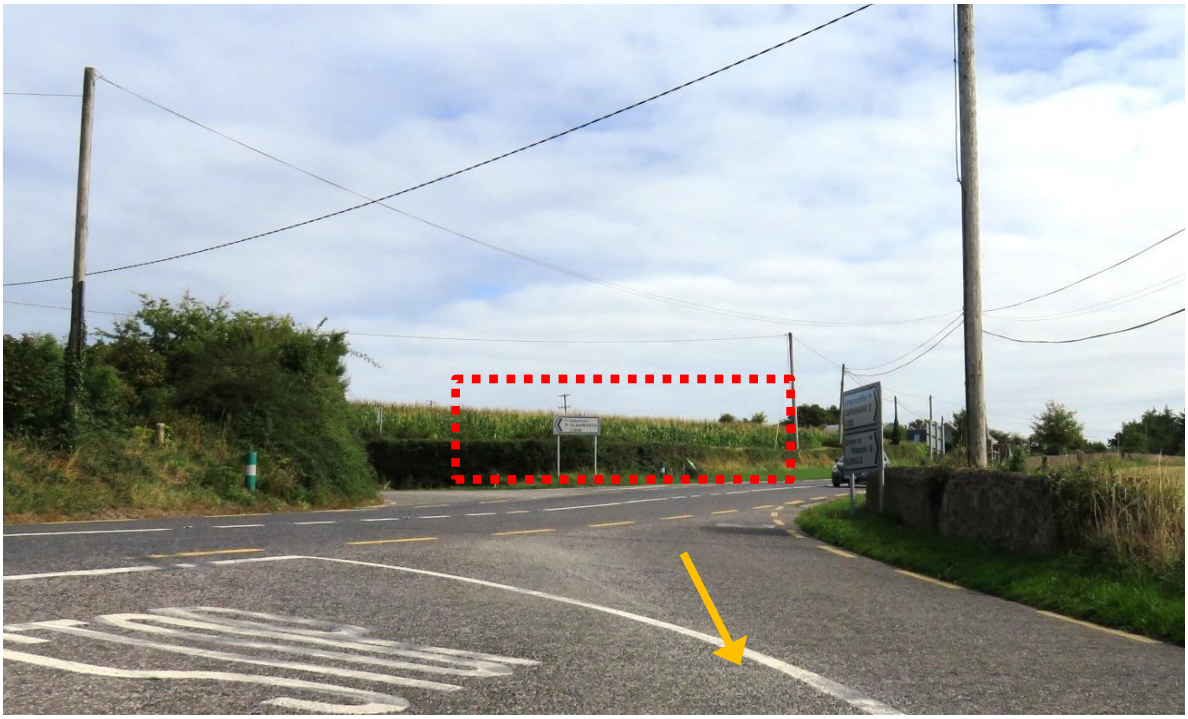




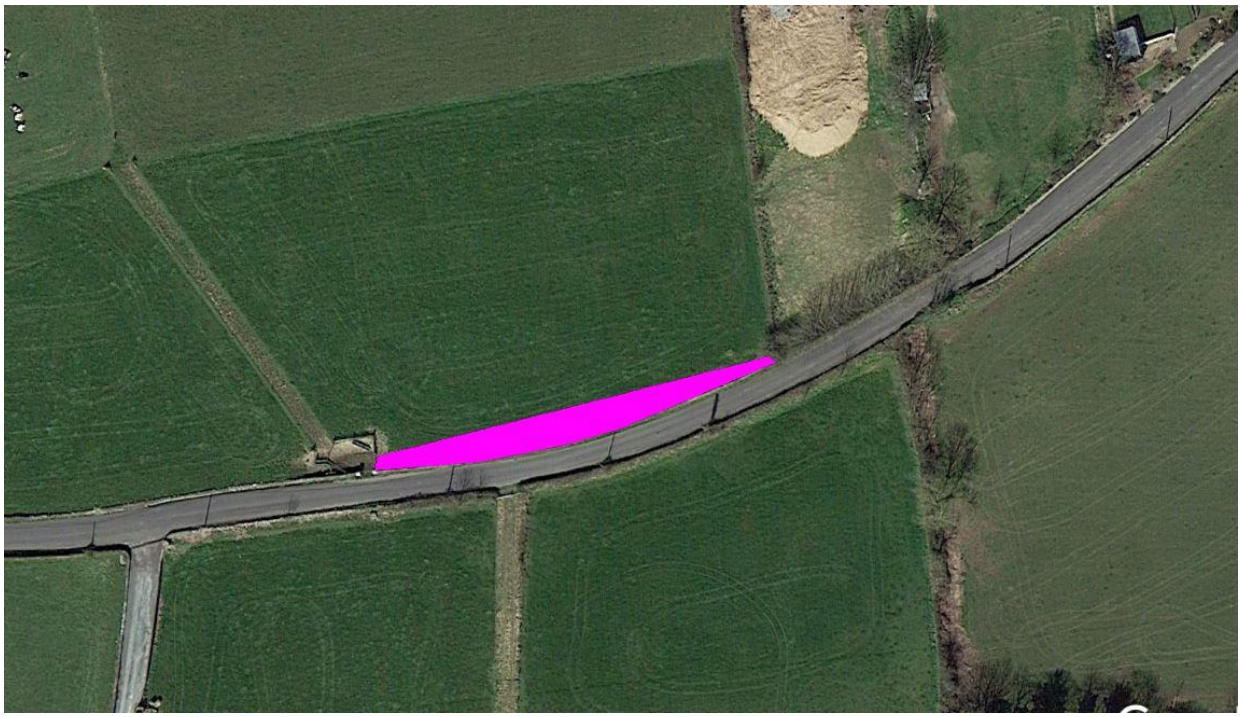
Node 2.5. N72 (580323, 598800)
Wall should be lowered to ground level. Pole and signs to be removed.
Bank on right should be lowered for rear oversail.





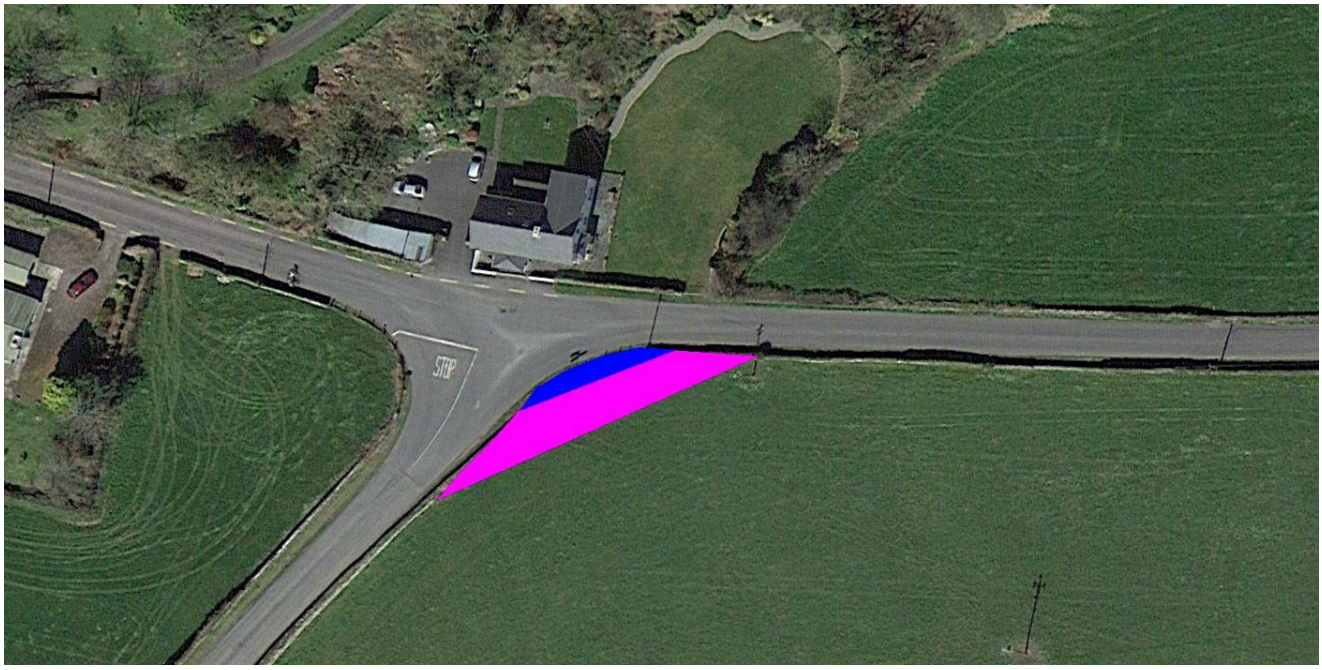


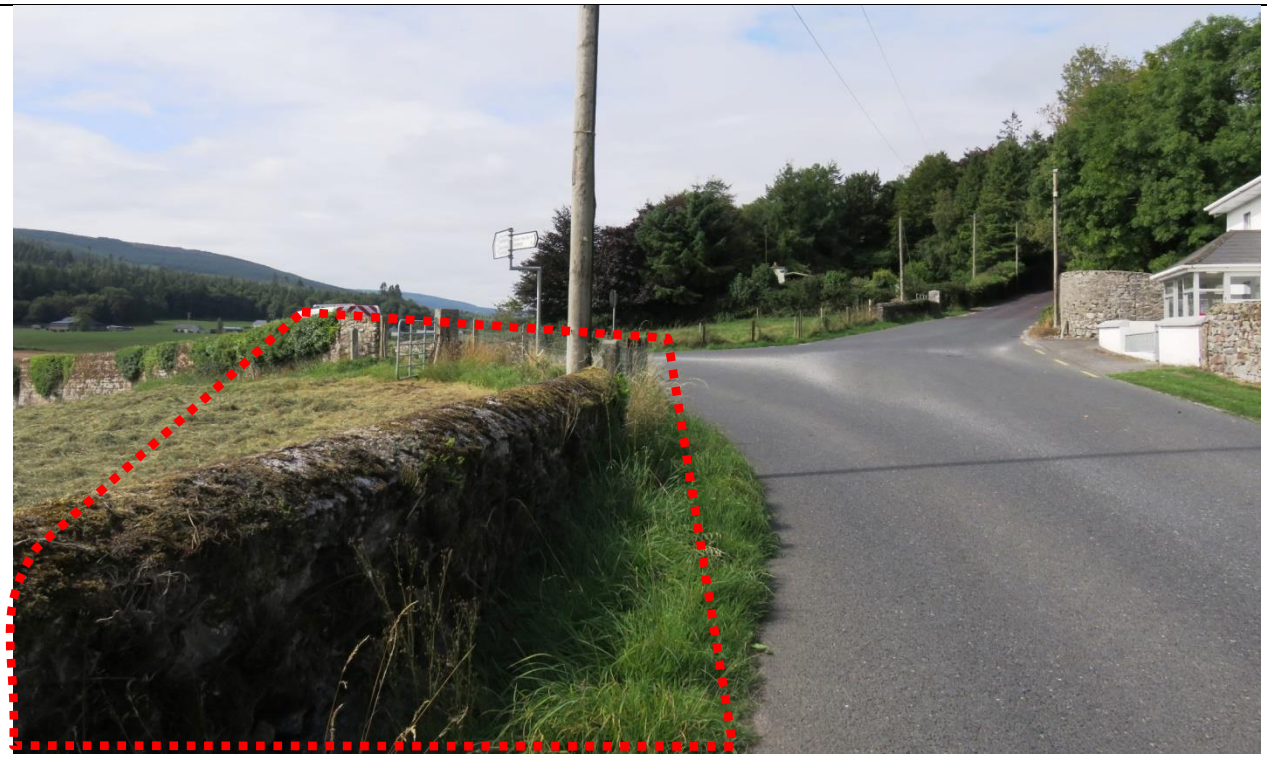
Node 2.6.
Depending on final rear overhang, telephone poles may have to be removed. A sweptpath analysis and early trial run are recommended. (This section could decide optimum overhang)



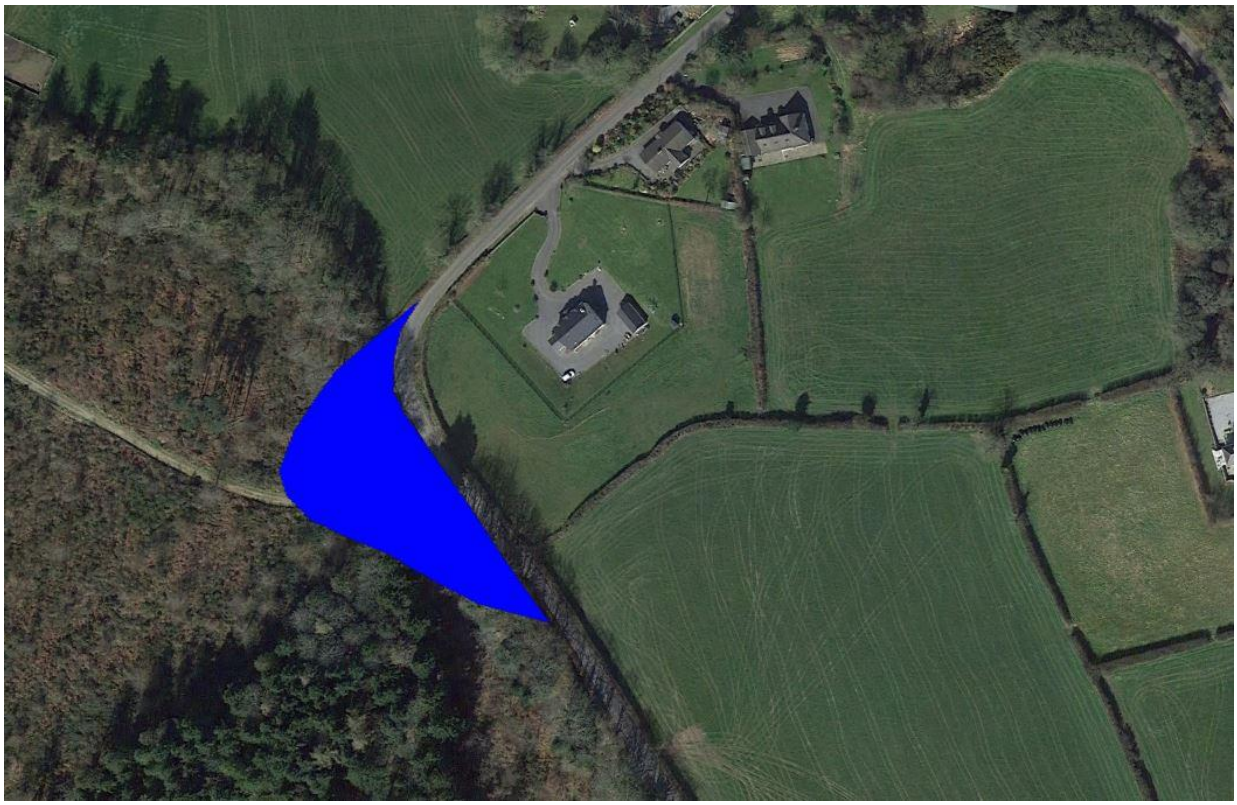


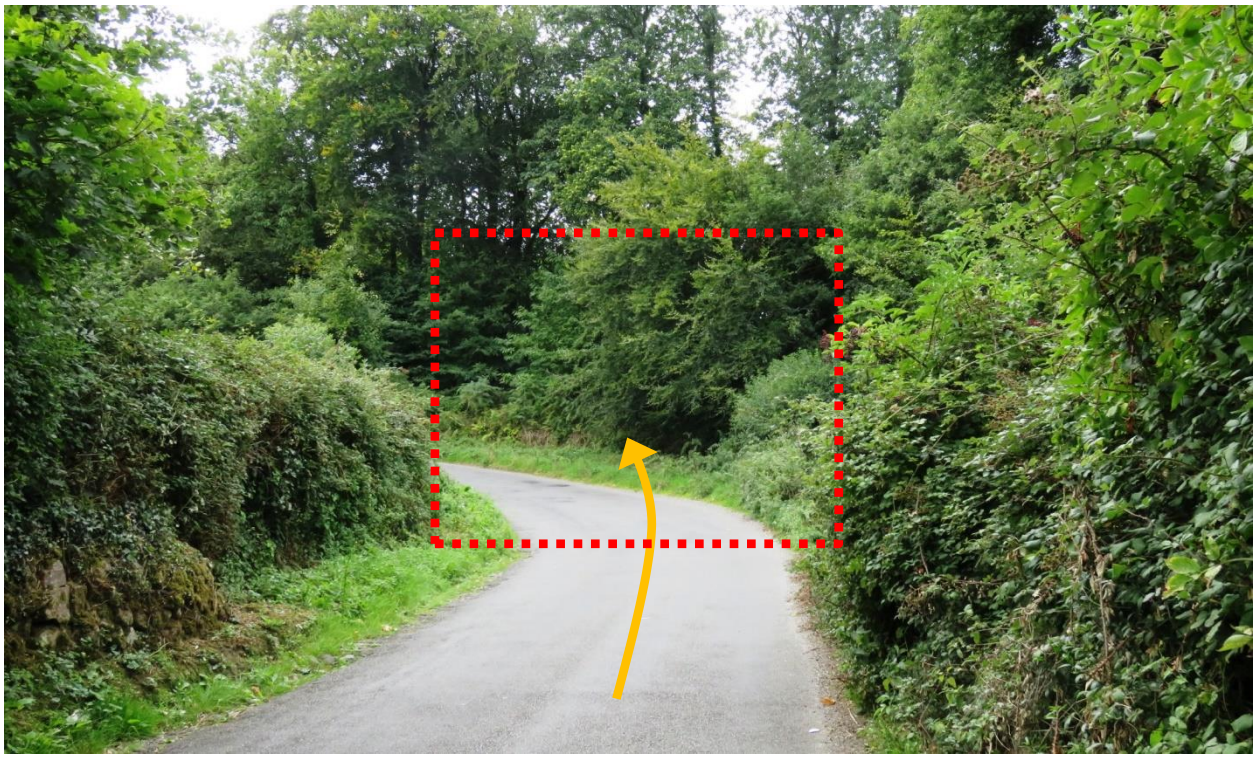
Node 2.7.
A section of wall should be lowered to road level for mid oversail. Depending on rear overhang some load bearing may be required

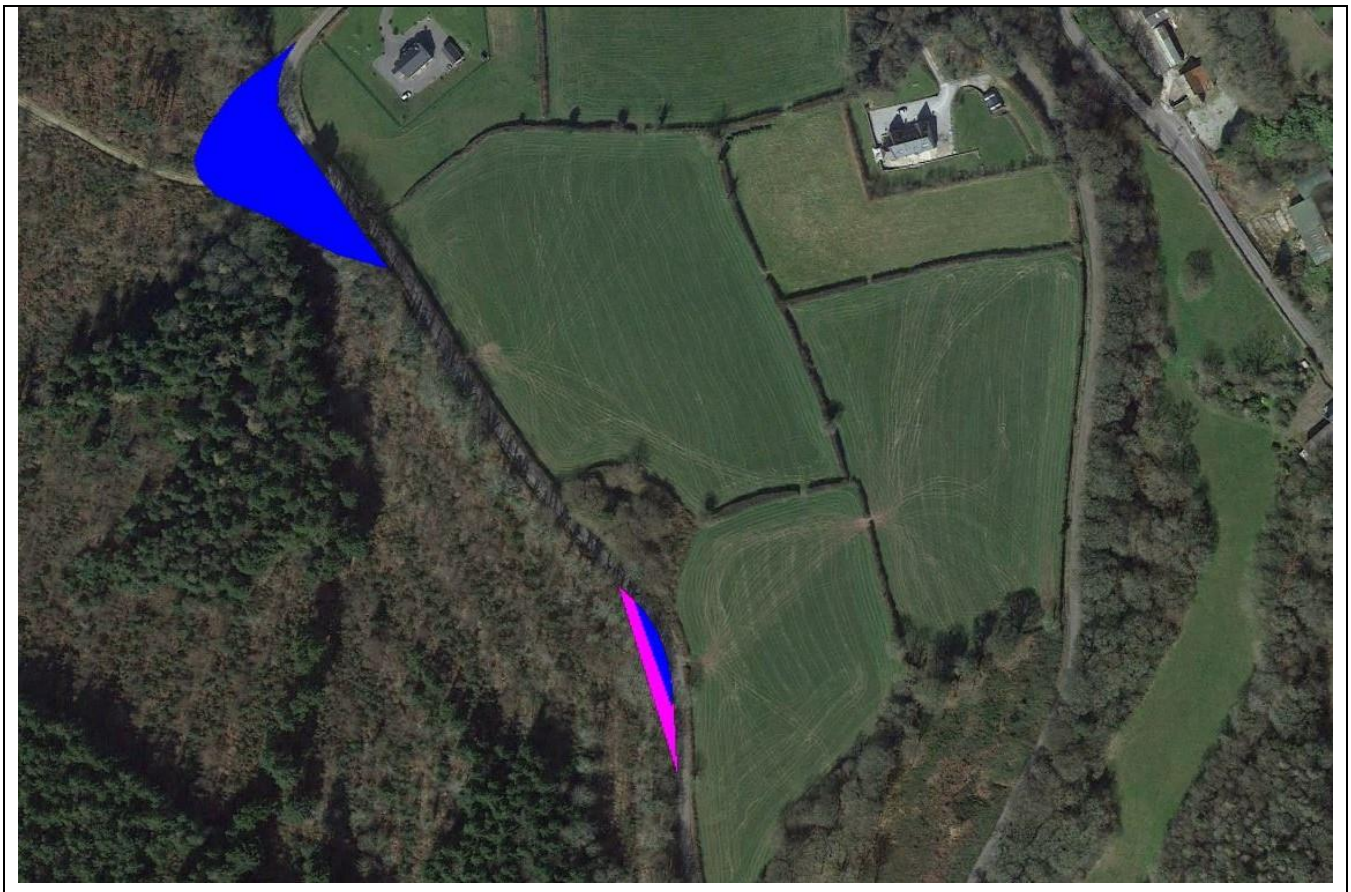




Node 2.8. Castlebagh
This left bend will require land take straight ahead



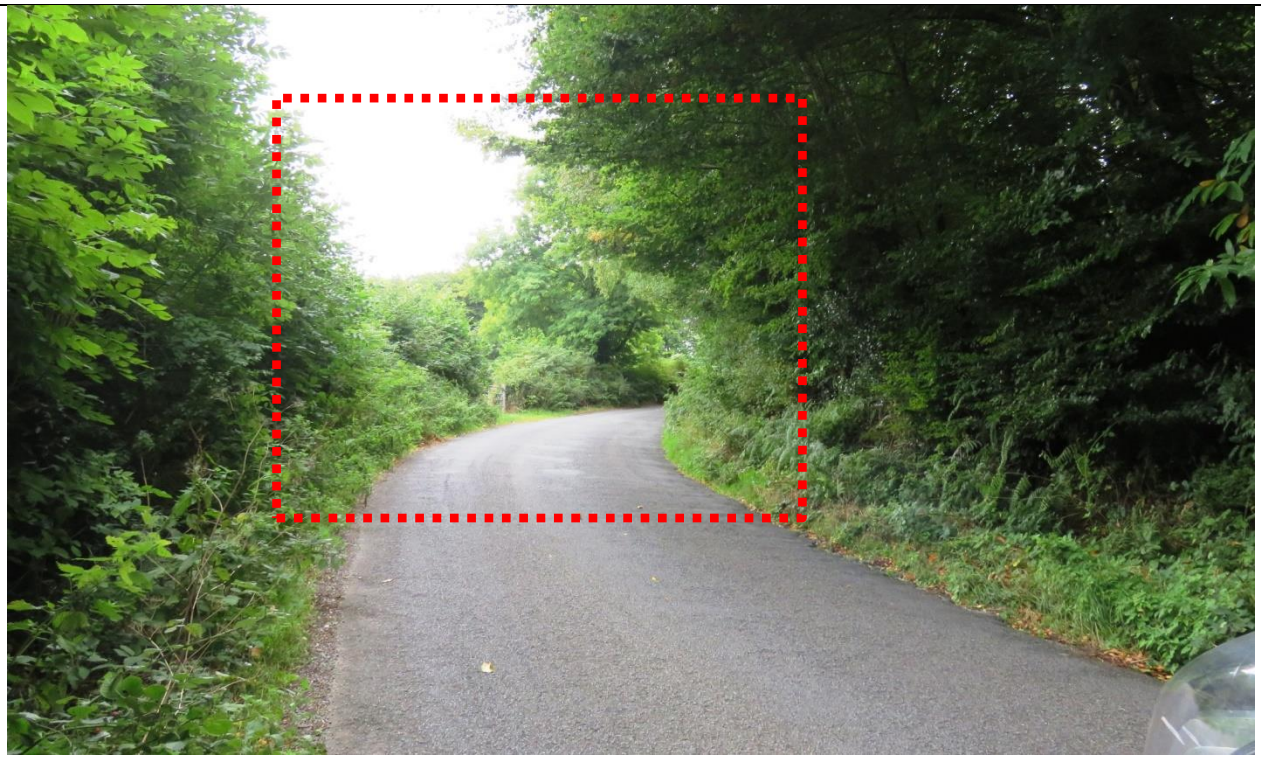


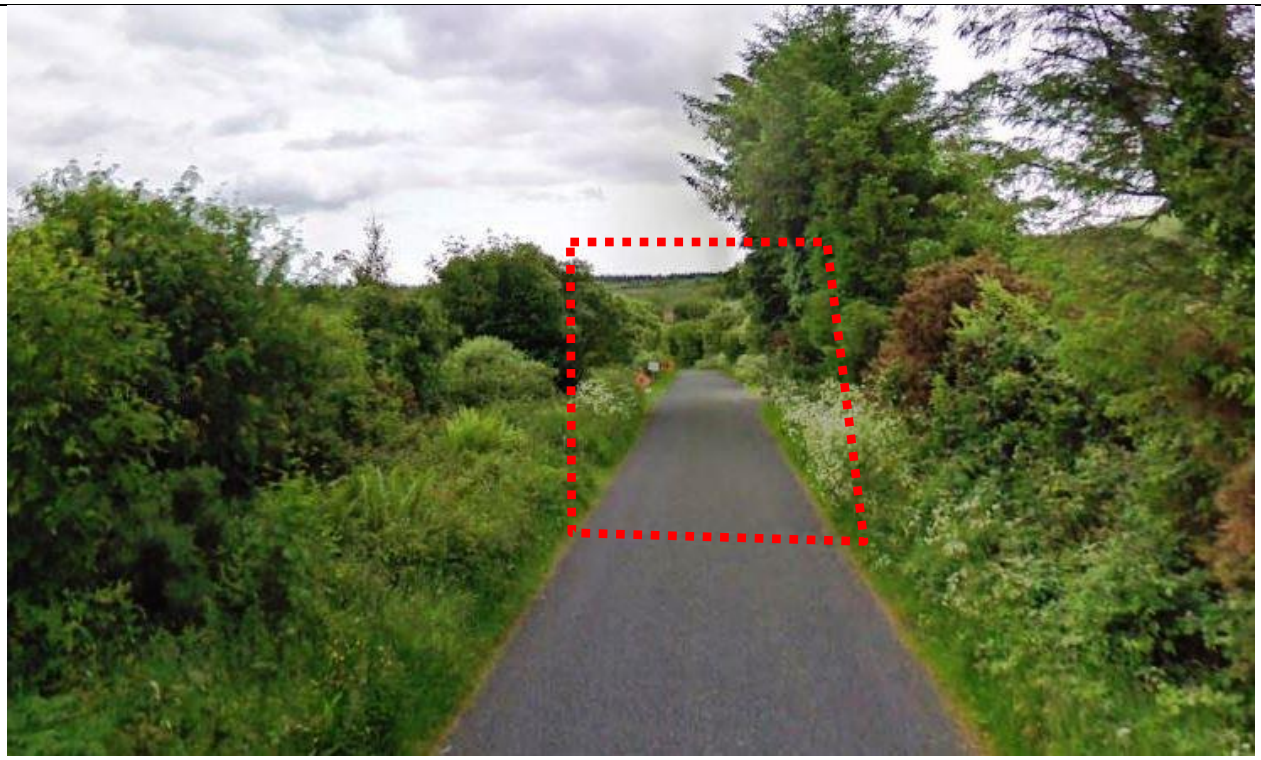




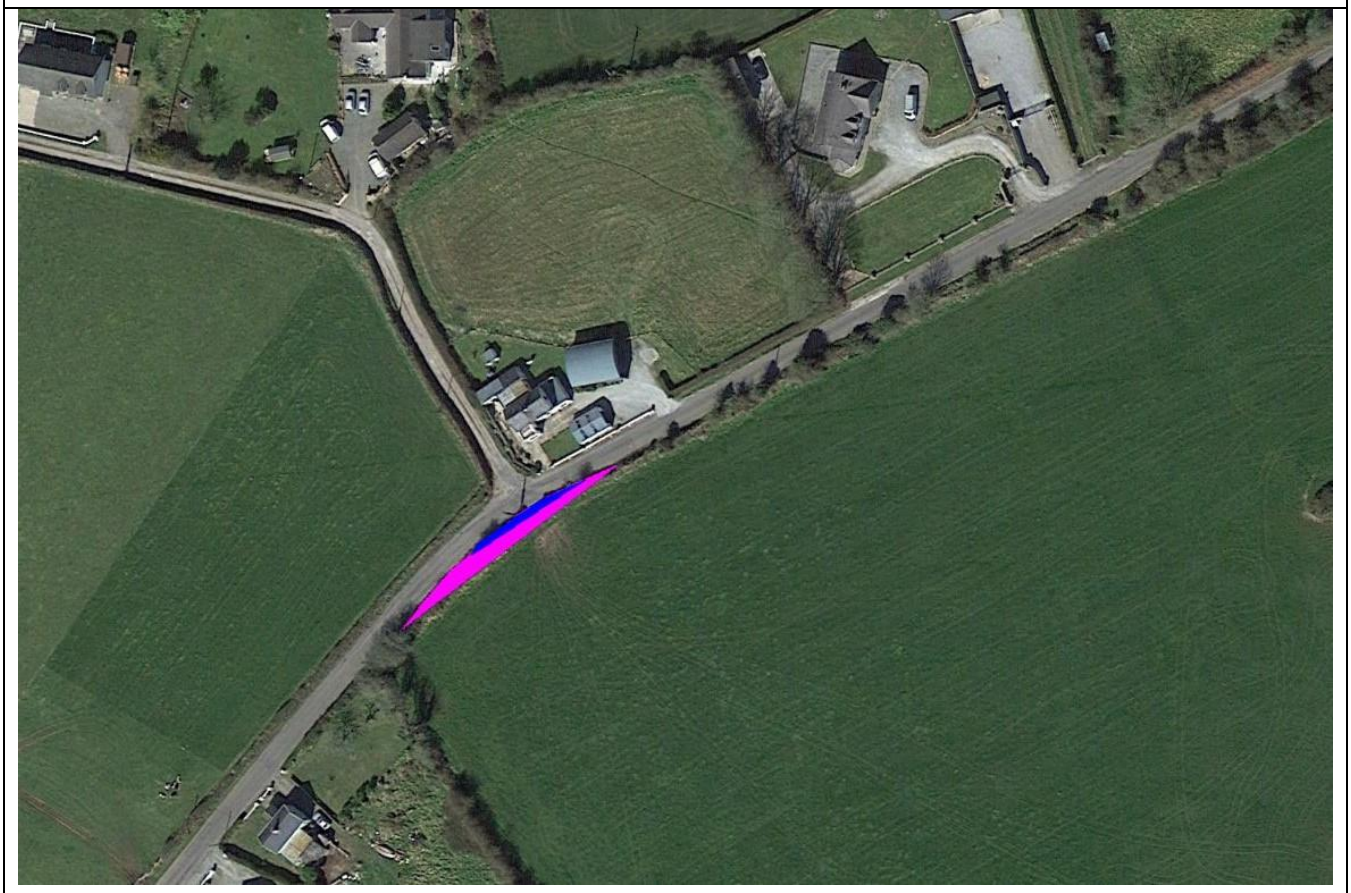
Node 2.9 Castlebagh to Site entrance

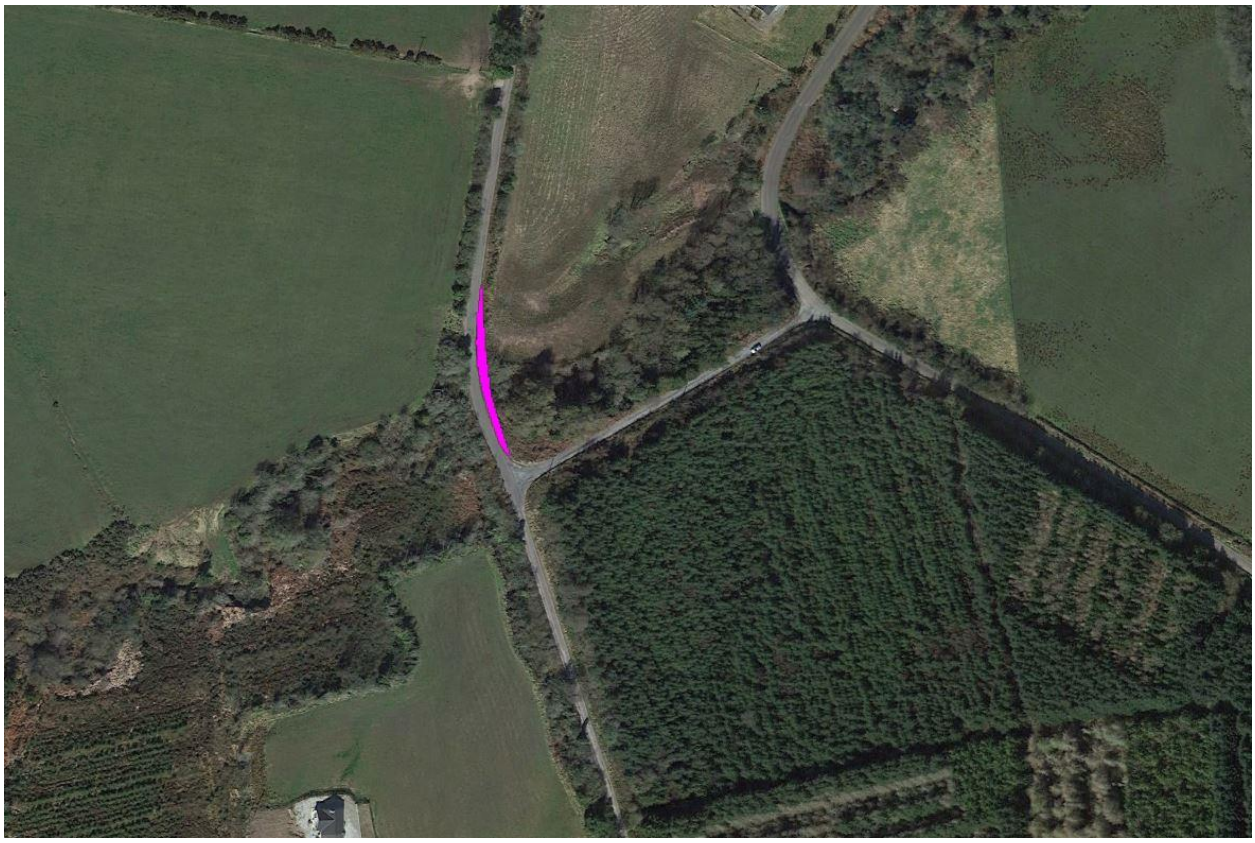
Site approach road will require land take for widening and tree trimming as per Turbine Suppliers/Hauliers requirements

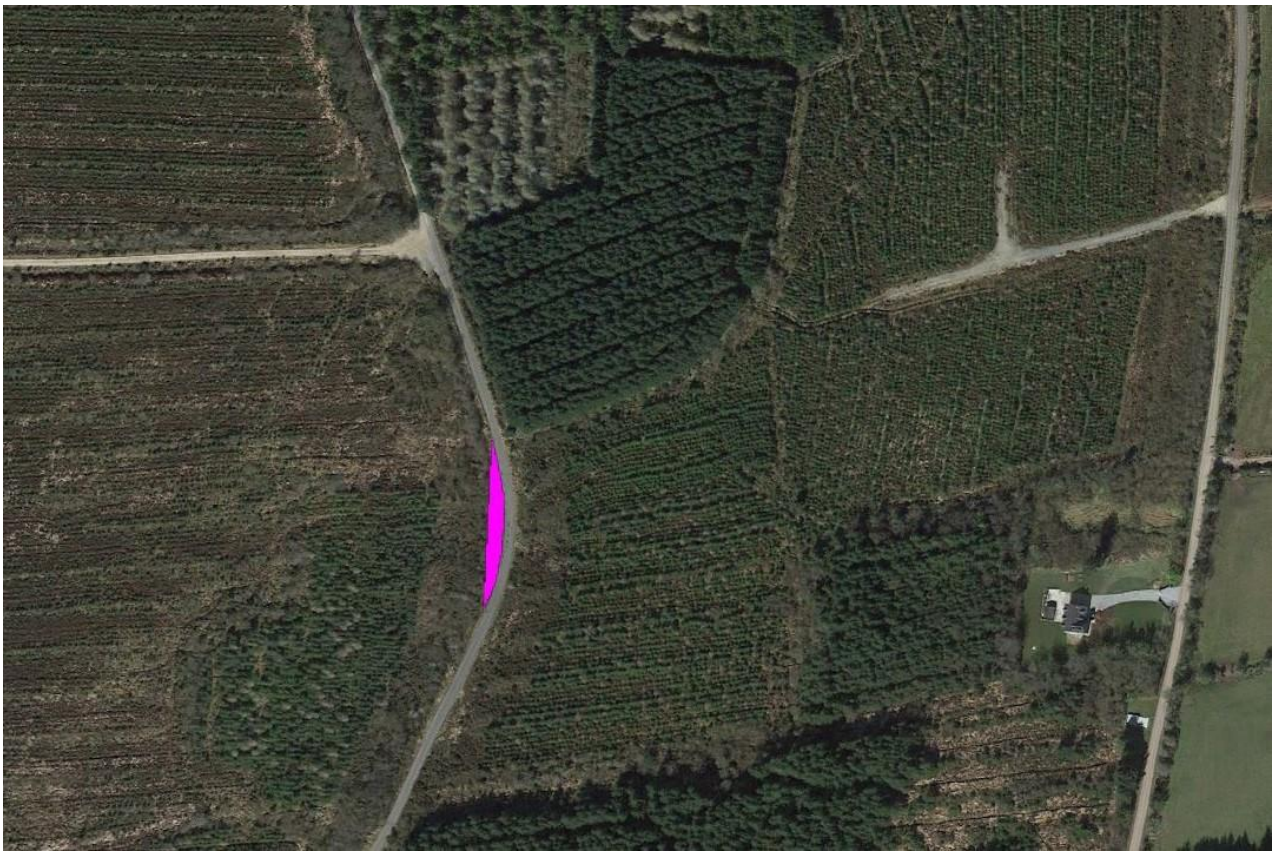














Other Route Options	Route options for each proposed entrance are limited to the options shown.
Conclusions	The route options shown are the only available for each entrance Bridge and other structure capacities have not been assessed. Tree canopy and overhead cables have not been surveyed as part of this survey A trial run should be carried out prior to delivery to verify works carried out. An early test run is recommended to establish passage and rear overhang through Node 2.6.
ELS	*Edwin Sunderland 03/12/18*

Pell Frischmann

Coom Wind Farm

Swept Path Assessment Results



August 2020

Revision Record					
Rev	**Description**	**Date**	**Originator**	**Checker**	**Approver**
A	Draft	24/08/20	T Lockett	G Buchan	G Buchan

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FEHILY TIMONEY
30 YEARS

Pell Frischmann

Contents

1 Introduction 1
1.1 Purpose of the Report 1
2 Site Background 2
2.1 Site Location 2
2.2 Candidate Turbines 2
2.3 Proposed Delivery Equipment 2
3 Access Route Review 5
3.1 Access Route 5
3.2 Swept Path Assessment Results 6
3.3 Swept Path Assessment Results and Summary 9
3.4 Access Junction Considerations 9
3.5 Summary Issues 9
4 Summary 11
4.1 Summary of Access Review 11
4.2 Further Actions 11

Figures

Figure 1: Site Location Plan 2
Figure 2: Superwing Carrier Trailer 3
Figure 3: Blade lifter 3
Figure 4: Tower Trailer 4
Figure 5: Requested Swept Path Locations 5

Tables

Table 1: Constraint Points and Details 6

Appendices

Appendix A - Points of Interest Locations
Appendix B - Swept Path Assessments

1 Introduction

1.1 Purpose of the Report

Pell Frischmann (PF) has been commissioned by Fehily Timoney and Company (FTC) to undertake swept path assessments at a number of FTC identified locations to demonstrate the mitigation requirement to facilitate the use of blade lifting technology.

The detailed designs of any remedial works are beyond the agreed scope of works between PF and FTC at this point in time.

No site visit had been undertaken at this time. A site visit will be required to confirm the results of this report.

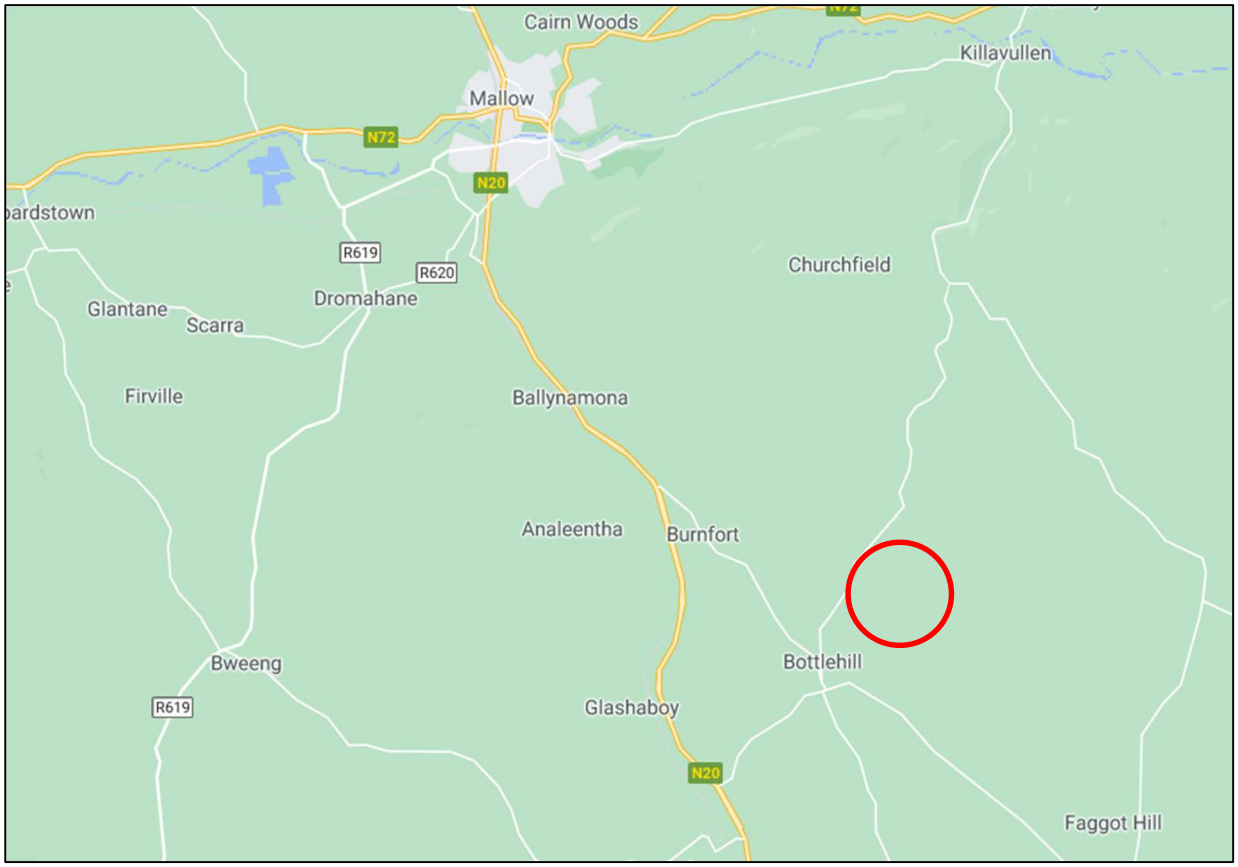
It is the responsibility of the wind turbine supplier to ensure that the entirety of the proposed access route is suitable and meets with their satisfaction. The turbine supplier will be responsible for ensuring that the finalised proposals meet with the appropriate levels of health and safety consideration for all road users, in line with the relevant legislation at the time of delivery.

2 Site Background

2.1 Site Location

The development site is located to the south-east of Mallow, County Cork. Figure 1 illustrates the general site location.

Figure 1: Site Location Plan



2.2 Candidate Turbines

FTC has indicated that they wish to consider the 'worst case scenario' components from the Vestas V136, Nordex N133, Enercon E138 or Enercon E136 turbines at a tip height of 169m.

The swept path assessment will be based on the following 'worst case scenario' components;

- 67.7m Blade; and
- 24.03m x 4.3m x 4.02m tower carried in 4 x 7 clamp trailer.

2.3 Proposed Delivery Equipment

The assessment has assumed the blade will utilise a standard superwing carrier for the route to the proposed transfer point.

It is proposed that the blade would be transferred onto a Goldhofer blade lifting trailer for onward movement to the site. This trailer has the ability to lift blades up to a maximum angle of 60 degrees, lifting blades over potential constraints and shortening the length plan view.

All overhead utilities and obstructions should be removed at any locations that the blades are raised on the blade lifting trailer.

Tower sections would be carried in a 4+7 clamp adaptor trailer.

Examples of the types of trailers proposed are provided in Figures 3, 3 and 4.

Figure 2: Superwing Carrier Trailer



Figure 3: Blade lifter



Figure 4: Tower Trailer

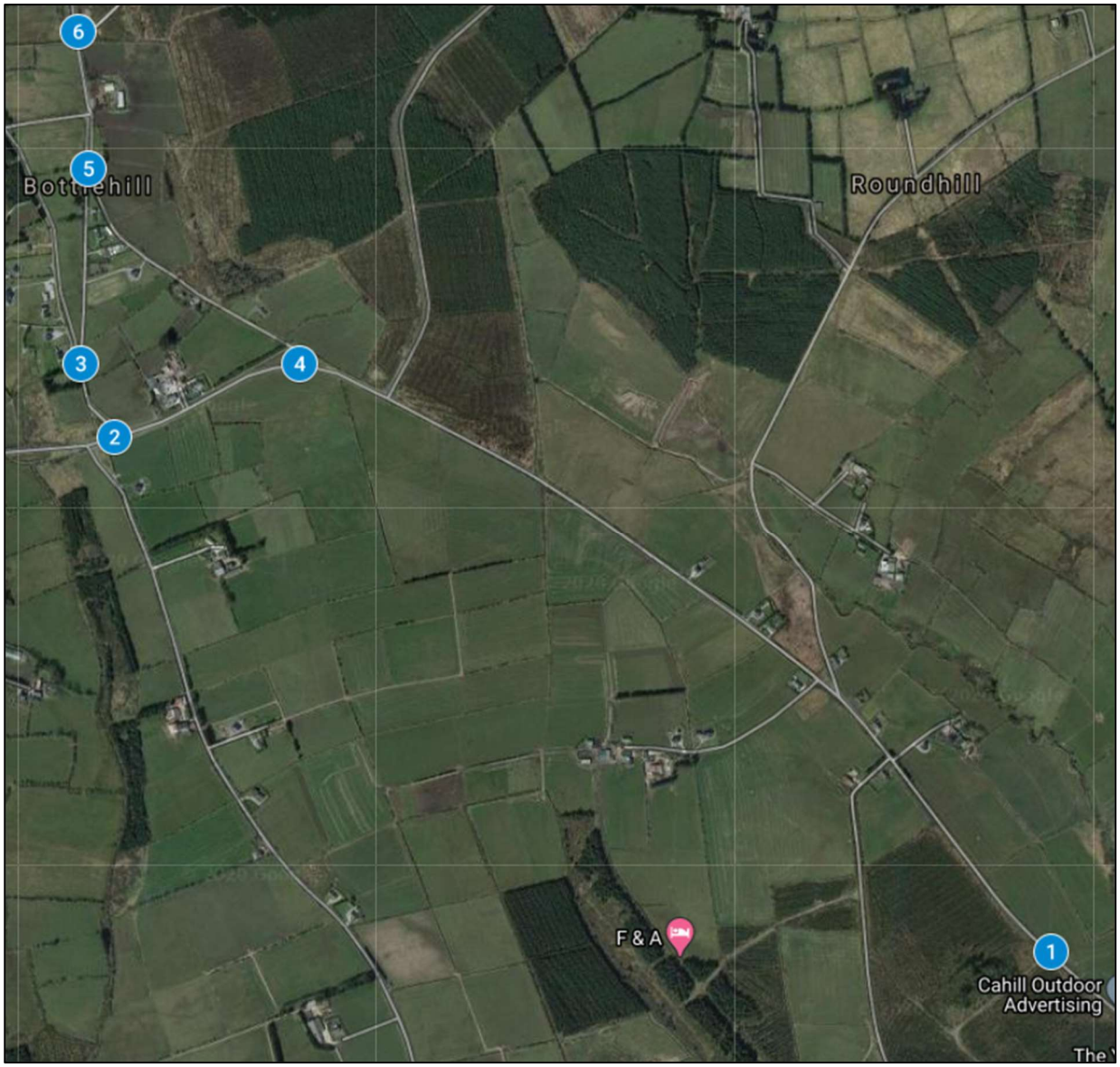


3 Access Route Review

3.1 Access Route

PF have been commissioned to undertake swept path assessments at the locations shown in Figure 5 below. No assessment of the wider route to this point has been undertaken as part of this study.

Figure 5: Requested Swept Path Locations



3.2 Swept Path Assessment Results

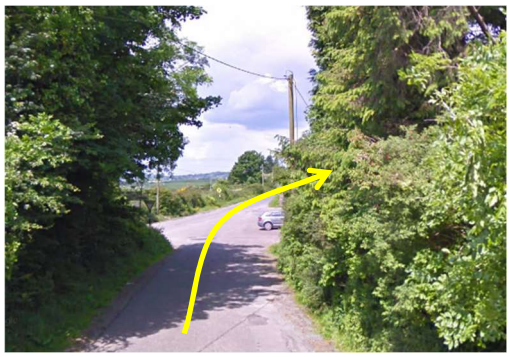
The constraints noted in Figure 5 are detailed in Table 1. No consideration of the transport issues within the port, the development site or the route to this point have been undertaken and this includes the design of the site access junction, which are addressed by others.

Where the blade lifting trailer is utilised all overhead utilities and obstructions should be removed at any location where the blade is in the raised position.

Table 1: Constraint Points and Details

POI	Key Constraint	Details
1	**Potential Turning Location** 	FTC have provided an indicative design for a blade transfer point at this location. Loads arriving at the site will be carried on a superwing carrier. They will then transfer to the blade lifting trailer for onward transportation to the site. All assessments from this point to the site have been undertaken with the blade in the raised position. *All overhead utilities and obstructions should be removed where the blade is carried in the raised position.* The swept path indicates that locations will oversail and overrun into **third party land** on the inside of the right turn into the junction where a load bearing surface should be laid. Trees and vegetation should be removed. The swept path assessment can be found in SK01 of Appendix A.

POI	Key Constraint	Details
2	**Junction 1 SPA** 	Loads will turn right at the junction from the L6957 onto the Tooreen North road. All overhead utilities and obstructions should be removed. The swept path assessment indicates that loads will overrun and oversail the southern verge on approach to the bend where a load bearing surface should be laid and one traffic sign removed. It is recommended that a land search is completed to confirm the extent of adopted road boundary at this location. Loads will overrun and oversail the verge on the inside of the bend where a load bearing surface should be laid and three traffic signs removed. Existing utilities should be protected. Loads will overrun and oversail the western verge of Tooreen North Road where a load bearing surface should be laid. Loads will continue to oversail both verges through the following right bend where vegetation should be cleared. The swept path assessment can be found in SK02 of Appendix A.
3	**Junction 2 SPA** 	Loads will turn right at the junction and continue on the Tooreen North Road. All overhead utilities and obstructions should be removed. The swept path assessment indicates that loads will oversail the western verge where vegetation should be trimmed. The proximity to a utility pole should be confirmed during the test run. The swept path assessment can be found in SK03 of Appendix A.

POI	Key Constraint	Details
4	**Junction 4 SPA** 	Loads would turn right from the L6956 onto the unclassified road leading north west. All overhead utilities and obstructions should be removed. The swept path assessment indicates that loads will oversail the southern verge of the L6956 on approach to the junction. Loads will overrun and oversail into **third party land** on the inside of the right turn where a load bearing surface should be laid and the drainage ditch culverted. The fence should be removed along with one road sign, one bollard and vegetation. Loads will overrun and oversail both verges through the following left bend where load bearing surfaces should be laid and one road sigh and a number of traffic bollards should be removed. The vegetation should be trimmed and the ditch culverted. The swept path assessment can be found in SK04 of Appendix A.
5	**Junction 3 SPA** 	Loads will continue north through the junction to the access junction. All overhead utilities and obstructions should be removed. The swept path assessment indicates that loads will loads will oversail the western verge where vegetation should be trimmed. Vegetation on the eastern verge should also be cut back. The swept path assessment can be found in SK05 of Appendix A.
6	**Potential Site Entrance Location (Option 1)** 	Loads would turn right into the proposed site entrance. In order to remain within the Coillte property boundary that was provided by FTC, the swept path assessment indicates that the existing junction will need to be upgraded to the allow loads to leave the road and continue north east until they are within the site to begin their turn. The junction should be designed to meet turbine manufacturer guidelines and Cork County Council standards. The swept path assessment can be found in SK06 of Appendix A.

3.3 Swept Path Assessment Results and Summary

The detailed swept path drawings for the locations assessed are provided in Appendix A for review. The drawings in Appendix A illustrate tracking undertaken for the worst case loads at each location.

The colours illustrated on the swept paths are:

- Grey / Black – OS / Topographical Base Mapping;
- Green – Vehicle body outline (body swept path);
- Red – Tracked pathway of the wheels (wheel swept path); and
- Purple – The over-sail tracked path of the load where it encroaches outwith the trailer (load swept path).

Where mitigation works are required, the extents of over-run and over-sail areas are illustrated on the swept path drawings.

Please note that where assessments have been undertaken using Ordnance Survey Ireland (OSI) base mapping or available CAD based aerial mapping, there can be errors in this data source.

Where provided by the client, aerial mapping has been utilised. Please note that PF cannot accept liability for errors on the data source, be that OSI base mapping or client supplied aerial mapping and data.

3.4 Access Junction Considerations

The access junction into the site would need to be built to accommodate the proposed physical size of loads and the number of trips predicted during the construction phase.

The design and form of the junction would need to be discussed with Cork County Council. The design of the junctions should take into account the requirement for provision of visibility splays which should be defined by the road authority.

The junctions would also need to be built in accordance with the turbine supplier design criteria.

3.5 Summary Issues

It is strongly suggested that following a review of the SPAs, FTC should undertake the following prior to the delivery of the first abnormal loads, to ensure load and road user safety:

- That a full site visit is completed and a route survey report prepared to ensure that all constraints have been noted;
- Negotiations with land owners where identified as being required should commence as a priority;
- A revised review of axle loading on structures along the entire access route with the various road agencies is undertaken immediately prior to the loads being transported in case of last minute changes to structures;
- A review of clear heights with utility providers and the transport agencies along the route to ensure that there is sufficient space to allow for loads plus sufficient flashover protection (to electrical installations);

- That any verge vegetation and tree canopies which may foul loads is trimmed prior to loads moving;

- That a review of potential roadworks and or closures is undertaken once the delivery schedule is established in draft form;

- That a test run is completed to confirm the route and review any vertical clearance issues; and

- That a condition survey is undertaken to ascertain the extents of road defects prior to loads commencing to protect the developer from spurious damage claims.

4 Summary

4.1 Summary of Access Review

PF has been commissioned by FTC to prepare a series of swept path assessments at locations identified by FTC in order to examine the issues associated with the transport of AIL turbine components to the development site.

This report identifies the issues associated with the identified locations and outlines the issues that will need to be considered for successful delivery of components.

The access review has been based upon a 67.7m blade and worst case tower components.

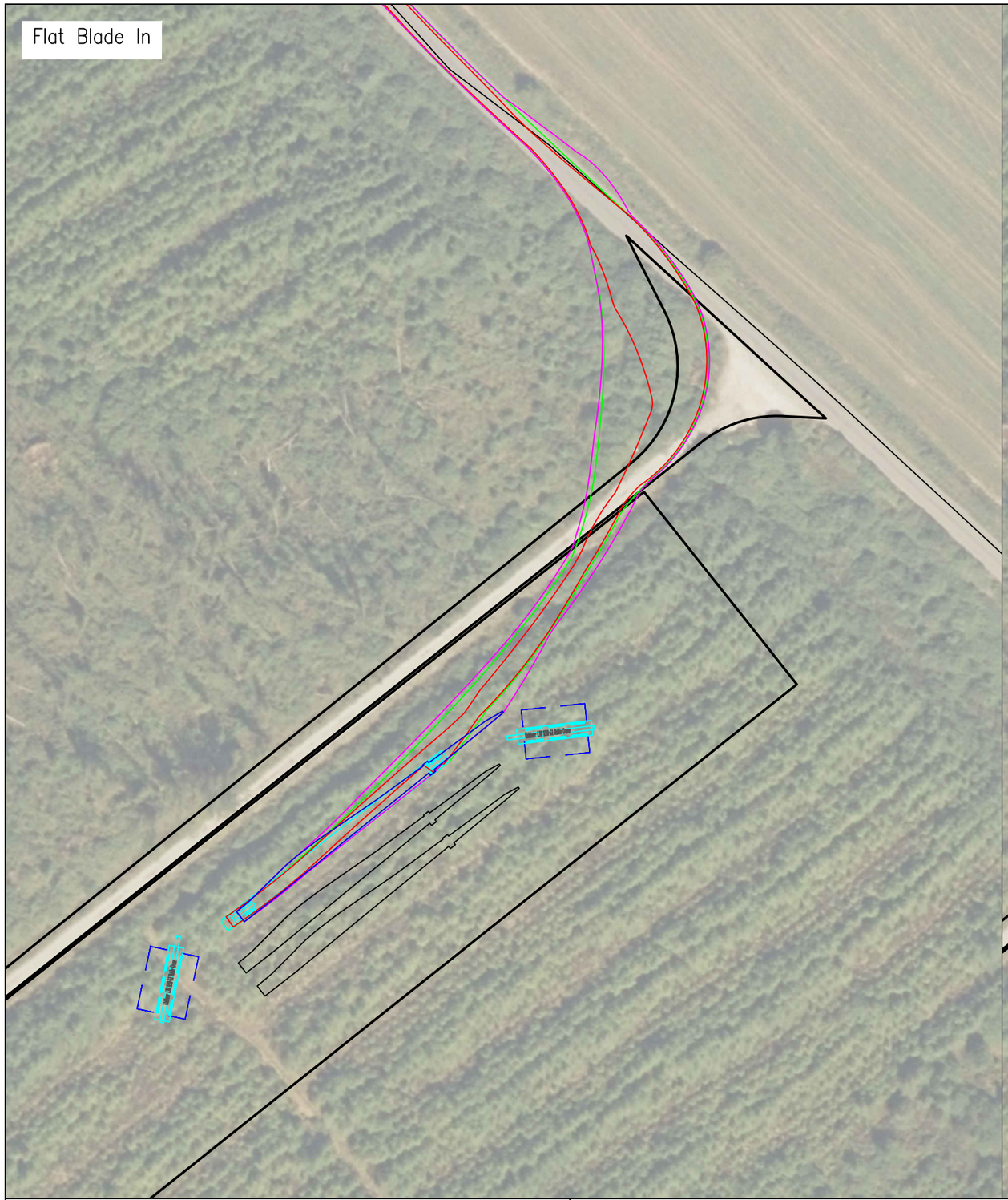
The report is presented for consideration to FTC. Various third party land arrangements, road modifications and interventions are required to successfully negotiate the identified points.

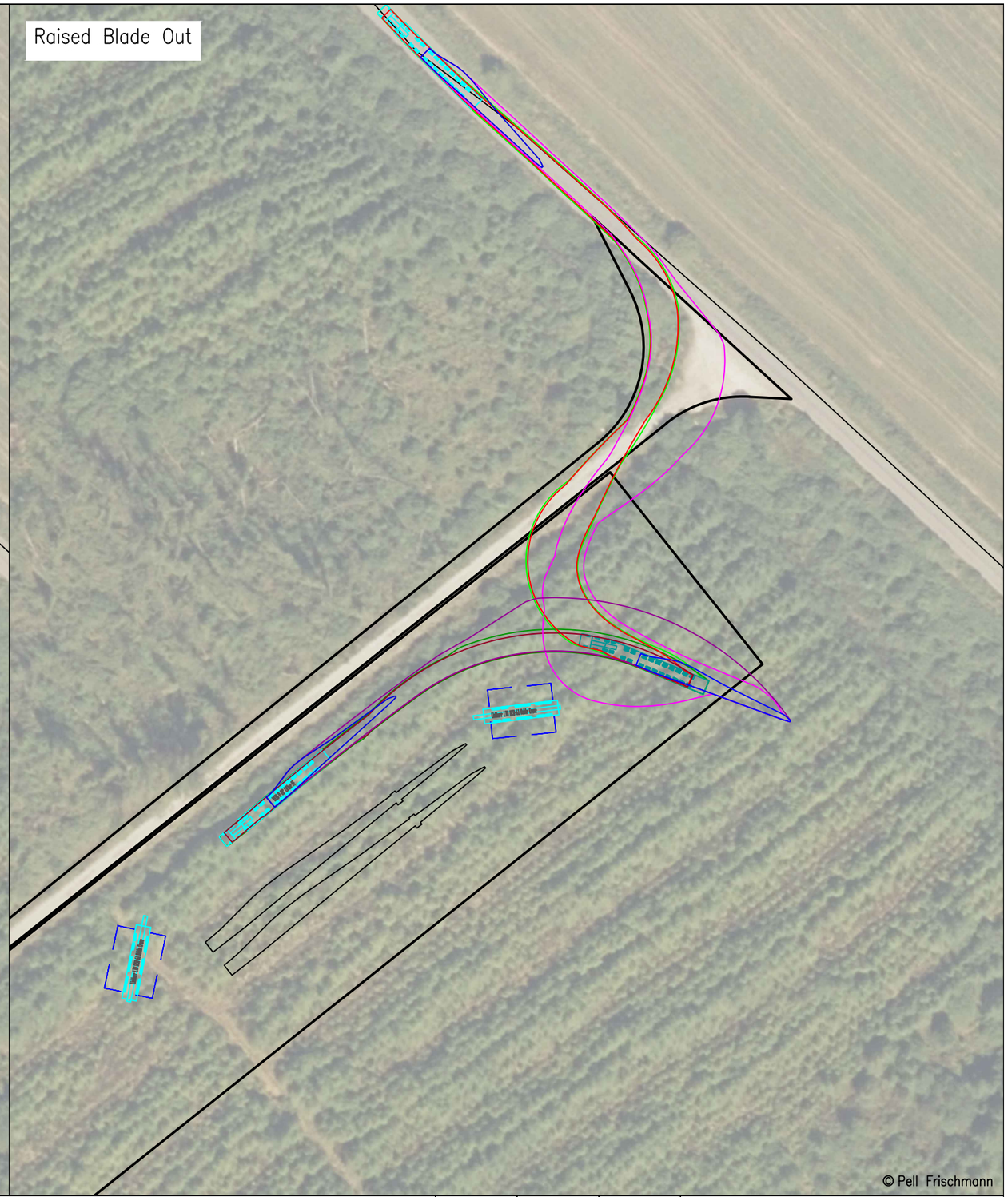
4.2 Further Actions

The following actions are recommended to pursue the transport and access issues further:

- Undertake a full site visit and route survey report for the proposed site;
- Prepare detailed mitigation design proposals to help inform the land option / consultee discussions;
- Obtain the necessary land options;
- Undertake discussion with the affected utility providers and roads agencies;
- Obtain the necessary statutory licences to enable the mitigation measures; and
- Develop a detailed operational Transport Management Plan to assist in transporting the proposed loads.

Appendix A
Swept Path Assessments





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Client: Fehily Timoney

Key: Wheel SPA; Body SPA; Load SPA; Indicative; Over-run; Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Potential Turning Location

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		1

Scale: 1:1000 @ A3

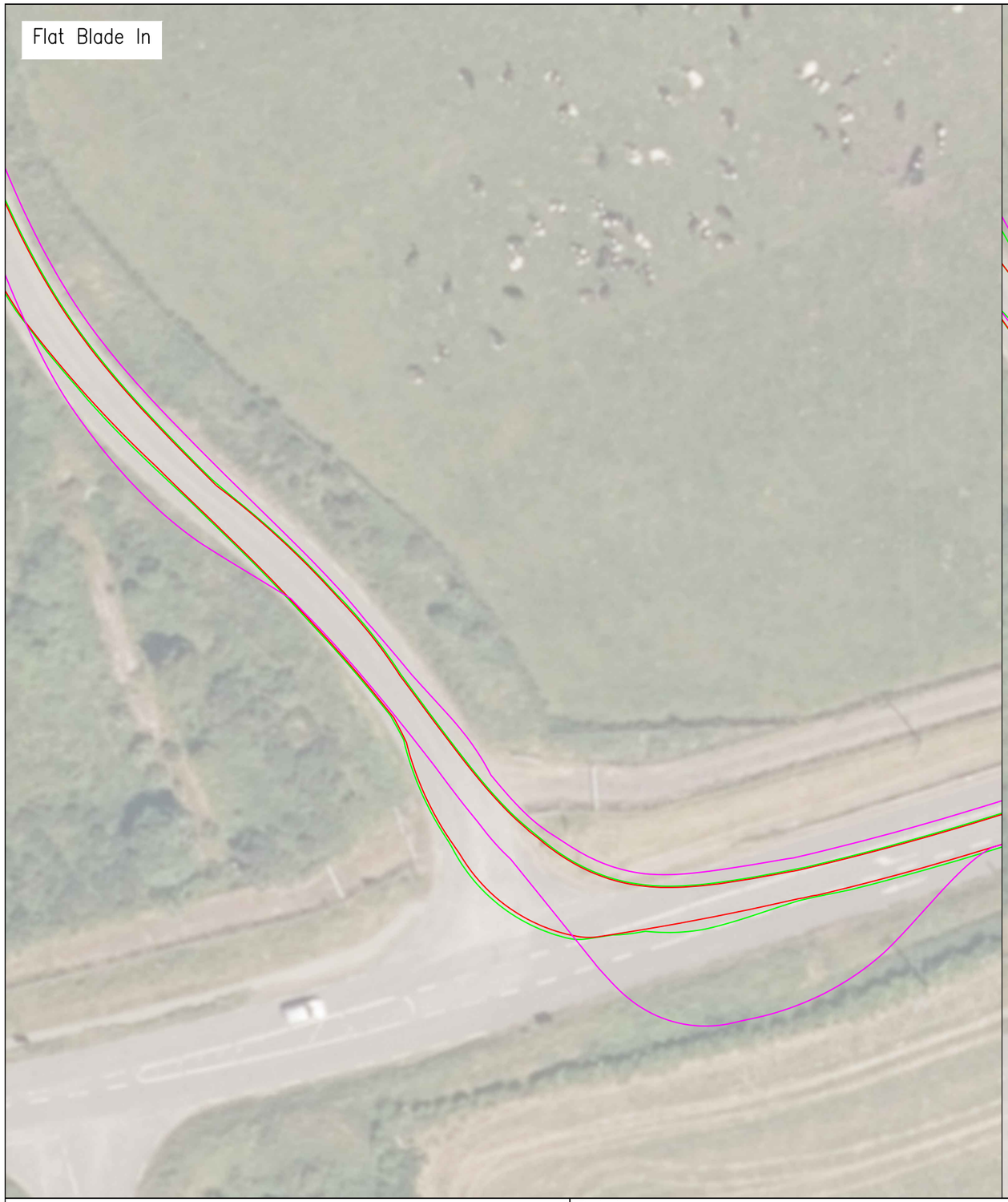
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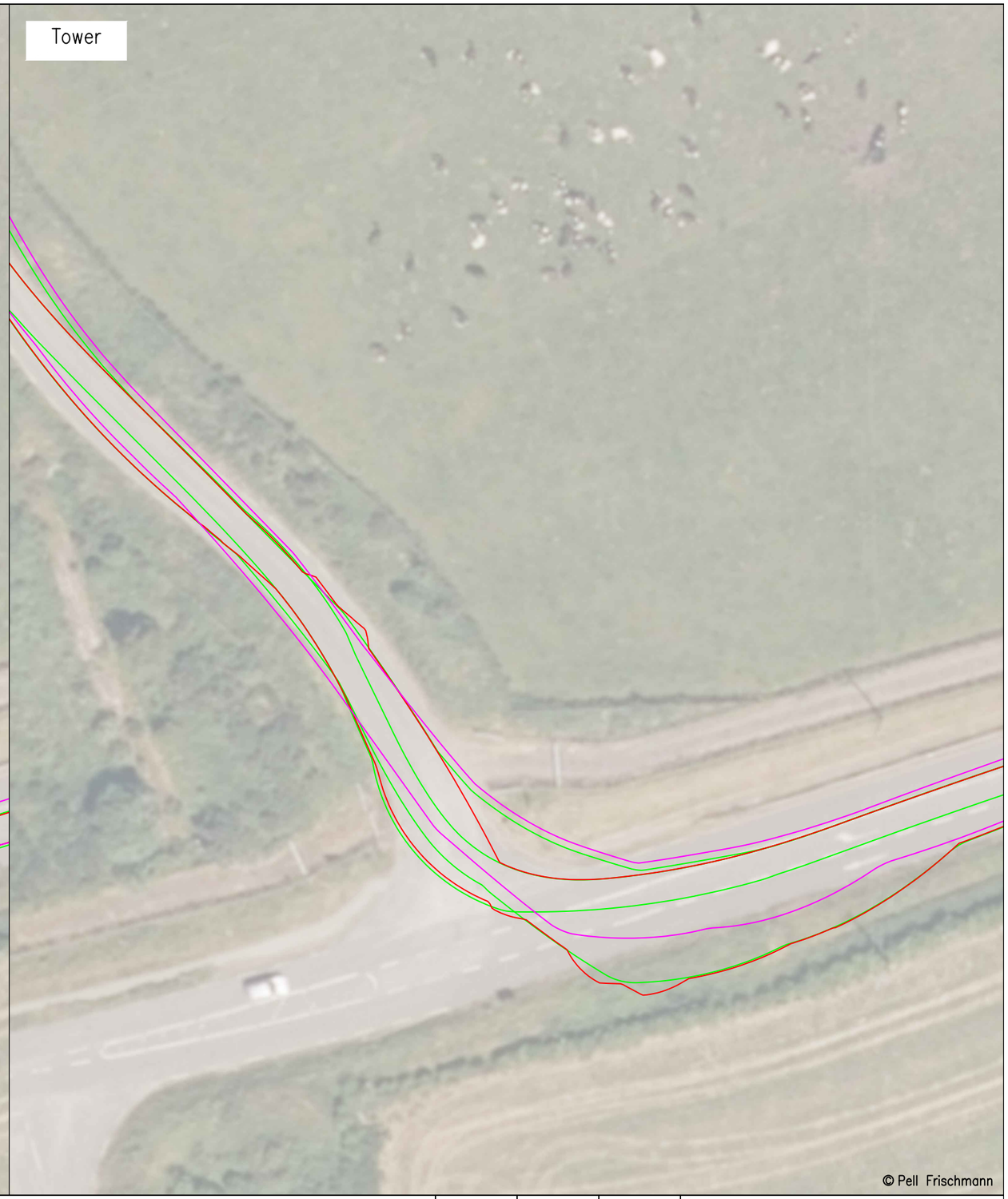
Drawing Status: Draft

Drawing No.: SK01

Notes:
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Client: Fehily Timoney

Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 1 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		2

Scale: 1:500 @ A3

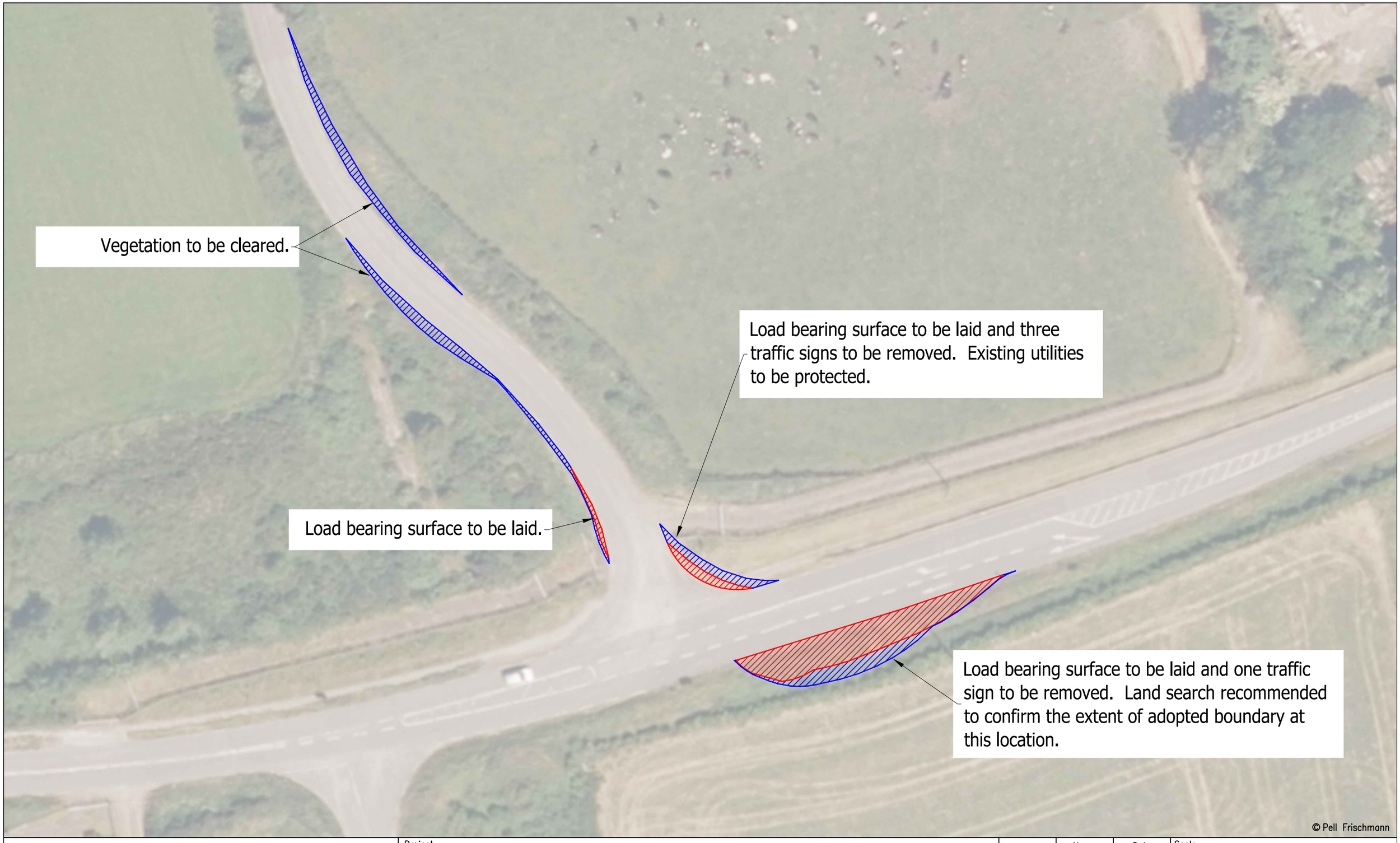
File No.: Coom Tracking 210820.dwg

Drawing Status: Draft

Drawing No.: SK02

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Client: Fehily Timoney

Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 1 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		2

Scale: 1:500 @ A3

File No.: Coom Tracking 210820.dwg

Drawing Status: Draft

Drawing No.: SK02A

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Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 2 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		3

Scale: 1:500 @ A3

File No.: Coom Tracking 210820.dwg

Drawing Status: Draft

Drawing No.: SK03

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Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 2 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		3

Scale: 1:500 @ A3

File No.: Coom Tracking 210820.dwg

Drawing Status: Draft

Drawing No.: SK03A

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Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 4 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		4

Scale: 1:500 @ A3

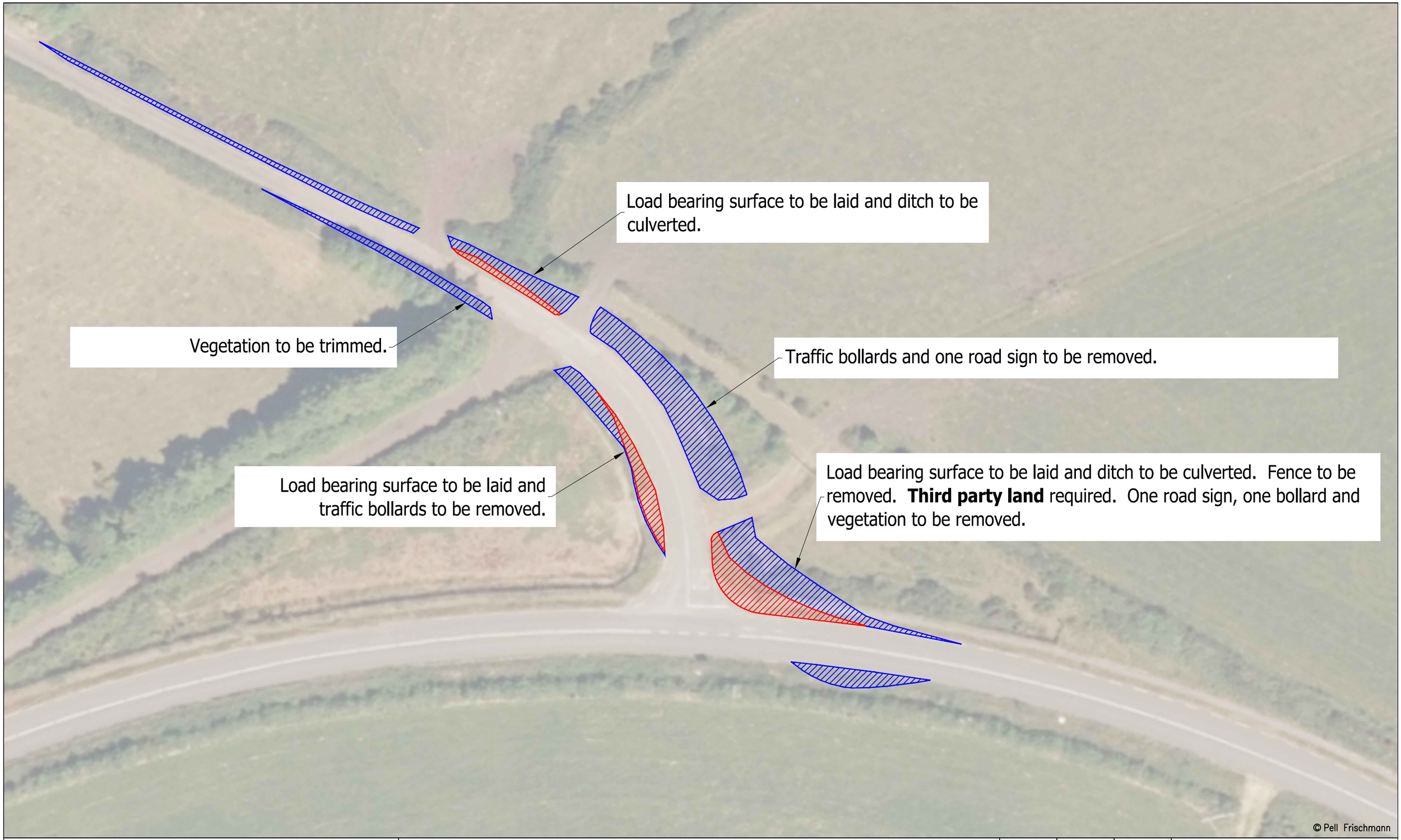
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Drawing Status: Draft

Drawing No.: SK04

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Client: Fehily Timoney

Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 4 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		4

Scale: 1:500 @ A3

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Drawing Status: Draft

Drawing No.: SK04A

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Client: Fehily Timoney

Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 3 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		5

Scale: Custom @ A3

File No.: Coom Tracking 210820.dwg

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Drawing No.: SK05

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Client: Fehily Timoney

Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Junction 3 SPA

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		5

Scale: 1:500 @ A3

File No.: Coom Tracking 210820.dwg

Drawing Status: Draft

Drawing No.: SK05A

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Client: Fehily Timoney

Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Potential Site Entrance Location (Option 1)

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		6

Scale: 1:500 @ A3

File No.: Coom Tracking 210820.dwg

Drawing Status: Draft

Drawing No.: SK06

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Client: Fehily Timoney

Key: Wheel SPA | Body SPA | Load SPA | Indicative | Over-run | Over-sail

Project: Coom Wind Farm

Drawing Title: 67.7m Blade & 24.03x4.3x4.02m Tower

SPA Location: Potential Site Entrance Location (Option 1)

	Name	Date
Drawn	TL	25/08/2020
Designed	CN	21/08/2020
Checked	GB	25/08/2020
Point of Interest		6

Scale: 1:500 @ A3

File No.: Coom Tracking 210820.dwg

Drawing Status: Draft

Drawing No.: SK06A

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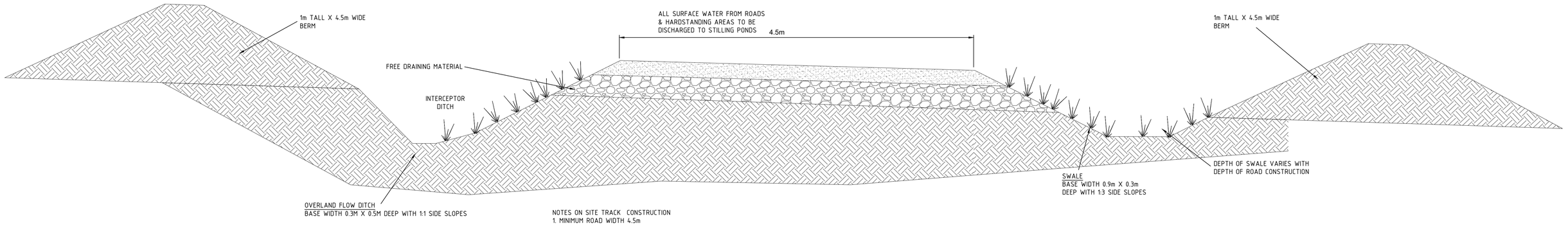
Revision: 1

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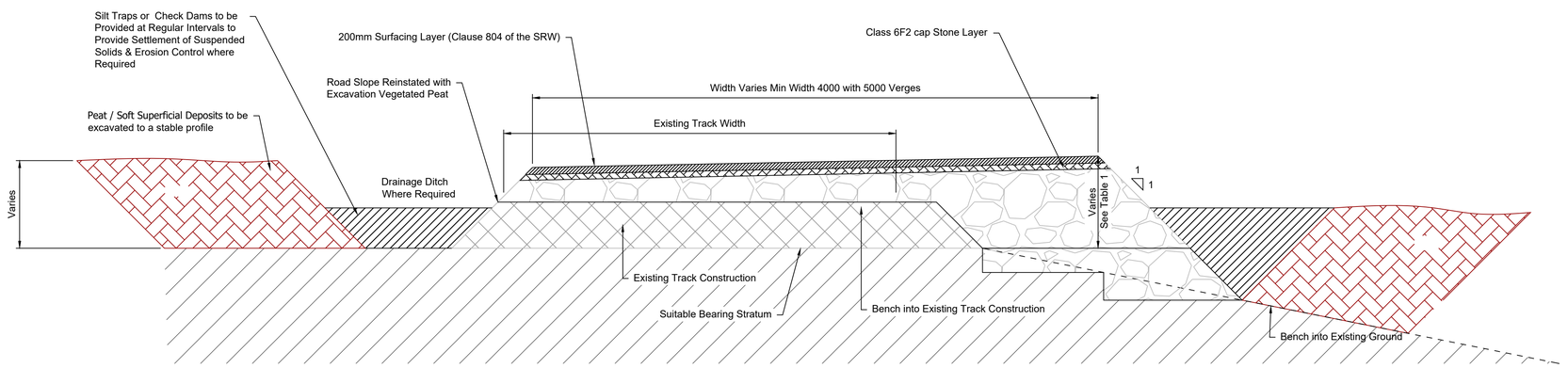
APPENDIX 3

Referenced Drawings



NEW ROAD DETAIL

Scale 1:25



UPGRADED ROAD DETAIL

Scale 1:25

0m 0.25m 0.50m 0.75m 1.00m 1.25m 1.50m 1.75m 2.00m 2.25m 2.50m

Scale 1:25

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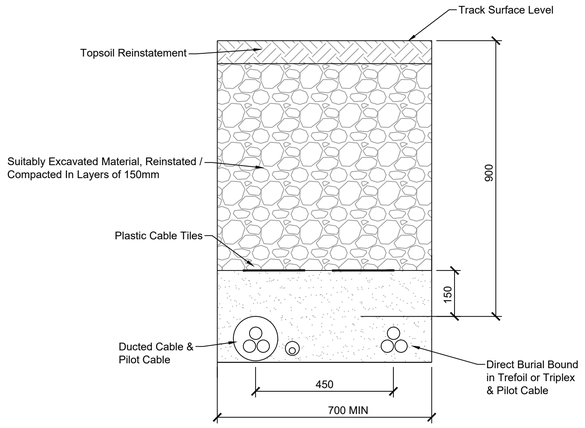
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Rev.	Description	App By	Date
A	ISSUE FOR APPROVAL	JH	23.11.20

PROJECT: COOM GREEN ENERGY PARK	CLIENT: CROOM GREEN ENERGY PARK LIMITED		
SHEET: ROAD DETAILS	Date: 23.11.20	Project number: P20-099	Scale (@ A1-): 1:25
	Drawn by: SOC	Drawing Number: P20-099-0300-0025	Rev: A
	Checked by: CL		

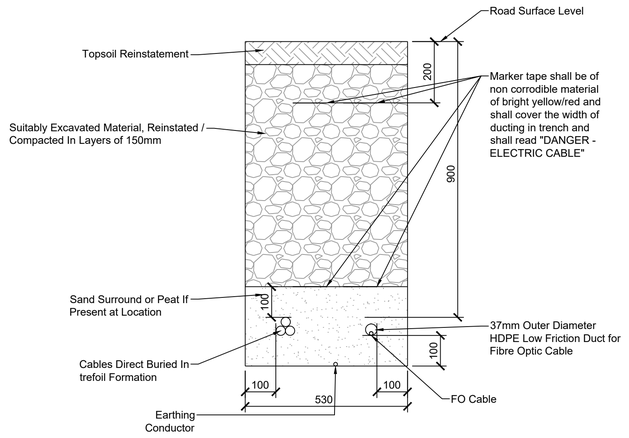
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02 December 2020



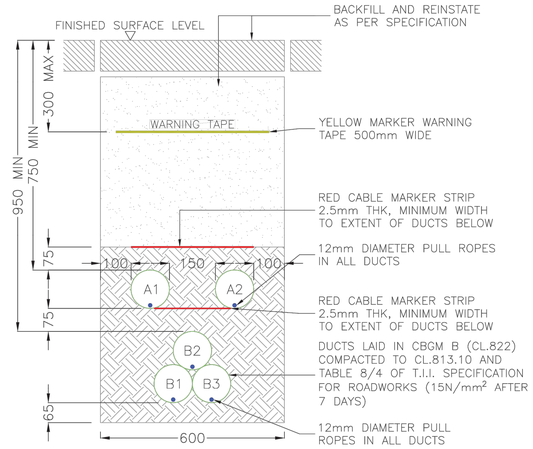
TRENCH CROSS SECTION - PILOT CABLES

Scale 1:10



COLLECTOR CIRCUIT VERGE (DIRECT BURY)

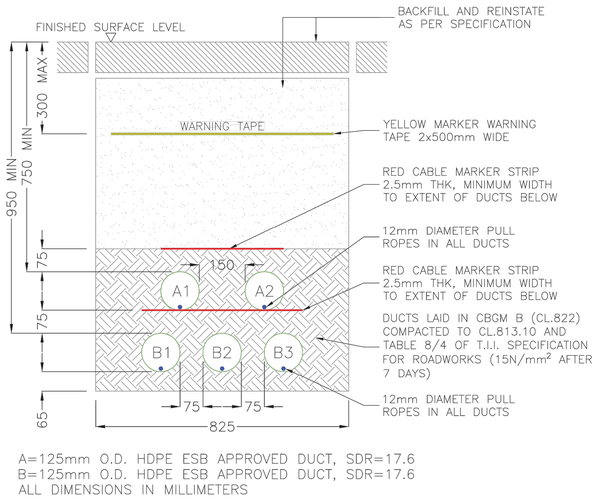
Scale 1:10



A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
B=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
ALL DIMENSIONS IN MILLIMETERS

110Kv SINGLE CIRCUIT TRENCH CROSS SECTION FOR POWER DUCTS IN TREFOIL FORMATION

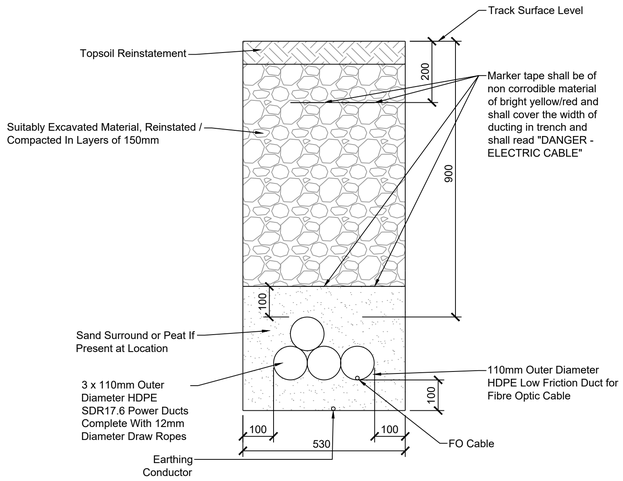
Scale 1:10



A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
B=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
ALL DIMENSIONS IN MILLIMETERS

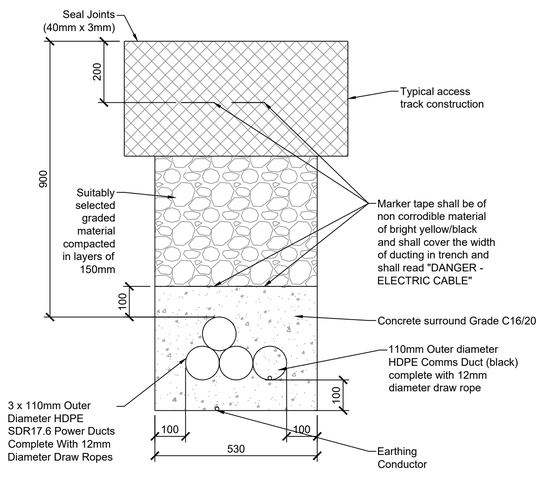
110Kv SINGLE CIRCUIT TRENCH CROSS SECTION FOR POWER DUCTS IN FLAT FORMATION

Scale 1:10



COLLECTOR CIRCUIT VERGE

Scale 1:10



COLLECTOR CIRCUIT CENTRE

Scale 1:10

0m 0.1m 0.2m 0.3m 0.4m 0.5m 0.6m 0.7m 0.8m 0.9m 1.0m

Scale 1:10

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Rev.	Description	App By	Date
A	ISSUE FOR COMMENT	JH	19.12.19

PROJECT
COOM GREEN ENERGY PARK

CLIENT
CROOM GREEN ENERGY PARK LIMITED

SHEET
TRENCH DETAILS FOR INTERNAL COLLECTOR CABLES & 110kV GRID CONNECTION CABLE

Date: 19.12.19	Project number: P20-099	Scale (@ A1-): 1:10
Drawn by: SOC	Drawing Number: P20-099-0300-0021	Rev: A
Checked by: TB		

O:\ACAD\2020\P20-099\P20-099-0300-0021

02 December 2020

STANDARD 110kV CABLE DRAWINGS
STANDARD CROSSING ABOVE
3rd PARTY SERVICE FOR 125mm DUCTS

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-001	001	STANDARD 3rd PARTY CROSSING 125mm INDEX SHEET	00
XDC-CBL-STND-H-001	002	STANDARD 3rd PARTY CROSSING ABOVE IN FULL FLAT FORMATION 125mm HV DUCTS	00
XDC-CBL-STND-H-001	003	STANDARD 3rd PARTY CROSSING ABOVE IN TREFOIL FORMATION 125mm HV DUCTS	00

REV	DESC	DRAWN	CHECKED	APPROVED	DATE
00	FIRST ISSUE	DA	DG	CF	09/03/2020

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The Oval, 160 Shelbourne Road,
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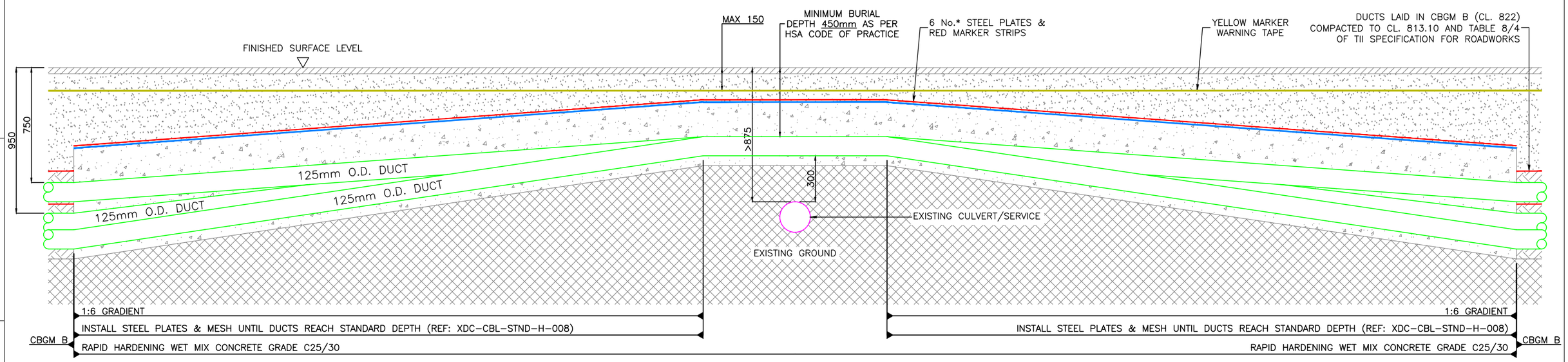
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING
125mm
INDEX SHEET

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-001	001	00

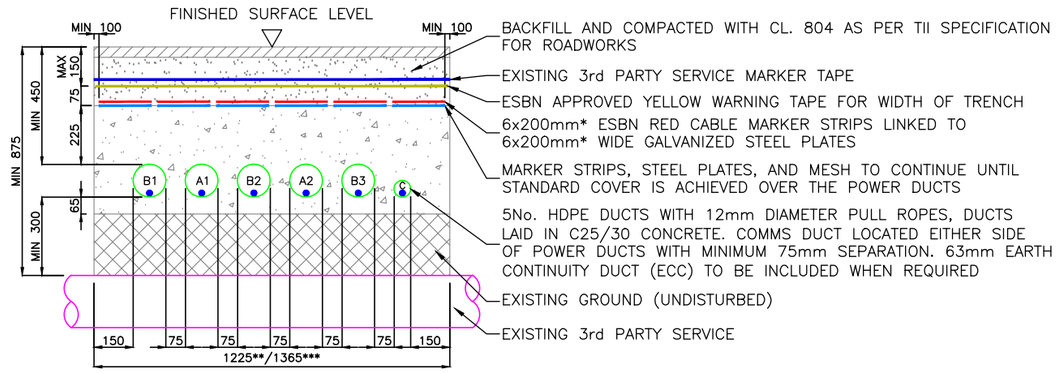


NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 25mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (TO BE CONFIRMED BY DESIGNER CABLE RATING CALCULATIONS).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM BURIAL DEPTH IS 450mm.
8. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
9. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

FULL FLAT FORMATION – REDUCED DEPTH FOR CROSSING OVER 3RD PARTY SERVICE



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
B= 125mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR

* 5x200mm STEEL PLATES AND RE MARKERS AND WHERE ECC IS NOT REQUIRED
** MIN 1225mm WHERE ECC NOT REQUIRED
*** SEE NOTE 9

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00	FIRST ISSUE	DA	DG	CF	09/03/2020

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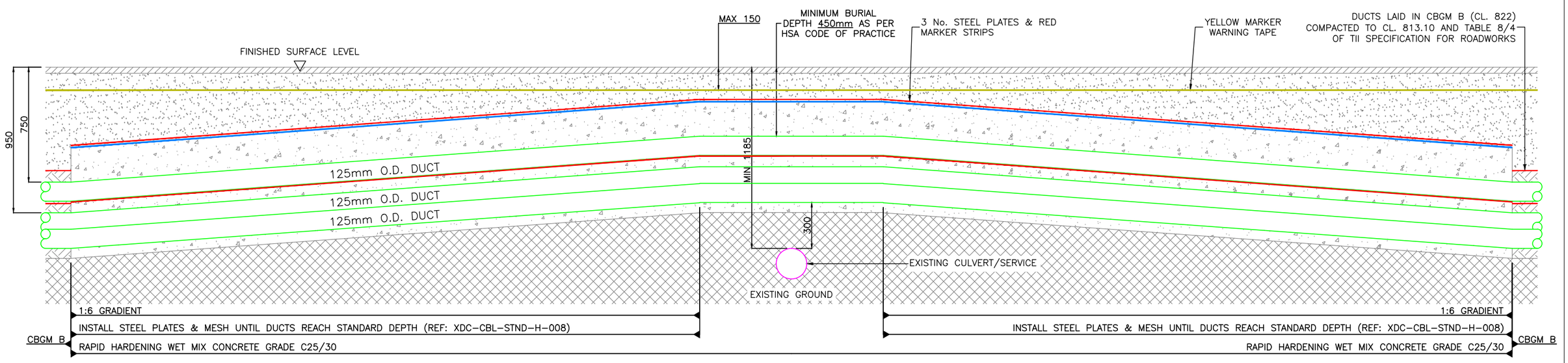
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING ABOVE IN FULL FLAT FORMATION 125mm HV DUCTS

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-001	002	00

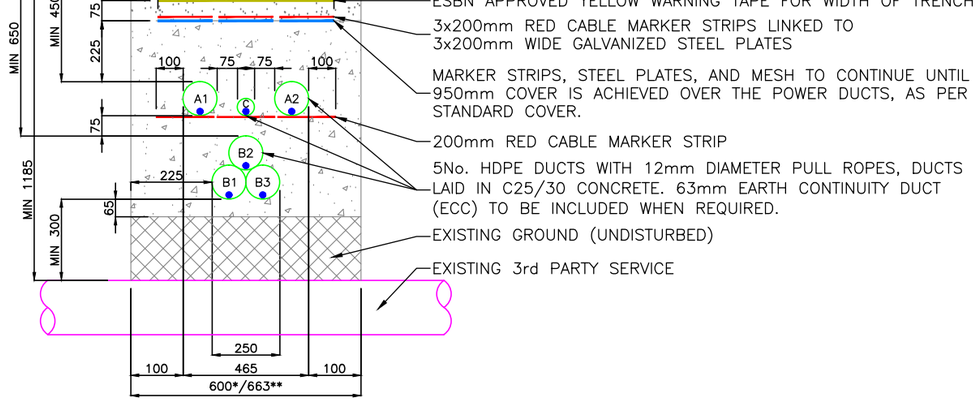


NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 25mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (TO BE CONFIRMED BY DESIGNER CABLE RATING CALCULATIONS).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM BURIAL DEPTH IS 450mm.
8. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
9. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

TREFOIL FORMATION – REDUCED DEPTH FOR CROSSING OVER 3RD PARTY SERVICE



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
B= 125mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR

* MIN 600mm WHERE ECC NOT REQUIRED
** SEE NOTE 9

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING ABOVE IN TREFOIL FORMATION 125mm HV DUCTS

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-001	003	00

STANDARD 110kV CABLE DRAWINGS
STANDARD CROSSING ABOVE
3rd PARTY SERVICE FOR 160mm DUCTS

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-002	001	STANDARD 3rd PARTY CROSSING 160mm INDEX SHEET	00
XDC-CBL-STND-H-002	002	STANDARD 3rd PARTY CROSSING ABOVE IN FULL FLAT FORMATION 160mm HV DUCTS	00
XDC-CBL-STND-H-002	003	STANDARD 3rd PARTY CROSSING ABOVE IN TREFOIL FORMATION 160mm HV DUCTS	00

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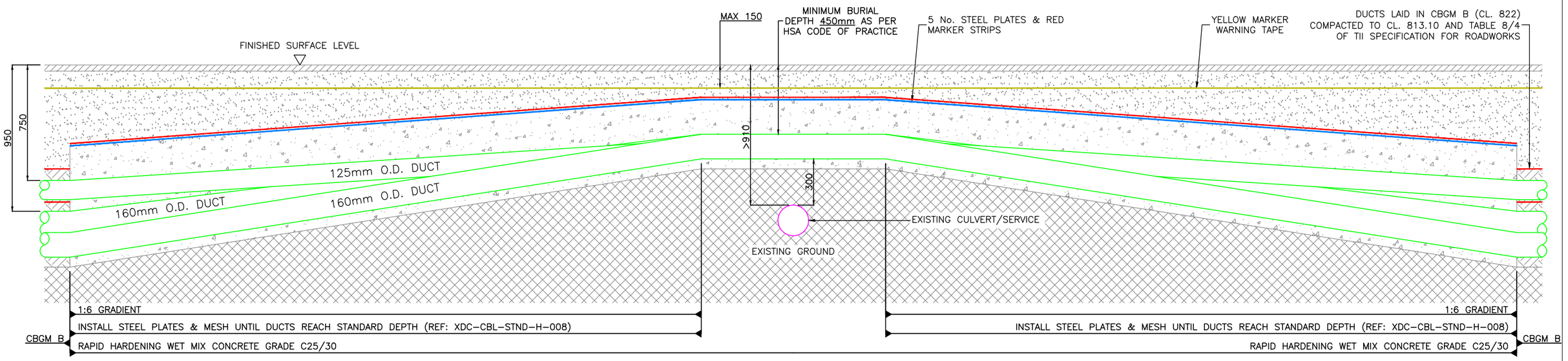
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING
160mm
INDEX SHEET

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
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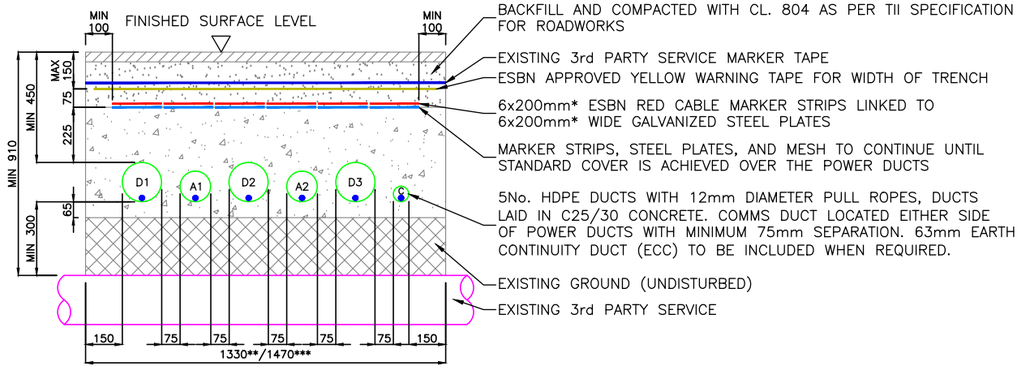


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2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 10mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (TO BE CONFIRMED BY DESIGNER CABLE RATING CALCULATIONS).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM BURIAL DEPTH IS 450mm.
8. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
9. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

FULL FLAT FORMATION – REDUCED DEPTH FOR CROSSING OVER 3RD PARTY SERVICE



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
D= 160mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR

* 5x200mm STEEL PLATES AND RED MARKER WHERE AND ECC IS NOT REQUIRED
** MIN 1225mm WHERE ECC NOT REQUIRED
*** SEE NOTE 9

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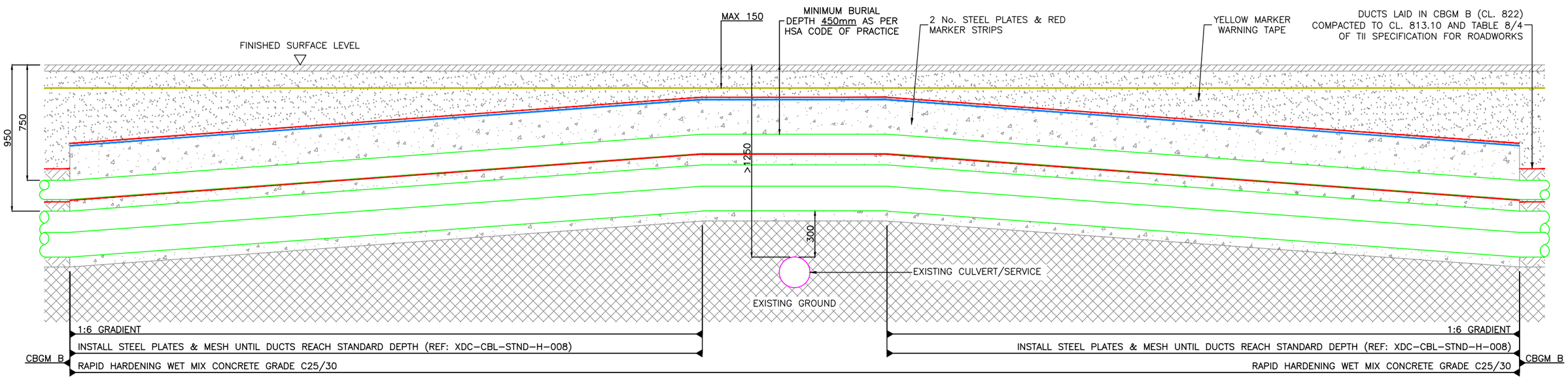
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING ABOVE IN FULL FLAT FORMATION 160mm HV DUCTS

No of Shts	SIZE	SCALE
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DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-002	002	00

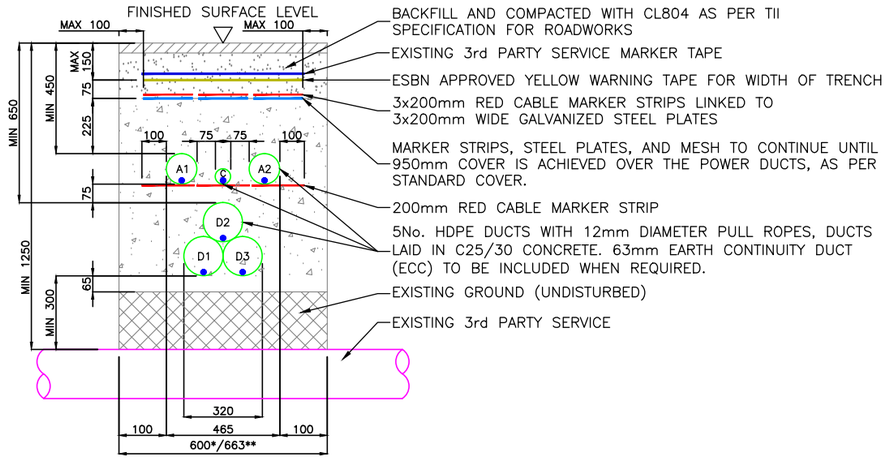


NOTES:

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2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 10mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (TO BE CONFIRMED BY DESIGNER CABLE RATING CALCULATIONS).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM BURIAL DEPTH IS 450mm.
8. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
9. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

TREFOIL FORMATION – REDUCED DEPTH FOR CROSSING OVER 3RD PARTY SERVICE



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
D= 160mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. PVC DUCT FOR EARTH CONTINUITY CONDUCTOR

* MIN 600mm WHERE ECC NOT REQUIRED
** SEE NOTE 9

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING ABOVE IN TREFOIL FORMATION 160mm HV DUCTS

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER: XDC-CBL-STND-H-002
SHEET: 003
REV: 00

STANDARD 110kV CABLE DRAWINGS
STANDARD CROSSING BELOW
3rd PARTY SERVICE FOR 125mm DUCTS

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-003	001	STANDARD 3rd PARTY CROSSING 125mm INDEX SHEET	00
XDC-CBL-STND-H-003	002	STANDARD 3rd PARTY CROSSING 125mm BELOW IN FULL FLAT FORMATION	00
XDC-CBL-STND-H-003	003	STANDARD 3rd PARTY CROSSING 125mm BELOW IN TREFOIL FORMATION	00

REV	DESC	DRAWN	CHECKED	APPROVED	DATE
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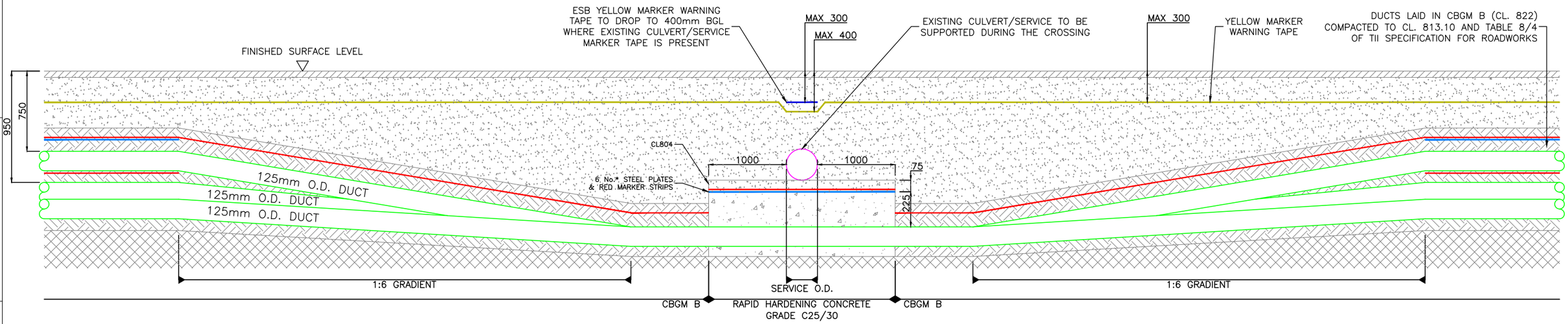
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING
125mm
INDEX SHEET

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-003	001	00



NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 25mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (TO BE CONFIRMED BY DESIGNER CABLE RATING CALCULATIONS).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
8. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.
9. IF EXISTING SERVICE MARKER TAPE IS NOT PRESENT, THE ESBN YELLOW MARKER TAPE SHOULD BE INSTALLED AT MAXIMUM 300mm BELOW FINISHED SURFACE LEVEL.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

FULL FLAT FORMATION FOR CROSSING BELOW 3RD PARTY SERVICE

A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
B= 125mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR

* 5x200mm STEEL PLATES AND RED MARKER WHERE ECC IS NOT REQUIRED
** MIN 1225mm WHERE ECC NOT REQUIRED
*** SEE NOTE 8

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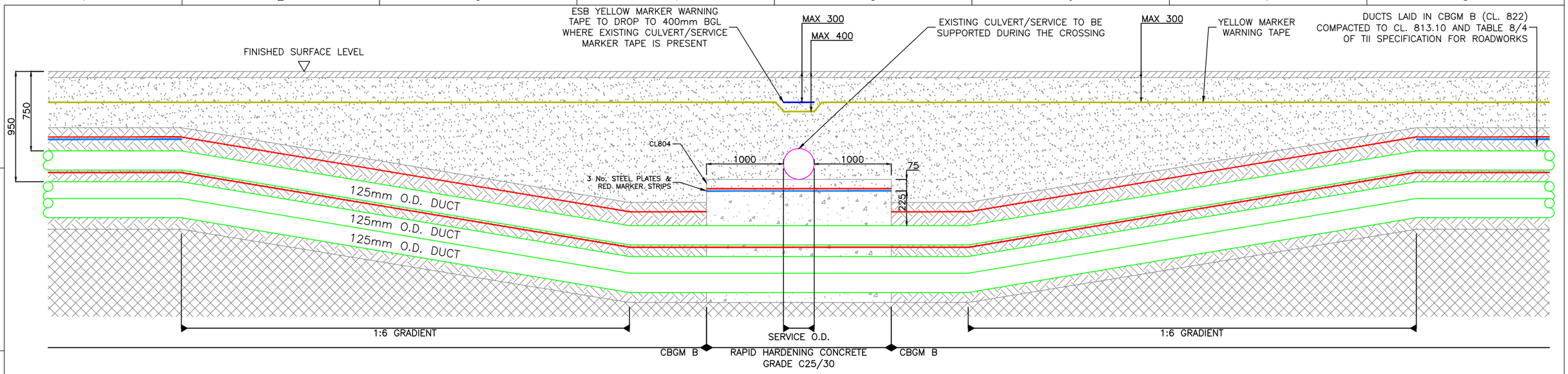
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING 125mm BELOW IN FULL FLAT FORMATION

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-003	002	00

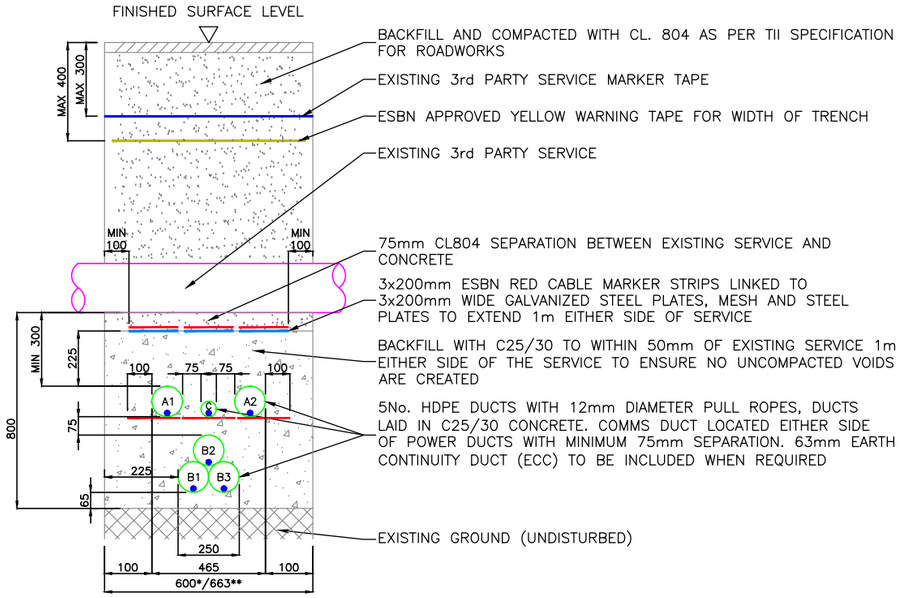


NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 25mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, (CABLE RATING CALCULATIONS TO BE REQUIRED FOR ACCEPTANCE).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
8. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.
9. IF EXISTING SERVICE MARKER TAPE IS NOT PRESENT, THE ESBN YELLOW MARKER TAPE SHOULD BE INSTALLED AT MAXIMUM 300mm BELOW FINISHED SURFACE LEVEL.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

TREFOIL FORMATION FOR CROSSING BELOW 3RD PARTY SERVICE



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
B= 125mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR

* MIN 600mm WHERE ECC NOT REQUIRED
** SEE NOTE 8

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING 125mm BELOW IN TREFOIL FORMATION

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-003	003	00

STANDARD 110kV CABLE DRAWINGS
STANDARD CROSSING BELOW
3rd PARTY SERVICE FOR 160mm DUCTS

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-004	001	STANDARD 3rd PARTY CROSSING 160mm INDEX SHEET	00
XDC-CBL-STND-H-004	002	STANDARD 3rd PARTY CROSSING 160mm BELOW IN FULL FLAT FORMATION	00
XDC-CBL-STND-H-004	003	STANDARD 3rd PARTY CROSSING 160mm BELOW IN TREFOIL FORMATION	00

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00	FIRST ISSUE	DA	DG	CF	09/03/2020

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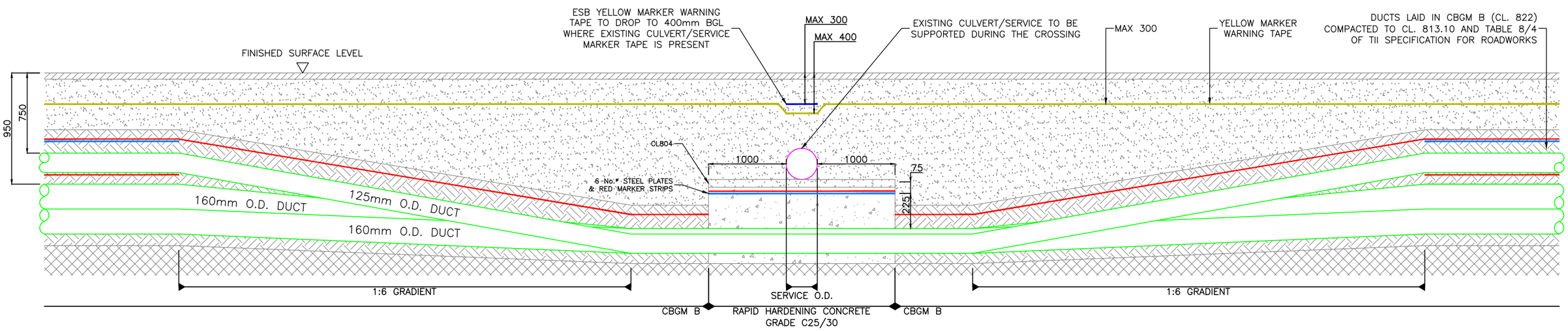
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING
160mm
INDEX SHEET

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-004	001	00

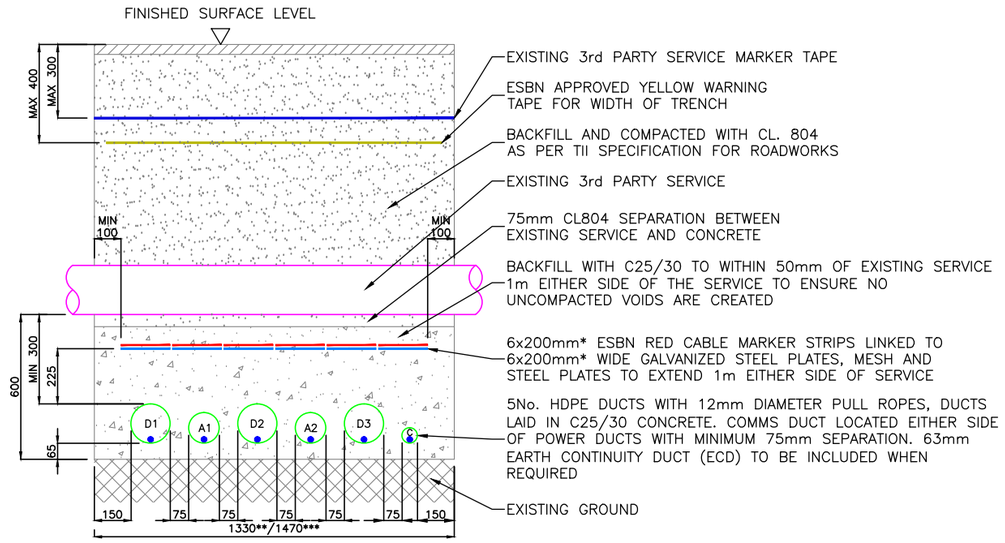


NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 10mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, (CABLE RATING CALCULATIONS TO BE PROVIDED FOR ACCEPTANCE).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM SPACING BETWEEN POWER DUCTS TO BE CONFIRMED WITH RATING CALCULATION.
8. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
9. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.
10. IF EXISTING SERVICE MARKER TAPE IS NOT PRESENT, THE ESBN YELLOW MARKER TAPE SHOULD BE INSTALLED AT MAXIMUM 300mm BELOW FINISHED SURFACE LEVEL.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

FULL FLAT FORMATION FOR CROSSING BELOW 3RD PARTY SERVICE



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
D= 160mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR

* 5x200mm STEEL PLATE AND RED MARKER WHERE ECC IS NOT REQUIRED
** MIN 1330mm WHERE ECC NOT REQUIRED
*** SEE NOTE 9

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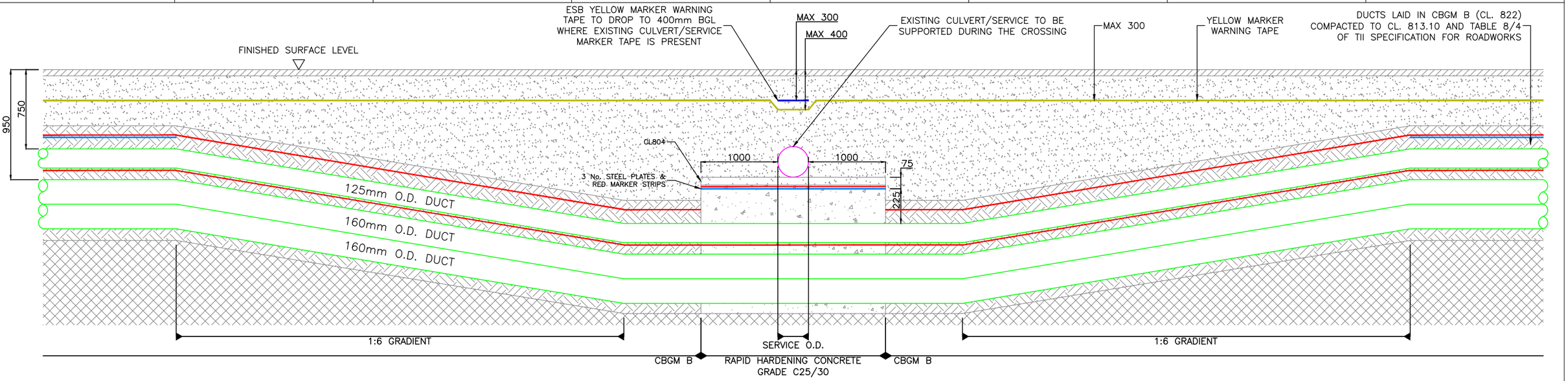
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING 160mm BELOW IN FULL FLAT FORMATION

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-004	002	00

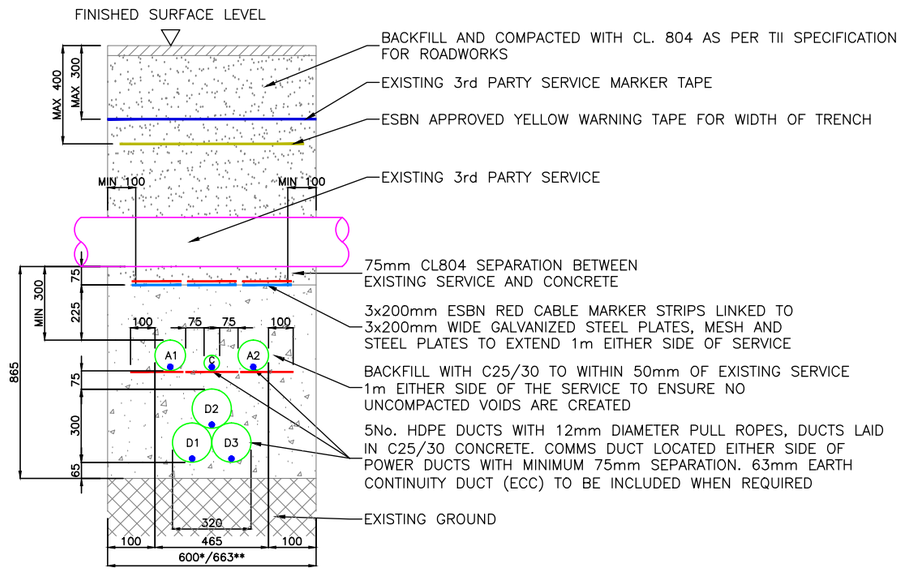


NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 10mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, (CABLE RATING CALCULATIONS TO BE PROVIDED FOR ACCEPTANCE).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM SPACING BETWEEN POWER DUCTS TO BE CONFIRMED WITH RATING CALCULATION.
8. HAND DIG WITHIN 500mm OF EXISTING SERVICE.
9. WHERE AN EARTH CONTINUITY CONDUCTOR (ECC) IS REQUIRED, A MIN 63mm DUCT TO BE INSTALLED OUTSIDE OF PHASE DUCT.
10. IF EXISTING SERVICE MARKER TAPE IS NOT PRESENT, THE ESBN YELLOW MARKER TAPE SHOULD BE INSTALLED AT MAXIMUM 300mm BELOW FINISHED SURFACE LEVEL.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- BACKFILL, COMPACTED (CL. 804)
- EXISTING GROUND

TREFOIL FORMATION FOR CROSSING BELOW 3RD PARTY SERVICE



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
D= 160mm O.D. HDPE DUCT FOR HV CABLE
C= 63mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR

* MIN 600mm WHERE ECC NOT REQUIRED
** SEE NOTE 9

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD 3rd PARTY CROSSING 160mm BELOW IN TREFOIL FORMATION

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-004	003	00

STANDARD 110kV CABLE DRAWINGS
STANDARD CROSSING BELOW
RIVERBED FOR 125mm & 160mm DUCTS

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-005	001	STANDARD RIVERBED CROSSING INDEX SHEET	00
XDC-CBL-STND-H-005	002	STANDARD RIVERBED CROSSING 125mm RIVERBED CROSSING	00
XDC-CBL-STND-H-005	003	STANDARD RIVERBED CROSSING 160mm RIVERBED CROSSING	00

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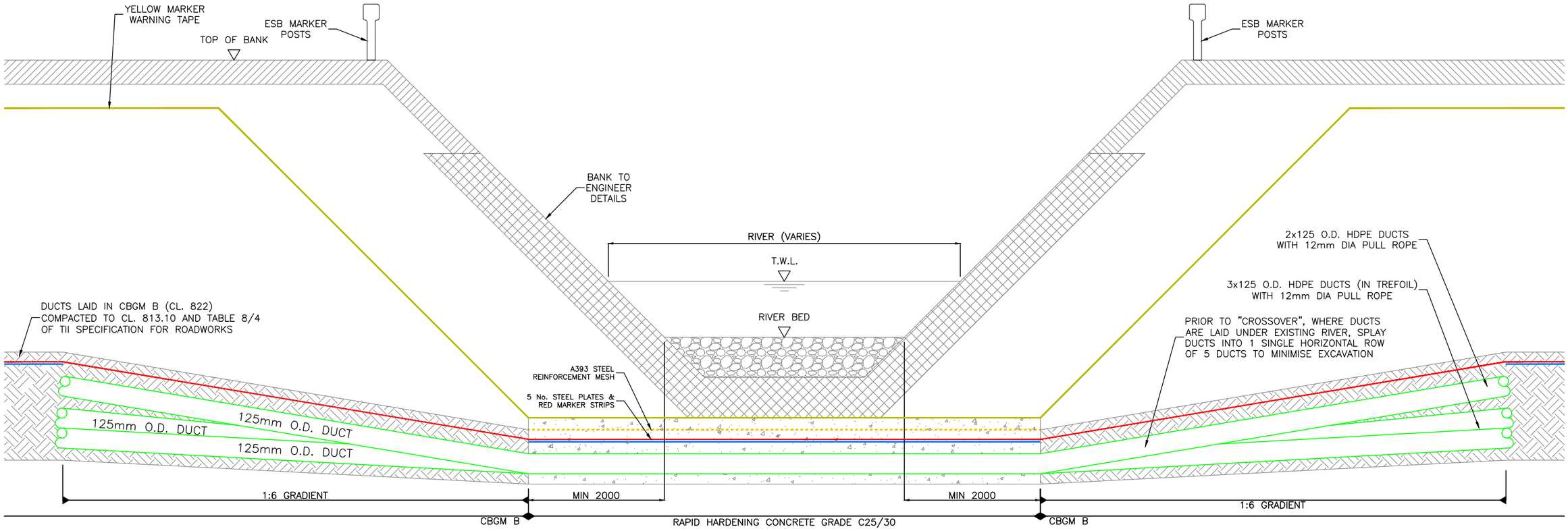
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD RIVERBED CROSSING
INDEX SHEET

No of Shts	SIZE	SCALE
3	A3	N/A

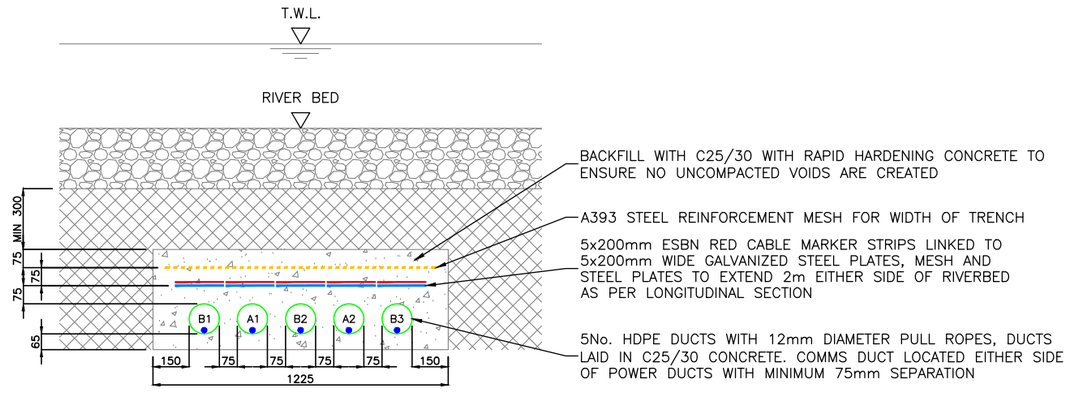
DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-005	001	00



NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 10mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (CABLE RATING CALCULATIONS TO BE PROVIDED FOR ACCEPTANCE).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM SPACING BETWEEN POWER DUCTS TO BE CONFIRMED WITH RATING CALCULATION.
8. MINIMUM CLEARANCE BETWEEN CABLE TRENCH CONCRETE AND RIVER BED TO BE AGREED WITH RELEVANT AUTHORITY. IN ANY CASE, NO LESS THAN 300mm.
9. STANDARD ESB MARKER POSTS TO BE INSTALLED AT EITHER SIDE OF RIVER CROSSING.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- A393 STEEL REINFORCEMENT MESH
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- EXISTING GROUND
- REINSTATED RIVERBED



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
B= 125mm O.D. HDPE DUCT FOR HV CABLE

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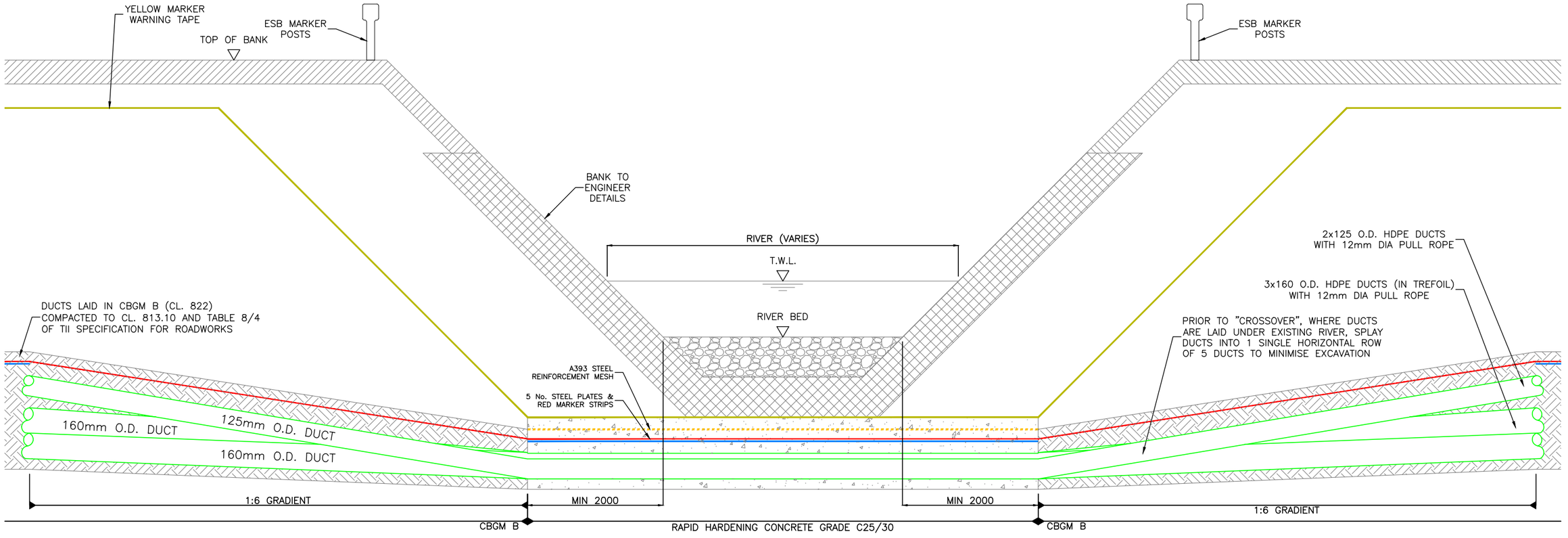
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD RIVERBED CROSSING
125mm RIVERBED CROSSING

No of Shts	SIZE	SCALE
3	A3	N/A

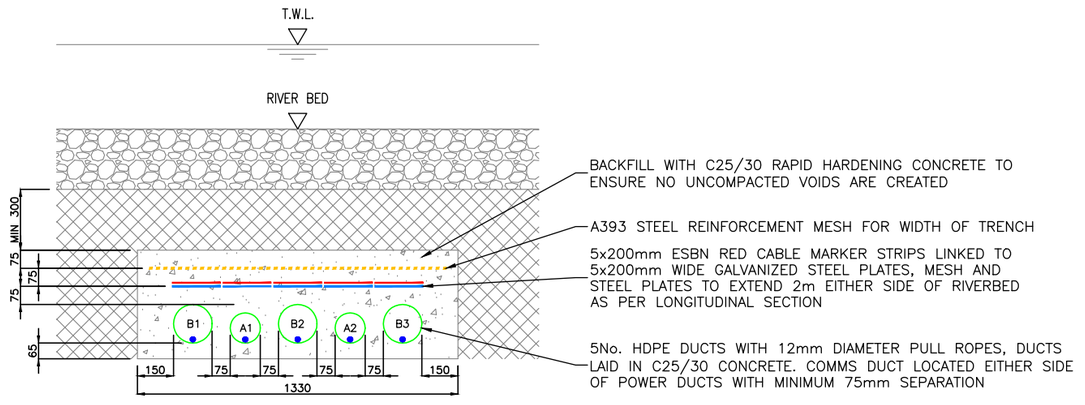
DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-005	002	00



NOTES:

1. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, ESBN STANDARDS, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
2. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
3. STEEL PLATES MUST COVER DUCTS. NO OVERLAP IS REQUIRED HOWEVER STANDARD DIMENSIONS MAY RESULT IN AN OVERLAP. SPACING OF 10mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
4. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (CABLE RATING CALCULATIONS TO BE PROVIDED FOR ACCEPTANCE).
5. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
6. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION IN CBGM. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED DURING DUCT INSTALLATION IN WET CONCRETE.
7. MINIMUM SPACING BETWEEN POWER DUCTS TO BE CONFIRMED WITH RATING CALCULATION.
8. MINIMUM CLEARANCE BETWEEN CABLE TRENCH CONCRETE AND RIVER BED TO BE AGREED WITH RELEVANT AUTHORITY.
9. STANDARD ESB MARKER POSTS TO BE INSTALLED AT EITHER SIDE OF RIVER CROSSING.

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- A393 STEEL REINFORCEMENT MESH
- 6mm GALVANISED STEEL PLATE
- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822), COMPACTED TO CL. 813.10
- EXISTING GROUND
- REINSTATED RIVERBED



A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS
B= 160mm O.D. HDPE DUCT FOR HV CABLE

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD RIVERBED CROSSING
160mm RIVERBED CROSSING

No of Shts	SIZE	SCALE
3	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-005	003	00

STANDARD 110kV CABLE DRAWINGS
STANDARD BRIDGE CROSSING

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-006	001	BRIDGE CROSSING INDEX SHEET	00
XDC-CBL-STND-H-006	002	BRIDGE CARRIAGEWAY STANDARD 110kV CABLE TRENCH	00

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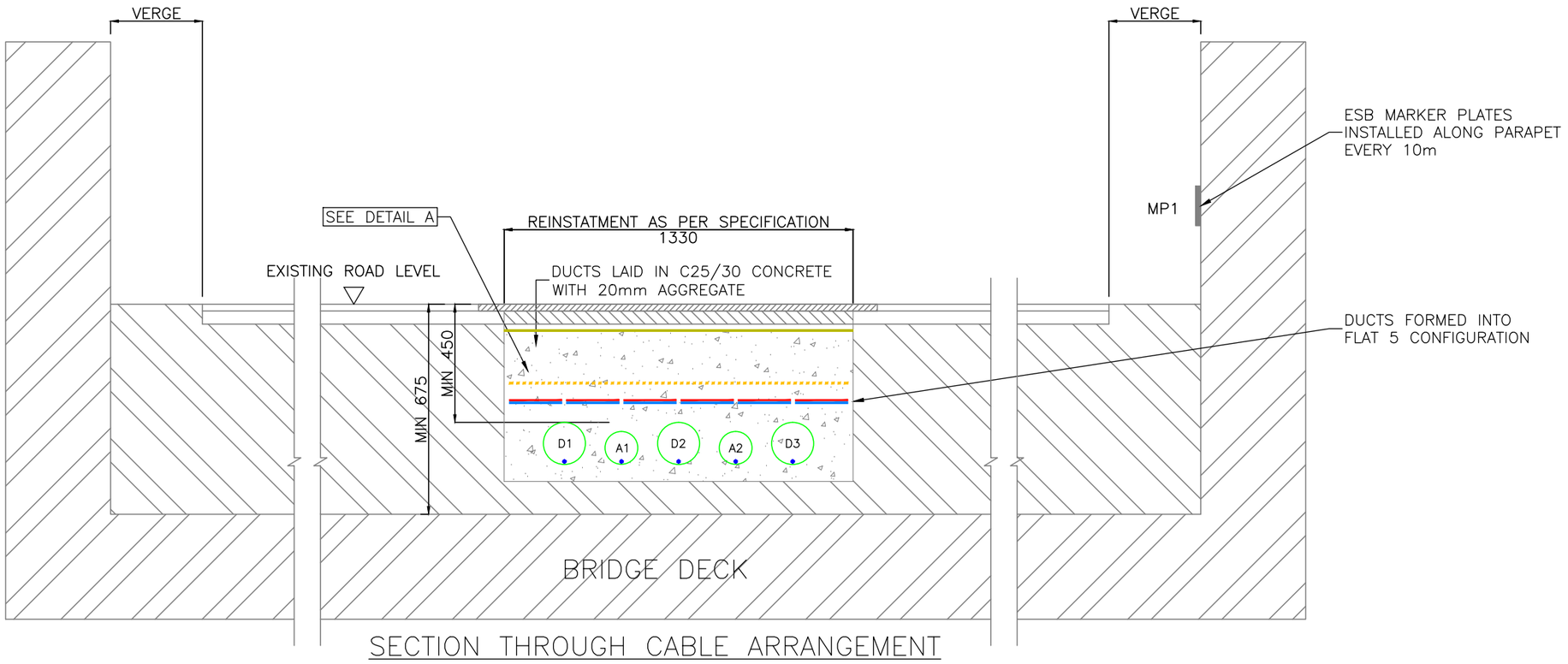
STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
BRIDGE CROSSING
INDEX SHEET

No of Shts	SIZE	SCALE
2	A3	N/A

DRAWING NUMBER
XDC-CBL-STND-H-006

SHEET	REV
001	00



SECTION THROUGH CABLE ARRANGEMENT

NOTES:

1. THE REQUIREMENT FOR THE BRIDGE INSTALLATION SHALL BE AGREED IN ADVANCE BY THE CUSTOMER WITH THE LOCAL AUTHORITY, OR RELEVANT PUBLIC/PRIVATE BODY.
2. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
3. REINSTATEMENT TO BE AS PER TII SPECIFICATION FOR THE REINSTATEMENT OF OPENINGS IN NATIONAL ROADS. WHERE ENTIRE ROAD TO BE RELAID IT IS TO BE DONE AS PER NRA SPECIFICATION FOR ROADWORKS.
4. 300mm MINIMUM VERTICAL AND HORIZONTAL CLEARANCES TO BE OBSERVED BETWEEN CABLE DUCTS AND THIRD PARTY SERVICES (e.g. GAS PIPES, WATER MAINS, CULVERTS, etc.) IN THE CASE OF HIGH RISK 3rd PARTY SERVICES, GREATER CLEARANCES MAY BE REQUIRED. DESIGNER TO CONSULT EIRGRID AND 3rd PARTY SERVICE OWNERS FOR GUIDANCE.
5. STEEL PLATES MUST COVER DUCTS. SPACING OF 10mm TO BE MAINTAINED BETWEEN STEEL PLATES TO PREVENT THE TRANSFER OF STRAY CURRENT.
6. THE MINIMUM CLEARANCE BETWEEN ALL HV AND COMMUNICATION DUCTS IS 75mm, BUT INCREASED SPACING MAY BE REQUIRED IN ORDER TO ACHIEVE THE CABLE RATING (CABLE RATING CALCULATIONS TO BE PROVIDED FOR ACCEPTANCE).
7. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
8. TEMPLATES ARE TO BE USED AT 5m INTERVALS DURING DUCT INSTALLATION. PRE-MADE 75mm WIDE CONCRETE SPACERS TO BE USED FOR INSTALLATION IN WET CONCRETE.
9. MINIMUM BURIAL DEPTH IS 450mm.

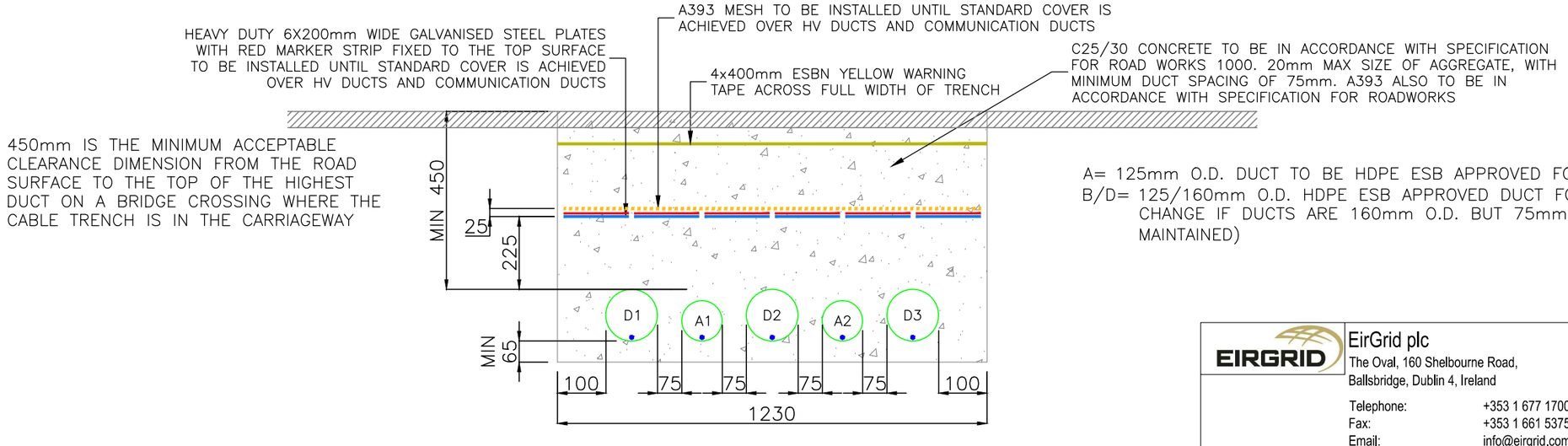
RED MARKER STRIP

YELLOW MARKER WARNING TAPE

A393 STEEL MESH

6mm STEEL PLATE

DETAIL A



450mm IS THE MINIMUM ACCEPTABLE CLEARANCE DIMENSION FROM THE ROAD SURFACE TO THE TOP OF THE HIGHEST DUCT ON A BRIDGE CROSSING WHERE THE CABLE TRENCH IS IN THE CARRIAGEWAY

A= 125mm O.D. DUCT TO BE HDPE ESB APPROVED FOR COMMUNICATIONS
B/D= 125/160mm O.D. HDPE ESB APPROVED DUCT FOR HV CABLE (OVERALL TRENCH WIDTH MAY CHANGE IF DUCTS ARE 160mm O.D. BUT 75mm DISTANCE REQUIREMENT BETWEEN DUCTS TO BE MAINTAINED)

PROPOSED FLAT 5 CONFIGURATION OVER BRIDGES WITH SHALLOW COVER – WITHIN CARRRIAGEWAY

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
BRIDGE CARRIAGEWAY
STANDARD 110kV CABLE TRENCH

No of Shts	SIZE	SCALE
2	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-006	002	00

STANDARD 110kV CABLE DRAWINGS
STANDARD CABLE TRENCH THROUGH PEAT

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-007	001	STANDARD CABLE TRENCH THROUGH PEAT INDEX SHEET	00
XDC-CBL-STND-H-007	002	SECTION THROUGH SOLID CABLE TRENCH (FLOATING ROAD) PEAT DEPTH <2.5m	00
XDC-CBL-STND-H-007	003	SECTION THROUGH FLOATING ROAD UPGRADED TO SOLID PEAT DEPTH <2.5m	00
XDC-CBL-STND-H-007	004	SECTION THROUGH FLOATING ROAD PEAT DEPTH >2.5m	00

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STANDARD 110kV CABLE DRAWINGS

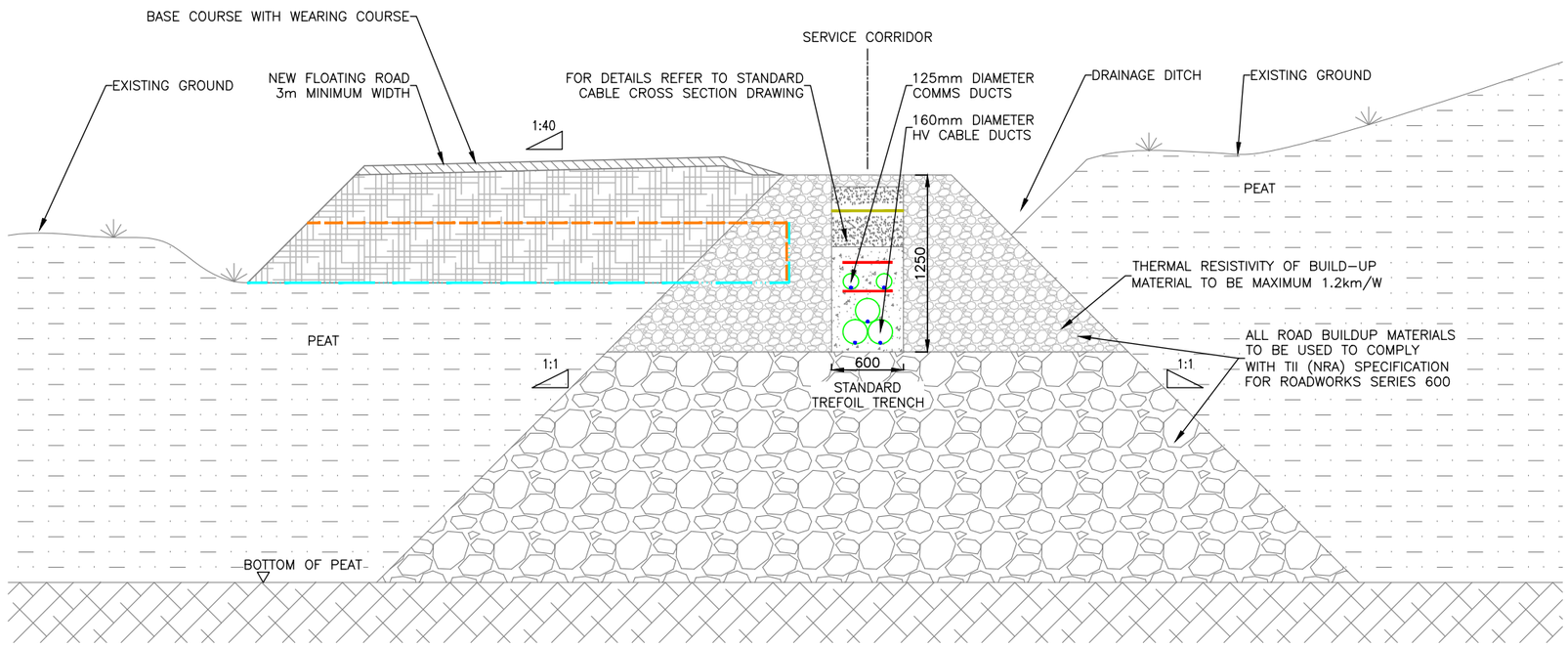
DRAWING TITLE
STANDARD CABLE TRENCH THROUGH PEAT INDEX SHEET

No of Shts	SIZE	SCALE
4	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-007	001	00

NOTES:

1. BASE COURSE AND WEARING COURSE TO BE IN ACCORDANCE WITH TII (NRA) SPECIFICATION FOR ROADWORKS SERIES 900.
2. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
3. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
4. FOR DETAILS OF CABLE TRENCH LAYOUT, REFER TO XDC-CBL-STND-H-008.
5. THIS IS A TYPICAL CROSS SECTION DETAIL FOR SHALLOW PEAT INSTALLATION. SPECIFIC CONSTRUCTION DESIGN SHALL COMPLY WITH CDS-HFS-01-001.



LEGEND:

- GEOTEXTILE
- GEOGRID
- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE

SECTION THROUGH CABLE TRENCH BUILT TO SOLID (FLOATING ROAD)
PEAT DEPTH <2.5m
SCALE 1:50

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STANDARD 110kV CABLE DRAWINGS

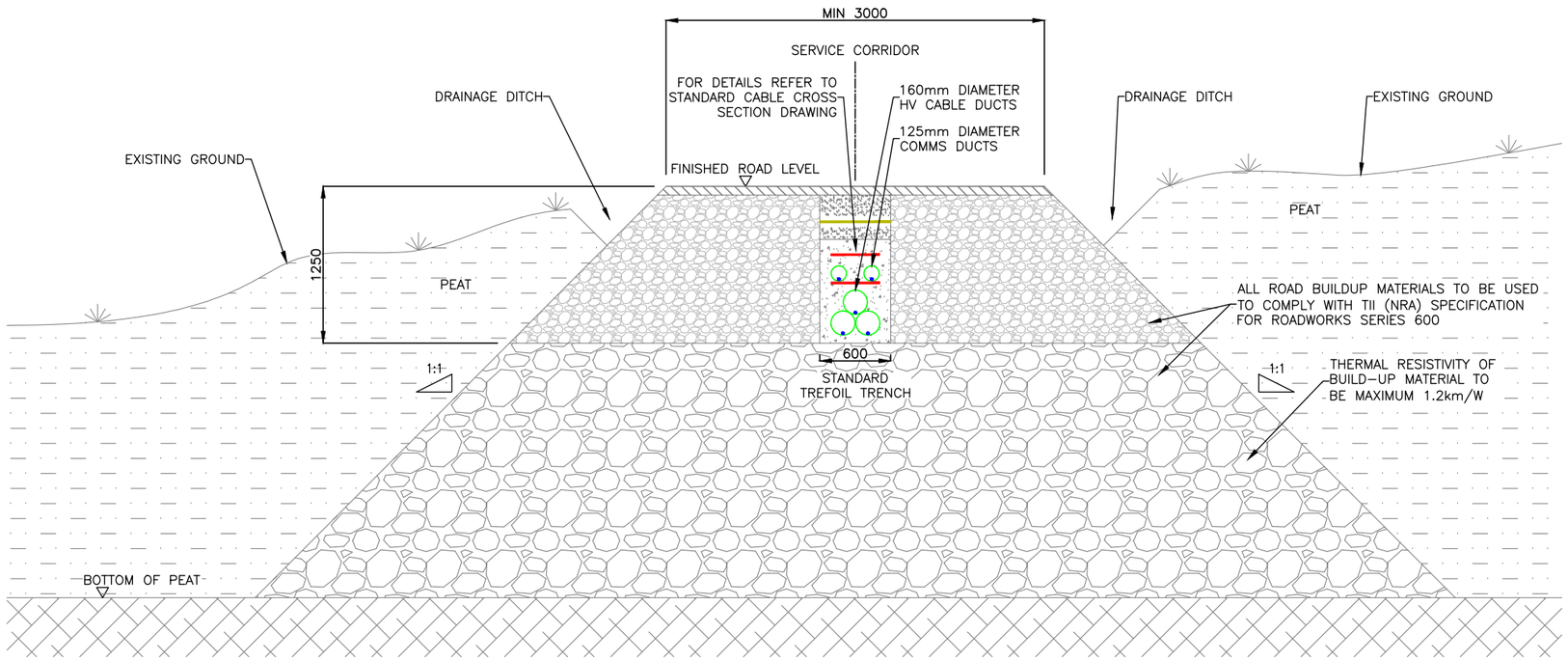
DRAWING TITLE
TYPICAL SECTION THROUGH SOLID CABLE TRENCH (FLOATING ROAD) PEAT DEPTH <2.5m

No of Shts	SIZE	SCALE
4	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-007	002	00

NOTES:

1. BASE COURSE AND WEARING COURSE TO BE IN ACCORDANCE WITH TII (NRA) SPECIFICATION FOR ROADWORKS SERIES 900.
2. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
3. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
4. FOR DETAILS OF CABLE TRENCH LAYOUT, REFER TO XDC-CBL-STND-H-008.
5. THIS IS A TYPICAL CROSS SECTION DETAIL FOR SHALLOW PEAT INSTALLATION. SPECIFIC CONSTRUCTION DESIGN SHALL COMPLY WITH CDS-HFS-01-001.



LEGEND:

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE

SECTION THROUGH FLOATING ROAD UPGRADED TO SOLID
PEAT DEPTH <2.5m
SCALE 1:50

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STANDARD 110kV CABLE DRAWINGS

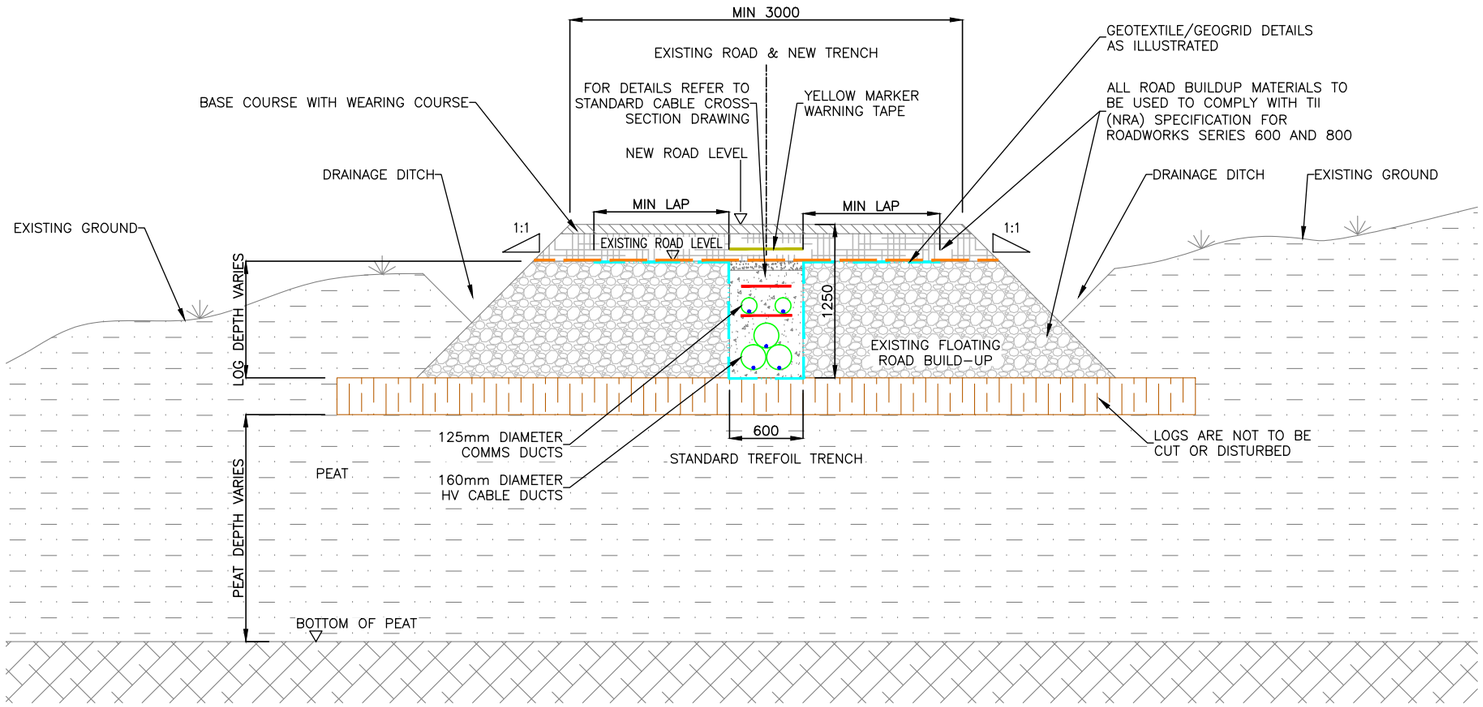
DRAWING TITLE
TYPICAL SECTION THROUGH FLOATING ROAD UPGRADED TO SOLID PEAT DEPTH <2.5m

No of Shts	SIZE	SCALE
4	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-007	003	00

NOTES:

1. BASE COURSE AND WEARING COURSE TO BE IN ACCORDANCE WITH TII (NRA) SPECIFICATION FOR ROADWORKS SERIES 900.
2. ALL PRODUCTS AND MATERIALS TO BE UTILISED DURING CONSTRUCTION TO COMPLY WITH EIRGRID FUNCTIONAL SPECIFICATION, TII SPECIFICATION FOR ROAD WORKS AND ALL RELEVANT IRISH (EUROPEAN) AND BRITISH STANDARDS.
3. DRAWING IS INDICATIVE ONLY, TO BE USED TO AID IN THE DESIGN OF THE RELEVANT INFRASTRUCTURE.
4. FOR DETAILS OF CABLE TRENCH LAYOUT, REFER TO XDC–CBL–STND–H–008.
5. THIS IS A TYPICAL CROSS SECTION DETAIL FOR DEEP PEAT INSTALLATION. SPECIFIC CONSTRUCTION DESIGN SHALL COMPLY WITH CDS–HFS–01–001.



SECTION THROUGH UPGRADED FLOATING ROAD
PEAT DEPTH >2.5m
SCALE 1:50

LEGEND:

- GEOTEXTILE
- GEOGRID
- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- BASE WEARING COARSE
- NEW ROAD BUILT–UP MATERIAL
- EXISTING MATERIAL
- LOGS
- PEAT

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TYPICAL SECTION THROUGH FLOATING ROAD
PEAT DEPTH >2.5m

No of Shts	SIZE	SCALE
4	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–007	004	00

STANDARD 110kV CABLE DRAWINGS
STANDARD CROSS SECTIONS
125mm AND 160mm DUCTS

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-008	001	STANDARD CROSS SECTIONS INDEX SHEET	00
XDC-CBL-STND-H-008	002	TRENCH CROSS SECTION FOR 125mm POWER DUCTS IN TREFOIL FORMATION	00
XDC-CBL-STND-H-008	003	TRENCH CROSS SECTION FOR 160mm POWER DUCTS IN TREFOIL FORMATION	00
XDC-CBL-STND-H-008	004	TRENCH CROSS SECTION FOR 125mm POWER DUCTS IN FLAT FORMATION	00
XDC-CBL-STND-H-008	005	TRENCH CROSS SECTION FOR 160mm POWER DUCTS IN FLAT FORMATION	00
XDC-CBL-STND-H-008	006	TRENCH CROSS SECTION FOR 125mm POWER DUCTS WITH EARTH CONTINUITY DUCT – TREFOIL FORMATION	00
XDC-CBL-STND-H-008	007	TRENCH CROSS SECTION FOR 160mm POWER DUCTS WITH EARTH CONTINUITY DUCT – TREFOIL FORMATION	00
XDC-CBL-STND-H-008	008	TRENCH CROSS SECTION FOR 125mm POWER DUCTS WITH EARTH CONTINUITY DUCT – FLAT FORMATION	00
XDC-CBL-STND-H-008	009	TRENCH CROSS SECTION FOR 160mm POWER DUCTS WITH EARTH CONTINUITY DUCT – FLAT FORMATION	00

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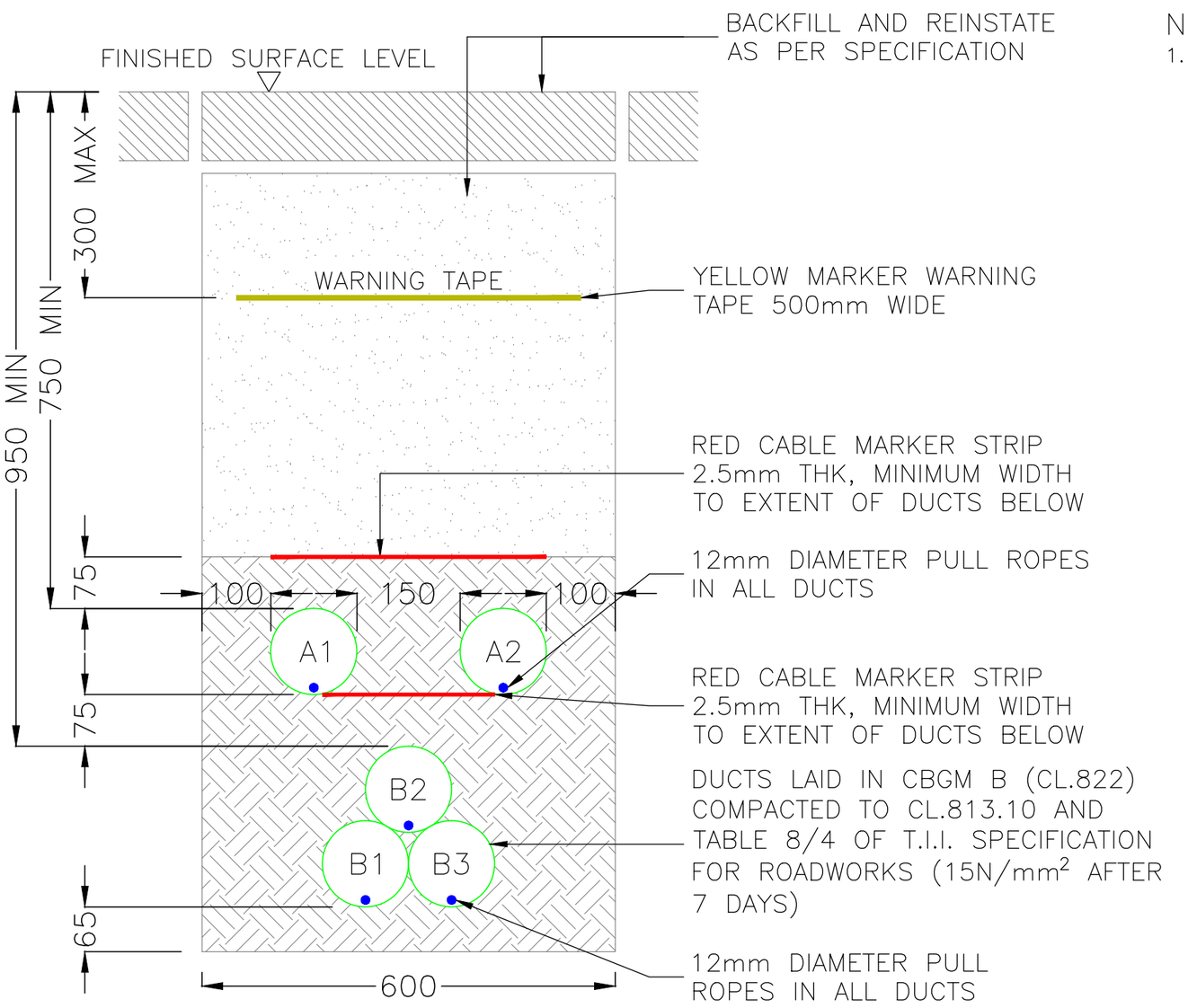
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD CROSS SECTIONS
INDEX SHEET

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-008	001	00



NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
B=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
ALL DIMENSIONS IN MILLIMETERS

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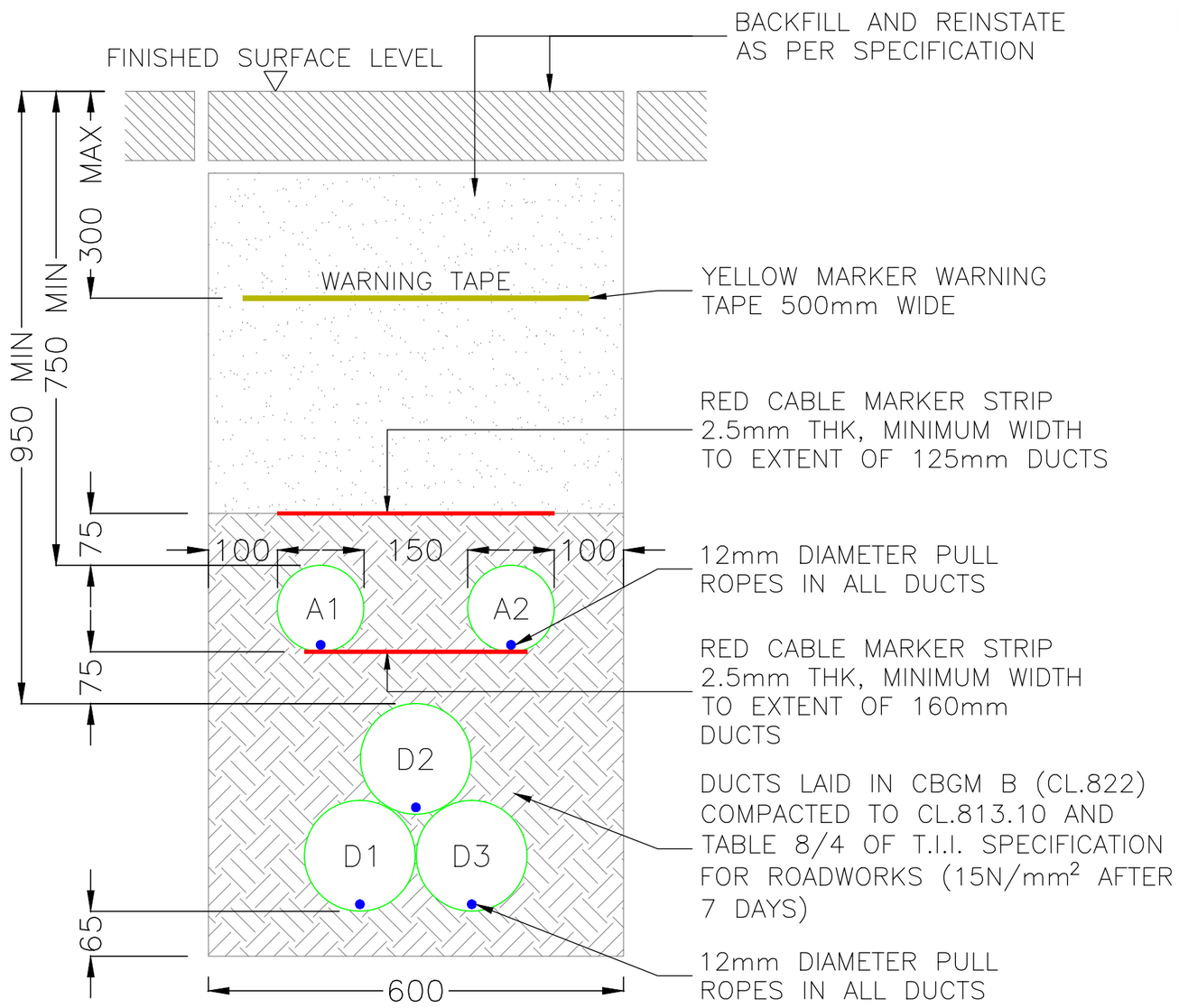
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 125mm POWER DUCTS IN TREFOIL FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–008	002	00



NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
D=160mm O.D. HDPE ESB APPROVED DUCT, SDR=21
ALL DIMENSIONS IN MILLIMETERS

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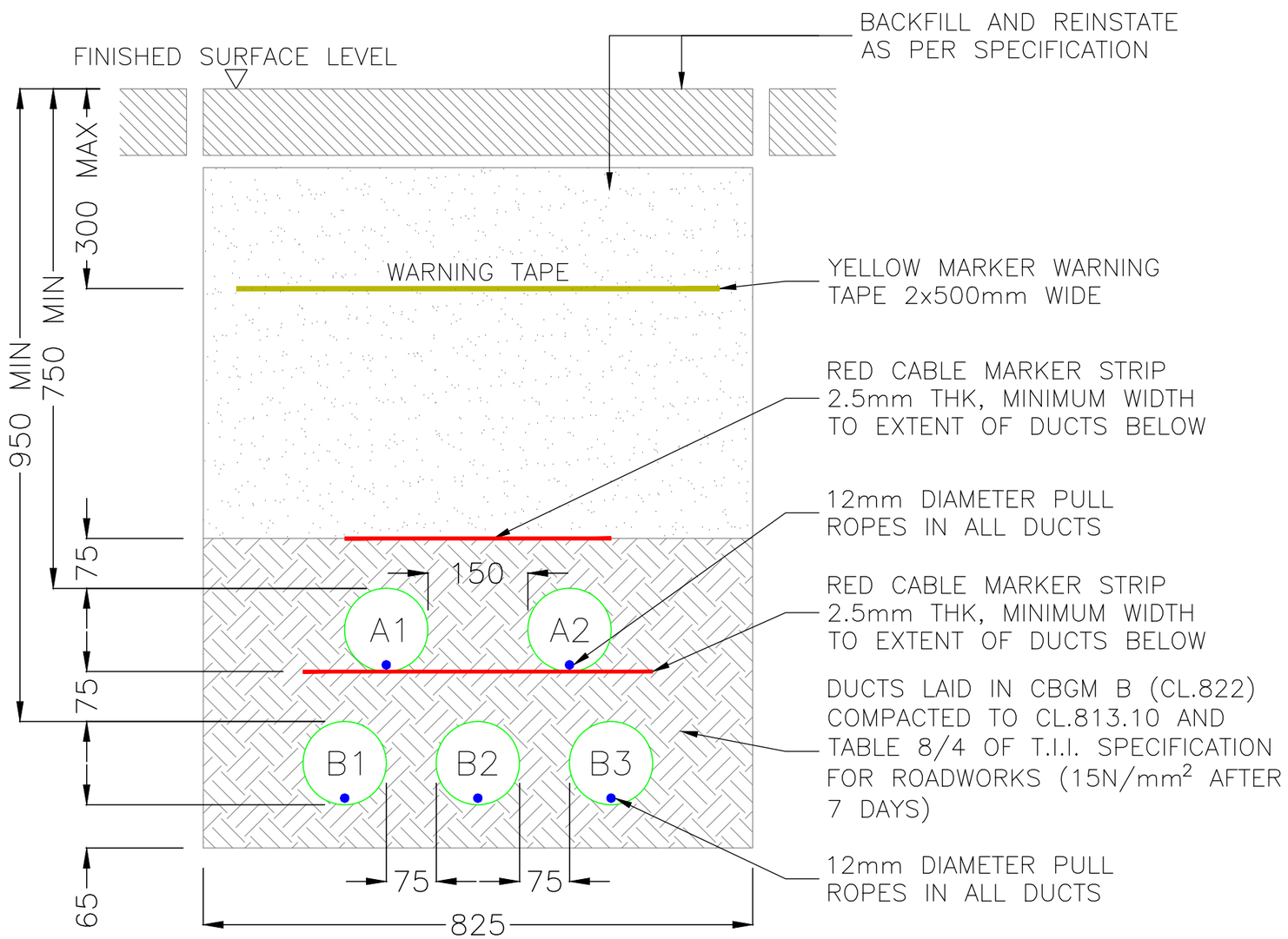
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 160mm POWER DUCTS IN TREFOIL FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–008	003	00



NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
B=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
ALL DIMENSIONS IN MILLIMETERS

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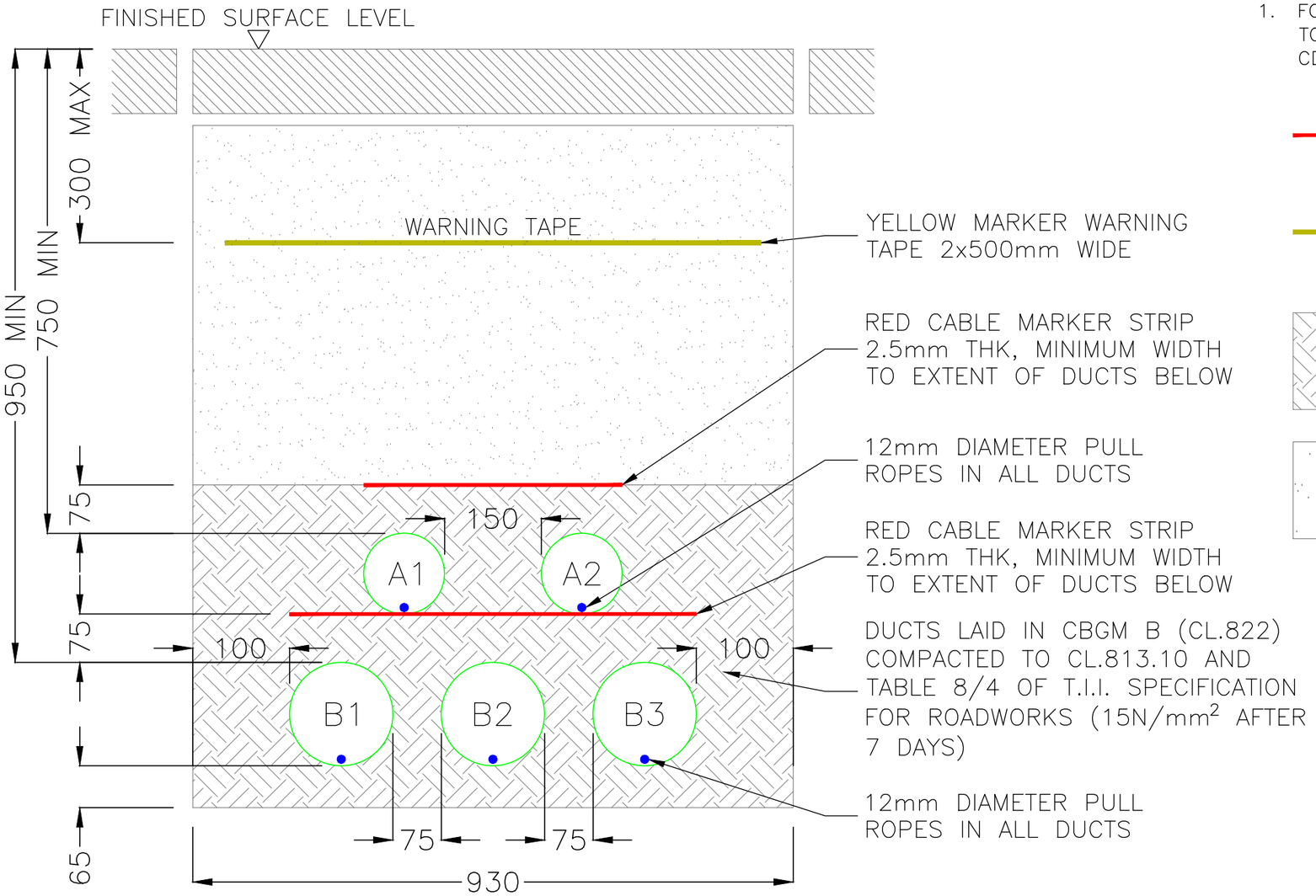
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 125mm POWER DUCTS IN FLAT FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–008	004	00



A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
D=160mm O.D. HDPE ESB APPROVED DUCT, SDR=21
ALL DIMENSIONS IN MILLIMETERS

NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

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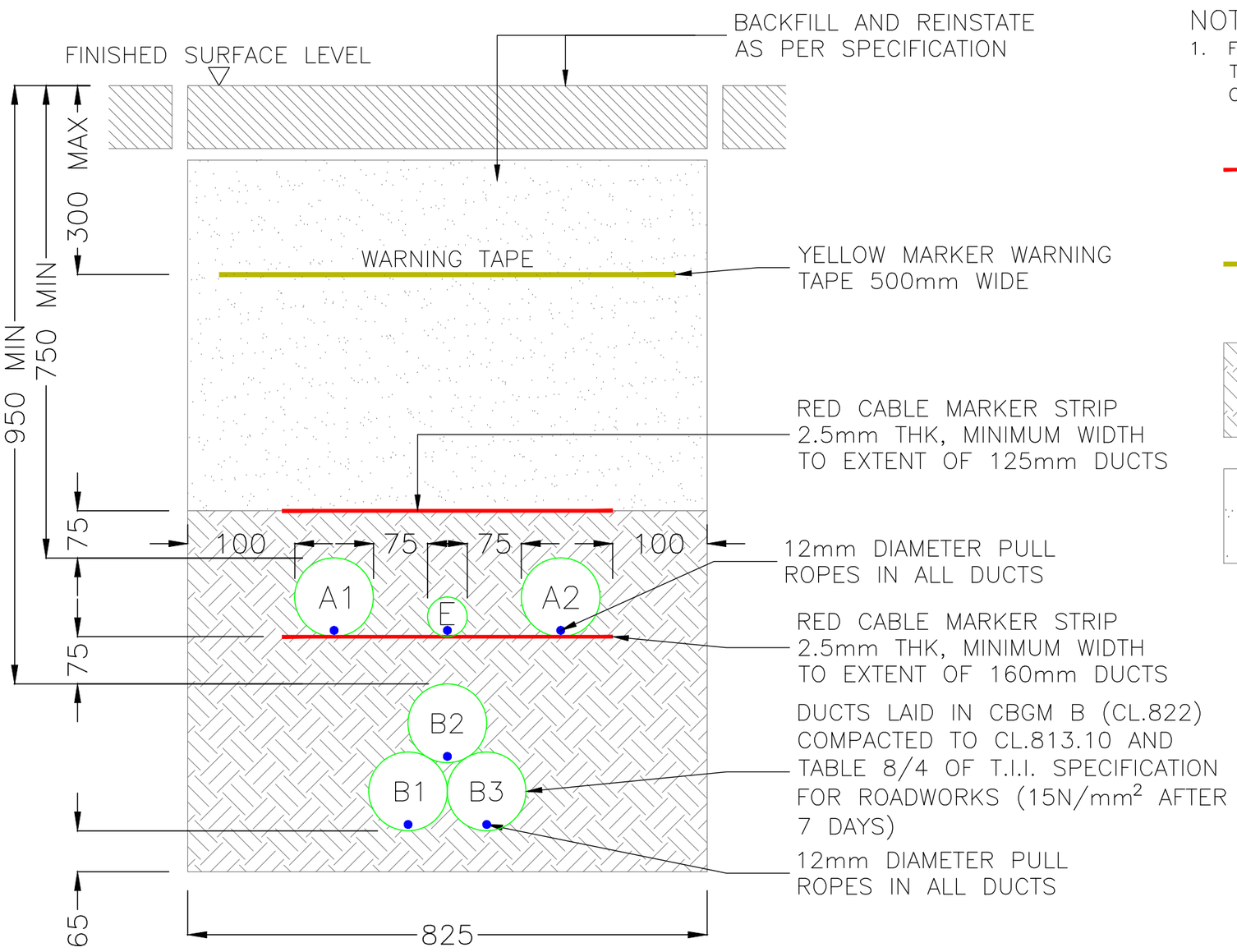
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 160mm POWER DUCTS IN FLAT FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–008	005	00



NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
B=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
E*=MIN 63mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
*DUCT TO BE USED FOR EARTH CONTINUITY CONDUCTOR
ALL DIMENSIONS IN MILLIMETERS

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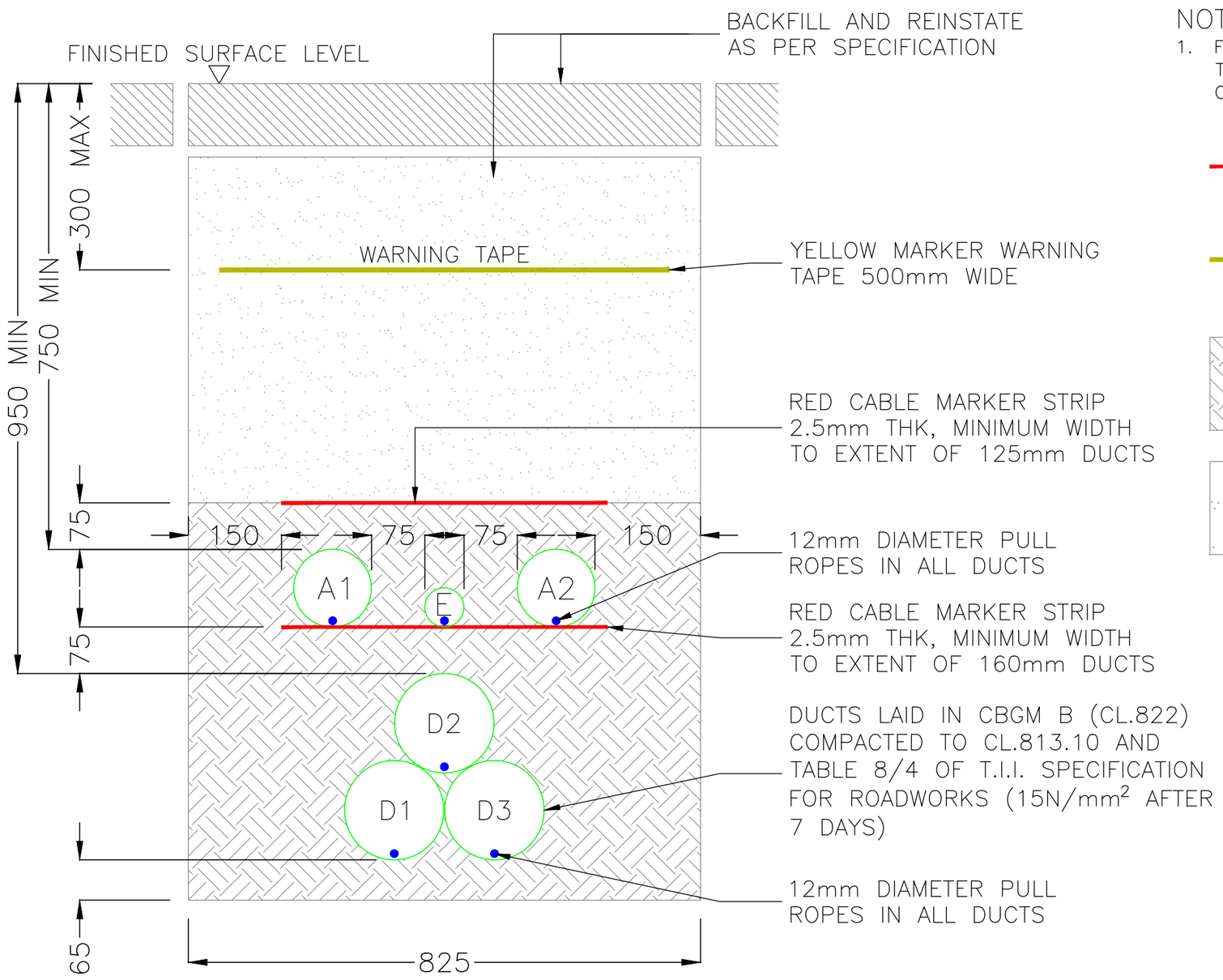
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 125mm POWER DUCTS WITH EARTH CONTINUITY DUCT – TREFOIL FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-008	006	00



NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
D=160mm O.D. HDPE ESB APPROVED DUCT, SDR=21
E*=MIN 63mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
*DUCT TO BE USED FOR EARTH CONTINUITY CONDUCTOR
ALL DIMENSIONS IN MILLIMETERS

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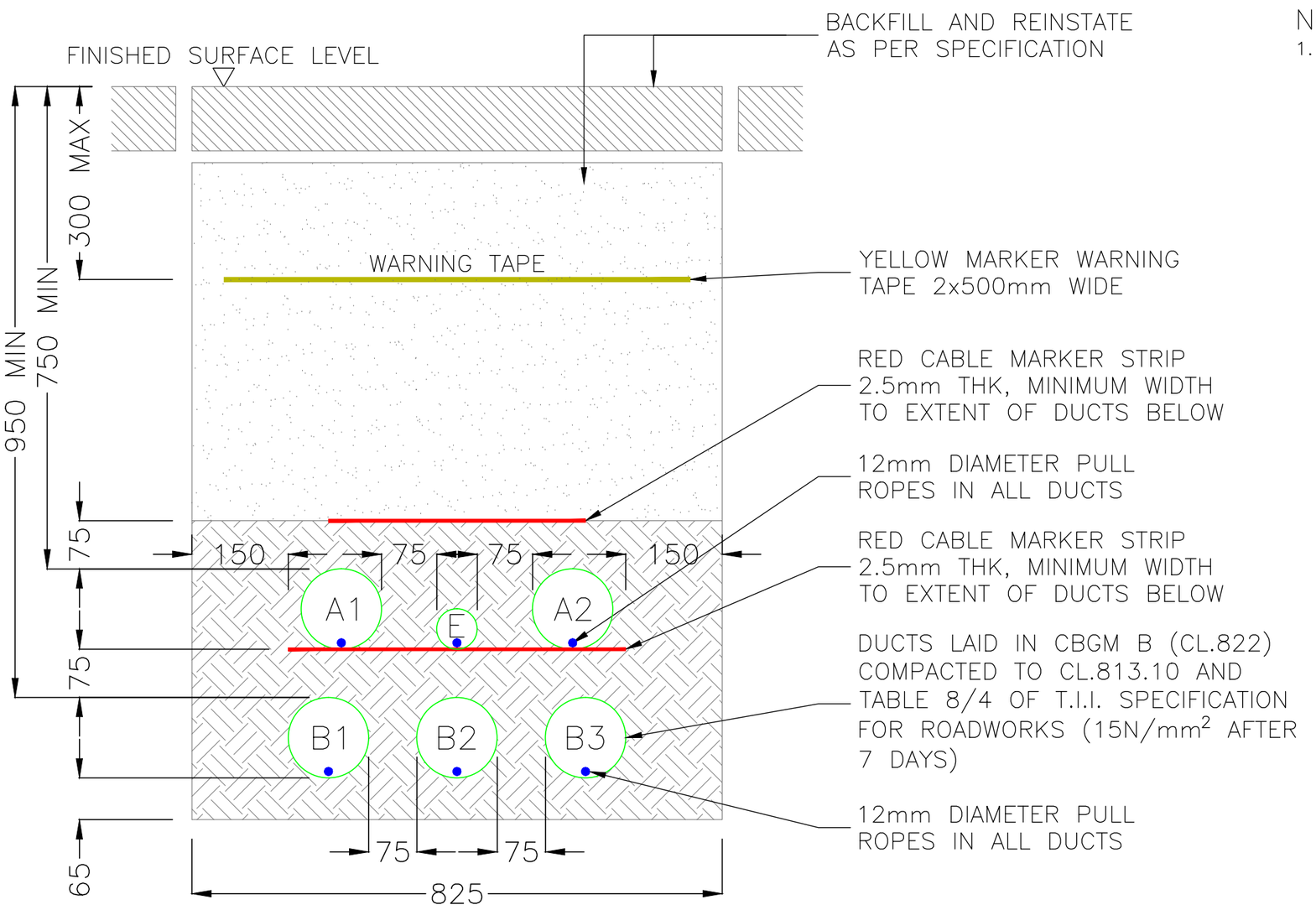
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 160mm POWER DUCTS WITH EARTH CONTINUITY DUCT – TREFOIL FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–008	007	00



NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
B=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
*E=MIN 63mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
*DUCT TO BE USED FOR EARTH CONTINUITY CONDUCTOR
ALL DIMENSIONS IN MILLIMETERS

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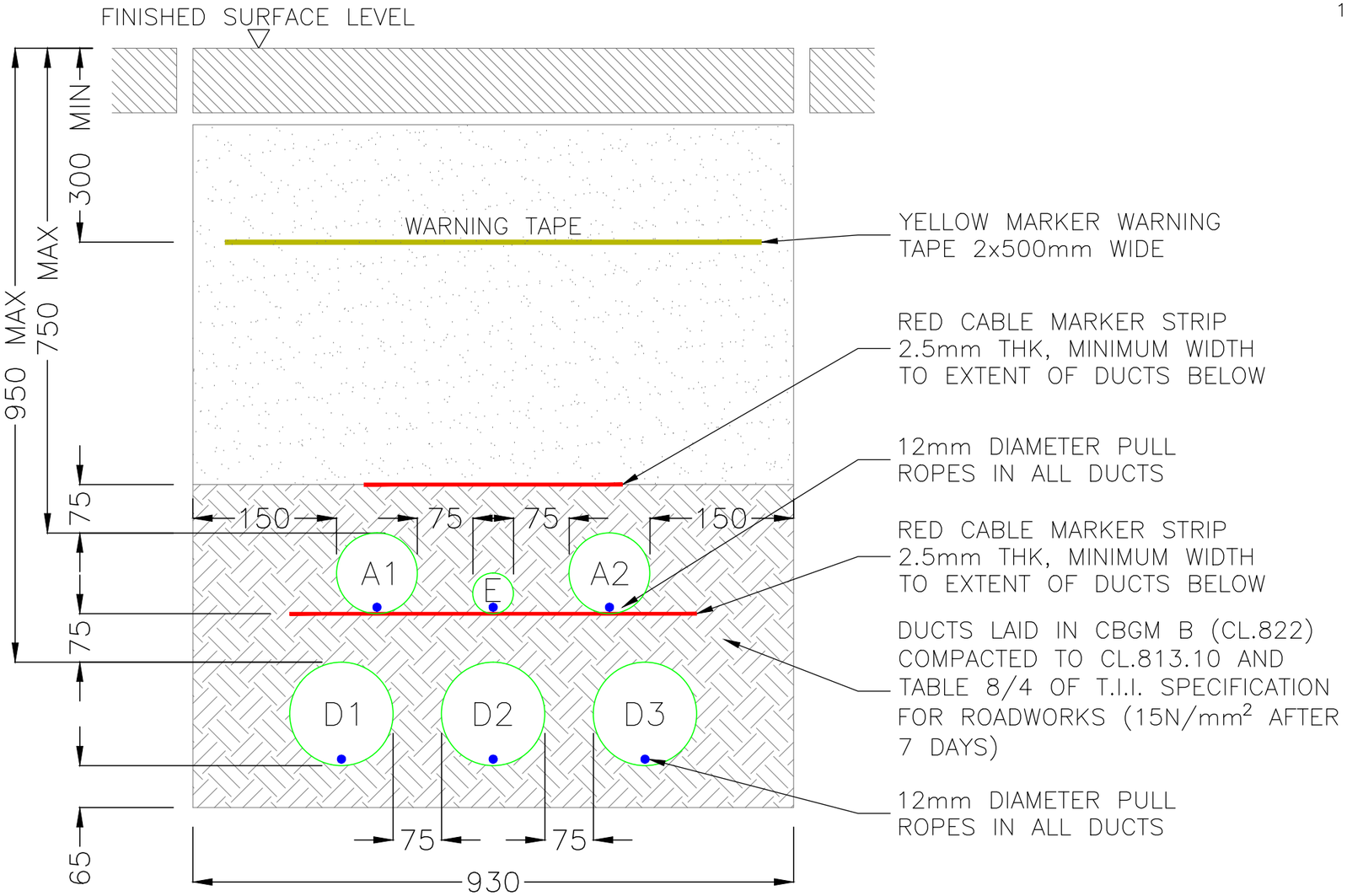
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 125mm POWER DUCTS WITH EARTH CONTINUITY DUCT – FLAT FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–008	008	00



YELLOW MARKER WARNING TAPE 2x500mm WIDE

RED CABLE MARKER STRIP 2.5mm THK, MINIMUM WIDTH TO EXTENT OF DUCTS BELOW

12mm DIAMETER PULL ROPES IN ALL DUCTS

RED CABLE MARKER STRIP 2.5mm THK, MINIMUM WIDTH TO EXTENT OF DUCTS BELOW

DUCTS LAID IN CBGM B (CL.822) COMPACTED TO CL.813.10 AND TABLE 8/4 OF T.I.I. SPECIFICATION FOR ROADWORKS (15N/mm^2 AFTER 7 DAYS)

12mm DIAMETER PULL ROPES IN ALL DUCTS

A=125mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
D=160mm O.D. HDPE ESB APPROVED DUCT, SDR=21
*E=63mm O.D. HDPE ESB APPROVED DUCT, SDR=17.6
*DUCT TO BE USED FOR EARTH CONTINUITY CONDUCTOR
ALL DIMENSIONS IN MILLIMETERS

NOTES:

1. FOR CBGM & SOIL SURROUND, THERMAL RESITIVITY VALUES TO BE USED IN RATING CALCULATION, REFER TO CDS–HFS–02–001 SPECIFICATION.

RED MARKER STRIP

YELLOW MARKER WARNING TAPE

CBGM B (CL. 822), COMPACTED TO CL. 813.10

BACKFILL, COMPACTED (CL. 804)

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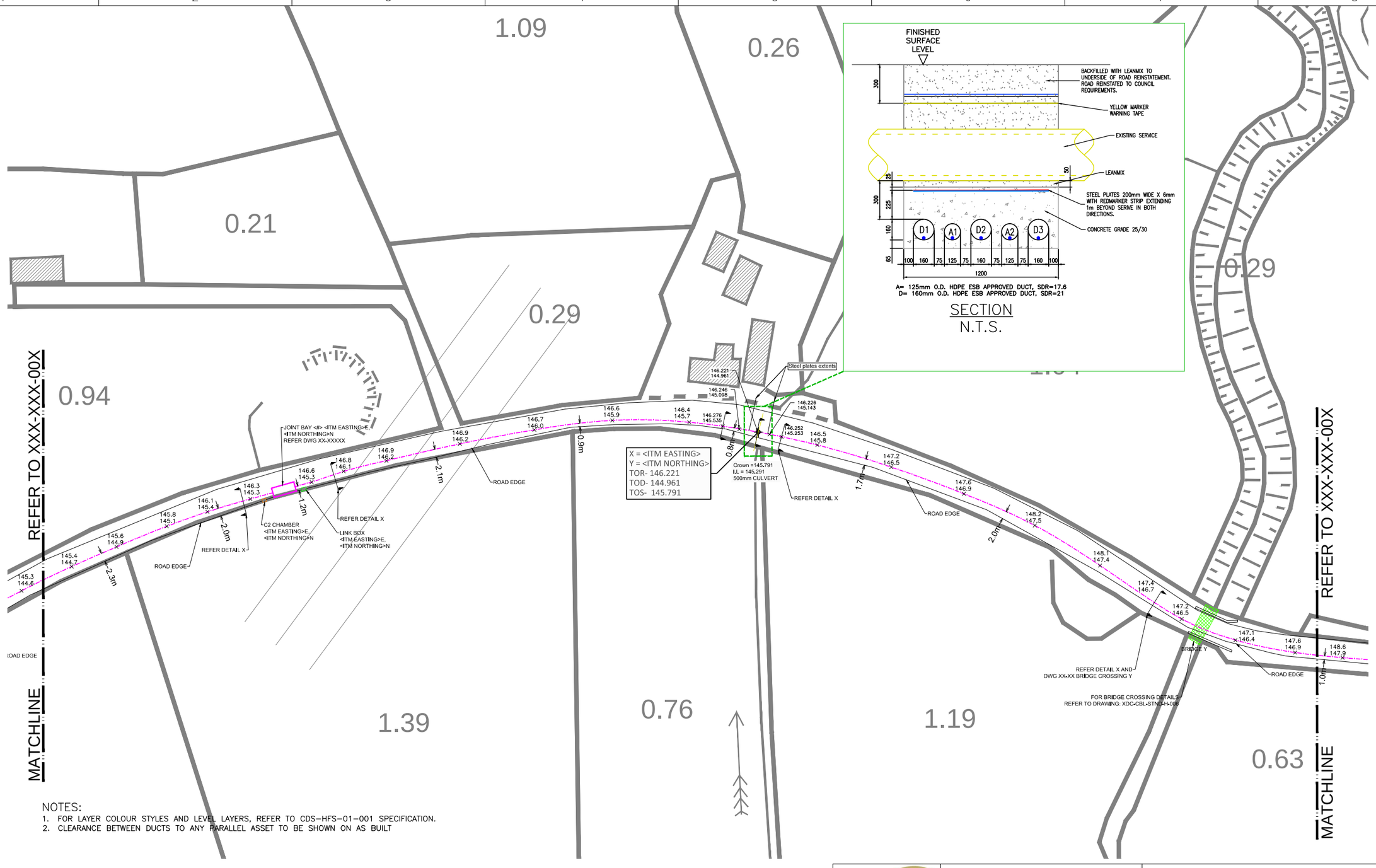
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRENCH CROSS SECTION FOR 160mm POWER DUCTS WITH EARTH CONTINUITY DUCT – FLAT FORMATION

No of Shts	SIZE	SCALE
9	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–008	009	00



NOTES:
1. FOR LAYER COLOUR STYLES AND LEVEL LAYERS, REFER TO CDS–HFS–01–001 SPECIFICATION.
2. CLEARANCE BETWEEN DUCTS TO ANY PARALLEL ASSET TO BE SHOWN ON AS BUILT

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
SAMPLE AS–BUILT CABLE ROUTE REQUIREMENTS

No of Shts	SIZE	SCALE
1	A3	1:1000

DRAWING NUMBER	SHEET	REV
XDC–CBL–STND–H–009	001	00

STANDARD 110kV CABLE DRAWINGS
STANDARD C2 COMMUNICATIONS CHAMBER

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-010	001	STANDARD C2 CHAMBER INDEX SHEET	00
XDC-CBL-STND-H-010	002	STANDARD C2 CHAMBER GENERAL ARRANGEMENT	00

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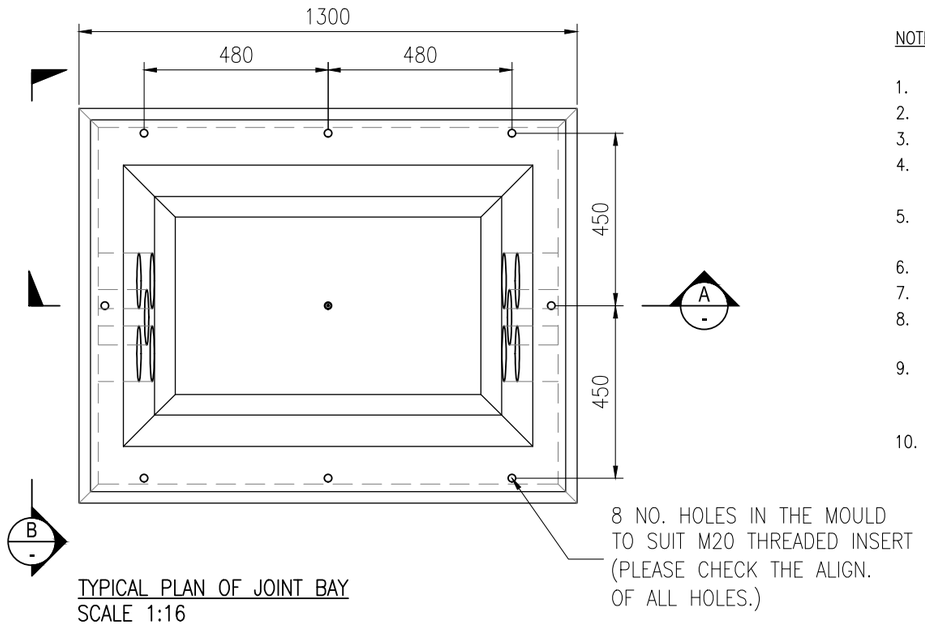
STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD C2 CHAMBER
INDEX SHEET

No of Shts	SIZE	SCALE
2	A3	N/A

DRAWING NUMBER: XDC-CBL-STND-H-010

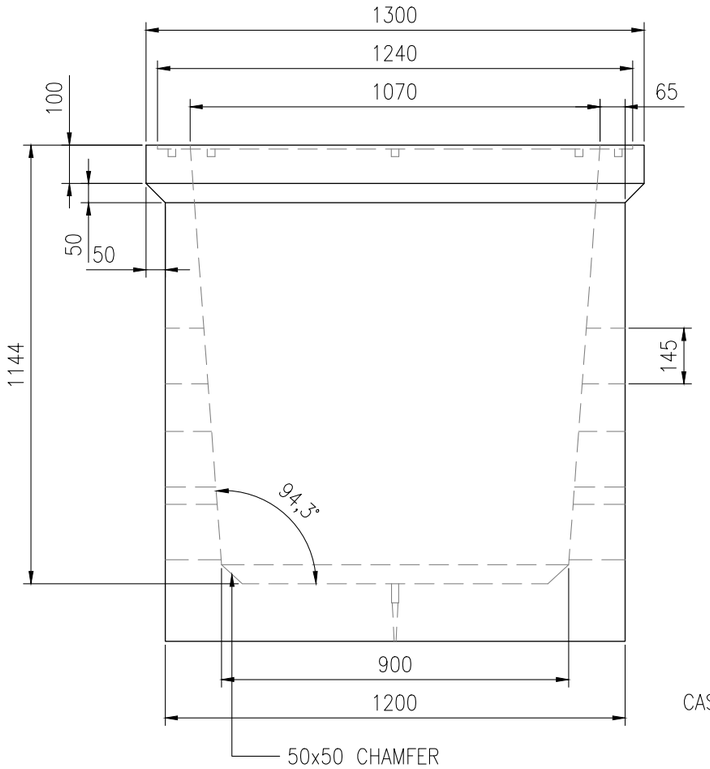
SHEET	REV
001	00



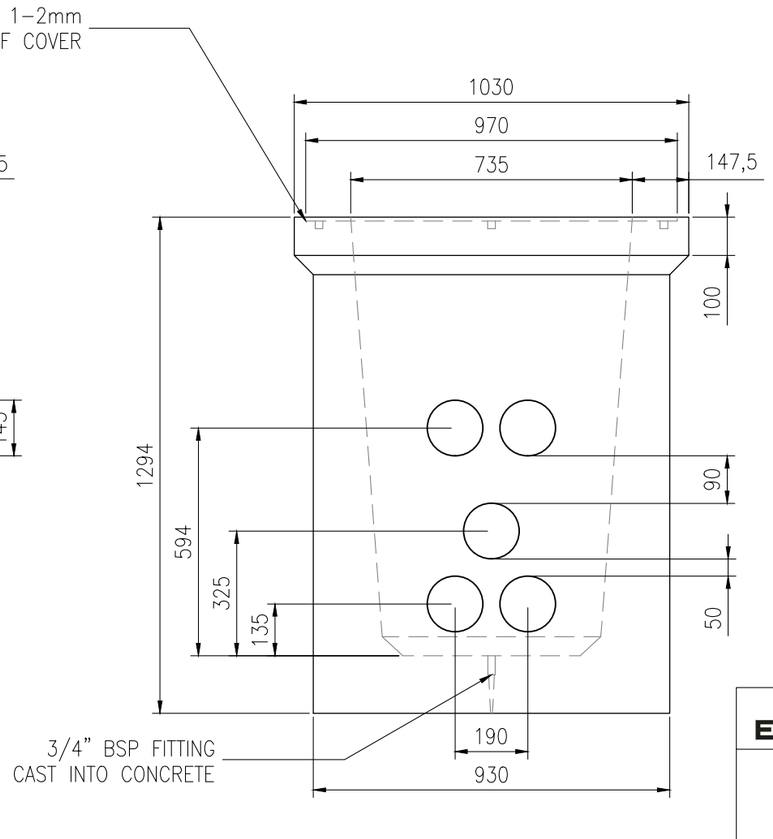
TYPICAL PLAN OF JOINT BAY
SCALE 1:16

NOTES:

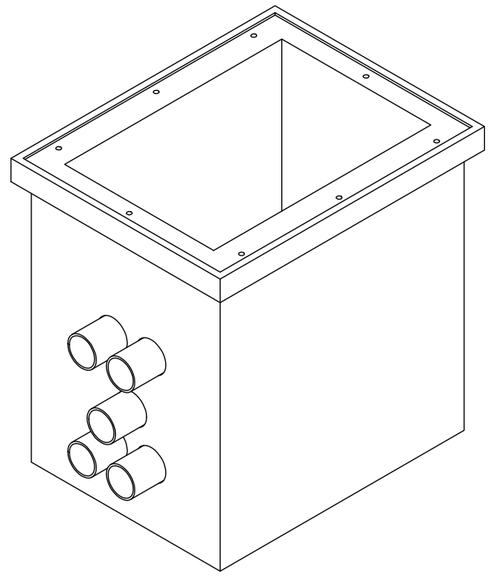
1. ALL DIMENSIONS IN MILLIMETERS.
2. REINSTATEMENT TO COMPLY WITH REQUIREMENTS OF THE RELEVANT LOCAL AUTHORITY/ASSET OWNER.
3. ENTRANCE & EXIT DUCTS TO BE IN LINE.
4. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH THE NRA/T.I.I. SPECIFICATION FOR ROADWORKS, MAY 2005 & SUBSEQUENT REVISIONS.
5. REINFORCED CONCRETE TO BE MINIMUM GRADE C32/40, SULPHATE RESISTING CEMENT TO BE USED WHERE AGGRESSIVE SOIL CONDITIONS APPLY, REFER TO TABLE 6.1 OF B.S. 8110.
6. CARRIAGEWAY COVERS AND FRAMES TO BE TO B.S. EN 124.
7. ALL COVERS SHALL HAVE 'ESB' LOGO INCORPORATED IN THEM TO THE APPROVAL OF EIRGRID.
8. STEP IRONS TO BE HOT DIPPED GALVANISED TO B.S. 729 AND POSITIONED AS SHOWN ON ANY CHAMBER DEEPER THAN 700mm ON THE END REMOTE FROM ANY SIDE ENTRY DUCT.
9. CONCRETE PRECAST CHAMBER AND COVER SHOULD BE TESTED THROUGH A 5 POINTS 40 TONNES VERTICAL STATIC LOADING TEST BY AN INDEPENDENT TEST COMPANY. IF REQUIRED, FURTHER DETAILS WILL BE PROVIDED BY EIRGRID.
10. FINAL POSITION OF C2 CHAMBERS SHALL BE AGREED WITH EIRGRID.



A SECTION A
- SCALE 1:16



B SECTION B
- SCALE 1:16



ISOMETRIC: C2 CHAMBER ARRANGEMENT
NOT TO SCALE

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
STANDARD C2 CHAMBER
GENERAL ARRANGEMENT

No of Shts	SIZE	SCALE
2	A3	1:16

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-010	002	00

STANDARD 110kV CABLE DRAWINGS
1300x800 LINK BOX CHAMBER

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-011	001	LINK BOX CHAMBER INDEX SHEET	00
XDC-CBL-STND-H-011	002	LINK BOX CHAMBER GENERAL ARRANGEMENT	00
XDC-CBL-STND-H-011	003	LINK BOX CHAMBER REINFORCEMENT	00
XDC-CBL-STND-H-011	004	LINK BOX CHAMBER STEEL REINFORCEMENT SCHEDULE	00

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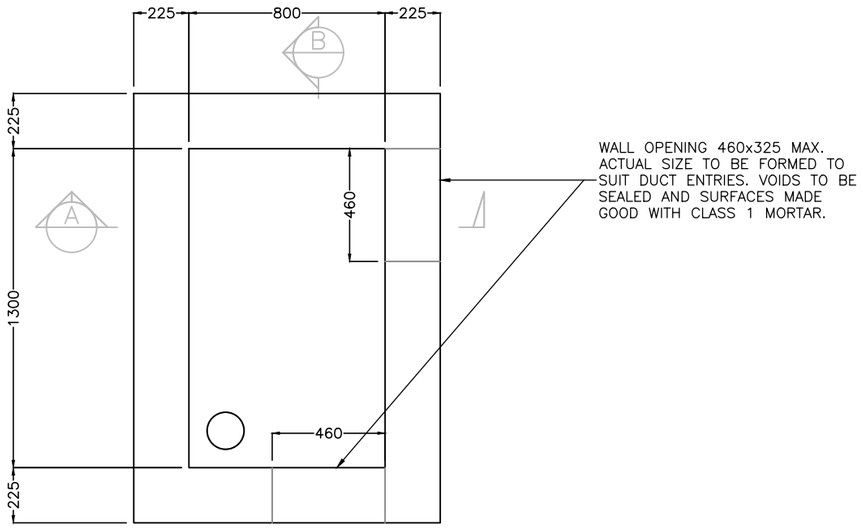
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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
LINK BOX CHAMBER
INDEX SHEET

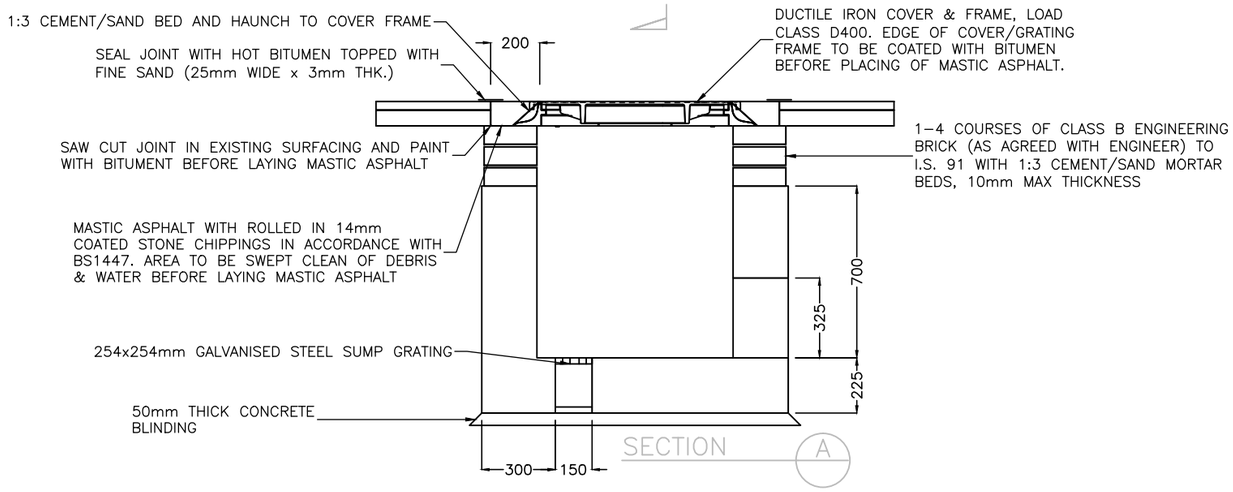
No of Shts	SIZE	SCALE
4	A3	N/A

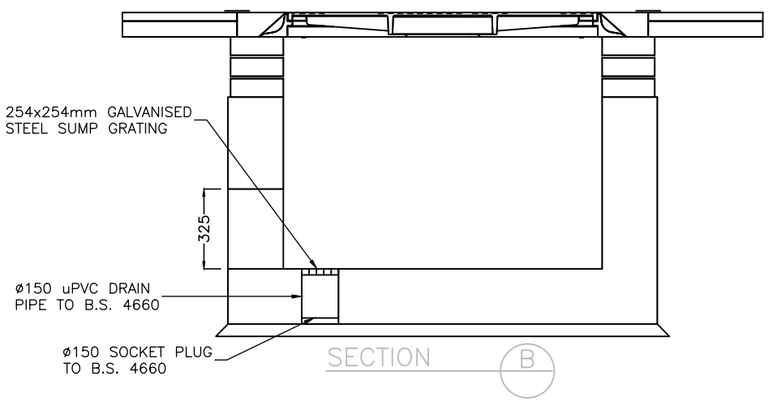
DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-011	001	00



NOTES:

1. ALL DIMENSIONS IN MILLIMETERS.
2. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH THE NRA/T.I.I. SPECIFICATION FOR ROADWORKS, MAY 2005 & SUBSEQUENT REVISIONS.
3. REINFORCED CONCRETE TO BE MINIMUM GRADE C32/40. SULPHATE RESISTING CEMENT TO BE USED WHERE AGGRESSIVE SOIL CONDITIONS APPLY.
4. CARRIAGEWAY COVERS AND FRAMES TO BE TO B.S. EN 124.
5. ALL COVERS SHALL HAVE APPROVED BADGE MARKING WITH "ESB" LOGO INCORPORATED IN THEM TO THE APPROVAL OF EIRGRID.
6. BRICKWORK TO BE CLASS B ENGINEERING, BEDS AND JOINTS TO BE CLASS 1 MORTAR.
7. FINAL POSITION OF LINK BOX TO BE AGREED WITH EIRGRID PRIOR TO INSTALLATION.





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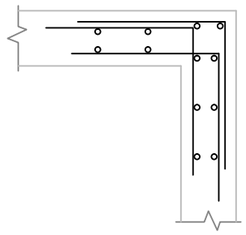
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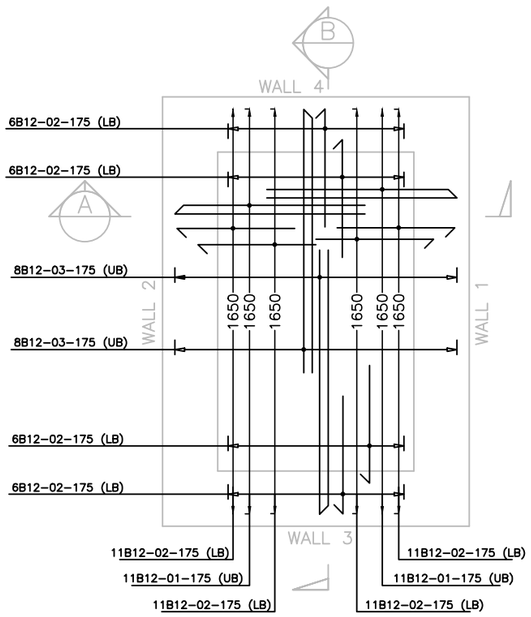
DRAWING TITLE
LINK BOX CHAMBER
GENERAL ARRANGEMENT

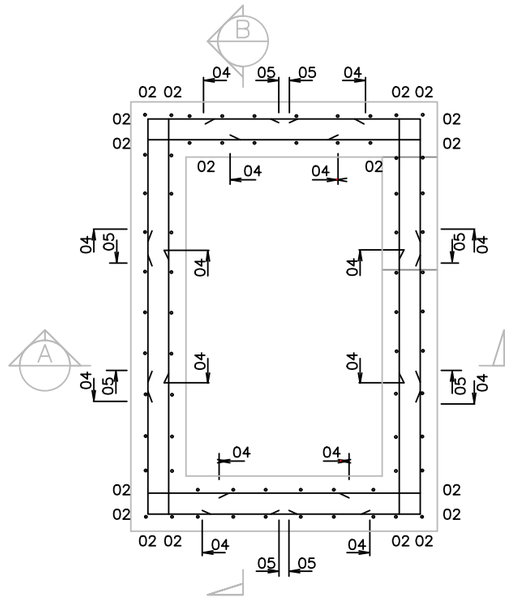
No of Shts	SIZE	SCALE
4	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-011	002	00



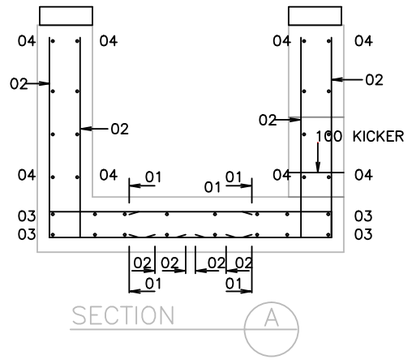
TYPICAL CORNER BAR DETAIL
SCALE 1:25

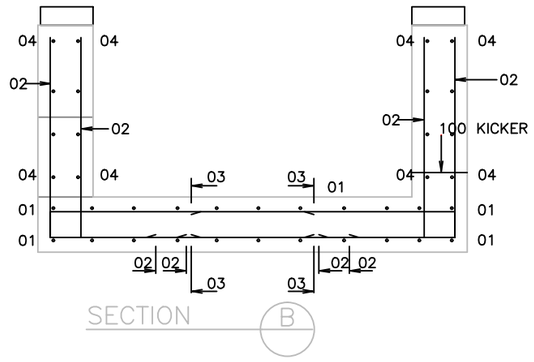


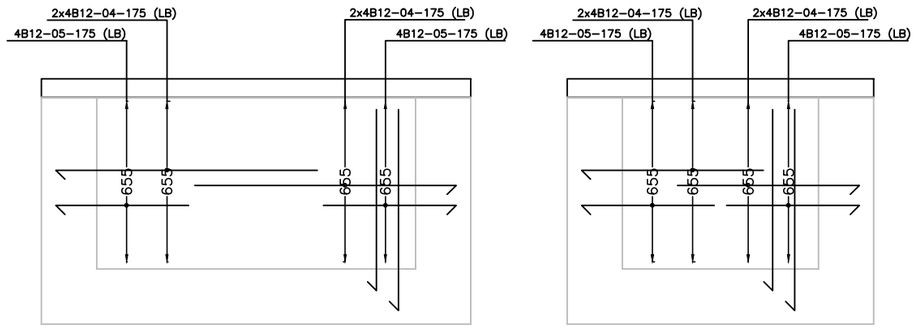


NOTES:

1. ALL DIMENSIONS IN MILLIMETERS.
2. COVER TO REINFORCEMENT TO BE A MINIMUM OF 50mm. LAP LENGTHS TO BE 40x Dia. ALL REINFORCEMENT TO BE CUT AND BENT IN ACCORDANCE WITH B.S. 8666:2005.
3. REINSTATEMENT TO COMPLY WITH REQUIREMENTS OF THE RELEVANT LOCAL AUTHORITY/ASSET OWNER.
4. DUCTS TO BE CAST OR BUILT IN.
5. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH THE NRA/T.I.I. SPECIFICATION FOR ROADWORKS, MARCH 2000 & SUBSEQUENT REVISIONS.
6. REINFORCED CONCRETE TO BE MINIMUM GRADE C32/40. SULPHATE RESISTING CEMENT TO BE USED WHERE AGGRESSIVE SOIL CONDITIONS APPLY, REFER TO TABLE 6.1 OF B.S. 8110.
7. BOXOUTS NAY BE PERMISSIBLE AT THE DISCRETION AND TO THE APPROVAL OF EIRGRID. WHERE THE DUCTS HAVE TO BE FITTED THE CONTRACTOR SHALL COMPLY WITH THE SPECIFICATIONS.







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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
LINK BOX CHAMBER REINFORCEMENT

No of Shts	SIZE	SCALE
4	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-011	003	00

*SPECIFIED TO NEAREST 25mm
**SPECIFIED TO NEAREST 5mm

ALL BENDING DIMENSIONS ARE IN ACCORDANCE WITH B.S. 8666:2005

MEMBER	BAR MARK	TYPE	SIZE (mm)	No. of MEMBERS	No. in EACH	TOTAL No.	LENGTH of EACH BAR mm*	SHAPE CODE	A mm**	B mm**	C mm**	D mm**	E/r mm**
BASE	01	T	12	1	22	22	1725	21	825	125			
	02	T	12	1	68	68	1275	11	800				
	03	T	12	1	16	16	2200	13	1075	110			
WALLS	04	T	12	1	32	32	1875	11	825				
	05	T	12	1	16	16	1125	37	575				

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STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
LINK BOX CHAMBER
STEEL REINFORCEMENT SCHEDULE

No of Shts 4 | SIZE A3 | SCALE N/A

DRAWING NUMBER XDC-CBL-STND-H-011 | SHEET 004 | REV 00

STANDARD 110kV CABLE DRAWINGS
6mx2.5m JOINT BAY

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-012	001	JOINT BAY INDEX SHEET	00
XDC-CBL-STND-H-012	002	JOINT BAY GENERAL ARRANGEMENT	00
XDC-CBL-STND-H-012	003	PRECAST JOINT BAY DETAILS SECTION 1	00
XDC-CBL-STND-H-012	004	PRECAST JOINT BAY DETAILS SECTION 2	00
XDC-CBL-STND-H-012	005	PRECAST JOINT BAY DETAILS SECTION 3	00
XDC-CBL-STND-H-012	006	JOINT BAY REBAR SCHEDULE	00
XDC-CBL-STND-H-012	007	JOINT BAY REINSTATEMENT	00
XDC-CBL-STND-H-012	008	JOINT BAY EARTHING ARRANGEMENT	00

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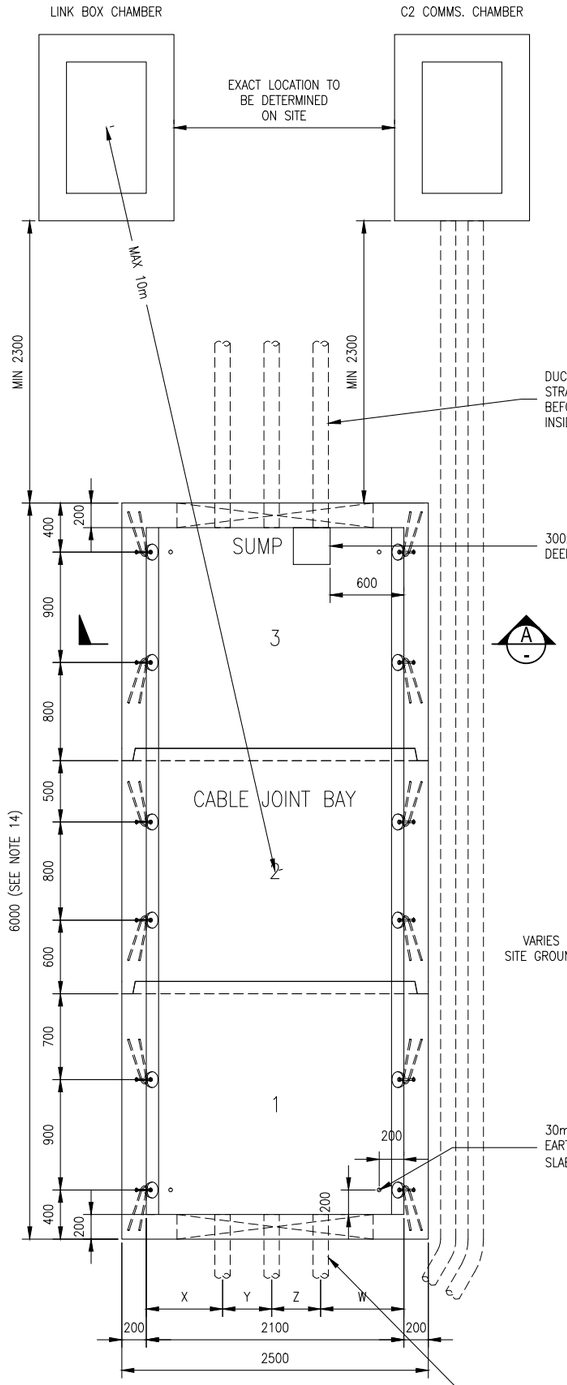
PROJECT
STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
JOINT BAY
INDEX SHEET

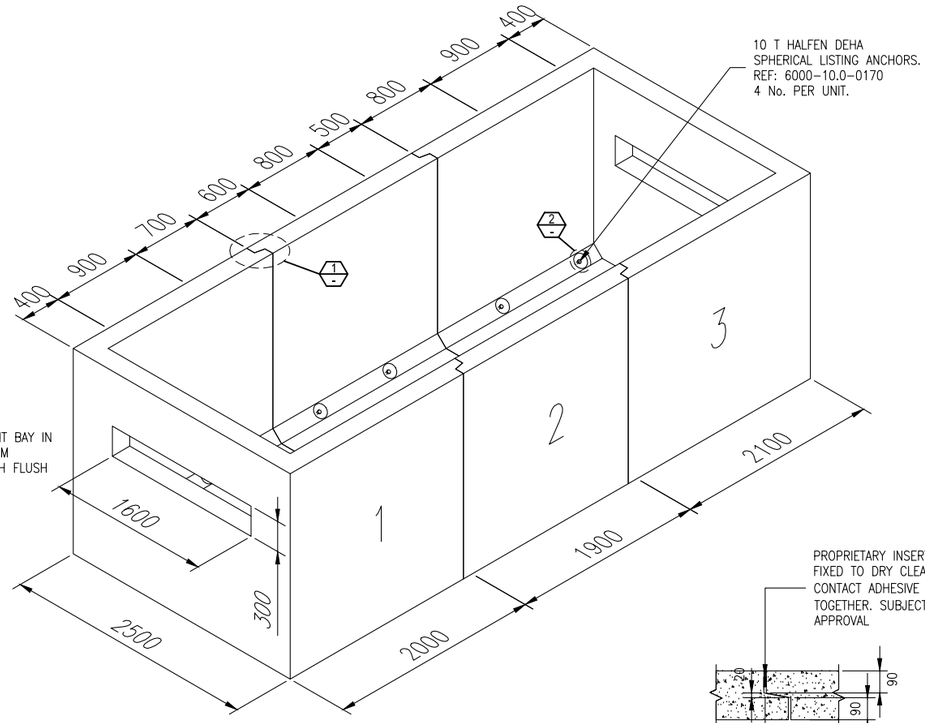
No of Shts 8 | SIZE A3 | SCALE N/A

DRAWING NUMBER
XDC-CBL-STND-H-012

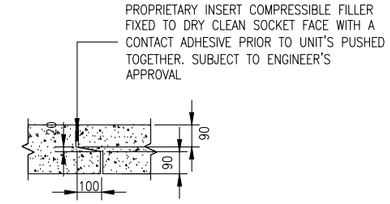
SHEET 001 | REV 00



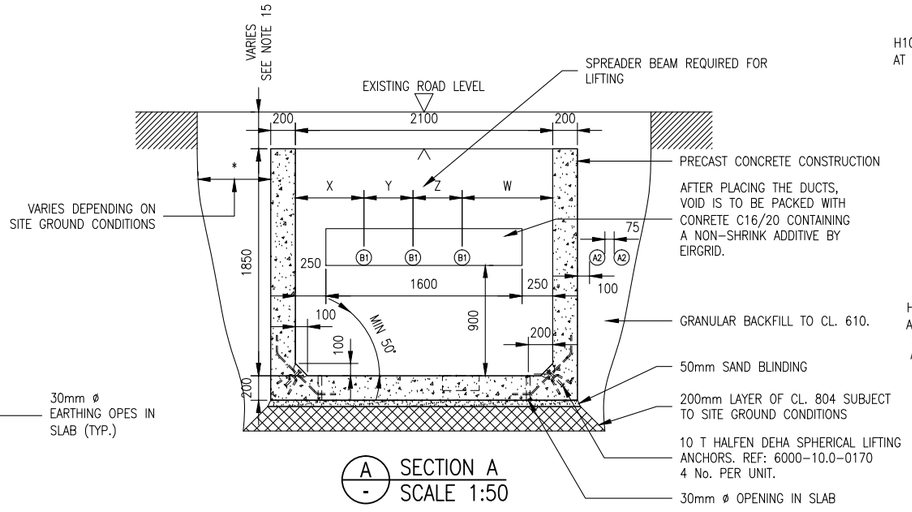
TYPICAL PLAN OF JOINT BAY
SCALE 1:50



ISOMETRIC: JOINT BAY ARRANGEMENT
NOT TO SCALE

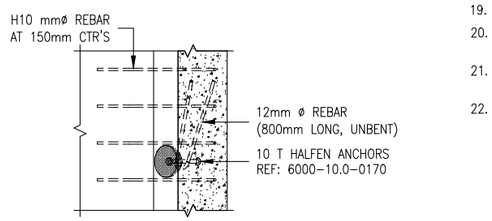


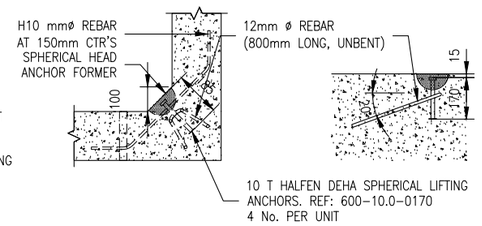
1 - DETAIL 1 – SOCKET AND SPIGOT DETAIL (WALL & FLOOR)
SCALE 1:25



A - SECTION A
SCALE 1:50

(A2) 125mm OD HDPE DUCT (COMMS)
(B1) 125/200mm/250mm OD HDPE DUCT (POWER)





2 - DETAIL 2 – LIFTING EYE DETAIL
SCALE 1:25

GENERAL NOTES

1. ALL PRECAST CONCRETE ELEMENTS TO BE MANUFACTURED TO B.S. EN 13369:2004 "COMMON RULES FOR PRECAST CONCRETE PRODUCTS"
2. LIFTING INSERTS TO BE DESIGNED & INSTALLED TO PD CEN/TR 15728:2008 "DESIGN AND USE OF INSERTS FOR LIFTING AND HANDLING OF PRECAST CONCRETE ELEMENTS."
3. SPECIFIED LIFTING INSERTS HAVE A S.W.L. OF 10 TONNE.
4. LOCATION AND SPECIFICATION OF LIFTING INSERTS ARE ASSUMED TO FACILITATE DEMOULDING AND HANDLING IN PRECAST MANUFACTURING FACTORY. IT IS THE RESPONSIBILITY OF THE CUSTOMER TO NOTIFY EIRGRID IF THESE ARE UNSUITABLE FOR THEIR MANUFACTURING METHODOLOGY. EIRGRID IS TO BE INFORMED OF ANY ALTERNATIVE LIFTING LOCATIONS FOR FACTORY HANDLING & DEMOULDING.
5. CONCRETE TO HAVE A MINIMUM STRENGTH OF 30 N/mm^2 PRIOR TO HANDLING OF DEMOULDING.
6. CUSTOMER IS TO ENSURE THAT A METHOD STATEMENT AND RISK ASSESSMENT, INCLUDING A LIFTING PLAN, IS PRODUCED FOR INSTALLATION AND ARE AVAILABLE TO EIRGRID FOR REVIEW IF REQUESTED. LIFTING PLAN TO INCORPORATE REQUIREMENTS OF LIFTING INSERTS AND LIFTING LOOP EYES.
7. A MINIMUM LIFTING SLING ANGLE OF 50° TO THE HORIZONTAL IS REQUIRED.
8. A LIFTING SYSTEM WHICH ENSURES ALL LIFTING POINTS TAKE ON AN EQUAL LOAD IS REQUIRED.
9. HALFEN DEHA SPHERICAL LIFTING ANCHORS TO BE USED AS SPECIFIED. ANY DEVIATION FROM THIS MUST BE NOTIFIED TO EIRGRID BY THE CUSTOMER. LIFTING INSERTS TO BE INSTALLED AS PER MANUFACTURER'S GUIDELINES AND IN ACCORDANCE WITH PD CEN/TR 15728:2008.
10. FORMWORK FOR PRECASTING TO BE OF A MINIMUM STANDARD OF VARNISHED WOODEN MOULD WITH PLANED BOARDS.
11. COVER TO REINFORCEMENT TO BE 40mm.
12. CONCRETE TO BE GRADE C30/37 AS SPECIFIED IN TABLE 1.
13. ALL CONCRETE TO BE IN ACCORDANCE WITH I.S. EN 206-1:2013 WITH THE MIX DESIGNS SHOWN IN TABLE 1.
14. FOR 7.9m JOINT BAY INSERT 1 No. ADDITIONAL PRECAST SECTION 2.
    FOR 9.8m JOINT BAY INSERT 2 No. ADDITIONAL PRECAST SECTION 2.
15. THE DEPTH FROM GROUND/ROAD LEVEL TO THE TOP OF THE CONCRETE WALL SHALL BE:
    A. 500mm – IN CULTIVATED FIELDS AND GRASSED LANDS
    B. 300mm – IN PAVED ROADS AND GRASS VERGES
    C. 350mm – IN PAVED CITY ROADS AND GRASSED VERGES.
16. LINK BOX CHAMBER TO BE POSITIONED AT THE EDGE OF OR OFF ROAD.
17. ALLOWABLE BEARING PRESSURE TO BE AT LEAST 185kPa
18. FOR HIGHLY AGGRESSIVE ENVIRONMENTS, TABLE 1 IS NOT APPLICABLE. CONSULT WITH EIRGRID FOR BESPOKE DESIGN.
19. JOINT BAY TO BE UNIFORMLY BACKFILLED IN LAYERS NOT EXCEEDING 300mm THICK.
20. WHERE JOINT BAY IS TO BE INSTALLED ADJACENT TO TRAFFICKED LANE, A 1m WIDE LATERAL SAFETY ZONE IS TO BE PROVIDED TO SATISFY DESIGN LOADING ASSUMPTIONS.
21. CUSTOMER IS RESPONSIBLE FOR ALL TRAFFIC MANAGEMENT INCLUDING WHERE NECESSARY SAFETY BARRIERS, AS PER D.R.A.
22. LINK BOX CHAMBER AND C2 COMM CHAMBER FINAL POSITIONING TO BE AGREED WITH EIRGRID PRIOR TO INSTALLATION.

TABLE 1

CONCRETE SPECIFICATION TO I.S. EN 206-1		
	BLINDING & MASS CONCRETE, DRAINAGE PIPE & MANHOLE SURROUNDINGS	FOUNDATIONS & WALLS
EXPOSURE CLASS	X0	XC2, XA2
MIN. CEMENT CONTENT (kg/m^2)	240	340
MAX. WATER/CEMENT RATIO	–	0.50
CEMENT TYPE TO I.S. EN 197-1	CEM 1 N	CEM 1 N
CHLORIDE CONTENT CLASS	Cl. 1,0	Cl. 0,40
MAX. AGGREGATE	10	20
MIN. COVER (CMin) (mm)	–	40
*COMPRESSIVE STRENGTH CLASS	C16/20	C30/37

NOTES:
1. *C16/20 TO BE READ AS FOLLOWS: 16 – REFERS TO MIN. CHARACTERISTIC CYLINDER STRENGTH (N/mm2/). 20 – REFERS TO MIN. CHARACTERISTIC CUBE STRENGTH (N/mm2/).
2. DESIGN WORKING LIFE TO BE 50 YEARS MINIMUM.

TABLE 2 – DUCT SEPERATION

	X	Y	Z	W
110kV	560	400	400	740
220kV	375	675	675	375

REV	DESC	DRAWN	CHECKED	APPROVED	DATE
00	FIRST ISSUE	DA	DG	CF	09/03/2020

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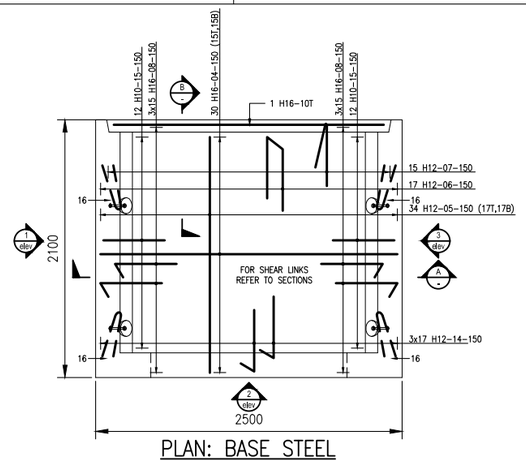
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PROJECT
STANDARD 110kV CABLE DRAWINGS

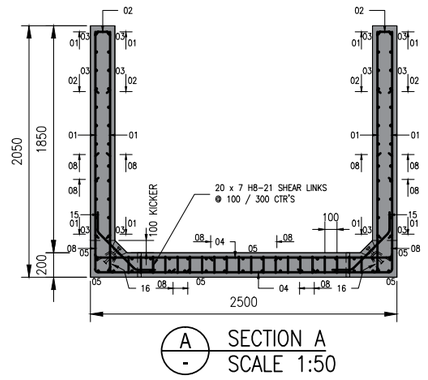
DRAWING TITLE
JOINT BAY
GENERAL ARRANGEMENT

No of Shts	SIZE	SCALE
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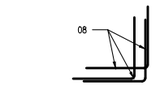
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XDC-CBL-STND-H-012	002	00



PLAN: BASE STEEL
SCALE 1:50



A SECTION A
SCALE 1:50



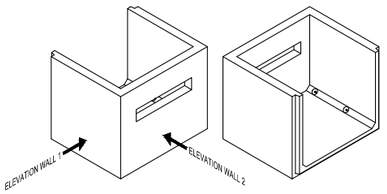
SECTION ARR. 08 BARS
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GENERAL NOTES

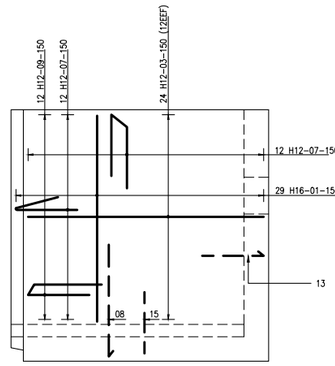
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7. CONCRETE TO BE GRADE C30/37 AS SPECIFIED IN TABLE 1.
8. ALL CONCRETE TO BE IN ACCORDANCE WITH I.S. EN 206-1:2013 WITH THE MIX DESIGNS SHOWN IN TABLE 1.
9. CONCRETE FINISH TO BE F2 FOR BELOW GROUND STRUCTURES AS PER T.I.I. PUBLICATION CC-SPW-01700.

THE NOTATION FOR THE LAYERING OF REINFORCEMENT SHALL BE AS FOLLOWS:

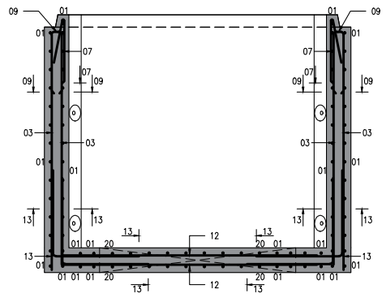
FF – FAR FACE
NF – NEAR FACE
B – BOTTOM
T – TOP
EF – EACH FACE



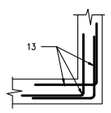
ISOMETRIC VIEW
SECTION 1



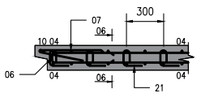
WALL ELEVATION 1
SCALE 1:50



WALL ELEVATION 1
SCALE 1:50

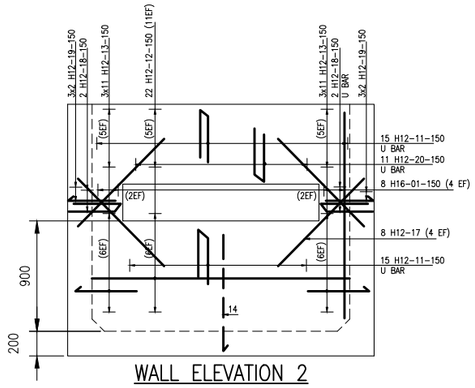


PLAN ARR. 13 BARS
SCALE 1:50



B SECTION B
SCALE 1:50





WALL ELEVATION 2
SCALE 1:50

CONCRETE SPECIFICATION TO I.S. EN 206-1		
	BLINDING & MASS CONCRETE, DRAINAGE PIPE & MANHOLE SURROUNDINGS	FOUNDATIONS & WALLS
EXPOSURE CLASS	X0	XC2, XA2
MIN. CEMENT CONTENT (kg/m³)	240	340
MAX. WATER/CEMENT RATIO	–	0.50
CEMENT TYPE TO I.S. EN 197-1	CEM 1 N	CEM 1 N
CHLORIDE CONTENT CLASS	Cl. 1,0	Cl, 0,40
MAX. AGGREGATE	10	20
MIN. COVER (CMin) (mm)	–	40
*COMPRESSIVE STRENGTH CLASS	C16/20	C30/37

NOTES
1. *C16/20 TO BE READ AS FOLLOWS: 16 – REFERS TO MIN. CHARACTERISTIC CYLINDER STRENGTH (N/mm2/). 20 – REFERS TO MIN. CHARACTERISTIC CUBE STRENGTH (N/mm2/).
2. DESIGN WORKING LIFE TO BE 50 YEARS MINIMUM.

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00	FIRST ISSUE	DA	DG	CF	09/03/2020

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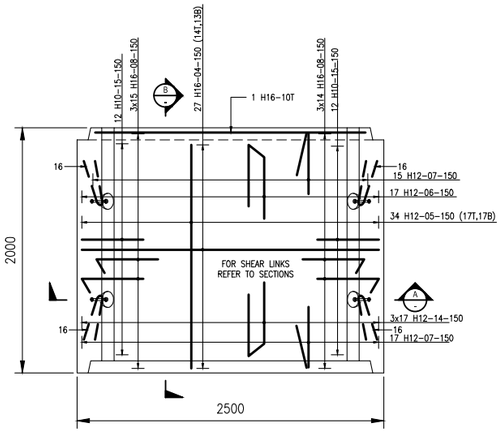
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PROJECT
STANDARD 110kV CABLE DRAWINGS

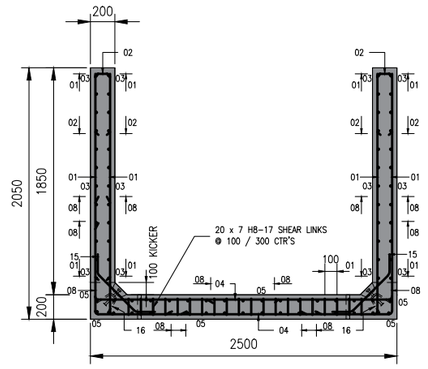
DRAWING TITLE
JOINT BAY
REINFORCEMENT DETAILS
JOINT BAY SECTION 1

No of Shts	SIZE	SCALE
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DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-012	003	00



PLAN: BASE STEEL
SCALE 1:50



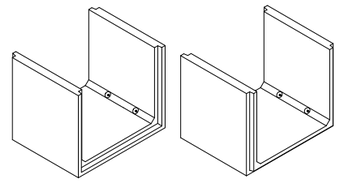
A
-
SECTION A
SCALE 1:50



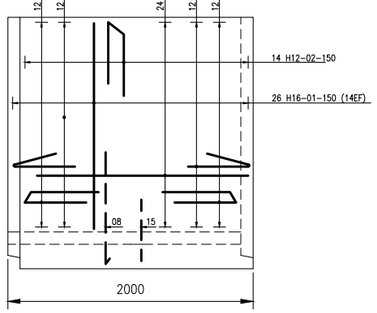
SECTION ARR. 08 BARS
SCALE 1:50

GENERAL NOTES

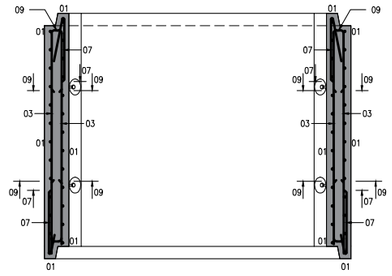
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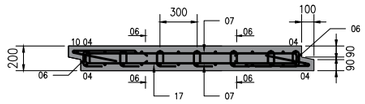
ISOMETRIC VIEW
SECTION 2



ELEVATION OF WALL TYP.
SCALE 1:50



PLAN: WALL STEEL
SCALE 1:50



B
-
SECTION B
SCALE 1:50



CONCRETE SPECIFICATION TO I.S. EN 206-1		
	BLINDING & MASS CONCRETE, DRAINAGE PIPE & MANHOLE SURROUNDINGS	FOUNDATIONS & WALLS
EXPOSURE CLASS	X0	XC2, XA2
MIN. CEMENT CONTENT (kg/m^3)	240	340
MAX. WATER/CEMENT RATIO	–	0.50
CEMENT TYPE TO I.S. EN 197-1	CEM 1 N	CEM 1 N
CHLORIDE CONTENT CLASS	Cl. 1,0	Cl, 0,40
MAX. AGGREGATE	10	20
MIN. COVER (CMin) (mm)	–	40
*COMPRESSIVE STRENGTH CLASS	C16/20	C30/37

NOTES
1. *C16/20 TO BE READ AS FOLLOWS: 16 – REFERS TO MIN. CHARACTERISTIC CYLINDER STRENGTH (N/mm2/). 20 – REFERS TO MIN. CHARACTERISTIC CUBE STRENGTH (N/mm2/).
2. DESIGN WORKING LIFE TO BE 50 YEARS MINIMUM.

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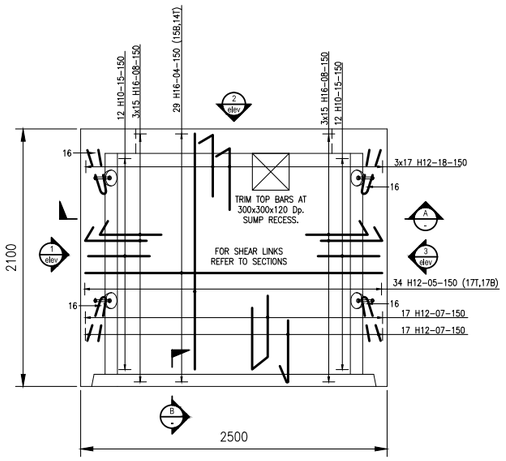
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PROJECT
STANDARD 110kV CABLE DRAWINGS

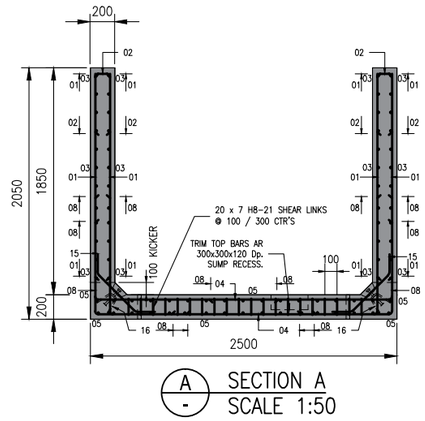
DRAWING TITLE
JOINT BAY
REINFORCEMENT DETAILS
JOINT BAY SECTION 2

No of Shts	SIZE	SCALE
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DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-012	004	00



PLAN: BASE STEEL
SCALE 1:50



A SECTION A
SCALE 1:50



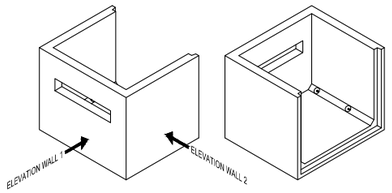
SECTION ARR. 08 BARS
SCALE 1:50

GENERAL NOTES

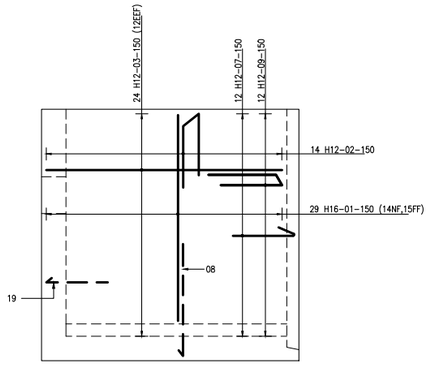
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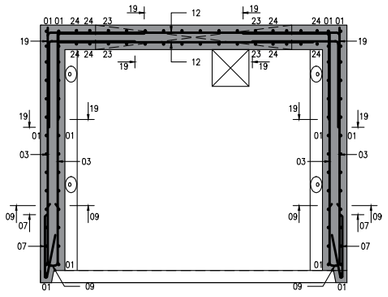
FF – FAR FACE
NF – NEAR FACE
B – BOTTOM
T – TOP
EF – EACH FACE



ISOMETRIC VIEW
SECTION 1



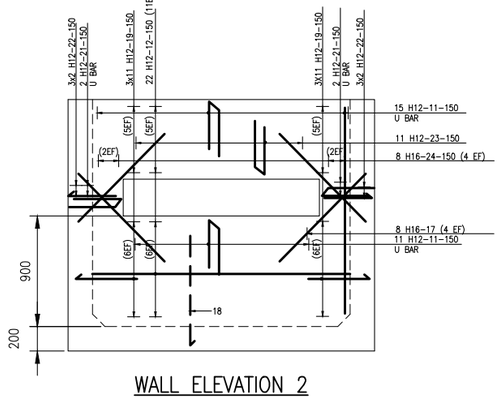
WALL ELEVATION 1
SCALE 1:50



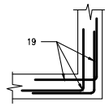
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MIN. COVER (CMin) (mm)	–	40
*COMPRESSIVE STRENGTH CLASS	C16/20	C30/37

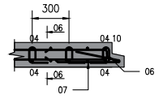
NOTES
1. *C16/20 TO BE READ AS FOLLOWS: 16 – REFERS TO MIN. CHARACTERISTIC CYLINDER STRENGTH (N/mm2/). 20 – REFERS TO MIN. CHARACTERISTIC CUBE STRENGTH (N/mm2/).
2. DESIGN WORKING LIFE TO BE 50 YEARS MINIMUM.



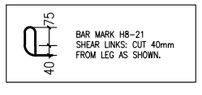
WALL ELEVATION 2
SCALE 1:50



PLAN ARR. 19 BARS
SCALE 1:50



B SECTION B
SCALE 1:50



REV	DESC	DRAWN	CHECKED	APPROVED	DATE
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PROJECT
STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
JOINT BAY
REINFORCEMENT DETAILS
JOINT BAY SECTION 3

No of Shts 8 | SIZE A3 | SCALE N/A

DRAWING NUMBER
XDC-CBL-STND-H-012

SHEET 005 | REV 00

TABLE 1: JOINT BAY R.C. DETAIL – SECTION 1

* – SPECIFIED TO NEAREST 5mm + – SPECIFIED TO NEAREST 25mm							ALL BENDING DIMENSIONS ARE IN ACCORDANCE WITH B.S. 8666:2005						
MEMBER	BAR MARK	TYPE	SIZE (mm)	No. OF MBRS	No. IN EACH	TOTAL No.	LENGTH OF EACH BAR (mm)	SHAPE CODE	A* mm	B* mm	C* mm	D* mm	E/r* mm
SIDE WALLS	01	H	16	2	29	58	1675	00					
	02	H	12	2	14	28	1075	21	500	120			
	03	H	12	2	24	48	1900	00					
	07	H	12	2	12	24	930	14	350	85	560		
	09	H	12	2	12	24	1000	13	480	80			
BASE	04	H	16	1	30	30	2400	00					
	05	H	12	1	34	34	1900	00					
	06	H	12	1	17	17	1025	13	500	80			
	07	H	12	1	15	15	930	14	350	85	560		
	08	H	16	1	90	90	1600	11	960				
	10	H	16	1	1	1	2200	00					
	14	H	12	1	51	51	1250	11	950	300			
	15	H	10	1	24	24	800	24	200	400	200	285	
	16	H	12	1	4	4	800	00	BEND ON SITE				
Shear Links	21	H	8	1	140	140	350	22	115	120	50	115	
END WALL	01	H	16	1	8	8	1675	00					
	11	H	12	1	26	26	1050	21	475	120			
	12	H	12	1	22	22	2075	00					
	13	H	12	1	66	66	1375	11	700				
	17	H	12	1	8	8	1000	00					
	18	H	12	1	4	4	775	13	375	75			
	19	H	12	1	12	12	675	11	350				
	20	H	12	1	11	11	1175	21	550	120			

TABLE 2: JOINT BAY R.C. DETAIL – SECTION 2

* – SPECIFIED TO NEAREST 5mm + – SPECIFIED TO NEAREST 25mm							ALL BENDING DIMENSIONS ARE IN ACCORDANCE WITH B.S. 8666:2005						
MEMBER	BAR MARK	TYPE	SIZE (mm)	No. OF MBRS	No. IN EACH	TOTAL No.	LENGTH OF EACH BAR (mm)	SHAPE CODE	A* mm	B* mm	C* mm	D* mm	E/r* mm
SIDE WALLS	01	H	16	2	28	56	1675	00					
	02	H	12	2	14	28	1075	21	500	110			
	03	H	12	2	24	48	1900	00					
	07	H	12	2	24	48	930	14	350	85	560		
	09	H	12	2	24	48	1000	21	480	80			
BASE	04	H	16	1	27	27	2400	00					
	05	H	12	1	34	34	1900	00					
	06	H	12	1	34	34	1025	21	500	110			
	07	H	12	1	32	32	930	14	350	85	560		
	08	H	16	1	84	84	1600	11	960				
	10	H	16	1	1	1	2200	00					
	15	H	10	1	24	24	800	24	200	400	200	285	
	16	H	12	1	4	4	800	00	BEND ON SITE				
Shear Links	17	H	8	1	140	140	350	22	115	120	50	115	

TABLE 3: JOINT BAY R.C. DETAIL – SECTION 3

* – SPECIFIED TO NEAREST 5mm + – SPECIFIED TO NEAREST 25mm							ALL BENDING DIMENSIONS ARE IN ACCORDANCE WITH B.S. 8666:2005						
MEMBER	BAR MARK	TYPE	SIZE (mm)	No. OF MBRS	No. IN EACH	TOTAL No.	LENGTH OF EACH BAR (mm)	SHAPE CODE	A* mm	B* mm	C* mm	D* mm	E/r* mm
SIDE WALLS	01	H	16	2	29	58	1675	00					
	02	H	12	2	14	28	1075	21	500	120			
	03	H	12	2	24	48	1900	00					
	07	H	12	2	12	24	930	14	350	85	560		
	09	H	12	2	12	24	1000	13	480	80			
BASE	25	H	8	1	140	140	350	22	115	120	50	115	
	04	H	16	1	29	29	2400	00					
	05	H	12	1	34	34	1900	00					
	06	H	12	1	17	17	1025	13	500	80			
	07	H	12	1	17	17	930	14	350	85	560		
	08	H	16	1	90	90	1600	11	960				
	15	H	10	1	24	24	800	42	200	400	200	285	
	16	H	12	1	4	4	800	00	BEND ON SITE				
	18	H	12	1	51	51	1375	11	900				
END WALL	11	H	12	1	26	26	1050	21	475	120			
	12	H	12	1	22	22	2075	00	475	120			
	19	H	12	1	66	66	1375	11	700				
	17	H	12	1	8	8	1000	00	700				
	21	H	12	1	4	4	775	13	375	75			
	22	H	12	1	12	12	675	11	350	75			
	23	H	12	1	11	11	1175	21	550	120			
	24	H	16	1	8	8	1675	00					

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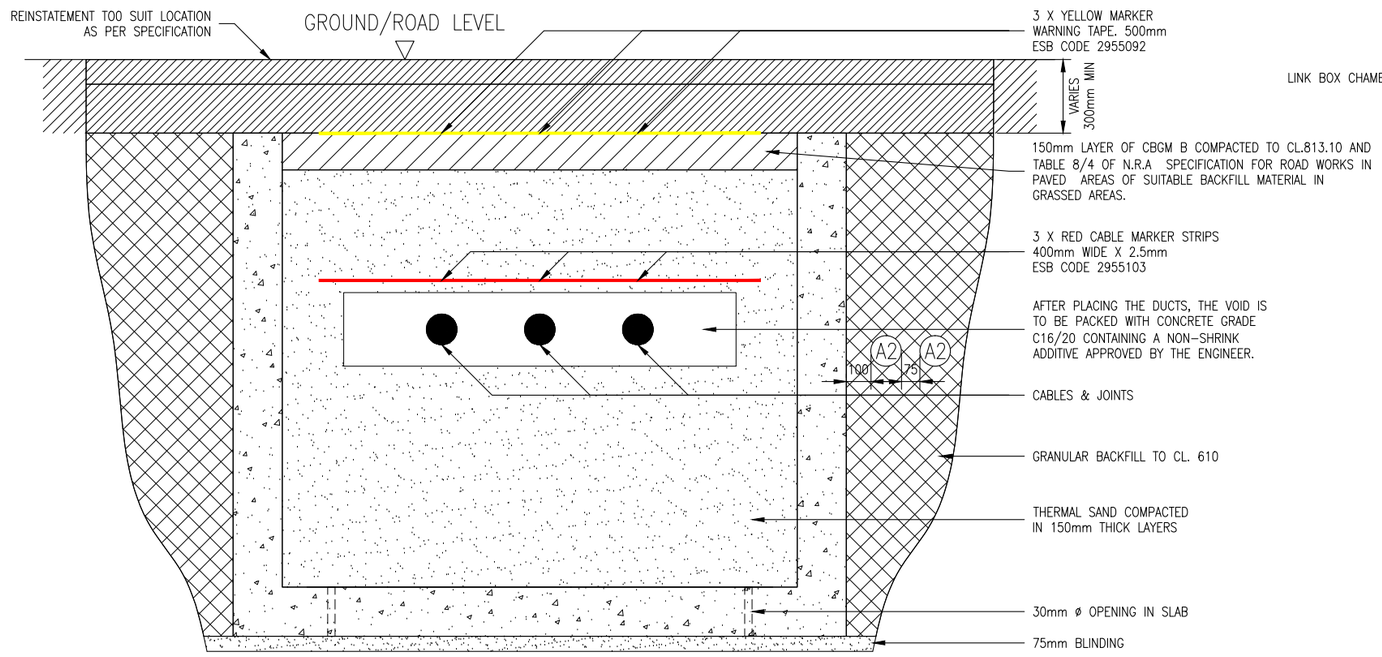
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PROJECT: STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE: JOINT BAY REBAR SCHEDULE

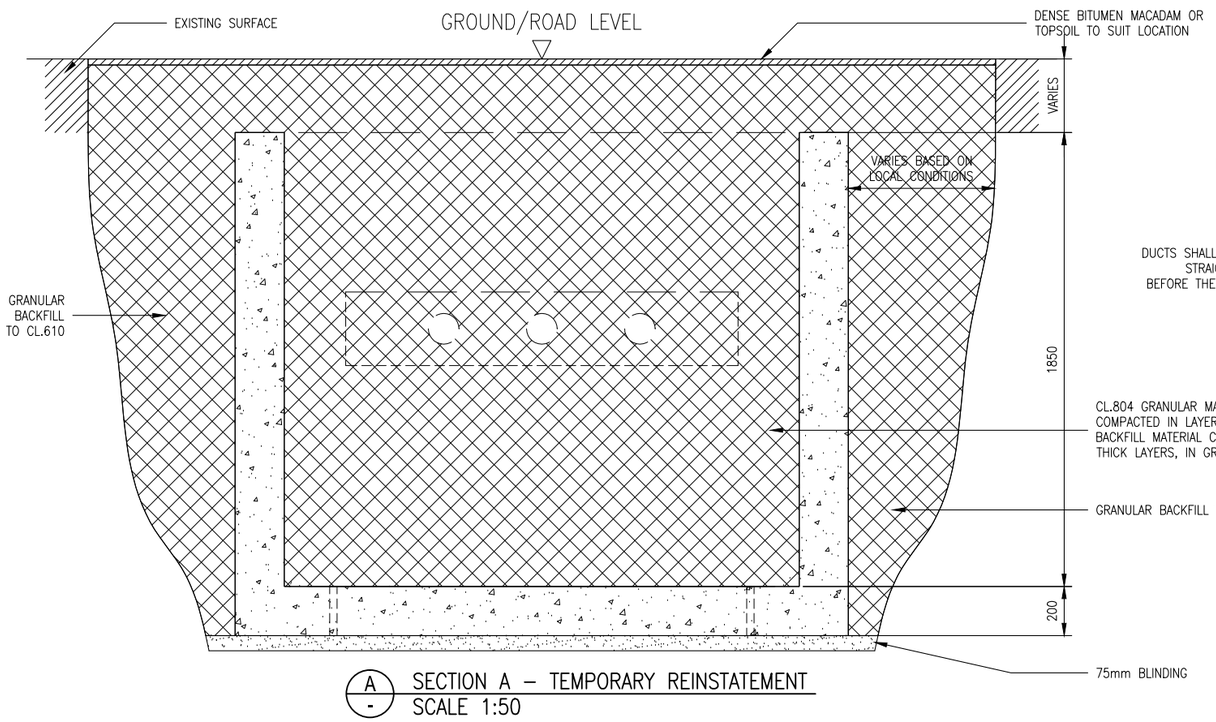
No of Shts: 8 | SIZE: A3 | SCALE: N/A

DRAWING NUMBER: XDC-CBL-STND-H-012 | SHEET: 006 | REV: 00

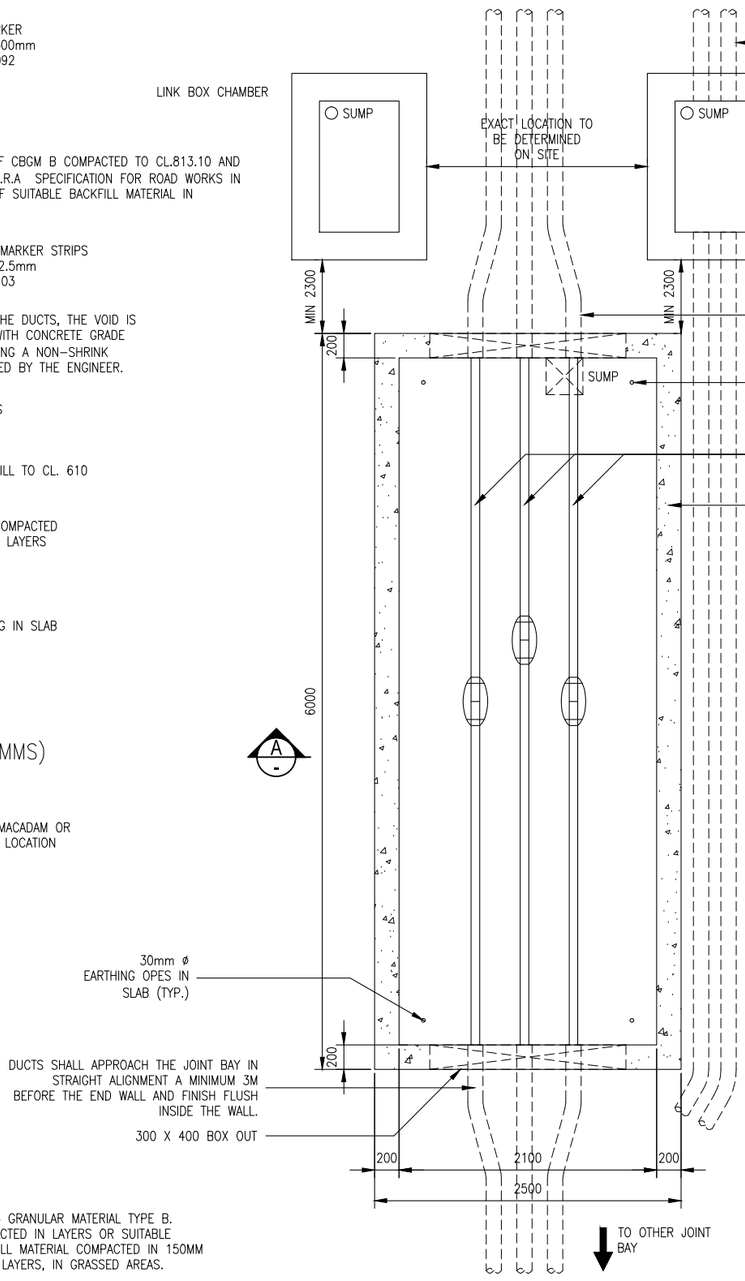


A / - SECTION A – PERMANENT REINSTATEMENT
SCALE 1:50

A2 = 125mm ø HDPE DUCT (COMMS)



A / - SECTION A – TEMPORARY REINSTATEMENT
SCALE 1:50



TYPICAL PLAN OF JOINT BAY IN ROAD
SCALE 1:50

GENERAL NOTES

1. ALL DRAWING TO BE READ IN CONJUNCTION WITH THE RELEVANT EIRGRID FUNCTIONAL SPECIFICATIONS. ANY DISCREPANCIES ARE TO BE NOTED IN WRITING TO EIRGRID IMMEDIATELY AND PRIOR TO COMMENCING THE WORK.
2. ALL DIMENSIONS ARE IN mm.
3. DO NOT SCALE DIMENSIONS
4. THE COMPACTION OF BACKFILL MATERIAL AROUND CABLES SHALL BE CARRIED OUT BY HAND.
5. THE CONTRACTOR SHALL PROVIDE TEST CERTIFICATES CONFIRMING THAT THE THERMAL RESITIVITY OF THE THERMAL SAND IS A MAXIMUM OF 1K.m/W.

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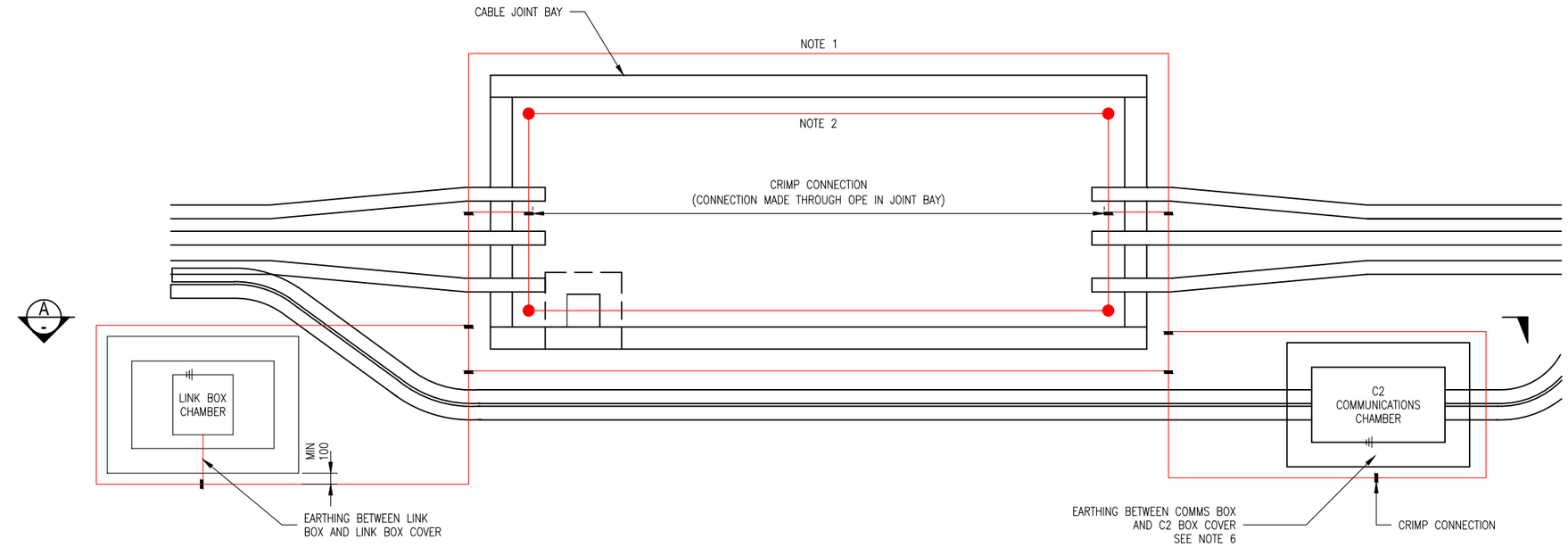
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PROJECT
STANDARD 110kV CABLE DRAWINGS

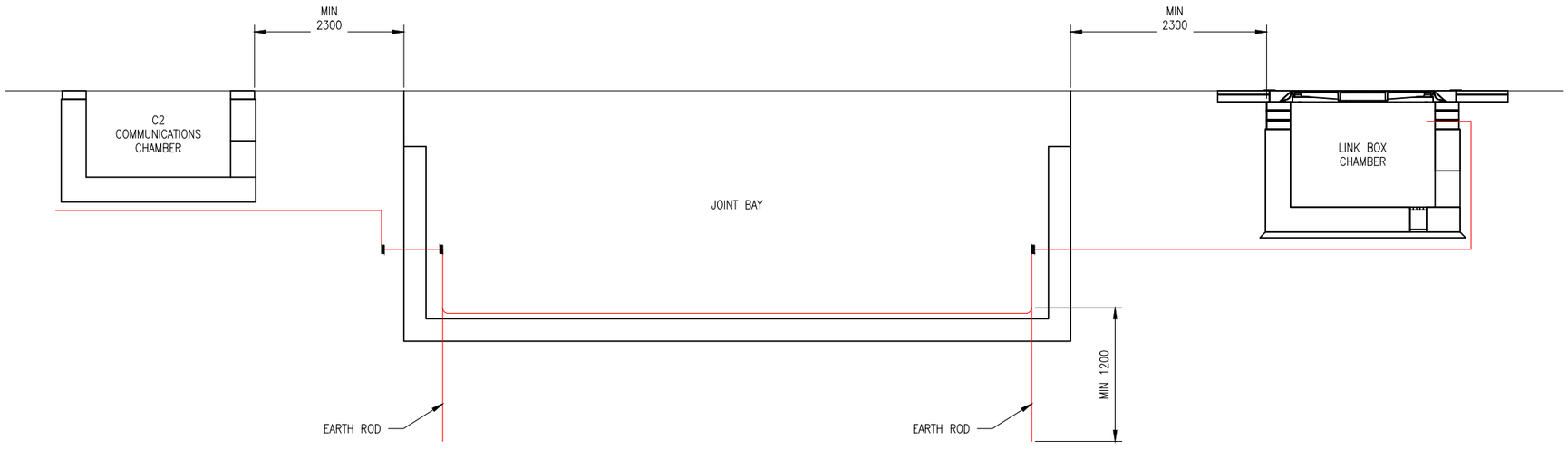
DRAWING TITLE
JOINT BAY REINSTATEMENT

No of Shts	SIZE	SCALE
8	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-012	007	00



TYPICAL PLAN OF JOINT BAY IN ROAD
SCALE 1:50



SECTION A
SCALE 1:50 (A -)

GENERAL NOTES:

1. FOR EARTH GRID SURROUNDING JOINT BAY AND CHAMBERS AREA, INSTALL A SINGLE LOOP OF 95mm² BARE Cu CONDUCTOR, EARTH GRID APPROX 500mm BELOW GROUND SURFACE LEVEL.
2. FOR EARTH GRID WITHIN THE JOINT BAY, INSTALL A SINGLE LOOP OF 95mm² BARE Cu CONDUCTOR RUNNING ALONG THE FLOOR OF THE JB CHAMBER. EARTH GRID APPROX 2000mm BELOW GROUND LEVEL.
3. EARTH RODS SHALL BE 1mm THICK COPPER-CLAD STEEL 1200mm LONG, 20mmø IN ACCORDANCE WITH ENA TS 43-94. THE EARTH CONNECTION TO THE EARTH ROD SHALL BE MOISTURE PROTECTED USING DENSO TAPE OVER THE COMPLETED CONNECTION.
4. EARTH RODS SHALL BE SUPPLIED COMPLETE WITH LUGS, BOLTS, HARDENED TIP, SCREW-ON STEEL DRIVING CAP, AND WITH THE APPROVED MEANS OF CONNECTING THE REQUIRED EARTHING LEADS.
5. EARTH RODS NOT LESS THAN 1.2m LONG TO BE INSTALLED VERTICALLY, ONE IN EACH CORNER OF THE JOINT BAY.
6. THE JOINT BAY EARTH RESISTANCE, WITH THIS ARRANGEMENT, SHOULD HAVE A MAXIMUM VALUE OF 10Ω. IF THIS VALUE CANNOT BE ACHIEVED, ADDITIONAL MEASURES WILL BE REQUIRED.
7. STEP VOLTAGE AND TRANSFERRED VOLTAGE TO OTHER METALLIC OBJECTS INSTALLED IN THE VICINITY OF THE JOINT BAY SHALL BE CALCULATED AND CHECKED AS PER LATEST IEEE 80 AND EIRGRID SPECIFICATION XDS-GFS-12-001.

   FOR REQUIRED SHORT CIRCUIT RATING REFER TO EIRGRID FUNCTIONAL SPECIFICATION XDS-GFS-00-001

LEGEND

- 95mm² Cu BARE CONDUCTOR
- EARTH ROD
- C CRIMP

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PROJECT: STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE: JOINT BAY
TYPICAL EARTHING ARRANGEMENT

No of Shts	SIZE	SCALE
8	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-012	008	00

STANDARD 110kV CABLE DRAWINGS
TRANSITION CHAMBER

DRAWING No.	SHEET No.	DESCRIPTION	REVISION No.
XDC-CBL-STND-H-013	001	TRANSITION CHAMBER INDEX SHEET	00
XDC-CBL-STND-H-013	002	TRANSITION CHAMBER GENERAL ARRANGEMENT	00
XDC-CBL-STND-H-013	003	TRANSITION CHAMBER SECTION DETAILS	00
XDC-CBL-STND-H-013	004	TRANSITION CHAMBER REINSTATEMENT	00
XDC-CBL-STND-H-013	005	TRANSITION CHAMBER NOTES	00

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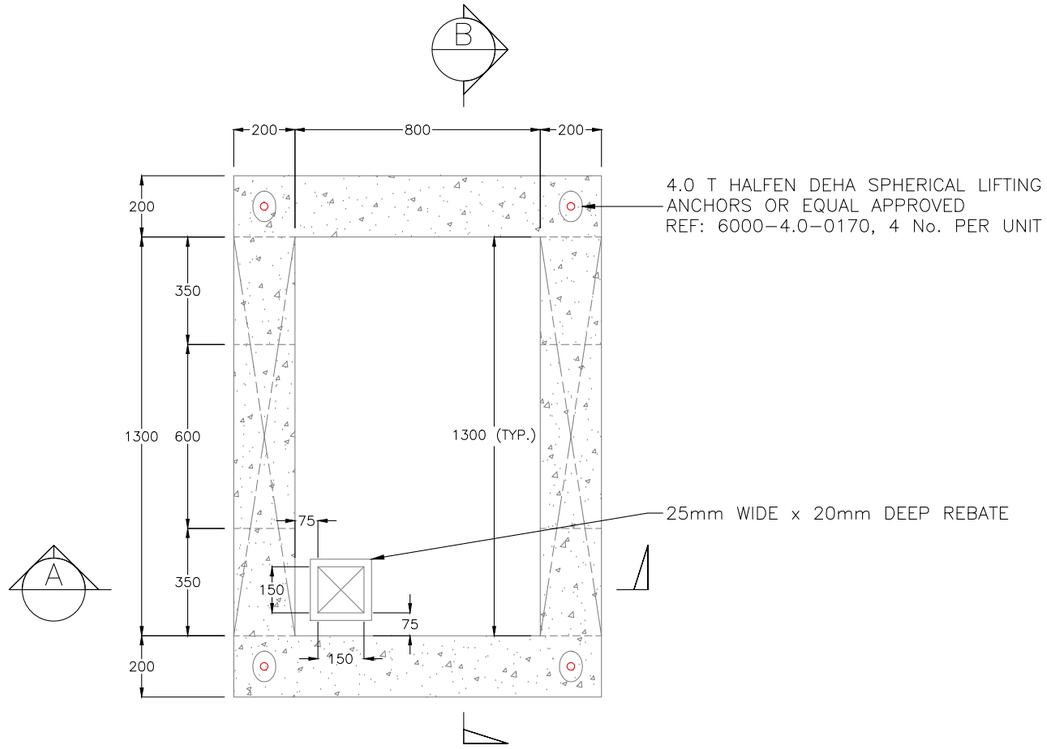
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PROJECT: STANDARD 110kV CABLE DRAWINGS

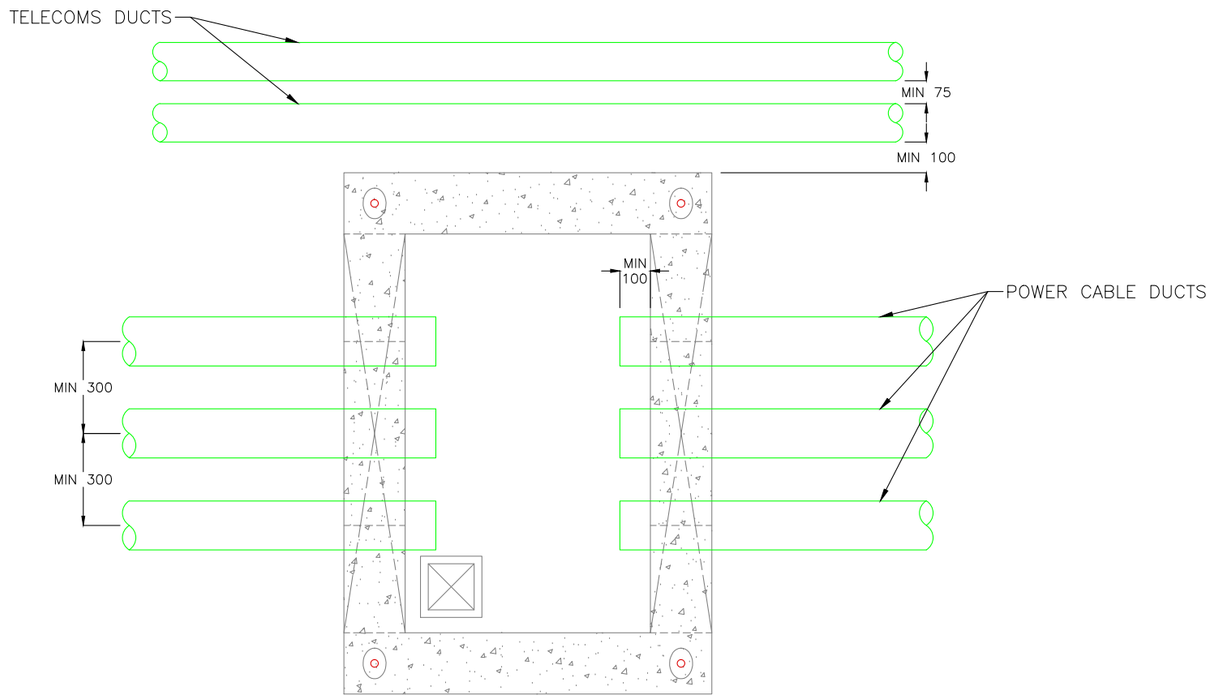
DRAWING TITLE: TRANSITION CHAMBER INDEX SHEET

No of Shts	SIZE	SCALE
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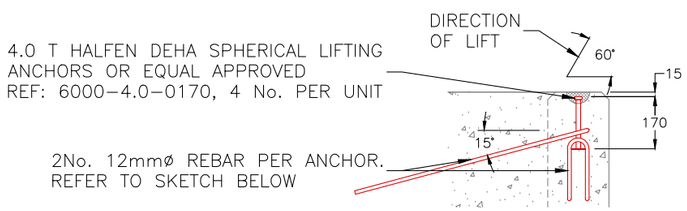
DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-013	001	00



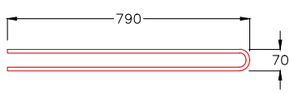
PLAN – TRANSITION CHAMBER
SCALE 1:20 (COVER, FRAME & DUCTS OMITTED FOR CLARITY)



PLAN – TRANSITION CHAMBER
SCALE 1:20 (DUCT SETTING OUT)



DETAIL 1 (1)
SCALE 1:20



H12mmø REBAR (1625mm LONG. UNBENT)

REFER TO SHEET 005 FOR GENERAL AND PRECAST CONCRETE NOTES

GENERAL NOTES FOR TELECOMS DUCTS:

1. TELECOMMUNICATION DUCTS NOT TO BE ROUTED THROUGH TRANSITION CHAMBER.
2. IF TRANSITION CHAMBER IS USED TO INTERFACE WITH AN HDD SECTION, THEN THE TELECOMS DUCT SDR 17.6 SHOULD BE CHAMFERED WHEN COUPLED WITH SDR 11 DUCTS.

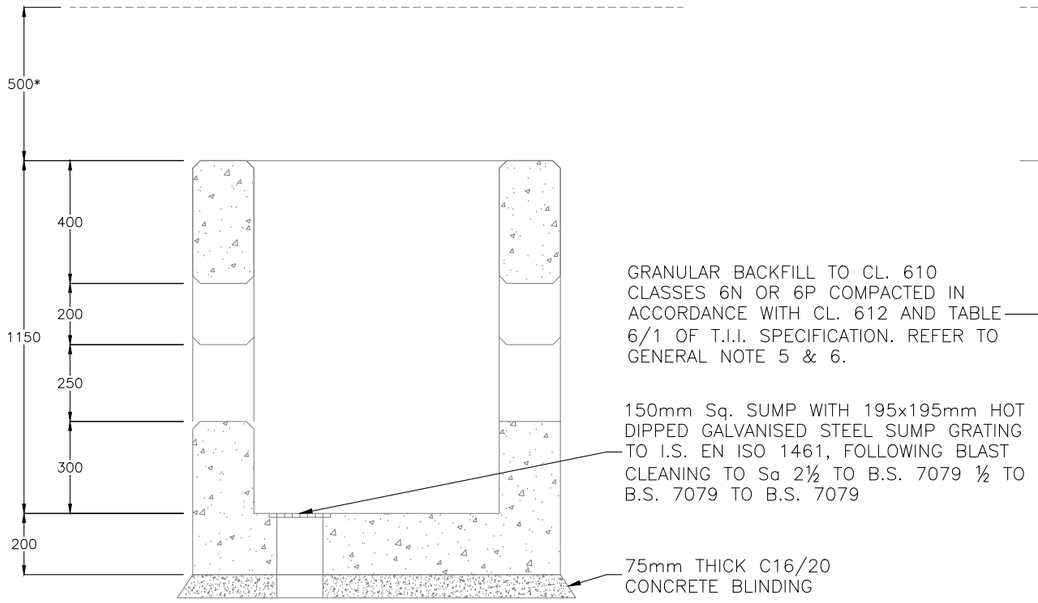
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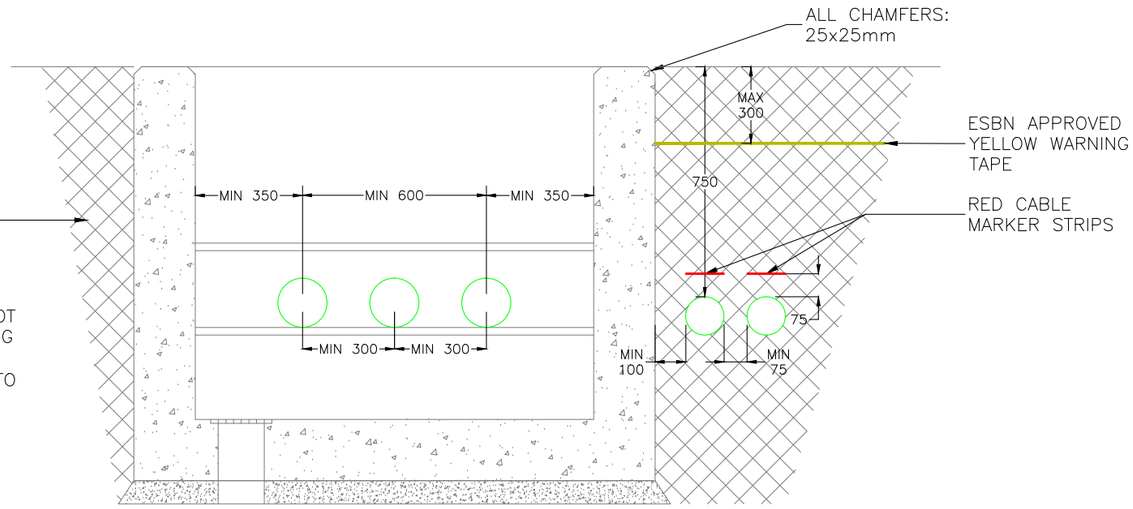
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PROJECT: STANDARD 110kV CABLE DRAWINGS
DRAWING TITLE: TRANSITION CHAMBER GENERAL ARRANGEMENT
No of Shts: 5 | SIZE: A3 | SCALE: N/A
DRAWING NUMBER: XDC-CBL-STND-H-013 | SHEET: 002 | REV: 00

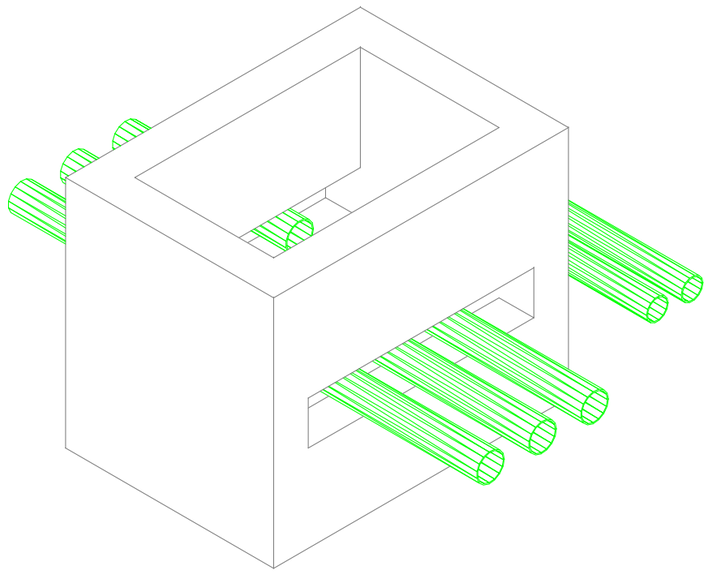
*COVER: REFER TO GENERAL NOTE 14
(SHEET 005)



SECTION A
SCALE 1:20 (A)



SECTION B
SCALE 1:20 (B)



REFER TO SHEET 005 FOR GENERAL AND PRECAST CONCRETE NOTES

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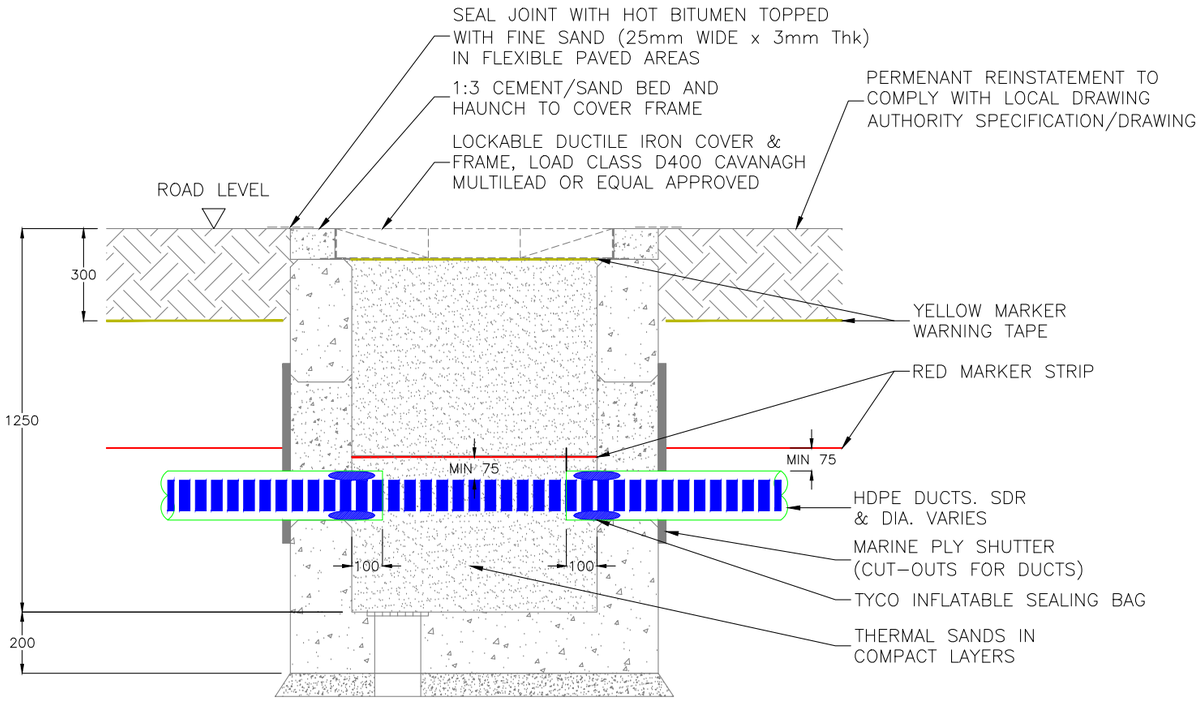
PROJECT
STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRANSITION CHAMBER SECTION DETAILS

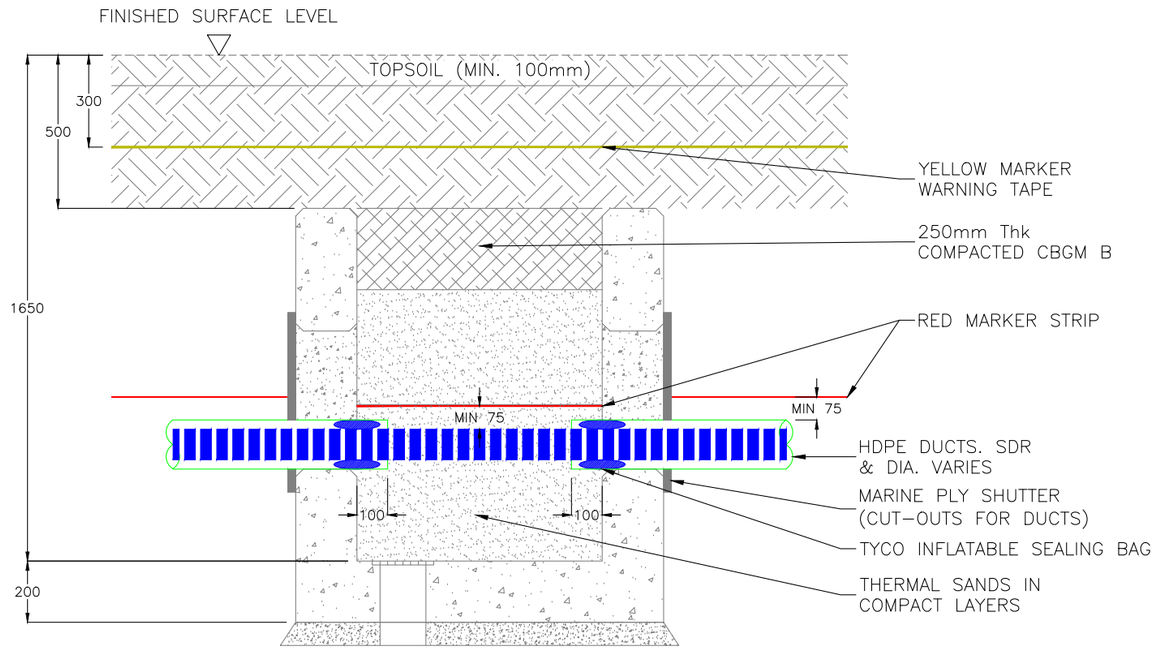
No of Shts	SIZE	SCALE
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DRAWING NUMBER
XDC-CBL-STND-H-013

SHEET	REV
003	00



SECTION A
SCALE 1:20 (CHAMBER BACKFILL IN ROAD) A



SECTION A
SCALE 1:20 (CHAMBER BACKFILL IN FIELD) A

REFER TO SHEET 005 FOR GENERAL AND PRECAST CONCRETE NOTES

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PROJECT
STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE
TRANSITION BAY REINSTATEMENT

No of Shts	SIZE	SCALE
5	A3	N/A

DRAWING NUMBER	SHEET	REV
XDC-CBL-STND-H-013	004	00

GENERAL NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEER'S, ARCHITECT'S AND ESB NETWORKS DRAWINGS & SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN mm.
3. DO NOT SCALE DIMENSIONS.
4. THE CONTRACTOR SHALL CHECK ALL DIMENSIONS PRIOR TO CONSTRUCTION, ANY DISCREPANCIES TO BE NOTIFIED TO THIS OFFICE IN WRITING IMMEDIATELY.
5. TEMPORARY SUPPORTS TO THE SIDES OF THE EXCAVATION MAY BE REQUIRED DEPENDENT ON SUBSOIL, METHOD OF WORK AND SITE CONSTRAINTS, AND ARE TO BE AGREED WITH THE ESBI ENGINEER PRIOR TO COMMENCEMENT OF EXCAVATION. SIDE SLOPES OF AN UNSUPPORTED EXCAVATION DEPENDENT UPON SUBSOIL AND SHALL BE AGREED WITH ESBI ENGINEER.
6. MAIN CONTRACTOR TO PROVIDE A METHOD STATEMENT AND RISK ASSESSMENT FOR THE EXCAVATION WORKS FOR THE ESBI ENGINEER TO REVIEW.
7. THE CONSTRUCTION, AS SHOWN, IS APPLICABLE ONLY WHERE THE SUBSOIL AT FORMATION LEVEL EXCEEDS 100 kN/m^2 BEARING CAPACITY.
8. SUITABILITY OF THE COVER AND CHAMBER TO BE ASSESSED BY THE PROJECT ENGINEER IN CIRCUMSTANCES OF HIGH TRAFFIC LOADING IN ACCORDANCE WITH THE RECOMMENDATIONS OF T.I.I. DESIGN MANUAL FOR ROADS AND BRIDGES ADDENDUM TO HA 104/09.
9. COVER AND FRAME TO B.S. EN 124.
10. COVER SHALL HAVE APPROVED BADGED MARKING INCORPORATED TO THE APPROVAL OF THE ESBI ENGINEER.
11. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH THE T.I.I. SPECIFICATION FOR ROADWORKS.
12. THE CENTER LINE OF THE DUCTS ENTERING THE CHAMBER SHALL BE ALIGNED WITH THE DUCTS ON THE OPPOSITE SIDE, SO THAT THE CABLE IS PULLED IN A STRAIGHT LINE.
13. DUCTS SHALL APPROACH THE CHAMBER IN STRAIGHT ALIGNMENT (HORIZONTAL & VERTICAL) FOR A MINIMUM OF 3 METERS BEFORE THE WALL OPENING.
14. * THE DEPTH FROM GROUND LEVEL TO TOP OF CONCRETE WALL SHALL BE 500 mm IN CULTIVATED FIELDS & GRASSED LANDS.

PRECAST CONCRETE NOTES:

1. ALL PRECAST CONCRETE ELEMENTS TO BE MANUFACTURED TO B.S. EN 13369:2013 "COMMON RULES FOR PRECAST CONCRETE PRODUCTS".
2. LIFTING INSERTS TO BE DESIGNED & INSTALLED TO PD CEN/TR 15728:2008 "DESIGN AND USE OF INSERTS FOR LIFTING AND HANDLING OF PRECAST CONCRETE ELEMENTS".
3. WEIGHT OF PRECAST CONCRETE UNIT (1.382 m^3) = 3.31 T. SPECIFIED LIFTING INSERTS HAVE A S.W.L. OF 4 T. ACCOUNTING FOR DYNAMIC LOADING.
4. LOCATION & SPECIFICATION OF LIFTING INSERTS ARE ASSUMED TO FACILITATE DEMOULDING AND HANDLING IN PRECAST MANUFACTURING FACTORY. IT IS THE RESPONSIBILITY OF THE PRECAST MANUFACTURER TO NOTIFY THE ESBI ENGINEER IF THESE ARE UNSUITABLE FOR HIS MANUFACTURING METHODOLOGY. ESBI ENGINEER TO BE INFORMED OF ANY ALTERNATIVE LIFTING LOCATIONS FOR FACTORY HANDLING & DEMOULDING.
5. CONCRETE TO HAVE A MINIMUM STRENGTH OF 30 N/mm^2 PRIOR TO HANDLING OR DEMOULDING.
6. MAIN CONTRACTOR TO ENSURE THAT A METHOD STATEMENT AND RISK ASSESSMENT INCLUDING A LIFTING PLAN, ARE PRODUCED FOR INSTALLATION AND ARE AVAILABLE TO ESBI ENGINEER FOR REVIEW IF REQUESTED. LIFTING PLAN TO INCORPORATE REQUIREMENTS OF LIFTING INSERTS AND LIFTING LOOP EYES.
7. A MINIMUM LIFTING SLING ANGLE OF 60° TO THE HORIZONTAL IS REQUIRED.
8. A LIFTING SYSTEM WHICH ENSURES ALL LIFTING POINTS TAKE ON AN EQUAL LOAD IS REQUIRED.
9. TRANSPORT THE CHAMBER BY TRAILER WHEN TRAVELING OVER ROUGH TERRAIN TO AVOID DAMAGE TO LIFTING ANCHORS.
10. HALFEN DEHA SPHERICAL LIFTING ANCHORS TO BE USED AS SPECIFIED. ANY DEVIATION FROM THIS MUST BE NOTIFIED TO ESBI ENGINEER BY PRECAST MANUFACTURER.
11. FORMWORK FOR PRECASTING TO BE OF A MINIMUM STANDARD OF VARNISHED WOODEN MOULD WITH PLANED BOARDS.
12. CONCRETE TO BE GRADE C32/40, AS SPECIFIED IN TABLE 1.

TABLE 1 – CONCRETE SPECIFICATION TO I.S. EN 206-1

ELEMENT	BLINDING & MASS CONCRETE, DRAINAGE PIPE & MANHOLE SURROUNDS	GROUND BEAMS, FOUNDATIONS & PITS/CHAMBERS
EXPOSURE CLASS	X0	XC4
MIN. BINDER (CEMENT+GGBS) CONTENT (kg/m^3)	220	320
GGBS TO EN 15167-1 (kg/m^3)	0	95
CEM II/A-L TO I.S. EN 197-1 (kg/m^3)	220	225
MAX. WATER/CEMENT RATIO	--	0.50
CHLORIDE CONTENT CLASS	Cl. 1.0	Cl. 0.40
MAX. AGGREGATE (mm)	10	20
MIN. COVER (CMin) (mm)	--	40
*COMPRESSIVE STRENGTH CLASS @ 28 DAYS	C16/20	C32/40

NOTES:
1. *C16/20 TO BE READ AS FOLLOWS:
   16 = MIN. CYLINDER STRENGTH (N/mm^2)
   20 = MIN. CUBE STRENGTH (N/mm^2)
2. DESIGN WORKING LIFE TO BE 50 YEARS MINIMUM

REV	DESC	DRAWN	CHECKED	APPROVED	DATE
00	FIRST ISSUE	DA	DG	CF	09/03/2020

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PROJECT: STANDARD 110kV CABLE DRAWINGS

DRAWING TITLE: TRANSITION CHAMBER NOTES

No of Shts: 5 | SIZE: A3 | SCALE: N/A

DRAWING NUMBER: XDC-CBL-STND-H-013 | SHEET: 005 | REV: 00

FEHILY TIMONEY
30 YEARS

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ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 4

Sample Public Complaints / Observations Procedure

RECORD OF PUBLIC COMPLAINTS & OBSERVATIONS

Observer Details

Name	
Address	
Telephone	
Email	

Contractors Representative

Name	
Position	
Contact	

Nature of the Complaint/Observation

Date		**Time**	
Location			
Nature	❑ Construction ❑ Operation ❑ Other		

Detailed Description of Complaint/Observation

Agreed Follow Up Actions

SAMPLE

General Public Contact and Response Procedure

Communicate

If a member of the general public wants to communicate about any aspect of our current operations, they can make contact through the following channels:

Phone & email

- Contact the Coom Green Enrergy Park Ltd. head office directly
  Facility Operations Point of Contact
  E:
  T:

or

Writing

- Write to:
  Facility Operations Point of Contact
  Coom Green Energy Park Ltd.,
  Address
  Address

Listen

Irrespective of the context of the communication, we will listen to what is being said and the message being conveyed with both understanding and empathy.

We will record all aspects of the communication to allow us have a better understanding of the conveyed message.

We will respond to all contacts in an organised and professional manner and treat all contact seriously.

Respond

If an issue is communicated in person or over the phone, we will try to resolve the issue there and then.

If an issue is communicated by email or in writing, we will endeavour to acknowledge the communication within 7 days and do everything we can to resolve it within 28 days.

If this is not possible to resolve an issue within these timeframes, we will explain why and provide a plan for addressing the issues in the longer term.

SAMPLE

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30 YEARS

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QUALITY ISO 9001:2015 NSAI Certified

ENVIRONMENT ISO 14001:2015 NSAI Certified

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APPENDIX 3.2

Schedule of Environmental Commitments and Mitigation Measures

Schedule of Mitigation Measures

This document sets out all mitigation measures as detailed in the Environmental Impact Assessment Report (EIAR) for the proposed Coom Green Energy Park

1 AIR AND CLIMATE

1.1 Air Quality

Construction Phase

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate;
- A water bowser will be available to spray work areas (wind turbine area and grid connection route) and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Gravel will be used at the site exit point to remove any dirt from tyres and tracks before travelling along public roads;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided at the entrance/exit point of the proposed wind farm site;
- The developer in association with the contractor will be required to implement a dust control plan as part of the CEMP (a CEMP is contained in Volume 3, Appendix 3-1. In the event An Bord Pleanála decides to grant permission for the proposed CGEP, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board.) This plan will address aspects such as excavations, haul roads, temporary stockpiling and restoration works. The plan will be prepared prior to any construction activities and will be established and maintained through the construction period.
- Receptors which receive dusting and soiling from local routes entering the site; and dwellings directly adjacent to the grid connection route construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling have taken place;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

Operational Phase

As the operation of the proposed CGEP will have positive impacts on air quality, mitigation measures are considered unnecessary.

Decommissioning Phase

Mitigation measures for the removal of wind turbines from the energy park would be similar as per the construction phase with respect to dust control and minimisation. If Cork County Council requires the removal of access tracks from the energy park as part of decommissioning, dust mitigation measures similar to those undertaken for the construction phase will be put in place to reduce any dust nuisance.

The proposed grid connection route will be left in situ in the public roadway, no mitigation measures are required.

1.2 Climate

It is considered that the proposed CGEP will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting the new binding renewable energy target for the EU of 32% by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2019. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase to 70% by 2030, with up to 8.2GW of increased onshore wind capacity. This will be achieved by:

- Phasing out fossil fuels
- Harnessing renewable energy
- Micro-generation; and
- Other measures.

As set out in the Climate Action Plan 2019, in terms of harnessing renewable energy, the volumes and frequencies of RESS will increase, so that the 70% target is met. The measures required to achieve this include finalising RESS, establishing a Community Framework to accompany RESS, begin the qualification process for the RESS 1 Auction and to finalise the design and implementation of RESS 2 and RESS 3.

As no significant impacts on climate are predicted during construction, no mitigation measures are proposed. In terms of the operational phase, the operation of the energy park will have a positive effect on climate due to the displacement of fossil fuels.

2 NOISE AND VIBRATION

Construction Phase

- The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required, i.e. 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. If turbine deliveries are required at night it will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.

- Consultation with the local community is important in minimising the impacts and therefore construction will be undertaken in consultation with the local authority as well as the residents being informed of construction activities through the Community Liaison Officer.

- The construction works on site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014, and the noise control measures set out in the Construction Environmental Management Plan (CEMP). Proper maintenance of plant will be employed to minimise the noise produced by any 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 project. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

- The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays. However, to ensure that optimal use is made of fair-weather windows, or at critical periods within the programme, it could occasionally be necessary to work outside these hours. Any such out of hours working would be agreed in advance with the local planning authority.

- Where the works are required to take place over an extended period (i.e. greater than 3 days), a temporary barrier or screen will be used to reduce noise level to as low as reasonably possible.

Operational Phase

The results of the noise predictions presented in Section 7.5.3 in Chapter 7 of the EIAR show that operational noise levels are above the derived daytime and night-time noise limits at several noise sensitive locations at a range of wind speeds. In order to ensure the proposed wind farm is compliant with the noise limits, some of the turbines will need to be operated in noise reduced modes of operation. Table 7.19, in Chapter 7 of the EIAR presents the sound power levels for the Enercon E-136 EP5 / 4650 kW with TES for noise reduced modes of operation and a range of standardised 10m height wind speeds. A range of mitigation strategies can be developed to ensure compliance with the noise limits. Tables 7.20 in Chapter 7 of the EIAR presents mitigation measures to ensure compliance with the derived daytime and night-time noise limits.

The predicted noise levels with mitigation measures are presented in Appendix 7.9, in Chapter 7 of the EIAR. With mitigation, new sources of noise will be introduced into the soundscape and it is expected that there will be a long-term slight to moderate significance of impact for dwellings within the 35 dB L_{A90} study area with a moderate significance of impact on the closest dwellings to the proposed wind farm.

Draft Revised Wind Energy Development Guidelines (December 2019) published by the Department of Housing, Planning and Local Government proposes amendments to the Wind Energy Development Guidelines 2006 and 'Draft Guidelines' were out to public consultation until the 19th February 2020 and may be subject to further revision. The Wind Energy Development Guidelines (2006) are current. However, the proposed development has been assessed against noise limits derived in accordance with the '2019 Draft Guidelines'.

The noise modelling undertaken assesses a worst case scenario with all noise sensitive locations downwind wind of all wind turbines. In practice, it is expected that the actual noise levels from the proposed development will be less than those predicted and hence, the extent of the mitigation will also be reduced. Ultimately, the derived noise limits will guide the turbine selection and operation and will be complied with.

Should the development be granted permission, an operational noise survey will be undertaken to ensure the development complies with the noise limits. If an exceedance in the noise limit occurs, mitigation measures will be refined to ensure compliance with the noise limits is achieved at all noise sensitive locations.

Decommissioning Phase

- Movements along access routes will be restricted to standard working hours and will exclude work on Sundays, unless specifically agreed otherwise with the local authority.

- The decommissioning works, will be carried out in accordance with the policies and guidance required at the time of the works, and restricted to normal working hours, typically 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 on Saturdays.

3 BIODIVERSITY

3.1 Mitigation Measures – CGEP and GCR

3.1.1 Mitigation Measures during Construction

Project Ecologist and Monitoring

The implementation of all mitigation presented in this section will be overseen by a suitably qualified Project Ecologist during the construction stage of the proposed CGEP development. An onsite Ecological Clerk of Works (ECoW) will be present to oversee construction works where required, to ensure that all agreed mitigation measures are carried out by the appointed contractor(s). Ongoing monitoring of the efficacy of said mitigation measures will be carried out throughout the construction stage.

Invasive Species

Measures to control the spread of invasive species will follow as relevant the manual '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*' by NRA (2010); and Cognisance will be made of 'The Best Practice Management Guidelines' produced by Invasive Species Ireland (Maguire et al, 2008). This shall include measures as detailed in the guidance above to preclude the spread of invasive species through excavation of and/or backfilling of borrow pits.

Wheel washes draining to silt traps will be implemented at site entrances to prevent the possible spread of any invasive species.

Removal of Vegetation

All works on trees, scrub or hedgerows, including internal roads, entrances and the proposed Turbine Delivery Route shall adhere to NRA guidelines for the protection of trees, hedgerows and scrub prior to, during and post construction of national road scheme.

In accordance with Section 40 of the Wildlife Acts 1976-2012, woody vegetation removal will be conducted outside the bird breeding season which runs from the 1st of March to the 31st of August inclusive. It should be noted that the provisions of Section 40 do not relate solely to birds, but a range of biodiversity that contributes to food chains and wider ecosystems. Where sections of hedgerow/ treeline are removed, these will be reinstated with native hedge/ tree species which are indigenous to the local area.

General Site Remediation

- Where feasible the areas around the turbine bases and other disturbed areas should be allowed to re-vegetate naturally. Larger trees as they grow over time will be trimmed back on an ongoing basis (every 2 – 3 years outside bird breeding season) if required. Woody material will be left in situ (deadwood) as an ecological habitat for invertebrates.

- It is important to note that the proposed reinstatement and planting regime will have a long-term goal to ensure that recolonisation of disturbed ground in keeping with the existing on-site semi natural scrub/ heath type vegetation. Therefore, natural regeneration of onsite flora will be encouraged where appropriate. If this is deemed unsuccessful, further action will be taken in the form of reseeding with local species in keeping with the natural character of the surrounding environs.
- Replacement of harvested vegetated sod to disturbed bare areas post construction should encourage re-vegetation and avoid erosion in the vicinity of turbines, hardstands, access roads, drainage structures and all other associated infrastructure.
- Where applicable the harvested surface vegetation sods will be maintained in a moist state during construction in preparation for re-use at locations where the non-vegetative layer has been exposed.
- Harvested turves should be reused in the restoration of all bare/exposed surfaces around turbines, exposed peat/soil, borrow pits, and on peat berms adjacent to access tracks.
- Where applicable, excavated peat should not be spread on ecologically sensitive habitats or areas adjacent to watercourses;
- Some areas of bare/exposed surface may remain following the completion of construction works, however if these areas remain stable, natural re-colonisation should eventually occur. No action is needed from the contractor in this case.
- Bare surfaces on slopes greater than 2° should be stabilised or re-vegetated as soon as possible to minimise the risk of erosion which may result from sustained rainfall.
- Natural re-vegetation is the preferred method of recovery. However, where required (for example, where adequate quantities of vegetated peat are not available or natural re-vegetation processes are insufficient), bare material and/or reinstated peat should be secured using vegetation blankets such as Greenfix Embankment Mat, Geojute or similar approved product. An appropriately pre-seeded CoirMesh is also suitable, if required.

Access Track Reinstatement

- Soil and peat excavated during the course of the access track construction works should be reused on-site in the form of landscaping roadside peat berms in areas of minimal peat cover and as backfill at other locations on site (e.g. areas of exposed soil and bedrock, landscaping around turbine bases and hardstands etc).
- Harvested vegetative layers will be placed on the berms where required. This will provide resistance against rainfall events, and will minimise sediment and nutrient release until natural re-vegetation is established.
- As part of the appointed Ecological Clerk of Works recommendations, the re-vegetation of access tracks an berms will be monitored on an on-going basis.

Cable Trench Reinstatement

- Where trenching is to be carried out off-road, the excavated material will be laid alongside the trench for use in reinstatement following the laying of cables; vegetated surface layers will be stored separately.
- Once cable laying work has been completed the excavated material should be backfilled and compacted to a suitable standard.
- The refilled trenches should then be capped with harvested surface layers which will be encouraged to re-vegetate naturally.
- The appointed Ecological Clerk of Works will monitor the on-site reinstatement of trenches and will survey the progress of plant recolonisation on an on-going basis.

Borrow Pit Reinstatement

- The stored soil overburden will be replaced and graded to reflect the surrounding landscape.
- This will be capped with the surface layer of sod to encourage rapid re-establishment of indigenous vegetation.
- In all cases disturbed ground will be allowed to naturally re-vegetate initially and this progression will be assessed post construction by the appointed Ecological Clerk of Works.
- Should reinstatement result in a surface root-zone composed of a mix of subsoil and topsoil, it is possible that vegetation will quickly succeed to a European gorse cover within 10 years of restoration.
- Should this occur, alternative land management will be carried out in consultation (and monitored) by an ecologist to ensure maintenance as suitable forage habitat for Hen Harriers. The Site Ecologist will monitor this succession as part of the site management plan over the lifetime of the project.

Settlement Pond Reinstatement

- Settlement ponds will be in-filled, reinstated and managed as per borrow pit reinstatement.

Protection of Aquatic and groundwater dependant habitats

Material stockpiles will be kept to a minimum size, covered and located at least 10m from the drainage system

The main fuel stocks for, and chemical wastes arising from, construction activities will be stored in a designated location, away from main traffic activity, within the temporary site compounds. All fuel will be stored in bunded, locked storage containers. The designated storage location will be greater than 100m from a watercourse.

Works will be avoided during prolonged periods of very heavy rainfall. Refuelling of machinery shall be carried out at designated areas on the site. Safe-guards such as drip-trays for refuelling of machinery, machine servicing, concrete mixing, etc. shall be utilised.

Any existing pools or aquatic areas will be fenced off and protected from disturbance during the construction phase.

The use of wet concrete and cement in or close to any watercourses and semi-natural habitats will be carefully controlled, particularly from shuttered structures or the washing of equipment. The cleaning and wash-out of chutes of concrete batching plant or ready-mix lorries should be carried out in a dedicated, contained area as far from sensitive habitats and watercourses as practical. This will be for the wash-out of the chutes only— after the pour. Concrete trucks will then exit the site and return to the supply plant to wash out the mixer itself.

<u>Project Component-Specific Mitigation Measures</u>

Mitigation measures are outlined below specific to each/all identified potential significant effects which will avoid/reduce/offset to not significant.

Invasive Species

CGEP

Pheasant Berry

The 2 no invasions of Pheasant berry located along the existing access road to the Bottlehill Landfill facility will be resurveyed by an invasive species specialist 3-4 weeks prior to the commencement of works. If disturbance is required, than all Pheasant Berry plants will be dug out by hand and left in-situ to rot.

Digging out is the selected method of treatment for this species as stumps can re-sprout following cutting back and treatment with herbicide. Digging out will not be carried out during the fruiting period for this species (October and November) as Pheasant berry spreads primarily by seed dispersal.

Japanese Knotweed

Three Japanese knotweed infestations were recorded during habitat assessments on the CGEP Grid Connection, two of which occur within the CGEP Grid Connection study area. The two Knotweed infestations occurring within the study area are located within 7m of the proposed works and will therefore require treatment. The introduction and spread of these invasive plant species will be avoided during the construction phase of the project by ensuring that appropriate precautionary measures are in place. Guidelines produced by the NRA (2010) on 'The management of noxious weeds and non-native invasive plant species on national roads' will be adhered to. It is of particular importance that excavated material from the areas where Japanese Knotweed is known to be present be appropriately managed.

The two Japanese knotweed infestations are located on the grid connection route at roadside locations in the townland of Cullenagh adjacent to Fermoy Golf Course. As the installation of the UGC will require excavation at this location, there is potential for spread of viable plant material to other areas during construction. The following specific mitigation measures will be applied at these infestations:

- Pre-Construction confirmatory surveys will be completed by an invasive species specialist, 3 – 4 weeks before construction begins. Mapping, showing the most up to date distribution and extent of Knotweed at the previously identified infestation locations, and also for any potential new infestations within the zone of influence of the construction works;
- Based on the updated surveys a Biosecurity Management Plan will be prepared prior to the commencement of site works to minimise risk of spread of high impact invasive species. This will incorporate mitigation detailed herein.
- A toolbox talk will be provided by the invasive species specialist with the Contractors construction site engineers and general operatives to explain about all invasive species identified along the route and the restrictions that will apply for the full construction period. The toolbox talk will cover all pertinent topics including all relevant invasive species close to construction works and the biosecurity measures to be implemented while working The invasive species toolbox talk will cover the full lifecycle of every construction activity including, but not limited to, all onsite construction activities, mechanical excavation, transportation and disposal of all material from excavations, through to the backfilling of excavations, and reinstatement of the construction works area;
- Where works are being carried out within 7m of a Japanese Knotweed infestation, the covering of infestations will be completed on sections seven days in advance of works. The infestations will be covered so that their full extent plus 1 metre is covered entirely and no vegetation is visible;

- The covering of vegetative knotweed infestations will be carried out using high density polyethylene grass carpet terram at all identified locations prior to any works commencing. When taking the terram off an infestation area, the construction team will need to ensure that all adherent material has been removed and placed within the adjacent infestation i.e. it will be important not to spread the infestation;
- The covering of knotweed infestations will only be carried out by the invasive species specialist i.e. this work will not be carried out by any general construction staff. No posts will be used to secure the coverings i.e. there will be no uncontrolled ground interference within 7 meters of any infestation during any of these operations;
- Once each knotweed infestation has been covered, works can begin at that location, an invasive species specialist will be present to provide supervision of all works adjacent to infestations;
- The site Environmental Clerk of Works will ensure that the Contractor engages a suitable waste disposal company with the requisite license for handling any hazardous waste (i.e. invasive species material). The Contractor will maintain records of all wastes arising, and the documentation will include the waste contractors local authority license and proof of appropriate haulage license per individual haulage vehicle.

Himalayan Balsam

Himalayan Balsam is most invasive in damp habitats particularly along river corridors, where it out-competes native vegetation in summer and dies back in winter, exposing river banks to erosion. It spreads rapidly downstream in river catchments due to its prolific seed production. Himalayan Balsam was recorded at a single location at a proposed watercourse crossing on the CGEP grid connection, where it was found to be growing on the riverbank upstream and downstream of the crossing location.

Prior to the commencement of works at this location on the Grid Connection Route, the infestation will be re-surveyed by an appropriately qualified invasive species expert to establish the extent of the infestation. Should the proposed woks at this location come into contact with vegetative material, control measures will be required. A range of methods are recommended for the treatment of *I. glandulifera* (Invasive Species Ireland, 2015; Inland Fisheries Ireland, 2015; Cabi, 2015), one of which is manual control. Manual control is carried out by physically pulling the plants by hand. If deemed necessary, manual control will be carried in late spring/early summer when newly germinated plants are distinguishable from surrounding vegetation, but prior to plants setting seed. Vegetative material will be left in-situ to rot, and not removed from site to avoid spreading viable material in transport. All operators must be trained in biosecurity protocol, control methodology, and in the identification of Himalayan Balsam at all stages of growth. At least one successive visit is recommended as Himalyan Balsam can germinate throughout the growing season. Manual control has been applied successfully in Ireland e.g. within the River Allow catchment in Co. Cork (IRD Duhallow Ltd., 2015). Works at the watercourse crossing can only commence upon successful removal of Himalyan Balsam from the works area.

Habitat Loss

Habitat disturbance in areas of semi-natural habitat during construction work should be strictly confined to within the direct land-take of the proposed wind farm and associated infrastructure. A working corridor will be set out in advance of the works, identified by low impact markers. The extent of construction activities will be controlled to limit vegetation removal and the exposure and/or compaction of soils. The setting out of the corridor will be preceded by a site walkover by an appropriately qualified ecologist to ensure that the working area is reduced to the minimum required for the works, taking account of minimising rutting and compaction by vehicles.

A suitably qualified Ecological Clerk of Works will be appointed to oversee environmental protection measures during the construction phase of the proposed site works to ensure full compliance with environmental protection measures which have been set out here. Excess peat or soil excavated to create the access road and other infrastructure shall not be side Cast or spread over existing habitats of local ecological value such as scrub, wet heath and wet grassland.

A total of 1.65ha of scrub will be permanently removed during the construction of the windfarm. This loss of scrub habitat will be compensated through allowing approximately 30.4ha of lands around turbines to develop a semi natural wet grassland / low scrub habitat as a result of mature tree clearance within a buffer around each turbine.

Hedgerow loss

During the construction of the project there will be a loss of 206m of hedgerow/ linear scrub habitat. Planting of a new hedgerow of equal length is proposed around the new substations using native woody species of local provenance only. Replanting should be carried out using native species only and species chosen should reflect the character of the locality and should consist of appropriate species for the receiving soil conditions.

CGEP and GCR

Water protection measures will prevent water pollution events and thus prevent negative impacts on Otter.

- The CEMP will be in place prior to the start of the construction phase.
- Machinery and materials will be parked/stored in the specified compound areas to minimise disturbance. Wherever possible, vehicles will be refuelled off-site in designated areas. This will be the case for regular, road-going vehicles.
- On-site refuelling of machinery will be carried out using a mobile double skinned fuel bowser at dedicated locations away from watercourses.
- The fuel bowser, a double-axle custom-built refuelling trailer will be towed around the site by a four-wheel drive 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 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.
- Refuelling operations will be carried out only by designated trained and competent operatives.
- Mobile anti-pollution measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
- Materials excavated (e.g. peat, soil, gravel or rock) during construction of the turbine bases, electrical sub-station, or during construction of new roadways or the upgrading works on existing roadways will be reused within the site.
- Re-use of these materials within the site will occur under conditions where there is no possibility of the material becoming mobile in the environment and entering into either surface or ground waters.
- The CEMP also provides for the appointment of a Site Supervisor/Construction Manager and/or Environmental Manager to maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. In addition, an Environmental Clerk of Works or Project Ecologist, Project Hydrologist, Project Geotechnical engineer will visit the site regularly and report to the Site Environmental Office.

This structure will provide a “triple lock” review/interaction by external specialists during the construction phase.

Project Component-Specific Mitigation Measures

CGEP

Project design measures will involve conducting all construction work during daylight hours where possible. This will minimise the likelihood of disturbing and displacing mammal which are exclusively nocturnal or are most active at dawn and dusk, such as Badgers, Pine Marten, Otter and Stoat. In the event that lighting is required cowled lighting will be employed to minimise potential disturbance in mammals due to light-spill.

In accordance with NRA Guidance, to account for the passage of time between the aforementioned mammal surveys and the commencement of construction activities/ clear felling in suitable habitat confirmatory surveys will be undertaken pre-construction to re-confirm the presence/absence of Badger setts, Otter holts, Pine Marten resting places or Red squirrel drays. Should new resting/breeding places of protected mammals be discovered then appropriate mitigation will be undertaken in agreement with NPWS and following NRA Guidance where applicable to prevent significant negative effects of the species. For example, any identified Badger setts will be protected by following NRA guidance, which states that no heavy machinery should be used within 30m of badger setts outside of the breeding season, and 50m during the breeding season (unless carried out under licence).

Construction work will be supervised by an on-site ECoW with stop works authority. This will further reduce the likelihood of destruction of the resting places of protected mammals.

GCR

Confirmatory surveys of the grid route connection will be undertaken prior to commencement of construction works. Should any resting/breeding places of protected mammals be discovered then appropriate mitigation will be undertaken in agreement with NPWS and following NRA Guidance where applicable to prevent significant negative effects of the species. For example, any identified Badger setts will be protected by following NRA guidance such as no heavy machinery should be used within 30m of badger setts (unless carried out under licence). Therefore, any effects are evaluated as negligible.

Water protection measures will be used when works are within 50 metres of a water body, thus the impact on Otter as a result of water pollution is considered as imperceptible. Given the design of the development and the construction methodologies and best practice, disturbance/displacement related impacts are also considered to be Imperceptible.

Bats

Generic Mitigation Measures and Best Practice

It is anticipated that the majority of construction works will be carried out during daylight hours, but some works may be carried out at night. In these cases, all lighting will be cowled in order to prevent light spill. Lights will be operational when work is taking place, but will be switched off when no longer required; no lighting will be left turned on overnight. In the site compound, lighting will be controlled by motion and time sensors to minimise the amount of time the lights are operational.

Project Component-Specific Mitigation Measures

The ground around turbine bases up to 92 M from Turbines will be cleared of mature conifer trees in order to reduce bat activity in the vicinity of turbines, and hence reduce risk of collision. Clearance works will be carried out in the construction phase, but the rationale for this measure is outlined in the operational section.

Avifauna

Generic Mitigation Measures and Best Practice

Ahead of any works to be undertaken, a confirmatory survey will be undertaken by the Project Ecologist, or experienced Ornithologist, to assess the presence of birds' nests, irrespective of the time of the year. Beyond any clear felling works to be avoided until the end of the bird breeding season (i.e. March to August, inclusive), in the event of nests being found within the study area, works will cease. The survey findings will be reported to the competent authority and an application for a derogation license will be made to NPWS.

Pre construction monitoring surveys will be conducted from early March and prior to any site clearance, enabling or forest clearance works focussed on breeding status determination of Goshawk and hen harrier relative to proposed works areas. No works will take place where evidence of possible nesting is recorded and a minimum 500m buffer will be retained between all works areas and possible nest areas or subject to advice from a competent adequately experienced ornithologist (minimum 10 years' experience). In this regard a wider or possibly narrower buffers may be required/ appropriate. Given risks of disturbance to these specific bird species no licencing will be sought as no works will be conducted between March 1st and August 31st within buffers identified or as advised by the site ornithologist and depending on breeding status. NPWS will be informed of breeding status and monitoring audits will be conducted and full disclosure provided to NPWS.

Project Component-Specific Mitigation Measures

CGEP and GCR

In order to avoid the potential impacts to breeding birds , tree removal and clearance of any other vegetation likely to hold nesting birds will be undertaken outside of the bird breeding season, i.e. not during the period of March to August, inclusive. In the eventuality of this not being possible, these works/activities will not take place before a confirmatory survey of the affected area (i.e. aerial and ground-based nests) is undertaken by the Project Ecologist. This includes hedgerow and scrub removal in addition to hedgerow trimming along turbine delivery routes and proposed cable routes. In the event of any nests being found, the works will immediately cease, the survey findings will be reported to the competent authority and an application for a derogation license will be made to NPWS. Any license requirements shall be facilitated by a complete confirmatory re-survey prior to works commencing and all future works associated with the derogation license will be supervised by the Project Ecologist.

Any works to be undertaken on existing culverts or other types of water-crossings must be preceded by a confirmatory nest survey by the Project Ecologist or an experienced Ornithologist. The survey will determine presence or absence of nests of riparian birds (e.g. Kingfisher) or birds that can use these habitats to nest (e.g. Grey Wagtail, Dipper). In the event of any nests being found that may be at risk of disturbance, than works will immediately cease, the survey findings will be reported to the competent authority and an application for a derogation license will be made to NPWS. Any license requirements shall be facilitated by a complete confirmatory re-survey prior to works commencing and all future works associated with the derogation license will be supervised by the Project Ecologist.

Sections of hedgerow/ treelines scheduled for removal and/or trimming and containing mature trees suitable for nesting Barn Owls will be surveyed prior to construction for occupancy by Owls.

Should Owls be present then minimum protection zones as outlined in published guidance will be adhered to for the period of construction (Shawyer, 2011).

Toolbox talks shall be held with construction staff on disturbance to key species during decommissioning. This will help minimise disturbance. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Any re-instated habitats will include native species where possible to enhance diversity of birds. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Other Species

CGEP and GCR

Reptiles and Amphibians

As Viviparous lizards are widespread in Ireland and can be found in a range of habitat types such as in bog, heath, the margins of coniferous woodlands, in addition to being common in a range of grassland habitats, particularly those not subject to heavy grazing pressure, a confirmatory survey will be conducted within these habitats prior to the commencement of construction activities to confirm the presence/absence of individuals. Capture and relocation operations for this species can be extremely labour-intensive and, in most cases, the most efficient approach is to cut down and rake-off vegetation during warm weather, with the intention of displacing the resident lizards prior to earthworks or other activities that could result in their incidental mortality (NRA, 2009). Whether or not reptile-proof fencing is then required to exclude the animals will need to be reviewed on a location-specific basis by the ECoW.

Should construction activities be proposed and scheduled for areas proximal to habitat suitable for breeding common frog or smooth newt during the species' respective breeding seasons (frogs: January-March and newts: March-May), confirmatory surveys following standardised methodologies will be required at those locations to confirm the presence/absence of breeding adults and/or spawn. If evidence of frog or newts is confirmed proximal to the work locations, it is essential the areas are fenced off with appropriate signage in order to protect these areas during construction activities.

Fisheries and Aquatic Ecology

Project Component-Specific Mitigation Measures

- **Instream works**
  - Instream works shall only take place during the period July to September (as required by IFI for instream works). However, as stated above, all instream works shall take place in written agreement with the IFI;
  - Operation of machinery in-stream should be kept to an absolute minimum. All construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery should be checked prior to commencement of in-stream works. Furthermore, machinery should be steam cleaned and appropriate measures for the spread of, amongst others, the crayfish plague shall be carried:
    - Before contact with water is made, any equipment or machinery that will be used in the water, including Personal Protective Equipment (e.g. footwear, gloves), will be sprayed and cleaned with a 1% solution of Virkon® Aquatic (or other proprietary disinfectant);
    - Upon completion of the work or moving the equipment or machinery from the water, these will be visually inspected for any possible sources of contamination and any attached plant or animal material or debris will be removed. The equipment and machinery will be further sprayed and cleaned with a 1% solution of Virkon® Aquatic (or other proprietary disinfectant); and
    - Any observations of mass mortality of Crayfish will be reported to the relevant authorities within 1 hour of evidence being found.
  - As the river water bodies hold fish species protected under the Wildlife Act and/or the EU Habitats Directive (e.g. Atlantic salmon, Brown trout, European eel), a pre-construction electrofishing survey will be conducted, in agreement with IFI, in the water bodies affected by the proposed CGEP Development watercourse crossings. This survey results, in addition with the results presented in the EIAR will inform about the significance of the fish abundances in relation to the local populations. If deemed significant by the IFI, dewatering of these water bodies will not be employed. If IFI considers the fish abundances not significant and authorises dewatering of the water body reach as part of the instream works, a fish salvage operation shall be undertaken. The fish salvage operation shall be authorised and licensed by the IFI and carried out by either the IFI or by fully qualified, licensed and authorised freshwater ecologists.
  - If temporary diversion channels are necessary as part of the instream works, they should provide for fish passage, be non-eroding, and be of similar width to the natural stream channel. The channel diversion should be compliant with the following 1) to 28) measures:
    - Diversion of water to and from temporary channels should only take place during the period July to September (as required by IFI for instream works) and in accordance with the IFI;
    - Consultation with the NPWS should also be carried out as species protected under the Wildlife Act, EU Habitats Directive and the EU Freshwater Fish Directive occur within the river water bodies affected by the instream works;
    - The works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
    - A minimum 10 meter vegetative buffer zone will be maintained between disturbed areas and the water body. There will be no storage of material/equipment, excavated material or overnight parking of machinery inside the 10m buffer zone;

- Double silt fencing will be placed upslope of the buffer zone on each side of the water body. The silt fencing will have removable "gates" as required to allow access of excavator while maintaining ease of replacement overnight or during periods of heavy rainfall. The silt fencing will be extended at least 10m upstream and downstream of the crossing location;
- Bog mats will be used underneath the excavator inside the 10 meter vegetative buffer zone to prevent soil erosion and potential water quality impacts from localised surface water runoff;
- Temporary storage of excavated overburden from the diversion channel will be undertaken outside of the 10m buffer on flat ground or within a local hollow. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;
- The water body dam (in the stream to be diverted) will be made of sand (clean) bags, cobbles or clean well-graded coarse gravel fill. Poorly sorted material will not be used as it would be a potential source of fine sediment (the dam will be installed once the diversion channel is in place);
- The banks and bottom of the diversion channel will be lined with impermeable geotextile to prevent erosion and surface water quality impacts. A layer of clean course gravel will be placed over the geotextile on the bed of the channel to keep it in place;
- An energy dissipater (such as clean rock fill or splash plates) will be placed on the water body bed and opposing bank of the receiving water body downstream of the diversion channel. This will prevent scouring and erosion of the water body bed and bank at the outfall during diversion;
- Water body bed trench excavation works will commence once stream flow is fully diverted from the crossing excavation area;
- Temporary storage of excavated material from the crossing trench will be undertaken separately to the material from the diversion channel. All storage areas will be outside the 10m buffer zone. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;
- Sediment laden water from trench dewatering will be discharged onto a well vegetated, dry, flat area at least 50m from a water body via a straw bale dewatering structure or geotextile filter bag. The outfall will also be surrounding by silt fencing;
- If there is no suitable area for discharge onto ground, settlement ponds will be used where necessary and will be put in place prior to commencement of preparation works;
- Any water from trench dewatering will not be discharged directly to a water body;
- Clay bunds will be placed within the trench backfill on either side of the water body to prevent the trench acting as a drain towards the stream, thus preventing potential water quality impacts;
- Once the lean mix concrete is in place in the trench, a layer of fine sand (5–10cm) will be over the cement prior to backfilling. This will prevent release of cement into the water body when flow is restored;
- Upon completion of the in-stream works, the stream crossing will be restored to its original configuration and stabilised to prevent bank erosion by means of timber stakes, timber planks and geotextiles as required (Project Design Measure);

- The diversion channel will be backfilled and reinstated to its original level and rock armour will be placed at the stream banks where the inflow and outflow of the diversion channel previously existed;
- The ground surface along the reinstated diversion channel will be re-seeded at the soonest opportunity to prevent soil erosion;
- The silt fencing on either side of the stream buffer will be left in place and maintained until the disturbed ground has re-vegetated;
- Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;
- Disturbance of bankside soils and stream sediments will be restricted to the minimum required for the cable laying process to avoid unnecessary impact on the stream morphology;
- There will be no batching or storage of cement allowed at the stream crossing;
- There will be no refuelling allowed within 100m of the stream crossing;
- All plant will be checked for purpose of use prior to mobilisation at the stream crossing;
- Works will not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted; and
- Once construction of the structure is completed, reconnection to the existing water body can be made and this should only occur within the approved operational window for in-stream works.

- **Culverts**
  - Construction/Replacing of culverts will only be done over a dry period between July and September (as required by IFI);
  - Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
  - Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
  - Where there is a requirement to disturb either the bed or bank as a result of the construction/replacement works, the watercourse will be dammed upstream and pumped prior to work commencing;
  - A temporary berm (i.e. sandbags and/or rectangular straw bales) will placed along the edge of the track/road to prevent loose material being dislodged or washed into the water body;
  - All culverts to be installed as part of the works, new and replacements, shall be of the open-bottomed type. These should be oversized, so that they can be set a minimum of 500 mm below bed-level, with a minimum diameter of 900mm regardless of the anticipated flood flow;
  - The culverts should be of similar width to that of the natural low-flow channel;
  - The culverts should be laid at a level and grade which allows the upstream invert to remain drowned (by back-watering) under low-flow conditions, to a depth suitable for the easy passage of the largest species frequenting the stream (150mm for salmon);
  - The effective slope of the culvert should not exceed 5%. If a higher slope is necessary, a site specific design is required;
  - Pools should be formed at each end of the culvert to provide for transition from the shape of the culvert to the shape of the river downstream;

- Culvert screening shall not be adopted in any circumstance;
- Where culvert widening has been completed, only clean, well-sorted fill or hardcore will be used to widen the road/track at the crossing location. Poorly sorted material will not be used as it would be a potential source of fine sediment;
- Before the road/track surface layer is put in place, a layer of geotextile will be placed over the fill to prevent wash down of fines into the fill and potentially into the water body;
- If high levels of silt or other contamination is noted in any local watercourse, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- All disturbed ground will be re-seeded at the soonest opportunity to prevent erosion;
- There will be no batching or storage of cement allowed at the watercourse crossing;
- There will be no refuelling allowed within 100m of the watercourse crossing; and
- All plant will be checked for purpose of use prior to mobilisation at the water body crossing.

Excavation works within the proximity (<50m) of surface water bodies

To prevent river water quality impacts from sediment runoff during excavation works within the proximity of surface water bodies (<50m), the following measures shall be put in place:

- Weather forecasting resources will be used, and works will be planned when a dry spell of weather is forecasted;
- Where the cable trench/access track/road/ works area is running within the 50m of a surface water body, a minimum 5m buffer will be maintained between the works area and the water body wetted width limit, except where works at existing culverts required, see above;
- Silt fencing will be placed down-gradient of the works during construction at all locations within the 50m water body buffer;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- In a case where only a 5 - 10m buffer is being maintained, double silt fencing will be put in place on the downslope side;
- Additional silt fencing or temporary straw bales (rectangular bales, pinned down firmly with stakes) will be placed across any natural surface depressions/channels that slope towards a local water body;
- Where the cable trench/access track/road route slopes down perpendicular towards a water body (i.e. base of stream valley), regularly spaced, temporary bunds or shallow swales will also be put in place perpendicular across the route corridor to dissipate surface water runoff from the works area and onto adjacent vegetated ground. Additional silt fencing will be put at the outfall location of the bunds/swales;
- Temporary check dams/silt fencing arrangements will be placed in any drainage ditches within 30m of the works corridor (this will also include existing road drains along the haul route works);
- The check dams/silt fencing arrangements will be placed every 10m;
- Bog mats will be used in wet/boggy areas zone to prevent ground rutting and soil erosion which could lead to potential water quality impacts. All ground rutted by vehicles/machinery will be levelled or backfilled to prevent their progression as preferential pathways for surface water runoff;

- If high levels of silt or other contaminants are noted in any local water body, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- Excavation work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
- All disturbed ground will be re-seeded at the soonest, practicable opportunity to prevent erosion;
- All temporary surface water control/protection measures, such as silt fencing and check dams, will be kept in place until disturbed ground has vegetated and stabilised. Regular daily checks will be undertaken;
- Where the cable trench route runs downslope for long distances (>50m) towards a water body or drainage ditch, regular spaced impermeable bunds will be placed within the trench backfill to prevent the trench acting as a drain towards the stream, thus preventing potential water quality impacts from surface water drainage within the trench;
- There will be no refuelling allowed within 100m of a water body/drainage ditch; and
- All plants will be checked for purpose of use prior to mobilisation.

Management of invasive alien species

To avoid the introduction, establishment and spread of invasive species in and to the proposed CGEP Development during the construction phase, the following measures shall be attended to:

- Prior to arrival of vehicles that will be kept on the site for extended periods e.g. earth moving machinery, the contractor's vehicles and equipment will be thoroughly cleaned and then dried using high-pressure steam cleaning, with water >65 °C, in addition to the removal of all vegetative material. Items difficult to soak/spray will be wiped down with a suitable disinfectant (e.g. solution of 1% Virkon® Aquatic);
- Evidence that all machinery has been cleaned will be required to be on file for review by the statutory authorities. The level of evidence required of the Contractor will be actual registration plates of vehicles onsite and a register of when, how and where each of these were cleaned before they arrived on site;
- The flagmen, which will be present at each active site access points, will be responsible for inspecting and cleaning delivery vehicles both entering and exiting the site, and will receive training in the correct techniques;
- Each flagman will be equipped with a 'disinfection box'. This will contain Virkon® Aquatic or another proprietary disinfectant, a spraying mechanism, cloths or sponges, a scrubbing brush and protective gloves. Protective gloves will be worn when using any disinfectant solution;
- Visual inspections will be carried out on all machinery and equipment (particularly for machinery and equipment exiting the site and which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the Temporary Compound at the end of the work day;
- No removed material or run-off will be allowed to enter a water body of any sort;
- Following cleaning, all equipment and vehicles will be visually inspected to ensure that all adherent material and debris has been removed manually;
- Records of supplies and cleaning of delivery vehicles will be kept by the flagmen and will be regularly inspected by the Environmental Clerk of Works; and

- Spot checks on the adequacy of cleaning will be carried out by the Project Ecologist.
- The above measures may not apply for vehicles that require regular on and offsite movements e.g. deliveries of cement during construction. These vehicles are highly unlikely to be at risk of contamination/ contact with aquatic habitats or invasive species. Before deliveries start the site EcoW/ Environmental Manager will review quarries supplying cement to confirm if the above disinfectant measure applies.

3.1.2 Mitigation Measures during Operation

Project Ecologist and Monitoring

A Project Ecologist will be appointed to oversee all works and mitigation measures during construction, operational and decommissioning phases.

Vegetation Clearance

Using the maximum potential dimensions of the proposed turbines and feature heights of 20m (based on the height of the forestry), it was calculated that buffer zones of up to 92 m are required around all turbines. During the site clearance phase, all trees and shrubs will be cleared within this radius. The buffer zone will be kept clear throughout the operational period of the proposed development.

Operational Curtailment

Turbines 11, 18 and 21 will be curtailed in April, May and June, throughout the night (starting 30 minutes prior to sunset, and ending 30 minutes after sunrise), when wind speeds are below 6 m/s, and when air temperatures are above 9°C. This will apply when all of the above conditions are met, but will not apply when one of the conditions is not met, i.e. turbines will operate as normal between April and June when wind speeds exceed 6 m/s. Similarly, turbines may operate as normal during daylight hours during these days, and in all other months of the year.

It is important to note that this is an initial curtailment strategy, based on pre-construction data. Spatial patterns of bat activity are likely to change after construction works (due to the felling of trees), which may affect the way that bats use the site. Therefore, post-construction monitoring will be undertaken, and based on the results, this curtailment strategy may be adapted.

Restrictions on Lighting

Where artificial lighting is required during the construction, operation and/or decommissioning phases, 'bat-sensitive' lighting techniques will be implemented. Site-specific advice will be given by the Ecological Clerk of Works, but the design principles will be in accordance with the Bats and Lighting guidelines (Stone 2013), as follows:

- Low-UV LEDs or low / high pressure sodium lamps will be the preferred bulb type, as they have least effect on bats. Mercury or metal halide bulbs will not be used.
- All outdoor lights will be fitted with directional hoods and/or luminaires to direct the light onto targeted areas and to prevent unnecessary light-spill.
- No lights will be directed towards any of the bat roosts, or towards any linear habitat features.
- Where lighting is required for staff safety (e.g. at site compounds), lights will be installed at a low level, e.g. on lighting poles of 1 - 2 metres height. Lux levels will be the minimum required for pedestrian safety.
- Where feasible, lights will be fitted with motion sensors and timers in order to provide light only when required. Constant, overnight lights will not be permitted.

Monitoring

Due to the clearance of forestry around wind turbines, it is highly likely that bat activity will change following the construction of the proposed development. The mitigation strategy outlined above adopts a precautionary approach based on pre-construction bat activity data, but post-construction monitoring will be required to confirm that it is effective.

The monitoring strategy will involve two components: surveys of bat activity using automated detectors (allowing comparison of activity with pre-construction levels), and searches for bat carcasses around the base of each turbine. This will be carried out during the first three years of operation, using standardised methods outlined in the SNH (2019) guidance, and/or other relevant guidelines available at the time.

The monitoring strategy will include the following:

- Monitoring of bat activity at ground level using automated detectors for periods of at least ten nights during spring (April, May), mid-summer (June, July) and autumn (August, September). Bat activity will be compared with the baseline levels.
- Searches for bat carcasses around the base of each turbine using trained search dogs, carried out twice per month between May and October (inclusive), i.e. a total of twelve occasions.
- Depending on the results of the monitoring, the initial mitigation strategy may be revised, for example by optimising curtailment parameters at some turbines, or by employing curtailment at additional locations. Annual monitoring reports will be provided to relevant statutory bodies (where required), and if significant bat fatalities are recorded, avoidance or mitigation measures will be proposed, such as the curtailment and feathering of turbines during periods of high bat activity, and/or other approaches that may be developed in the future.

Avifauna

Project Component-Specific Mitigation Measures

CGEP

A post construction monitoring programme is to be implemented at the subject site in order to confirm the efficacy of the bird diverters. The results of this programme are to be submitted annually to the competent authority and NPWS. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society (Drewitt & Langston, 2006) for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure.

In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring adapted to quantify collision, barrier and displacement to be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed:

1) Fatality Monitoring: A comprehensive fatality monitoring programme is to be undertaken following published best practice; the primary components are as follows:
    a. Initial carcass removal trials to establish levels of predator removal of possible fatalities. This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Smallwood, *et al*., 2010). No turbines which are used for carcass removal trials are to be used for subsequent fatality monitoring.
    b. Turbine searches for fatalities are to be undertaken following best practice (Fijn, Krijgsveld & Tijsen, 2012; Grunkorn, 2011) in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g. 2 per month). To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. Dependant on results, further monitoring to be agreed with NPWS.
    c. The large scale of the proposed wind development allows for a standardised approach with a possible control group of Turbines and/or variation in search techniques, such as straight line transects/ randomly selected spiral transects/ dog searches as a means of robustly estimating the post construction impact in terms of fatality.
    d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

An annual report will be submitted to the competent authority and copied to NPWS for each of the first three years of operation.

Following the first 7 years, a report shall be disseminated publicly via publication in a recognised journal. Although post-construction mortality is considered unlikely to be significant, in the event of significant fatalities during *post-construction monitoring*, the following adaptive management techniques shall be considered and an appropriate approach implemented. The approach implemented will be based on the survey findings and recommendations of an experienced ornithologist (>10 years relevant experience) in consultation with Bird Experts in NPWS:

- Curtailment or feathering of turbine blades at specific time periods dependent on target species affected[1].
- Use of Bird Deterrent Systems such as DTBird[2].
- Use of on the ground observers to determine feathering requirement during periods of peak bird activity[3].
- Use of DeTect MERLIN Avian Radar system or similar as a control mechanism for specific turbine operation[4].

2) Flight Activity Survey: A flight activity survey is to be undertaken during the to:
    a. Record any barrier effect, i.e. the degree of avoidance exhibited by species approaching or within the wind farm (Rees, 2012). Target species to be ...
    b. Record changes in flight heights of key receptors post construction.

An annual report will be submitted to the competent authority and copied to NPWS. To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. A review will be conducted after 4 years to determine if the level of survey is warranted. Dependant on results, further monitoring to be agreed with NPWS. Following the first 7 years, a report shall be disseminated publicly via publication in a recognised journal.

3) Breeding Hen Harrier and Goshawk survey: A breeding Hen Harrier and Goshawk survey, following methods used in the baseline survey to be repeated yearly March – July (inclusive). This aims to:
    a. Assess any displacement effects such as those recorded in the literature (Pearce-Higgins *et al*., 2009, 2012; Reichenbach & Steinborn, 2011). Overall density of these species to be annually recorded.
    b. To be conducted for an initial period of 7 years to allow for annual variation and cumulative effects. A review will be conducted after 4 years to determine if the level of survey is warranted. Dependant on results further monitoring to be agreed with NPWS. Following the first 7 years a report shall be disseminated publicly via publication in a recognised journal.

[1] An example would be feathering at dawn and dusk for a minimal period to avoid collision risk to roding woodcock during the summer months.

[2] DTbird is a self-working system that detects flying birds in real time and takes programmed actions such as dissuasion of birds in collision risk with turbines or controlled stopping of the turbine. It can also be used to monitor collisions if occurring.

[3] Studies in Spain, at an operational wind farm site, have found that controlled stopping of turbines based on observation reduced mortality of certain species by up to 48% (Munoz Gallejo *et al*., 2011).

[4] The DeTect MERLIN Avian Radar System can precisely track targets within avian size ranges and then provide deterrent techniques such as laser, or interface with the wind farm control system to curtail turbines.

Fisheries and Aquatic Ecology

Generic Mitigation Measures and Best Practice

The operation of the development will incorporate effective maintenance of the drainage system and the permanent mitigation measures detailed. The maintenance regime will include inspection and servicing of:

- Drains, cross-drains and culverts for any blockages
- Outfalls to existing field drains and watercourses
- Existing roadside swales for any obstructions
- Swales
- Progress of the re-establishment of vegetation.

Project Component-Specific Mitigation Measures

In order to prevent the spread of invasive alien species that are already established within the proposed CGEP Development or may become established, the following measures shall be conducted:

- Monitoring in the form of confirmatory surveys will be carried out by the Project Ecologist to accurately determine the current status of invasive species locations identified during baseline studies; and identify any other infestations close to the construction works areas or operational stage maintenance works areas;
- Surveying will be carried out each year of operation and this survey information will be used to inform any construction works/operational stage maintenance activities. Surveys will focus always on the works area plus 7m;
- The results of this will be made available to Project Team, and any bodies as agreed at the consenting stage; and
- The measures included in the Invasive Species Management Plan will be implemented.

3.1.3 Mitigation Measures during Decommissioning

Project Ecologist and Monitoring

A Project Ecologist will be appointed to oversee all works and mitigation measures during construction, operational and decommissioning phases. The project ecologist will monitor the baseline ecology prior to decommissioning and provide mitigation measures at this time based on what biodiversity receptors are relevant.

Habitats and Flora

Project Component-Specific Mitigation Measures

The introduction of invasive species has been identified as a significant potential impact during the decommissioning stage of the CGEP Development.

To avoid the introduction, establishment and spread of invasive species in and to the proposed CGEP Development during the construction phase, the following measures shall be attended to:

- Prior to arrival of vehicles that will be kept on the site for extended periods e.g. earth moving machinery, the contractor's vehicles and equipment will be thoroughly cleaned and then dried using high-pressure steam cleaning, with water >65 °C, in addition to the removal of all vegetative material. Items difficult to soak/spray will be wiped down with a suitable disinfectant (e.g. solution of 1% Virkon® Aquatic);
- Evidence that all machinery has been cleaned will be required to be on file for review by the statutory authorities. The level of evidence required of the Contractor will be actual registration plates of vehicles onsite and a register of when, how and where each of these were cleaned before they arrived on site;
- The flagmen, which will be present at each active site access points, will be responsible for inspecting and cleaning delivery vehicles both entering and exiting the site, and will receive training in the correct techniques;
- Each flagman will be equipped with a 'disinfection box'. This will contain Virkon® Aquatic or another proprietary disinfectant, a spraying mechanism, cloths or sponges, a scrubbing brush and protective gloves. Protective gloves will be worn when using any disinfectant solution;
- Visual inspections will be carried out on all machinery and equipment (particularly for machinery and equipment exiting the site and which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the Temporary Compound at the end of the work day;
- No removed material or run-off will be allowed to enter a water body/drainage ditch of any sort;
- Following cleaning, all equipment and vehicles will be visually inspected to ensure that all adherent material and debris has been removed manually; and
- Spot checks on the adequacy of cleaning will be carried out by the Project Ecologist.
- The above measures may not apply for vehicles that require regular on and offsite movements e.g. deliveries of cement during construction. These vehicles are highly unlikely to be at risk of contamination/ contact with aquatic habitats or invasive species. Before deliveries start the site EcoW/ Environmental Manager will review quarries supplying cement to confirm if the above disinfectant measure applies.

Terrestrial Mammals (excluding bats)

Generic Mitigation Measures and Best Practice

A project ecologist will be on site during the decommissioning phase.

Project Component-Specific Mitigation Measures

CGEP & Grid Connection Route

No significant impacts are likely on terrestrial mammals as no decommissioning is likely for the grid connection which will be operated by ESBN and EirGrid

Avifauna

Project Component-Specific Mitigation Measures

CGEP

Decommissioning operations will take place predominantly during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species.

This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006). Limited operations, such as turbine removal, may require night time operating hours.

Toolbox talks shall be held with construction staff on disturbance to key species during decommissioning. This will help minimise disturbance. This in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Any re-instated habitats will include native species where possible to enhance diversity of birds. This is line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt & Langston, 2006).

Project Component-Specific Mitigation Measures

CGEP and GCR

During decommissioning phase, all mitigation measures indicated for the construction phase with regards to excavation works within the proximity (<50m) of surface water bodies and Management of alien invasive species shall be implemented, namely:

- Where the cable works or vehicle/machinery movement is within the 50m of a surface water body, a minimum 5m buffer will be maintained between the works area/access track and the water body wetted width limit;
- Silt fencing will be placed down-gradient of the works during construction at all locations within the 50m water body buffer;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- In a case where only a 5 - 10m buffer is being maintained, double silt fencing will be put in place on the downslope side;
- Additional silt fencing or temporary straw bales (rectangular bales, pinned down firmly with stakes) will be placed across any natural surface depressions/channels that slope towards a local water body;
- Where the access tracks/road routes slopes down perpendicular towards a water body (i.e. base of stream valley), regularly spaced, temporary bunds or shallow swales will also be put in place perpendicular across the route corridor to dissipate surface water runoff from the works area and onto adjacent vegetated ground. Additional silt fencing will be put at the outfall location of the bunds/swales;
- Temporary check dams/silt fencing arrangements will be placed in any drainage ditches within 30m of the works corridor (this will also include existing road drains along the haul route works);
- The check dams/silt fencing arrangements will be placed every 10m;

- Bog mats will be used in wet/boggy areas zone to prevent ground rutting and soil erosion which could lead to potential water quality impacts. All ground rutted by vehicles/machinery will be levelled or backfilled to prevent their progression as preferential pathways for surface water runoff;
- If high levels of silt or other contaminants are noted in any local water body, all works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- Excavation work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
- All disturbed ground will be re-seeded at the soonest, practicable opportunity to prevent erosion; and
- All temporary surface water control/protection measures, such as silt fencing and check dams, will be kept in place until disturbed ground has vegetated and stabilised. Regular daily checks will be undertaken.

Management of invasive alien species

To avoid the introduction, establishment and spread of invasive species in and to the proposed CGEP Development during the construction phase, the following measures shall be attended to:

- Prior to arrival of vehicles that will be kept on the site for extended periods e.g. earth moving machinery, the contractor's vehicles and equipment will be thoroughly cleaned and then dried using high-pressure steam cleaning, with water >65 °C, in addition to the removal of all vegetative material. Items difficult to soak/spray will be wiped down with a suitable disinfectant (e.g. solution of 1% Virkon® Aquatic);
- Evidence that all machinery has been cleaned will be required to be on file for review by the statutory authorities. The level of evidence required of the Contractor will be actual registration plates of vehicles onsite and a register of when, how and where each of these were cleaned before they arrived on site;
- The flagmen, which will be present at each active site access points, will be responsible for inspecting and cleaning delivery vehicles both entering and exiting the site, and will receive training in the correct techniques;
- Each flagman will be equipped with a 'disinfection box'. This will contain Virkon® Aquatic or another proprietary disinfectant, a spraying mechanism, cloths or sponges, a scrubbing brush and protective gloves. Protective gloves will be worn when using any disinfectant solution;
- Visual inspections will be carried out on all machinery and equipment (particularly for machinery and equipment exiting the site and which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the Temporary Compound at the end of the work day;
- No removed material or run-off will be allowed to enter a water body of any sort;
- Following cleaning, all equipment and vehicles will be visually inspected to ensure that all adherent material and debris has been removed manually;
- Records of supplies and cleaning of delivery vehicles will be kept by the flagmen and will be regularly inspected by the Environmental Clerk of Works; and
- Spot checks on the adequacy of cleaning will be carried out by the Project Ecologist.
- The above measures may not apply for vehicles that require regular on and offsite movements e.g. deliveries of cement during construction.

These vehicles are highly unlikely to be at risk of contamination/ contact with aquatic habitats or invasive species. Before deliveries start the site EcoW/ Environmental Manager will review quarries supplying cement to confirm if the above disinfectant measure applies.

3.1.4 Mitigation Measures – TDR

Mitigation Measures for Invasive Species

Detailed mitigation measures to manage invasive species in particular Japanese Knotweed will follow similar approaches for minimising risk of invasive spread, as outlined above for CGEP and GCR.

Prior to the clearing of vegetation or trees, confirmatory surveys will be conducted to ensure that no resting/breeding places of protected mammals are within the area of clearance.

Sections of hedgerow scheduled for removal and/or trimming and containing mature trees suitable for nesting Barn Owls will be surveyed prior to construction for occupancy by Owls. Should Owls be present then minimum protection zones as outlined in published guidance will be adhered to for the period of construction (Shawyer, 2011).

The TDR will be used during the decommissioning phase, to remove the turbines from sites. Trees and vegetation may be required to be trimmed back or possibly removed in certain locations (nodes) similar to the construction phase.

The TDR may be used during the decommissioning phase, to remove the turbines from sites. Trees and vegetation may be required to be removed.

General Measures for Preventing the Spread of Non-Native Invasive Species

Communication

- Informing all site staff through toolbox talks as part of site inductions;
- Raising awareness of site workers through tool box talks given by a suitably qualified person as part of site introduction; informing workers what to look out for and the what procedure to follow if they observe an invasive species.

Advance planning and incorporation into works schedule

- Constraints and invasive species mapping will be consulted at the planning stage for works to be undertaken in each area, to ensure all parties are aware of the species present, their locations and extents and the measures required to eradicate, control and/or prevent the spread of each species as applicable.
- Treatment measures will be incorporated into the construction programme where treatment will progress in conjunction with works.
- Where treatment will progress independent of other works, the same consultation and advance planning will also be required.

Pre-works survey and establishment of exclusion zones

- A preconstruction/pre-treatment survey of each area will be undertaken prior to implementation of treatment measures and/or construction works to confirm the locations of invasive species and communicate these to supervisors and operatives involved in treatment and works.
- Exclusion zones will be established where necessary at this stage. Fencing, clear signage and good housekeeping within the site to prevent spread.
- No machinery or personnel will be allowed within exclusion zones, other than where necessary to undertake treatment measures. Similarly, there will be no storage of materials within or adjacent to exclusion zones.

Disposal of cut material

- Where mechanical control by cutting has been undertaken, it may be possible to mulch wood where re-growth from vegetative material will not take place.
- All other plant material arising from mechanical control may be stored in a controlled manner on-site, or disposed of appropriately off-site,
- If retention on-site is required, material will be kept in a secure area onsite for composting and herbicide treatment where necessary.
- This material will be monitored for re-growth, which will trigger targeted herbicide application where necessary. No vehicles or operatives other than those involved in invasive species management will enter this area and no other materials will be stored here.
- Where off-site disposal is used, material will be transported off site by an appropriately licensed waste contractor and disposed of properly at a suitably licenced facility.

Re-vegetation

- Where invasive species have been physically removed and disturbed soil, this soil will be seeded or replanted (including 5cm deep mulch) with native plant species. This will prevent the easy colonisation of bare soil by invasive species in the area.

Good hygiene

- Ensure good hygiene practices when working with invasive species:
  - Remove the build-up of soil on equipment
  - Keep equipment clean
  - Do not move fouled equipment from one site to another.
- Where necessary a pressure washer will be used to wash the build-up of soil, clean equipment and vehicles. The water arising from washing will be contained to avoid the further spread of species within the site.
- Biosecurity measures required for working near water (intertidal areas) and protected species within the site e.g. receptor sites for rare plants, the pNHA, etc.

Table 4-1: Species-specific invasive species

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
Japanese Knotweed (F*allopia japonica*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. While the stand is >7m outside of the proposed works footprint and will not be interfered with, a buffer of 7m around the stand will be put in place to demarcate this and ensure there is no interference with the area. This will be put in place prior to construction. Roots 1-3 m deep and up to 7 m lateral spread.	By clearly marking the area to avoid, it will avoid accidental interference with the area, and the risk of spreading the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this buffer.
Winter Heliotrope (*Petasites fragrans*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. As this species spreads vegetatively via rhizomes, the risk of spread through unregulated soil movements is high. Where the infested area can be retained in situ, burial under minimum 1.5m of soil is sufficient. Areas which will be required to be excavated will require treatment with herbicide prior to movement. Following treatment, soil from	The species covers a bank at node 2.0 and 2.4 and is within the bank regrading footprint and load-bearing footprint of these nodes. Implementing this mitigation will prevent the spread of the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	these areas can be re-used, but not as topsoil and will be required to be buried at a depth of minimum 1.5m. Spraying will be carried out using glyphosate-based herbicide after flowering in February to March or midsummer or later but before the foliage begins to die back (NRA, 2010). The following general recommendations will be adhered to: • Establishment of a 1m buffer zone around all growths prior to operations; staff shall be made aware of this buffer zone when working within infested areas. • Construction works will not be allowed within exclusion zones until treatment procedures have been followed. • No treatment measures to take place in these areas without supervision and agreement by appointed ecologist/eradication specialist. • All machinery and vehicles operating within areas of infestation will be thoroughly checked and if necessary, cleaned prior to leaving the area to protect against further spreading of Winter Heliotrope.		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	• No material shall be taken from areas of infestation except in accordance with the measures outlined above. All material will be either deep buried (1.5m) or transported by an appropriately licensed waste contractor and received by an appropriately licensed facility. • Wheel washes shall be put in place at infected areas. Waste water from these facilities will need to be stored and treated to avoid further spread. • If operating within an area of known infestation all machinery, vehicles, equipment, foot ware and clothing will need to be cleaned thoroughly (if necessary using steam cleaners) in a contained area to avoid further contamination. • The contractor must appropriately dispose of winter heliotrope plant material and soil containing plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 1.5m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.		
Old Man's Beard /Traveller's Joy (*Clematis vitalba*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. Two options for the treatment of Old Man's Beard at the site have been proposed. These options shall be used to eradicate Old Man's Beard from the site and avoid the spread of the species. The following general	The species is present in a 5x2m patch within the load-bearing and vegetation clearance footprint at node 1.3, as well as within sections of hedge at node 2.3 adjacent to the vegetation clearance footprint. Implementing this mitigation will prevent the spread of the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	recommendations will be adhered to as part of the plan: ***Option 1*** – Physical removal Seedlings can be pulled out of the ground and larger plants can be cut to the stem (and foliage will die) and roots and stem removed. Roots can then be grubbed out with material stored above the ground, so plants cannot take root again. For more mature plants, the stem can be cut near ground level and herbicide applied to the outer rim of the stem. The stem is likely to produce regrowth in the next growing season and herbicide will need to be applied to this growth. Glyphosate can be used in late spring and summer and Triclopyr can be applied in summer. This is the preferred option where plants infest the crowns of trees. ***Option 2*** – Chemical control Growths at ground level can be treated with herbicide, using spray application where native species are not present, or targeted application using a weed wiper where		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	there is a risk of damage to non-target species. Re-survey to check for re-growth will be required in both cases. The contractor must appropriately dispose of Old Man's Beard plant material and soil containing plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
Himalayan honeysuckle (*Leycesteria formosa*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. Two options for the treatment of Himalayan honeysuckle at the site are proposed. These options can be used to eradicate Himalayan honeysuckle from the site and avoid the spread of the species: **Option 1** – hand pulling of seedlings Seedlings and/or small plants can be pulled out of the ground along with the root system (BMCC, 2015). **Option 2** – cut to base and treated with herbicide. More established plants can be cut to near ground level and the freshly cut wound immediately painted with herbicide (BMCC, 2015).	There is a single plant growing on top of a wall at node 2.2. While the latest swept-path analysis shows it is unlikely to be interfered with, the aforementioned mitigation will be included to prevent the spread of the species along the TDR route	A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.
Cherry laurel (*Prunus laurocerasus*)	A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. Cherry laurel is spread vegetatively only and a buffer of 1m will be left to prevent damage to the plant which can result in the production of new stems which can make the plant more	There are three young bushes present within the vegetation-clearance footprint at node 1.7. The species spreads vegetatively by suckering, or by seed.	

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	difficult to treat. Staff shall be made aware of this buffer zone when working within areas of infestation. Where the plant cannot be avoided, one of the following methods will be implemented: **Option 1** – Cut to stump and digging out stump This method involves cutting the main stem of the plant down near ground level and digging out the stump and any visible roots. This option is not practical in areas where there are other invasive plants present as the disturbed soil can allow for the setting of seeds or the spread of rhizomes of adjacent species (ISI, 2012b). **Option 2** – Cut to stump and treat stump with herbicide This method involves cutting the main stem of the plant down near ground level and applying herbicide to the freshly cut wound. The herbicide concentrations used, and timings of applications vary according to which chemical is used. When treating many stems, vegetable dye added to herbicide is useful for highlighting the stems that have and haven't been treated.		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	The use of a brush or other such applicator will provide an accurate application and prevent damaging adjacent non-target plants via spray drift. Please see table below for best treatment time (ISI, 2012b). ***Option 3*** – Cut to main stem and inject stem with glyphosate This method involves the 'drill and drop' method where the main stem is cut, and a hole drilled into the cut. This provides a targeted application of glyphosate (25% solution). The main drawback to this technique is that the plant is left in place to rot away; which can take a decade or more. Please see table below for best treatment time (ISI, 2012b). ***Option 4*** – Cut back to stump and spray regrowth with chemicals This application involves cutting a main stem down near ground level and then treating the new stems with herbicide. This method is the least effective as some stems may be missed and not treated. Also, the application of herbicide is generally via spraying which can result in adjacent non-		

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	target plants being killed off. The contractor must appropriately dispose of excavated waste, including soils containing cherry laurel plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.		

Mitigation measures for the protection of watercourses

The following mitigation measures are proposed for the protection of watercourses:

Table 4-2: Mitigation Measures for the Protection of Watercourses

Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
All personnel working on site will be trained in pollution incident control response. Emergency Silt Control and Spillage Response Procedures contained within the Construction Environmental Management Plan (CEMP) will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt.	Ensure site operatives are informed and equipped to deal pollution incidents such as spillages or silt containment failures.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
A regular review of weather forecasts of heavy rainfall will be undertaken, and a contingency plan will be prepared for before and after such events.	Ensure works are not carried out during periods of heavy rainfall and ensure potential sources of siltation are secured in advance of heavy rainfall.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.

Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
Silt traps and silt fencing will be put in place in advance of excavation works at each node.	Ensure erosion control and silt arrest measures are in place in advance of works.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Nodes requiring temporary hardcore shall be capped as soon as practicably possible.	Cover exposed subsoils, thereby reducing the concentration of suspended solids in any run-off.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.	Allow repair and strengthening of silt interception measures if and where necessary.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.

Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
Refuelling of plant & machinery during planting will only be carried out at designated refuelling station locations within the wind farm site. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site.	Prevent fuels, oils or other contaminants from entering the drainage network.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site.	Prevent fuels, oils or other contaminants from entering the drainage network.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.

4 LAND, SOILS AND GEOLOGY

Mitigation by Design & Best Practice

- The proposed development has been designed in accordance with best practice
- The works have been designed and checked by geotechnical and civil engineers, suitably qualified and experienced in excavation and earthworks design and construction methodologies.
- Any excavation and construction related works will be subject to a design risk assessment at detailed design stage to evaluate risk levels for the construction, operation and maintenance of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded and relayed to appropriate parties
- A detailed method statement for each element of the works will be prepared by the Contractor prior to any element of the work being carried out.
- Given that the works comprises a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.
- The Contract will require programming of the works such that earthworks are not scheduled during severe weather conditions. Where such weather is forecast, suitable measures will be taken to secure the works.

Construction Phase

The primary mitigation measure employed has been the design of the wind farm in terms of locating the turbines, access roads, borrow pits, material storage areas and other site infrastructure within an area of commercial forestry where the soils are extensively worked and drained. In order to reduce the impacts on geology, hydrogeology and slope stability, infrastructure has been primarily located within areas of thinner peat/soft ground and lower slope gradients. Extensive work has already been undertaken at the preliminary design stage to apply risk avoidance by design which included:

- Extensive peat probing to identify areas of peat deposits across the site.
- Excavation of trial pits and advancement of boreholes to establish overburden and bedrock characteristics.
- Shear vane testing to establish characteristic peat strengths where shallow peat deposits were identified.
- Relocation and micro-siting of turbines, hardstandings, borrow pits and access roads based on the site assessments and geotechnical assessments in order to reduce ground risk associated with the proposed development.

Construction Environmental Management Plan (CEMP)

- Tree Felling
- Earthworks
- Control of Sediment Laden Runoff
- Measure for Spills
- Slope Stability
- Groundwater.

Mitigation Measures during Operation

It is not envisaged that the operation of the proposed development will result in significant impacts on the geological and hydrogeological regimes within the study area, as there will be no further disturbance of overburden post-construction.

The main potential residual impact during the operation phase would be the risk to groundwater from contamination from spills. Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of maintenance vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas.

Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the refuelling areas and in each item of plant to deal with any accidental spillage.

Decommissioning

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

The Irish Wind Energy Association (IWEA) (11) states that when decommissioning a wind farm "*the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbanc*e". It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that "*it may be best*" to leave site tracks in-situ depending on the size and geography of the development.

It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing and recycling them. It is proposed to retain these elements of the construction and cover with overburden material to allow for re-vegetation of the development site.

Removal of this infrastructure would result in considerable disruption to the local environment in terms of increased sedimentation, erosion, dust, noise, traffic and an increased possibility of contamination of the local water table. However, if removal is deemed to be required by the respective local authority all infrastructure will be removed with mitigation measures similar to those during construction being employed.

Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures outlined above.

5 HYDROLOGY AND WATER QUALITY

Construction Stage:

- The increase in the rate of runoff along the route of the site access roads and hardstanding areas will be mitigated by the proposed drainage system which includes provision of stilling ponds to reduce concentration of suspended solids in the runoff from these areas. This has been further mitigated by avoidance through design, in the utilisation of existing tracks and existing drainage systems where possible. A minimum buffer of 50m from watercourses has been adopted, where possible, for all new site tracks that run parallel to a watercourse, with the existing tracks being widened in their existing locations.
- There is one location where proposed access and drainage infrastructure (in the vicinity of T17) are located within 50m of an existing drain. This flows into the Chimneyfield Stream which subsequently joins the River Bride. Due to the proximity of this infrastructure to a waterbody which flows into a downstream SAC, Blackwater River (Cork/Waterford), specific details of silt management mitigation measures for this area have been detailed in the CEMP. This includes proposed locations of temporary construction stage silt management infrastructure.
- Stilling ponds with a diffuse outflow detail will be put in place in advance as construction progresses across the site. Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase. The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream.
- A water quality monitoring programme will be established to ensure that water quality is maintained throughout the construction phase. The details of this programme are outlined below. This programme will ensure that designed measures including stilling ponds are working, and existing water quality is maintained.
- Where haul roads pass close to watercourses, silt fencing will be used to protect the streams.
- Silt traps will also be provided at outfalls from roadside swales to stilling ponds.
- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the subject development will include regular monitoring of the drainage system and maintenance as required.
- Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. The excavations for turbines will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.
- Drains around hardstanding area will be shallow to minimise the disturbance of sub soil.
- The developer will ensure that erosion control, namely silt-traps, silt fencing, swales, stilling ponds and diffuse outflow areas are regularly maintained during the construction phase.
- Interceptor cut-off drains will be provided on the upslope side of the access roads to prevent the mixing of overland flows with the drainage for the proposed development. These interceptor drains will discharge diffusely over land to avoid concentration of runoff. The roadside drains will therefore only carry the site access road runoff and so avoid carrying large volumes of water and concentrating flows.
- Interceptor cut-off drains will be provided around borrow pits to divert overland flow to the nearest watercourse and prevent it from entering the borrow pits.
- Cross drains of 450 mm will be provided to prevent a risk of clogging for drainage crossings and conveying flow from agricultural drains and forestry drains under access track roads.

- Where new cross-drains are proposed on this site to convey surface water from roadside swales to stilling ponds, these will be sized at a minimum of 225 mm diameter to avoid blockages.
- Roadside swales will serve to attenuate any increase in surface water runoff.
- Silt fencing will be erected at the locations of the drain crossings for the duration of the construction period.
- All open water bodies adjacent to proposed construction areas will be protected by fencing including the proposed stilling ponds.
- Excavated subsoil material not required for in-site reinstatement will be removed to the designated material storage areas at the borrow pit locations.
- Site access tracks have been laid out to reduce longitudinal slope of roadside drains where possible. Where roadside drains are laid at slopes greater than 2%, check damns will be provided. This will reduce effective slope and runoff velocities and any consequent potential for erosion.
- Where agricultural tracks and forestry roads will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions, should it be found that debris and vegetation are impeding flows.
- Any diesel, fuel or hydraulic oils stored on site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored.
- Refueling of plant during construction will only be carried out at designated refueling station locations on site.
- Prior to leaving the site, every truck delivering concrete to the site must wash the chute only to a lined pit provided at each turbine location.
- Silt fencing will be erected at the location of stream crossings along the cable route.
- Cables will be installed in trenches adjacent to the site access roads, or laid within the access road line, where required. Trenches will be excavated during dry periods in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.
- The temporary storage of excavated material on site will be put at least 50 m from watercourses.
- Wet concrete operations are not required for this site within or adjacent to watercourses.
- Portaloos and/or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor.
- Emergency drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site. The emergency response procedure is provided in section 1.8 of SWMP.

Proposed Mitigation Measures for Installation of New Crossings

- A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the subject development will include regular monitoring of the drainage system and maintenance as required.
- All open water bodies adjacent to proposed construction areas will be protected by fencing.
- Weather warnings will be monitored, and no construction will take place during extreme events to mitigate against potential flooding.
- Excavated subsoil material not required for in-site reinstatement will be removed to the designated material storage areas at the borrow pit locations.

- Any diesel, fuel or hydraulic oils stored on site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored.
- Refueling of plant during construction will only be carried out at designated refueling station locations on site.
- Additional protection will be provided in the form of silt fencing downslope where required during construction, to further ensure that there is no impact from the development to streams and rivers downslope of the site.
- Daily visual inspections of drains and streams will be performed during the construction period to ensure suspended solids are not entering the streams and rivers alongside the work area, to identify any obstructions to channels, and to allow for appropriate maintenance of the existing roadside drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

Water Quality Monitoring Programme

Grid Cable Installation

- Weather warnings will be monitored, and no construction will take place during extreme events to mitigate against potential flooding.
- Mitigation measures will be provided where surface water flows may be temporarily prevented from reaching gullies during trench excavation. Mitigation measures will include the provision of temporary over ground surface water channels using sand bagging for example to divert flows to downstream gullies.
- Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.
- Any excavated material will be used in the reinstatement of the cable trenches subject to approval. Surplus material will be removed from the site to an appropriate licenced facility. There will be no stockpiling of excavated material. For trenching within the domain of public roads, approved fill material will be imported.
- All excavated soil material will be managed on site in accordance with the CEMP.
- Silt fencing will be provided around any exposed areas to prevent the ingress of suspended solids into adjacent watercourses. These mitigation measures will prevent surface water contamination and will prevent subsequent flows of contaminated water into watercourses.
- Additional protection will be provided in the form of silt fencing downslope where required during construction, to further ensure that there is no impact from the development to streams and rivers downslope of the site.
- Daily visual inspections of drains and streams will be performed during the construction period to ensure suspended solids are not entering the streams and rivers alongside the work area, to identify any obstructions to channels, and to allow for appropriate maintenance of the existing roadside drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

Horizontal Directional Drilling (HDD)

- An Environmental Engineer with a “stop work” authority will be engaged to monitor the construction phase of the development when the water crossing is being undertaken.
- The working area around the bridge/culvert crossings will be fenced off prior to the commencement of works to avoid damage to bankside habitat
- Watercourses will be visually inspected
- Should increase levels of siltation be recorded within the watercourses during the course of the construction phase, the environmental auditor will seek to halt construction works until the source of the pressure can be found and remediated
- Surplus material will be removed from the site to an appropriate facility. There will be no stockpiling of excavated material. A setback distance of at least 20 m from watercourses will be adhered to when storing temporary spoil
- Prior to any works taking place near water courses the Inland Fisheries Ireland will be consulted
- Construction works onsite will be timed to occur outside periods where heavy rainfall would be expected
- Silt traps will be regularly maintained during the construction phase. All personnel working onsite will be trained in pollution incident control response.
- Appropriate signage will be placed along the proposed route outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall is required, and the contractor is required to prepare a contingency plan for before and after such events
- Visual inspection to take place at all times along the bore path of the alignment.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- No refuelling will take place within 50m of the stream zone or any sensitive habitats.
- During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid will be used

Tree Felling

Tree felling will be undertaken prior to the construction of site access tracks and hardstanding areas. The area of proposed felling is small relative to the overall area and is expected to develop a vegetation ground cover relatively quickly on areas which are not built upon.

Thus, no significant increase in the rate of runoff is anticipated as a result of felling nor is there a risk of downstream flooding or sedimentation due to increased erosion.

Tree felling will be the subject of a felling license from the Forest Service and to the conditions of such a license. A Limited Felling License will be in place prior to works commencing on site. To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Trees will be felled away from aquatic zones where possible. Brash mats will be used as necessary on any off-road harvesting routes, removed and replenished if they become worn. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible.

Mitigation Measures for Installation of Meteorological Mast

- Drainage infrastructure shall be put in place prior to commence of works. Dirty water from roads will be drained to swales which will be connected to settlement pond with a diffused outfall.
- There will be small usage of concrete for foundations and anchoring. No batching of wet-cement products will occur on sit. Ready-mixed supply of wet concrete product and where possible, emplacement of pre-cast elements, will take place.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site.

  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. Plastic covers will be ready in case of sudden rainfall event.

Operation and Maintenance Phase

There is deemed to be insignificant impacts on the hydrology and the water quality during the operational phase. The maintenance regime will include inspecting the following:

- Drains, cross-drains and culverts for any blockages
- Outfalls to existing field drains and watercourses
- Existing roadside swales for any obstructions
- Swales
- Progress of the re-establishment of vegetation.

Decommissioning Stage

In the event of decommissioning of the Coom Green Energy Park, the access tracks may be used in the decommissioning process. Mitigation measures applied during decommissioning activities will be similar to those applied during construction but will be of reduced magnitude.

It is proposed that turbine foundations and hardstanding area should be left in place and covered with local soil/topsoil at decommissioning stage. It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing them.

The grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur. Hence no mitigation measures are required.

Mitigation measures for Flooding

The proposed access track between turbines T9 and T13 will cross an area identified in the OPW PFRA mapping as an indicative floodplain and therefore have the potential to obstruct flood flows. This impact will be avoided by design as follows; any stream crossings will be conveyed in culverts, sized to take the 1 in 100-year flood flow with a 20% allowance for climate change plus freeboard.

No construction personnel, operation or maintenance personnel will be permitted on this area of the site during extreme flood events.

Landowners will carry on their normal activities in the vicinity of the development and will take the usual precautionary measures as far as practicable during flood events. Emergency operations during a flood event are not envisaged on the development.

The Flood Risk Assessment for Coom Green Energy Park concludes that the proposed development does not increase the flood risk.

6 TRAFFIC AND TRANSPORTATION

Construction:

Traffic Management Plan

A detailed traffic management plan (TMP) has been submitted with the EIAR in Appendix 3-2. This shall be developed further at construction stage by the main Contractor and in consultation with the roads authority and An Garda Siochána prior to commencing construction. The TMP will include the following:

- **Road Condition Survey**: a pre-condition survey will be carried out on all public roads that will be used in connection with the development to record the condition of the public roads in advance of construction commencing. A post-construction survey will also be carried out after the works are completed. The specification and timing of the surveys will be agreed with the roads authority. Joint surveys shall be completed if the roads authority requests.
- **Road Reinstatement**: All roads will be reinstated expeditiously on completion of the construction works. Roads will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.
- **Site Inductions**: All workers will receive a comprehensive site induction which will include a section on traffic management and clear guidance on the routes to be used/not used to access the site.
- **24-Hour Emergency Contact**: a 24-hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for grid connection) and the site entrance for the wind farm site.
- **Traffic Management Guidance**: all necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual published by the Department of Transport.
- **Letter Drops**: a letter drop will be carried out to notify members of the public living near the proposed site and cable route to advise them of any particular upcoming traffic related matters e.g. temporary lane/road closure or delivery of turbine components.
- **Signage**: Clear signage relating to the development, both temporary and permanent, will be provided for accessing the site.
- **Road Sweeper**: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. If necessary, a road sweeper will be used to maintain the public roads in a clean condition during the construction activities of the project.
- **Site Entrances**: The entrances to the site will be secured when the site is not in use. When necessary a flagman will be used to assist traffic movements at the site entrance or in other areas as required.
- **Temporary Road Crossing Point**: Where the internal wind farm access track crosses the local road L-69650 between Bottlehill and Mullenaboree, this junction will be managed appropriately to allow safe passage of constriction vehicles in and out of the junction. Priority at this junction will be maintained for public traffic. This crossing point will be secured when not in use.
- **Abnormal Load Deliveries:** Abnormal loads will require an abnormal load permit prior to delivery and will be delivered at times and frequencies directed by An Garda Siochána.

Grid Connection Works

- **Road Opening Licence**: The road works associated with the grid connection cabling will be completed in line with the requirements of a road opening licence as agreed with the local authority.
- **Route Proofing**: In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed. This will include slit trenching with the aim of minimising the construction impacts and avoiding existing services in the road.
- **Maintaining Local Access**: reasonable access to local houses, farms and businesses will be maintained at all times during any road closures associated with the grid connection works. The details of this will be agreed with the roads authority in advance of the grid connection works commencing.
- **Road Cleanliness**: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. Road sweeping vehicles will be used if necessary, to ensure that the public road network remains clean.
- **Temporary Trench Reinstatement**: Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority.
- **Surface Overlay after Trench Reinstatement**: following temporary reinstatement of trenches on public roads, sections of the public roads will receive a full surface overlay. Details to be agreed with the roads authority At a minimum they will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.
- **Haul Route Interface**: aggregate imported to the wind farm site from local quarries will be managed to ensure they do not conflict with the grid connection works. Grid connection works will be planned to avoid conflicts with other major activities on the main construction site such as concrete foundation pours and large component deliveries. It is recommended that measures contained within the construction stage TMP shall be agreed with Coillte forestry operators in advance of the works to ensure no conflicts occur between felling and construction operations.

On the local road from Knockacullata to Knoppoge, it is anticipated that grid cable installation will involve short rolling temporary road closures over approximately 7km. A diversion route will be used via the Knockacullata to Slumberhill Road. Roadworks along this section will impact on road users and will lead to slightly increased journey times for the duration of the roadworks.

Horizontal directional drilling operations will be required at a number of locations along the grid connection route between Knockacullata and Barrymore. These activities are isolated and carried out in under a day at each location. It is expected that a temporary road closure will be required for 2 no. of these locations where the cable will cross existing watercourses by this method.

Where the grid connection route crosses the M8 motorway, horizontal directional drilling (HDD) will be used. The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage, foundations or surface of the motorway. Detailed descriptions of HDD construction methodologies are contained in Chapter 3 of the EIAR and the CEMP.

The existing structures will be protected, and adequate separation will be maintained from and under the existing structures. Traffic management and licensing will be required to install these ducts which will likely take place during one mobilisation ahead of the grid trenching work.

Traffic management for HDD operations shall be carried out in accordance with the TMP submitted with the EIAR.

Turbine Component Delivery

The turbine delivery route has been assessed using a detailed appraisal of potential routes and the identification of the most appropriate route including the required accommodation works along the route to mitigate the impact of the turbine delivery. The impact of the deliveries on traffic is mitigated by delivering components during off-peak or night-time deliveries.

- **Programme of Deliveries:** a programme of deliveries will be submitted to the roads authority in advance of deliveries of turbine components to the site. The programme will include details of the dates and times of each component delivery along with the route to be taken.
- Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company.
- **Garda Escort:** Turbine deliveries will be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.
- **Reinstatement:** Any area affected by the works to facilitate turbine delivery will be fully reinstated to its original condition unless agreed otherwise.
- **Consultation:** Consultation with the local residents and Cork County Council will be included in the traffic management plan to manage turbine component deliveries.

Felling

Measures contained within the construction stage CEMP and TMP shall be agreed with Coillte forestry operators in advance of the works to ensure no conflicts occur

Permanent Met Masts

Construction works associated with met mast installations shall be subject to the same traffic management requirements as the wind farm construction.

Operational Phase

It is considered that no further mitigation measures are necessary for the operational stage of the development.

Decommissioning Phase

- All decommissioning works are to be carried out in accordance with a decommissioning plan to be agreed with the planning authority in advance of the works. Traffic management measures identified will be included in the decommissioning plan for the wind farm.
- Infrastructure associated with the grid connection will form part of the national transmission network and will be left in-situ. Therefore, no impacts are envisaged upon decommissioning of the wind farm development and no mitigation is required.
- Traffic and transportation impact mitigation for decommissioning of the energy park will be the same as those identified here and in the TMP in Appendix 3-4 for construction stage works and will be tailored to suit the existing environment conditions of the day and technology available.

7 ARCHAEOLOGY, ARCHITECHTURAL AND CULTURAL HERITAGE

Energy Park

The extensive forestry plantation that dominates the lands within the proposed energy park will preclude advance archaeological site investigations such as geophysical survey and test trenching. A systematic advance programme of archaeological site inspections will be undertaken within all development areas following pre-construction tree felling to assess whether there are any surface traces of any potential unrecorded archaeological or architectural heritage sites within the forestry plantations. Archaeological monitoring of ground excavation works during the construction phase will then be carried out under licence by the National Monument Service. In the event that any archaeological sites are identified during these site investigations they will be recorded and cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation by avoidance or preservation by record through a systematic archaeological excavation.

The operational phase of the proposed energy park will result in a slight, indirect, long term, negative impact on the setting of Island wedge tomb, a National Monument in State Guardianship (ref. 502) located 2.3km from the proposed energy park. A number of slight to moderate visual impacts on other cultural heritage receptors within the wider region have also been identified by the Landscape and Visual Impact Assessment consultants following consultation with the Archaeologist and these are presented in Chapter 15 of the EIAR, Landscape and Visual. No mitigation measures have been identified which will ameliorate these visual impacts but they will be reversible during the decommissioning phase.

Grid Connection

A programme of licensed archaeological monitoring of all ground excavation works within the section of road to the west of the recorded location of the levelled Enclosure (CO035-042----) in Glanakip townland and within green field areas at joint bay locations will be undertaken during the construction phase. Trenching works within the road material over the masonry bridges along the route will also be subject to archaeological monitoring. An archaeological watching brief of ground excavation works will be maintained for the remainder of the grid connection route and the extent of this supervision will be agreed in advance with the National Monuments Service as part of the licence application process.

Turbine Delivery Route

The delivery of turbines to the proposed energy park will require localised widening works in green field road margins that will include ground excavations that may reveal unrecorded, sub-surface archaeological features and works in such locations will be subject to archaeological monitoring. These works will not result in any interventions to any structures of architectural heritage significance and there are, therefore, no mitigation measures required for this element of the cultural heritage resource.

Monitoring of mitigation measures

There are a number of obligatory processes to be undertaken as part of archaeological licence applications and these will allow for monitoring of the successful implementation of the archaeological mitigation measures. Method statements detailing the proposed strategy for all site investigations will submitted for approval to the National Monuments Service as part of the licence application. These will clearly outline the proposed extent of works and outline the onsite and consultation processes to be enacted in the event that any unrecorded archaeological sites or features are identified. A report will be compiled on all site investigations which will clearly present the results in written, drawn and photographic formats and copies will be submitted to the National Monuments Service, the Planning Authority and the National Museum of Ireland.

8 LANDSCAPE AND VISUAL IMPACT

Mitigation by Avoidance and Design:

During the early design stages of the proposed Coom Green Energy Park, key landscape and visual constraints were identified. In terms of macro level design consideration, the most sensitive of these were deemed to be the Black Water Valley, for reasons of both landscape character and scenic designations as well as Blarney Castle and associated demesne because of its tourism, heritage and amenity value.

Reverse ZTV maps were prepared from several scenic designations within the Blackwater Valley and the top of Blarney Castle. Unlike standard ZTV maps, reverse ZTV maps can identify areas within the site in which turbines can be placed so as not to be visible from a particular location, or visible to a particular degree (i.e. hub height and above). From an early iteration of the wind farm design, Reverse ZTV from key Blackwater Valley viewpoints showed visibility of nine turbines, being those closest to the Nagles ridgeline.

Whilst it was not considered feasible or necessary to remove turbines from all sections of the site with potential visibility from the Blackwater Valley, the design was substantially altered to remove many of the relevant turbines from view and limit the visual exposure of those remaining turbines so as to minimise landscape and visual impacts on the Blackwater Valley. The result is a much-reduced lateral extent of development along the Nagles ridgeline and the view of only partial blades sets of up to 3-4 turbines above the forested ridge, but not including from sections of designated scenic route within the valley where either no turbine visibility remains or the partial view of one turbine at nearly 8 km.

The reverse ZTV map prepared in respect of Blarney Castle indicated that several of the Bottle Hill turbines would be potentially visible from this receptor.

However, the context of the visibility was barely noticeable blade tips amongst trees and buildings that line an intervening ridge above Blarney Village at viewing distances in excess of 18km. Thus, it was not considered necessary to alter the design of the wind farm to avoid what is a very minor impact from this receptor.

Buffering of Residential Receptors:

For the proposed Coom Green Energy Park, the minimum distance of any turbine from the nearest residential receptor is 750m, which is in excess of the current Wind Energy Development Guidelines (2006) recommended distance of 500m. It is also in excess of the recently published Draft Revised Wind Energy Guidelines (2019), which indicates a 4 X tip height buffer distance; up to 676m distance from residential receptors in this instance. As no neighbouring dwellings fall within 750m of nearest turbines for the proposed development the setback is 50% greater than the requirement for the current Guidelines. Furthermore, the residential amenity setback for the Draft Revised Guidelines is also complied with (minimum setback 676m from 169m tip height turbines), which also gives a considerable buffer to account for 'curtilage' of dwellings, as specified by the Draft Revised Guidelines.

Variation in residential buffer distances within the nearest kilometre has a much more noticeable effect on perceived turbine scale than when it occurs in the context of more distant views. This is due to the law of perspective – that doubling the distance to an object halves its perceived height. The reduction factor is even more pronounced when considered in the context of the 'swept area' of turbine blades and not just their tip height.

9 HUMAN BEINGS, POPUALTION AND HUMAN HEALTH & MATERIAL ASSETS

Population

As there will be no significant impact on population trends, density, household size or age structure, no mitigation measures are required.

Socio-economics, Employment and Economic Activity

Given that the potential impacts of the proposed development at construction, operation and decommissioning phases are predominantly positive in respect of socio-economics, employment and economic activity, no other mitigation measures are considered necessary.

Land Use

The proposed development will alter the land use of undeveloped land where proposed works will take place. Mitigation measures for land use are primarily related to preliminary design stage, which has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations to occur. The construction footprint has been kept to the minimum necessary to avoid impact on existing land uses in so far as possible.

Existing forestry and agricultural tracks have been incorporated into the design in order to minimise the construction of new tracks and roads and minimise the removal of forested areas. Where new access tacks are required, these have been sensitively designed in order to minimise impact on forestry and agricultural lands.

Electricity cables will be installed underground to avoid impact on agricultural and forestry practices. The grid connection cable, is to be installed along forestry tracks and the public road. Once the cable is laid, the sections of forestry track and public road will be reinstated. Upon decommissioning, the cable will remain in situ and form part of the national grid, thus avoiding further excavation.

The construction and decommissioning works will be planned and controlled by a Construction and Environmental Management Plan, which will provide details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which may impact on their properties or agricultural practices. This will be communicated to members of the public through a community liaison officer. Prior to the grid connection installation works within public roads, it is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions, to maintain local access as much as possible and avoid impacts on various land uses. All proposed works and deliveries along the TDR route will also be controlled by a Construction and Environmental Management Plan to avoid undue impact to adjacent land uses.

As it is proposed to fell approximately 62.8ha of coniferous forestry for the proposed CGEP development, replant lands of the same area are required. Potential replanting sites have been identified at Moneygorm, Co. Cork and Ballard, Co. Wicklow. This will mitigate against loss of forestry land use.

Recreation, Amenity and Tourism

Mitigation measures for recreation, amenity and tourism are primarily related to the preliminary design stage of the CGEP, which has allowed for the prevention of unnecessary or inappropriate development to occur that would significantly affect any recreational or tourist amenity. In designing the CGEP, careful consideration was given to the potential impact the proposed turbines may have on high value landscape located to the north of the Nagle Mountains along the Blackwater Valley. As such, the design removed major views of the development from this high value landscape, which includes designated scenic routes and tourism and heritage sites, in order to protect its high value amenity. The magnitude of visual impact on the Blackwater Valley is considered to be low.

The area's potential for tourism and amenity was identified as trail walking and hiking. The development of the proposed CGEP has the potential to increase the amenity value of the area by making the area more accessible to recreational users than at present, providing both new and improved tracks in and around the site which can be used for walking and hiking. This provision is in keeping with the character of recreational activities popular in the area.

In providing for public safety, appropriate signage and safety measures will be put in place where forestry tracks will be closed to the public due to construction and decommissioning activities.

Human Health

Health and Safety Mitigation Measures – Construction & Decommissioning

To maintain safety and avoid health impacts on construction workers and the general public, best practice site safety and environmental management will be maintained. The proposed development will be designed, constructed, operated and decommissioned in accordance with the following:

- Safety, Health & Welfare at Work (Construction) Regulations 2013
- Safety, Health & Welfare at Work Act 2005
- Safety, Health & Welfare at Work (General Applications) Regulations 2007

All construction staff will be adequately trained in health and safety and will be informed and aware of potential hazards. Furthermore, a Construction and Environmental Management Plan will be circulated to all construction workers which will detail safety protocol and methodology. Furthermore, site investigation has been completed and mitigation has been proposed as detailed in Chapter 9: Lands, Soils and Geology and Chapter 10: Hydrology and Water Quality.

A site-specific Safety and Health Management Plan has been prepared for the project in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 and is included in the CEMP in Appendix 3.2 of Volume 3 of this EIAR. The Safety and Health Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works. Similarly, a site-specific Safety and Health Management Plan will be prepared for the decommissioning works.

All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established.

The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project.

FÁS Safe Pass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required.

The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety & Health Management Plan.

Up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site precautions will be taken to reduce the spread of COVID-19 on construction sites if COVID-19 remains a significant health issue during the construction phase.

Once mitigation measures and health and safety measures are followed, the potential for impact on human health on the construction site during construction and decommissioning is expected to be non-significant and temporary.

Public safety will be addressed by restricting access to the public in the vicinity of the site works during the construction stage. Appropriate warning signs will be posted at the construction site, directing all visitors to the site manager. Appropriate signage will be provided on public roads approaching site entrances and along haul routes. Extra safety measures will be employed when large loads are being transported, for instance, Garda escort will be requested for turbine delivery and a comprehensive turbine delivery plan will be utilised to avoid potential impact to human safety for road users and pedestrians.

For the installation of the grid connection cable in the public road, a detailed traffic management plan will be developed in discussion with locals who will be directly impacted by the works and the local authority. Public consultation will be conducted along the grid cable route to inform local residents ahead of construction works.

Appropriate safety measures, traffic management, signage and communication with the public will be utilized to maintain safety and mitigate against potential danger. A traffic and transport assessment has been completed and is detailed in Chapter 13: Traffic and Transportation.

Once mitigation measures and health and safety measures are followed, the potential for impact on human health for members of the public during construction and decommissioning of the proposed project is expected to be not significant and temporary.

Human Health and Safety Mitigation Measures - Operational

For operation and maintenance staff working at the proposed wind farm, appropriate site safety measures will be utilised during the operational phase by all permitted employees. All personnel undertaking works in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.

Access to Coillte lands will remain open during the operational phase, however, access to the towers and the substation compound will not be restricted to approved and appropriately trained personnel.

The substation and battery storage area will be enclosed by palisade fencing and will be remotely monitored and equipped with intruder and fire alarms, in line with ESB and EirGrid standards.

Adequate clearance of structures from overhead lines will be provided. All on-site electrical connections are carried by underground cable and will be marked out above ground where they extend beyond the track or hardstanding surface. Details of cables installed in the public road will be available from ESBN.

Lightning conductors will be installed on each turbine as all structures standing tall in the sky require this protection. Turbines specifically require this to prevent power surges to electrical components.

Turbines will be fitted with ice detection systems which will stop the turbine from rotating if ice is forming on a turbine blade. This aims to prevent ice throw which can cause injury.

Human Health Mitigation Measures – Operational

Rigorous statutory and engineering safety checks imposed on the turbines during design, construction, commissioning and operation will ensure the risks posed to humans are negligible. 24-hour remote monitoring and fault notifications are included as standard in the Turbine Operations and Maintenance Contracts. In addition to scheduled maintenance, the maintenance contracts will allow for call out of local engineers to resolve any issues as soon as they are picked up on the remote monitoring system.

All maintenance work will only be carried out by people with the appropriate training and qualifications for the task at hand. All maintenance and operations work will be carried out in accordance with the relevant health and safety legislation with the appropriate planning and preparation.

Regular visual inspections and testing of battery system equipment shall be incorporated into the project's operation and maintenance schedule as per the battery storage manufacturers' requirements.

Fire safety measures and equipment in the battery storage facility shall be kept in effective working order. This includes all fixtures and fittings such as fire doors, fire detection and alarm systems, fire-fighting equipment, notices and emergency lighting. Regular checks, periodic servicing and maintenance shall be carried out. Any defects will be put right as quickly as possible.

A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of fire-fighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.

Shadow flicker detection systems will be installed on all turbines in order to achieve zero shadow flicker on nearby receptors. This is further detailed in Chapter 12: Shadow Flicker.

In certain wind conditions, turbines will run at reduced modes of operation in order to maintain appropriate daytime and night-time noise levels so as not to impact on residential amenity, as required. Details of these measures are set out in Chapter 7: Noise and Vibration.

The wind farm system shall include a kill switch that can be operated at any time with an overriding manual shutdown system in case of an emergency.

In line with the Health Service Executive's Emergency Planning recommendations, any incident which may occur at the site which requires emergency services, incident information will be provided in the 'ETHANE' format.

- Exact location
- Type of incident
- Hazards
- Access and egress
- Number of casualties (if any) and condition
- Emergency services present and required

The design of the proposed wind farm has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding with the use of swales as described in Chapter 10 – Hydrology and Water Quality. Coillte fire plans are reviewed and updated on a regular basis.

Renewable, Non-Renewable Resources and Utility Infrastructure

Existing services along the proposed cable route have been predicted through a desktop study and will be confirmed in the pre-construction surveys prior to construction. This will minimise the impact in terms of disruption or damage to existing utilities. It is not intended to divert existing services but instead, where possible, the cable will be laid above or below existing services. Communication with service providers will be maintained for the duration of the construction works where required.

Non-renewable resources of stone and fill will be sourced locally and will be excavated from on-site borrow pits insofar as possible to minimise transportation distances, reducing CO^2 emissions.

The 62.8 hectares of forestry which will be felled at the CGEP site will be replanted at alternative lands under a felling licence.

To manage potential impact to roads infrastructure, a Turbine Delivery Report has been prepared and is included in Appendix 13.2.

10 SHADOW FLICKER

Shadow flicker control modules, consisting of light sensors and specialised software, will be installed on the turbines to prevent operation during periods when shadow flicker may occur. The calculated shadow flicker periods can be input into the turbine control software and when the correct conditions are met i.e. the light intensity is sufficient and during a potential period of shadow flicker, individual turbines will cease operation until the conditions for shadow flicker are no longer present. This method of mitigation can be used to fully mitigate all shadow flicker effects resulting in zero shadow flicker. These are standard widely accepted control modules that are installed in most wind turbines.

Appendix 12.2 contains all calculated potential shadow flicker periods for each turbine, which will be input into the turbine control software. When a sufficient light intensity is measured during any of these periods, the corresponding turbine will be shut down if required to ensure zero hours of shadow flicker from CGEP.

11 TELECOMMUNICATIONS AND AVIATION

Telecommunications

Sections 5.10 of the Department of Environment Heritage and Local Government (DoEHLG) Planning Guidelines on Wind Energy Developments (2006) acknowledge that "electromagnetic interference can be overcome." There are a number of mitigation options that can be explored to overcome any residual impacts. The following link mitigation measures will be implemented as necessary to overcome electromagnetic interference:

- **Technology Upgrade:** Replacement of the existing telecommunications service equipment with another less affected type
- **Diverting telecommunications links -** The possibility of diverting telecommunication links to another telecommunications tower in the vicinity can be investigated.
- **Relocation of telecommunications equipment -** The possibility of moving telecommunication equipment to another telecommunications tower in the vicinity can be investigated.
- **Wind Turbine Tower –** To mitigate interference the turbine tower could be utilised as a transmitter/receiver (hop point).
.
- **Relay Base Station** – a relay base station can be deployed at a suitable location in the vicinity of the proposed development that would provide additional coverage to impacted service subscribers from an existing primary transmitter in the area.
- **Combination –** The possibility of providing a mix of the above or an alternative could be explored.

The proposed grid connection will be left in situ underground within the public roadway. There are no telecommunications related mitigation measures proposed.

Television and Radio Reception

Consultation with RTE indicates that there will be no impact to any of their microwave telecoms links but there is potential of interference with TV reception. Mitigation of this potential interference could require some remedial measures in relation to television reception. In practice, such measures are not difficult to implement, are relatively inexpensive and if necessary, will be undertaken by the developer in conjunction with 2rn/RTÉ.

A 2rn Protocol Agreement has been signed by the applicant and 2rn in relation to interference on viewers television sets and broadcast radio receivers. This protocol has been included in Appendix 16.2. The measures to be undertaken, as per the protocol agreement include:

- If a problem is identified by a customer, 2RN will undertake a preliminary assessment and if it is wind farm related, the developer will be notified and a local dealer will visit the viewer.
- Where reception interference affects a number of viewers in the same vicinity, it will be necessary for 2RN to develop an alternative or additional transposer site.

- Where 2RN detects interference with the reception of a receive and/or transmission signal at a transposer site, 2RN will investigate and determine if this is attributable in whole or in part to the development.
- The developer shall be entitled to retain its own engineer to inspect and report on the source of interference.
- Engineers representing 2RN and the developer will agree on remedial works and cost of same.

In the event that an additional or alternative installation is required, 2RN will identify a new location and the developer will be responsible for all costs associated with the development of the new installation.

The proposed grid connection will be left in situ underground within the public roadway. There are no television or radio reception related mitigation measures proposed.

Aviation

Whilst the proposed development will not impede aircraft flying the test trajectories it would nevertheless be prudent to ensure that pilots of test aircraft are fully aware of the presence of wind turbines, and any associated anemometry masts, before undertaking any test flights. The following mitigation measures are therefore recommended:

- All turbines and meteorological masts having a height of 100m or more are promulgated in the Irish Air Navigation Obstacle database
- The extremities of the wind farm are lit
- Meteorological masts are lit
- Locations of meteorological masts having a height of less than 100m are promulgated to the pilots of test aircraft
- Test aircraft are fitted with Terrain Awareness and Warning System (TAWS)
- Test aircraft TAWS obstacle databases are regularly updated.

The proposed grid connection will be left in situ underground within the public roadway. There are no aviation related mitigation measures proposed.

FEHILY TIMONEY
30 YEARS

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 3.3

Environmental Assessment of Replant Lands at Moneygorm and Ballard

FEHILY TIMONEY
30 YEARS

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

COOM GREEN ENERGY PARK

ENVIRONMENTAL ASSESSMENT OF REPLANT LANDS AT MONEYGORM AND BALLARD

Prepared for: Coom Green Energy Park Limited

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TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 Background to the Report 1
1.2 Proposed Replanting Land 1
1.2.1 Moneygorm, Co. Cork 1
1.2.2 Ballard, Co. Wicklow 2

2. REPLANTING REQUIREMENTS AND LANDS 3

2.1 Replanting Requirements 3
2.2 Proposed Afforestation Techniques 3
2.2.1 Moneygorm 5
2.2.2 Ballard 6

3. RELEVANT POLICIES AND GUIDELINES 7

3.1 Relevant National Policy 7
3.1.1 Forests, Products and People: Ireland's Forest Policy – A Renewed Vision (2014) 7
3.1.2 Forestry Programme 2014-2020 7
3.1.3 Climate Action Plan 2019 8
3.2 Relevant Regional Policy 8
3.2.1 Regional Planning Guidelines for the South West 2010 - 2022 8
3.2.2 Regional Planning Guidelines for the Greater Dublin Area 2010 - 2022 8
3.3 Relevant County and Local Policies 9
3.3.1 Cork County Development Plan: 2014-2020 9
3.3.2 Development Plan for the Greater Dublin Area 2010 – 2022 9
3.4 Relevant National Guidelines 9
3.4.1 Forest Service Guidelines 9

4. IMPACT ASSESSMENT METHODOLOGY 14

5. ASSESSMENT OF LANDS 15

5.1 Biodiversity 15
5.1.1 Brief Description of Existing Site 16
5.1.2 Contributors to the Report 19
5.1.3 Methodology 19
5.1.4 Existing Environment 29

5.1.5 Potential Effects 65
5.1.6 General Mitigation Measures – Both Sites 76
5.1.7 Residual effect 79
5.1.8 Conclusion 80
5.1.9 REFERENCES 81
5.2 Hydrology and Water Quality 84
5.2.1 Moneygrom, Co. Cork 84
5.2.2 Ballard, Co. Wicklow 85
5.3 Population, Human Health and Material Assets 87
5.3.1 Moneygorm, Co. Cork 87
5.3.2 Ballard, Co. Wicklow 89
5.4 Geology and Soils 90
5.4.1 Desk Study 90
5.4.2 Methodology 91
5.4.3 Existing Environment 95
5.4.4 Potential Effects 97
5.4.5 Mitigation Measures 98
5.4.6 Residual effect 98
5.4.7 Conclusion 98
5.5 Archaeology 98
5.5.1 Moneygorm 99
5.5.2 Ballard 100
5.6 Landscape and Visual Impact 103
5.6.1 Potential Impacts 103
5.6.2 Mitigation Measures 104
5.6.3 Residual impacts 104

LIST OF APPENDICES

Appendix 1: Technical approval for Afforestation
Appendix 2: Forestry & Water Quality Guidelines.

LIST OF FIGURES

Page

Figure 2-1: Standard forestry Drainage (Forestry Schemes Manual) 5
Figure 3-1: Site Location - Moneygorm 12
Figure 3-2: Site Location - Ballard 13
Figure 5-1: European sites within 15km of Replant Lands at Moneygorm, Co. Cork 42
Figure 5-2: Nationally designated sites within 10km of Replant Lands at Moneygorm, Co. Cork 43
Figure 5-3: Fish stock length distribution recorded via electro-fishing at site B15 on the River Bride at Old Bridge, July 2020 46
Figure 5-4: Habitats at replant lands, Moneygorm, Co. Cork 51
Figure 5-5: European sites within 15km of Replant Lands at Ballard, Co. Wicklow 53
Figure 5-6: Nationally designated sites within 10km of Replant Lands at Ballard, Co. Wicklow 54
Figure 5-7: Habitats at replant lands, Ballard, Co. Wicklow 64
Figure 5-8: Important habitat exclusion areas. 75
Figure 5-9 Extract from Archaeological Survey of Ireland aerial image showing Zone of Notification around Enclosure WI034-006 as shaded area 101
Figure 5-10: Extract from 6-inch OS map showing replant boundary as blue line 101

LIST OF PLATES

Plate 5-1: Overview of the existing landscape in the proposed fields (fox cub in the middle-ground) 17
Plate 5-2: Displaying the array of habitats within the western block of the proposed replant lands site 18
Plate 5-3: Displaying the array of habitats within the eastern block of the proposed replant lands site 18
Plate 5-4: Adult brown trout and Atlantic salmon parr recorded from site B15 on the River Bride at Old Bridge, July 2020 46

LIST OF TABLES

		Page
Table 1-1:	Proposed Replant Lands and Replant Areas	2
Table 5-1:	Survey Details	22
Table 5-2:	Ecological Resource Evaluation Criteria (from NRA, 2009)	24
Table 5-3:	Probability of Effects (EPA, August 2017)	27
Table 5-4:	Quality of Effects (EPA, August 2017)	27
Table 5-5:	Significance of Effects (EPA, August 2017)	27
Table 5-6:	Duration of Effects (EPA, August 2017)	28
Table 5-7:	Types of Effects (EPA, August 2017)	28
Table 5-8:	Definition of Terms – Source, Pathway, Receptor (EPA, August 2017)	29
Table 5-9:	National Sites Within 10km	30
Table 5-10:	Rare or Protected Flora (NBDC)	31
Table 5-11:	Rare or Protected Mammals recorded within 10km grid squares (W69, W79)	35
Table 5-12:	Records of rare and protected birds within 10km grid squares W79 and W69	37
Table 5-13:	Records of rare and protected other species within 10km grid squares W79 and W69	40
Table 5-14:	Invasive Species records within 10km (NBDC)	41
Table 5-15:	Fish species densities per m^2 recorded at sites in the vicinity of Moneygorm replant lands via electro-fishing in July 2020. Lamprey numbers are presented per $1m^2$ targeted quadrat unless otherwise stated	47
Table 5-16:	Life Cycle Unit scores for sites surveyed in the vicinity of the proposed Moneygorm replant lands, July 2020	47
Table 5-17:	Lamprey Habitat Quality Index (LHQI) scores for sites surveyed in the vicinity of the proposed Moneygorm replant lands, July 2020	47
Table 5-18:	Evaluation of Habitats	48
Table 5-19:	Evaluation of Species	49
Table 5-20:	National Sites Within 10km	52
Table 5-21:	Rare or Protected Flora at T18 (NBDC)	55
Table 5-22:	Potential Bat Roost detail	59
Table 5-23:	Evaluation of habitats	60
Table 5-24:	Evaluation of fauna, birds, flora and other species	61
Table 5-26:	Population of Carrig Electoral Division	87
Table 5-27:	General Health of Carrig Electoral Division (Census 2016)	88
Table 5-28:	Population of Ballinaclash Electoral Division	89
Table 5-29:	General Health of Clogher Electoral Division (Census 2016)	89
Table 5-30:	Criteria rating Site Importance of Geological Features (NRA, 2009)	91
Table 5-31:	Criteria rating Site Importance of Hydrogeological Features (NRA, 2009)	92
Table 5-32:	Estimation of Magnitude of Impact on Geological Features (NRA, 2009)	93
Table 5-33:	Estimation of Magnitude of Impact on Hydrogeological Features (NRA, 2009)	94
Table 5-34:	Ratings of Significance of Impacts for Geology/Hydrogeology (NRA, 2009)	94

1. INTRODUCTION

1.1 Background to the Report

Replacement replanting of forestry can occur in Ireland subject to licence in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by S.I. No. 191/2017 Forestry Regulations 2017 . This legislation provides for afforestation and forest road construction project's compliance with the EIA Directive as amended (Directive 2011/92/EU as amended by 2014/52/EU) insofar as it applies to forestry development.

As described in EIS Volume 2 Chapter 3 'Description of the Replant lands', Felling of approximately 64.3ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation, with a requirement of the felling licence application to replant the same area.

1.2 Proposed Replanting Land

1.2.1 Moneygorm, Co. Cork

The proposed replant lands are made up of a large (c.39.9 Ha) open expanse of Improved Agricultural Grassland (GA1) bordered by Scrub (WS1) and Grassy Verges (GS2) in the townland of Moneygorm on the southern side of Nagle's Mountains on a flat spur overlooking the Bride valley, accessed via the R614, un-named local roads, and farm/forestry access tracks.

The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the west and north-east by conifer plantations, and to the north, south and south-east by agricultural land.

The site is at an elevation of 210-230m OD. The bedrock geology is purple mudstone and sandstone of the Ballytrasna Formation; the soils are made up of fine loamy drift with siliceous stones. The surrounding land drops off on three sides and the land at the site was observed to be dry, with no associated drainage network.

The Bunaglanna watercourse is located c. 450m east of the proposed replant lands; drainage channels carrying flowing water are present: one flowing north-south along the eastern replant lands boundary which joins another channel flowing west-east from within the replant lands site exit the site to join a drainage channel flowing downhill (west-east) along the edge of the adjacent conifer plantation towards the Bunaglanna. Assessment of satellite imagery indicates this drainage channel connects with the Bunaglanna c. 565m downstream of the replant lands site.

The Bunnaglanna is a tributary of the Bride River, which it joins c. 2.5 km to the south of the replant lands site. The Bride is a tributary of the Blackwater River, flowing east from the Bunnaglanna/Bride confluence for c. 52 km before joining the Blackwater south of Villierstown in Co. Waterford.

The Bunaglanna and Bride are within the Blackwater River (Cork/Waterford) SAC (002170); the SAC boundary is c. 380m east of the replant lands site at its closest point. The in-stream distance between the replant lands and Blackwater River (Cork/Waterford) SAC is also c. 565m.

1.2.2 Ballard, Co. Wicklow

The proposed replant land is composed of 37.1 Ha, divided two large sections of approximately 24 and 13.1 Ha, of open expanse of mosaic of Scrub (WS1), Recently felled woodland (WS5) and Dry-humid acid grassland (GS3), Dense bracken (HD1), Recolonising bare ground (ED3), Hedgerow (WL1), Treeline WL2, Immature Woodland (WS2), species poor Wet Grassland (GS4), Drainage Ditches (FW4), species poor Bog Woodland (WN7), a mosaic of Immature woodland (WS2) and Scrub (WS1), and Conifer plantation (WD4), Buildings and artificial surfaces (BL3) and a mosaic of Scrub (WS1) and Recently felled woodland (WS5).

The proposed replant lands lies within the townland of Ballard. The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the west and south by conifer plantations, and to the north, by semi-natural woodland, rivers and then further to agricultural land.

The site is divided into two sections by a private road, the westerly and easterly sections and are composed of areas of c.23.7 and 12.8 Ha, respectively. Both sites are at elevations of 160-207m OD.

The bedrock geology is Sandstone and shale till (Lower Paleozoic); the soils are clayey and classed as Tills (diamictons). The surrounding gently slopes in a north-westerly direction and the land at the site was observed to be dry at higher altitudes, becoming increasingly wetter as the westerly block sloped downhill eventually ending in standing pools. The easterly block was observed as dry. Drainage throughout the site is typical of conifer plantation, with small drains every 2-3 metres typically dry, larger drains contained quantities of standing water.

Table 1-1: Proposed Replant Lands and Replant Areas

Site	County	Available Replant Area, ha
Moneygorm	Cork	c.39.9 Ha
Ballard	Wicklow	C.34 Ha

2. REPLANTING REQUIREMENTS AND LANDS

2.1 Replanting Requirements

Replacement replanting of forestry can occur in Ireland subject to licence in compliance with the Forestry Act 1946 as amended. The consent for such replanting is covered by statutory instrument (S.I.) 558 of 2010 European Communities (Forest Consent and Assessment) Regulations 2010 as amended. This legislation provides for development of afforestation and forest road construction projects which require adherence to and compliance with the Environmental Impact Directive (85/337/EEC) if the afforestation is likely to have a significant effect on the environment, insofar as it applies to forestry development

The lands assessed in this report have been granted Technical approval by the Forest Service of afforestation. To afforest any land where the area involved is greater than 0.1Ha requires the approval of the Minister under the 2010 regulations. The application for approval is known as Pre-Planting Approval-Form 1 and is subject to the following procedures:

- The application is referred to the relevant Forest Service inspector for assessment and recommendations;
- If there are any environmental considerations identified, the application is referred to the relevant external body, e.g. National Parks and Wildlife Services, National Monuments Service, Regional Fisheries Boards, Local Authorities, etc. for consideration;
- If the proposed replant lands is greater than 25 hectares, the application is referred to the relevant Local Authority;
- If the site is greater than 2.5 hectares, the application is advertised on the Department's website;
- If the site is greater than 50 hectares an Environmental Impact Assessment and planning permission are required.

The area of the proposed replant lands is not greater than 50 hectares, therefore it is not required to carry out a mandatory EIA or obtain planning permission for replanting.

2.2 Proposed Afforestation Techniques

Planting of the proposed replant lands will be carried out in accordance with the Forest Service best practice guidance. Adherence to these guidelines, described below, will minimise potential impacts on the environment.

- 'Code of Best Forest Practice – Ireland'
- 'Forestry and Water Quality Guidelines' (2000)
- 'Forestry and the Landscape Guidelines' (2000)
- 'Forestry and Archaeology Guidelines' (2000)
- 'Forestry Biodiversity Guidelines' (2000)
- 'Forestry Protection Guidelines' (2002)

- 'Forestry Harvesting and Environmental Guidelines' (2000)
- 'Environmental Requirements for Afforestation' (2016)
- 'Forestry Standards Manual' (2015)

Planting will be carried out as described in 'Forestry Schemes Manual' (Forest Service, 2011), which provides guidance in relation to cultivation, stocking, spacing, plant handling, planting dates, fertiliser application, fencing, fire, and weed control. Specific conditions set out in the Forest Service Technical Approvals for each site will also be adhered to.
Drainage systems will be developed for each site comprising collector, interceptor and cut-off drains in accordance with Forestry Schemes Manual. A description of each drain type is set out below.

Collector Drains
Collector drains collect water from mound drains, plough furrows, mole drains, etc. and discharge via sediment traps and/or an interceptor drain. Collector drains are excavated to a depth not greater than 10-15cm below the depth of mound drains. Where collector drains have to be extended into erodible material, 'mini' silt traps are placed appropriately by deepening the drains in places.

Interceptor Drains
Interceptor Drains are constructed along the edges of aquatic buffer zones, i.e. areas where forest operations are curtailed and which are managed for environmental protection and enhancement. Interceptor drains collect the discharge channels from the drainage sub-catchment and allow it to overflow into the buffer zone. In most cases, slope will allow for drainage channels to taper out or be connected to an interceptor drain rather than enter the buffer zone. However, on flat sites, or those with low slopes, it will be necessary to connect drains into the aquatic zone. This may be done only where it will not result in sediment or any pollutants entering the aquatic zone.

Cut off drains
Cut off drains are constructed immediately up slope of a site and are designed to direct water away from the site.

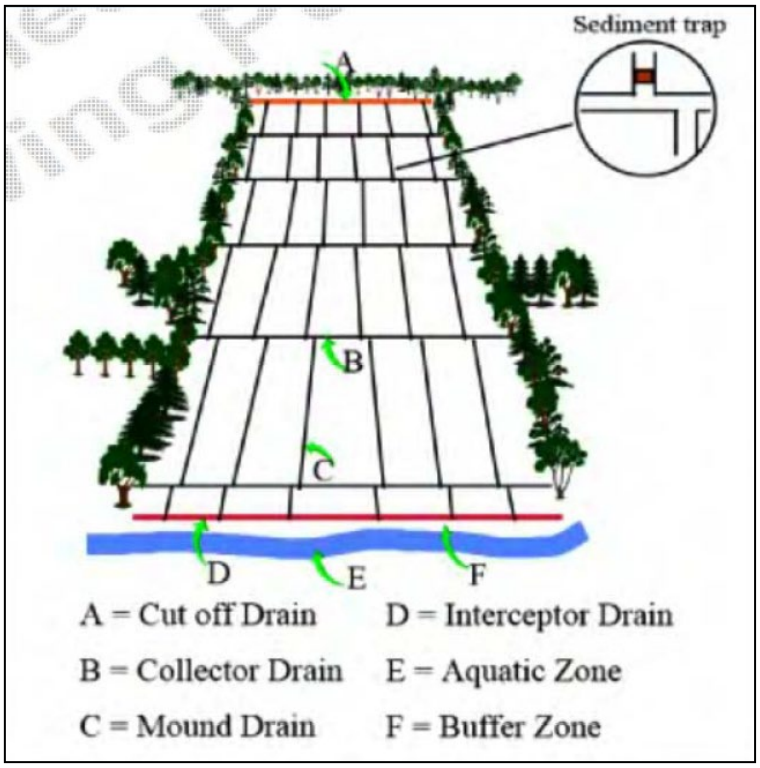


Figure 2-1: Standard forestry Drainage (Forestry Schemes Manual)

2.2.1 Moneygorm

Technical approval has been granted by the Department of Food, Agriculture and the Marine for the following planting at Moneygorm, Co. Cork (Forest Owner No: FOI35956U, Contract No: CN82229):

Tree Planting:

- Sitka Spruce (34.02 ha)
- Additional Broadleaved Species (6 ha)

Additional Details:

- Drainage
- Ground preparation: Mounding
- Planting Method: Angle Notch
- Access: Existing Track
- Fertilizer [Zero Phosphate]
- Herbicide Control (years 0 – 2)
- Manual Control (years 3 - 4)
- Upgrade existing fence to deer & sheep-proof specification.

The technical approval document (included in Appendix 1) states that all applications must be developed in accordance with detailed procedures & standards as described in the current Forestry Schemes Manual, and also requires Adherence to Forestry & Water Quality Guidelines (included in Appendix 2).

2.2.2 Ballard

Technical approval has been granted by the Department of Agriculture, Food and the Marine for the following planting at Ballard, Co. Wicklow (Forest Owner No: FO101174V, Contract No: CN77296):

Tree Planting:

- Sitka Spruce / Additional Broadleaved Species Integrated Mix (34.11 ha)
- Alder / Silver Birch Integrated Mix (1.67 ha)
- Alder (1.32 ha)

Additional Details:

- Drainage
- Ground preparation: Mounding
- Planting Method: Angle Notch
- Access: Existing Track
- Fertilizer [Zero Phosphate]
- Herbicide Control (years 0 – 2)
- Manual Control (years 3 - 4)
- Upgrade existing fence to deer & sheep-proof specification

The technical approval document (included in Appendix 1) states that all applications must be developed in accordance with detailed procedures & standards as described in the current Forestry Schemes Manual, and also requires Adherence to Forestry & Water Quality Guidelines (included in Appendix 2).

3. RELEVANT POLICIES AND GUIDELINES

3.1 Relevant National Policy

3.1.1 Forests, Products and People: Ireland's Forest Policy – A Renewed Vision (2014)

This document was published by the Department of Agriculture, Food and Marine in 2014. It contains strategic goals and recommendations of the Forest Policy Review Group.

The Strategic goal is stated as:

> "*Develop an internationally competitive and sustainable forest sector that provides a full range of economic,*
> *environmental and social benefits to society and which accords with the Forest Europe definition of sustainable development*."

It highlights the important role that forestry is playing in terms of the economy, environmental and society. Forests now account for 10.5% of the land area of Ireland with a strong forest growth rates compared to other European countries.

The importance of forests' contribution to climate change mitigation is also described in this report. Irish Kyoto-eligible forests will sequester about 4.8 million tonnes of carbon dioxide (CO_2) in 2020, representing between 40% and 60% of the target.

The afforestation policy outlined in the policy document aims to support transition to a low carbon economy and reach the demanding greenhouse gas emission reduction targets as well as reduce dependence on fossil fuels.

Some of the recommended policies and actions are:

- Expansion of the Forest Resource: To increase the forest area, in accordance with sustainable forest management (SFM) principles, in order to support a long term sustainable roundwood supply of 7 to 8 million cubic metres per annum. This policy aims to increase afforestation to 15.000 hectares annually.
- Management of the Resource: To ensure that the sustainable management of the forest resource in accordance with best practice thereby ensuring its capacity to provide the full range of timber and other benefits.
- Environment and Public Goods: To ensure that afforestation, management of existing forests and development of the forest sector are undertaken in a manner that enhances their contribution to the environment and the capacity to provide public goods and services.

3.1.2 Forestry Programme 2014-2020

This programme was finalised in January 2015 by the Forest Service, Department of Agriculture, Food and the Marine in accordance with European Union Guidelines on State aid for agriculture and forestry and in rural areas 2014 to 2020.

The measures proposed within this programme are consistent with the '*Forests, Products and People: Ireland's Forest Policy – A Renewed Vision*' report and identifies needs and measures in relation to Ireland's forest sector.

Some objectives under Measure 1: Afforestation and Creation of Woodland are:

- Increase Ireland's forest cover from 10.7% to 18% by the 2046
- Establish up to 8,290 hectares of new forests and woodlands per annum (subject to the availability of funds)
- Foster carbon sequestration and climate change mitigation.
- Provide a resource which will contribute to long-term sustainable development in the rural economy.

This measure is the most relevant to increase, on a permanent basis, Ireland's forest cover to capture carbon, produce wood resources and help mitigate emissions from agriculture.

3.1.3 Climate Action Plan 2019

One of the targets of the Climate Action Plan is to achieve 26.8 $MtCO_2eq$ abatement through LULUCF (Land Use, Land-Use Change and Forestry) actions over the period 2021 to 2030, comprising of an average of 8,000ha per annum of newly planted forest, and sustainable forest management of existing forests (providing 21$MtCO_2eq$ cumulative abatement).

3.2 Relevant Regional Policy

3.2.1 Regional Planning Guidelines for the South West 2010 - 2022

The guidelines note that the forestry sector comprises mainly small and medium sized privately owned farm based enterprises that provide a potentially viable area for diversification. The National Forest Inventory quantifies the productive forest are for the South West region as covering 112,190ha, with Kerry having in excess of 40,000 ha of forestry plantations. The cycle of planting over the past 15 years indicates that many private forestry plantations will be at or approaching maturity during the next decade. The Regional Bio-energy Plan for the South West shows that enhanced management of this resource is required.

3.2.2 Regional Planning Guidelines for the Greater Dublin Area 2010 - 2022

The Greater Dublin Area Regional Planning Guidelines confirms that plantation forestry covers less than 5% of the area and effects only a small proportion of its water resources, which are mainly in Wicklow.

"In 2007, land under forestry in Co. Wicklow amounted to 36,270 Ha or 18% of the county. This was the highest percentage cover of any county in the state, almost double the national average of 10%. The amount of land under forestry cover was already ahead of the national target objective of 17% by 2030 contained in the Government's Strategic Plan (Growing for the Future). The existing and draft Wicklow County Development Plans seek to support existing resource based industries particularly agriculture and forestry while also promoting the diversification of the rural economy.

Objectives contained in the most recent draft County Development Plan seek to:

- Promote the County as a Center of Excellence in Forestry Research and Management, and;
- Encourage the development of Forestry for Biomass."

These guidelines are applicable to the Ballard replant site.

3.3 Relevant County and Local Policies

3.3.1 Cork County Development Plan: 2014-2020

Cork County has a total forest area in excess of 79,188ha of forest and woodland area, or 10.5% land cover which is higher than the national average of 9%. The Cork County Development Plan 2014-2020 highlights that the sector will continue to be an important economic activity in rural areas, as well as an alternative enterprise for farmers. Sustainably managed forestry can also become an important tourism asset. The forestry industry will also play an important role in the future development of the Bioenergy sector.

The council states it will continue to support sustainable forestry development throughout the County, but acknowledges the importance of protecting sensitive areas, water supplies and fisheries and to ensure that the development is compatible with the protection of the environment and nature conservation areas.

3.3.2 Development Plan for the Greater Dublin Area 2010 – 2022

The strategic forestry objective is stated to "…promote state and private afforestation, to a scale and in a manner, which maximises its contribution to the County's economic and social wellbeing on a sustainable basis and which is compatible with the protection of the environment."

Additional objectives include; to promote County Wicklow as a centre of excellence in the forestry research and management field, to promote the use of native hardwood species using seed of native providence where possible.

3.4 Relevant National Guidelines

The replanting at the proposed site will be carried out in accordance with the Forest Service Guidelines described below and any further requirements resulting from the technical approvals.

3.4.1 Forest Service Guidelines

Code of Best Forest Practice – Ireland[1]

[1] Part 1
https://www.agriculture.gov.ie/media/migration/forestry/publications/codeofbestforestpractice/Code%20of%20Best%20Forest%20Prac%20Part%201.pdf

The aim of the Code of Best Forest Practice is to complement on an operational level that of *Growing for the Future - A Strategic Plan* for the Development of the *"To develop forestry to a scale and in a manner which maximises its contribution to national economic and social well-being on a sustainable basis and which is compatible with the protection of the environment."*

In the context of sustainable forest management, it aims to ensure that the various environmental, economic and social forest values are recognised. Most forests in Ireland are managed on a commercial basis, therefore a careful balance between measures to protect the environment and measures to maintain forest productivity are deemed necessary in this code.

Environmental Requirements for Afforestation[2]

The aim of the guidelines is to ensure that the establishment of new woodlands and forests is carried out so that it compatible with the protection and enhancement of our environment. In assessing an application for afforestation, the Forest Service is required to consider potential impacts across a range of issues and sensitivities. This includes in-combination impacts regarding water, biodiversity, landscape, social issues, etc.

Forestry and Water Quality Guidelines[3]

Forestry activities have the potential to interact both positively and negatively with aquatic resources and the maintenance and enhancement of water quality is of utmost importance. These guidelines describe a range of measures intended to cover all situations relating to forestry and water quality.

Forestry and the Landscape Guidelines[4]

These guidelines set describe a range of measures that forest owners can employ in relation to the landscape, it is recognised that some may be impractical for individual forests, due to land ownership pattern, location and other set factors. Where a degree of flexibility exists, forest owners are required to implement those landscape measures which can be applied effectively to their property.
All forest workers and machine operators involved in any forest operation should be made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance.

Forestry and Archaeology Guidelines[5]

Archaeological sites and monuments are part of the national heritage. These guidelines have been developed to ensure that forest development should not disturb sites of archaeological importance. They have been compiled to assist non-archaeologists involved in forest development to identify archaeological sites, and set out the procedures which should be followed to avoid site disturbance.

Forest Biodiversity Guidelines[6]

Part 2
https://www.agriculture.gov.ie/media/migration/forestry/publications/codeofbestforestpractice/Code%20of%20Best%20Forest%20Prac%20Part%202.pdf

[2] https://www.agriculture.gov.ie/media/migration/forestry/grantandpremiumschemes/2016/EnvironmentalRequirementsAfforestationDecember121216.pdf

[3] https://www.agriculture.gov.ie/media/migration/forestry/publications/water_quality.pdf

[4] https://www.agriculture.gov.ie/media/migration/forestry/publications/landscape.pdf

[5] https://www.agriculture.gov.ie/media/migration/forestry/publications/archaeology.pdf

[6] https://www.agriculture.gov.ie/media/migration/forestry/publications/biodiversity.pdf

Forests are among the most diverse and complex ecosystems in the world, providing a habitat for a multitude of flora and fauna. Ireland's forests represent an important opportunity to conserve and enhance biodiversity at both a local and national level. These guidelines are biodiversity considerations to be incorporated into all forest development, harvesting, roading and maintenance plans to consider biodiversity, habitat and nature conservation issues.

Forest Harvesting and Environmental Guidelines[7]

These guidelines address issues relating to soil conservation; the protection of water quality, archaeological sites, biodiversity and the visual landscape; the maintenance of forest health and productivity in the context of timber harvesting and forest road construction and maintenance. It therefore provides guidelines for:

- harvest planning;
- harvest operation;
- harvest site restoration;
- road planning;
- road construction;
- *machine servicing.*

Forest Protection Guidelines [8]

These guidelines are set up to protect the forest, ensure a healthy and vigorous forest and to prevent and control damage in a correct, timely, effective and safe manner. For that purpose, forest owners and managers have an obligation to value the need for vigilance, experienced forest management and advice on site in order. Methods include the use of herbicides in controlling competing vegetation and pesticides in dealing with insects.

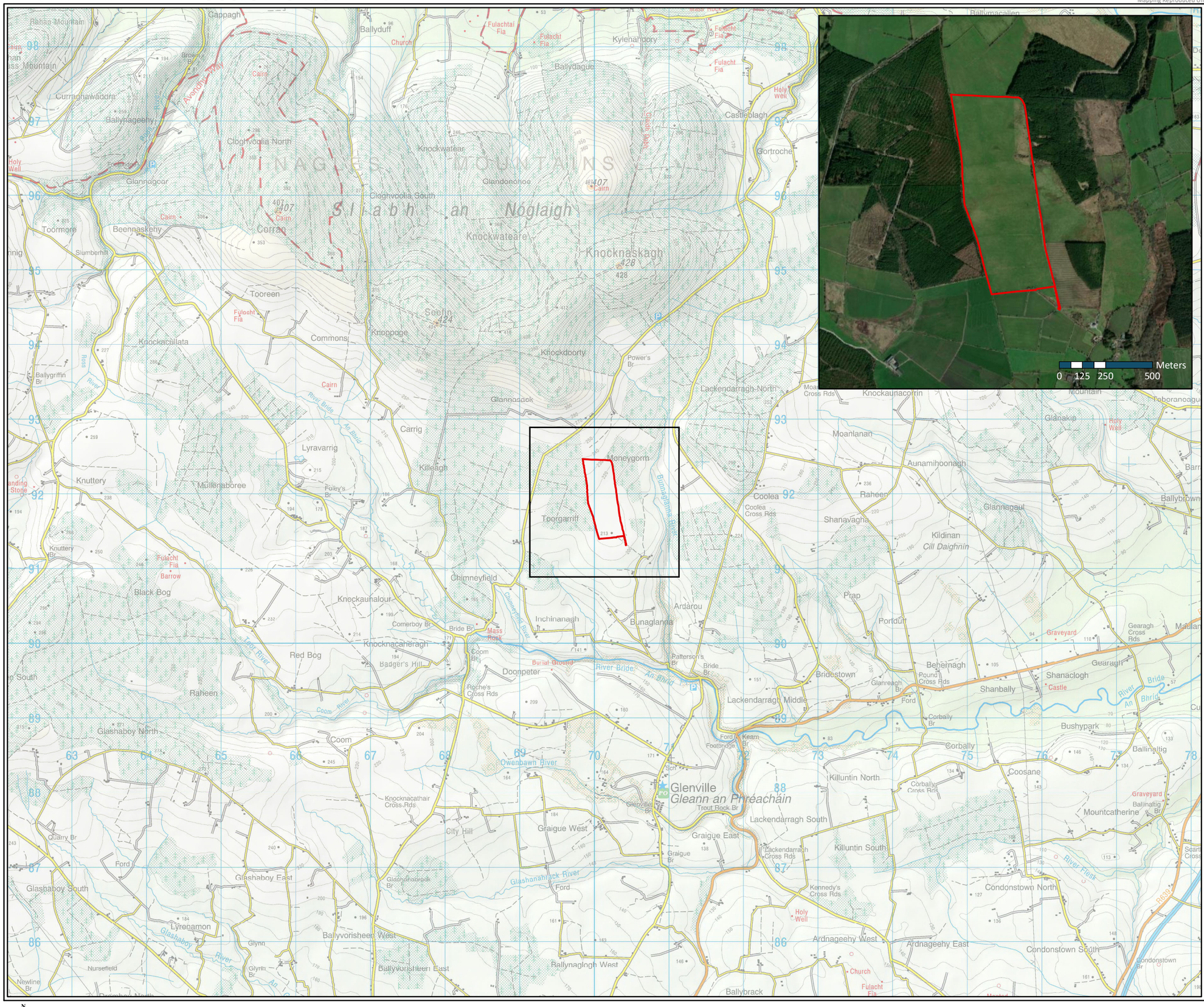
All of the above-mentioned guidelines set out sound and practical measures based on the principles of Sustainable Forest Management (SFM), and are based in the best available scientific information. All forest workers and machine operators involved in any forest operation should be made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance.

[7] https://www.agriculture.gov.ie/media/migration/forestry/publications/harvesting.pdf

[8] https://www.agriculture.gov.ie/media/migration/forestry/publications/fsFPG.pdf

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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TITLE:
Location of Replant Lands at Moneygorm, Co. Cork

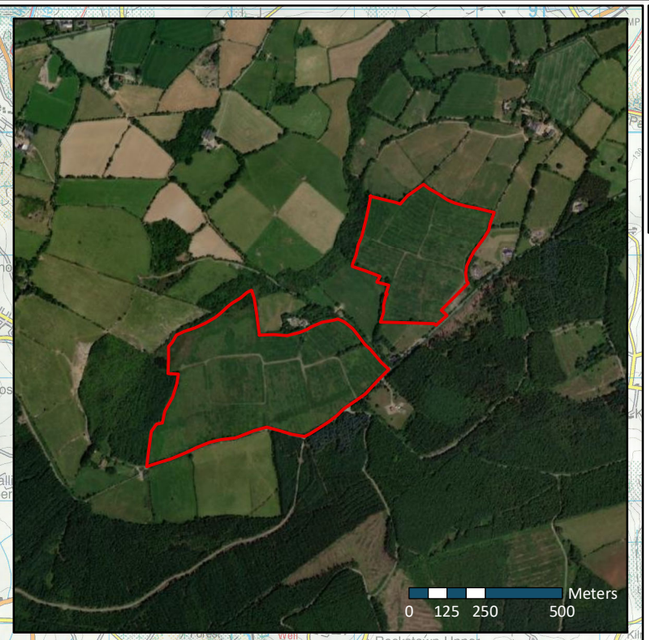
PROJECT:
Coom Green Energy Park, Co. Cork

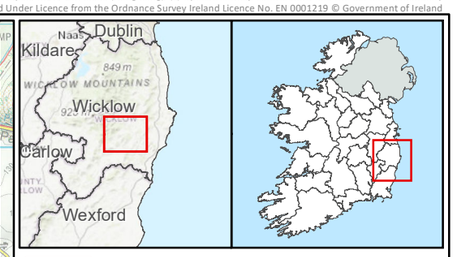
FIGURE NO:	3.1		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:50000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Kilometers
0 0.5 1 2

TITLE:	Location of Replant Lands at Ballard, Co. Wicklow
PROJECT:	Coom Green Energy Park, Co. Cork
FIGURE NO:	3.2
CLIENT:	Coom Green Energy Park Ltd.
SCALE:	1:50000
REVISION:	0
DATE:	29/10/2020
PAGE SIZE:	A3

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4. IMPACT ASSESSMENT METHODOLOGY

The impact of the proposed replanting has been appraised under the following environmental headings:

- Biodiversity
- Archaeology, Architectural and Cultural Heritage
- Population and Human Health including noise, air/climate and material assets
- Land, Soils and Geology
- Hydrology and Water Quality
- Landscape and Visual

The baseline environmental conditions at each site were determined following a desktop review of publicly available information including aerial photograph and geospatial datasets. A site walkover was also carried out.

The impact of the proposed replanting before recommended mitigation measures are introduced is described under each topic. Interactions and in-combination effects with other environmental topics are also included in this evaluation.

The evaluation of the significance of the impact is also undertaken as per the EPA guidelines (EPA, 2017).

If impacts are anticipated, mitigation measures are devised to minimise impacts on the environment through avoidance, by reduction and by remedy.

5. ASSESSMENT OF LANDS

The impacts associated with afforestation at the potential replanting land are assessed in the sections below, under the headings:

- Biodiversity
- Archaeology, Architectural and Cultural Heritage
- Population and Human Health including noise, air/climate and material assets
- Land, Soils and Geology
- Hydrology and Water Quality
- Landscape and Visual

Each section contains a description of the existing environment, potential impacts and appropriate mitigation measures to reduce, remedy or eliminate those impacts. Residual impacts are also described in the cases where mitigation measures are recommended.

5.1 Biodiversity

The ecological appraisal for the project was carried out by Fehily Timoney & Company (FT) on 17th June 2019 (Moneygorm, Co. Cork) as well as 29th and 30th January 2020 (Ballard, Co. Wicklow). The Ballard site was previously assessed by Malachy Walsh and Partners on the 29th October 2018 in an assessment of ecological features within the site. An ecological appraisal was carried out at both sites proposed as replant lands for the proposed Coom Green Energy Park. The ecological surveys undertaken included habitat and botanical surveys, and the recording of fauna including birds and mammals. Based on the results of these studies, FT considered potential direct, indirect and cumulative effects of the proposed replant lands on the existing ecological receptors and proposed appropriate mitigation measures to minimise these potential effects.

The purpose of this evaluation was to:

- Undertake a desktop review of available ecological data for both the receiving environment and greater area, including a review of designated sites within 15 km of each project site;
- Undertake ecological field surveys of the receiving environments;
- Identify flora and fauna present within the footprint of the replant lands;
- Evaluate the ecological significance of the receiving environments;
- Appraise the potential effects of the project on the ecology of the receiving environment;
- Consider measures to mitigate the potential negative effect(s) of the project on the ecology of the receiving environments.

5.1.1 Brief Description of Existing Site

5.1.1.1 *Moneygorm, Co. Cork*

The proposed replant lands are made up of a large (c.39.9 Ha) open expanse of improved agricultural grassland (GA1) bordered by scrub (WS1) and grassy verges (GS2) in the townland of Moneygorm on the southern side of Nagle's Mountains on a flat spur overlooking the Bride valley, accessed via the R614, un-named local roads, and farm/forestry access tracks.

The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the west and north-east by conifer plantations, and to the north, south and south-east by agricultural land.

The site is at an elevation of 210-230m OD. The bedrock geology is purple mudstone and sandstone of the Ballytrasna Formation; the soils are made up of fine loamy drift with siliceous stones. The surrounding land drops off on three sides and the land at the site was observed to be dry, with no associated drainage network.

The Bunnaglanna watercourse is located c. 450m east of the proposed replant lands; drainage channels carrying flowing water are present: one flowing north-south along the eastern replant lands boundary which joins another channel flowing west-east from within the replant lands site exit the site to join a drainage channel flowing downhill (west-east) along the edge of the adjacent conifer plantation towards the Bunnaglanna. Assessment of satellite imagery indicates this drainage channel connects with the Bunaglanna c. 565m downstream of the replant lands site.

The Bunnaglanna is a tributary of the Bride River, which it joins c. 2.5 km to the south of the replant lands site. The Bride is a tributary of the Blackwater River, flowing east from the Bunnaglanna/Bride confluence for c. 52 km before joining the Blackwater south of Villierstown in Co. Waterford.

The Bunaglanna and Bride are within the Blackwater River (Cork/Waterford) SAC (002170); the SAC boundary is c. 380m east of the replant lands site at its closest point. The in-stream distance between the replant lands and Blackwater River (Cork/Waterford) SAC is also c. 565m.



Plate 5-1: Overview of the existing landscape in the proposed fields (fox cub in the middle-ground)

5.1.1.2 *Ballard, Co. Wicklow*

The proposed replant land is divided into two sections by a private road. The proposed footprint is 37.1 Ha in area and is largely composed of open expanse of mosaic of scrub (WS1), recently felled woodland (WS5) and dry-humid acid grassland (GS3), dense bracken (HD1), recolonising bare ground (ED3), hedgerow (WL1), treeline (WL2), immature woodland (WS2), species poor wet grassland (GS4), drainage ditches (FW4), species poor bog woodland (WN7), a mosaic of immature woodland (WS2) and scrub (WS1), and conifer plantation (WD4), buildings and artificial surfaces (BL3) and a mosaic of scrub (WS1) and recently felled woodland (WS5).

The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the west and south by conifer plantations, and to the north, by semi-natural woodland, rivers and then further to agricultural land.

The site is divided into two sections by a private road, the westerly and easterly sections. The total area of the replant land at Ballard is 37.1 Ha. Both sites are at elevations of 160-207m OD.

The bedrock geology is sandstone and shale till (Lower Paleozoic); the soils are clayey and classed as Tills (diamictons). The surrounding gently slopes in a north-westerly direction and the land at the site was observed to be dry at higher altitudes, becoming increasingly wetter as the westerly block sloped downhill eventually ending in standing pools. The easterly block was observed as dry. Drainage throughout the site is typical of conifer plantation, with small drains every 2-3 metres typically dry, larger drains contained quantities of standing water.

Both the easterly and westerly aspects of the replant lands site are drained by the Ballyeustace Stream (EPA Code: 10B05). A 1st order watercourse, the Ballyeustace Stream flows in a north-easterly direction for ca. 3km before its confluence with the Avonbeg River (EPA Code: 10A04). Along the northerly section of the easterly aspect of the replant lands, a section of the Ballyeustace Stream has been split from the natural course though an artificial course to the south. It was previously noted in 2018 ecological surveys (undertaken by Malachy Walsh and Partners) completed within the site, that the stream bed of the Ballyeustace Stream that flow to the north of the western portion of Ballard replacement lands, was laden with sediment. It was thought in 2018 to have originated from recently re-seeded agricultural land. This was found to also be the case during surveys in January 2020.

The Ballyeustace Stream (EPA Code: 10B05) flows into the Avonbeg River (EPA Code: 10A04), a 4th order watercourse, at the edge of the Ballinatone Lower and Ballard townlands. From here The Avonbeg River flows for approximately 5.6km in a southerly direction before entering the Avoca River (EPA Code: 10A03). The Avoca River travels for approximately 15.48km until entering the Irish Sea at Arklow.



Plate 5-2: Displaying the array of habitats within the western block of the proposed replant lands site



Plate 5-3: Displaying the array of habitats within the eastern block of the proposed replant lands site

5.1.2 Contributors to the Report

FT was commissioned by Brookfield Renewable Ireland Ltd and Coillte to prepare the Ecological Assessment of the replant lands.

5.1.3 Methodology

The baseline environmental conditions at each site were determined following a desktop review of publicly available information including aerial photograph and geospatial datasets. A site walkover was also carried out. As per the EIAR submitted for Coom Green Energy Park Wind Farm, the effect of the proposed replanting before recommended mitigation measures are introduced is described under each topic. Interactions and in-combination effects with other environmental topics are also included in this evaluation.

The evaluation of the significance of the effect is also undertaken. Where possible, pre-existing standardised criteria for the significance of effects will be used. Such criteria can include Irish legislation, international standards, European Commission and Environmental Protection Agency (EPA) guidelines or good practice guidelines. Where appropriate criteria do not exist the assessment methodology section states the criteria used to evaluate the significance.

If effects are anticipated, mitigation measures are devised to minimise effects on the environment through avoidance, by reduction and by remedy.

The lands identified for consideration as replant lands had to meet a set of stringent criteria. The commitments applied to the identification of the replant lands included in this assessment are:

- Not located within an environmentally designated area;
- Not within high ecological value habitat;
- To be replanted in accordance with Forest Service Guidelines e.g. 'no-plant' buffers from aquatic zones to be implemented.
- Not to be fertilised when replanting.

The replant land selection process was designed to identify sites less likely to have significant constraints on replanting – mitigation by design.

The detailed desktop and field assessments were then carried out to establish any potential for adverse effects upon high-value habitat and species. This process was designed to identify areas of the potential replant sites that should be excluded or subject to additional environmental controls before replanting could proceed.

5.1.3.1 *Relevant Guidance*

The methodology for this appraisal has been devised in consideration of the following relevant guidance published by the Environmental Protection Agency (EPA) including '*Guidelines on the information to be contained in Environmental Impact Statements* (2002), reference was also made to the revised draft (July 2017) '*Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*' (2003), reference was also made to the draft (2015) guidelines and '*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*' (DoECLG, 2013).

Additional guidance available from the EU such as '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*' (2013) and '*Guidance on the preparation of Environmental Impact Assessment of Report*' (EC, 2017) has also been considered. The appraisal also takes account of '*Guidelines for Ecological Impact Assessment in the UK and Ireland, Freshwater and Coastal*', 2nd edition (CIEEM, 2018). The Heritage Council publication '*Best Practice Guidance for Habitat Survey & Mapping'* (Smith *et al*., 2011) is also referenced.

Relevant guidance published by the National Roads Authority (NRA) such as '*Guidelines for Assessment of Ecological Impacts of National Road Schemes*' (2009a), and '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (2008a) have also been followed.

Documentation and guidance available from Wicklow County Council (WCC), such as the 'Wicklow County Development Plan: 2016-2022', the 'County Wicklow Biodiversity Action Plan 2010-2015', along with Documents and guidance available from Cork County Council (CCC), such as 'Regional Planning Guidelines for County Cork 2010 to 2022' and the 'Cork County Development Plan: 2014-2020', were assessed.

Relevant guidance published by the National Roads Authority (NRA), and applicable to assessing watercourses in Ireland, was also followed, including '*Guidelines for the Assessment of Ecological Impacts of National Road Schemes – Revision 2*' (NRA 2009a), '*Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes – Version 2*' (NRA 2009b), '*Environmental Impact Assessment of National Road Schemes – A practical guide*' (NRA 2008b) and '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA 2008a).

5.1.3.2 *Legislative context*

A diversity of flora and fauna, rare at a national level, are protected under the provisions of the Wildlife Act 1976, as amended, and the orders and regulations made thereunder, such as the Flora Protection Order (2015). The Habitats Directive 1992 has been transposed into Irish law, for the purposes of this application for permission by Part XAB of the Planning and Development Act 2000, as inserted. In addition, certain other obligations of the Habitat Directive have been transposed by the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall onto any waters deleterious matter. Deleterious matter is defined as not only as any substance that is liable to injure fish but is also liable to damage their spawning grounds or the food of any fish or to injure fish in their value as human food or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish. It will be necessary to get written permission from Inland Fisheries Ireland to proceed with the works in any areas where disturbance to the spawning and nursery areas of both salmonids and lampreys will occur as a result of the proposed grid connection route. Salmon, all lamprey species and their habitats are further protected under the EU Habitats Directive, 1992.

Under Section 3 of the Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act) it is an offence to cause or permit any polluting matter to enter waters. Suspended solids would be a key parameter here. Likewise, any visual evidence of oil/fuel in the river would constitute an offence.

Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall onto any waters deleterious matter.

Deleterious matter is defined as not only as any substance that is liable to injure fish but is also liable to damage their spawning grounds or the food of any fish or to injure fish in their value as human food or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish.

5.1.3.3 *Consultation*

The details of consultation undertaken as part of the proposed Coom Green Energy Park are outlined in Chapter 5, Volume 2 of the EIAR.

5.1.3.4 *Desktop study*

5.1.3.4.1 Designated Nature Conservation Sites

Nationally designated sites within 10 km of this project, such as Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) have been identified. European sites within 15km of the proposed grid connection route namely candidate Special Areas of Conservation (cSACs)[9] and Special Protection Areas for birds (SPAs) were identified as part of this ecological assessment using the Map Viewer at www.npws.ie. A separate AA Screening Report and Natura Impact Statement (NIS) was prepared to evaluate the potential effect to European sites as a result of the proposed replant lands.

5.1.3.4.2 Flora and Fauna

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. Records available on the NPWS and the National Biodiversity Data Centre websites were reviewed.

Other data sources include Ireland's Wetlands and their Waterbirds: Status and Distribution (Crowe 2005), the Atlas of Wintering Birds in Britain and Ireland (Lack, 1986), the Atlas of Breeding Birds in Britain and Ireland (Sharrock, 1976) and the Breeding and Winter Birds of Britain and Ireland Bird Atlas 2007-11 (Balmar *et al*., 2013).

Botanical species were assessed in accordance with their occurrence on the Flora Protection Order 2015 and the Ireland Red List No. 10: Vascular Plants (Wyse *et al*. 2016). Other sources included:

- OSI Aerial photography and 1:50000 mapping;
- National Parks and Wildlife Service (NPWS);
- NPWS; Checklists of Protected and Threatened Species in Ireland (Nelson *et al*. 2019);
- The Ireland Red List No. 10: Vascular Plants (Wyse *et al*. 2016);
- Teagasc Soil area maps;
- Bat Conservation Ireland (BCI);
- Geological Survey Ireland (GSI) area maps;

[9] Note: At present many SACs in Ireland are currently 'candidate' SACs, and referred to as cSACs. The relevant Statutory Instruments for the SACs in Ireland have not yet been made, however, these "candidate" sites must still be afforded the same level of protection as if they were SACs in accordance with the Habitats Directive.

- Environmental Protection Agency (EPA) water quality data;
- Inland Fisheries Ireland; and
- South Western River Basin District (SWRBD) and Eastern River Basin District (ERBD) datasets (Water Framework Directive).

5.1.3.5 *Field study*

5.1.3.5.1 Habitats / Flora

Table 5-1: Survey Details

Site	Date:	Weather Conditions:
Moneygorm	17/07/2019	***Precipitation***: Dry, ***Cloud:*** 4/8-8/8, ***Wind:*** F3-4 ***Visibility:*** Excellent
Ballard	29/01/2020	***Precipitation***: Dry, ***Cloud:*** 2/8-7/8, ***Wind:*** F0-1, F4 at times ***Visibility:*** Excellent
Ballard	30/01/2020	***Precipitation:*** Light rain, ***Cloud:*** 8/8, ***Wind:*** F0-2 ***Visibility:*** Ok

Both sites were walked, and all plant species were identified and recorded, and structural and compositional data relating to vegetation within the site were also recorded. The site was also checked for drainage ditches to ascertain and map any hydrological connections between the site and European sites.

The Ballard proposed replant lands site has previously been surveyed by MWP in 2018. During this site visit ecologists described the site area, habitats and ecological features. This report was also used to provide further details of the existing environment for FT site visits in 2020.

The habitats within the footprint of the proposed replant lands were identified and classified, according to '*A Guide to Habitats in Ireland*' (Fossitt, 2000), during a walkover survey. The dominant plant species present in each habitat type was recorded. Habitats have been appraised and evaluated according to their occurrence as protected habitats under Annex I of the EU Habitats Directive (92/43/EEC) and for their capacity to support rare, threatened and endangered species. The methodology used to assess the effect on habitats is based on NRA guidelines (2009 a and b), CIEEM guidelines and EPA guidelines. The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al*., 2011) published by the Heritage Council.

Scientific and common names for plants follow Parnell *et al*. (2012) and Blamey *et al*. (1996), respectively. In addition to habitat identification, each habitat was assessed for its ecological significance, based on the National Roads Authority (NRA) Site Evaluation Scheme (NRA, 2009a) (see Table 5-2 below).

Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcGIS 10.4.1, which was also used to calculate habitat areas and lengths.

Once the baseline ecological survey and mapping was complete, a constraints map highlighting important ecological features and resources was generated, indicating areas for preclusion from the final planting layout. The ecological constraints map was used to design a planting layout with the least ecological effect.

5.1.3.5.2 Mammals

The total footprint of the proposed planting area was walked by experienced ecologists for potential signs of mammals within the study area. As well as direct observations of mammal features such as tracks, trails, fur, droppings and shelter (setts, dreys and holts) were also recorded using GPS. Watercourse crossings within and connected to the proposed replant lands were surveyed for evidence of otter.

The conservation status of mammals within Ireland and Europe is assessed using one or more of the following documents; Wildlife Acts (1976 - 2019), the Red List of Terrestrial Mammals (Marnell *et al*., 2019) and NPWS (2019) *The Status of EU Protected Habitats and Species in Ireland*.

5.1.3.5.3 Bats

Trees within treelines and hedgerows were examined for their potential to offer roosting habitat to bats.
The conservation status of bats within Ireland and Europe is assessed using one or more of the following documents: Wildlife Acts (1976 - 2019), *The Status of EU Protected Habitats and Species in Ireland* (NPWS, 2019) and the Red List of Terrestrial Mammals (Marnell *et al*., 2019).

5.1.3.5.4 Avifauna

All bird species observed and heard within the study area boundary were noted during the field study of the site. Habitats within the study area were also assessed for the value to bird species noted during the desktop study.

5.1.3.5.5 Aquatic

Aquatic surveys were carried on 24th, 25th and 29th to 31st July 2020 by Triturus Environmental Ltd. All watercourses which could be affected directly or indirectly by the proposed replant lands at Moneygorm were considered as part of the current baseline assessment. Survey effort focused on both instream and riparian habitats at each location. Surveys at each aquatic site included a fisheries assessment (electro-fishing), fisheries habitat appraisal and white-clawed crayfish assessment. A freshwater pearl mussel assessment was undertaken across the wider catchment of the replant lands. Additionally, biological water quality (Q-sampling) was undertaken at *n*=12 sites. Rare, protected and or conservation interest aquatic species such as otter were also searched for at each survey site. This holistic approach informed the overall aquatic ecological evaluation of each site in context of the project.

A broad aquatic habitat assessment was conducted at each site utilising elements of the methodology given in the Environment Agency's *'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003'* (EA, 2003) and the Irish Heritage Council's *'A Guide to Habitats in Ireland'* (Fossitt, 2000).

All sites were assessed in terms of:

- Stream width and depth and other physical characteristics.
- Substrate type, listing substrate fractions in order of dominance, i.e. bedrock, boulder, cobble, gravel, sand, silt etc.
- Flow type, listing percentage of riffle, glide and pool in the sampling area.
- In-stream macrophyte, bryophytes occurring and their percentage coverage of the stream bottom at the sampling sites.
- Riparian vegetation composition.

The watercourse at each aquatic survey site was described in terms of the important aquatic habitats and species. This helped to evaluate species and habitats of ecological value in the vicinity of the replant lands and watercourse crossings. The aquatic baseline prepared would inform mitigation for the replant lands at Moneygorm.

This survey confirmed the absence of freshwater pearl mussel and white-clawed crayfish, and the lack of suitable habitat for either species.

The higher reaches of river systems are not used by twaite and allis shad.

5.1.3.5.6 Other Taxa

During ecological surveys at the proposed site, other species of fauna were noted and included in the report. The conservation status of other taxa within Ireland and Europe was assessed using one or more of the following documents: Wildlife Acts (1976 - 2019), NPWS (2019), *The Status of EU Protected Habitats and Species in Ireland*, Irish Red Lists (Byrne *et al*., 2009; Regan *et al*., 2010; King *et al.,* 2011).

5.1.3.6 *Ecological Resource Evaluation*

The value of the ecological resources/receptors at the subject site was evaluated using the ecological evaluation guidance given in the NRA guidance on assessment of ecological effects of National Road Schemes (NRA, 2009a).

This guidance provides ratings for resources based primarily on geographic context and allows for resources at International, National, County and Local (higher and lower value) levels. Key ecological receptors (for assessment) are those deemed to be above the 'Local Importance (lower value) evaluation. Evaluation criteria are outlined below in Table 5-2.

Table 5-2: Ecological Resource Evaluation Criteria (from NRA, 2009)

International Importance	'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. Proposed Special Protection Area (pSPA). Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).

	Features essential to maintaining the coherence of the Natura 2000 Network.[1] Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. Resident or regularly occurring populations (assessed to be important at the national level)[2] of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). Biosphere Reserve (UNESCO Man & The Biosphere Programme). Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). Biogenetic Reserve under the Council of Europe. European Diploma Site under the Council of Europe. Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[3]
National Importance	Site designated or proposed as a Natural Heritage Area (NHA). Statutory Nature Reserve. Refuge for Fauna and Flora protected under the Wildlife Acts. National Park. Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. Resident or regularly occurring populations (assessed to be important at the national level)[4] of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Site containing 'viable areas'[5] of the habitat types listed in Annex I of the Habitats Directive.

[1] See Articles 3 and 10 of the Habitats Directive.

[2] It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[3] Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

[4] It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[5] A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

County Importance	Area of Special Amenity.[6] Area subject to a Tree Preservation Order. Area of High Amenity, or equivalent, designated under the County Development Plan. Resident or regularly occurring populations (assessed to be important at the County level)[7] of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list; Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance; County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP,[8] if this has been prepared; Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county; Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Locally Important (higher level)	Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; Resident or regularly occurring populations (assessed to be important at the Local level)[9] of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list; Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Locally Important (lower level)	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; Sites or features containing non-native species that are of some importance in maintaining habitat links.

[6] It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

[7] It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[8] BAP: Biodiversity Action Plan

[9] It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

5.1.3.7 *Assessing Effect Significance*

Once the value of the identified ecological receptors (features and resources) was determined, the next step was to assess the potential effect or impact of the proposed replant lands on the identified key ecological receptors.

Table 5-3 to Table 5-8 outline the EPA evaluation criteria utilised in this appraisal of the Environmental Factor, Biodiversity. This criteria is included in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, August 2017).

Table 5-3: Probability of Effects (EPA, August 2017)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table 5-4: Quality of Effects (EPA, August 2017)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities)
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 5-5: Significance of Effects (EPA, August 2017)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends

Significance of Effect	Description
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics

Table 5-6: Duration of Effects (EPA, August 2017)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

Table 5-7: Types of Effects (EPA, August 2017)

Type of Effect	Description
Effect/Impact	A change resulting from the implementation of a project
Likely Effects	The effects that are specifically predicted to take place – based on an understanding of the interaction of the proposed project and the receiving environment.
Indirect Effects (a.k.a. secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
'Do Nothing' Effects	The environment as it would be in the future should the subject project not be carried out.
'Worst Case' Effects	The effects arising from a project in the case where mitigation measures substantially fail
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.

Type of Effect	Description
Reversible Effects	Effects that can be undone, for example through remediation or restoration
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect
Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

Table 5-8: Definition of Terms – Source, Pathway, Receptor (EPA, August 2017)

Term	Description
Source	The activity or place from which an effect originates
Pathway	The route by which an effect is conveyed between a source and a receptor.
Receptor	Any element in the environment which is subject to effects.
Effect/Impact	A change resulting from the implementation of a project

5.1.4 Existing Environment

5.1.4.1 *Moneygorm, Co. Cork*

5.1.4.1.1 Desktop Study

5.1.4.1.1.1 *European Sites within 15km*

Special Areas of Conservation (cSACs)

Special Areas of Conservation (SACs) are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC), as implemented in Ireland by the European Communities (Natural Habitats) Regulations, 1997. There is one SAC within 15km of the proposed replant lands. The full NPWS site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) were initially designated under Directive 79/409/EEC, The Directive on the Conservation of Wild Birds ('The Birds Directive') and are now protected as European (Natura 2000) Sites under the EU 'Habitats Directive'. There is one SPA within 15km of the study area.

- Blackwater River (Cork/Waterford) cSAC* (Site Code 002170) is located c. 380 m east
- Blackwater Callows SPA (Site Code 004094) is located c. 13.9 km northeast

5.1.4.1.1.2 *National Sites Within 10km*

There are nine pNHAs, and no NHAs within 10km of the proposed replant lands.

Table 5-9: National Sites Within 10km

Site Name	Distance from Replant Lands (km)	Hydrological Connection
Bride/Bunaglanna Valley pNHA	0.36 km	Yes
Blackwater Valley (Kilcummer) pNHA	6.63 km	No
Blackwater Valley (Ballincurrig Wood) pNHA	6.72 km	No
Convamore, Ballyhooly (Near Fermoy) pNHA	6.78 km	No
Blackwater Valley (Killathy Wood) pNHA	7.61 km	No
Blackwater Valley (Killavullen) pNHA	7.94 km	No
Awbeg Valley (Castletownroche) pNHA	8.03 km	No
Blackwater Valley (Cregg) pNHA	8.93 km	No
Cregg Castle pNHA	9.24 km	No

5.1.4.1.1.3 *Rare or Protected Flora*

The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of plant species. This list was then compared to the lists of species protected under the Flora (Protection) Order of 2015; the Ireland Red List No. 10: Vascular Plants (Wyse *et al*. 2016). Table 5-10 presents details of the rare and protected plant species found within the 10km squares N51 and N52. Information on habitats was completed using; Webb's '*An Irish Flora*', 8th edition, 2012., F. Rose '*The Wild Flower Key*', Revised edition, 1981., and The British Bryological society's '*Mosses and Liverworts of Britain and Ireland a field guide*', first edition, 2010.

Table 5-10: Rare or Protected Flora (NBDC)

Common Name	Scientific Name	Grid Square	Year of Last Record	Conservation Status	Habitat	Result of surveys for Moneygorm
Bordered Screw-moss	*Tortula marginata*	W69	16/03/2006	Threatened Species: Near threatened	Grows on moist, often shaded or sheltered rocks and walls (especially of limestone and base-rich sandstone) in woodland, and also on the mortar of buildings	Not recorded
Flexuous Bog-moss	*Sphagnum flexuosum*	W69	27/06/2009	Threatened Species: Vulnerable	Grows in slightly mineral-rich sites, for example poor fens and wet woodland. Slightly more base-demanding than S. fallax, though often growing with that species. Scarce in the most acidic habitats. This is probably an under-recorded species.	Not recorded

Common Name	Scientific Name	Grid Square	Year of Last Record	Conservation Status	Habitat	Result of surveys for Moneygorm
Fountain Feather-moss	*Amblystegium tenax*	W69	27/06/2009	Threatened Species: Near threatened	It occurs on stones and tree roots, but also on concrete, bricks, weirs and other man-made substrates. It may also occur on rocks and stones where water trickles	Not recorded
Spruce's Bristle-moss	*Orthotrichum sprucei*	W69	27/06/2009	Protected Species: Flora Protection Order || Protected Species: Flora Protection Order >> Flora Protection Order 2015 Schedule B (Mosses) || Threatened Species: Vulnerable	Grows on trees by very silty zones of large lowland rivers.	Not recorded
Toothed Streak-moss	*Rhabdoweisia crispata*	W69	27/06/2009	Threatened Species: Near threatened	Generally found in acidic habitats but may be slightly more tolerant of base-rich rocks.	Not recorded

Common Name	Scientific Name	Grid Square	Year of Last Record	Conservation Status	Habitat	Result of surveys for Moneygorm
River Bristle-moss	*Orthotrichum rivulare*	W79	27/06/2009	Threatened Species: Near threatened	Grows on trees by silty rivers; and is also sometimes found on riverside rocks or masonry.	Not recorded

5.1.4.2 *Mammals*

The protected mammal species listed in Table 5-11 have been recorded within the 10 km grid squares (W69, W79) in which the proposed replant land is located.

Nine species have been recorded within 10km of the proposed study area namely badger (*Meles meles*), red squirrel (*Sciurus vulgaris*), otter (*Lutra lutra*), pygmy shrew (*Sorex minutus*), hedgehog (*Erinaceus europaeus*), fallow deer (*Dama dama*), Irish hare (*Lepus timidus*), Irish stoat (*Mustela erminea Hibernica*) and pine marten (*Martes martes*). Two of the records are within the last three years. The most recent Irish stoat record dates from 2010.

Table 5-11: Rare or Protected Mammals recorded within 10km grid squares (W69, W79)

Grid Square	Common Name	Scientific Name	Year of Last Record	Survey	Conservation Status	Records within the study area
W69	Daubenton's Bat	*Myotis daubentonii*	08/08/2013	National Bat Database of Ireland	Wildlife Act, 1976, as ammeded. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W69	Eurasian Badger	*Meles meles*	31/12/2016	Badger Setts of Ireland Database	Wildlife Act, 1976, as ammeded.	Not recorded on site
W69	Eurasian Pygmy Shrew	*Sorex minutus*	24/07/2015	Atlas of Mammals in Ireland 2010-2015	Wildlife Act, 1976, as ammeded.	Not recorded on site, but likely to be present
W69	Eurasian Red Squirrel	*Sciurus vulgaris*	03/10/2018	Mammals of Ireland 2016-2025	Wildlife Act, 1976, as ammeded.	Not recorded on site
W69	European Otter	*Lutra lutra*	31/07/2018	Mammals of Ireland 2016-2025	EU Habitats Directive Annex II & Annex IV Wildlife Acts	Not recorded on site
W79	Lesser Noctule	*Nyctalus leisleri*	09/08/2008	National Bat Database of Ireland	Wildlife Act, 1976, as ammeded. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W69	Natterer's Bat	*Myotis nattereri*	28/01/2001	National Bat Database of Ireland	Wildlife Act, 1976, as ammeded. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat

Grid Square	Common Name	Scientific Name	Year of Last Record	Survey	Conservation Status	Records within the study area
W79	Pipistrelle	*Pipistrellus pipistrellus sensu lato*	09/08/2008	National Bat Database of Ireland	Wildlife Act, 1976, as ammeded. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W79	Soprano Pipistrelle	*Pipistrellus pygmaeus*	13/05/2016	Mammals of Ireland 2016-2025	Wildlife Act, 1976, as ammeded. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W69	West European Hedgehog	*Erinaceus europaeus*	24/07/2015	Atlas of Mammals in Ireland 2010-2015	Wildlife Acts	Not recorded on site, but likely to be present

5.1.4.2.1.1 *Birds*

The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of rare and protected birds. Table 5-12 details this below:

Table 5-12: Records of rare and protected birds within 10km grid squares W79 and W69

Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W79, W69	Barn Owl	*Tyto alba*	31/12/2011	Red listed	Not recorded within the study area
W79, W69	Barn Swallow	*Hirundo rustica*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Black-headed Gull	*Larus ridibundus*	31/07/1991	Red listed	Not recorded within the study area
W69	Black-headed Godwit	*Limosa limosa*	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Coot	*Fulica atra*	31/12/2011	Amber listed	Not recorded within the study area
W69	Common Goldeneye	*Bucephala clangula*	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Grasshopper Warbler	*Locustella naevia*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Common Kestrel	*Falco tinnunculus*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Common Kingfisher	*Alcedo atthis*	31/12/2011	Annex I EU Birds Directive, Amber List	Not recorded within the study area
W79, W69	Common Linnet	*Carduelis cannabina*	31/12/2011	Amber listed	Not recorded within the study area
W69	Common Pochard	*Aythya ferina*	31/12/2001	Amber listed	Not recorded within the study area
W69	Common Redshank	*Tringa totanus*	31/12/2001	Red listed	Not recorded within the study area
W69	Common Sandpiper	*Actitis hypoleucos*	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Snipe	*Gallinago gallinago*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Common Starling	*Sturnus vulgaris*	31/12/2011	Amber listed	Not recorded within the study area

Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W69	Common Shelduck	*Tadorna tadorna*	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Swift	*Apus apus*	31/12/2011	Amber listed	Not recorded within the study area
W69	Dunlin	*Calidris alpina*	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Eurasian Curlew	*Numenius arquata*	31/07/1991	Red listed	Not recorded within the study area
W79, W69	Eurasian Teal	*Anas crecca*	31/12/2011	Amber listed	Not recorded within the study area
W69	Eurasian Wigeon	*Anas penelope*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Eurasian Woodcock	*Scolopax rusticola*	31/12/2011	Red listed	Not recorded within the study area
W79, W69	European Golden Plover	*Pluvialis apricaria*	31/12/2011	Annex I EU Birds Directive, Red listed	Not recorded within the study area
W69	European Nightjar	*Caprimulgus europaeus*	31/07/1972	Annex I EU Birds Directive, Red listed	Not recorded within the study area
W69	Great Black-backed Gull	*Larus marinus*	29/02/1984	Amber listed	Not recorded within the study area
W79, W69	Great Cormorant	*Phalacrocorax carbo)*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Hen Harrier	*Circus cyaneus*	10/04/2016	Annex I EU Birds Directive, Amber listed	Not recorded within the study area during 2019 survey. Nests previously recorded during the 2016-2017, and 2017 survey periods. These are located within 500m of the proposed replant lands.
W79, W69	Herring Gull	*Larus argentatus*	29/02/1984	Red listed	Not recorded within the study area
W79, W69	House Martin	*Delichon urbicum*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	House Sparrow	*Passer domesticus*	31/12/2011	Amber listed	Not recorded within the study area

Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W69	Lesser Black-backed Gull	*Larus fuscus*	31/12/2001	Amber listed	Not recorded within the study area
W79	Jack Snipe	*Lymnocryptes minimus*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Little Egret	*Egretta garzetta*	31/12/2011	Annex I EU Birds Directive, Green listed	Not recorded within the study area
W69	Little Grebe	*Tachybaptus ruficollis*	31/12/2001	Amber listed	Not recorded within the study area
W79	Merlin	*Falco columbarius*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Mew Gull	*Larus canus*	29/02/1984	Amber listed	Not recorded within the study area
W79, W69	Mute Swan	*Cygnus olor*	31/12/2011	Amber listed	Not recorded within the study area
W69	Northern Goshawk	*Accipiter gentilis*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Northern Lapwing	*Vanellus vanellus*	29/02/1984	Red listed	Not recorded within the study area
W69	Northern Shoveler	*Anas clypeata*	31/12/2001	Red listed	Not recorded within the study area
W79, W69	Peregrine Falcon	*Falco peregrinus*	31/12/2011	Annex I EU Birds Directive	Not recorded within the study area
W69	Red Grouse	*Lagopus lagopus*	31/07/1972	Red listed	Not recorded within the study area
W79, W69	Sand Martin	*Riparia riparia*	21/05/2016	Amber listed	Not recorded within the study area
W79, W69	Sky Lark	*Alauda arvensis*	31/12/2011	Amber listed	Not recorded within the study area
W69	Snowy Owl	*Bubo scandiaca*	01/01/2015	Annex I EU Birds Directive, Amber listed	Not recorded within the study area
W79, W69	Spotted Flycatcher	*Muscicapa striata*	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Stock Pigeon	*Columba oenas*	31/12/2011	Amber listed	Not recorded within the study area

Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W79, W69	Tufted Duck	*Aythya fuligula*	31/12/2011	Amber listed	Not recorded within the study area
W69	Whooper Swan	*Cygnus cygnus*	31/12/2001	Annex I EU Birds Directive, Amber listed	Not recorded within the study area
W79	Yellowhammer	*Emberiza citrinella*	31/12/2011	Red listed	Not recorded within the study area

5.1.4.2.1.2 *Other Species*

The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of rare and protected birds. Table 5-13 details this below:

Table 5-13: Records of rare and protected other species within 10km grid squares W79 and W69

Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W69, W79	Common Frog	*Rana temporaria*	25/02/2018	EU Habitats Directive Annex V, Wildlife Acts	Not recorded within the study area
W69, W79	Marsh Fritillary	*Euphydryas aurinia*	10/04/2019	EU Habitats Directive Annex II	Not recorded within the study area
W79	Smooth Newt	*Lissotriton vulgaris*	12/04/2018	Wildlife Act	Not recorded within the study area
W79	Freshwater White-clawed Crayfish	*Austropotamobius pallipes*	16/07/2015	EU Habitats Directive Annex V and II, Wildlife Act	Not recorded within the study area
W79	Freshwater Pearl Mussel	*Margaritifera margaritifera*	25/07/2006	EU Habitats Directive Annex II and Annex V, Wildlife Act	Not recorded within the study area

5.1.4.2.1.3 *Invasive Species*

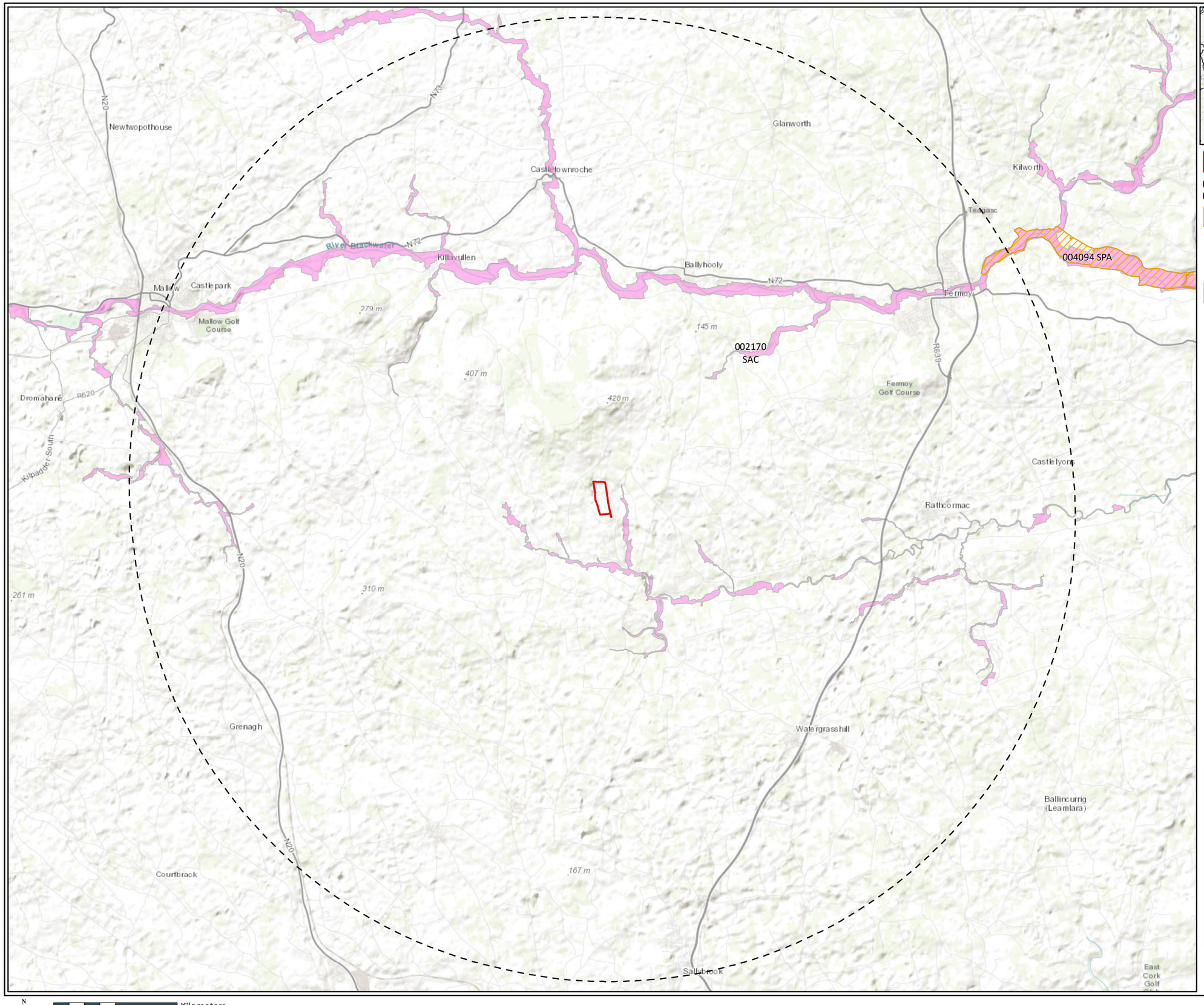
The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of invasive species. Table 5-14 details the invasive species recorded during this desktop study.

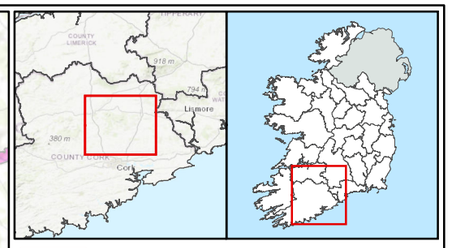
Table 5-14: Invasive Species records within 10km (NBDC)

Common Name	Scientific Name	10km	Invasive Impact
Douglas Fir	*Pseudotsuga menziesii*	x	High Effect
American Skunk-cabbage	*Lysichiton americanus*	x	Medium Effect
Black Currant	*Ribes nigrum*	x	Medium Effect
Cherry Laurel	*Prunus laurocerasus*	x	High Effect
Indian Balsam	*Impatiens glandulifera*	x	High Effect
Japanese Knotweed	*Fallopia japonica*	x	High Effect
Rhododendron ponticum	*Rhododendron ponticum*	x	High Effect
Sycamore	*Acer pseudoplatanus*	x	Medium Effect
Budapest Slug	*Tandonia budapestensis*	x	Medium Effect
Common Garden Snail	*Cornu aspersum*	x	Medium Effect
Keeled Slug	*Tandonia sowerbyi*	x	Medium Effect
Wrinkled Snail	*Candidula intersecta*	x	Medium Effect
American Mink	*Mustela vison*	x	High Effect
Brown Rat	*Rattus norvegicus*	x	High Effect
European Rabbit	*Oryctolagus cuniculus*	x	Medium Effect
Fallow Deer	*Dama dama*	x	High Effect
Greater White-toothed Shrew	*Crocidura russula*	x	Medium Effect
Sika Deer	*Cervus nippon*	x	High Effect
Himalayan knotweed	*Persicaria wallichii*	X	Medium Effect

Path: R:\Map Production\2020\P20-099\Workspace\Replant Lands EA\P20_099_GIS_Fig5-3_EuropeanSitesWithin15km_Moneygorm_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

15km Distance from Site Boundary

Special Protection Area (SPA)

Site Code, Site Name, Distance(km)

004094, Blackwater Callows SPA, 13.9

Special Area of Conservation (SAC)

Site Code, Site Name, Distance(km)

002170, Blackwater River SAC, 0.4

N
W E
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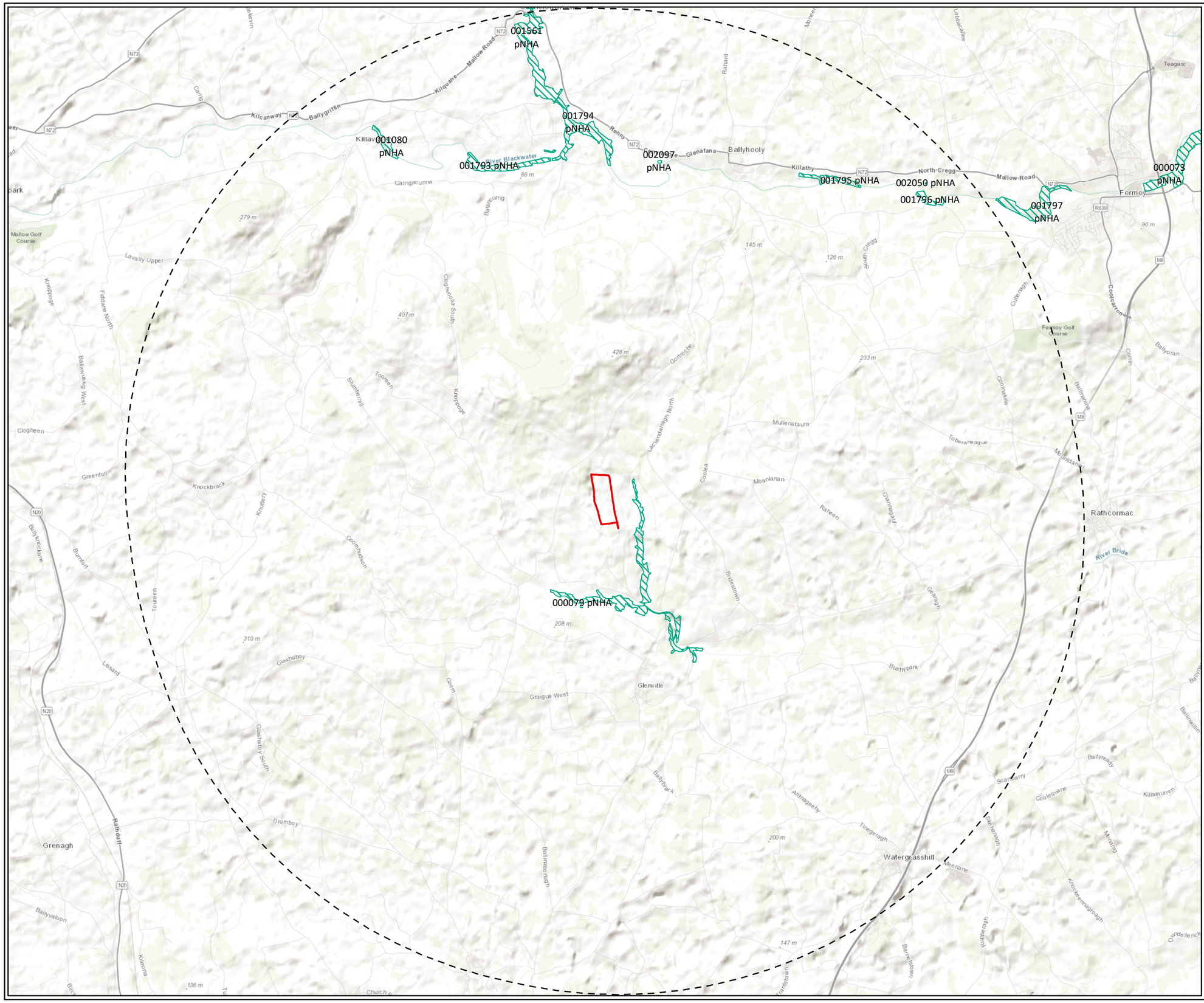
0 1 2 4 Kilometers

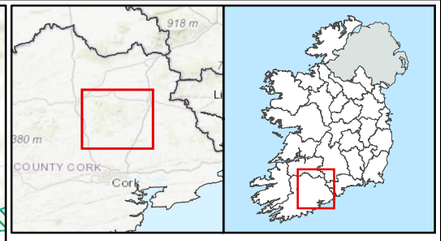
TITLE: European Sites within 15km of Replant Lands at Moneygorm, Co. Cork			
PROJECT: Coom Green Energy Park, Co. Cork			
FIGURE NO:	5.1		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:120000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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Path: R:\Map Production\2020\P20-099\Workspace\Replant Lands EA\P20_099_GIS_Fig5-4_NationalSitesWithin10km_Moneygorm_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

10km Distance from Site Boundary

Proposed Natural Heritage Area (pNHA)

Site Code, Site Name, Distance (km)

000079, Bride/Bunaglanna Valley, 0.4

001080, Blackwater Valley (Killavullen), 7.9

001561, Awbeg Valley (Castletownroche), 8

001793, Blackwater Valley (Ballincurrig Wood), 6.7

001794, Blackwater Valley (Kilcummer), 6.6

001795, Blackwater Valley (Killathy Wood), 7.6

001796, Blackwater Valley (Cregg), 8.9

002050, Cregg Castle, 9.2

002097, Convamore Ballyhooly (Near Fermoy), 6.8

N W E S

0 1 2 4 Kilometers

TITLE: National Sites within 10km of Replant Lands at Moneygorm, Co. Cork

PROJECT: Coom Green Energy Park, Co. Cork

FIGURE NO:	5.2		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:80000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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5.1.4.2.2 Description of existing habitats

5.1.4.2.2.1 *Habitats / Flora*

Improved Agricultural Grassland GA1

Improved Agricultural Grassland covers the majority of the site. Grasses include Yorkshire fog *Holcus lanatus*, perennial rye-grass *Lolium perenne* and annual meadow-grass *Poa annua,* with a range of herbaceous plants including common mouse-ear *Cerastium fontanum*, creeping buttercup *Ranunculus repens,* daisy *Bellis perennis,* dandelion *Taraxicum officinale* Agg., broad-leaved dock *Rumex obtusifolius* white clover *Trifolium repens,* greater plantain *Plantago major*, creeping thistle *Cirsium arvense* cuckooflower *Cardamine pratensis* and field forget-me-not *Myosotis arvensis* also present.

Improved Agricultural Grassland (GA1) is an artificial and intensively managed habitat type, with limited biodiversity value and is classified as being of Local Importance (lower value).

Dry Meadows and Grassy Verges GS2

The semi-natural habitat Dry Meadows and Grassy Verges in narrow strips bordering the replant lands fields. Species recorded in this habitat included Yorkshire fog *Holcus lanatus,* annual meadow-grass *Poa annua* cocksfoot *Dactylis glomerata,* soft rush *Juncus effusus,* creeping buttercup *Ranunculus repens,* birds foot trefoil *Lotus corniculatus*, hogweed *Heracleum sphondylium*, spear thistle *Cirsium vulgare*, common sorrel *Rumex acetosa*, cleavers *Galium aparine,* bilberry *Vaccinium myrtillus*, creeping cinquefoil *Potentilla reptans* and herb Robert *Geranium robertianum.*

Dry Meadows and Grassy Verges (GS2) is classified as being of Local Importance (lower value).

Scrub WS1

Scrub was also present in strips associated mainly with the outer margins of the replant lands; one narrow strip also extends into the Improved Agricultural Grassland GA1 which dominates the site.

Species recorded included goat willow *Salix caprea*, bramble *Rubus fruticosus* Agg., Bracken *Pteridium aquilinum*, willowherb *Epilobium* sp.gorse *Ulex* sp. foxglove *Digitalis purpurea,* soft shield fern *Polysticum setiferum*, rowan *Sorbus aucaparia*, holly *Ilex aquifolium*, oak *Quercus* sp. and a single Fuchsia *Fuchsia magellanica* bush.

Fuchsia is a non-native naturalised species. Its invasiveness effect has not been assessed.

Scrub (WS1) is classified as being of Local Importance (higher value).

Drainage Ditches FW4

The drainage channels within and bordering the replant lands site are shallow (1-3 cm wet depth), narrow (0.2 -0.3 m wet width) carrying flowing water over a rocky substrate. Aquatic vegetation is absent, with grasses such as Yorkshire fog and soft rush *Juncus effusus* present fringing the channels. The amount of water in these channels is likely to fluctuate markedly between wet and dry periods.

Drainage Ditches (FW4) is classified as being of Local Importance (higher value).

5.1.4.2.2.2 *Rare and protected Flora*

No rare or protected flora were identified on site during surveys.

5.1.4.2.2.3 *Mammals*

Three fox cubs were observed within the site during the walkover survey. No setts, holts, or dreys were recorded during the survey.

5.1.4.2.2.4 *Avifauna*

No rare or protected bird species were observed during ecological surveys within the proposed replant landssite. Other species observed were jackdaw *Coloeus monedula*, hooded crow *Corvus cornix*, and robin *Erithacus rubecula*.

During ornithological surveys undertaken for Coom Wind Energy Park, two hen harrier nests were recorded within 500m of the proposed replant lands; one during the 2015-2016 survey period, and one during the 2017 surveys. No nests were recorded within 500m of the proposed replant lands during the 2018 survey period. A confirmed hen harrier territory was recorded ca. 355m from the replanting site 2019.

5.1.4.2.2.5 *Aquatic*

5.1.4.2.2.5.1 Fish stock assessment (electro-fishing)

Site B14 – Bunnaglanna Stream, Moneygorm

No fish were recorded during electro-fishing at site B14. The shallow, upland nature of the small channel with heavily bedded substrata (heavy siltation) reduced its viability for salmonids albeit populations were present further downstream in higher order reaches. Lamprey habitat was absent. The stream may be utilised seasonally by migratory European eel during periods of higher flow (e.g. autumn, winter) although the site's overall fisheries value was considered low.

Site B15 – River Bride, Old Bridge

Atlantic salmon and brown trout were the only two species recorded from site B15 on the River Bride (Figure 5-3). Both species were recorded in similar numbers (n=22, n=21 respectively). A healthy range of juvenile and adult trout size classes were present along with two distinct Atlantic salmon size classes. With the exception of European eel, the same species assemblage was also recorded during a 2017 survey of this site (Triturus, 2017) although abundances of juvenile Atlantic salmon and brown trout were notably higher in 2020.

The site was evidently an excellent salmonid nursery (Table 5-15) and also exhibited good spawning habitat locally, as reflected by the stock demographic captured during the survey. The best nursery areas were in the faster riffle area near the bridge. Holding habitat was also good moving upstream where pool habitat existed below large instream boulders. However, the River Bride was of too high energy at site B15 to support lamprey species. Some suitability existed as an eel nursery in the boulder and cobble areas although none were recorded during the survey.

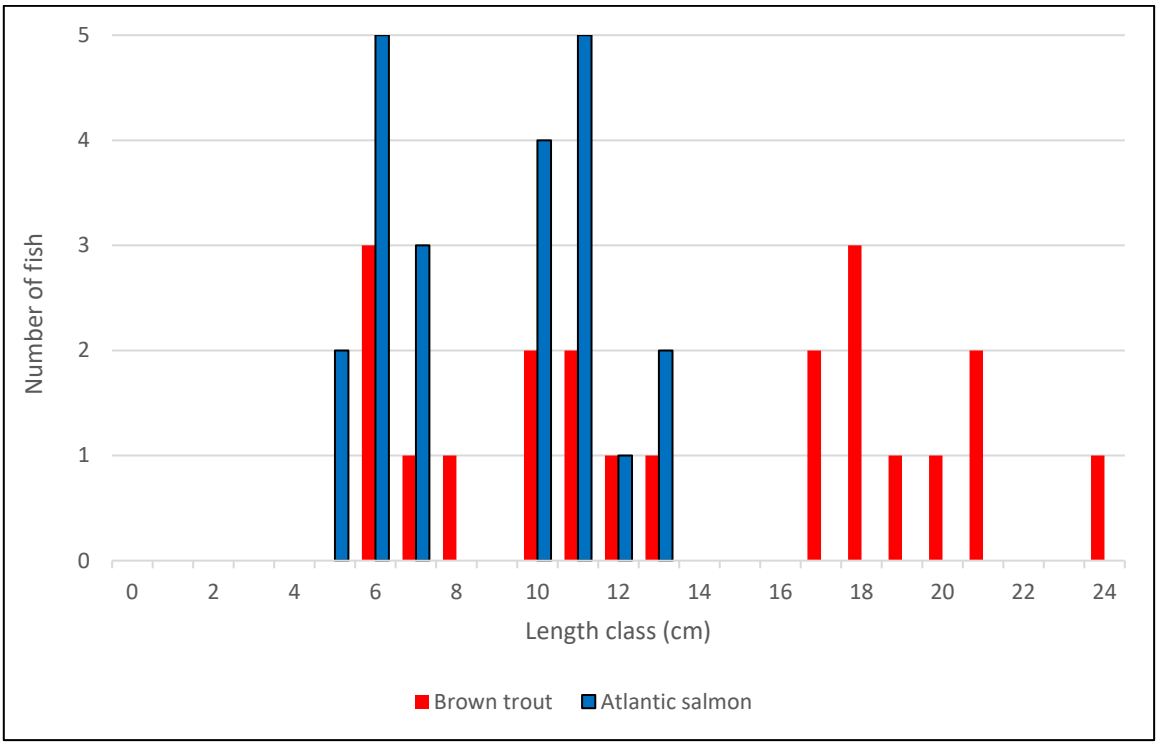


Figure 5-3: Fish stock length distribution recorded via electro-fishing at site B15 on the River Bride at Old Bridge, July 2020.



Plate 5-4: Adult brown trout and Atlantic salmon parr recorded from site B15 on the River Bride at Old Bridge, July 2020.

Table 5-15: Fish species densities per m² recorded at sites in the vicinity of Moneygorm replant lands via electro-fishing in July 2020. Lamprey numbers are presented per 1m² targeted quadrat unless otherwise stated

	Fish density (number fish per m²)						
Site	CPUE	Approx. area fished (m²)	Brown trout	Atlantic salmon	*Lampetra* sp.	European eel	Three-spined stickleback
B14	10-minute	65	0	0	0	0	0
B15	10-minute	240	0.088	0.092	0	0	0

5.1.4.2.3 Fisheries habitat

5.1.4.2.3.1 *Salmonid habitat*

Salmonid habitat ranged from poor to excellent value across the survey sites (Table 5-16). B15 (River Bride) offered excellent quality salmonid habitat according to life Cycle Unit scores. B14 offered little or no value for salmonids and scored as 'poor' in terms of salmonid habitat.

Table 5-16: Life Cycle Unit scores for sites surveyed in the vicinity of the proposed Moneygorm replant lands, July 2020

Site	Salmonid habitat value	Spawning	Nursery	Pool (holding)	Total score
B14	Poor	4	4	4	**12**
B15	Excellent	2	1	2	**5**

5.1.4.2.3.2 *Lamprey habitat*

Lamprey habitat was typically of poor to moderate quality across the majority of the survey area based on Lamprey Habitat Quality Index (LHQI) scores (Table 5-17). B14 offered poor lamprey habitat whilst B15 offered moderate quality lamprey habitat.

Table 5-17: Lamprey Habitat Quality Index (LHQI) scores for sites surveyed in the vicinity of the proposed Moneygorm replant lands, July 2020

Site	Lamprey habitat value	Spawning	Nursery	Total score
B14	Poor	4	4	**8**
B15	Moderate	3	4	**7**

5.1.4.2.3.3 *European eel habitat*

European eel was not recorded B14 Bunnaglanna river, and B15 River Bride.

5.1.4.2.3.4 *Other Species*

No other rare or protected species were observed during ecological surveys within the proposed replant landssite.

5.1.4.2.3.5 *Invasive Species*

No invasive species were observed during ecological surveys within the proposed replant lands .

5.1.4.2.4 Habitats Evaluation

The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 5-18 below outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a). Figure 5-4 details the habitats within the Moneygorm replant lands site.

Table 5-18: Evaluation of Habitats

Habitat type	Annex I status	NRA Evaluation	Rationale	Key Ecological Receptor
Improved Agricultural Grassland GA1	No	Local Importance (lower value)	Improved agricultural grassland is dominant within the footprint of the proposed replant lands at Moneygorm. This habitat type has a low level of ecological potential although can facilitate the feeding and provision of cover for species.	No
Dry Meadows and Grassy Verges GS2	No	Local Importance (lower value)	Dry meadows and grassy verges were found along the southern, eastern and northern boundaries of the footprint of the proposed replant lands. This habitat type has a low level of ecological potential although can facilitate the feeding and provision of cover for species.	No
Scrub WS1	No	Local Importance (higher value)	Scrub are identified along the southern and eastern border of the proposed replant lands site. This habitat type is of local importance (higher level) to biodiversity.	No

Habitat type	Annex I status	NRA Evaluation	Rationale	Key Ecological Receptor
Drainage Ditches FW4	No	Local Importance (higher value)	Drainage ditches are located along the eastern aspect of the proposed replant lands at Moneygorm. This habitat type is of local importance (higher level) to biodiversity.	Yes

5.1.4.2.5 Species Evaluation

The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 5-19 below outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a).

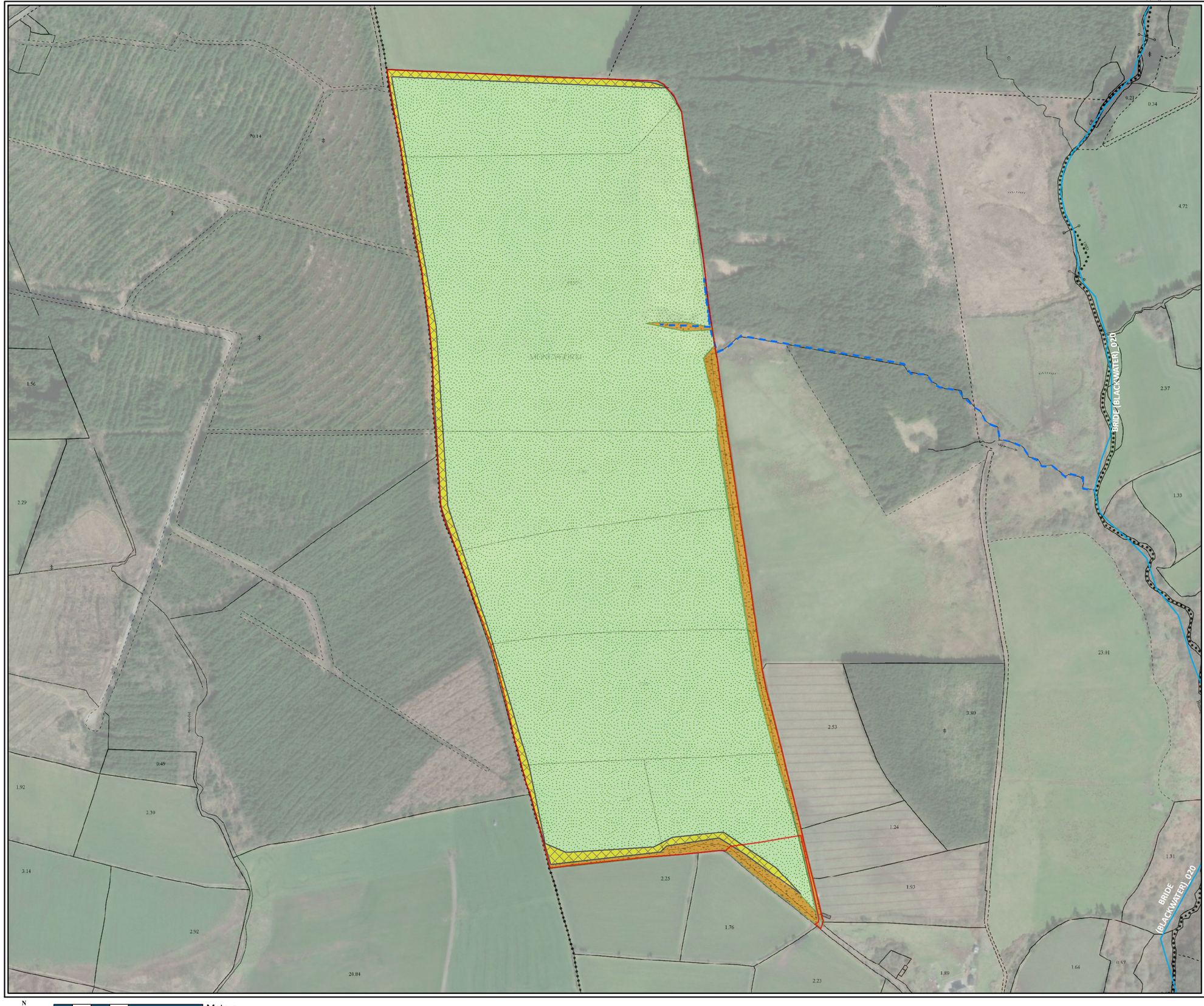
Table 5-19: Evaluation of Species

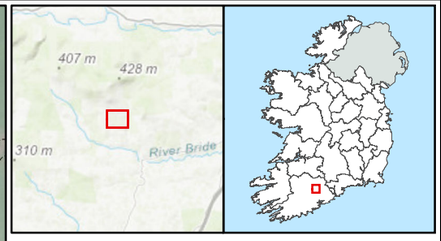
Common Name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Otter	EU Habitats Directive Annex II; Protected Species: EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Bats	EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Legal status and ecological sensitivity	Yes
Badger	Wildlife Act (Amendment) 2000	County Importance	Records in the greater area but not recorded within the site.	Yes
Pygmy Shrew	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area and potentially present within the site.	Yes
Red Squirrel	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Fallow Deer	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Records in the greater area but not recorded within the site.	Yes
Irish Hare	EU Habitats Directive Annex V, Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Irish Stoat	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded	Yes

Common Name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Pine Marten	EU Habitats Directive Annex V, Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded	Yes
Hedgehog	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded	Yes
Grey Squirrel	Invasive non-native species	Not of ecological importance	Records in the greater area but not recorded	No
Wood Mouse	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Records in the greater area but not recorded	No
Rabbit	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Records in the greater area but not recorded	No
Fox	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Recorded on site	No
American Mink	Invasive non-native species	Not of ecological importance	Records in the greater area but not recorded within the site.	No
Common Newt	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Common Frog	EU Habitats Directive Annex V, Wildlife Acts	Local Importance (Higher Value)	Records in the greater area but not recorded within the site.	Yes
Marsh Fritillary	EU Habitats Directive Annex II	National Importance	Records in the greater area but not recorded within the site. Habitats not suitable.	No
Smooth Newt	Wildlife Act	National Importance	Records in the greater area but not recorded within the site.	No
Freshwater White-clawed Crayfish	EU Habitats Directive Annex V and II, Wildlife Act	National Importance	Records in the greater area but not recorded within the site.	No
Freshwater Pearl Mussel	EU Habitats Directive Annex II and Annex V, Wildlife Act	National Importance	Records in the greater area but not recorded within the site.	No

Path: R:\Map Production\2020\P20-099\Workspace\Replant Lands EA\P20_099_GIS_Fig5-6_Habitats_Moneygorm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

WFD River Water Bodies

Habitat Classification

FW4, Drainage Ditch

GS2, Dry meadows and grassy verges

WS1, Scrub

GA1, Improved Agricultural Grassland

N
W E
S

0 50 100 200 Meters

TITLE:	Habitat Map of Replant Lands at Moneygorm, Co. Cork		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	5.4		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:5000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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5.1.4.3 *Ballard, Co. Wicklow*

5.1.4.3.1 Desktop Study

5.1.4.3.1.1 *European Sites within 15km*

Special Areas of Conservation (cSACs)

Special Areas of Conservation (SACs) are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC), as implemented in Ireland by the European Communities (Natural Habitats) Regulations, 1997. There are five SACs within 15km of the proposed replant lands. The full NPWS site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) were initially designated under Directive 79/409/EEC, The Directive on the Conservation of Wild Birds ('The Birds Directive') and are now protected as European (Natura 2000) Sites under the EU 'Habitats Directive'. There is one SPA within 15km of the study area.

5.1.4.3.1.2 *National Sites Within 10km*

There are five pNHAs, and no NHAs within 10km of the proposed replant lands.

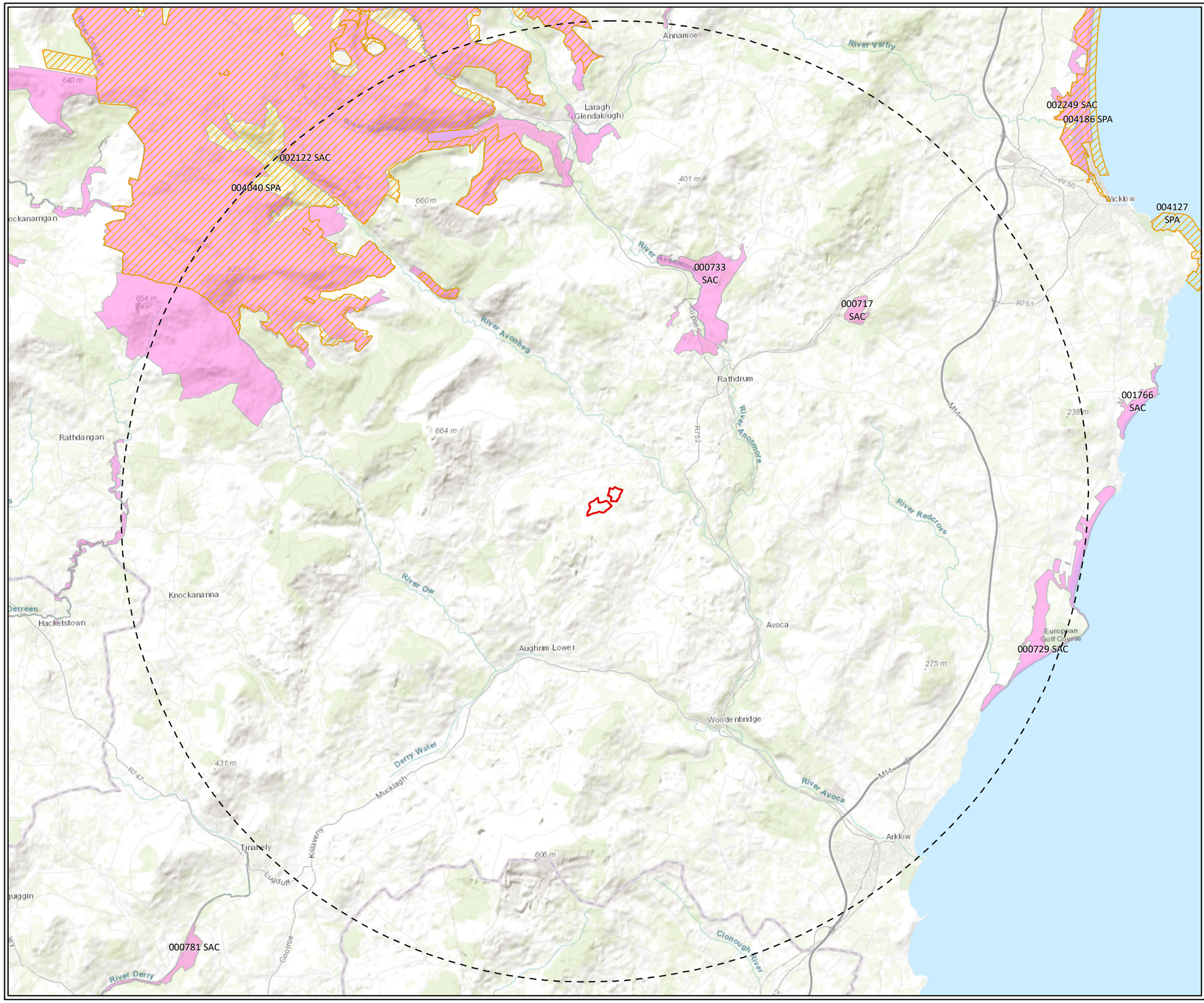
A sixth site located greater than 10km from the proposed replant lands namely Arklow Town Marsh pNHA (Site Code: 001931) is hydrologically connected to the proposed replant landssite, 20.40km downstream along the Avoca River.

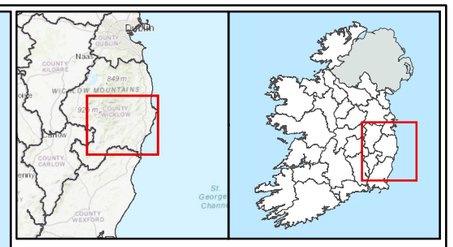
Table 5-20: National Sites Within 10km

Site Name	Distance from Replant Lands (km)	Hydrological Connection
Ballinacor Wood pNHA	2.7	No
Vale of Clara (Rathdrum Wood) pNHA	4.7	No
Glenealy Woods pNHA	8.8	No
Avoca River valley pNHA	4.9	Yes
Avondale pNHA	3.9	No

Path: R:\Map Production\2020\P20-099\Workspace\Replant Lands EA\P20_099_GIS_Fig5-7_EuropeanSitesWithin15km_Ballard_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

15km Distance from Site Boundary

Special Protection Area (SPA)

Site Code, Site Name, Distance

004040, Wicklow Mountains SPA, 7853m

Special Area of Conservation (SAC)

Site Code, Site Name, Distance

000717, Deputys Pass Nature Reserve SAC, 9010m

000729, Buckroney-Brittas Dunes And Fen SAC, 13406m

000733, Vale of Clara Rathdrum Wood SAC, 4708m

000781, Slaney River Valley SAC, 14744m

002122, Wicklow Mountains SAC, 7852m

N W E S

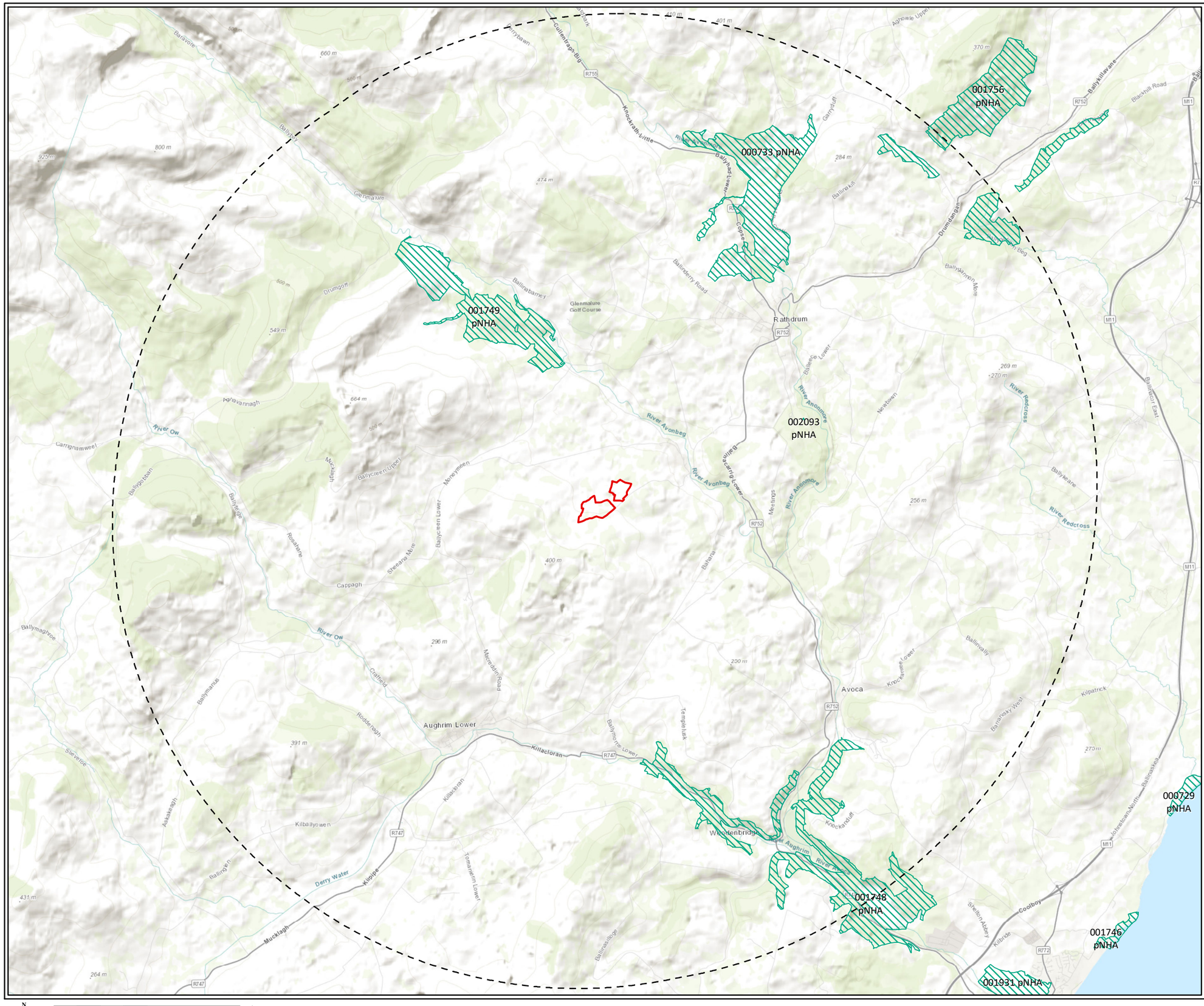
Kilometers
0 1 2 4

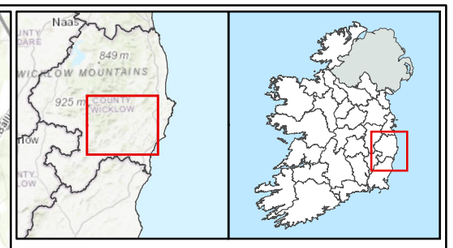
TITLE:	European Sites within 15km of Replant Lands at Ballard, Co. Wicklow		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	5.5		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:120000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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Site Boundary

10km Distance from Site Boundary

Proposed Natural Heritage Area (pNHA)

Site Code, Site Name, Distance

000733, Vale Of Clara Rathdrum Wood, 4702m

001748, Avoca River Valley, 4938m

001749, Ballinacor Wood, 2696m

001756, Glenealy Woods, 8848m

002093, Avondale, 3942m

N W E S

0 1 2 4 Kilometers

TITLE: National Sites within 10km of Replant Lands at Ballard, Co. Wicklow

PROJECT: Coom Green Energy Park, Co. Cork

FIGURE NO:	5.6		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:80000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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5.1.4.3.1.3 *Rare or Protected Flora*

The Study Area lies within Ordnance Survey National Grid 10km Squares T18. The 10km grid squares were searched for recent (>1980) records of rare or protected plant, fern, bryophyte and lichen species, using records from the National Biodiversity Data Centre. This list was then compared to the lists of species protected under the Flora (Protection) Order of 2015; the Ireland Red List No. 10: Vascular Plants (Wyse *et al*. 2016). Table 5-21 presents details of the rare and protected plant species found within the 10km square T18. Information on habitats was completed using; Webb's '*An Irish Flora*', 8th edition, 2012., F. Rose '*The Wild Flower Key*', Revised edition, 1981., and The British Bryological society's '*Mosses and Liverworts of Britain and Ireland a field guide*', first edition, 2010.

Table 5-21: Rare or Protected Flora at T18 (NBDC)

Common Name	Scientific Name	Year of Last Record	Conservation Status	Habitat
Greater Copperwort	*Cephaloziella nicholsonii*	24/04/2009	Protected Species on the Flora Protection Order 2015 Schedule C, Threatened Species: Vulnerable	Mineral rich soil

5.1.4.3.2 Description of existing environment

5.1.4.3.2.1 *Habitats / Flora*

Scrub WS1 and dry-humid acid grassland GS3 mosaic

This habitat mosaic was found to be dominant across the westerly portion of the replant lands site. Young saplings of downy birch (*Betula pubescens*) of between 2 and 3m in height were frequent, with lodgepole pine (*Pinus contorta*) also frequent to occasional. Bramble (*Rubus fruticosus* agg.) and gorse (*Ulex europaeus*) were found to be abundant, forming dense stands across the habitat, classified as areas of scrub (WS1). The abundance of other species including rosebay willowherb (*Chamaenerion angustifolium*) give the habitat elements of recently felled woodland (WS5). *Agrostis capillaris* and *Molinea caeulea* were found to be frequent in the field layer with *Centaurea nigra* noted as being rare within the study area. Stands of bracken (*Pteridium aquilinum*) and gorse (*Ulex* spp.) were found to be frequent.

Scrub (WS1) and dry-humid acid grassland (GS3) mosaic, with elements of recently felled woodland (WS5) is the result of the re-vegetation of an area following the cessation of conifer plantation management practices. This habitat type is of biodiversity value, although it does not conform to any protected (Annex I) habitat types under the EU habitats directive.

Dense bracken HD1

This habitat type is found across both the westerly and easterly portions of the replant lands site. The habitat is dominated by bracken (*Pteridium aquilinum*), with bryophytes such as *Rhytidiadelphus triquetrus* being dominant at ground level.

Dense bracken (HD1) is of some limited biodiversity value, through the provision of food and shelter for wildlife, although is considered a nuisance species due to its ability to out compete other native plants.

Recolonising bare ground ED3

Recolonising bare ground was identified in both the westerly and easterly portions of the replant lands site. This habitat was largely found along the disused conifer plantation access tracks throughout the site. These habitats were largely composed of mats of vegetation (>50%) with areas of exposed stone chipping. Grass species such as *Poa annua* were occasional along with species such as rosebay willowherb (*Chamaenerion angustifolium*). The habitat is dominated by lichen and bryophyte species including; *Cladonia chlorophaea* agg., *Peltigera hymenina* and *Rhytidiadelphus triquetrus.*

Recolonising bare ground (ED3) is classified as being locally important (lower value).

Hedgerow WL1

Hedgerow habitats are found across both the westerly and easterly portions of the replant lands site. Species recorded within this habitat type included bramble (*Rubus fruitcosus* agg.), bracken (*Pteridium aquilinum*), ash (*Fraxinus excelsior*), holly (*Ilex aquifolium*), hawthorn (*Crataegus monogyna*) and gorse (*Ulex* spp.). One invasive species was identified at a single location across the site, cherry laural (*Prunus laurocerasus*) was identified at a hedgerow/ treeline edge at 715475, 684479 (ITM).

Hedgerow (WL1) habitat is classified as being locally important (higher value).

Treeline WL2

Treelines within the proposed replant lands site are largely located along the boundary of the site, with one exception of a birch dominant treeline at the westerly portion, which appears to be an old field boundary. This habitat is largely abundant in species such as holly (*Ilex aquifolium*) and hawthorn (*Crataegus monogyna*), with ash (*Fraxinus excelsior*) being dominant. Gorse (*Ulex* spp.), bramble (*Rubus fruitcosus* agg.) and bracken (*Pteridium aquilinum*) were also found to be frequent to occasional across the field layer of this habitat.

Treelines (WL2) are classified as being locally important (higher value).

Species poor wet grassland GS4

replant lands. *Molinea caeulea* and *Juncus inflexus* are frequent within this habitat with *Juncus conglomeratus* frequent in dryer areas. Within wet pools between hammocks and stands of *Juncus* spp is noted. Species including lesser spearwort (*Ranunculus flammula*), broad buckler-fern (*Dryopteris dilatate*), gorse (*Ulex* spp.) is occasional. This wet habitat is fed by a small unnamed stream which flows through adjacent conifer plantations and disperses into pre-existing drains before flowing into the adjacent Ballyeustace Stream. Stands of scrub are encroaching upon this habitat..

Species poor wet grassland (GS4) is classified as being locally important (higher value).

Drainage ditches FW4

Drainage ditches are found across both sites in varying sizes. The larger drainage ditches are located within the western aspect of the proposed replant lands and have been identified as providing adequate spawning grounds for frogs. Vegetation within these ditches is largely composed of overhang of *Juncus* spp. and *Rubus fruiticosus* agg.

Drainage ditches (FW4) is classified as being locally important (higher value).

Species poor wet bog woodland WN7

A small section of species poor bog woodland (840 m^3) was identified north of westerly section of the proposed replant lands, within the site boundary. This habitat is waterlogged, containing a canopy layer dominant in downy birch (*Betula pubescens*) and rare in scots pine (*Pinus Sylvestris*). The field layer is dominant in hummocks of *Molinea caerulea*, abundant in *Juncus effuses*, occasional in lesser spearwort (*Ranunculus flammula*), *Polytrichum commune*, *Polypodium vulgare*, *Sphagnum palustre*, *Rhytideodelphyus triquetius*, *Thuidium tamariscinum* and Great Woodrush (*Luzula sylvatica*) and rare in *Cirsium palustre*, *Sphagnum papilosum* and *Veronica beccabunga*.

This habitat was identified as being species poor, was identified as lacking the adequate species assemblage in order to be termed as the Annex I protected habitat of 91D0 bog woodland.

Species poor bog woodland (WN7) is classified as being locally important (higher value).

Immature woodland WS2 and scrub WS1 mosaic

Mosaic habitats of immature woodland and scrub was identified across both sections of the proposed replant lands. The canopy layer of this habitat mosaic is dominant in downy birch (*Betula pubescens*). The field layer is dominant in bramble (*Rubus fruitcosus* agg.).

Immature woodland (WS2) and scrub (WS1) are classified as being locally important (higher value).

Conifer plantation WD4

A small area (1,688 m^2) of conifer plantation was identified to the west of the replant lands site. Sitka spruce (*Picea sitchensis*) dominates the canopy layer of this habitat type, bryophytes including *Rhytidiadelphus triquetrus* dominate the field layer.

This habitat type is man-made and composed of non-native conifers, of little use to biodiversity and is classified as being locally important (lower value).

Eroding/ upland rivers FW1

The Ballyeustace Stream flows adjacent, in a northerly direction, to both blocks of the replant lands site. Drainage ditches from both sites feed into this stream. The stream contains low levels of instream vegetation and evidence of its management can be observed.

This habitat type is classified as being locally important (higher value) due to its connectivity.

Oak-ash-hazel woodland WN2

This habitat type is present along the northern edge of the eastern block site boundary. This habitat's canopy layer is dominant in ash (*Fraxinus excelsior*) and rare in *Quercus robur*. The ground layer is dominated by bare litter filled ground with ivy (*Hedera helix*) and holly (*Ilex aquifolium*) being frequent.

This habitat type is classified as being locally important (higher value).

Scrub WS1

This habitat type is dominant within the easterly portion of the proposed replant lands site. It is largely dominated by species such as bramble (*Rubus fruticosus* agg.), gorse (*Ulex europaeus*) and rosebay willowherb (*Chamaenerion angustifolium*).

This habitat is of importance locally, although is typically of recently felled pre-immature woodland sites. This habitat type is classified as being locally important (higher value).

Conclusion

Scrub (WS1) and dry-humid acid grassland (GS3) mosaic, hedgerow (WL1), treeline (WL2), species poor wet grassland (GS4), drainage ditches (FW4), species poor wet bog woodland (WN7), immature woodland (WS2) and scrub (WS1) mosaic, eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2) and scrub (WS1) were all identified as being habitats of locally high quality.

Habitat types including eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2), species poor wet bog woodland (WN7), drainage ditches (FW4) and species poor wet grassland (GS4) have all been identified as having the potential to support rare or protected species within the local area. These habitats will be excluded from the development area and will not be considered as part of this assessment, as detailed in the mitigation measures section 5.1.6 and Figure 5-7.

5.1.4.3.2.2 *Rare and protected Flora*

No rare or protected flora were identified on site during surveys in 2018 or 2020.

5.1.4.3.2.3 *Mammals*

A badger sett (*Meles meles*) was identified at the westerly portion of the existing replant lands site during previous ecological surveys in 2019. No evidence of recent activity was noted around this sett during the 2020 survey. However, badger hair was identified throughout the site along with foraging evidence, indicating presence within the site. No additional badger setts were noted however during the survey in 2020. Fox (*Vulpes vulpes*) scat and feeding signs were identified throughout both portions of the proposed replant lands.

Three potential bat roosts were identified on site. These trees were identified as having moderate roosting potential due to the heavy ivy which has grown amongst their branches. These trees are largely ash with heavy densities of ivy (*Hedera helix*) and are identified within Table 5-22 below. As these potential bat roost trees are located along the site boundary outside the replanting area, the development of the conifer plantation will not result in the loss of these potential bat roosts within the area.

Table 5-22: Potential Bat Roost detail

Tree Number	Location (ITM)
1	715539, 684845
2	682708, 5864841
3	715494, 684580

A dead pygmy shrew (*Sorex minutus*) was observed within the site during the walkover survey. No holts or dreys were recorded during the survey.

5.1.4.3.2.4 *Birds*

Species including buzzard, pheasant, woodpigeon and snipe were identified to be utilising habitats adjacent, to commute, hunt and roost.

Buzzard (Green-listed) was identified commuting and hunting in nearby habitats. Twelve pheasants (Green-listed) were observed utilising the sites habitats for feeding and roosting. Eight snipe (Amber-listed) were identified feeding within the development footprint of the site during surveys.

Woodpigeon and pheasant were identified within and surrounding the proposed replant lands during site survey. These species are both green listed in Ireland and ware widespread within the surrounding environment.

5.1.4.3.2.5 *Other Species*

A number of frogs were observed to be breeding and spawning on site. Drainage ditches and pools on site were observed as holding large quantities of frog spawn.

5.1.4.3.2.6 *Invasive species*

One invasive species was identified at a single location outside of the replant lands footprint, cherry laurel (*Prunus laurocerasus*) was identified within a hedgerow/ treeline edge (684479.37, 715475.94 ITM).

5.1.4.3.3 Habitat Evaluation

The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018).

Table 5-23 over outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a). Table 5-24 details the habitats within the Ballard replant lands site.

Table 5-23: Evaluation of habitats

Habitat type	Annex I Status	NRA Evaluation	Rationale	Key Ecological Receptor
Scrub WS1 and dry-humid acid grassland GS3 mosaic	No	Local Importance (higher value)	This mosaic habitat type exists within the proposed footprint and provides cover, feeding opportunities and prey for wildlife within the area, including pheasant and snipe.	Yes
Dense bracken HD1	No	Local Importance (lower value)	This habitat type exists within the proposed footprint, although is widespread within the local area.	No
Recolonising bare ground ED3	No	Local Importance (lower value)	This habitat type exists within the proposed footprint.	No
Hedgerow WL1	No	Local Importance (higher value)	This linear habitat type borders the replant lands footprint. Hedgerows provide valuable roosting, foraging, commuting and feeding areas many species.	Yes
Treeline WL2	No	Local Importance (higher value)	This linear habitat type exists both along the border and within the replant lands footprint. An estimated 100m of treeline is located within the footprint.	Yes
Species poor wet grassland GS4	No	Local Importance (higher value)	This habitat type exists within the exclusion area (areas not being planted), adjacent to the replant lands footprint Figure 6-1	No
Drainage ditches FW4	No	Local Importance (higher value)	This habitat type exists within the exclusion area, adjacent to the replant lands footprint Figure 6-1	Yes
Species poor wet bog woodland WN7	No	Local Importance (higher value)	This habitat type exists within the exclusion area, adjacent to the replant lands footprint Figure 6-1	No
Immature woodland WS2 and scrub WS1 mosaic	No	Local Importance (higher value)	This habitat type exists within the replant lands footprint.	Yes
Conifer plantation WD4	No	Local Importance (lower value)	This habitat exists within the replant lands footprint.	No

Habitat type	Annex I Status	NRA Evaluation	Rationale	Key Ecological Receptor
Eroding/ upland rivers FW1	No	Local Importance (higher value)	This habitat does not exist within the replant lands footprint, although is hydrologically linked through onsite drainage.	Yes
Oak-ash-hazel woodland WN2	No	Local Importance (higher value)	This habitat does not exist within the replant lands footprint, although is located adjacent.	No
Scrub WS1	No	Local Importance (higher value)	This habitat type exists within the replant lands footprint.	Yes

5.1.4.3.4 Species Evaluation

The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 5-24 below outlines the key fauna / flora receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a).

Table 5-24: Evaluation of fauna, birds, flora and other species

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Greater Copperwort	Protected Species on the Flora Protection Order 2015 Schedule C, Threatened Species: Vulnerable	National Importance	Records in the greater area but not recorded within the site.	No
Otter	EU Habitats Directive Annex II; Protected Species: EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential to occur downstream of the site	Yes

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Bats	EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Legal status and ecological sensitivity. Some potential bat roosting habitat outside the site and potential foraging habitat within the site.	Yes
Badger	Wildlife Act (Amendment) 2000	County Importance	Badger sett and activity within the site	Yes
Pygmy Shrew	Wildlife Act (Amendment) 2000	National Importance	Potential habitat within the site	Yes
Red Squirrel	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential habitat adjacent to the site.	Yes
Pine Marten	EU Habitats Directive Annex V, Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential habitat adjacent to the site.	Yes
Fox	Wildlife Act (Amendment) 2000	Local Importance (lower Value)	Recorded on site. Low conservation value species	No
Hedgehog	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential habitat within the site	Yes
Red Deer	Wildlife Act (Amendment) 2000	National Importance if native but likely to be introduced	Records in the greater area but not recorded during surveys	Yes

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Common Pheasant	Green listed	Local Importance (lower Value)	Recorded on site. Low conservation value species	No
Common Snipe	Amber listed	National Importance	Recorded on site.	Yes
Common Wood Pigeon	Green listed	Local Importance (lower Value)	Recorded on site. Low conservation value species	No
Buzzard	Green listed	Local Importance (lower Value)	Recorded adjacent to site included as it is a raptor species	Yes
Common Frog	EU Habitats Directive Annex V, Wildlife Act	National Importance	Recorded on site	Yes

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- Cherry Laurel (Invasive Species)
- Site Boundary

Habitat Classification

- ED3, Recolonising bare ground
- FW1, Eroding/upland rivers
- FW4, Drainage ditches
- WL1, Hedgerows
- WL2, Treelines
- GS4, Wet grassland
- HD1, Dense bracken
- WD4, Conifer plantation
- WN2, Oak-ash-hazel woodland
- WN7, Bog woodland
- WS1, Scrub
- WS1/GS3, Scrub / Dry-humid acid grassland
- WS1/WS2, Scrub / Immature woodland

TITLE:	Habitats of Replant Lands at Ballard, Co. Wicklow		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	5.7		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:5000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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5.1.5 Potential Effects

5.1.5.1 *Construction Phase*

5.1.5.1.1 Effects on European sites

There are no European sites within the proposed replant lands therefore no direct effects are predicted during construction. European sites hydrologically linked to the replant lands site have the potential to be indirectly effected due to hydrological changes and effects such as increased siltation, nutrient release and/or contaminated run-off through drainage channels and watercourses.

A separate Natura Impact Statement (NIS) has been prepared for the proposed replant lands and has been submitted with the planning application. The NIS addresses potential effects on European Sites resulting from the proposed replant lands. Whilst it has been acknowledged that there is the potential for the project to have significant indirect effects on two European sites, with the implementation of the detailed mitigation measures identified in the NIS, it is concluded beyond reasonable scientific doubt that the replant lands shall not result in a significant effect to any European sites.

5.1.5.1.2 Effects on Natural Heritage Areas or Proposed Natural Heritage Areas (NHAs / pNHAs)

5.1.5.1.2.1 ***Direct Effects***

Moneygorm

The proposed replant lands are not within the boundary of any designated nature conservation sites. All NHAs or pNHAs previously described are outside the footprint of the Moneygorm site and, therefore, no direct effects are predicted.

Ballard

The proposed replant lands are not within the boundary of any designated nature conservation sites. All NHAs or pNHAs previously described are outside the footprint of the Ballard site and, therefore, no direct effects are predicted. The nearest pNHA and NHA to the proposed replant lands is the Vale of Clara (Rathdrum Wood) pNHA, located 4.7km to the north east and upstream of the project.

5.1.5.1.2.2 ***Indirect***

Moneygorm

The Moneygorm replant lands are hydrologically linked to Bride/Bunnaglanna Valley pNHA (000079) which intersects with the Blackwater River SAC (002170). Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a ***short-term slight effect***.

Ballard

The downstream distance to the nearest hydrologically linked Natural Heritage Area or Proposed Natural Heritage Area to the proposed replant land site (Avoca River Valley pNHA, Site Code: 01748) is 12.08km downstream of the site and 4.9km (straight line distance) from the site. Arklow Town Marsh pNHA, Site Code: 001931 is also hydrologically linked to the site, 20.40km downstream.

Both of these sites are located along the Avoca River. Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a ***short-term slight effect.***

5.1.5.1.3 Effects on Habitats / Flora

5.1.5.1.3.1 *Direct Effects*

Moneygorm

There are no Annex I habitat types within the study area and no rare and / or protected species of flora. There are no high value habitats recorded on site.

The effect of afforestation on those habitats recorded on-site, notably improved agricultural grassland (GA1), would be a ***long-term imperceptible effect*** as these habitat types shall be lost but they are common in the greater area and are already subjected to of disturbance. The effect of afforestation on these habitats would be, prior to mitigation ***long-term slight Effect*** as these habitat types and flora.

Ballard

There are no Annex I habitat types within the study area and no rare and / or protected species of flora. Habitats, such as scrub (WS1) and dry-humid acid grassland (GS3) mosaic, hedgerow (WL1), treeline (WL2), species poor wet grassland (GS4), drainage ditches (FW4), species poor wet bog woodland (WN7), immature woodland (WS2) and scrub (WS1) mosaic and eroding/ upland rivers (FW1), all classified as Locally Important (higher value), were identified as being key ecological receptors in relation to the proposed replanting lands.

Habitats types including dense bracken (HD1), scrub (WS1), scrub (WS1) and dry-humid acid grassland (GS3) mosaic, scrub (WS1) and immature woodland (WS2), treeline (WL2), hedgerow (WL1) and recolonising bare ground (ED3) are located within the footprint of the proposed replant lands site at Ballard. The impact of the proposed replant lands ***long-term slight effect.***

Habitat types including eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2), species poor wet bog woodland (WN7), drainage ditches (FW4) and species poor wet grassland (GS4) have all been identified as having the potential to support rare or protected species within the local area. These habitats are excluded from the replanting area (Figure 6-1). There shall be no direct loss of these excluded habitats as a result of the proposed replant lands works.

5.1.5.1.3.2 *Indirect*

Moneygorm

Indirect effects on habitats and flora include the spread of invasive species which could be distributed during planting works. Fuscia was identified onsite, this invasive plant species is easily spread by human activities. Interaction of proposed works with these species will likely occur and there exists the possibility of it being spread with the proposed site during replanting.

It is likely that invasive species could affect the existing environment and habitats within the site. It is considered that prior to mitigation a ***long-term slight effect*** could arise as a result of invasive species.

There is potential for the conveyance of silt or contaminants towards the Suir via drainage ditches. Silt and other contaminants also have the potential to effect riparian woodlands bordering the site. The high gradient and array of Drainage Ditches (FW4) throughout the site increases the likelihood of contaminants or pollutants reaching the watercourses downstream of the development. Prior to mitigation, a ***short-term moderate effect*** is predicted.

Ballard

Indirect effects on habitats and flora include the spread of invasive species which could be distributed during planting works. Cherry laurel was identified onsite. This invasive plant species is not easily spread by human activities. It is likely that this species will not impact biodiversity in the short-term after the proposed works.

It is likely that invasive species could affect the existing environment and habitats within the site. It is considered that prior to mitigation a ***long-term imperceptible effect*** could arise as a result of invasive species.

There is potential for the conveyance of silt or contaminants towards the Ballyeustace Stream via drainage ditches. Silt and other contaminants also have the potential to effect riparian habitats bordering the site and downstream. The high gradient and array of drainage ditches throughout the site increases the likelihood of contaminants or pollutants reaching the watercourses downstream of the development. Without mitigation, a ***short-term moderate effect*** is predicted.

5.1.5.1.4 Effects on Fauna

5.1.5.1.4.1 *Direct*

Moneygorm

The proposed replanting of trees at Moneygorm will result in habitat loss, largely attributed to intensive agriculture. These habitats are widespread in the general area and this small-scale loss of habitat will not result in a significant negative effect on the distribution of local protected fauna including pine marten, pygmy shrew, Irish hare, hedgehog, bat species and wood mouse. It is considered that any unmitigated effects will be ***short-term imperceptible***.

<u>Birds</u>
Jackdaw, Hooded Crow, and Robin were recorded during the site walkover. Jackdaw and hooded crow are green listed and are of low of conservation concern.

The habitats recorded on site are offer some nesting-suitability for these species (i.e. immature trees, low-growing scrub and hedgerows). Therefore, the resultant habitat loss is considered to be a ***temporary imperceptible effect***.

Robin was also recorded on site during the site walkover. The species is amber listed for breeding, and protected under the Wildlife Act, 1979 (as amended). The habitats on site offer suitable nesting habitat for robin and other passerine species. However, these habitats are widespread and common in the surrounding area. Furthermore, the planting of trees of which a percentage will be broadleaved trees will in time provide additional nesting habitat for robin and other bird species. Therefore, the resultant habitat loss is considered to be a ***short-term slight effect***.

Hen Harrier

The habitats present on site, particularly improved agricultural grassland GA1 which is dominant within the site, offers low value habitat for nesting and foraging hen harrier. Therefore, the resultant habitat loss is considered to be a ***long-term imperceptible effect***. The planting of conifer plantation would between years 2 and 10 (prior to the canopy becoming enclosed) offer potential nesting habitat for the species.

Bats

The closest confirmed bat roost is located ca. 1.9km from site. *Myotis nattereri, Plecotus auritus*, and *Pipistrellus* were recorded here. *Myotis nattereri* were recorded as using the roost during summer, autumn and winter of the 2017 survey period. *Plecotus auratus* was recorded using the roost in summer of the 2017 survey period. Common pipistrelle was recorded using the roost in 2016. It has been recorded as a maternity, mating and hibernation roost.

In terms of potential roosts, there are 20 features within 2km as recorded during the 2017 survey. The closest is ca. 500m from the site and is a "metal farm building". There are no roosts identified within the replant lands site, and no potential roosting habitat identified. Improved agricultural grassland which is dominant within the site offers low value foraging habitat for bats. Therefore, the resultant habitat loss is a ***long-term imperceptible effect.*** Hedgerows, treelines and scrub present on site is immature are low-growing but may offer potential foraging and commuting habitat for bat species. Where this vegetation is removed, there will be a short-term, slight impact. Tree planting will in time allow continued connectivity through the site for bats. Therefore, the resultant habitat loss is a ***long-term imperceptible effect***. The planting of a portion of broadleaved trees will provide additional foraging habitat for bat species within the site.

Ballard

The planting of trees at Ballard will result in the loss of habitats within the footprint of the replanting area. However, these habitats are widespread in the general area and this small-scale loss of habitat will not result in a significant negative effect on the distribution of mammals including pine marten, red deer, pygmy shrew, hedgehog and wood mouse. It is considered that any unmitigated effects will be ***short-term imperceptible***.

Badger

One badger sett (within the site boundary) was identified during surveys. If afforestation were to be carried out in close proximity to an active sett particularly during the breeding season (December to June), it is considered a ***long-term significant effect*** would result (without mitigation).

Otter

No holts or otter evidence were recorded during surveys within the site. Therefore, ***no direct effect*** to otter is predicted during planting.

Red Squirrel

No dreys or squirrel evidence were recorded during surveys within the site. Habitats within and along the edge of the footprint of the replanting area are suitable to squirrel. Suitable habitats within the proposed footprint, include a ca. 100m section of treeline and areas of scrub/ immature woodland (2.4 ha). The area of scrub/ immature woodland, to be removed, is imperceptible in relation to the overall habitat availability for squirrels within the locality and higher value habitats within the study area that are not being lost as a result of replanting. These higher value habitats were identified during the current appraisal and have subsequently been avoided for replanting.

It is considered that the construction of the proposed replant lands site will result in an initial ***short-term imperceptible effect***. The planting of woodland will in time provide suitable habitat for the species.

Bats
Three potential bat roosts were identified along the border of the replant lands. These trees are located outside of the replant lands footprint; therefore they will not be removed as a result of the proposed replanting.
As replanting will only occur during the daytime, and not at night when bats are most active, it is considered that the construction of the proposed replant lands site will result in a ***temporary imperceptible effect***.

Common Snipe
Common snipe were identified throughout the proposed replant site at Ballard. The species were identified as utilising the habitats within the footprint of the proposed replanting area for roosting and feeding. If replanting were to be carried out at a sensitive period for snipe (i.e. the breeding season) this could cause the abandonment or loss of nests resulting a ***localised temporary significant effect***.

Buzzard
Buzzards were identified to be commuting over and utilising habitats adjacent to the proposed replant lands site at Ballard. These habitats are common within the wider area. It is considered that the planting of the proposed replant lands at Ballard will result in a ***long-term slight effect*** to buzzard.

Common Frog
Common frog and frogspawn were identified within the wetland habitats towards the north of the proposed replant lands site at Ballard. These wetland areas are not within the footprint of the proposed replanting area and therefore it is considered that the planting of the proposed replant lands at Ballard will result in a ***long-term imperceptible effect*** to common frogs

5.1.5.1.4.2 *Indirect*

Moneygorm

The planting (construction phase of the development) may result in temporary disturbance to fauna, however as this will be temporary in duration, and given the habitats present in the wider environment, affected mammals will be able to move to other locations in the wider area until the disturbance has ceased.

Prior to mitigation, there is potential for indirect effects to otter through the transport of pollutants and/or contaminants which could negatively affect the aquatic habitats and prey on which otter depend. These effects could occur as the result of afforestation activities and considering the high gradient and flow rate of the streams draining the study the magnitude of any such effect would be high. As such, any effects on otter prior to mitigation are predicted to be ***short term slight***.

Birds
The amber listed species robin was recorded on site during the site walkover. The habitats on site offer suitable nesting habitat for robin and other passerine species. Thus, there is the potential for disturbance during the nesting season which would result in a ***short-term significant effect.***

Hen Harrier
Hen harrier nests has been recorded within 2km of the replanting site in both the 2015-2016, and 2017 survey periods. A nest was confirmed ca. 380m from the replanting site during the 2015-2016 survey period. A nest was also recorded ca. 1.57km from the replanting site in 2017. There are no records of historic nests within 2km prior to this period. Similarly, there were no nests recorded within 2km in 2018. A confirmed hen harrier territory was recorded ca. 355m from the replanting site 2019.

Given the location of a potential nesting site within 500m of the replanting area there is the potential for disturbance to the species, particularly during sensitive periods i.e. the breeding season.
Therefore, based on the precautionary principal the resultant disturbance of planting works during the breeding season if the nest is occupied could lead to a ***short-term significant effect.*** However, it is worth noting that the location of these nesting sites within conifer plantation and the existing conifer plantation between the nesting site and the Moneygorm site do offer a degree of screening / buffering to the replanting site. The nature of the works are also consistent with the ongoing forestry management within the area.

Bats

Given the proximity of the closest known roost (1.9km) and the closest potential roosting site (500m), the resultant impact due to disturbance is considered to be ***temporary imperceptible effect***.

Ballard

The proposed replanting may result in temporary disturbance to fauna, however as this will be temporary in duration, and given the habitats present in the wider environment, affected fauna will be able to move to other locations in the wider area until the disturbance has ceased.

Prior to mitigation, there is potential for indirect effects to otter through the transport of pollutants and/or contaminants which could negatively affect the aquatic habitats and prey on which otter, snipe and common frog depend.

The effects could occur as the result of afforestation activities and considering the high gradient and flow rate draining the study the magnitude of any such effect would be high. As such, any effects on otter and badger prior to mitigation could result in a ***temporary/short-term significant effect*** (without mitigation).

The development of the proposed project could impact local mammals including pygmy shrew, pine marten, squirrel, red deer and hedgehog. The development of forestry has the potential to displace these species from the local area. Although, these species will be able to move to other locations in the wider area until the disturbance has ceased. It is envisaged that the proposed replant lands will result in a ***temporary imperceptible effect*** upon these species.

Snipe also have the potential to be impacted as a result of disturbance If replanting were to be carried out at a sensitive period for snipe (i.e. the breeding season) this could cause the abandonment or loss of nests resulting a ***localised temporary significant effect*** (without mitigation).

The development of the proposed replant lands is likely to result in a low level of localised disturbance to buzzards within the area. However, the habitat within the replanting area offer some foraging habitat only with no potential roosting habitat. The availability of similar habitat throughout the area it is envisaged that buzzards will result in a ***temporary imperceptible effect***.

The local development of forestry is likely to reduce the level of bat prey within the immediate local area. This could be as a result of homogenised habitats typically within conifer plantations. Bats typically require linear features in order to hunt (Russ and Montgomery, 2002).

The development of conifer plantation has the potential to provide a concentration of such features benefiting bats and will not effect the connectivity through the site for bats. It is envisaged that the development of the replant lands at Ballard could result in a ***long-term slight effect***, without mitigation.

The development of the proposed replant lands at Ballard is likely to indirectly effect frogs within the area.

The development of forestry, including the afforestation of land, has the potential to result in negatively affected aquatic habitats and prey species populations. However, it is noted that most valuable habitats within the site for frog (the wetland habitats towards the north) is not within the footprint of the replant lands. It is envisaged that the development of the replant lands at Ballard could result in a ***long-term slight effect*** on frogs, without mitigation.

5.1.5.2 *Operational Phase*

5.1.5.2.1 Effects on European sites

There are no European sites within the replant lands area therefore no direct effects are predicted during operation. European sites hydrologically linked to the replant lands site have the potential to be indirectly effected due to hydrological changes and effects such as increased siltation, nutrient release and/or contaminated run-off through drainage channels and watercourses.

A Natura Impact Statement (NIS) has been prepared for the proposed replant lands and has been submitted with the planning application. The NIS addresses potential effects on European Sites resulting from the proposed replant lands. Whilst it has been acknowledged that there is the potential for the project to have significant indirect effects on two European sites, with the implementation of the detailed mitigation measures identified in the NIS, it is concluded beyond reasonable scientific doubt that the replant lands shall not result in a significant effect to any European sites.

5.1.5.2.2 Effects on Natural Heritage Areas or Proposed Natural Heritage Areas (NHAs / pNHAs)

5.1.5.2.2.1 *Direct Effects*

Moneygorm

No direct effects are envisaged as a result of the planting phase of the Moneygorm replant lands as no pNHAs or NHAs are located within the site.

Ballard

The nearest hydrologically linked Natural Heritage Area or Proposed Natural Heritage Area to the proposed replant land site Avoca River Valley pNHA (Site Code: 01748), is 12.08km downstream of the site. Arklow Town Marsh pNHA (Site Code: 001931), is 20.40km downstream along the Avoca River.

No direct effects are envisaged as a result of the planting phase of the Ballard replant lands as no pNHAs or NHAs are located within the site.

5.1.5.2.2.2 *Indirect*

Moneygorm

The Moneygorm replant lands are hydrologically linked to the Bride/ Bunaglanna Valley pNHA (Site Code: 000079). According to the site synopsis for the pNHA, "*is situated in county Cork, some 13km. south-west of the town of Fermoy. Both valleys are created by rivers that originate in the Nagles Mountain range*". The major

features of interest in the site are "*firstly, the diverse range of comparatively intact habitat type present and, secondly, the microfungi community, some of which have not been recorded elsewhere*" (NPWS, 1995).

Other features noted as being present within the pNHA are "*semi-natural deciduous woodland of Willow (Salix. sp.), Oak (Quercus sp.) and Rowan (Sorbus aucuparia) occurs with abundant Great Woodrush (Luzula sylvatica) in the ground flora along with a little Hairy Wood-rich (Luzula pilosa), Marsh Hawk's-beard (Crepis paludosa), Water Avens (Geum rivale), Common Cow-wheat (Melampyrum pratense) and Golden-saxifrage (Chrysosplenium oppositifolium)*" (NPWS, 1995). No such habitat, or species were recorded on site.

Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a ***long-term slight effect***.

Ballard

The nearest hydrologically linked Natural Heritage Area or Proposed Natural Heritage Area to the proposed replant land site Avoca River Valley pNHA (Site Code: 01748), is 12.08km downstream of the site. Arklow Town Marsh pNHA, (Site Code: 001931) is also hydrologically connected to the proposed replant lands site (20.40km downstream). Both pNHAs are located along the Avoca River. Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a ***long-term imperceptible effect*** due to the significant instream distance to these designated sites.

5.1.5.2.3 Effects on Habitats / Flora

5.1.5.2.3.1 *Direct Effects*

Moneygorm

No direct effects to habitats and flora are envisaged as a result of operation of the proposed replant lands at Moneygorm. No Flora Protection Order species were identified at this intensively managed agricultural grassland site. Following planting as the forestry matures the understory shall be shaded out and changed. As such, any effects, prior to mitigation, are predicted to be ***long term slight effect.***

Ballard

No direct effects to habitats and flora are envisaged as a result of operation of the proposed replant lands at Ballard. No Flora Protection Order species were identified on site during either survey in 2018 or 2020. Following planting as the forestry matures the understory shall be shaded out and changed. As such, any effects, prior to mitigation, are predicted to be ***long term slight effect.***

5.1.5.2.3.2 *Indirect*

Moneygorm

Water quality as a result of growth of the conifer crop is likely to result in acidification and siltation of surrounding habitats, effecting flora. An indirect effect on habitats both on and off site is envisaged as a result of the high level of drainage from the site. The addition of silt, herbicides and other contaminants to the site is likely to result in a ***long-term slight effect*** to water quality, and species using this habitat if unmitigated.

Ballard

Water quality as a result of growth of the conifer crop is likely to result in acidification and siltation of surrounding habitats, effecting flora.

An indirect effect on habitats both on and off site is envisaged as a result of the increased drainage from the site. The addition of silt, herbicides and other contaminants to the site is likely to result in a ***long-term slight effect*** to water quality locally, and species using this habitat if unmitigated.

5.1.5.2.4 Effects on Fauna

5.1.5.2.4.1 *Direct*

Moneygorm

No protected fauna species were identified on site. It is envisaged that the operation of the conifer plantation will have a ***long-term imperceptible effect***.

Birds

It is envisaged that the operational phase of the replanting will have a ***long-term imperceptible effect***. The planting of conifer plantation would between years 2 and 10 (prior to the canopy becoming enclosed) offer potential nesting habitat for hen harrier. The planting of trees of which a percentage will be broadleaved trees will in time provided additional nesting habitat for robin and other passerine bird species.

Bats

It is envisaged that the operational phase of the replanting will have a ***long-term imperceptible effect***. The planting of a portion of broadleaved trees will provide additional foraging habitat for bat species within the site.

Ballard

Two bird species have been identified as key receptors. One amber-listed bird species, snipe, and one green-listed species, buzzard, were identified using, or adjacent to, the site. Snipe were observed throughout the site. Buzzard were observed flying over and perched alongside the site. Both species are likely to utilise habitats within the site, either for roosting, feeding or cover. The site's habitats are widely common within the area, particularly after the felling of plantation forestry. The operation phase of this proposed replant lands will likely result in a ***long-term slight effect*** on these species, without mitigation.

Frogs are likely to be impacted as a result of conifer plantation operational management such as the thinning of trees and fertilisation. Without implementation of mitigation measures the direct effect of the operation phase is likely to result in a ***long-term slight effect***.

Terrestrial mammals within the site, including pygmy shrew, hedgehog, red deer, red squirrel badger and otter, are likely to be impacted as a result of the operation phase of the replant lands. The disturbance of species during operation is likely to effect populations, although due to the high level of similar habitat located within the area, this effect is envisaged to result in a ***long-term slight effect,*** without mitigation.

The operation phase of the replant lands is not likely to impact bats within the area.

5.1.5.2.4.2 *Indirect*

Moneygorm

Afforestation of the site may result in an increase in nutrient, silt and herbicide runoff from the site. This is likely to have a reduction in oxygen levels in spawning beds caused by siltation; reduced oxygen levels at night-time caused by over-production of plant material. Knock-on effects include potential alteration in macrofaunal assemblage resulting in reduction of fish prey, and reduction in fish numbers (caused by effects to prey and/or spawning grounds) affecting otter which rely on fish stocks. It is envisaged that the operation of the conifer plantation will have a ***long-term slight effect***.

Ballard

Afforestation of the site may result in an increase in nutrient, silt and herbicide runoff from the site. This has the potential (unmitigated) to result in a reduction in oxygen levels in spawning beds caused by siltation and reduced oxygen levels at night-time caused by over-production of plant material. Knock-on effects include potential alteration in macrofaunal assemblage resulting in reduction of fish prey, and reduction in fish numbers (caused by effects to prey and/or spawning grounds) affecting otter which rely on fish stocks. It is envisaged that the operation of the conifer plantation will have a ***long-term slight effect*** locally.

Afforestation of the site is likely to result in the increased siltation and flow rate of waterbodies within the site. Drainage practices completed for the development of plantation forestry are likely to result in increased flowrates of stagnant water on site (which frogs prefer to breed within). It is envisaged that the operation of the conifer plantation will have a ***long-term slight effect***.

Path: R:\Map Production\2020\P20-099\Workspace\Replant Lands EA\P20_099_GIS_Fig5-10_BufferZonesOfFeaturesOfInterest_Ballard_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- Exclusion Zone
- Planting Area
- Site Boundary

Habitat Classification

- ED3, Recolonising bare ground
- FW1, Eroding/upland rivers
- FW4, Drainage ditches
- WL1, Hedgerows
- WL2, Treelines
- GS4, Wet grassland
- HD1, Dense bracken
- WD4, Conifer plantation
- WN2, Oak-ash-hazel woodland
- WN7, Bog woodland
- WS1, Scrub
- WS1/GS3, Scrub / Dry-humid acid grassland
- WS1/WS2, Scrub / Immature woodland

N W E S

0 50 100 200 Meters

TITLE:	Buffer Zones of Features of Interest at Ballard, Co. Wicklow		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	5.8		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:5000	**REVISION:**	0
DATE:	29/10/2020	**PAGE SIZE:**	A3

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5.1.6 General Mitigation Measures – Both Sites

The following mitigation measures are proposed for both Moneygorm and Ballard replant lands.

Mitigation measures which will reduce the risk of enrichment of suspended solids and nutrient release in surface watercourses comprise best practice methods which will be applied at the replanting site. These include:

Careful mapping of existing site drainage and vulnerabilities (wet ground, preferential flow paths) prior to planting will be carried out and the appropriate drainage design and management will be employed. This includes the provision of collector drains which will disperse drainage water with low velocity through wide (20m) vegetated buffer zones increasing the efficacy of sediment and nutrient retention across the area. Silt fencing will be erected along the drainage ditch at the location of the proposed replanting to provide additional protection to the watercourses in this area.

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage.

Site preparation for replanting will be carefully managed to prevent any loss of silt and sediment conveyed in surface water run-off to receiving waters.

This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.

5.1.6.1 *Mitigation Measures – Site Specific*

The following site specific mitigation measures are proposed:

5.1.6.1.1 Moneygorm

The layout of the replant lands takes cognisance of the drainage regime on the site:

- A buffer of 10m either side of the drainage ditch will be maintained, as per the Forestry and Water Quality Guidelines (Department of Agriculture, 2000) (for areas of moderate slope of 0-15%). 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.
- The drainage ditch will be protected by fencing, including the proposed stilling ponds.
- Additional protection will be provided in the form of silt fencing downslope where required during planting, to further ensure that there is no effect from the development to streams and rivers downslope of the site.
- This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.

Preconstruction hen harrier survey to reconfirm findings of the bird surveys for the EIAR for the wind farm.

Planting and vegetation clearance to be undertaken outside the nesting season (1st March to 31st August).

5.1.6.1.2 Ballard

A number of locally important wetland habitats have been identified on site, accounting for 2.3 Ha of the total 37.1 Ha of the proposed site. Habitat types including eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2), species poor wet bog woodland (WN7), drainage ditches (FW4) and species poor wet grassland (GS4) have all been identified as habitats of locally high quality or having the potential to support rare or protected species.

An exclusion buffer of 15m will be applied to these habitats in order to preserve their integrity and reduce the rate of siltation as a result of the proposed forestry replanting.
See Figure 5-7 for more details.

In addition to the above design mitigation,

The following mitigation measures are proposed for Ballard replant lands:

- The drainage ditch will be protected by fencing, including the proposed stilling ponds.
- Additional protection will be provided in the form of silt fencing downslope during planting, to further ensure that there is no effect from the replanting to streams and rivers downslope of the site.
- This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.
- For waterbodies and wetland habitats (including valuable drainage ditches) within the site, a buffer of 15m either side of the drainage ditch will be maintained, as per the Forestry and Water Quality Guidelines (Forestry Service, 2000b). This 15m buffer is specifically employed on steep ground at between 15-30%). See Figure 3-9 for more details in relation to the buffer zones required.
- Additional protection will be provided in the form of silt fencing downslope during planting, to further ensure that there is no effect from the development to streams and rivers downslope of the site.
- This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.
- A preconstruction mammal survey to reconfirm the finding of this survey particularly for badger and to inform a future derogation license for badgers will be undertaken prior to replanting. A buffer of 100m is required around the noted badger sett if derogation is not granted.
- The removal of scrub, trees or saplings will be completed outside of the bird nesting season only. As scrub makes up a large portion of the proposed site, this mitigation measure will be adhered to during the nesting season (1st March to the 31st August) (Section 40 of the Wildlife Act 1976).
- Pre-construction frog surveys will be completed, to reconfirm the findings of this report, within the replant lands site prior to construction, in the event that frogspawn is identified, translocation will be carried out in accordance with the NRA guidelines (NRA, 2009).
- Potential bat roost locations were not identified within the direct development footprint of the proposed replant lands. Potential bat roosts are located within the adjacent treeline habitats of the replant lands site, as treelines or hedgerows will not be impacted as a result of this replanting, mitigation measures are not required.
- As the identified invasive species, cherry laurel, was not located within the replant lands site, no mitigation will occur.

- A single cherry laurel plant is located within the adjoining treeline habitat, adjacent to the development site, as this habitat will not be impacted during the construction or operation of the replanting, no mitigation is needed in relation to the invasive species. A pre-construction invasive species survey will be undertaken to reconfirm the findings of this report.

A pre-construction mammal survey will be undertaken, to reconfirm the findings of this report, within the footprint of the replant lands and the findings of the mammal surveys cognisant of the NRA *Guidelines for the Treatment of Badgers Prior To the Construction of National Road Schemes* (NRA, 2008c). The following measures taken from this document shall be adhered to.

Disused and inactive setts

In the instance of disused setts or setts verified as inactive, and to prevent their reoccupation, the entrances shall be lightly blocked with vegetation and a light application of soil (soft blocking). The purpose of soft-blocking is to confirm that an apparently inactive sett is not occupied by badgers.

If a sett is deemed active after soft blocking a motion detection camera will be installed to confirm species and the number of individuals present.

If all entrances remain undisturbed for a minimum of five days, they will be hard-blocked immediately using stone and wire mesh, under the supervision of an experienced and suitably qualified ecologist.

Hard-blocking is best achieved using buried fencing materials and compacted soil with further fencing materials laid across and firmly fixed to blocked entrances and surrounds. If all entrances remain undisturbed for a minimum of five days, setts will be immediately destructed due to the close proximity to the proposed replant lands.

A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues will be submitted to the NPWS, in fulfilment of the wildlife licence conditions.

Active setts

Where field signs or monitoring reveal any suggestion of current or recent badger activity at any of the sett entrances, the sett will require thorough evacuation procedures.

Inactive entrances will be soft and then hard-blocked or destructed as described for inactive setts, but any active entrances will have one-way gates installed (plus proofing around sides of gates) to allow badgers to exit but not to return. The gates will be tied open for three days prior to being set to exclude. Sticks will be placed at arm's length within the gated tunnels to establish if badgers remain within the sett.

Gates will be left installed, with regular inspections, over a minimum period of 21 days (including period with gates tied open) before the sett is deemed inactive. Any activity at all will require the procedures to be repeated or additional measures taken. The sett will be monitored regularly for signs of occupancy. Once all badgers have been excluded from active setts, they will be immediately hard-blocked (using a stone and wire) and will be destructed, under the supervision of an experienced and suitably qualified ecologist. Hard-blocking is best achieved using buried fencing materials and compacted soil with further fencing materials laid across and firmly fixed to blocked entrances and surrounds.

A toolbox talk shall be provided to all construction workers accessing the site to raise the awareness of the species. If badgers do attempt to reoccupy the site all works shall cease within 30m of this area and the project ecologist/ECoW shall consult with NPWS. The area shall be treated as an active sett and the procedure outlined above shall apply in full.

A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues will be submitted to the NPWS, in fulfilment of the wildlife licence conditions.

Vegetation clearance

There is the potential for further setts to be discovered during vegetation clearance works. Care will need to be taken during this early stage of the proposed replanting and a competent ecologist will be required on-site for these works. If further setts are discovered all works within 30m of the sett shall be ceased including vegetation clearance. NPWS shall be contacted and an amendment to the derogation licence shall be sought with the inclusion of the new sett. An activity survey shall be carried out to assess the potential for the sett to be used by badgers. And the steps followed above under the titles 'Disused and Inactive Setts' and/or 'Active Setts' will be followed.

Measures to prevent the injury of badgers during proposed mitigation measures

In the event that a badger is found injured during the implementation of proposed mitigation measures, it is important to realise that injured badgers will be frightened and can be very dangerous. They are strong animals and are not used to being handled, so no attempt will be made to touch an injured badger, as this could result in workers being bitten. NPWS shall be contacted along with ISPCA and potentially a vet specified by NPWS capable of treating the species.

5.1.7 Residual effect

5.1.7.1 *Residual Effect (Moneygorm)*

With the implementation of the aforementioned mitigation measures, no significant residual effects are envisaged as a result of the proposed replanting. The overall residual effects to biodiversity will be a ***localised reversible imperceptible*** to ***slight effect***.

5.1.7.2 *Residual Effect (Ballard)*

With the implementation of the aforementioned mitigation measures, no significant residual effects are envisaged as a result of the proposed replanting. The overall residual effects to biodiversity will be a ***localised reversible imperceptible*** to ***slight effect***.

5.1.8 Conclusion

5.1.8.1 *Assessment Conclusions*

Moneygorm, Co. Cork

The proposed site is located in an area of agricultural pasture, with adjacent conifer plantation. The afforestation methodology is not intensive and all works and subsequent maintenance will be carried out in accordance with the various Guidelines described in Section 3.4 and the Technical Approvals issued by the Forest Service.

With the implementation of Forestry and Water Quality Guidelines, and the aforementioned mitigation measures (particularly in managing site drainage to ensure ground disturbance is kept to a minimum), there is a low risk of significant nutrient and sediment run-off to watercourses in the area. Thus, the residual effect will be ***localised reversible long-term imperceptible*** to ***slight effect***.

Ballard, County Wicklow

The proposed site is located in an area dominated in both agricultural pasture and conifer plantation. The surrounding landscape is both mountainous and rural in character with semi-natural woodland to the north.

The afforestation methodology is not intensive and all works and subsequent maintenance will be carried out in accordance with the various Guidelines described in Section 3.4 and the Technical Approvals issued by the Forest Service.

With the implementation of Forestry and Water Quality Guidelines, and the aforementioned mitigation measures (particularly in managing site drainage to ensure ground disturbance is kept to a minimum and the sensitive habitats are excluded from planting), there is a low to slight risk of significant nutrient and sediment run-off to watercourses in the area. Thus, the residual effect will be ***localised reversible long-term imperceptible*** to ***slight effect***.

5.1.9 REFERENCES

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5.2 Hydrology and Water Quality

This section of the report provides baseline information on the environmental setting of the proposed replanting lands in terms of hydrology and water quality and discusses the potential impacts and associated effect that the activity may have on them. Where required, appropriate mitigation measures to limit any identified significant impacts to hydrology and water quality are recommended.

5.2.1 Moneygrom, Co. Cork

The site is located in the Bride (Blackwater)_020 sub-basin. The surrounding land at the replant land drops off on three sides and the land at the site was observed to be dry, with no associated drainage network. The greenfield runoff drains to the east into the Bunnaglanna Stream and southerly to the Toorgarrif Stream and the Bride River.

The river water quality status of these watercourses is classified as 'Good' as defined by Water Framework Directive (WFD). The risk status is according to the EPA under 'Review'.[10]

The Bunaglanna watercourse is located c. 450m east of the proposed replant lands; drainage channels carrying flowing water are present: one flowing north-south along the eastern replant lands boundary which joins another channel flowing west-east from within the replant lands site exit the site to join a drainage channel flowing downhill (west-east) along the edge of the adjacent conifer plantation towards the Bunaglanna. Assessment of satellite imagery indicates this drainage channel connects with the Bunaglanna c. 565m downstream of the replant lands site.

The Bunnaglanna is a tributary of the Bride River, which it joins c. 2.5 km to the south of the replant lands site. The Bride is a tributary of the Blackwater River, flowing east from the Bunnaglanna/Bride confluence for c. 52 km before joining the Blackwater south of Villierstown in Co. Waterford.

The Bunaglanna and Bride are within the Blackwater River (Cork/Waterford) SAC (002170); the SAC boundary is c. 380m east of the replant lands site at its closest point. The in-stream distance between the replant lands and Blackwater River (Cork/Waterford) SAC is also c. 565m.

5.2.1.1 *Potential Impact*

While the process of afforestation may result in a slight alteration in the water runoff of the site, the small size of the site (0.39 km2) when compared with the catchment area of Bride (Blackwater)_020 (59.90 km2).

The afforestation will lead to an imperceptible reduction in the runoff volumes in the longer term as trees mature.

The potential impacts on water quality are as described in the ecology section as potential disturbance of soil from plant and personnel movement on site causing sediment loss and/ or possible nutrient loss. The site is of a low gradient (virtually flat) and there is a proposed 15m buffer zone between the planting and the drainage ditches on site. The predicted impact on water quality is negative-short-slight prior to the implementation of mitigation measures.

[10] https://gis.epa.ie/EPAMaps/

5.2.1.2 *Proposed Mitigation Measures*

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which will be applied at the replanting site. These include:

Careful mapping of existing site drainage and vulnerabilities (wet ground, preferential flow paths) prior to planting will be carried out and the appropriate drainage design and management will be employed. This includes the provision of collector drains which will disperse drainage water with low velocity through wide (10m) vegetated buffer zones increasing the efficacy of sediment and nutrient retention across the area. Silt fencing will be erected along the banks of drains to the east and south of the site to provide additional protection to the watercourses in this area.

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. A buffer of 10m from the drainage ditches will be maintained, following the buffer zone widths of 10m as recommended in the Forest Service guidance document " Forestry and Water Quality Guidelines".

The drainage ditch will be protected by fencing. Additional protection will be provided in the form of silt fencing downslope where required during planting, to further ensure that there is no effect from the development to streams and rivers downslope of the site. This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.

Site preparation for replanting will be carefully managed to prevent any loss of silt and sediment conveyed in surface water run-off to receiving waters.

These measures will reduce potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site.

5.2.1.3 *Residual Impact*

The residual impact is temporary- not significant during the planting stage and future harvesting stage.

5.2.2 Ballard, Co. Wicklow

The Ballard replant lands are split into two aspects one easterly and the other westerly of the townland. The site is drained by the Ballyeustace Stream (EPA Code: 10B05). A 1st order watercourse, the Ballyeustace Stream flows in a north-easterly direction for ca. 3km before its confluence with the Avonbeg River (EPA Code: 10A04). Along the northerly section of the easterly aspect of the replant lands, a section of the Ballyeustace Stream has been split from the natural course though an artificial course to the south.

The Ballyeustace Stream (EPA Code: 10B05) flows into the Avonbeg River (EPA Code: 10A04), a 4th order watercourse, at the edge of the Ballinatone Lower and Ballard townlands. From here The Avonbeg River flows for approximately 5.6kmin a southerly direction before entering the Avoca River (EPA Code: 10A03). The Avoca River travels for approximately 15.48km until entering the Irish Sea at Arklow.

The Ballyeustance Stream is of ‘Good’ and ‘Not at Risk’ status as defined by the WFD.

5.2.2.1 *Potential Impact*

While the process of afforestation may result in a slight alteration in the water runoff of the site, the small size of the site compared to the catchment area of the sub-basin. The afforestation will lead to an imperceptible reduction in the runoff volumes in the longer term as trees mature.

The potential impacts on water quality are as described in the ecology section as potential disturbance of soil from plant and personnel movement on site causing sediment loss and/ or possible nutrient loss.

The site is of steep gradient and there is a proposed 15m buffer zone between the planting and the drainage ditches on site, along with important habitats. The predicted impact on water quality is slight prior to the implementation of mitigation measures.

5.2.2.2 *Proposed Mitigation Measures*

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which will be applied at the replanting site. These include:

Careful mapping of existing site drainage and vulnerabilities (wet ground, preferential flow paths) prior to planting will be carried out and the appropriate drainage design and management will be employed. This includes the provision of collector drains which will disperse drainage water with low velocity through wide (15 m) vegetated buffer zones increasing the efficacy of sediment and nutrient retention across the area. Silt fencing will be erected along the banks of drains to the east and south of the site to provide additional protection to the watercourses in this area.

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. A buffer of 10m from the drainage ditches will be maintained, following the buffer zone widths of 15 m as recommended in the Forest Service guidance document " Forestry and Water Quality Guidelines".

The drainage ditch will be protected by fencing. Additional protection will be provided in the form of silt fencing downslope where required during planting, to further ensure that there is no effect from the development to streams and rivers downslope of the site. This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.

Site preparation for replanting will be carefully managed to prevent any loss of silt and sediment conveyed in surface water run-off to receiving waters.

These measures will reduce potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site.

5.2.2.3 *Residual Impact*

The residual impact is temporary- not significant during the planting stage and future harvesting stage.

5.3 Population, Human Health and Material Assets

This section of the report sets out the baseline information for population, human health and material assets at the replant sites of Moneygowm, Co. Cork and Ballard, Co. Wicklow. The proposed afforestation of the sites is then considered with respect to potential impacts on population, human health and materiel assets. The areas considered include:

- Population
- Socio-economics, Employment and Economic Activity
- Land Use
- Recreation, Amenity and Tourism
- Human Health
- Renewable, Non-renewable and Utility Infrastructure.

5.3.1 Moneygorm, Co. Cork

The proposed replant lands are made up of an open expanse of approximately 40 hectares of Improved Agricultural Grassland bordered by scrub and Grassy Verges in the townland of Moneygorm. The lands are situated on the southern side of the Nagles Mountains on a flat spur overlooking the Bride valley. The site is accessed via the R614, un-named local roads, and farm/forestry access tracks.

The lands are located in the Electoral Division of Carrig which makes up the study area for the purpose of this assessment. As detailed in table 5-25, the population of Carrig in the 2016 census was 159 persons. This is an increase of approximately 20% since 2006. The figures represent a sparsely populated rural area. There are 3 no. dwellings within 500m of the replant site. The closest dwelling is located 200m to the south east of the lands.

Table 5-25: Population of Carrig Electoral Division

	Population		
Electoral Division	**2006**	**2011**	**2016**
Carrig	133	145	159

The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the west and north-east by conifer plantations, and to the north, south and south-east by agricultural land. The lands are currently in use as pasture. The main employment activities based in the area are agriculture and forestry. There are no significant tourism attractions in the immediate area. Recreation activity in the area is focused on hiking and hill walking.

The general health of the population within the electoral division of Carrig is set out in the 2016 census and detailed in table 5-26. The general health of the population in the electoral division of Carrig is of good quality with 89% of the respondents indicated that their health is good or very good.

Table 5-26: General Health of Carrig Electoral Division (Census 2016)

General Health	Very Good	Good	Fair	Bad	Very Bad	Not Stated
Population	100	41	7	1	0	10
% Population	63%	26%	4%	1%	0%	6%

Forestry is the main resource of the area. There is no major utility infrastructure located at the site.

5.3.1.1 *Potential Impacts*

The proposed afforestation on the site at Moneygorm is not expected to have an impact on population trends in the electoral division of Carrig. A long-term impact on land use will occur due to planting of commercial forestry creating a transition from agricultural pasture to forestry. This will result in a permanent impact on land use in the area and is considered non-significant due to the relatively small size of the proposed afforestation area. This change in land use may have a slight negative impact on socio-economic activity due to the loss of agricultural lands, however, this loss will be offset by the increase in commercial forestry lands and will result in an increase in forestry related economic activity in the area.

The proposed afforestation on the site at Moneygorm is not expected to impact on recreation, amenity and tourism in the greater area. There are no negative health impacts envisaged as a result of the planting of the site. There will be a slight negative impact on materiel assets in the area due to the removal of approximately 63 hectares of forestry at the CGEP site. This impact will be offset by the planting of approximately 40 hectares at Moneygorm, however, the remaining 23 hectares required to replace the forestry removed during the project will be located elsewhere on lands at Ballard, County Wicklow. Therefore, there will be a net deficit of forestry in the CGEP area as a result of the CGEP project. However, in the national context, there will be no loss of quantum of commercial forestry lands due to the overall planting of approximately 63 hectares of replacement forestry.

5.3.1.2 *Mitigation Measures*

As there are no significant impacts envisaged on Population, Human Health and Materiel Assets, mitigation measures are not required for the replant lands at Moneygorm.

5.3.1.3 *Residual Impacts*

Residual impacts associated with Population, Human Health and Materiel Assets as a result of afforestation on the subject lands at Moneygorm will include a long-term impact on land use in the area as a result of planting on agricultural lands. This residual impact is considered to be permanant and insignificant due to the low quantum of agricultural lands affected and the likelihood that agricultural practices will not be significantly impacted due to the change in land use.

The proposed removal of ca. 63 hectares of forestry as a result of the CGEP project and the replacement of this forestry with 40 hectares at Moneygorm and 23 hectares at Ballard will result in a slight negative residual impact on materiel assets in the area of the CGEP due to a net deficit of commercial forestry at this location. However, this impact is considered imperceptible at a national level due to the replacement of all ca. 63 hectares of forestry. Therefore, the residual impact on materiel assets is considered to be imperceptible.

5.3.2 Ballard, Co. Wicklow

The proposed afforestation area is situated in the townland of Ballard, Co. Wicklow, west of the village of Ballinaclash in a rural, mountainous area. The replant lands consist of two sites within 100m of one another. The sites are made up of scrub, grassland, hedgerows and tracks. The lands are accessed via the R753 and local roads. The sites make up a total of 77 hectares, of which, 62.8 hectares will be replanted.

The replant lands are located in the Electoral Division of Ballinaclash which makes up the study area for the purpose of this assessment. As detailed in table 5-27, the population of Ballinaclash in the 2016 census was 633 persons. This is an increase of approximately 7% since 2006. A slight decline in population was recorded between 2011 and 2016 representing a population decrease of less than 1%. The figures recorded in the census represent a sparsely populated rural area with much of the population focused on the village of Ballinaslash. There are 11 no. dwellings within 500m of the replant site. There are 3 no. dwellings directly adjacent to the site boundary.

Table 5-27: Population of Ballinaclash Electoral Division

	Population		
Electoral Division	**2006**	**2011**	**2016**
Ballinaclash	592	636	633

The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the south and east by conifer plantations, to the north and west with semi-natural woodland and agricultural pasture lands. The main employment activities based in the area are agriculture and forestry. There are no significant tourism attractions in the immediate area. Recreation activity in the area is focused on hiking and hill walking.

The general health of the population within the electoral division of Ballinaclash is set out in the 2016 census and detailed in table 5-28. The general health of the population in the electoral division of Ballinaclash is of good quality with 90% of the respondents indicated that their health is good or very good.

Table 5-28: General Health of Clogher Electoral Division (Census 2016)

General Health	Very Good	Good	Fair	Bad	Very Bad	Not Stated
Population	411	159	47	7	0	9
% Population	65%	25%	8%	1%	0%	1%

Forestry is the main resource in the area. There is no major utility infrastructure located at the site.

5.3.2.1 *Potential Impacts*

The proposed afforestation on the site at Ballard is not expected to have an impact on population trends in the electoral division of Ballinaclash. The planting of commercial forestry will result in the subject lands transitioning from scrub and grassland to forestry. This will result in a permanent impact on land use in the area and is considered not to be significant due to the relatively small size of the proposed afforestation area. This change in land use will have a slight positive impact on socio-economic activity in the area due to the increase in commercial forestry.

The proposed afforestation on the site at Ballard is not expected to impact on recreation, amenity and tourism in the greater area. There are no negative health impacts envisaged as a result of the planting of the site. There will be a slight positive impact on materiel assets in the area due to the planting of approximately 62.8 hectares of new forestry.

5.3.2.2 *Mitigation Measures*

As there are no significant impacts envisaged on Population, Human Health and Materiel Assets, mitigation measures are not required for the replant lands at Ballard.

5.3.2.3 *Residual Impacts*

Residual impacts associated with the replant lands at Ballard includes a permanant change in land use which will result in the planting of commercial forestry on scrub lands and grassland. This residual impact is expected to be imperceptible due to the presence of existing commercial forestry in the area and the relatively small extent of the lands at Ballard.

5.4 Geology and Soils

This section of the report provides baseline information on the environmental setting of the potential replanting lands in terms of soils and geology and discusses the potential impacts and associated effect that the activity may have on them. Where required, appropriate mitigation measures to limit any identified significant impacts to soils and geology are recommended.

5.4.1 Desk Study

This desk study involved collecting all relevant geological data for each site and its surrounding area. This included consultation of the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series. Sheet 19 and 22, Geological Survey of Ireland (GSI, 1995);
- General Soil Map of Ireland 2nd edition (www.epa.ie).

5.4.2 Methodology

The baseline environmental conditions at each site were determined following a desktop review of publicly available information including aerial photograph and geospatial datasets. As per the EIAR submitted for Coom Green Energy Park Wind Farm, the effect of the proposed replanting before recommended mitigation measures are introduced is described under each topic. Interactions and in-combination effects with other environmental topics are also included in this evaluation.

Where potential impacts were identified, mitigation measures were recommended to minimise impacts on the environment to acceptable levels of significance. The residual impact from the proposed development was then re-appraised taking into account the recommended remedial measures.

5.4.2.1 *Assessment of Magnitude and Significance of Impact on Land, Soils and Geology*

An impact rating has been developed for each of the phases of the proposed development based on the Institute for Geologists Ireland (IGI) "Guidance for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements". In line with the IGI Guidance, the receiving environment (Geological Features) was first identified. Using the NRA rating criteria in Appendix C of the IGI Guidance, the importance of the geological and hydrogeological features are rated followed by an estimation of the magnitude of the impacts on geological and hydrogeological features.

This determines the significance of the impact prior to application of mitigation measures.

Table 5-29: Criteria rating Site Importance of Geological Features (NRA, 2009)

Magnitude	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying the site is significant on a national or regional scale	• Geological feature on a regional or national scale (NHA). • Large existing quarry or pit. • Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying the site is significant on a local scale	• Contaminated soil on site with previous heavy industrial usage • Large recent landfill site for mixed wastes • Geological feature of high value on a local scale (County Geological Site) • Well drained and/or high fertility soils • Moderately sized existing quarry or pit • Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale.	• Contaminated soil on site with previous light industrial usage • Small recent landfill site for mixed wastes

Magnitude	Criteria	Typical Example
	Volume of peat and/or soft organic soil underlying the site is moderate on a local scale	• Moderately drained and/or moderate fertility soils • Small existing quarry or pit • Sub- economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying the site is small on a local scale	• Large historical and/or recent site for construction and demolition wastes • Small historical and/or recent landfill site for construction and demolition wastes • Poorly drained and/or low fertility soils • Uneconomic extractable mineral resource

Table 5-30: Criteria rating Site Importance of Hydrogeological Features (NRA, 2009)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – e.g. NHA status. Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Potable water source supplying <50 homes.

Table 5-31: Estimation of Magnitude of Impact on Geological Features (NRA, 2009)

Magnitude	Criteria	Typical Example
Large Adverse	Results in loss of attribute	• Loss of high proportion of future quarry or pit reserves • Irreversible loss of high proportion of local high fertility soils • Removal of entirety of geological heritage feature • Requirement to excavate / remediate entire waste site • Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	• Loss of moderate proportion of future quarry or pit reserves • Removal of part of geological heritage feature • Irreversible loss of moderate proportion of local high fertility soils • Requirement to excavate / remediate significant proportion of waste site • Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	• Loss of small proportion of future quarry or pit reserves • Removal of small part of geological heritage feature • Irreversible loss of small proportion of local high fertility soils and/or • high proportion of local low fertility soils • Requirement to excavate / remediate small proportion of waste site • Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Table 5-32: Estimation of Magnitude of Impact on Hydrogeological Features (NRA, 2009)

Magnitude	Criteria	Typical Example
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >1% annually.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer. Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually.

The matrix in Table 5.33 determines the significance of the impacts based on the importance and magnitude of the impacts as determined by Tables 5.29 to 5.32.

Table 5-33: Ratings of Significance of Impacts for Geology/Hydrogeology (NRA, 2009)

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Very High	Imperceptible	Significant/Moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/Moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

5.4.3 Existing Environment

The existing environment is described hereunder. This includes descriptions of the underlying quaternary and bedrock geology, areas of geological heritage, areas of economic interest with respect to geological resources and potential for soil contamination.

5.4.3.1 *Moneygorm, Co. Cork*

5.4.3.1.1 Quaternary Deposits

The Quaternary Geology underlying the proposed development is discussed below. The subsoils present within the proposed replant lands were taken from the Geological Survey of Ireland (GSI) online mapping - Quaternary Geology of Ireland and comprise:

- Till derived from Devonian Sandstone (TDSs);

Areas of bedrock outcrop or subcrop are noted to the southwest and southeast of the replant lands.

5.4.3.1.2 Bedrock Geology

The Geological Survey of Ireland (GSI) 1:100,000 scale bedrock geology map shows that the proposed replant lands are underlain by the Ballytrasna Formation, which is described as dusky-red to purple mudstone with subordinate pale-red sandstone.

There are no recorded faults within the bedrock on the site. There are no recorded karst features in the area.

5.4.3.1.3 Geological Heritage

There are no recorded geological heritage sites within the proposed replant lands.

5.4.3.1.4 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer shows no active or historic quarries or mineral occurrences surrounding the study area.

The GSI Aggregates database indicates that there is a very low to low potential for crushed rock across of the site.

5.4.3.1.5 Hydrogeology

The Geological Survey of Ireland (GSI) has classified the bedrock formation at the site as a Locally Important Aquifer (Ll - Bedrock which is Moderately Productive only in Local Zones. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m^3/d). In the bedrock aquifers, groundwater predominantly flows through fractures, fissures, joints or conduits

5.4.3.1.6 Groundwater Vulnerability

The vulnerability rating of the aquifer within the site is categorised as 'High' due to the presence of bedrock relatively close to the surface. To the south and east of the site, the groundwater vulnerability is categorised as 'Extreme' (E) and 'Rock near surface or karst' (X) which is likely to be as a result of the presence of bedrock at or within 1 to 3 metres of the surface.

5.4.3.1.7 Groundwater Wells and Springs

Based on a review of the GSI Groundwater Wells and Springs database there are no wells or springs on the proposed replant lands. There are no wells or springs recorded within 1km of the Moneygorm site.

5.4.3.1.8 Groundwater Bodies Description

The proposed replant lands are located within the Glenville Groundwater Body (GWB). Due to the general absence of intergranular permeability within the underlying Ballytrasna Formation, groundwater flow generally occurs in faults and joints within this GWB. The majority of the groundwater flow generally occurs in an upper, shallow weathered zone. This is due to the lesser frequency and connectivity of water-bearing fractures and fissures at depth within the GWB.

5.4.3.2 *Ballard, Co. Wicklow*

5.4.3.2.1 Quaternary Deposits

The Quaternary Geology underlying the proposed development is discussed below. The subsoils present within the proposed replant lands were taken from the Geological Survey of Ireland (GSI) online mapping - Quaternary Geology of Ireland and comprise:

- Till derived from Lower Paleozoic Sandstones and Shales (TLPSsS);

A localised area of gravel derived from Lower Paleozoic Sandstones and Shales is present to the north of the proposed replant lands.

5.4.3.2.2 Bedrock Geology

The Geological Survey of Ireland (GSI) 1:100,000 scale bedrock geology map shows that the proposed replant lands are underlain by the Ballybeg Member, which is described as a dark grey semi-pelitic psammitic Schist.

A fault runs along the western boundary of the site, in a northeast to southwest direction. There are no recorded karst features in the area.

5.4.3.2.3 Geological Heritage

There are no recorded geological heritage sites within the proposed replant lands.

5.4.3.2.4 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer shows two potential mineral localities to the east of the proposed replant lands. These are described as the site of an old furnace (no mineral recorded) and non-metallic mineral in the townland of Ballinaclash.

The GSI Aggregates database indicates that there is a moderate to very high potential for crushed rock across of the site.

5.4.3.2.5 Hydrogeology

The Geological Survey of Ireland (GSI) has classified the bedrock formation at the site as a Locally Important Aquifer (Ll - Bedrock which is Moderately Productive only in Local Zones. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m^3/d). In the bedrock aquifers, groundwater predominantly flows through fractures, fissures, joints or conduits

5.4.3.2.6 Groundwater Vulnerability

The vulnerability rating of the aquifer within the site is categorised as 'High' due to the presence of bedrock relatively close to the surface. To the south and east of the site, the groundwater vulnerability is categorised as 'Extreme' (E) and 'Rock near surface or karst' (X) which is likely to be as a result of the presence of bedrock at or within 1 to 3 metres of the surface.

5.4.3.2.7 Groundwater Wells and Springs

Based on a review of the GSI Groundwater Wells and Springs database there are no wells or springs on the proposed replant lands. The Ballard site recorded one borehole approximately 1km to the east of the site.

5.4.3.2.8 Groundwater Bodies Description

The proposed replant lands are located within the Avoca-Vartry Groundwater Body (GWB). It was classified during the 2010-2015 assessment cycle as having 'Good Status'.

5.4.4 Potential Effects

The likely impacts of the proposed replant lands are described below.

Construction of Drains and Planting of Trees
There will be some minor disturbance of soils, associated with the construction of drains through the site. Planting of trees will be carried out by hand using the slit planting method, so soil disturbance from this will be insignificant. There are no likely impacts of this afforestation on the underlying geology.

Site Roads and Track Construction
Forestry felling can occur within 0.8-1km of access points (roads & tracks) to the main forest body. Due to the small size of this site, additional access tracks or roads will not be required. This site is located adjacent to the existing public road network. There are no likely impacts from this on the underlying geology.

5.4.5 Mitigation Measures

5.4.5.1 *General Mitigation Measures – Both Sites*

The following mitigation measures are proposed for both Moneygorm and Ballard replant lands.
Planting of trees will be carried out by hand. Any drains will be generally shallow and will be constructed in accordance with the forestry service best practice guidelines described in detail in Section 2. Soils will remain in situ at the site and will not be removed offsite.

5.4.6 Residual effect

There will be no residual impacts on Land, Soils & Geology associated with the proposed replant lands.

5.4.7 Conclusion

Moneygorm, Co. Cork

The proposed replant lands will not results in any significant Construction Impacts, nor are there anticipated to be any residual Impacts associated with the proposed replanting.

Ballard, County Wicklow

The proposed replant lands will not results in any significant Construction Impacts, nor are there anticipated to be any residual Impacts associated with the proposed replanting.

5.5 Archaeology

The archaeological and cultural heritage appraisal for the proposed replant lands in Moneygorm, Co. Cork and Ballard, Co. Wicklow was undertaken by John Cronin and Associates. The Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) were reviewed for both locations. Archaeological monuments included in the RMP are protected under the National Monuments Act (1994 Amendment). A desktop review of relevant cartographic and historical sources was also carried out to assess the cultural heritage resource which encompasses tangible assets, such as structures of architectural heritage significance, including designated examples listed in Records of Protected Structures, and historic boundary features such as townland boundaries. Cultural heritage also encompasses intangible assets such as tradition, language and historical associations.

5.5.1 Moneygorm

The proposed replanting site in Moneygorm townland is within an area of improved pasture farmland that is shown as vacant heathland on Ordnance Survey (OS) mapping published between 1840-1940 indicating that its existing character is the result of modern land improvement works. There are no recorded archaeological sites located within the landholding and the nearest example is a ringfort (CO043-018----) located c. 730m to the east. No potential unrecorded archaeological sites were noted during the inspection and assessment of the proposed replant lands. There are no designated architectural heritage structures within the replant area or within its environs and no undesignated cultural heritage assets, such as townland boundaries or vernacular structures, were noted within the landholding during the assessment.

5.5.1.1 *Potential Impacts*

Do Nothing Impact

If the proposed site location in Moneygorm was not used for replanting, then it is likely that its current use as pastureland would continue for the foreseeable future. The impact on the archaeological and cultural heritage resource would remain unaltered as a result.

Direct Impacts

There are no recorded archaeological sites or architectural heritage structures located on the footprint of the Moneygorm replant area and no potential unrecorded examples were identified during the assessment. The proposed replanting works will, therefore, not result in any direct impacts on the known archaeological and cultural heritage resource. The potential does exist for the presence of unrecorded, archaeological sites within this green field location.

As the existence, nature and extent of any such unrecorded archaeological remains are unknown; the level of potential impacts is indeterminable but ground works during the planting phase and subsequent development of root networks will have the potential to result in permanent, direct, negative effects on any unrecorded, sub-surface archaeological sites that may exist within the landholding.

Indirect Impacts

There are no recorded archaeological sites or other known cultural heritage assets located within the Moneygorm replant area or its within its close environs and no indirect impacts on known elements of the cultural heritage resource are predicted.

5.5.1.2 *Mitigation*

The green field nature of the proposed replant site in Moneygorm has the potential to contain unrecorded, sub-surface archaeological features which would be negatively impacted by ground works during the planting phase and by the subsequent development of root networks. This area will, therefore, be subject to a pre-works geophysical survey followed by targeted archaeological test trenching at the location of all identified features of archaeological potential to confirm whether unrecorded, sub-surface archaeological remains exist within these lands. These site investigation works will be carried out under licence from the National Monuments Service. In the event that any archaeological features are identified, they will be recorded and securely cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation by avoidance within buffer zones or preservation by record through a systematic archaeological excavation.

5.5.1.3 *Residual Impacts*

With the implementation of the aforementioned mitigation measures, no residual effects are envisaged as a result of the proposed replanting.

5.5.2 Ballard

The Ballard replant site comprises two adjacent land parcels which have been occupied by a forestry plantation within an area of former pastureland since the 20th century. The assessment revealed that the northern area contains the recorded location (ITM 715502, 684603) of a levelled archaeological enclosure (Figure 5.5.1; WI034-006----). This enclosure is listed in the Record of Monuments and Places for Co. Wicklow and is therefore afforded protection under the National Monuments Act (1994 Amendment). The enclosure has been described as follows by the Archaeological Survey of Ireland:

> *Situated on a gentle NW-facing slope. Circular enclosure (dims. c. 40m x 35m) marked only on the 1838 OS 6-inch map. Not visible at ground level. (December 2008).*

The Zone of Notification surrounding the enclosure, as designated by the National Monuments Service, measures 120m in diameter and extends outside the boundary of the replant site to the southwest (Figure 5.5.1). The extent of the Zone within the interior of the replant boundary averages approx. 60m in length in all other directions.

The first edition Ordnance Survey (OS) 6-inch map published in the 1840s indicates that the majority of the enclosure was located within the replant site with a section of the southwest quadrant extending outside its boundary (Figure 5.5.2).

The map depicts the extent of the monument with a dotted line and labels it as 'Site of fort' which may indicate that its enclosing earthen bank was partially levelled at that time. The enclosure is not depicted on the late 19th century 25-inch OS map indicating that no surface remains were clearly evident at that time.

A review of available online Ordnance Survey Ireland (OSI) aerial images revealed that the location of the enclosure has been forested since at least the 1990s and it is not visible on any of the imagery. A north-south forest road constructed in the period between the publication of the 1995 and 2000 OSI aerial images appears to have extended through the eastern line of the enclosure bank. While it has been noted that site preparation works for forestry plantations and subsequent development of root networks result in the widespread disturbance and potential removal of archaeological sites[11], the potential exists for the survival of truncated sub-surface remains of the enclosure within the boundary of the replant site.

There are no other recorded archaeological sites or any designated architectural structures located within the proposed replant site. The landholding is shown as vacant fields on the historic OS maps which do not depict any other potential unrecorded features of archaeological or cultural heritage significance within the replant boundary.

There are two recorded archaeological sites (Enclosure WI035-002---- and Mound WI035-001----) located within a forestry plantation outside the east end of the northern land parcel and these are at respective distances of 90m and 145m from the boundary of the proposed replant area (Figure 5.5.1). The Zones of Notification around these sites do not extend into the proposed replant area.

11 https://www.heritagecouncil.ie/content/files/archaeology_and_forestry_in_ireland_1998_1mb.pdf



Figure 5-9 Extract from Archaeological Survey of Ireland aerial image showing Zone of Notification around Enclosure WI034-006 as shaded area

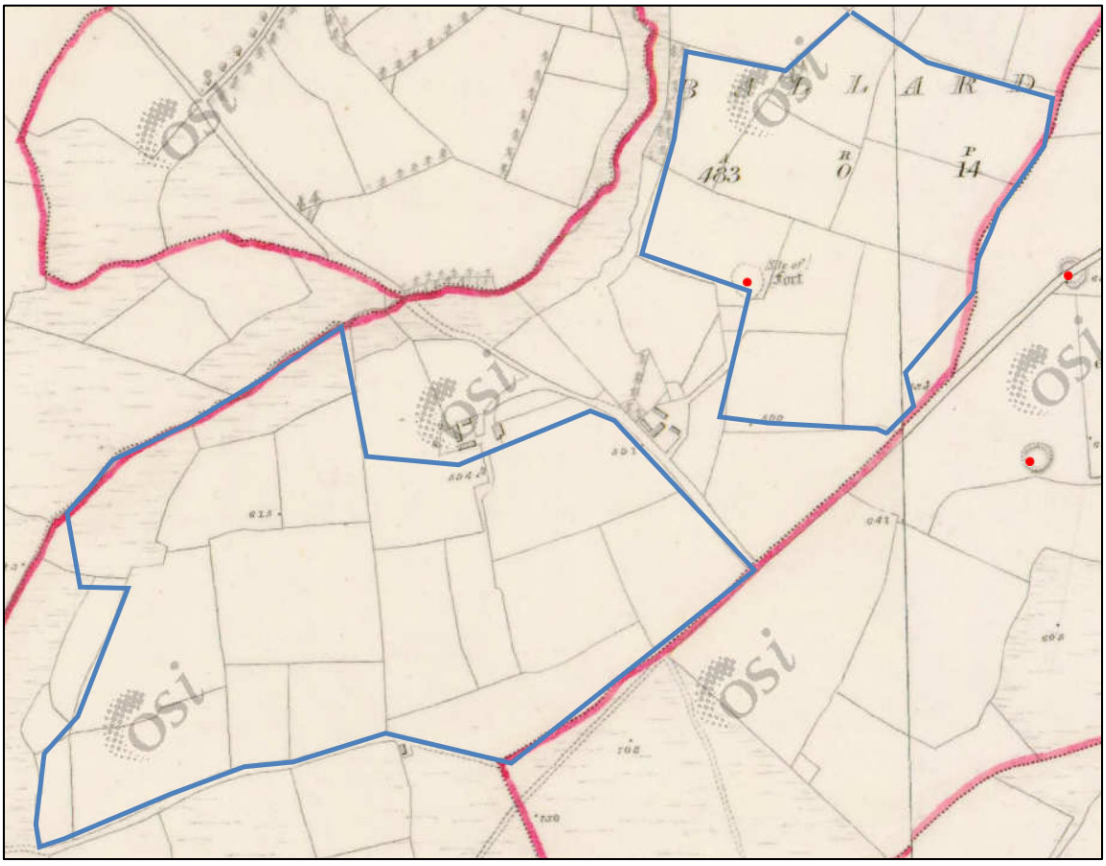


Figure 5-10: Extract from 6-inch OS map showing replant boundary as blue line

5.5.2.1 *Potential Impacts*

Do Nothing Impact

If the proposed location in Ballard was not used for replanting, then it is likely that the current land use would continue for the foreseeable future. The impact on the archaeological and cultural heritage resources would remain unaltered as a result.

Direct Impacts

The proposed replant site in Ballard contains the location of a recorded archaeological site (Enclosure WI034-006----) listed in the RMP and is likely that past forestry site preparation works, including the construction of an access road on the south side, and subsequent tree root action have previously resulted in a direct, negative impact of indeterminate magnitude and significance on the sub-surface remains of this site. Further planting works at the location of this enclosure will have the potential to result in further direct impacts on any surviving archaeological features or deposits that may survive at its location. The continued use of the forest road on the east side of the enclosure as an access route will not result in any additional direct negative impacts on this site. The proposed replant works will result in no predicted direct impacts to the two recorded archaeological sites (Enclosure WI035-002---- and Mound WI035-001----) located within the forestry plantation outside the east side of the replant boundary.

Indirect Impacts

There are no other recorded archaeological sites or other cultural heritage assets located within the subject site and no indirect impacts resulting from the proposed replant works are predicted. The proposed replant works will result in no predicted indirect impacts to the two recorded archaeological sites (Enclosure WI035-002---- and Mound WI035-001----) located within the forestry plantation outside the east side of the replant boundary.

5.5.2.2 *Mitigation*

The recorded location of the enclosure site (WI034-006----), and its surrounding designated Zone of Notification (Figure 5.5.1) will not be replanted and will remain *in situ* within the subject site. The extent of the Zone of Notification will be cordoned off in advance of works and clearly signed as a 'No Entry' area. This cordon will extend along the east and west sides of the existing forest road that extends through the eastern end of the Zone. The use of this existing forest road in the will not result in any additional predicted impacts on the enclosure and no other mitigation for its continued use is required. The ground surface within remainder of this landholding has been disturbed by forestry and the presence of tree stumps and root systems will form a constraint to advance geophysical and archaeological test trenching investigations. Any required ground excavation works within this landholding will, therefore, be subject to archaeological monitoring during the planting phase. This will be licensed by the National Monuments Service who will be provided with a method statement outlining the extent of works to be monitored as part of the licensing process. In the event that any archaeological features are identified during monitoring, they will be recorded and securely cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation by avoidance within buffer zones or preservation by record through a systematic archaeological excavation.

5.5.2.3 *Residual Impacts*

With the implementation of the aforementioned mitigation measures, no residual effects are envisaged as a result of the proposed replanting.

5.6 Landscape and Visual Impact

This Landscape and Visual Impact Assessment of the forest replant lands at Moneygorm in County Cork and Ballard in County Wicklow employs the same impact assessment criteria as contained in Chapter 15 of the EIAR for Coom Green Energy Park (CGEP), to which it is associated.

The baseline landscape setting of the Moneygorm replant site is the same as that described in respect of the proposed Coom Green Energy Park as it is located around 1km to the southeast of the nearest proposed turbines in the knockdoorty portion of the site. Like the entire CGEP site, it is contained within Landscape Character Type 13b from the Cork County Development Plan (2014) Landscape Character Assessment. Landscape Character Type 13b – 'Valleyed Marginal Middleground' is recognised as having; Medium landscape sensitivity; Medium Landscape Value; and Local Landscape Importance. It is a landscape unit described, amongst other elements, as being *"valued for agriculture while the more marginal upland areas are particularly used for commercial forestry"*. It is not contained within a High Value Landscape (HVL) in the Cork CDP and there are no designated scenic routes in the near vicinity.

The proposed Ballard replant site in County Wicklow is contained within a similar marginal upland landscape setting where land cover is dominated by marginal farmland and commercial conifer plantations. It straddles the border between the 'Southeast Mountain Lowlands' landscape character area and the 'Mountain Uplands' landscape character area. The former is classified as an Area of High Amenity, whilst the latter is designated as an Area Of Outstanding Natural Beauty (AONB), which are the second highest and highest sensitivity landscape classifications in the Wicklow County Development Plan respectively. There are two designated scenic prospects within the vicinity and these occur 4km to the northeast and 3.5km to the southeast respectively. Based on the separation distances and descriptions of the prospects, neither is relevant to the proposed replant lands.

5.6.1 Potential Impacts

In the case of both replant sites there is potential for very minor physical impacts on land cover during planting works as well as very minor impacts on landscape character and visual amenity from a higher than normal degree of activity on the site during temporary planting operations. The nature, extent and temporary duration of these effects in landscape areas that already contain forest plantations at various stages of rotation are considered to have an Imperceptible impact on landscape character and visual amenity.

During the long term growing phase of the proposed forest replant areas, the emerging forests will merge with the evolving mosaic of mature and immature conifer forests, recently harvested areas and marginal farmland. Although this combination of land cover may be relatively dynamic over the course of decades, the cycle of commercial forest rotations will not result in a distinct change to landscape character as the elements do not change – just their state. Thus, the forest replant lands will have an Imperceptible effect on landscape character.

In terms, of visual amenity the greatest potential for effects from forest planting in these areas is the blocking of currently open and pleasant views from surrounding roads and residences. In neither case is likely that the maturing forests will block or unduly intrude on existing views as they are set well back from nearest visual receptors and are likely to be noted more as a tonal landcover change than an enclosing feature.

During harvesting operations at both replant sites there will be a greater level physical landscape impact, consisting of vegetation and land disturbance, than at any other stage of the forest rotation. There is also likely to be the construction of new forest haul roads and processing pads, but these will not be substantial in the context of c. 40 ha sites and may be shared with surrounding forest compartments. There will be a higher intensity of vehicle movement to and from the sites as well as within the sites, which will contribute to impacts on landscape character and visual amenity, but only temporarily.

Furthermore, the scale and nature of forest harvesting operations is a regular and familiar phenomenon in both of these predominantly forestry upland areas. For these reasons the landscape and visual effects are considered to be Slight-imperceptible.

5.6.2 Mitigation Measures

Given the very low order of landscape and visual impacts associated with the forest replant areas at both Moneygorm and Ballard, specific mitigation is not considered necessary.

5.6.3 Residual impacts

Mitigation measures are not deemed to be required due to the assessed low order of landscape and visual effects. Thus, the impacts described above in respect of Potential Impacts are equivalent to the residual impacts of the replacement planting.

FEHILY TIMONEY
30 YEARS

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 1

Technical Approval for Afforestation

An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

MR DONAL KELLEHER
BALLYPHILIP
GLANMIRE
CO CORK

02/11/2018

Application for Technical Approval for an Afforestation Licence

Forest Owner	FO135956U
Contract Number	CN82229
Townland	Moneygorm
County	Cork
Approved Area (ha)	40.02
Fencing Length (lm)	1,960.00

This is technical approval for an afforestation licence only and is not grant approval. You should note that the project will not be eligible for grant aid unless prior financial approval has been given in writing in advance of commencement of planting. Also, to qualify for Afforestation grant and premiums applicants must own, lease or be in joint management of the lands proposed for planting. You should consult with your registered forester about applying for financial approval under the Scheme.

I refer to your application for an afforestation licence as described above and shown on the enclosed map. Your application has been assessed and a licence is hereby issued on the basis that the works will be undertaken in accordance with the prescription set out in Appendix A, attached herewith. You are now required to remove your site notice immediately.

This scheme is financed by the State and payment of the grant, if financial approval is given, is subject to the following conditions:

1. Availability of funds in each financial year.

2. Submission of a fully completed and signed Form 2 (Application for Payment) and the following documents to support this application.

Proof of Ownership (including removal of any constraints on ownership)
Valid Mandate
Current Tax Clearance Certificate(s)
C2 Certificate
Provenance Certificates
Fencing Map
Biodiversity Map
Certified Species Map

3. Satisfactory completion of the work not later than 30/10/2021.

4. Compliance with Operational Proposals and Specifications enclosed.

5. Compliance with Departmental guidelines and requirements for Landscape, Water Quality, Harvesting, Biodiversity and Archaeology.

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Department of Agriculture,
Food and the Marine

6. Compliance with Ecological Survey and Management Plan as submitted (if applicable).

7. The work is carried out by the registered company or forester specified on the original application. If it is intended to have a different company or forester undertake the work, it will be necessary to submit a new application (Form 1) to the Forest Service.

8. All applications are subject to the provisions of the penalty schedules as set out in the Afforestation Grant and Premium Scheme document.

9. All applications are subject to Cross Compliance checks with other grant schemes.

10. Grant payment may be subject to the netting policy of the Department of Agriculture, Food and the Marine.

11. This licence is issued subject to the terms and conditions of the Forestry Standards and Procedures Manual.

12. Your acceptance that the responsibility for the ultimate success of the plantation rests with you, the applicant. Plantations which fail to establish successfully will result in grant and premium recoupment.

13. Additional Environmental & Silvicultural Conditions

- Adhere to forestry & water quality guidelines,
- All guidelines to apply,
- Adhere to forestry & water quality guidelines

You are required to notify the Department of Agriculture, Food and the Marine in writing if any of the details of your application have changed. Changes to your application may invalidate this licence.

In order to allow for the possibility of appeals, you must not commence any works until 28 days from the date of this letter have elapsed. If an appeal is lodged, this licence will be suspended and no work may commence until the appeal process has concluded.

If you wish to appeal any condition attached to this licence, where applicable, you should do so in writing within 28 days of the date of this letter to the Forestry Appeals Committee. You must set out the grounds of your appeal and include a statement of the facts and contentions upon which you intend to rely along with any documentary evidence you wish to submit in support of your appeal. The appeal must be sent to the Forestry Appeals Committee, Kilminchy Court, Portlaoise, Co. Laois, Lo-Call 076 1064418 or 057 8631900.

Yours sincerely

L. Chigara

LISA CHIGARA
Approval Section
Forestry Division

An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

Department of Agriculture, Food and the Marine

Operational Proposals for Technical Approval for an Afforestation Licence

Forest Owner Number	FO135956U
Contract Number	CN82229
Townland	Moneygorm
County	Cork
Area Approved	40.02(ha)
Fencing Length (LM)	1,960.00

All applications must be developed in accordance with detailed standards and procedures as described in the current Forestry Schemes Manual. Certain specific operational proposals particular to this application are described below. No change is permitted to these proposals and species approved unless approved in advance by the Department. The Department may insist that proposed changes constitutes a new application.

Operational Proposal Details

Agro Forestry (GPC 11)		
1.	Tree Shelters	Not Entered
2.	Plant Size and Stocking	Not Entered
Drainage		
1.	Drainage	Required
2.	Drainage Comment	500
Fertiliser		
1.	Zero	Yes
2.	350 Kg Granulated Rock Phosphate	Not Entered
3.	250 Kg Granulated Rock Phosphate	Not Entered
4.	Split Application	Not Entered
5.	Other Details	50
Firebreaks/Res.		
1.	Firebreaks/Res	Not Required
Forestry for Fibre (GPCs: 12a and 12b))		
1.	Is Land Free Drainage arable or pasture soils	Not Entered
2.	Are there surface water gleys without a peat layer	Not Entered
3.	Do you intend to use improved genetic material	Not Entered
4.	Details	500
Ground Prep.		
1.	Woody Weed Removal	Not Entered
2.	Ripping	Not Entered
3.	Pit Plant	Not Entered
4.	Mole Drainage	Not Entered
5.	Mounding	Yes
6.	Ploughing	Not Entered
9.	Other Details	50
Planting Method		
1.	Angle Notch	Yes
2.	Pit	Not Entered
3.	Machine	Not Entered

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4.	Slit	Not Entered
5.	Other Details	50
Road Access		
1.	Road Access	Provided
Standard Stocking		
1.	Standard Stocking	Yes
2.	Details	50
Weed Control		
1.	Herbicide Control yr0	Yes
2.	Herbicide Control yr1	Yes
3.	Herbicide Control yr2	Yes
3.	Herbicide Control yr4	Not Entered
4.	Manual	Yes
4.	Herbicide Control yr3	Not Entered

Fencing Details (metres)				
	Stock	0	Stock-Sheep	960
	Stock-Rabbit	0	Upgrade to Deer	0
	Deer-Rabbit	0	Deer	1000
	Upgrade Existing Fence(s)	Y	Tree Shelter (Hectares)	0
	Upgrade Details: Deer fence 15% broadleaf section in SW section of site			

Species Approved

The species approved in this proposal relate to the digitised certified species map attached.

Species Approved for Afforestation

Plot	Area	GPC	Land Type	Species	Species Area	Yield Class	Mixture Type	Exclusion	Exclusion Type
1	40.02	GPC 3	CHF	SS	34.02	20	Groups		
				ADB	6	8			

Additional Silvicultural and Environmental Conditions

In addition to the Department's environmental and silvicultural guidelines the following specific conditions apply to this proposal:

Silvicultural and Environmental Conditions

Adhere to forestry & water quality guidelines,
All guidelines to apply,
Adhere to forestry & water quality guidelines

Certified Species Information

Contract Number CN82229
Townland Moneygorm

County Cork City
6" OS No: CK43

Plot No	GPC	Parcel No	GPC Area(H)	Land Use Type	Species Area	Species	Mixture Type	Excl Area(h)	Excl Type
1	3	47654323	40.02	CHF	40.02	ADB,SS	Groups	0	
		TOTALS	**40.02**		**40.02**			**0**	

Remarks:

Area Surveyed By: **Date:**

Species Certified By: **Date:**



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Contract: **CN82229**

Scale 1: 5000



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Contract: **CN82229**

Scale 1: 5000

Department of
Agriculture,
Food and the Marine
An Roinn
Talmhaíochta,
Bia agus Mara

COILLTE TEORANTA
ACCOUNTS PAYABLE
COILLTE TEORANTA, CEDAR HSE.,
MONEEN RD., CASTLEBAR
CO MAYO

08/08/2018

Licence for Non Grant Aided Forest Road

Forest Owner	FO101174V
Contract Number	CN77296
Townland	Ballard
County	Wicklow.
Approved Area (Ha)	37.1
Fencing Length (LM)	3,977.00

This is a preliminary technical approval only and is not a grant approval. If you wish to proceed with this project you must notify the undersigned in writing within four weeks of the proposed planting date in order to receive full approval to plant and to obtain financial grant approval if applicable. You should note that the project will not be eligible for grant aid unless prior financial approval has been given in writing in advance of commencement of planting.

I refer to your licence application requesting approval of Afforestation

You are required to notify the Department of Agriculture, Food and the Marine in writing if any of the details of your application have changed.

In order to allow for the possibility of appeals, you must not commence any works until 28 days from the date of this letter have elapsed. If an appeal is lodged, this licence will be suspended and no work may commence until the appeal process has concluded.

If you wish to appeal any condition attached to this licence, where applicable, you should do so in writing within 28 days of the date of this letter to the Forestry Appeals Committee. You must set out the grounds of your appeal and include a statement of the facts and contentions upon which you intend to rely along with any documentary evidence you wish to submit in support of your appeal. The appeal must be sent to the Forestry Appeals Committee, Kilminchy Court, Portlaoise, Co. Laois, Lo-Call 076 1064418 or 057 8631900.

Yours sincerely

COLIN GALLAGHER
Approval Section
Forestry Division

An Roinn Talmhaíochta,
Bia agus Mara
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Contract: **CN77296** Scale 1: 5000

Certified Species Information

Contract Number	CN77296
Townland	Ballard
County	Wicklow
6" OS No:	WW34

Plot No	GPC	Parcel No	GPC Area(H)	Land Use Type	Species Area	Species	Mixture Type	Excl Area(h)	Excl Type
1	3	42568105	22.89	CHF	22.89	ADB,SS	Integrated Mix	0	
2	8	42567868	1.67	BHF	1.67	ALD,SBI	Integrated Mix	0	
3	8	42589585	1.32	BHF	1.32	ALD	Pure	0	
4	3	42570542	11.22	CHF	11.22	ADB,SS	Integrated Mix	0	
		TOTALS	**37.1**		**37.1**			**0**	

Remarks:

Area Surveyed By: **Date:**

Species Certified By: **Date:**

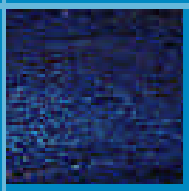
FEHILY TIMONEY
30 YEARS

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 2

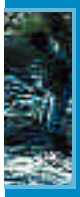
Forestry & Water Quality Guidelines

Front Cover

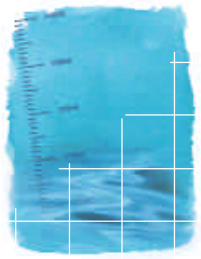


CONTENTS

Introduction	1
Sensitive Areas	3
Buffer Zone Guidelines	5
Ground Preparation and Drainage	6
Fertiliser Application and Storage	7
Chemicals, Fuel and Machine Oils	9
Roads	9
Bridges, Culverts and Fords	10
Harvesting	10
Appendix: Examples of Water Quality Indicators	12







INTRODUCTION

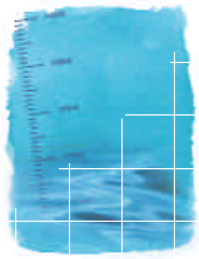
The maintenance and enhancement of water quality is of utmost importance. Forestry activities have the potential to interact both positively and negatively with aquatic resources. Careful planning and management will mitigate against potential negative impacts while maximising the positive aspects of forestry, such as aquatic biodiversity enhancement and the creation of appropriate riparian ecosystems.

> An aquatic zone is defined as a permanent or seasonal river, stream or lake shown on an Ordnance Survey 6 inch map.

Each river or lake has a unique drainage basin or catchment area. Some catchments are more vulnerable than others to changes in water quality, due to their particular soils and underlying geology. The type of landuses and associated operations within the overall catchment area can also have a major bearing on the volume and quality of water flowing into that particular river or lake. All land owners, including forest owners, have a responsibility to play their role in conserving and enhancing overall catchment quality.

> The FORESTRY AND WATER QUALITY GUIDELINES have been developed through extensive consultation with a wide range of relevant parties. They set out sound and practical measures based on the principles of Sustainable Forest Management (SFM), and are firmly rooted in the best available scientific information. The guidelines will be kept under review to facilitate amendment in the light of new research findings.
>
> To ensure the successful implementation of SFM in Ireland, it is important that forest owners adhere to the guidelines and undertake all work in a way which is compatible with the protection of the environment.
>
> The guidelines describe a range of measures intended to cover all situations relating to forestry and water quality. Not all of the measures outlined will be applicable to every site. However, it is the responsibility of forest owners to identify and apply those measures which are appropriate to their particular forest.
>
> The FORESTRY AND WATER QUALITY GUIDELINES apply to all grant-aided projects and to all activities associated with a Felling Licence. Any breach may result in the forfeit of grant aid and premium payment or the withdrawal of a Felling Licence.
>
> It is essential that all forest workers and machine operators involved in any forest operation are made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance. All operators should have contact telephone numbers onsite for all relevant agencies (Local Authorities, Regional Fisheries Boards, Dúchas The Heritage Service, National Museum of Ireland, Garda Síochána, etc.) in case of accidental damage to aquatic zones, archaeological sites, important wildlife habitats and other environmental features.





SENSITIVE AREAS

SPECIAL AREAS OF CONSERVATION, SPECIAL PROTECTION AREAS AND PROPOSED NATURAL HERITAGE AREAS

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are protected by European Union and national legislation. Proposed Natural Heritage Areas (pNHAs) have been identified by National Parks and Wildlife of Dúchas as areas of value in the national effort to conserve biodiversity.

- Planting is not permitted in SACs and SPAs.
- Approval for planting in pNHAs is dependent on formal consultation between the Forest Service and Dúchas The Heritage Service.

AREAS SENSITIVE TO ACIDIFICATION

The Forest Service recognises the importance of water acidification arising from atmospheric pollution. It will continue its ongoing policy of consultation with Regional Fisheries Boards and Local Authorities on whether or not to proceed with forestry applications in areas where there is a perceived risk of acidification. These sensitive areas are designated on the basis of the following criteria:

- the aquatic zone is part of a recognised salmonid fishery and is a spawning, nursery or angling area, **and**
- the geology is base-poor, **and**
- in water samples taken regularly between 1st February and 31st May, **either**
  - pH readings are equal to or less than 5.5, **or**
  - water hardness, in mg calcium carbonate/litre, is less than 12, **or**
  - water alkalinity, in mg calcium carbonate/litre, is equal to or less than 10.

The Forest Service will also take account of new research findings as they become available.

AREAS SENSITIVE TO EROSION

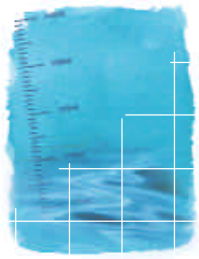
Where certain soil types (e.g. peat, sandstone-derived soils) and steep slopes occur together, there is a greater risk of soil erosion and subsequent sedimentation. It should also be noted that subsoils may be more prone to erosion than the associated topsoil. In such areas, due care should be taken when



Left: Research and consultation are key elements in protecting water quality.

Right: Forest owners, as with all landowners, have a responsibility to play their role in conserving and enhancing overall catchment quality.





planning all forest operations. Correct buffer zone management will help reduce the risk of sedimentation. Sensitivity to acidification or erosion can be local or confined to a sub-catchment. These sub-catchments may be identified by their particular geology, soil and terrain.

BUFFER ZONE GUIDELINES

The buffer zone is an area adjacent to an aquatic zone and managed for the protection of water quality and aquatic ecosystems. A buffer zone includes the riparian zone, i.e. that area directly adjacent to an aquatic zone, representing the intermediate between the aquatic and terrestrial environments and having its own distinctive hydrological and ecological characteristics. The buffer zone may also occupy adjacent areas beyond the riparian zone. Within the buffer zone, natural ground vegetation is allowed to develop, with additional planting of suitable riparian tree species.

Within the buffer zone, ground preparation and other forest operations are curtailed in order to protect water quality. Furthermore, drainage channels leading from the site must taper out before entering the 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. Buffer zones further enhance and protect water quality by:

- physically stabilising banks;
- acting as a source of leaf litter input into aquatic zones, which represents an important food source for a number of aquatic animals;
- providing cover and dappled shade.

Buffer zones should be in place throughout the rotation, and have particular relevance to establishment, road construction and harvesting.

Table 1. Buffer zone widths.

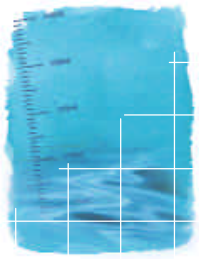
Average slope leading to aquatic zone	Buffer zone width on each side of the aquatic zone	Buffer zone width for highly erodable soils
Moderate (even to 1 in 7 / 0-15%)	10 m	15 m
Steep (1 in 7 to 1 in 3 / 15-30%)	15 m	20 m
Very steep (1 in 3 / >30%)	20 m	25 m

Buffer zone width is based on the following factors:

- the average slope of the area adjacent to the aquatic zone (buffer zone widths should be greater where slopes are steep);
- the sensitivity to erosion of the soil adjoining the aquatic zone.

- The width of the buffer zone may vary in certain situations, for example, to avoid straight edges for landscaping purposes. However, the minimum width, as set out above, must be maintained in all cases.
- Buffer zones should be actively managed to encourage sustainable vegetative growth and cover for the protection and enhancement of water quality. Well-vegetated banks are more resistant to undercutting and collapse. Vegetation shields the soil surface from rainfall impacts, slows run-off velocity and increases infiltration. Open and partially wooded conditions should be planned, so that bank vegetation thrives. Approximately half the length of a stream should be left open and the remainder kept under partial shade from trees and shrubs. Ground vegetation in buffer zones can be augmented by the planting of native tree species such as birch, willow and sally, with occasional alder, oak and ash. These species help to stabilise the riparian zone and protect it in times of flood. Such planting is permitted in the buffer zone and within 5 m of the aquatic zone, if this would, in the view of the Regional Fisheries Board, have a beneficial effect on that particular aquatic zone. On good fertile sites, natural regeneration of desirable species from local seed sources is likely to occur.

The development of natural riparian vegetation, including suitable tree species, will benefit water quality and aquatic life.



- All tree planting within the buffer zone should be carried out using pit planting only, except in wet areas where inverted mounding is allowed.
- Pruning and/or removal of undesirable trees should be carried out where required, inorder to maintain the riparian vegetation and aquatic conditions.

Afforestation plans should be made for all sites, regardless of size. Such plans should include the location and treatment of aquatic zones located on or adjacent to the site.

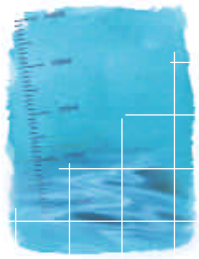
GROUND PREPARATION AND DRAINAGE

An essential element of protecting water quality is to ensure that sediment contained in water draining from the site does not enter the aquatic zone. Incorrect ground preparation and drainage can result in soil disturbance and subsequent sedimentation of nearby aquatic zones, particularly if ground preparation is followed by prolonged and heavy rainfall. For these reasons, ground preparation must be well-planned and drain layout/sediment traps correctly designed and installed. Mounding, moling, ripping and subsoiling will result in less soil disturbance than ploughing.

- Do not carry out ground preparation within the buffer zone. Where trees are being planted to restore or create riparian woodland, pit planting must be used, except in wet areas where inverted mounding is allowed. In general, trees should not be planted within 5 m of an aquatic zone.
- Where possible, ground preparation should be carried out when there is less of a risk of heavy rainfall.
- Where possible, do not disturb existing drains.
- Drains and sediment traps should be installed during ground preparation.
- Collector drains should 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 must be provided with waterdrops and rock armour where there are steep gradients, and should avoid being placed at right angles to the contour.
- Make sure that all drainage channels taper out before entering the 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 erodable soils, install sediment traps at the end of the drainage channels tothe outside of the buffer zone.



Buffer zones play a major role in underpinning water quality.



- Drains and sediment traps must be maintained throughout the rotation, 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 controlled.
- Sediment traps should be sited outside the buffer zone and have no direct outflow into the aquatic zone. Their capacity can extend over the life of the forest or have limited storage. In the latter case, machine access is required to enable the accumulated sediment to be excavated. Sediment should be carefully disposed of away from all aquatic zones. Sediment traps must be clearly marked and securely fenced for safety.Where possible, sediment traps should be constructed on even ground and not onsloping ground.
- In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps.

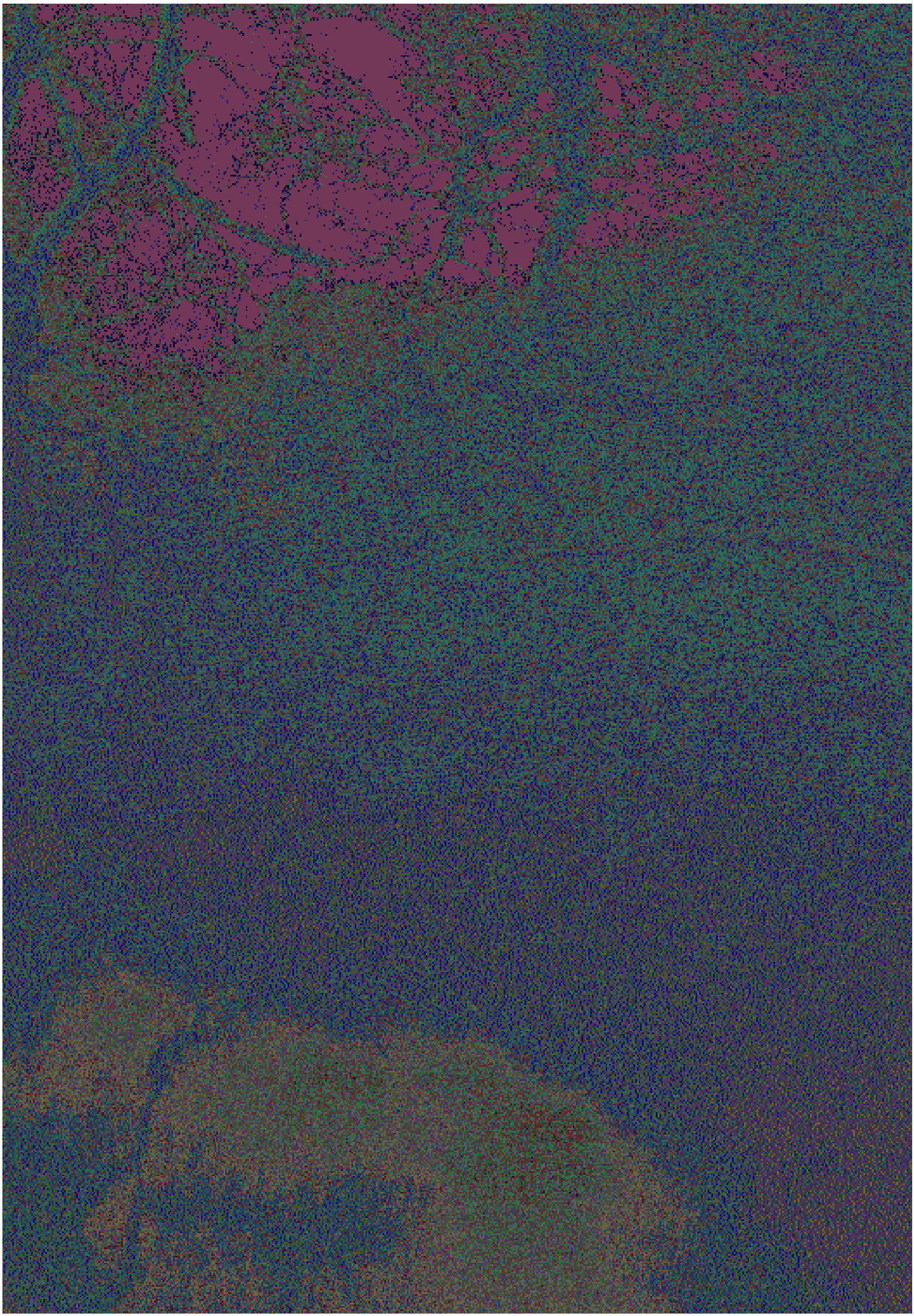
FERTILISER APPLICATION AND STORAGE

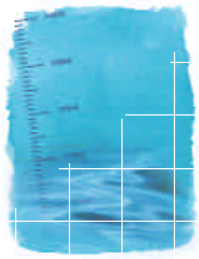
Complete all planting before fertiliser application takes place. Species selection together with site type and conditions determine fertiliser type and application rates. Phosphorus (P) is the main nutrient fertiliser applied, with nitrogen (N) and potassium (K) occasionally applied as remedial fertilisation. The following practices should be followed to minimise the risk of fertiliser run-off and transport to aquatic zones.

- Proposed fertiliser types and application rates should be included in the afforestation application.
- Fertiliser should not be applied within the buffer zone or within 20 m of an aquatic zone, whichever is greatest.
- Fertilisers should be prepared and securely stored under shelter on a dry, elevated site at least 50 m from the nearest aquatic zone.
- Granular fertiliser formulations should be used, with the exception of muriate of potash which is not available in granular form.



Care in the storage and application of fertilisers and chemicals will avoid risk to water quality and aquatic life.





Watercourses are a major component of the environment, and their protection is an essential element of sustainable forest management.

- Phosphate application rates on peat soils should be kept to a minimum in any single application.
- Apply fertiliser manually or by ground-based machine, wherever possible. Fertiliser must be applied by hand in the 20-50 m area adjacent to the aquatic zone.
- Do not, under any circumstances, discharge fertilisers into an aquatic zone, drain orsediment trap.
- Where later fertilisation is required to counteract nutrient deficiencies, aerial application using helicopter can be considered where branch growth and onsite vegetation prevent manual application. However, a 50 m wide corridor adjacent to aquatic zones must be left unfertilised. Never undertake aerial fertilisation during high winds.
- Do not apply fertiliser during or following prolonged rainfall or if heavy rain is forecast.
- Fertiliser should only be applied during the months of April to August, inclusive.
- Remove all empty fertiliser bags and other rubbish from the site during and after the operation, for environmentally-acceptable off-site disposal.

CHEMICALS, FUEL AND MACHINE OILS

The on-site use of chemicals (herbicides, pesticides and urea), fuel and machine oils (hydraulic, engine, gearbox, lubricant or cutting oils) should be kept to a minimum. Accidental spillage or leakage can be detrimental to aquatic flora and fauna and can impair water quality. Training and safety are of primary importance to avoid hazards and to ensure the correct use of herbicides and pesticides.

- Do not apply chemicals if heavy rainfall is forecast or during high winds.
- Do not apply chemicals within the buffer zone.
- Refer to *Guidelines for the Use of Herbicides in Forestry*[1].
- Prepare and securely store all chemicals, fuel and machine oils under shelter on a dry, elevated site at least 50 m from the nearest aquatic zone.
- Cleaning of equipment should not take place within 50 m of an aquatic zone. All wash waters must be disposed of carefully.
- Unused diluted herbicides must not be spread within the buffer zone.
- Remove all containers from the site and dispose of carefully.
- All maintenance and refuelling operations and machine repairs (if required and practical) should be carried out at least 50 m from the nearest aquatic zone on a dry, elevated site.
- Spent oil must be collected and retained for correct off-site disposal.
- Where possible, biodegradable oil should be used as a substitute for mineral oil.
- Do not, under any circumstances, discharge chemicals, fuel or machine oils into an aquatic zone.
- The relevant Local Authority must be informed promptly of any accidental chemical, fuel or machine oil spillage which threatens an aquatic zone.

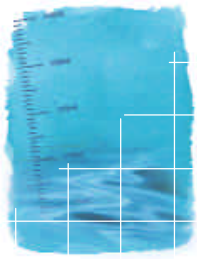
ROADS

Each stage of forest road construction has implications for water quality. Before road construction begins, the road network within the forest must be planned and outlined in the plan required by the FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES. Key actions required for this plan include:

- inspection of the area and the preparation of a map containing a broad terrain classification and details of all aquatic zones;
- determination of the appropriate density and spacing of the road network, based on the size and shape of the area, machinery employed and the nature of the terrain;
- delineation of aquatic zones and associated buffer zones.

- The FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES require a road and track network scheme as part of the harvesting plan. This plan should include a terrain classification which indicates all aquatic zones and buffer zones together with sources of public and private water supplies, access points, landings and, if

[1]Ward, D. (ed.) 1998. Guidelines for the Use of Herbicides in Forestry. 2nd Edition. Coillte, Forest Protection, Newtownmountkennedy, Co. Wicklow.



necessary, proposed stream crossings. The map will identify the site location and provide directions and distances to the nearest national road.

- Roads should be located at least 50 m from an aquatic zone, where possible. Road layout should aim to direct off-road traffic away from streams. If there is no other option but to cross an aquatic zone, construct an appropriate bridge or culvert.
- Where possible, roads should follow the natural contours of the terrain.
- All ancillary drainage associated with road construction should be designed to divert water away from buffer zones and should not be allowed to discharge directly into aquatic zones. Sediment traps will be necessary. Roadside drains should not directly intercept run-off from higher ground. Cut-off drains should be constructed to a flat gradient at least 5 m back from the upper edge of the road formation, to avoid erosion.
- Carry out construction during dry weather, ideally from April to October.
- Cement must not be discharged into the aquatic zone.
- Do not remove gravel from an aquatic zone. Gravel may be removed from a buffer zone only after consultation with the Regional Fisheries Board and fishery owner. The opening of a new quarry requires planning permission.
- The maintenance of roadside drains and sediment traps is essential. Inspect periodically to ensure that they are free of debris and sediment, undertaking remedial action if necessary.

BRIDGES, CULVERTS AND FORDS

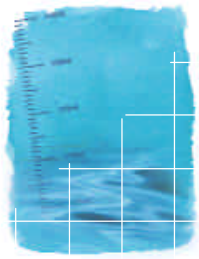
Aquatic zones may need to be crossed during forest operations. The construction of bridges and culverts, whether temporary or permanent, can cause soil and site disturbance, with subsequent soil erosion and the movement of sediment into the aquatic zone. The careful planning of these crossings is essential.

Where fish passage is important, e.g. spawning beds in the upper reaches of aquatic zones, bridge and culvert design should reflect this requirement. Fords are generally not appropriate, as their use can often result in the generation of considerable sediment and the restriction of fish passage.

Bridges are the most desirable structure as they allow unimpeded fish movement. Bridges also ensure that machines parts (and associated fuel and oils) are kept out of the aquatic zone.

Culverts can be open topped or embedded. In fish spawning aquatic zones, embedded culverts are favoured as they provide unrestricted passage for all fish sizes and retain the natural streambed and sediment. Embedded culverts are usually large diameter (greater than 1 m) culverts which aim to maintain the natural channel width, gradient and conditions.

- All water crossings should be marked and indicated in the road network plan.
- Minimise the number of crossings over a given aquatic zone. All crossings should be at right angles to the flow.
- Consult with the Regional Fisheries Board at the design stage of any crossing in a fish-bearing or potentially fish-bearing aquatic zone.
- Bridges should be constructed with minimum disturbance to the bank, channel or adjacent buffer zone.
- Do not build culverts or bridges over an aquatic zone in a way that would hinder fish passage.
- Use local stone for bridge kerbs and end treatments for culverts.
- Do not discharge cement into the aquatic zone. Uncured concrete can kill fish by altering water pH. When cast-in-place concrete is required, all work must be done in dry weather conditions and isolated from any water which may enter the aquatic zone, for a period sufficient to cure the concrete.
- Culvert ends should be tapered to match the embankment slope.
- Specifications for culvert design and size should reflect:
  - whether or not the aquatic zone is a spawning or fisheries watercourse;
  - the type of terrain;
  - the necessity to carry the ‘normal’ flow and to accommodate flash floods;
  - the requirement to embed culverts.



- Embedded culverts should be buried to a depth of 0.3 m or 20% of their height (whichever is greatest) below the streambed. The original bed material as well as boulder sized stones should then be placed in the culvert.
- Culverts should be maintained, removing debris which can cause clogging and eventual culvert failure.

HARVESTING

Harvesting (thinning and final harvesting) and associated activities such as extraction have the potential to adversely impact on water quality, through increased erosion rates, sedimentation and nutrient losses. These impacts can be mitigated through good planning and the implementation of the FORESTRY AND WATER QUALITY GUIDELINES. The factors that affect water quality at harvesting can be summarised as follows:

- soil type, sensitivity and slope;
- number and type of machine passes.

- All harvesting and extraction operations must be carried out in accordance with the FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES. Consult with the Regional Fisheries Board and Dúchas before commencing harvesting operations in areas of importance to fisheries and wildlife.
- Prepare a forest harvesting plan as detailed in the FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES, which will include:
  - a broad terrain classification detailing: the location of areas of potentially high erosion risk; the location of all aquatic zones and buffer zones; the identification of



A brash mat which has been used several times and now in need of renewal.

public/private water supplies; and existing and planned road network, landings, turntables, bridges and extraction routes;
- the identification of appropriate machines to minimise adverse impacts;
- the location of machine maintenance areas and storage areas for chemicals (herbicides, pesticides, urea), fuel and machine oils.

- Construct sediment traps prior to harvesting and maintain these traps throughout operations.
- Plan felling operations with the shortest possible extraction routes, designed to be compatible with the avoidance of sedimentation.
- Always fell trees away from the aquatic zone.
- Avoid machine extraction within the buffer zone.
- On sites where risk of erosion is high, brash mats must always be used to avoid soil damage, erosion and sedimentation. 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. Cable extraction may be an alternative in these situations.
- Do not refuel or maintain machinery within 50 m of an aquatic zone.

	Classification	***Chlorophyll (mg/m³) Annual max.***	***Total P (µg P/litre) Annual mean***	***Phosphate (MRP) (µg P/litre) Annual median***
Lakes	Oligotrophic	Ž2.5 and <8	>5 and •10	
	Mesotrophic	Ž8 and <25	>10 and •20	
Rivers	Q5			15
	Q4-5 Q4			20
				30

S.I. 258 of 1998

- Do not pile logs within the buffer zone or on very low lying ground prone to water-logging. Select a dry area away from the aquatic zone.
- Do not allow branches, logs or debris to build up in aquatic zones. All such material should be removed when harvesting operations have been completed, but avoid removing natural debris deflectors.

APPENDIX
EXAMPLES OF WATER QUALITY INDICATORS

Catchment waters may be used for some or all of the following purposes: salmonid water; drinking water; or bathing water. Statutory Instruments are in place which set standards for each of these categories. The following water quality parameters may be measured by the Local Authority, depending on the intended use and the respective Statutory Instruments. The relevant Statutory Instrument for each indicator is quoted in brackets. Indicators marked with (*), although not mentioned in Statutory Instruments, denote the lowest standard *which current knowledge suggests* will not indicate damage to water quality.

The objective at all times is to ensure that forest operations do not cause a deterioration in water quality.

Eutrophication

Biological parameters

- *Phytoplankton/Cyanobacteria (lakes):* Critical limit: Composition and abundance consistent with those in unpolluted lakes(*).
- *Macrophytes (lakes and rivers):* Critical limit: Composition and abundance consistent with those in unpolluted lakes(*).
- *Macroinvertebrates (rivers):* Maintenance of existing EPA Quality (Q) rating, where it is Ž Q4 (Statutory Instrument 258 of 1998).
- *Fish:* Critical limit: Presence of 0+ salmonids(*).

Physico-chemical parameters

"The existing trophic status for any part of a lake shall be maintained" (S.I. 258 of 1998).

- *Nitrate (NO_3):* Critical limit: 11.3 mg N/litre (S.I. 81 of 1988).
- *Un-ionised ammonia:* Critical limit: <0.02 mg NH_3/litre (S.I. 293 of 1988).
- *Dissolved oxygen:* Critical limit: 80-120% saturation(*).

Acidification

Biological parameters

Production: Magner Communications

The Forest Service gratefully acknowledges the contribution of Dr Miriam G. Ryan, COFORD, National Council for Forest Research and Development, to the development of the FORESTRY AND WATER QUALITY GUIDELINES, made through the preparation of a commissioned report. Copies of this report can be obtained from the Forest Service, Department of the Marine and Natural Resources, Leeson Lane, Dublin 2.

Photos: All photos Forest Service, except COFORD, National Council for Forest Research and Development (pages 2 and 6) and T. Cummins, Forest Ecosystem Research Group, UCD (page 11).

Published by the Forest Service, Department of the Marine and Natural Resources
July, 2000

- *Macrophytes (lakes):* Critical limit: Presence of *Lobelia* and *Isoetes* spp.(*).
- *Macroinvertebrates:* Critical limit: Presence of several specimens of any or all of the following: *Baetis rhodani*, *Gammarus* spp., *Caenis* spp., *Centroptilum luteolum* and *Cloeon* spp. (Raddum,1999).
- *Fish:* Critical limit: Presence of 0+ salmonids(*).

Physico-chemical parameters

- *Total aluminium:* Critical limit: 0.2 mg Al/litre (S.I. 81 of 1988).
- *Labile monomeric aluminium:* Critical limit: 0.04 mg Al/litre (S.I. 293 of 1988).
- *pH:* pH Ž 6 and • 9 (S.I. 293 of 1988). pH between 5.5 and 8.5 (S.I. 294 of 1989).

Sedimentation

Parameter

- *Suspended solids:* Critical limit: <25 mg/litre (S.I. 293 of 1988).

Hydrology

Hydrological parameter

- *Flow:* Critical limit: Maintenance of base flow level throughout the catchment(*).

S.I. 81 of 1988 European Community (Quality of Water Intended for Human Consumption) Regulations 1988.
S.I. 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988 (Note: List of relevant water bodies is included).
S.I 294 of 1989 European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989.
S.I. 258 of 1998 Local Government (Water Pollution) Act 1977 (Water Quality Standard for Phosphorus) Regulations 1998.
Raddum, G.G. 1999. Large scale monitoring of invertebrates: Aims, possibilities and acidification indexes. *In* Proceedings of Workshop on Biological Assessment and Monitoring, Evaluation and Models. Raddum, G.G., Rosseland, B.O. and Bowman, J. (eds.) Zakopane, Poland. ICPWaters Report 50/99, NIVA, Oslo.

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