PUNCH
consulting engineers

Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG) Wind Farms

Civil & Structural Due Diligence Report

October 2020

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R0	Due Diligence Report	14-08-2020	K O Kelly	K O Kelly	A O Connell
R1	Due Diligence Report	27-10-2020	A O Connell	A O Connell	A O Connell
R2	Due Diligence Report	26-02-2021	A O Connell	A O Connell	A O Connell

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1 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG), Millstreet, for Coillte Group.

This report will review the existing available environmental, geotechnical, planning, utilities and hydrological information for the routes. The report will record the impact of any of this information on the proposed routes as assigned a risk rating to each of the routes.

The report also contains reports on the bridges on the various routes. The principal inspection system (in accordance with TII's Eirspan bridge management system) is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

Based on the above assessment this report also contains a preliminary high-level costing and construction risks. In addition, the report identifies conflict areas, potential issues and investigation works required to carry out design of the crossings as part of the cable route installation.

Based on all the assessments noted above PUNCH will determine the most viable route.

2 Site Location

2.1 Overview

The system operator will decide the grid connection location. This feasibility study was undertaken to understand the challenges associated with connection to Ballyvouskill 220 kV substation and where there are multiple options to identify a preferred route. Illustrated from Figure 1 below, the three proposed windfarm sites are located at three individual areas. Therefore, the distances from Ballyvouskill 220 kV substation to Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) Windfarm varies. Cummeennabuddoge (CMBG) Windfarm is the closest and Gortyrahilly Windfarm is the furthest away from the substation respectfully. The various possible routes are shown below in Figure 1.0, and they will be investigated to determine the most efficient route. A number of routes were preliminary investigated with the most advantageous routes are outline below in Figure 1.

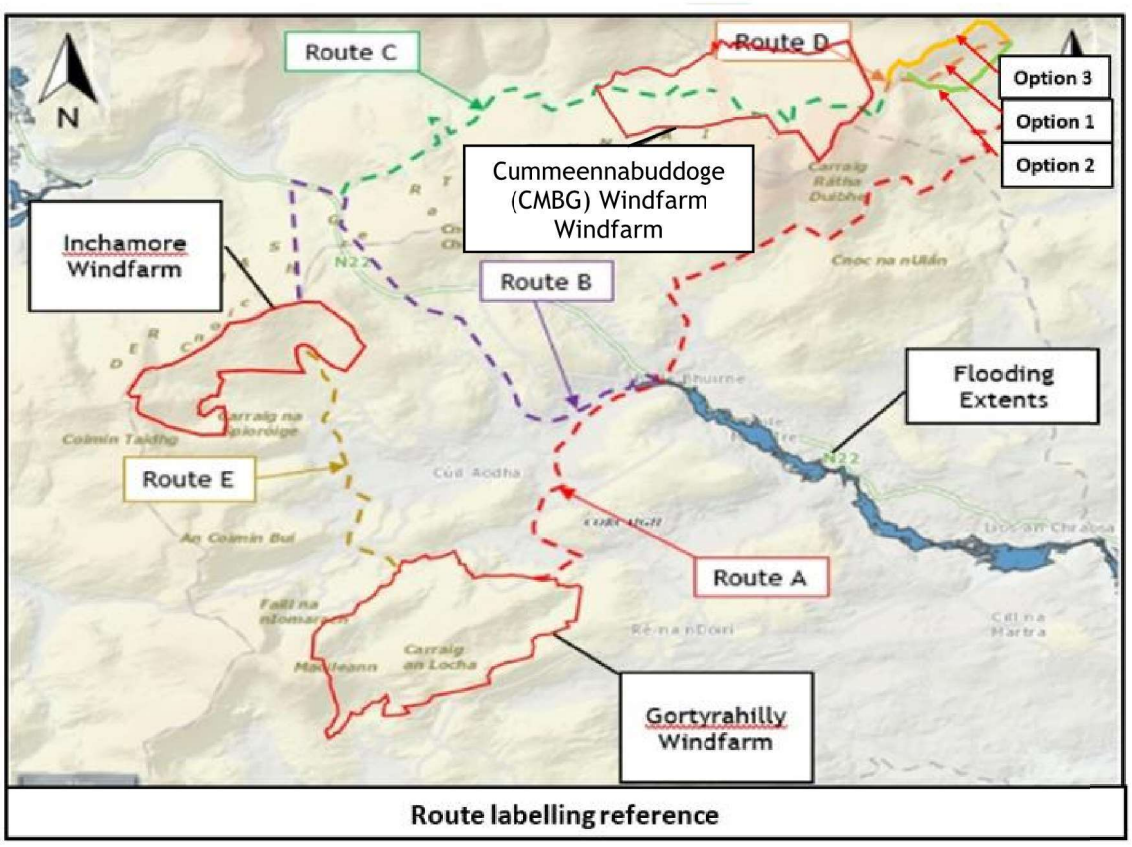


Figure 2.1-1: Cable Route Options

2.2 Existing Utilities

We have approached the utility providers for information of their infrastructure along the route and report as follows:

2.3 ESB

ESB have responded with relevant information of their network installations, which are adjacent to and cross the cable route. There is a high voltage cable route crossing the bridge 5 at (refer to Appendix B image 33 & 34).

There is also joint bays in routes A and route E. The location has been recorded and is shown in the route images in Appendix B.

2.4 Eircom

Eircom have provided a link to their cable website of the locations of the eircom cables along the route and any underground crossings that may traverse the proposed cable route have been recorded as part of the site survey. This information is included in the determination of the proposed cable route as discussed in section 6.

2.5 Gas Networks

Gas Networks Ireland (GNI) have responded illustrating there are existing services. Along with this, from our site investigation there appears to be no visible gas infrastructure along the proposed routes.

Virgin Media have responded advising that they have no records of infrastructure installations along the cable route.

2.6 Irish Water & Cork County Council

Irish Water and Cork Co. Council have been contacted for information on existing watermains and watermain crossing information for this route please see image 38 & 39 for details. During the survey of the proposed route, the locations of watermains, fire hydrants, metres and sluice valves were observed and recorded against the cable route. This information is commented on in our proposed cable route as discussed in section 6.

3 Historical Use and Current Use

3.1 Historical Route Overview (Location shown on drawings 201-164-001/005) refer to Appendix A.

Route A/B
Item 1 – Ringfort
In the townland of Gort Uí Rathile, there is a ringfort located to the south east of the road. The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Ringfort - cashel
Townland: Gort Uí Rathile
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In level pasture. Circular area (34m N-S; 36m E-W) enclosed by substantial stone wall (H 2.1m; T 3m) SE->NNE; collapsed elsewhere. Wall rebuilt in places; batter on external face. Fallen stones against inner and outer face of wall to height of 0.6m. Ledge (Wth 0.4m) c. 0.5m above ground level on internal face of wall. Interior boggy to E; possible souterrain CO069-004002-) in NE quadrant.

Item 2 – Souterrain
In the townland of Gort Uí Rathile, there is a souterrain located to the south east of the road. description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Souterrain
Townland: Gort Uí Rathile
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In NE quadrant of cashel (CO069-004001-); depression indicates position. According to local information, stone-built chamber with lintelled roof, long axis N-S. Inaccessible. Further recent collapse to NW.

Item 3 – Ringfort
In the townland of An Muirneach Beag, there is a ringfort located to the east of the road. The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Ringfort - rath
Townland: An Muirneach Beag
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In pasture, on W-facing slope. Circular raised area (27m E-W; 24m N-S) defined by traces of earthen bank (max. int. H 1.2m) NW->SE; scarp (H 1m) S->NW, topped by stone field boundary.

Item 4 – Ringfort
In the townland of An Muirneach Beag, there is a ringfort located to the east of the road. The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Ringfort - rath
Townland: An Muirneach Beag
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In pasture, on gentle SW-facing slope, above sharp fall in slope. Circular, slightly raised area (28m N-S; 28m E-W) enclosed by earthen bank (int. H 0.6m; ext. H 1.8m). Gaps in bank to N and

W; entrance (Wth 4m) to S. Interior slopes gently down to S; foundations of circular hut site (8m N-S; 8m E-W) in E half. Bullaun stone (CO058-027002-) protrudes from S side of hut site.

Item 5 – Ballaun stone
In the townland of An Muirneach Beag, there is a ballaun stone located to the east of the road. The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Ballaun stone
Townland: An Muirneach Beag
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: Protruding from S side of hut site in ringfort (CO058-027001-). Large boulder with circular hollow (diam. 0.23m; D 0.05m) on upper surface.

Item 6 – Enclosure
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Enclosure
Townland: An Muirneach Beag
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In pasture, on N-facing slope, commanding extensive view across Sullane River valley to Derrynasaggart Mountain. Depicted as hachured circular enclosure (diam. c. 12m) on 1842 OS 6-inch map. Levelled; no visible surface trace.

Item 7 – Designated landscape
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Designated landscape - belvedere
Townland: An Sliabh Riabhach
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In Ballyvourney, mid-19th-century 3-storey tower with projecting battlements supported by corbels; rectangular in plan with 2-bay, 2-storey, gabled projection from NE corner. Known locally as 'Court House' and 'Police Barracks' (Healy, 1988, 20). Tower sited just beyond L-shaped range shown as 'Police Barracks' on 1842 OS 6-inch map. In mid-19th century, Colthurst family-built country house to S; may have built tower at same time. House and tower burnt in 1920s; house subsequently

Item 8 – Hut Site
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Hut Site
Townland: Com an Ghadhair
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: On S side of Derrynasaggart Mountains, to S of Mullaghanish. Circular area (5.2m N-S; 5m E-W), on natural platform, enclosed by low collapsed wall (H 0.85m; Wth 1.6m) of loose stones. Interior level and grass-covered; some stones protrude through grass.

Item 9 – Architectural fragment

The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Architectural fragment.
Townland: An Sliabh Riabhach
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: Built into ivy-clad wall on N side of road. Opening (H c. 0.8m; Wth c. 0.4m), framed by cut-stone surround with pointed chamfered arch, gives access to a well. Surround of late-medieval appearance.

Item 10 – Kiln
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Kiln – lime.
Townland: An Doinín Álainn
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: Built on break in slope, in pasture field. Rectangular kiln (c. 4m N-S; c. 5m E-W; front H 3.5m; rear H 1.1m); front elevation (S) has lintelled recess (H 1.3m; Wth 1.35m; D 2m) with sloping slabs to rear. Circular stone-lined funnel (diam. 1.45m) half filled with rubble. Kiln dismantled and rebuilt c. 200m to N in 1993 in advance of roadworks (Kelleher, 1993); according to Kelleher (ibid.) 'probably built in mid 1830s under instruction from the Colthurst family'.

Item 11 – Enclosure
Compiled by: Elizabeth Byrne, Ursula Egan and Sheila Ronan, Archaeological Survey Unit, University College, Cork

Class: Enclosure
Townland: Glashacormick
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In a wooded area, on a river bank, on a N-facing slope in the valley of the Clydagh River. A roughly triangular area (c. 11m N-S; 8.5m NE-SW; 2.6m NW-SE) defined by a linear scarp (H 1m) at SW and SE, and by gradually curving river bank at E. The interior, which is obscured by bushes and undergrowth, slopes gently down to the N

Item 12 – Fulacht fia
Compiled by: Frank Coyne.

Class: Fulacht fia
Townland: Cummeenavrick
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: Located in a level marshy field, on the immediate E side of a small stream, on the S side of the old Killarney-Ballyvourney road, on lower gently sloping mountain side on the 240m contour. The dominant aspect from the site is to the SE and W. This is a low grass-covered, kidney-shaped mound, measuring 15m N-S by 7m E-W, 1m in maximum height. A 1m wide entrance to a 2.5m wide trough, 0.4m below the crest of the mound. This trough area is on the W side of the mound, and is open to the nearby stream, which is approximately 5m away

Item 13 – Megalithic tomb
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Megalithic Tomb – wedge tomb
Townland: Caherdowney

Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: On flat boggy land on N side of Garrane River valley. Well-preserved tomb, comprises gallery, aligned E-W, surrounded by closely set outer walling. Short portico at W end (L 0.4m) separated from main chamber (L c. 3m) by short septal-stone set in front of two jambs. Gallery sides each represented by three stones, with inset backstone to E; covered by three roofstones. Traces of low mound around structure. (de Valera and O Nualláin 1982, 7, Co. 8)

Item 14 – Kiln
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Kiln - lime
Townland: Ré na bPobal
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: At edge of forest plantation, to N of road. Partially collapsed mid-19th-century kiln. Front elevation (SE) has lintelled recess (H 1.6m; Wth 1.55m; D 2m) with sloping slabs to rear. Stone-lined circular funnel (diam. 1.65m).

Item 15 – Stone circle
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Stone circle - five stone
Townland: An Lománach Mhór
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: In rough pasture, 30m E of Sullane River between ridges of outcropping rock. Circle complete; interior filled with field clearance stones. Entrance stones parallel, set end-on to circumference. Orthostats are 0.9m to 1.1m L, 0.17m to 0.55m T and 0.8m to 1m H. Internal measurement along main axis, aligned ENE-WSW, is 2.1m.

Item 16 - Kiln.
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Kiln – lime
Townland: Na Millíní
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: Small, roughly square mid/late 19th-century kiln on E side of road. Front elevation (S) (H 3.4m; Wth 3.8m) has lintelled recess (H 1.65m; Wth 1.1m; D1.7m), with sloping slabs immediately inside front lintel. Funnel visible but inaccessible.

Item 17 – Rectangular Kiln.
The below description is derived from the published 'Archaeological Inventory of County Cork. Volume 3: Mid Cork' (Dublin: Stationery Office, 1997). In certain instances, the entries have been revised and updated in the light of recent research.

Class: Kiln – lime
Townland: Na Millíní
Scheduled for inclusion in the next revision of the Record of Monuments and Places: Yes
Description: On N side of laneway, built into slight break in slope. Roughly rectangular kiln (c. 6m N-S; c. 8m E-W; front H 3.8m; rear H 0.6m), partially collapsed. Front elevation (S) has lintelled recess (H 1.75m; Wth 1.5m; D 2.1m), with sloping slabs to rear. Circular funnel (diam. c. 1.5m) almost completely infilled.

Item 18 - Structure.
Class: Structure
Townland: Na Millíní
Scheduled for inclusion in the next revision of the Record of Monuments and Places: No
Description: N/A.

3.2 Current Review

The current use of the lands along the route is predominately forestry and agriculture. There are sections of the route that are sparsely populated. These services have been highlighted in the desktop study and upon visual inspection during the site visit. The challenges associated would be trying to negotiate the cable underneath the existing services and achieve the required separation of at least 300mm between all crossings. A detailed GPR survey and slit trenches would be required within the village to for the depths and locations of all the services within the constraints of the road.

An aerial view of the wind farm locations and Ballyvouskill locations are indicated in Figure 3.1. This aerial few gives an appreciation of the locations of the forestry and agricultural lands relative to the windfarms.

There are a number of historical sites present along the route. These specific sites have been recorded in section 3.1 above and is outlined in drawings 201-164-001/005 (Please refer to Appendix A).

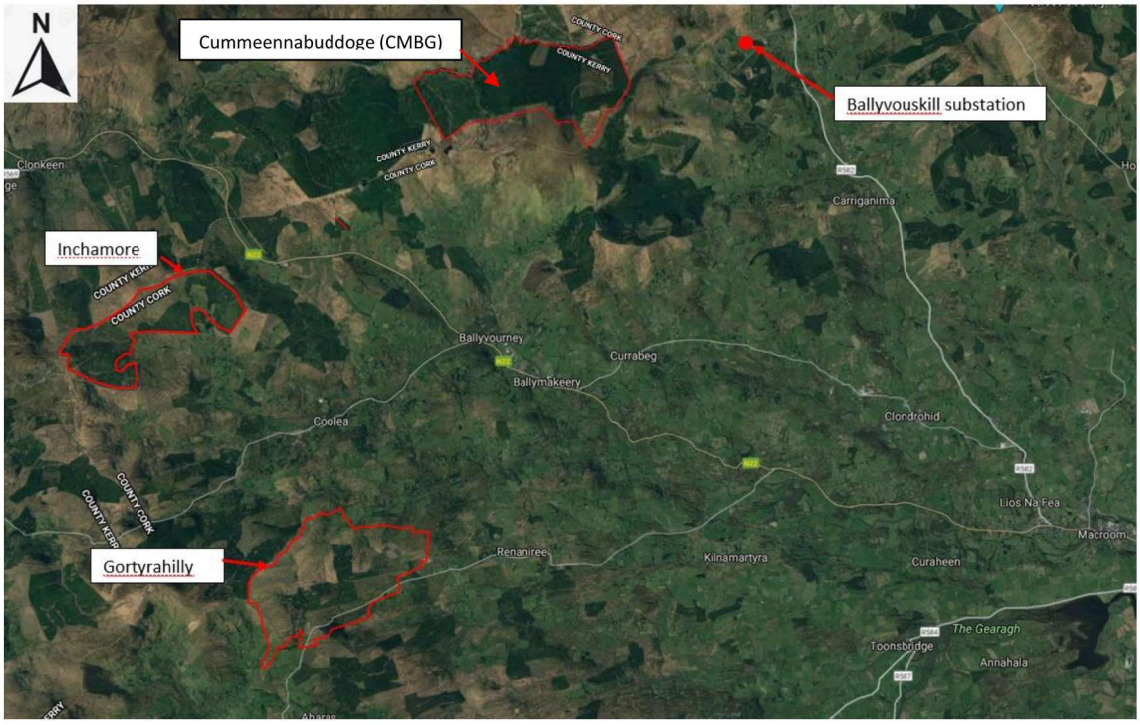


Figure 3-1: Aerial View of Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG) Wind Farms and Ballyvouskill Substation locations

Reference should also be made to PUNCH drawing 201-164-008 for the locations of the Coillte own land relative to each windfarm and Ballyvouskill substation.

4 Flooding

4.1 Context of Flooding

Any flooding associated with this site is considered to be fluvial flooding.

4.2 History of Flooding

A review of the data available from the Office of Public Works (OPW) online mapping portal (2020) was completed. There is one recorded flood event noted adjacent to the proposed cable routes. The River Sullane flooded the area in Baile Bhuirne shown in Figure 4-1 in August 1986. This area coincides with the N22 crossing of the proposed cable route A.

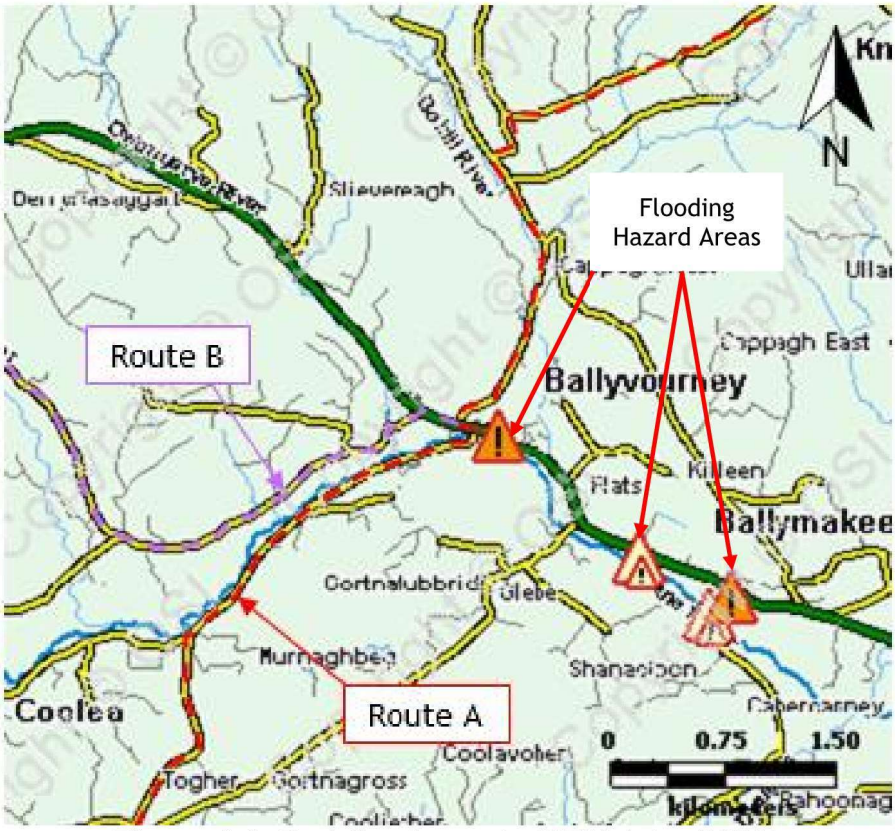


Figure 4-1: Past flood events (OPW data, 2020)

4.3 Preliminary Flood Risk Assessment Mapping

The OPW (2020) online flood mapping has been reviewed with a map of the estimated flood extents reproduced in **Error! Reference source not found.**. The proposed cable route A was identified as crossing the area located for the indicative 1% AEP (100yr) Event for fluvial events.

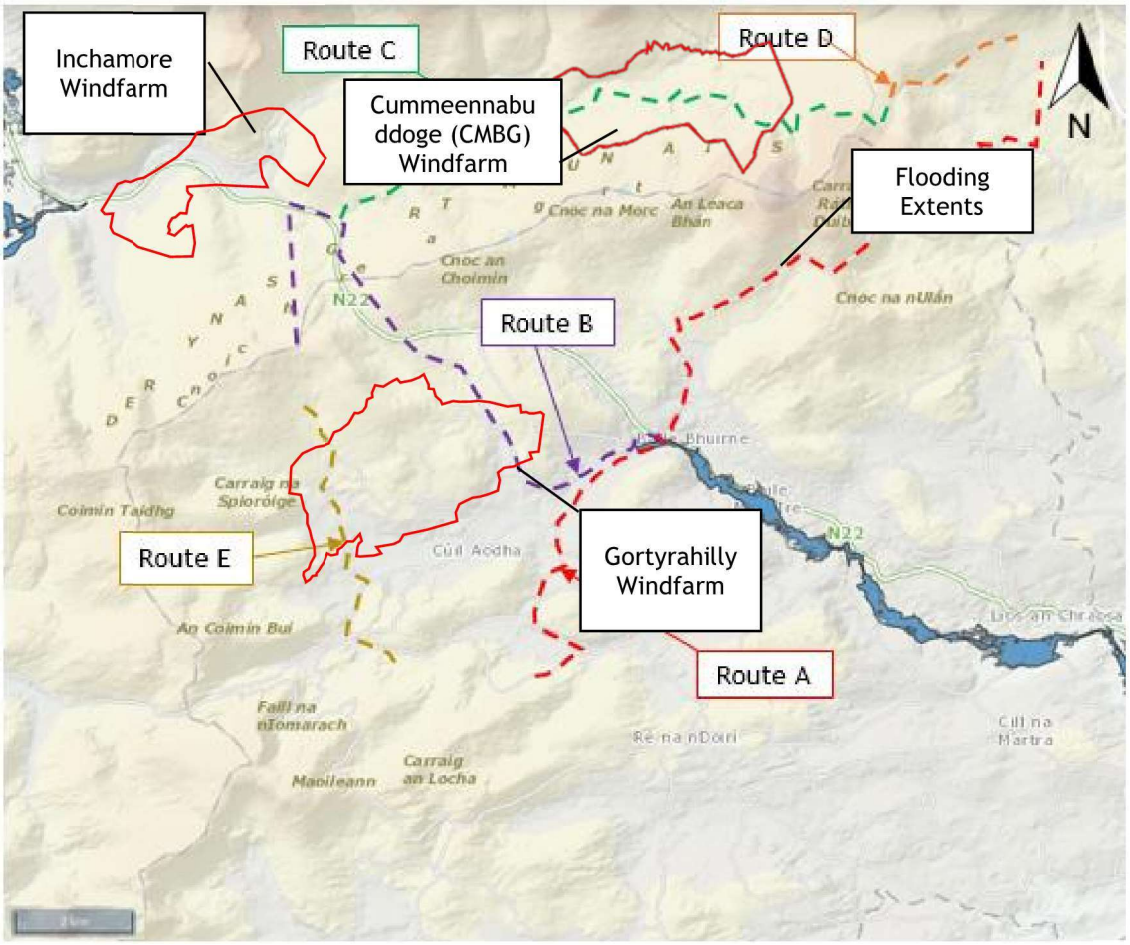


Figure 4-2: Estimated flood extents (EPA data, 2020)

4.4 CFRAMS Mapping

There is no CFRAM mapping available for this area.

4.5 Estimate of Flood Zone

The proposed route A locally traverses the 1% AEP flood zone at the N22 crossing in Baile Bhuirne as identified on the OPW information.

4.6 Flood Risk Management Plan

The OPW has developed a Flood Risk Management Plan for River Basin (19) Lee, Cork Harbour and Youghal Bay. Ballymakeery/Ballyvourney (Baile Mhic Ire/Baile Bhuirne) has been identified as an area for further assessment, with the extents of this area shown in Figure 4-3 which coincides with the

proposed cable routes A and B at the N22 crossing in Baile Bhuirne. The flood relief scheme is currently proposed to comprise of a combination of embankments, walls, channel straightening, bridge underpinning and localised dredging and is expected to provide protection against a 100-Year flood event (1% AEP) for 80 properties against fluvial flooding. These measures were taken into consideration when determined the finalised route layout.

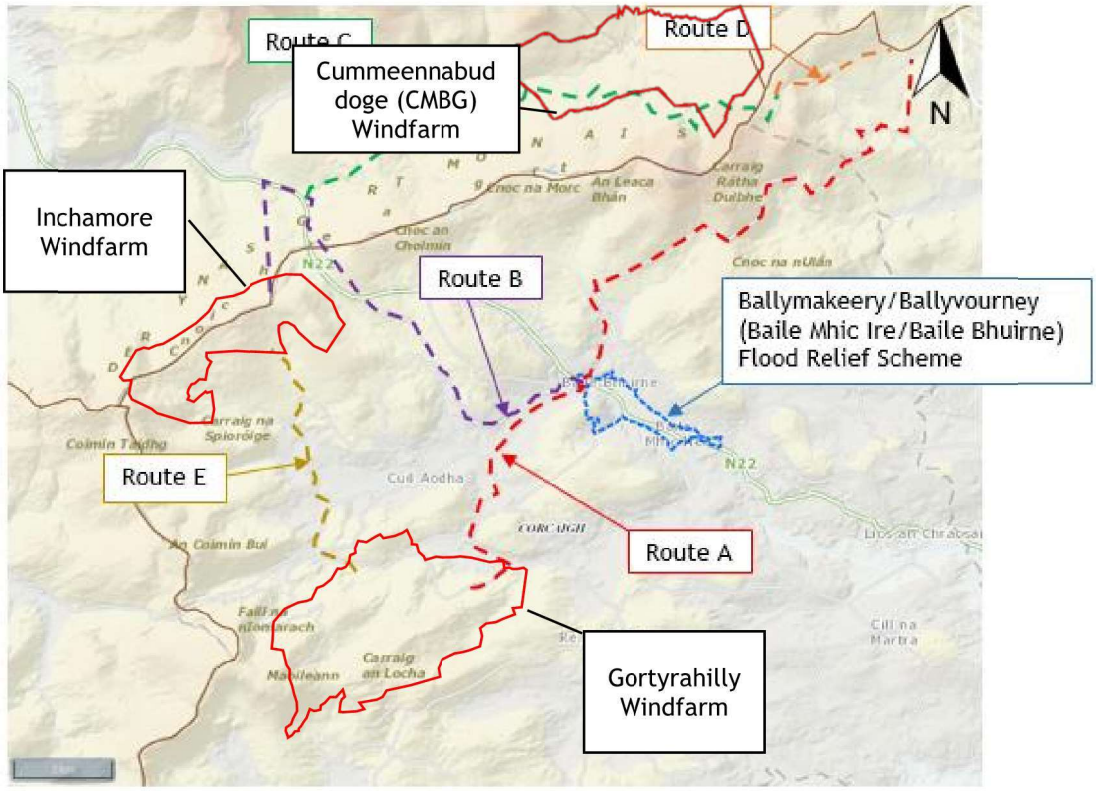


Figure 4-3: Areas identified for further flood risk assessment (OPW, 2020)

4.7 Site Vulnerabilit

Following the assessment of the available information of historic flood events, the vulnerability of all proposed cable routes is classified as low. Further investigation is required to determine the extents of the water table along the entire route.

4.8 Flood Mitigation Measures

As the risk of flooding to the chosen cable routes is low, there are minimal mitigation measures required. However, the client should reference the CFRAMS and OPW records to ensure that all information is recorded when it is updated.

4.9 Flood Risk Conclusion

Further to the review of the existing flood information available, the risk of flooding along all of the routes is low.

5 Geology, Water and Hydrology

5.1 Geology

The quaternary deposits and bedrock geology of the site obtained from the GSI (2020) online mapping database are shown on 1:100,000 geological maps illustrated in Figure 5-1 and Figure 5-2 respectively. The details of the superficial deposits and bedrock geology are summarised in Table 5-1.

The proposed cable routes in the north are typically underlain by blanket peat to the north whilst the cable routes in the southern half of the site are underlain by tills derived from Devonian Sandstones. Bedrock outcrops or subcrops are also frequently identified in the southern half of the site. Alluvial deposits occur along the River Sullane and River Clydagh which are in proximity to sections of the proposed cable routes.

The bedrock in the area is covered by Glenflesk Chloritic Sandstone Formation, Gun Point Formation, Bird Hill Formation, Gortanimill Formation and Caha Mountain Formation. There are many structural line features described as a fault in the GSI (2020) online mapping dataase, on the project area.

It is recommended to carry out a site investigation at the detailed design stage, to determine the appropriate strength and stiffness parameters of the underlying soil and rock parameters.

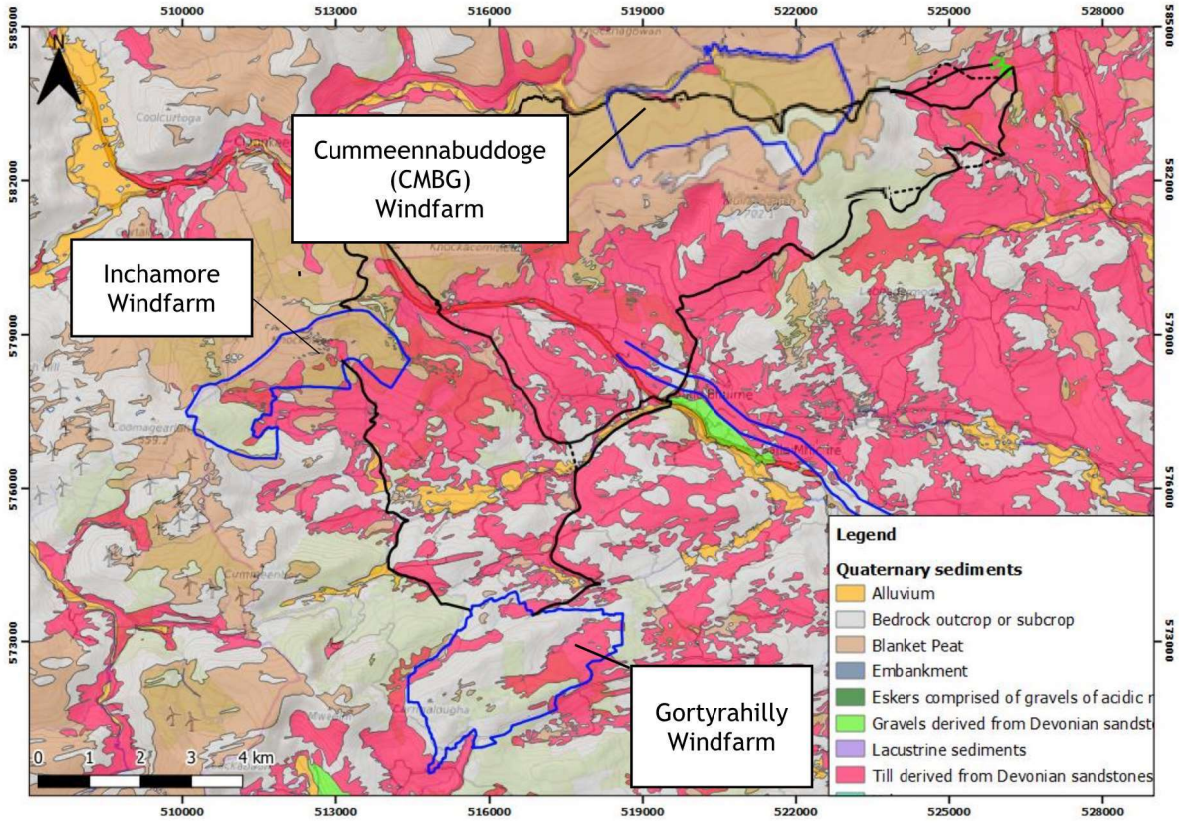


Figure 5-1: Quaternary deposits 1:100,000 (GSI data, 2020)

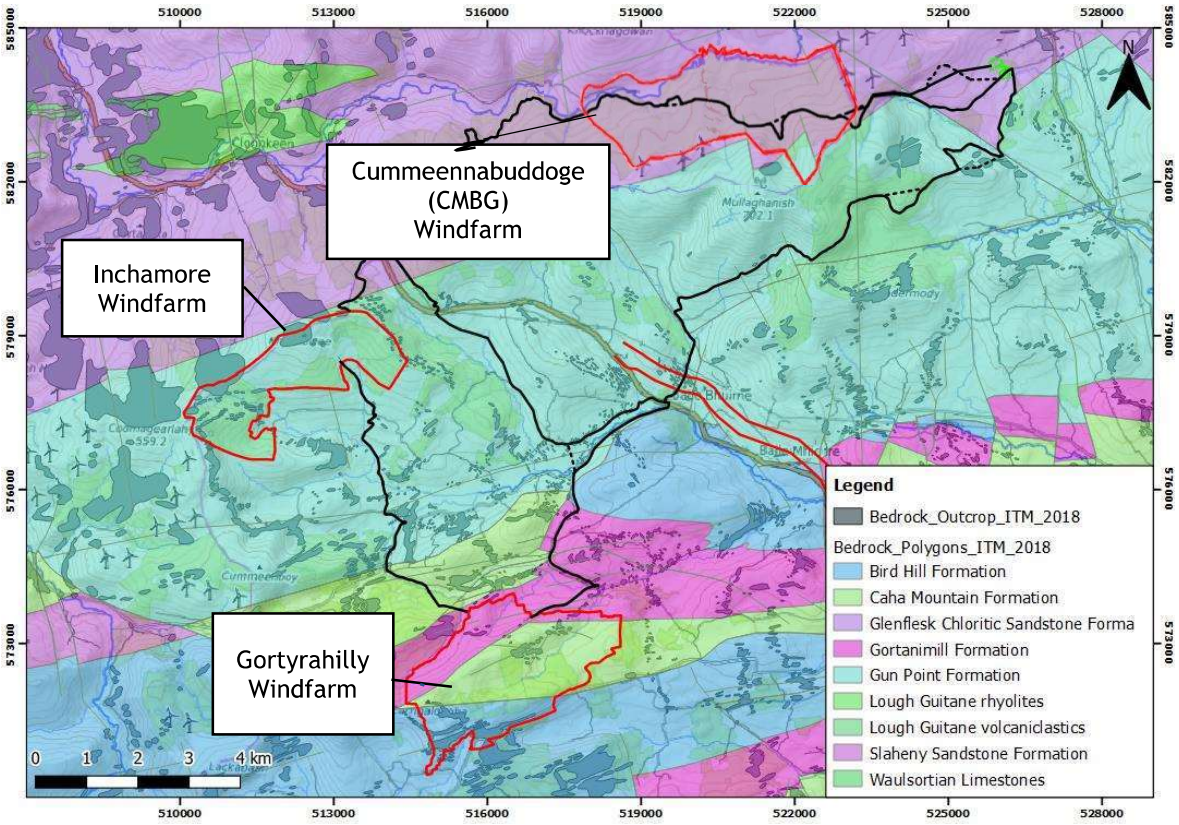


Figure 5-2: Bedrock geology 1:100,000 (GSI data, 2020)

Table 5-1: Geological succession

Soil or Rock Deposit Name	Brief description
Drift Geology	
Blanket Peat	Peat is a typically fibrous material due to decaying organic matter and is a highly compressible material when loaded. Typical engineering characteristics of peat include high moisture content values which may exceed 500%, and unit weight values typically in the region of 11kN/m^3. A higher strength crust is usually present at the surface of peat which is typically 300mm in thickness. This crust provides a beneficial tensile capacity of the peat surface.
Alluvium	Alluvium deposited in low energy fluvial and marine environments and is typically found in flood plains, estuaries, deltas and nearshore locations. Typically, under consolidated and therefore highly compressible but can be improved with vertical drains and surcharging ground improvement techniques.
Till derived from Devonian Sandstones	The structure of glacial till varies in composition from granular to cohesive material. Granular glacial till is often found in areas of glacial outwash and lateral moraine features. These tend to be in the form of loose to dense material. Cohesive glacial till varies in forms from poorly to well-graded till. Cobbles and boulders may be present. Consistency varies from firm to hard.

Soil or Rock Deposit Name	Brief description
Gravel Derived from Devonian Sandstones	Gravels are coarse-grained soils, with particle diameters between 2mm and 63mm. The gravels in this area may have a percentage of fine-grained materials and/or sand content, alongside cobble and boulder content. No description of the gravel constituents, strength parameters or compaction was available at the time of writing.
Solid Geology	
Glenflesk Chloritic Sandstone Formation	The main lithologies consist of green-coloured, mostly medium-grained sandstone, conglomerate and pebbly sandstone, together with green and purple siltstone. The green medium to coarse-grained highly chloritic sandstones are characteristic for the format
Gun Point Formation	Green-grey to purple medium to fine-grained sandstones, interbedded with green and red to purple siltstones and fine sandstones.
Bird Hill Formation	Purple-red, fine-grained sandstone and subordinate lightly calcretised purple siltstone. The sandstone is weakly parallel-laminated and contains small-scale cross-lamination. The sandstones are thinly interbedded with siltstones.
Gortanimill Formation	Medium to fine-grained trough and tabular cross-bedded green sandstones and red siltstones.
Caha Mountain Formation	The sandstone bodies show low angle cross-stratification and usually have erosive bases, cutting into underlying fine-grained material. Towards the top of the formation, intraformational breccias occur sporadically, showing low angle cross-stratification.

5.2 Historic Landslide Events

The historical landslide events recorded in proximity to the site obtained from the GSI (2020) online mapping database are shown on the map illustrated in Figure 5-3. Several landslide events were noted in the River Clydagh valley along the northern-most extents of the proposed cable routes. Vigilance should be maintained in relation to potential ground movements leading to landslide events during construction, including peat slips.

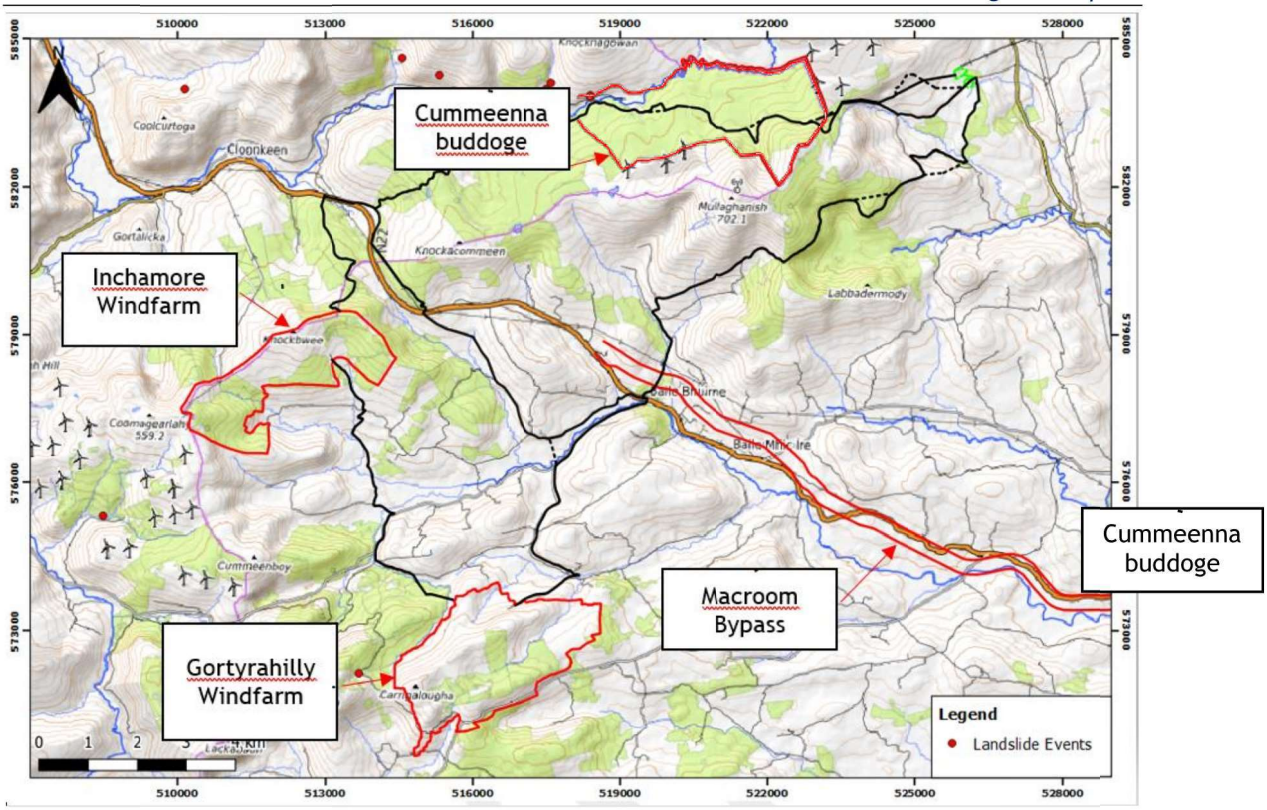


Figure 5-3: Recorded landslide events (GSI data, 2020)

5.3 Water & Hydrogeology

According to the GSI online mapping database (2020), the bedrock on the site area is noted as moderately productivity aquifers only in local zones (Ll – locally important aquifer) and in some areas is unproductive except for local zones (Pl). Also, there is a small area between Baile Bhuirne and Baile Mhic Ire which is underlain by a locally important gravel aquifer (Lg). A map of the bedrock and Sand and Gravel aquifers is shown in Figure 5-4.

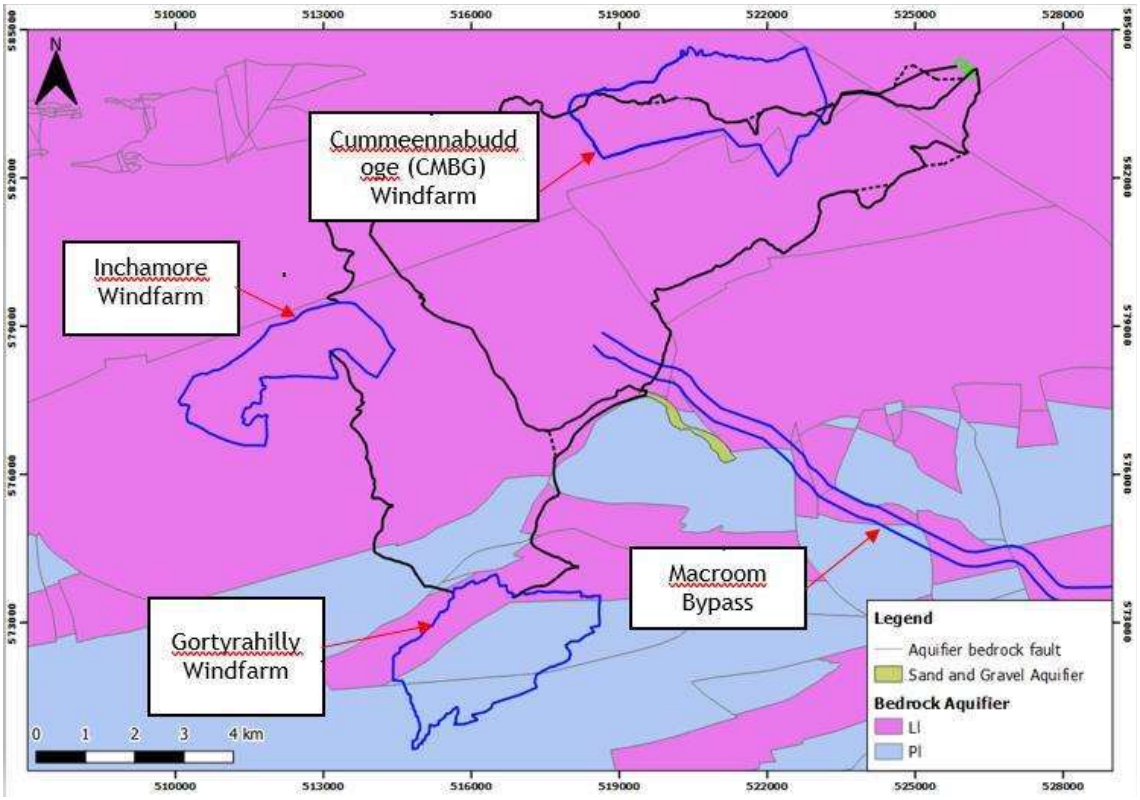


Figure 5-4: Bedrock/Sand and Gravel aquifers (GSI data, 2020)

The groundwater vulnerability map, produced in Figure 5-5, presents the risk of groundwater contamination. The following vulnerability grades are indicated in the designed along the proposed cable routes: rock near-surface or karst (X), extremely (E), high (H) and medium (M). The proposed cable installation typically requires shallow excavations and occasionally directional drilling. As such, the risk of contaminants entering the groundwater aquifers is anticipated to be low.

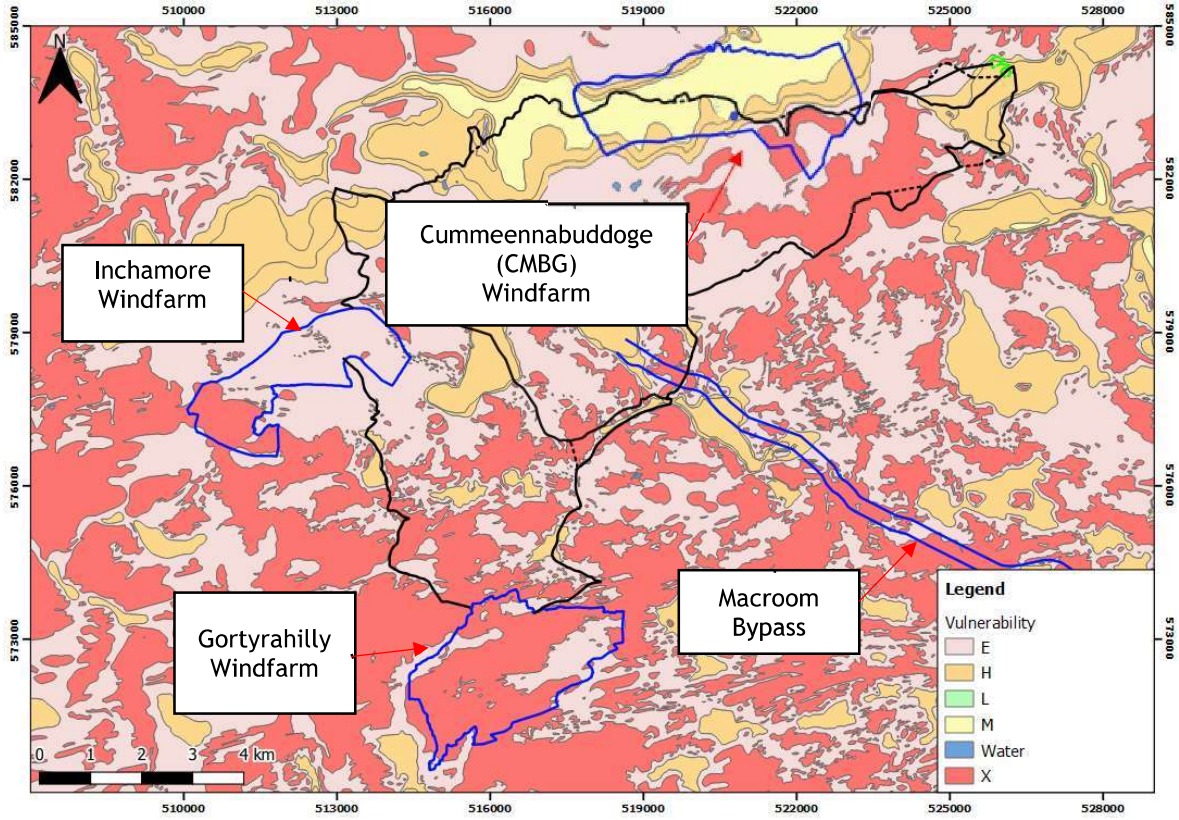


Figure 5-5: Groundwater vulnerability (GSI data, 2020)

The Environmental Protection Agency's (EPA) online mapping data was reviewed to assess the WFD catchment areas of the site. A map of the WFD catchments is presented in Figure 5-6. This map indicates that the following WFD catchments are present across the site:

1. Laune-Maine-Dingle Bay with the subcatchment of the River Flesk along the northern cable routes,
2. Lee, Cork Harbour and Youghal Bay with the subcatchments of the River Sullane along the southern cable routes and Foherish river along the eastern cable routes,
3. Blackwater (Munster) with the subcatchment of the River Blackwater is present to the north of the substation, and
4. Dunmanus-Bantry-Kenmare with the subcatchment of the River Roughty to the southeast of the Inchamore wind farm.

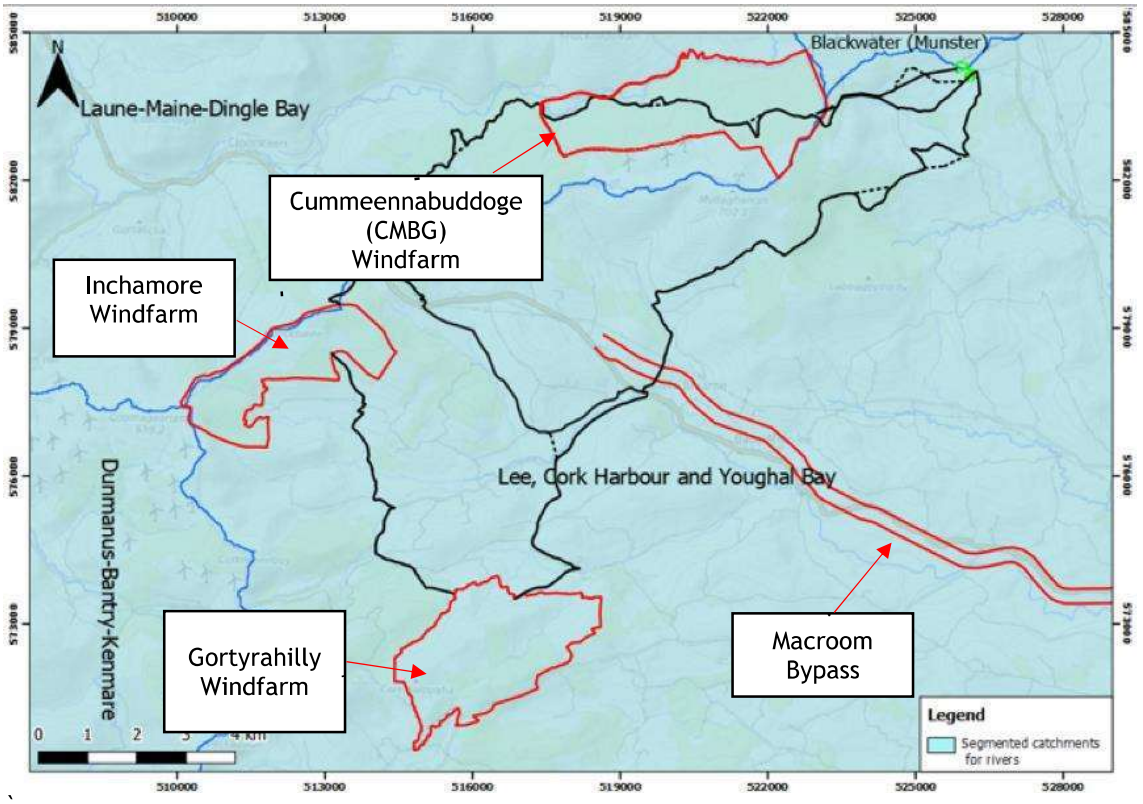


Figure 5-6: WFD catchments (EPA data, 2020)

6 Cable Route Geotechnical Assessment

6.1 Proposed Cable Routes

The proposed cable route options are to connect the three proposed wind farms to the existing substation at Ballyvouskill, which is located at approximate ITM coordinates 526101 E, 584096 N. The proposed cable routes are illustrated in Figure 6-1.

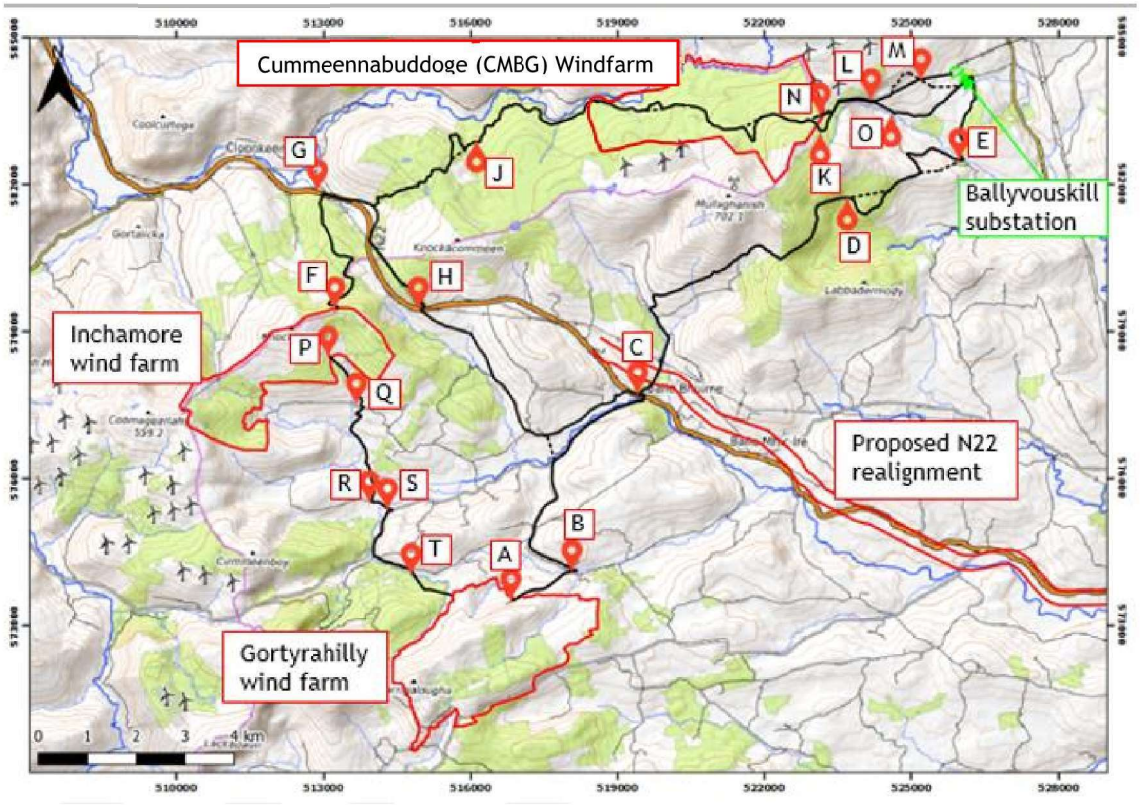


Figure 6-1: Proposed cable routes with waypoints indicated

Gortyrahilly is located approximately 14km south-southwest of the Ballyvouskill substation and will be connected to the substation via route A. Inchamore is located approximately 13.5km to the west-southwest of the Ballyvouskill substation and will be connected to the substation via route B or route C. Alternatively, Gortyrahilly may be connected to the Inchamore windfarm via Route E. Cummeennabuddoge (CMBG) is located approximately 3km west of the Ballyvouskill substation and will be connected to the substation via route C or route D. The cable routes will generally be installed along the road network installed in accordance with ESBN and EirGrid Specifications.

6.2 Route A

Route A runs between Gortyrahilly Wind Farm and Ballyvouskill via Baile Bhuirne (waypoints A-B-C-D-E-substation). Route A is typically proposed to be installed along existing local roads and boreens (very narrow single lane local roads) with some alternative routes through Coillte forestry and privately owned farmland in the northern sections of this route (waypoints D-E). There are some particularly narrow boreen stretches adjacent to the Gortyrahilly wind farm (waypoints A-B) and within 2km of the Ballyvouskill substation (waypoints D-E). These sections will likely require road closures during the installation of the cable route and may prevent access by larger plant.

The route is typically adjacent to farmland, with rushes frequently present which suggests a soft peaty soil underlies the area, although areas with till, weathered rock and rock outcrops were also

observed. In areas of peat, either a geotextile membrane should be incorporated into the floor of the trench to support the ducts or the peat should be excavated down to the top of the till/weathered rock stratum. No special measures are anticipated for areas of till, weathered rock or road hardcore, which should be excavatable. In areas where rock is present along the edge of the road the trench excavation process may be hindered by this rock.

The existing topography to the south of Baile Bhuirne includes steep slopes (greater than 30°) sloping east to west/southeast to northwest (waypoints B-C). Some scarping of the steep slopes was noted on site as shown in Figure 6-2, although rock outcrops were noted in adjacent slopes and ditches, suggesting rock is likely shallow in the area. The vertical gradient of the road south of Baile Bhuirne (waypoints A-B-C) was observed to be generally acceptable. The cross slopes along the route to the north of Baile Bhuirne (waypoints C-D-E) are typically lesser than those to the south, however, the vertical gradients are typically greater in this section. The existing boreens have historically been levelled by constructing embankments along the cross slopes between waypoints C, D and E.

There are three existing bridge crossings along the southern half of route A (waypoints A-B-C). There are three existing bridge crossings and five existing culvert crossings for minor streams along the northern half of route A (waypoints C-D-E). In addition, a new crossing will have to be constructed over the existing stream located approximately 1.8km south of the Ballyvouskill substation. The worst-case scenario of directional drilling should be assumed to cross beneath the watercourses at bridge/culvert/river crossing locations. Pending further on-site investigation, it may be possible to traverse some of these watercourses via alternative methods. These include in flat formation within the bridge itself, where the trenches will be surrounded with reinforced concrete protection, or, via dedicated cable bridges. These methods may reduce costs, however, the feasibility of such can only be determined following further investigations.

Figure 6-2: Evidence of overburden slope scarping along route A

6.3 Route B

Route B runs between Inchamore wind farm and Baile Bhuirne (waypoints F-G-H-C). Route B is typically proposed to be installed along existing local roads and boreens with local sections north and northeast of Inchamore wind farm to be installed through Coillte forestry areas (waypoints F-G-H). There are some particularly narrow boreen stretches between the N22 crossing at waypoint H and

Baile Bhuirne (waypoint C) and within 2km of the Ballyvouskill substation (waypoints D-E). These sections will likely require road closures during the installation of the cable route and may prevent access by larger plant. Stone masonry walls were also noted along the northern side of the short stretch of route B along the existing N22 in Baile Bhuirne (waypoint C).

The route from waypoints F to H inclusive traverse through forestry areas which will require clearance. This forestry is likely underlain by peaty soil over till/weathered rock, however, the majority of existing tracks through the forestry appear to have been excavated to allow the tracks to be founded on the till/weathered rock. The remainder of the route is typically adjacent to farmland, with rushes frequently present which suggests a soft peaty soil underlies the area, although areas with till, weathered rock and rock outcrops were also observed. In areas of soft peaty soil, a geotextile membrane should be incorporated into the floor of the trench to support the ducts. No special measures are anticipated for areas of till, weathered rock or road hardcore, which should be excavatable. In areas where rock is present along the edge of the road the trench excavation process may be hindered by this rock.

The existing topography through the Coillte land to the north of waypoint F has a southwest to northeast downslope including some relatively steep inclines approaching the Inchamore wind farm boundary. The remainder of the section between waypoints F and G is along the existing N22 and the adjacent side road (waypoint G) which are within a valley. The route section between waypoints G and H is through privately owned land and Coillte owned land on a northeast to southwest downslope. Between the N22 crossing and the Baile Bhuirne (waypoints H-C) traverses along and around the base of an unnamed hill with gentle cross slopes observed along this section of the route. The route between waypoint C and D was discussed previously.

There are four existing culverts along the N22 and the side road between waypoints F, G and H. Two existing bridges and one culvert are located between waypoints H and C. The worst-case scenario of directional drilling should be assumed to cross beneath the watercourses at bridge/culvert/river crossing locations. Pending further on-site investigation, it may be possible to traverse some of these watercourses via alternative methods. These include in flat formation within the bridge itself, where the trenches will be surrounded with reinforced concrete protection, or, via dedicated cable bridges. These methods may reduce costs, however, the feasibility of such can only be determined following further investigations.

6.4 Route C

Route C runs between Inchamore Windfarm and Cummeennabuddoge (CMBG) Windfarm (waypoints F-G-J-K). Route C is typically proposed to be installed along existing forestry tracks with some alternative routes through Coillte forestry and privately owned farmland in the northern sections of this route. The forest tracks were typically cut into the existing topography, although some embankments were also noted. The ground conditions observed in the cuttings (Figure 6-3) included 1.0m to 1.5m of peat overlying till and/or weathered rock, with some rock outcrops also observed.

Figure 6-3: Ground conditions observed along route C

In areas of peat either a geotextile membrane should be incorporated into the floor of the trench to support the ducts or the peat should be excavated down to the top of the till/weathered rock stratum. No special measures are anticipated for areas of till, weathered rock or road hardcore, which should be excavatable. In areas where rock is present along the edge of the road the trench excavation process may be hindered by this rock.

The existing topography between waypoints G and J results in steep vertical gradients on the track. The track is typically in cut along this section with the track founded on the underlying glacial till/bedrock.

Between waypoints J and K, the existing track levels out vertically with the cross slope falling south to north as observed, with the track typically being cut with near-vertical edges into the southern side of the track, and occasionally on both sides of the track. Some deeper sections of cut were observed to have exposed peat overlying till consisting of a cohesive material with sand and gravel content. Several locations were observed to have been subjected to erosion with shallow slips evident as shown in Figure 6-4 to Figure 6-7 inclusive with approximate ITM coordinates provided for each location. As described in Section 5.2, historic landslide events were also identified on the GSI online mapping portal in the River Clydagh valley. As such, there is a risk associated with potential landslides along route C should this option be progressed to construction. This risk could be managed by felling trees where necessary and cutting the adjacent slopes to a suitable gradient of 1V:2H or shallower. Some alternative routes are proposed along route C between waypoints G and K which typically pass through steeper areas which would require tree felling to permit the installation of the cables.

Figure 6-4: Exposed overburden cut with evidence of erosion/shallow slips (ITM 515852E,582740N)

Figure 6-5: Exposed overburden cut with evidence of erosion/shallow slips (ITM 516203E,582876N)

Figure 6-6: Exposed overburden cut with evidence of erosion/shallow slips (ITM 516203E,582880N)

Figure 6-7: Exposed overburden cut with evidence of erosion/shallow slips (ITM 519555E,583500N)

Figure 6-8: The view of waypoints L-K from the east

Eight existing culvert crossings and one stream (approximate ITM 518310E, 583460N) passing over the access track were observed along route C. The worst-case scenario of directional drilling should be assumed to cross under the watercourses at crossing locations. Pending further on-site investigation, it may be possible to cross some of these via alternative methods including but not limited to dedicated cable bridges. These methods may reduce costs, however, the feasibility of such can only be determined following further investigation.

6.5 Route D

Route D runs between Cummeennabuddoge (CMBG) Windfarm and Ballyvouskill Substation (waypoints N-O-substation). Route D is proposed to initially run down a steep forested slope before diverting southeasterly towards an existing local road at waypoint O and following this road to Ballyvouskill Substation. Two alternatives are also proposed within Route D to maximise the use of existing Coillte lands.

The route along the local road (waypoint O to the substation) is typically adjacent to farmland, with rushes frequently present which suggests a soft peaty soil underlies the area, although areas with till and/or weathered rock were also observed. In areas of peat either a geotextile membrane should be incorporated into the floor of the trench to support the ducts or the peat should be excavated down to the top of the till/weathered rock stratum. No special measures are anticipated for areas of till, weathered rock or road hardcore, which should be excavatable.

The alternative route between waypoints K and L passes to the south of the existing Caherdowney and Curragh wind farms through an area of forestry on a relatively steep slope. A view of the slope is shown in Figure 6-8. Beyond this steep forested slope, the route traverses open grassland down to Ballyvouskill Substation (waypoints L-M-substation). This final stretch of the proposed route is located along a cross slope falling from north to south. Another alternative route to waypoints L-M-substation is proposed along an existing access track to the existing windfarms before traversing southwest to the local road before connecting to the Ballyvouskill substation.

The existing topography of the alternative routes is similar to the main route along the local road. However, the cross slope along the existing local road between waypoint O and the substation is shallower than that between waypoint L, waypoint M and the substation.

No existing bridges, culverts or streams were observed to cross the proposed cable route D. However, local streams may be present within the forestry areas which were not accessible at the time of the site visit.

6.6 Route E

Route E runs between Gortyrahilly Windfarm and Inchamore Windfarm (waypoints P-Q-R-S-T). Route E is typically proposed to be installed along existing local roads with a section on the south-eastern end running through agricultural land and a short section at the northern end running along a forestry track.

The route is typically adjacent to farmland, with rushes frequently present which suggests a soft peaty soil underlies the area, although areas with till, weathered rock and rock outcrops were also observed. In areas of peat, either a geotextile membrane should be incorporated into the floor of the trench to support the ducts or the peat should be excavated down to the top of the till/weathered rock stratum. No special measures are anticipated for areas of till, weathered rock or road hardcore, which should be excavatable. In areas where rock is present along the edge of the road the trench excavation process may be hindered by this rock

The road is a narrow boreen with a poorly paved surface between waypoints P and Q, typically with gentle cross slopes. There are some steeper vertical gradients and sharp bends in the section around the junction at waypoint Q. These factors may prevent access by larger plant to this stretch of the road. The existing roads in the middle section of the route (waypoints Q-R) are typically adjacent to reasonably level farmland. The road runs directly alongside a stream for 200m between waypoints Q and R. The roads are narrow in places with trees also noted along the road boundaries. The route along waypoints R and S, west of the bridge crossing is a narrow paved road with an open drain on the southern side of the road and frequent rock outcrops along the northern side of the road. To the east of the bridge, the cross-slope falls south to north with trees present along the southern side of the road. The route along the northern section of waypoints S and T is a narrow paved road with a cross-slope dipping from east to west. Some scarping of the slopes was noted along the section with steep slopes between waypoints S and T and trees were also noted along both sides of the road. Outcrops are noted to frequent the central section between waypoints S and T. The route is along a narrow boreen at the southern end of the route within 600m of waypoint T with a cross-slope dipping from north to south on this section of the route. Some scarping of the slopes was noted along the southernmost section of the road within 600m of waypoint S although rock outcrops were noted in adjacent slopes and ditches, suggesting rock is likely shallow in the area. From waypoint T the route turns southward towards the Gortyrahilly windfarm, through agricultural/forestry land.

There are three existing bridge crossings along Route E, and the route will likely have to cross a stream at two further points between waypoint T and the Gortyrahilly windfarm. The worst-case scenario of directional drilling should be assumed to cross beneath the watercourses at bridge/river crossing locations. Pending further on-site investigation, it may be possible to traverse some of these watercourses via alternative methods. These include in flat formation within the bridge itself, where the trenches will be surrounded with reinforced concrete protection, or, via dedicated cable bridges. These methods may reduce costs, however, the feasibility of such can only be determined following further investigations.

7 Environmental Assessment

7.1.1 Biodiversity, Flora and Fauna

This high-level assessment of the underground grid connection (UGC) route options Route A, Route B, Route C Route D and Route E are informed by extensive ecological desktop studies which included:

- The identification of sites designated for nature conservation;
- Collation of information on rare and protected habitats and species;
- Examination of OSI maps and aerial photography; and
- Review of datasets, mapping and reports for the 10km grid squares W17, W18 and W28 held by
    - the National Parks and Wildlife Service (NPWS);
    - NPWS Flora Protection Order (FPO) Bryophytes database;
    - EPA Rivers Dataset;
    - Geohive OSI Mapviewer;
    - National Biodiversity Data Centre (NBDC) and;
    - Birdwatch Ireland, amongst others.

- CORINE Landcover Mapping Layer (2012)

This review has been conducted by Claire Deasy (B.Sc., MRes) of EcoSource Consulting, Claire has over 18 years of experience in environmental and ecological impact assessment including project management, surveying, data analysis and report writing in support of planning applications, EIAR, appropriate assessments and planning compliance with a particular focus on the ecological impacts of renewable energy projects (wind farms, solar, battery storage). Claire is an independent ecological consultant with experience across a range of ecological disciplines including botanical and habitat surveys, invasive species and bird surveys. She has also contributed Habitat & Species Conservation Plans for EU protected species such as the Annex I Hen Harrier and Annex II Marsh Fritillary Butterfly.

7.2 Review of UGC Route Options

A summary description and high-level assessment of impacts to identified key ecological receptors in the vicinity of the proposed UGC route options is summarised below. Key ecological receptors identified are detailed under the following headings:

- Designated Sites;
- Aquatic Ecology;
- Habitats;
- Birds; and
- Other Fauna.

The potential impacts and effects on these receptors are based on an understanding of the anticipated likely impacts, in particular from the proposed river crossings and off-road sections at the key locations highlighted, and with consideration of the site-specific ecological sensitivities.

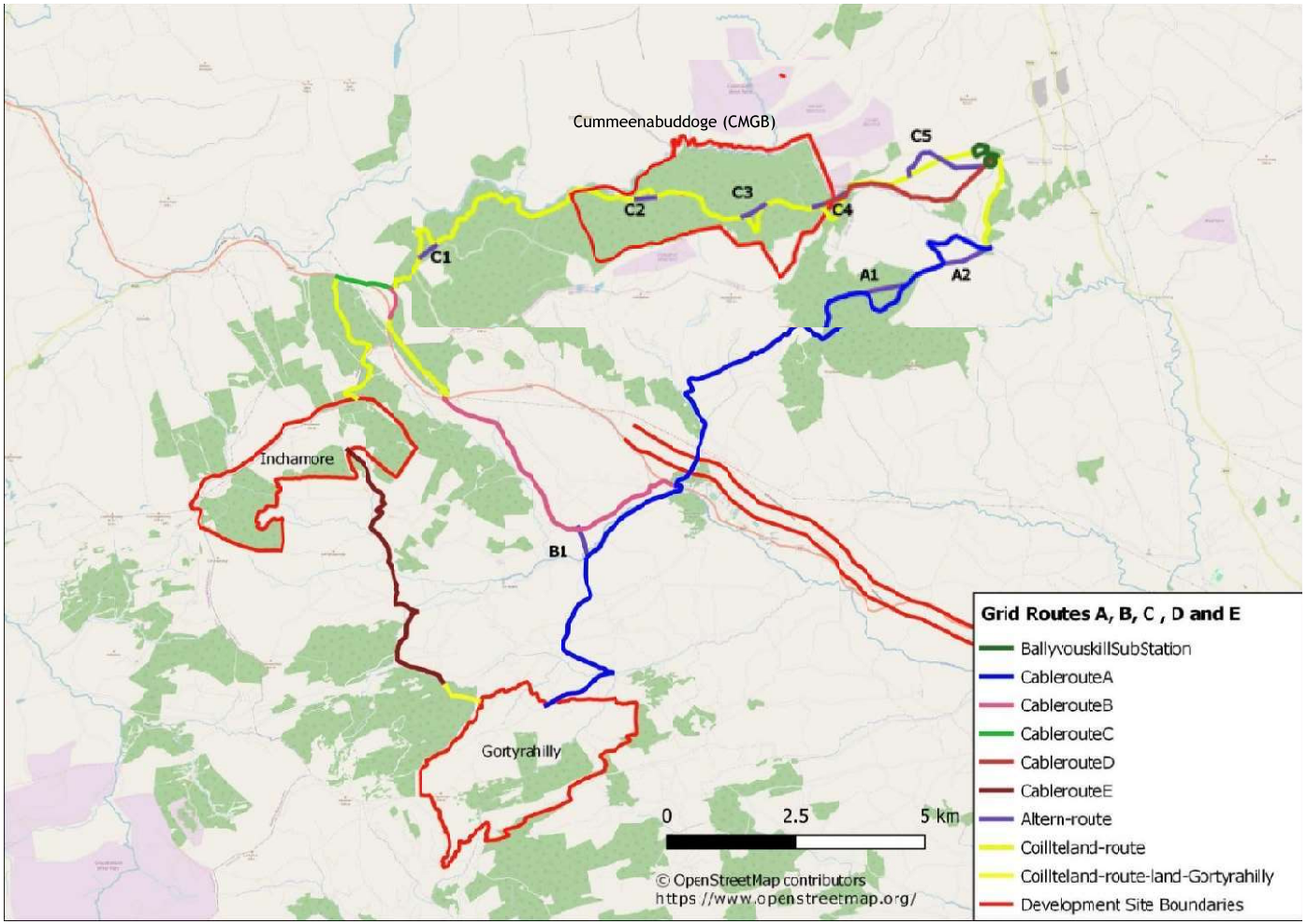
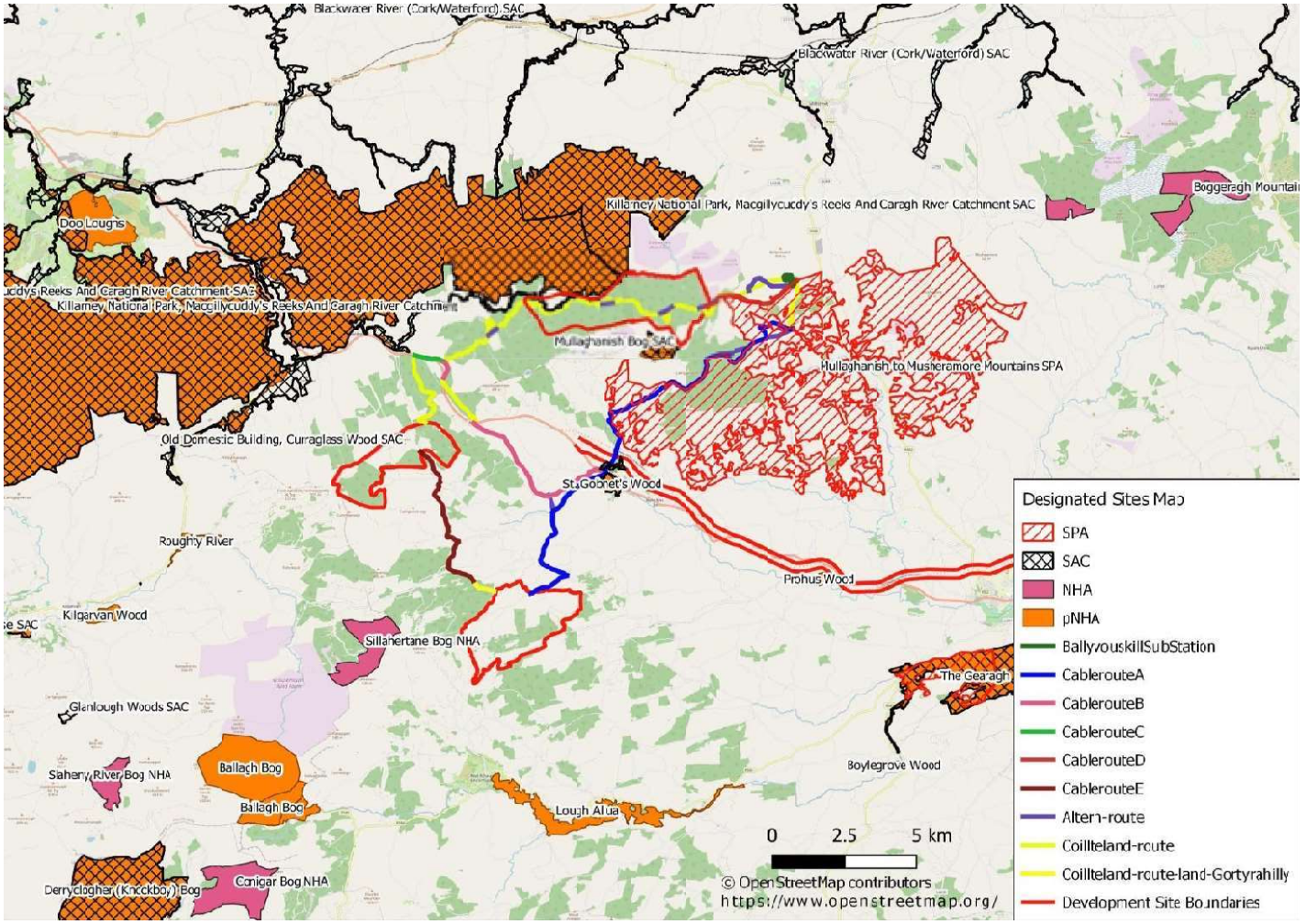


Figure 7.1 Site Layout of Coillte Grid Connection Options A, B, C, D & E for proposed wind farms Inchamore, Gortyrahilly and Cummeennabuddoge (CMBG) including alternative routes A1, A2, B1 and C1-C5.

Figure 7.2



Environmental Designated Sites Map- EU designated sites (SAC's & SPA's) and Nationally Designated Sites (NHA's & pNHA's)

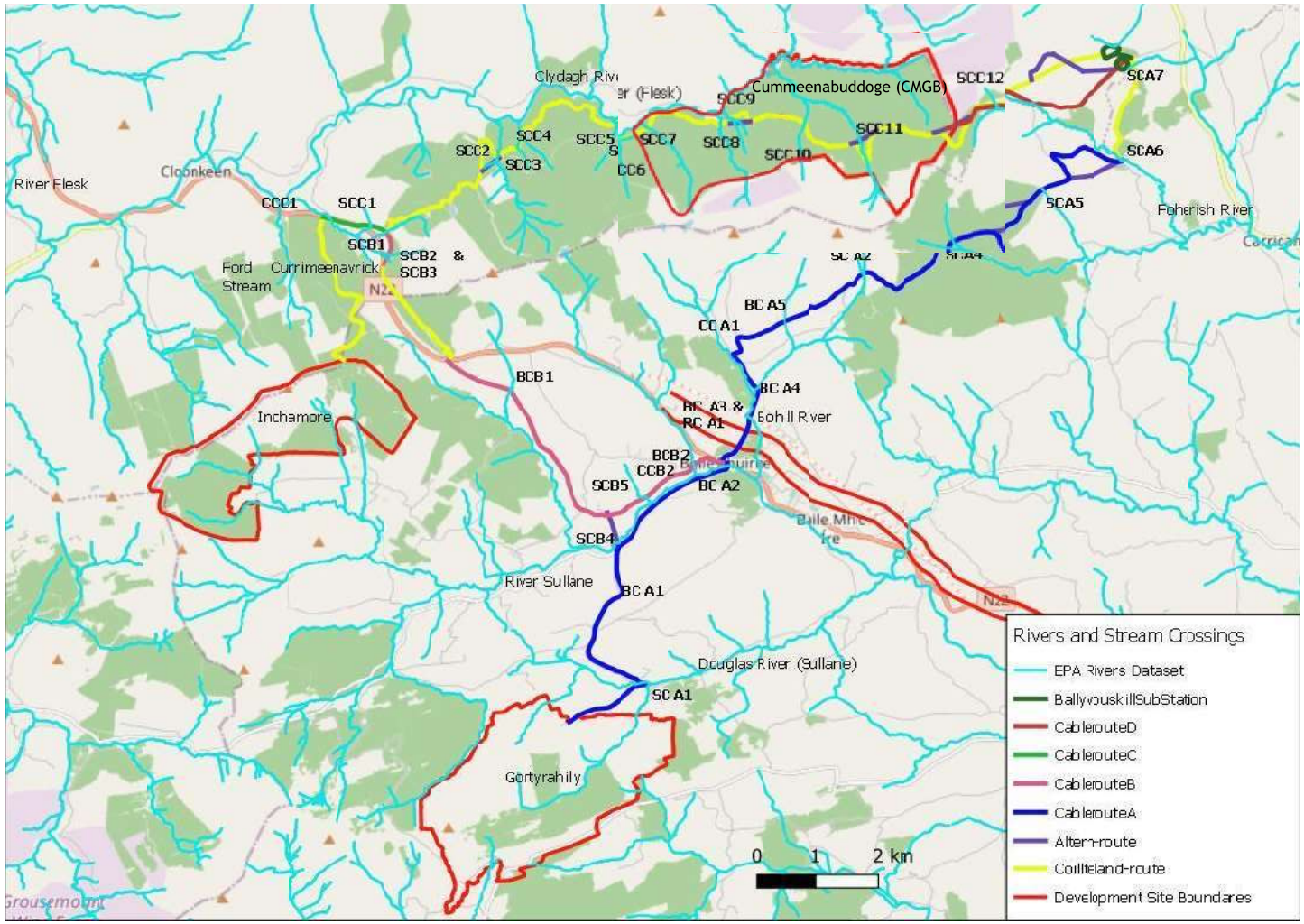


Figure 7.3 Rivers in the receiving environment and water crossings associated with Grid Connection Options A, B, C and D.

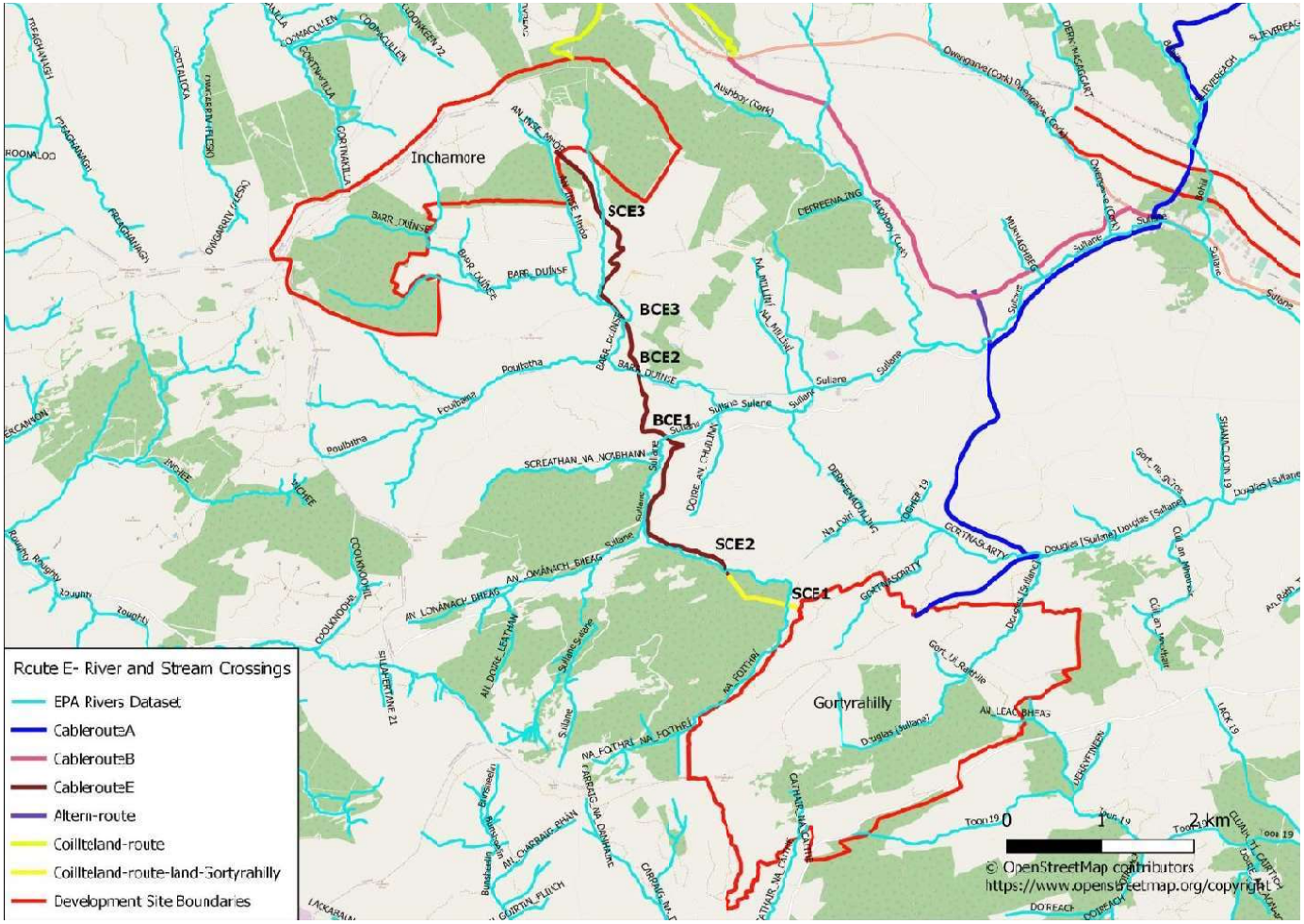


Figure 7.4 Rivers in the receiving environment and water crossings associated with Grid Connection Route Option E.

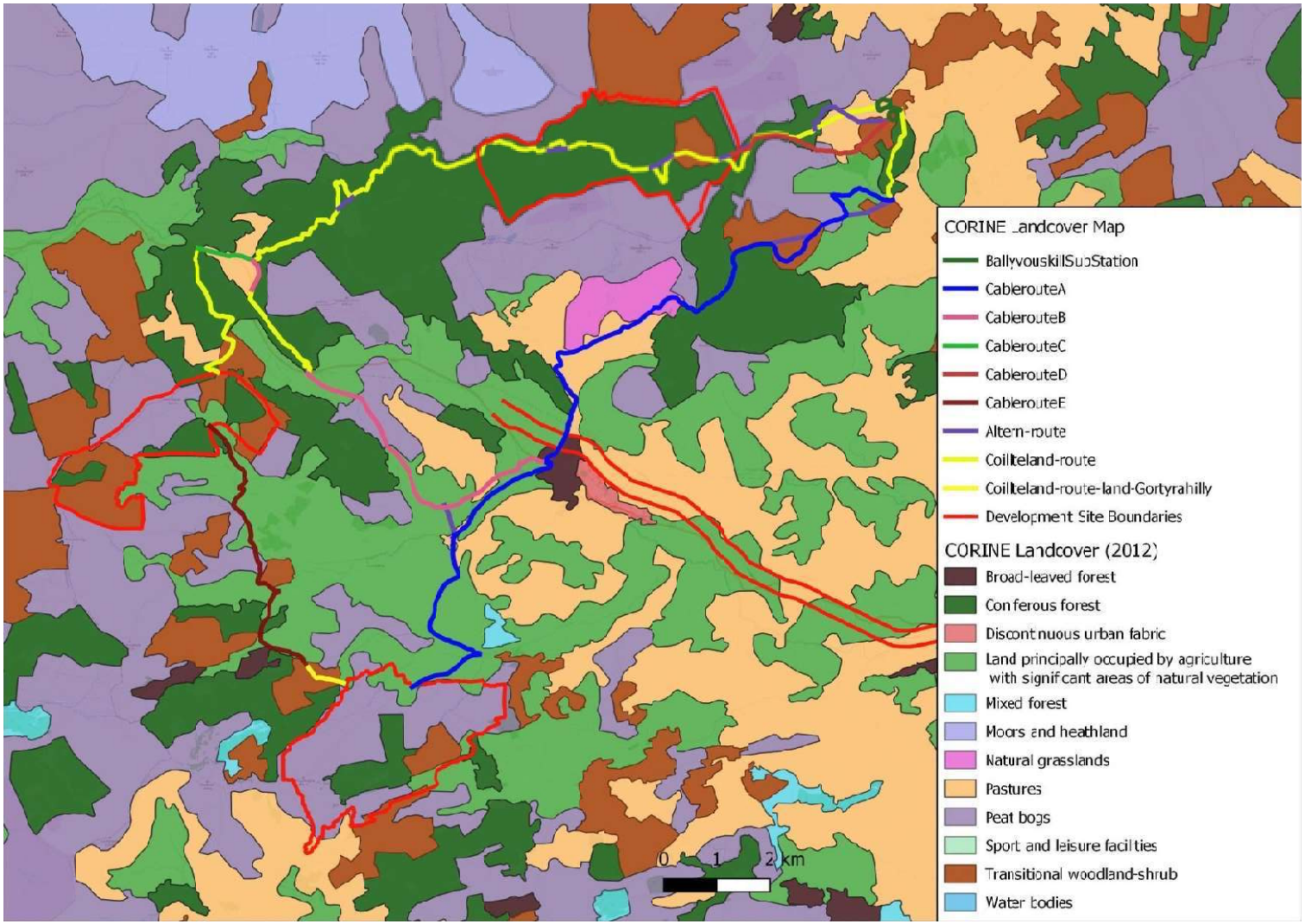

CORINE Landcover Map
BallyvouskillSubStation
CableRouteA
CableRouteB
CableRouteC
CableRouteD
CableRouteE
Altern-route
Coillteland-route
Coillteland-route-land-Gortyrahilly
Development Site Boundaries
CORINE Landcover (2012)
Broad-leaved forest
Coniferous forest
Discontinuous urban fabric
Land principally occupied by agriculture with significant areas of natural vegetation
Mixed forest
Moors and heathland
Natural grasslands
Pastures
Peat bogs
Sport and leisure facilities
Transitional woodland-shrub
Water bodies
0 1 2 km

Figure 7.5 CORINE Landcover Mapping (2012) of habitats along Grid Connection Options A, B, C, D and E

7.3 Environmental Review- Route A

Route A is the eastern-most route, which runs from the Gortyrahilly wind farm (in the south) to the Ballyvouskill substation in the northeast for approximately 20.4kms (See Figure 7.1). For the most part, the preferred UGC route runs along public roads, crossing the N22 at Ballyvourney and running along local public roads in a north-westerly then in a north-easterly direction. Route A exits the public road and crosses the Garrane River, travelling overland until it reaches a forestry track which it travels along for approximately 1.8km until reaching Ballyvouskill substation. The landscape through which Route A travels is upland at the western and eastern extents where commercial forestry and upland habitats dominate, the middle section runs through more lowland areas where agricultural activities are more intensive in nature with improved agricultural grassland becoming more common (See Figure 7.4 CORINE Landcover Map).
From a review of the drawings available (provided by Punch Consulting Engineers, Drawing ref.'s 201-164-001 to 005), there are 5 bridge crossings, 1 river crossing and 1 culvert crossing along this route. A further review of aerial imagery, mapviewers and the EPA National Rivers Dataset mapping layer have revealed a further seven potential stream crossings along Route A meriting further investigation and verification on the ground (See Figure 7.3). These are discussed in more detail below in Section 7.2.2.

7.3.1 Designated Sites- Route A

The designated sites within 15km of Route A are summarised in the below Table 7.1 and illustrated in Figure 7.2. The avoidance of potential significant impacts on European Designated Sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA) are key considerations informing route design. Route A adjoins and runs through the following EU Designated sites;

Mullaghanish to Musheramore Mountains SPA (code 04162): This site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest (SCI) for the Hen Harrier, an Annex I bird species. The conservation objective of this SPA is to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA-the hen harrier. The SPA comprises a substantial part of the Boggeragh/Derrynasaggart Mountains and traditionally supported an important Hen Harrier population of 5 pairs however since 2005 an 80% decline has been recorded with just 1 confirmed breeding pair recorded in 2015.
Over 50% or approximately 10km of Route A runs adjacent to or through this SPA however it is largely confined to public roads and forestry tracks with the exception of a small section near the Garrane stream crossing. Two alternative routes are proposed along Route A that run off road within or near the SPA.

- **Alternative Route A1** traverses over immature coniferous forestry plantation for c 816m, this habitat is outside of but adjacent to the SPA and holds potential value to the hen harrier as foraging and nesting habitat (confirmation of open canopy status of the plantation is needed to fully confirm its value).
- **Alternative Route A2** traverses overland for approximately 944m within the SPA on upland blanket bog, dry siliceous heath, wet heath and immature coniferous forestry plantation habitat. As these habitats are potential nesting and/or foraging habitats for the hen harrier, and form part of the SPA, Alternative Route 2A would have potential for impact on the qualifying interests of the SPA.

St. Gobnet's Wood SAC (code 0106) and pNHA (code 0106): St. Gobnet's Wood SAC includes St. Gobnet's Wood itself and an area of woodland to the north, called Cascade Wood. St. Gobnet's Wood is situated on the north-east side of a hill immediately south of Ballyvourney village in Co. Cork. Cascade Wood is situated immediately to the north of Ballyvourney. Together they form a relatively large but fragmented stand of woodland. The site supports old oak woodland (Annex 1 Code 91A0), as well as a small area of alluvial woodland alongside the Sullane River. The Cascade Wood part of the SAC is in close proximity to the cable route. Route A underground cable route runs within the third class road that splits Cascade Wood into east and west sections. Route A crosses the Sullane River at this point, appropriate crossing design, methodologies and environmental management

measures will be required to ensure the river and associated habitats (notably alluvial woodland) and species will not be affected.
Other than the aforementioned sites, there are no Natura 2000 sites present with a hydrological connection to the underground cable Route A within 15 km of any part of the site. The nearest Natura site with a hydrological connection is to the east, the Great Island Channel SAC (Site Code 004030) in Cork Harbour which is over 50km away. Further detail on the qualifying interests/special conservation interests and conservation objectives of the Natura 2000 sites within 15km can be found at https://www.npws.ie/protected-sites.

Table 7.1 List of EU and Nationally Designated sites within 15km of Route A.

Designated Site	Site Code	Distance (km)	Source-Pathway-Receptor Links
St Gobnets Wood SAC	**000106**	0	Yes- Route A runs within this SAC along public roads and is hydrologically connected.
The Gearagh SPA	**004109**	11.7	No, due to the distance and absence of hydrological or habitat connectivity.
Mullaghanish Bog SAC	**001890**	0.87	No, due to the absence of hydrological or habitat connectivity
Mullaghanish to Musheramore Mountains SPA	**004162**	0	Yes Route A runs within the SPA mainly within roads/tracks but some off-road sections within the SPA are proposed. Connectivity due to potential suitability of habitat in the proposed off-road sections to the hen harrier, of special conservation interest (SCI) for this SPA.
The Gearagh SAC	**000108**	11.1	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC	**000365**	3.8	No hydrological or habitat connectivity
Blackwater River (Cork/Waterford SAC)	**002170**	5.8	No hydrological or habitat connectivity
Old domestic building, Curraglass Wood SAC	**002041**	13.8	No, due to distance and the absence of hydrological or habitat connectivity
Silahertane Bog NHA	**001882**	4.8	No hydrological or habitat connectivity
Boggeragh Mountains NHA	**002447**	8.9	No, due to distance and the absence of hydrological or habitat connectivity
Prohus Wood pNHA	**001248**	8.4	No, due to distance and the absence of hydrological or habitat connectivity
Ballagh Bog pNHA	**001886**	9.9	No, due to distance and the absence of hydrological or habitat connectivity
Gouganebarra Lake pNHA	**001057**	10.6	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment pNHA	**000365**	3.8	No hydrological or habitat connectivity
Kilgarvan wood pNHA	**001787**	14.31	No, due to distance and the absence of hydrological or habitat connectivity
Lough Allua pNHA	**001065**	6.4	No, due to distance and the absence of hydrological or habitat connectivity
The Gearagh SPA	**004109**	11.7	No, due to distance and the absence of hydrological or habitat connectivity

The Gearagh NHA	**000108**	11.7	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House SAC	**000364**	13.6	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House pNHA	**000364**	13.6	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SPA	**004038**	3.8	No hydrological or habitat connectivity. There is a remote connection to the SPA special conservation interest (SCI), the Greenland White-fronted goose, if they occur along the grid route. Route A however is outside the species core foraging range (5-8km) (SNH, 2016) therefore potential significant impact to the SPA SCI is not likely.

7.3.2 Aquatic Ecology- Route A

The route of the UGC from Gortyrahilly to Ballyvouskill (Route A) is located in hydrometric area 19 Lee, Cork harbour and Youghal Bay and traverses two main river subcatchments, namely the Sullane River and Foherish River. Route A can be sub-divided into five sections according to the river it drains to, the first and most southerly section which runs along the Douglas (Sullane), a second section running along the main Sullane River running east as far as Ballyvourney, a third section travelling through the Bohill River catchment to the north east and finally at the eastern end of the route in the upper Foherish catchment through the Garrane (Lee) and Keel river sub basin districts (both tributaries of the Foherish river). From a review of the drawings available (provided by Punch Consulting Engineers, Drawing ref.'s 201-164-001 to 008) in total there are seven watercourse crossings along Route A, including five bridge crossings, one river crossing and one culvert crossing. A further review of available online mapping and the EPA National Rivers Dataset mapping layer have revealed a further seven potential stream crossings along Route A and its alternative routes (See Table 7.2 below and Figure 7.3). The locations of the watercourse crossings are indicated in Figure 7.3.

Table 7.2 Route A water course crossings and their catchments/rivers and their Water Framework Directive Water Quality Status Data for River Waterbodies 2013-2018 (EPA).

Site Name	Catchment/Stream	WFD Status
Bridge Crossing (BCA1)	Douglas (Sullane)	High
Bridge Crossing (BCA2)	Sullane	Good
River Crossing (RCA1)	Bohill	Good
Bridge Crossing (BCA3)	Bohill	Good
Bridge Crossing (BCA4)	Slievereagh (Bohill)	Good
Culvert Crossing (CCA1)	Tributary of Bohill	Good
Bridge Crossing (BCA5)	Labadermody (Bohill)	Good
Additional Stream Crossings (EPA National Rivers Dataset)		
Stream Crossing (SCA1)	Gortnascarty (Douglas/Sullane)	High
Stream crossing (SCA2)	Slievereagh (Bohill)	Good
Stream Crossing (SCA3)	Foherish Tributary	Good
Stream Crossing (SCA4)	Foherish Tributary	Good
Stream Crossing (SCA5)	**Gleann damh (Foherish)**	Good
Stream Crossing (SCA6)	**Garrane (Foherish)**	Good
Stream Crossing (SCA7)	**Glantane West (Keel/Foherish)**	Good

7.3.2.1 Conservation Species

Two Annex II aquatic species are present within the Sullane catchments, namely the Freshwater Pearl Mussel (*Margaritifera margaritifera*) and the Atlantic salmon (*Salmo salar*).

Freshwater pearl Mussel- Sullane River

The freshwater pearl mussel (*Margaritifera margaritifera*), which is protected under Irish and European legislation, is an Annex II species under the EU Habitats Directive. The species is extinct across much of its European range or represented there by very small and declining residual populations. The Irish populations are some of the most important in Europe and are largely protected by the designation of SACs in which the species is a listed conservation objective. A total of 19 designated populations exist around the country. In addition, several rivers that are not designated contain smaller populations of the species and these include the main channel of the Sullane and its tributaries the Foherish and the Laney. No mussels have been recorded in the Bohill River (RPS, 2014). An extensive survey of the species was undertaken on the Sullane, the Foherish and the Laney in 2007 (Moorkens, 2007) and this is the benchmark study of the species in that catchment. A more recent study (RPS, 2014) concentrating on a shorter stretch around Ballyvourney, confirmed that the population was stable in the intervening 7 years since the Moorkens study. The survey report would suggest that suitable pearl mussel habitat on the Sullane is fairly localised and that in many places a combination of filamentous algae, heavy macrophyte cover and silt are all contributing to reducing its suitability. The overall estimated numbers for the surveyed stretches came to 684 and the Moorkens (2007) report concluded that the total population for the main channel of the Sullane was unlikely to exceed 2,000. A number of crossings are proposed on the Sullane river channel itself and tributaries of the Sullane including the Douglas, the Foherish and Bohill rivers.

Route A crosses the main channel of the Sullane River at Ballyvourney Bridge (Bridge Crossing 2), this channel was surveyed by Moorkens in 2007 from just below the confluence of the Owengarve River to immediately upstream of the confluence of the Bohill Stream. Within those three sections only 5 mussels were recorded (in Section 5) where the density estimate was 10 mussels per 1 km.

There were no freshwater pearl mussel recorded in the Bohill River (RPS, 2014) where the majority of crossings along Route A occur, however the River Bohill is a tributary of the Sullane and a relatively high density of freshwater pearl mussel was recorded just downstream of the Bohill Stream confluence (Section 8) within the Sullane where an estimated 278 per km were recorded.

Freshwater pearl Mussel- Foherish River

Moorkens (2007) also surveyed six sections on the Foherish River from upstream of Carriganimmy Bridge to the confluence with the Sullane. The survey found no mussels in the two most upstream sections with the first mussel recorded in Section 3 at Clondrohid, where just one individual was observed and the per km density estimated at 2 individuals. A total of 82 mussels were estimated to have been present in the six sections surveyed and the report concluded that the Foherish population was unlikely to exceed 200 individuals overall. Again, as in the case of several points within the Sullane, the 2007 survey pointed to significant evidence of eutrophication on the Foherish which negatively impacts upon the survival and reproduction of *Margaritifera*.

Route A crosses five tributaries of the Foherish River- the Garrane stream, the Keel stream, Gleann damh, and two unnamed tributaries. The closest population of freshwater pearl mussel according to Moorkens study (2007) is located over 7-8km downstream of these crossings.

Conclusion- Freshwater pearl mussel

Both the Sullane and Foherish Rivers contain populations of the Annex II freshwater pearl mussel. The Route A bridge crossing at Ballyvourney bridge is also located on a stretch of the Sullane with known populations of freshwater pearl mussel albeit in low numbers. Specific pollution controls will be required here to ensure the fresh water pearl mussel are not impacted by works on the bridge or nearby road works when constructing the grid connection route. There were no freshwater pearl mussel recorded in the Bohill River (RPS, 2014) where the majority of crossings along Route A occur however a relatively high density of freshwater pearl mussel was recorded just downstream of the Bohill Stream confluence (Section 8) with the Sullane therefore works in and around watercourses will need to ensure adequate control measures are in place of sufficient standard to prevent any impact on the freshwater pearl mussel downstream of the confluence of the Bohill and Sullane rivers. Avoidance of instream works where possible and pollution control will be required at all stream, river and drainage ditch crossings, in particular where linked to the Sullane and Foherish Rivers due to the presence of freshwater pearl mussel populations. Detailed and potentially species-specific surveys will be required for aquatic fauna in order to inform specific mitigation measures (if required).

Atlantic Salmon

The Sullane River and its main tributaries the Foherish and Laney Rivers discharge into the upper Lee Reservoir (Carrigadrohid reservoir) downstream of Macroom. The presence of the Carrigadrohid and Iniscarra hydroelectric dams on the River Lee downstream, means that the Sullane and its tributaries have no natural migration run of the species, despite extensive areas of suitable habitat. A salmon restocking programme by the ESB releases thousands of juveniles into the catchment above Carrigadrohid annually and some juveniles have been recorded from time to time in the river during electrofishing surveys. An IFI survey (2014) recorded juvenile salmon in the Sullane, with 46 individuals recorded at Sullane Bridge upstream of Macroom in 2014 and it is possible that small numbers of salmon occur more widely within the system. However, the population is not believed to be self-sustaining, is currently below its conservation limits and no salmon angling is permitted within this part of the River Lee system.

The Sullane system has a healthy trout population with extensive areas of suitable habitat throughout the main channel and in the tributaries. The Sullane has only been surveyed once under the WFD monitoring programme (in 2014) at Sullane Bridge near Lissacresig approximately 6 km upstream of Macroom. The survey recorded 180 brown trout, 46 salmon, 5 minnow, 4 stickleback, and 4 stone loach.

Along the underground cable route the Bohill Stream contains habitat suitable for trout and they are likely to be common in these waters. In addition, a number of the smaller streams e.g. Garrane, Douglas and Keel are also likely to contain suitable habitat for trout and the species is also likely to be present in some of these.

7.3.3 Habitats- Route A

Route A is located primarily within the existing road and forestry track network with the exception of a small section in the east near the Garrane stream crossing and along the alternative routes (See Figure 7.4 CORINE Habitat Map). Roadside fringe habitats including hedgerows and grassland verges may be impacted at some locations. Direct permanent habitat removal may occur at or close to riparian habitats where the cable is routed through private lands off the public road, in order to cross streams and rivers. The indirect effects to semi natural habitats such as wetlands (bogs in particular) and riparian zones from drainage effects will also require consideration. Where the UGC route is located off-road, (in particular at river crossings), the sensitivity of ecological habitats in conjunction with other technical and environmental constraints will inform the locations of temporary works areas.

Key areas which will require off-road crossings on Route A are identified below:

- **Alternative Route A1-** is located at Carrigalissey less than 2km south west of Ballyvouskill substation. This route will traverse over semi mature conifer plantation which appears to have been planted atop blanket bog/wet heath habitat. This area is outside of but adjacent to the Mullaghanish to Mushermore SPA designated for hen harrier. Indirect impacts are likely to arise with the loss of habitat of potential value to the hen harrier in the form of immature open canopy plantation (if present) and future rotations of this habitat type. These habitats may be potentially used by foraging and breeding hen harriers from the SPA.
- **Alternative Route A2-** this off road section is located approximately 1km south west of Ballyvouskill Substation and is within the Mullaghanish to Musheramore SPA designated for the Annex I species- the Hen Harrier. From an examination of aerial imagery direct impacts are likely to arise to habitats including improved agricultural grassland, wet heath, dry heath, blanket bog and immature conifer plantation. The habitat along the Alternative Routes A2 (blanket bog, wet heath, immature conifer plantation) are potential foraging and/or nesting habitat for the hen harrier therefore loss of this habitat from construction of the underground grid connection route has the potential for a direct impact to the species of conservation interest for this SPA. Consideration should be given to relocating or avoiding this overland route to avoid the SPA and habitat of value to the hen harrier.

Consideration of recent planning case precedent here regarding the ABP refusal of the Upperchurch Wind Farm underground grid connection route in relation to the Slievefelim to Silvermines Mountains SPA for hen harriers.
Permission was refused by An Bord Pleanala in this instance due to the loss of suitable hen harrier foraging habitat and disturbance resulting from works to breeding and roosting hen harriers connected to the SPA. An Bord Pleanala gave the following reasoning in making its decision to refuse permission;

"Impacts to hen harrier will arise from a reduction or loss of suitable foraging habitat and disturbance resulting from works within and close to sensitive roosting and breeding areas for the hen harrier. There will be a net permanent loss of 3.14 hectares in the wider study area. The significance of this impact is considered to be moderate (negative). The Board is not satisfied that adequate mitigation measures have been set out in the Environmental Impact Assessment Report to address this issue and that adverse impacts will not occur. The efficacy of measures, such as concealed roads within the Special Protection Area to mitigate against habitat loss, may also be inadequate and, therefore, it cannot be ruled out beyond all scientific doubt that no adverse impacts to the integrity of the Special Protection Area will occur." ***(An Bord Pleanala, Order for Planning ABP Ref.PL92-301959, Upperchurch Wind Farm Underground Grid Connection.)***

The Upperchurch grid connection route is now awaiting a planning decision following a redesign and reapplication for planning (ABP Ref PL92 .306204). The redesign involved a relocation of the grid route from off road sections in and close to the SPA onto public roads and tracks reducing and/or avoiding habitat loss and disturbance to breeding and roosting hen harrier.

7.3.4 Birds- Route A

Route A is located primarily within the existing road network and forestry tracks therefore direct loss of habitat of value to birds is deemed to be low in these areas. Roadside fringe habitats including hedgerows, treelines and grassland verges may be impacted at some locations via direct loss from the development footprint or through temporary disturbance due to construction work activities. The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Species-specific surveys may be required in order to inform specific mitigation measures (if required) and timing of works outside of the breeding season can be employed to avoid impact.

7.3.4.1 Conservation Species

A number of birds of conservation interest occur in the receiving environment of Route A including Annex I Hen harrier and Merlin in upland habitats and the Annex I Kingfisher and red listed grey wagtail and dipper along the rivers. The Annex I White tailed sea eagle is also known to occur occasionally in the wider area e.g. Gouganebarra Lake and the Gearagh/Lee valley area as does the Peregrine falcon. Other birds which have been recorded in the 10km OSI grid squares (W17 and W28) include the BoCCI red listed red grouse and curlew and amber listed Kestrel and snipe and the Annex I whooper swan. Species specific surveys of proposed works areas will be required to fully confirm the abundance and distribution of bird species as well as to inform general bird and species specific mitigation measures if needed.

Hen Harrier

Hen harriers are known to occur in the study area in and around the Mullaghanish to Musheramore Mountains SPA. The national hen harrier survey in 2005 resulted in 5 confirmed breeding pairs, which represented over 3% of the national total. However since then the population has dropped to 1 confirmed pair in 2015, which represents a significant decline of 80%. The SPA site also supports a breeding population of Merlin (1-2 pairs), a further Annex I listed species which utilises similar habitats to that of the hen harrier.
The off-road sections on Route A which occur on the Alternative Routes have the most potential for disturbance to birds and include;

- **Alternative route A1** is located outside of but adjacent to the Mullaghanish to Musheramore Mountains SPA designated for the Annex I hen harrier. The core foraging range of Hen Harriers is 2km (SNH, 2016) however they will generally forage up to c. 5 km from the nest site (and foraging up to 9km has been recorded), utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Direct impacts are likely to arise with the

loss of habitat of potential value to the hen harrier in the form of immature open canopy conifer plantation (if present) and future rotations of this habitat type which may potentially be used by foraging and breeding hen harrier from the SPA. Immature forestry is of potential value to foraging and nesting hen harrier for the period of time it is in the open canopy stage albeit recent literature suggests that it may also act as an ecological trap for the species (Wilson et al., 2009). As this section is located within 2km of the SPA boundary it is potentially within the core foraging range of hen harriers from the SPA. It is also within 500m of the SPA boundary therefore there is potential for hen harrier nest sites within the SPA to be within 500m of the proposed Route A grid works. Hen harrier surveys will be required to establish the location of nest sites in relation to the location of Route A works, this will inform the route design and appropriate mitigation.

- **Alternative Route A2** This off-road section is within the Mullaghanish to Musheramore SPA designated for the Annex I species- the Hen Harrier. The habitat along the Alternative Routes A2 (blanket bog, wet & dry heath, immature conifer plantation) are potential foraging and/or nesting habitat for the hen harrier therefore loss of this habitat from construction of the underground grid connection route has the potential for a direct impact to the species of conservation interest for this SPA. Consideration should be given to relocating or avoiding this overland route to avoid the SPA and habitat of value to the hen harrier.

7.3.5 Other Fauna- Route A

7.3.5.1 Conservation Species- mammals

Protected species requiring particular consideration in relation to the underground grid connection include:

- Otter - listed on Annex II of the E.U. Habitats Directive; and
- Bat species – Listed on Annex IV of the E.U. Habitats Directive.

Disturbance impacts potentially affecting otter during construction include direct impacts to breeding/resting sites (if present) and indirect impacts due to visual and noise disturbance. This could result in the loss of resting, foraging or breeding sites, and potentially a temporary decline in extent of the range of this species. Bat roosts (within bridges/mature trees) have the potential to be impacted during river crossing construction works.
Otter and bat breeding sites will require consideration in the vicinity of river crossings to minimise potential disturbance effects, in particular during construction.
Mammals including Pine Marten, Red Squirrel and Badger are dispersed throughout the study area and may require mitigation consideration for potential disturbance effects.

Bats

Bats are expected to be widespread throughout the cable route corridor, especially in the low-lying section along Route A in areas where hedgerows and woodland are frequent. Buildings, stone bridges and mature trees provide potential roosts for bats. Cascade Wood (north of Ballyvourney) is known to be frequented by at least seven species of bat: Soprano and Common Pipistrelle, Brown Long-eared, Leisler's, Daubenton's, Natterer's and Whiskered/Brandt's bat. The local area around Ballyvourney and Cascade woods was systematically searched for lesser horseshoe bat roosts in 1999, 2000 and 2002 by the Vincent Wildlife Trust (Kelleher 1999, 2000, 2002) and 44 lesser horseshoe bat roosts of varying significance were found in the surrounding area (NPWS, National Lesser Horseshoe Bat Roost Database). Some of these are important breeding sites and the most important breeding sites in the wider area have been designated as candidate SACs as follows: Kilgarvan Ice House (0364), Old Domestic Building, Curraglass Wood (no. 2041) and Glanlough Woods (023.

Kerry Slug

The Kerry Slug (Annex II listed species) is known to be resident in the general area, including St. Gobnet's Wood cSAC. The potential impact on this species is considered low for the most part due to the location of Route A largely on public roads and forestry tracks including near St Gobnet's Wood SAC. The preferred habitat of the Kerry slug includes deciduous woodland, blanket bog or unimproved oligotrophic open moor and lake shores (McDonnell & Gormley 2011). However, the species has also been recently discovered on both granite outcrops within blanket bog and from a Conifer plantation in County Galway (Kearney 2010). Further records of the species from Conifer Plantations suggest that this may also be a suitable habitat for the species (McDonnell et al. 2013). A possible explanation put forward to explain the recent discovery of the species in County Galway is an inadvertent introduction (during forestry operations) (McDonnell et al. 2013). However this has not yet been determined (Reich et al. 2012).
Alternative Route A2 which is located off road may have some potential for Kerry slug presence as it traverses blanket bog/wet heath habitat. Specific surveys for the Kerry slug may need to be considered at this location if they are to be progressed.

7.4 Environmental Review- Route B

As illustrated in Figure 7.1, Route B travels north from the proposed Inchamore wind farm site (in the west) along a Coillte forestry track before reaching the N22 which it travels along for approximately 620m before turning onto a local road. Route B then travels south east along a short section of local road which comes to an end and from here the cable route progresses overland under the 110kV overhead line. The off road habitat over which Route B travels is composed of scrub and a narrow strip of blanket bog surrounded by mature forestry which has been left unplanted to allow for the overhead electrical line. Route B then joins a short section of Coillte forestry track travelling southeast until it meets the N22 which it crosses to join a narrow single carriage local road with mature trees and hedgerow on either site. Route B travels along this local road continuing in a southeasterly direction to join route A in Baile Bhuirne before travelling north east to the Ballyvouskill substation along the same line as Route A. An alternative route along Route B is located south west of Ballyvourney (Alternative Route B1), this route is off road and crosses the River Sullane to join with Route A upstream of Ballyvourney. From an examination of aerial imagery Alternative Route B1 traverses over habitats including scrub, wet grassland, improved agricultural grassland, blanket bog/wet heath, riparian habitat, hedgerows/treelines and eroding upland stream. This land is not located in an environmentally designated site (See Figure 7.4 CORINE Landcover Map).
From a review of the drawings available (provided by Punch Consulting Engineers, Drawing ref.'s 201-164-001 to 008) there are 2 culvert crossings and two bridge crossings along Route B (not including those crossings in common with Route A). Culvert 1 crosses the Ford Curmeenavrick stream a tributary of the River Flesk, Culvert 2 crosses over an unnamed tributary of the Sullane River. Bridge crossing 1 crosses an unnamed tributary of the Aughboy River, itself a tributary of the Sullane. Bridge crossing 2 runs over the Owengarve River, also a tributary of the Sullane River. A further review of available mapping and the EPA National Rivers Dataset mapping layer have revealed a further five potential stream crossings along Route B meriting further investigation and verification on the ground (See Figure 7.3). These are discussed in more detail below in Section 7.3.2.

7.4.1 Designated Sites- Route B

The designated sites within 15km of Route B are summarised in the below Table 7.3 and illustrated in Figure 7.2. Route B does not run through or adjacent to any designated sites apart from the sections in common with Route A (St. Gobnets Wood SAC and Mullaghanish to Musheramore Mountains SPA) which have already been discussed in Section 7.2.1. At the northern end, near the proposed Inchamore Wind farm, Route B is within 293m of Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC and pNHA (site code 000365) and is hydrologically linked to the SAC via a tributary of the River Flesk named the Ford Currimeenavrick stream which runs under the N22 along which the grid route travels.

Table 7.3 List of EU and Nationally Designated sites within 15km of Route B.

Designated Site	Site Code	Distance (km)	Source-Pathway-Receptor Links
St Gobnets Wood SAC	000106	0	Yes- Route B runs within this SAC along public roads after joining with Route A and is hydrologically connected.
The Gearagh SPA	004109	11.7	No, due to the distance and absence of hydrological or habitat connectivity.
Mullaghanish Bog SAC	001890	0.87	No, due to the absence of hydrological or habitat connectivity
Mullaghanish to Musheramore Mountains SPA	004162	0	Yes Route B runs within the SPA (in section in common with Route A) mainly within roads/tracks but some off-road sections within the SPA are proposed. Connectivity due to potential suitability of habitat in the proposed off-road sections to the hen harrier, of special conservation interest (SCI) for this SPA.
The Gearagh SAC	000108	11.1	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC	000365	0.26	Yes hydrological connectivity via the Ford Curmeenavrick stream a tributary of the River Flesk.
Blackwater River (Cork/Waterford SAC)	002170	5.8	No hydrological or habitat connectivity
Old domestic building, Curraglass Wood SAC	002041	9.0	No, due to distance and the absence of hydrological or habitat connectivity
Silahertane Bog NHA	001882	6.9	No hydrological or habitat connectivity
Boggeragh Mountains NHA	002447	8.9	No, due to distance and the absence of hydrological or habitat connectivity
Prohus Wood pNHA	001248	8.1	No, due to distance and the absence of hydrological or habitat connectivity
Ballagh Bog pNHA	001886	12.74	No, due to distance and the absence of hydrological or habitat connectivity
Gouganebarra Lake pNHA	001057	13.26	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment pNHA	000365	0.26	Yes hydrological connectivity via the Ford Curmeenavrick stream a tributary of the River Flesk.
Kilgarvan wood pNHA	001787	12.2	No, due to distance and the absence of hydrological or habitat connectivity
Lough Allua pNHA	001065	12.4	No, due to distance and the absence of hydrological or habitat connectivity
The Gearagh SPA	004109	11.7	No, due to distance and the absence of hydrological or habitat connectivity
The Gearagh NHA	000108	11.7	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House SAC	000364	13.6	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House pNHA	000364	10.9	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SPA	004038	0.26	Yes hydrological connectivity. There is a remote connection to the SPA special conservation interest (SCI), the Greenland White-fronted goose, if they occur along the grid route.

Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC

This very large site extends from southwest of Millstreet to west of Killarney and supports a high diversity of Annex I habitats and Annex II species. The SAC has been selected for the following Annex I habitats and Annex II species which are the SAC Qualifying Interests:

- Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110]
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130]
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- Northern Atlantic wet heaths with *Erica tetralix* [4010]
- European dry heaths [4030] • Alpine and Boreal heaths [4060]
- *Juniperus communis* formations on heaths or calcareous grasslands [5130]
- Calaminarian grasslands of the *Violetalia calaminariae* [6130]
- Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]
- Blanket bogs (* if active bog) [7130]
- Depressions on peat substrates of the *Rhynchosporion* [7150]
- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]
- *Taxus baccata* woods of the British Isles [91J0]
- *Geomalacus maculosus* (Kerry Slug) [1024]
- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]
- *Euphydryas aurinia* (Marsh Fritillary) [1065]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303]
- *Lutra lutra* (Otter) [1355]
- *Trichomanes speciosum* (Killarney Fern) [1421]
- *Najas flexilis* (Slender Naiad) [1833]
- *Alosa fallax killarnensis* (Killarney Shad) [5046]

The general conservation objective for the site is to maintain or restore the favourable conservation condition of the Annex 1 habitats and Annex II species for which the SAC has been selected. *NPWS (2015) Conservation objectives for Killarney Park, Macgillicuddy Reeks and Caragh River Catchment SAC [00365]. Generic Version 4.0. Department of Arts, Heritage and the Gaeltacht.*

Route B is not located within Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC however at its closest it is approximately 260m from the SAC boundary and is hydrologically linked via a tributary named Ford Currimeenavrick, of the River Flesk. A culvert crossing and a number of potential stream crossings are proposed over this tributary therefore potential impacts and likely significant effects could include the following:

- Temporary significant pollution risk (negative impact) to protected aquatic species. This risk is related to the potential for increased suspended solids arising from construction works and storage/removal/reinstatement of disturbed soil and/or the release of construction related pollutants. Any impact could result in adverse effects to qualifying Annex II species such as salmon, lamprey and to fresh water pearl mussel. These impacts are further considered below under the aquatic ecology section.
- Disturbance risk to Otter including the potential loss of resting or breeding sites (if present).
- Ongoing risk of pollution and disturbance during operation if faults arise and further excavation works are required.

Such effects may have implications for the conservation status of qualifying habitats/species and the overall integrity of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC depending on the scale of works and methodologies involved. Specific mitigation and consideration of the design will be required to avoid such impacts.

7.4.2 Aquatic Ecology- Route B

Route B is located in two hydrometric areas, the Lee, Cork harbour and Youghal Bay (Ref. 19) to the south and the Laune-Maine-Dingle Bay (Ref. 22) to the north with the majority of the grid route located in the former hydrometric area. Three main river subcatchments, are traversed by Route B, namely the River Flesk, the Sullane River and the Foherish River subcatchments. From a review of the drawings available (provided by Punch Consulting Engineers, Drawing ref.'s 201-164-001 to 008) there are four watercourse crossings along Route B from Inchamore site to Ballyvourney including two bridge as illustrated in Figure 7.3 and Table 7.4. A further review of available mapping and the EPA National Rivers Dataset mapping layer have revealed a further five potential stream crossings along Route B (see Figure 7.3 and Table 7.4 below) meriting further investigation and verification on the ground. Stream crossing SCC1 on Route C is included as it is common to both Route B and C. Route A and Route B merge from Ballyvourney to Ballyvouskill after which additional stream crossings take place, these have already been discussed in Section 7.2.2.

Table 7.4 Route B water course crossings and their catchments/rivers and the Water Framework Directive Water Quality Status Data for River Waterbodies 2013-2018 (EPA).

Site Name	Catchment/Stream	WFD Status
Culvert Crossing 1(CCC1)	Ford Currimeenavrick (Flesk)	High
Culvert Crossing 2 (CCB2)	Tributary of Sullane	Good
Bridge Crossing 1 (BCB1)	Tributary of the Aughboy (Sullane)	Good
Bridge Crossing 2 (BCB2)	Owengarve (Sullane)	Good
Additional Stream Crossings (EPA National Rivers Dataset)		
Stream Crossing (SCC1)	Ford Currimeenavrick (Flesk)	High
Stream crossing (SCB1)	Ford Currimeenavrick (Flesk)	High
Stream Crossing (SCB2)	Ford Currimeenavrick (Flesk)	High
Stream Crossing (SCB3)	Ford Currimeenavrick (Flesk)	High
River Crossing (SCB4)	Sullane River	Good
Stream Crossing (SCB5)	Murnaghbeg (Sullane)	Good

7.4.2.1 Conservation Species

A number of EU Habitats Directive Annex II aquatic species are present downstream of Route B within all three subcatchments (Flesk, Sullane, Foherish). The Flesk Catchment is hydrologically linked to and forms part of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC a site which is valuable for its rare fish species, five of which are listed on Annex II of the E.U. Habitats Directive: Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Sea Lamprey (*Petromyzon marinus*), Atlantic Salmon (*Salmo salar*) and Killarney Shad (*Alosa fallax killarnensis*). The Killarney Shad is a unique land-locked subspecies confined to the Killarney lakes. Annex II aquatic species the Freshwater Pearl Mussel (*Margaritifera margaritifera*) has also been recorded within the Flesk catchment.
Species of conservation interest in the Sullane and Foherish subcatchments include the Annex II Atlantic Salmon and Freshwater Pearl Mussel. These are discussed further below, sections where Route A and B overlap (from Ballyvourney to Ballyvouskill) have already been discussed in Section 7.2.2.

Freshwater Pearl Mussel- River Flesk
The whole of the subcatchment is an extensive area for Freshwater Pearl Mussel and is categorised under the Margaritifera Sensitive Areas in the orange zone or within a "Catchment of other extant populations". The closest SAC population of Freshwater Pearl Mussel is the Caragh, Currane and

Gearhameen freshwater pearl mussel populations, which are listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Statutory Instrument No. 296 of 2009). There is no hydrological linkage between the works area and these populations. No freshwater pearl records are present from a review of the NBDC records for the 2km square W18F where Route B drains to Ford Currimeenavrick stream a tributary of the River Flesk however they have been recorded further downstream in the Flesk catchment within the greater 10km square (W18, NBDC record).

Freshwater Pearl Mussel- Sullane River

A Freshwater Pearl Mussel survey of Sullane River by Moorkens (2007) found Freshwater Pearl mussel to be present and concluded that the total population for the main channel of the Sullane was unlikely to exceed 2,000. In the Moorkens (2007) study the highest density within the 15 study sections of the Sullane River was noted (i.e. 300 mussels per 1 km) about 1.2 km downstream of Coolea. An Alternative Section of the grid connection along Route B (Alternative Route B1) is proposed to cross the River Sullane near this stretch of river where the highest density of Freshwater Pearl Mussel was recorded.

The Alternative Route B1 water course crossing of the Sullane River at this location could present a significant negative impact through potential loss of the local Freshwater Pearl Mussel population and their habitats if present at the water crossing and if instream works are proposed. A short-term, significant negative pollution risk to the freshwater pearl mussel has the potential to occur to Freshwater Pearl Mussel populations in the immediate vicinity of the excavation works as well as to populations further downstream. There is also an ongoing risk of pollution and disturbance during operation if faults arise and further excavation works are required at this water crossing. The magnitude of the impact will vary depending on the methodology of crossing involved, consideration should be given to relocating this water crossing if practicable, if the crossing is required instream works should be avoided at this location, other methods such as bridge crossing and directional drilling will avoid instream works however siltation risk is still present due to stream bank works and the risk of bentonite release from the latter. Species specific surveys should be carried out to in advance of works avoid freshwater pearl mussels and their habitats. Construction methodologies employed should include mitigation measures to ensure the Freshwater Pearl Mussel is not impacted negatively by the works.

Atlantic Salmon- River Flesk Subcatchment

There are no records for Salmon (*Salmo salar*) in the 2km grid square where Route B drains to Ford Currimeenavrick stream however downstream the River Flesk is known to support salmon and these form part of the qualifying interests of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC. IFI note that the Flesk is a spring salmon fishery. The River Flesk was sampled for the WFD monitoring programme (in 2008) Salmon were the most abundant species present, followed by eels and brown trout. Appropriate mitigation and species specific surveys will be required to avoid potential impacts on these species and their habitats.

Atlantic Salmon- River Sullane & Foherish Subcatchments

Atlantic salmon are known to occur in the River Sullane and Foherish River and are discussed in Section 1.2. Appropriate mitigation is required particularly at stream crossings to avoid impact.

7.4.3 Habitats- Route B

Route B running from Inchamore to Ballyvourney is approximately 13.85km long and is located primarily within the existing road network and Coillte forestry tracks with small sections located off-road. The habitats surrounding Route B are dominated by large swathes of coniferous forestry plantations of different age classes many of which have been planted on blanket bog (See Figure 4.0). Upland habitats occur at either end of the grid route near Inchamore and Ballyvouskill and include upland blanket bog, wet heath, dry siliceous heat, wet grassland and exposed rock. The mid-section of Route B is located in more lowland areas and as a result the presence of habitats such as improved agricultural grassland and deciduous forest increase although blanket bog, wet heath and wet grassland are still common. While the majority of Route B is located within roads and tracks, roadside fringe habitats including hedgerows and grassland verges may be impacted at some locations. Direct

permanent habitat removal may occur at or close to riparian habitats in order to cross streams and rivers. The indirect effects to wetlands (bogs in particular) from drainage effects will also require consideration. Where the Route B is located off-road, (in particular at river crossings), the sensitivity of ecological habitats in conjunction with other technical and environmental constraints will inform the locations of temporary works areas. Key areas which will require off-road crossings on Route B are identified below:

- A section of the route north east of Inchamore is located on a strip of blanket bog/wet heath, scrub and wet grassland surrounded on both sides by mature coniferous plantation. This strip has been left unplanted as the 110kv overhead line runs along here. This off road section is approximately 1.3km long.

- **Alternative Route B1-** this off road section is approximately 558m long and is located southeast of Inchamore proposed wind farm site and upstream of Ballyvourney and will include a crossing of the Sullane River. From an examination of aerial imagery habitats include scrub, wet grassland, improved agricultural grassland, blanket bog/wet heath, riparian habitat, hedgerows/treelines and eroding upland stream. The crossing point of the Sullane River appears to lie on riparian/deciduous woodland and therefore may support ecologically sensitive habitat or species such as the Kerry Slug.

For the off-road sections of Route B direct impacts are likely to arise resulting in loss of habitats including scrub, wet grassland, improved agricultural grassland, blanket bog/wet heath, riparian habitat, hedgerows/treelines and eroding upland stream. These impacts are likely to be permanent to allow maintenance of a clearway to facilitate cable maintenance and fault repair. There is also an ongoing risk of pollution and disturbance during operation if faults arise and further excavation works are required.
Habitat surveys will be required particularly in upland habitats and riparian zones to establish whether these off-road areas support any EU Habitat Directive Annex I habitats such as Annex I Priority habitat, Active Blanket Bog (7130) or Annex I Northern Atlantic Wet Heath with *Erica tetralix* (4010) or Annex I European Dry Heaths (4030).

7.4.4 Birds- Route B

Route B is located primarily within the existing road network and forestry tracks therefore direct loss of habitat of value to birds is deemed to be low in these areas. Roadside fringe habitats including hedgerows, treelines and grassland verges may be impacted at some locations via direct loss from the development footprint or through temporary disturbance due to construction work activities. The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Route B off road sections are located on habitat such as blanket bog, wet heath and wet grassland which are of potential value as nesting and foraging habitat to upland bird species many of which are species of conservation interest e.g. Annex I Merlin and Hen harrier. Riparian zones and wetland habitat at watercourse crossings also have potential for species of conservation interest such the Birds Directive Annex I listed Kingfisher, the red listed grey wagtail (BoCCI, 2013) and other aquatic birds such as the dipper and heron. Species-specific surveys may be required in order to inform specific mitigation measures (if required) at stream crossings and off road sections. The timing of works such as vegetation clearance outside of the bird breeding season can be employed to avoid impact where necessary.

7.4.5 Other Fauna- Route B

7.4.5.1 Conservation Species- mammals

Protected species requiring particular consideration in relation to the underground grid connection include:

- Otter - listed on Annex II of the E.U. Habitats Directive; and

- Bat species – Listed on Annex IV of the E.U. Habitats Directive.

Disturbance impacts potentially affecting otter during construction include direct impacts to breeding/resting sites (if present) and indirect impacts due to visual and noise disturbance. This could result in the loss of resting, foraging or breeding sites, and potentially a temporary decline in extent of the range of this species. Bat roosts (within bridges/mature trees) have the potential to be impacted during river crossing construction works.
Otter and bat breeding sites will require consideration in the vicinity of river crossings to minimise potential disturbance effects, in particular during construction.
Mammals including Pine Marten, Red Squirrel and Badger are dispersed throughout the study area and may require mitigation consideration for potential disturbance effects.

Bats

Seven bat species records exist for the area around Route B according to the NBDC records (10km grid squares, W17 & W18).

- Pipistrelle (Pipistrellus pipistrellus sensu lato)
- Nathusius's Pipistrelle (Pipistrellus nathusii)
- Lesser Noctule (Nyctalus leisleri)
- Lesser Horseshoe Bat (Rhinolophus hipposideros)
- Daubenton's Bat (Myotis daubentonii)
- Brown Long-eared Bat (Plecotus auritus)
- Soprano Pipistrelle (Pipistrellus pygmaeus)

St Gobnets Wood SAC through which Route B travels is also known to support at least seven species of bat including Soprano and Common Pipistrelle, Brown Long-eared, Leisler's, Daubenton's, Natterer's and Whiskered/Brandt's bat. Bats are expected to be widespread throughout the cable route corridor, especially in the low-lying areas where hedgerows and woodland are frequent. Buildings, stone bridges and mature trees provide potential roosts for bats. Bat surveys will be required at suitable habitat along Route B to establish the locations of roosts, should bats be found, an application for a derogation licence to legally allow works on or near a bat roost, which is a notifiable action under current legislation, will be made to National Parks and Wildlife Service.

Kerry Slug

The Kerry Slug (Annex II listed species) is known to be resident in the general area, including St. Gobnet's Wood cSAC. The potential impact on this species is considered low for the most part due to the location of Route B largely on public roads and forestry tracks including near St Gobnet's Wood SAC. The preferred habitat of the Kerry slug includes deciduous woodland, blanket bog or unimproved oligotrophic open moor and lake shores (McDonnell & Gormley 2011). The off road sections along Route B which may have some potential for Kerry slug presence include the section on blanket bog/wet heath habitat under the 110kv overhead line and the Alternative Route B1 which also traverses blanket bog/wet heath habitat. Specific surveys for the Kerry slug may need to be considered at these locations if they are to be progressed.

7.5 Environmental Review- Route C

Route C initially follows the same route as Route B and travels north from the proposed Inchamore wind farm along a forestry track for approximately 3.4km before reaching the N22 which it travels along for approximately 620m. Route C then turns off the N22 and travels south east along a short section of local road at which point Route C and Route B diverge as Route C turns onto a forestry track. Route C travels in a north-easterly direction along the forestry track along the northern slopes of the Derrynsaggart Mountains for approximately 13.6km running through Clydaghhroe proposed wind farm site. East of Cummeennabuddoge (CMBG) wind farm Route C leaves the forestry track and travels overland until it reaches Ballyvouskill substation. There are five proposed alternative routes

along the forestry section of Route C labelled Alternative Route C1, Alternative Route C2, Alternative Route C3, Alternative Route C4 and Alternative Route C5 for reference (See Figure 7.1 Site Layout).

- **Alternative Route C1**- this section leaves the forestry track and travels approximately 344m to join up with the forestry track once again. The proposed route is located on conifer plantation planted atop blanket bog and passes over a tributary of the Clydagh River itself a tributary of the River Flesk.
- **Alternative Route C2-** this section leaves the forestry track and travels approximately 345m to join up with the forestry track once again. The proposed route is located on conifer plantation planted on blanket bog and crosses over two tributaries of the Clydagh River (Flesk).
- **Alternative Route C3-** this section leaves the forestry track and travels approximately 419m to join up with the forestry track once again. The proposed route is located on mature conifer plantation planted on blanket bog and crosses over a tributary of the Clydagh River (Flesk).
- **Alternative Route C4**- this section leaves the forestry track and travels approximately 613m to join up with the forestry track once again. The proposed route is located on mature conifer plantation planted on blanket bog, from an examination of available mapping there are no water crossings associated with this route.
- **Alternative Route C5-** this section leaves Route C along its off-road section and travels approximately 640m on the Curragh Wind Farm site access road before travelling off-road to Ballyvouskill wind farm. From an examination of available mapping there are no watercourse crossings associated with this route.

From an examination of aerial imagery and CROINE Landcover mapping the landscape surrounding Route C is largely composed of established upland conifer forestry plantation interspersed with smaller areas of blanket bog, wet heat, wet grassland and improved agricultural grassland (See Figure 7.4). Landuse is primarily commercial forestry throughout Route C with sheep farming and to a lesser extent cattle farming concentrated at the eastern end of the route. Route C does not run through an environmentally designated site but it is hydrologically connected to and travels within 25m of Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC and travels outside of but within 82m of the Mullaghanish to Musheramore Mountains SPA. From an examination of available mapping and the EPA National Rivers Dataset there appear to be 12 minor stream crossings along Route C from when it leaves the local road west of Inchamore site and runs along a forestry track and overland to Ballyvouskill substation site. With the exception of one, all of these watercourse crossings are tributaries of the River Clydagh, itself a tributary of the River Flesk and are within the Flesk subcatchment. Just one watercourse crossing is within the Foherish subcatchment, this is a tributary of the Foherish River which joins with the Sullane River further downstream.

7.5.1 Designated Sites- Route C

The designated sites within 15km of Route C are summarised in the below Table 7.5 and illustrated in Figure 7.2. Route C does not run through or adjacent to any designated sites however it does run close to and/or is hydrologically linked to the following;

- **Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC and pNHA (site code 000365)-** Route C travels within 25m of the SAC and is hydrologically linked via tributaries of the River Clydagh which is itself a tributary of the River Flesk, a river that forms part of the SAC. The qualifying interests of the SAC have been listed in Section 1.3.1. Potential impacts and likely significant effects could include the following:
    - Temporary significant pollution risk (negative impact) to protected aquatic species and aquatic habitats. This risk is related to the potential for increased suspended solids arising from construction works and storage/removal/reinstatement of disturbed soil and/or the release of construction related pollutants. Potential

impacts could result in adverse effects to the following qualifying Annex II species; Atlantic salmon, lamprey (Sea, brook and River lamprey) and to the fresh water pearl mussel. Qualifying Annex I habitats that could be potentially impacted include; Oligotrophic Waters containing very few minerals [3110],
Oligotrophic to Mesotrophic Standing Waters [3130], Floating River Vegetation [3260]
  - These impacts are further considered below under the aquatic ecology section.
  - Disturbance risk to the Annex IV species the Otter also a qualifying feature of the SAC including the potential loss of resting or breeding sites (if present).
  - Ongoing risk of pollution and disturbance during operation if faults arise and further excavation works are required.

Such effects may have implications for the conservation status of qualifying habitats/species and the overall integrity of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC depending on the scale of works and methodologies involved. Specific mitigation and consideration of the design will be required to avoid such impacts.

- **Mullaghanish to Musheramore Mountains SPA-** Route C travels within 82m of the SPA, therefore there is a potential for impact on breeding hen harriers within the SPA from construction activity disturbance during the breeding season if nesting is present within 500m of the construction works. There is also potential for impact on foraging hen harriers. While works areas are not located within the SPA there are off-road sections of grid Route C proposed which are located on habitat of potential value to foraging hen harriers (e.g. blanket bog, wet heath, wet grassland, open canopy forestry). If works proceed in these off-road sections they will result in the permanent loss of habitat within the foraging range of SPA hen harriers. Hen harrier can forage core foraging range is 2km (although they have been known to forage up to 9-10km) (SNH, 2016) therefore if developed could have potential for impact on the SCI of this SPA. Note Planning precedent from Upper church grid connection (ABP Ref. 301959-18) where ex-situ impacts on foraging hen harriers from the SPA were cited as a reason for refusal by ABP.

Table 7.5 List of EU and Nationally Designated sites within 15km of Route C.

Designated Site	Site Code	Distance (km)	Source-Pathway-Receptor Links
St Gobnets Wood SAC	**000106**	5.48	No, due to the distance and absence of Hydrological or habitat connectivity.
The Gearagh SPA	**004109**	12.15	No, due to the distance and absence of hydrological or habitat connectivity.
Mullaghanish Bog SAC	**001890**	0.670	No, due to the absence of hydrological or habitat connectivity
Mullaghanish to Musheramore Mountains SPA	**004162**	0.082	Yes due to potential suitability of habitat in the proposed works area (off road sections) for the SCI, the hen harrier, of this SPA.
The Gearagh SAC	**000108**	14.0	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC	**000365**	0.025	Yes due to hydrological connectivity
Blackwater River (Cork/Waterford SAC)	**002170**	4.2	No, due to the absence of hydrological or habitat connectivity

Old domestic building, Curraglass Wood SAC	**002041**	8.9	No, due to distance and the absence of hydrological or habitat connectivity
Silahertane Bog NHA	**001882**	6.8	No, due to distance and the absence of hydrological or habitat connectivity
Boggeragh Mountains NHA	**002447**	9.2	No, due to distance and the absence of hydrological or habitat connectivity
Prohus Wood NHA	**001248**	10.10	No, due to distance and the absence of hydrological or habitat connectivity
Ballagh Bog pNHA	**001886**	12.32	No, due to distance and the absence of hydrological or habitat connectivity
Gouganebarra Lake pNHA	**001057**	13.60	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment pNHA	**000365**	0.245	Yes due to hydrological connectivity
Kilgarvan wood pNHA	**001787**	12.3	No, due to distance and the absence of hydrological or habitat connectivity
Lough Allua pNHA	**001065**	12.32	No, due to distance and the absence of hydrological or habitat connectivity
The Gearagh SPA	**004109**	14.0	No, due to distance and the absence of hydrological or habitat connectivity
The Gearagh NHA	**000108**	14.0	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House SAC	**000364**	11.31	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House pNHA	**000364**	11.31	No, due to distance and the absence of hydrological or habitat connectivity
Doo Loughs pNHA	**000350**	10.50	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SPA	**004038**	14.91	Indirect connectivity through loss of peatland habitats in off-road sections of the grid route, which is potential foraging habitat for the SPA SCI, the Greenland White-fronted geese. This habitat loss however is outside the species foraging range (5-8km) (SNH, 2016) therefore potential significant impact to the SPA SCI is not likely.

7.5.2 Aquatic Ecology- Route C

Route C is largely located in the Laune-Maine-Dingle Bay Hydrometric Area (Ref. 22) with a small section located in the Lee, Cork harbour and Youghal Bay Hydrometric Area (Ref. 19) at the eastern most end of the route near Ballyvouskill Substation. Two main river subcatchments, are traversed by Route C, namely the River Flesk and the Foherish River subcatchments. In total there are 13 watercourse crossings along Route C including that which is common to Route B and C. The locations of the watercourse crossings are indicated in the below Table 7.6 and Figure 7.3. The watercourse crossing of the Ford Currimeenavrick stream which is common to both Route C and Route B is located just north of the Inchamore windfarm site has already been discussed in Section 1.3.

Table 7.6 Route C water course crossings and their catchments/rivers and the Water Framework Directive Water Quality Status Data for River Waterbodies 2013-2018 (EPA), see also Figure 7.3.

Site Name	Catchment/Stream	WFD Status
Culvert Crossing (CCC1)	Ford Currimeenavrick Tributary of the Flesk	High

Stream Crossing (SCC1)	Tributary of Clydagh (Flesk)	Good
Stream Crossing (SCC2)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC3)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC4)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC5)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC6)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC7)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC8)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC9)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC10)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC11)	Tributary of Clydagh (Flesk)	Good
Crossing (SCC12)	Tributary of Foherish (Sullane)	Good

7.5.2.1 Conservation Species

A number of EU Habitats Directive Annex II aquatic species are present downstream of Route C in both the Flesk and Foherish (Sullane) subcatchments. The Flesk Catchment is hydrologically linked to and forms part of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC a site which is valuable for its rare fish species, five of which are listed on Annex II of the E.U. Habitats Directive and of relevance include: Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Sea Lamprey (*Petromyzon marinus*), Atlantic Salmon (*Salmo salar*) and Killarney Shad (*Alosa fallax killarnensis*). The Killarney Shad is a unique land-locked subspecies confined to the Killarney lakes. Annex II aquatic species the Freshwater Pearl Mussel (*Margaritifera margaritifera*) has also been recorded within the Flesk catchment.
Species of conservation interest recorded in the Sullane and Foherish subcatchments include the Annex II Atlantic Salmon and Freshwater Pearl Mussel. These have already been discussed in the previous Section 1.3 where Route B and C overlap (from Inchamore wind farm site to the local road east of the N22).

<u>Freshwater Pearl Mussel- River Flesk</u>
The whole of the subcatchment within which Route C is located is an extensive area for Freshwater Pearl Mussel and is categorised under the Margaritifera Sensitive Areas in the orange zone or within a "Catchment of other extant populations". The closest SAC populations of Freshwater Pearl Mussel is the Caragh, Currane and Gearhameen freshwater pearl mussel populations, which are listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Statutory Instrument No. 296 of 2009). There is no hydrological linkage between the works area and these populations. However freshwater Pearl Mussel records do exist for the Flesk River into which the majority of Route C drains, therefore appropriate mitigation and survey techniques are required to ensure these populations are protected during any construction works along the Route C that drain to the River Flesk.
No freshwater pearl records are present from a review of the NBDC records for the 2km square W18F where Route B drains to Ford Currimeenavrick stream a tributary of the River Flesk however they have been recorded further downstream in the Flesk catchment within the greater 10km square (W18, NBDC record) .

<u>Atlantic Salmon- River Flesk Subcatchment</u>
The River Flesk and its tributaries are known to support populations of salmonids including Atlantic Salmon which form part of the qualifying interests of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC. IFI note that the Flesk is a spring salmon fishery. The River Flesk was sampled for the WFD monitoring programme (in 2008) Salmon were the most abundant species present, followed by eels and brown trout. Appropriate mitigation and species specific surveys will be required to avoid potential impacts on these species.

Atlantic Salmon- River Sullane & Foherish Subcatchments
Atlantic salmon are known to occur in the River Sullane and Foherish River and have been discussed in Section 1.3. Appropriate mitigation is required particularly at stream crossings to avoid impact.

7.5.3 Habitats- Route C

Route C running from Inchamore, along the northern slopes of the Derrynasaggart Mountains through Cummeennabuddoge (CMBG) and on to Ballyvouskill is located primarily within the existing road network and forestry tracks with small sections located off-road. The habitats surrounding Route C are dominated by large swathes of coniferous forestry plantations of different age classes many of which have been planted on blanket bog (See Figure 7.4). Upland habitats occur at either end of the grid route near Inchamore and Ballyvouskill and include upland blanket bog, wet heath, dry siliceous heat, wet grassland and exposed rock. While the majority of Route C is located within roads and tracks, roadside fringe habitats including hedgerows and grassland verges may be impacted at some locations. Direct permanent habitat removal may occur at or close to riparian habitats in order to cross streams and rivers. The indirect effects to wetlands (bogs in particular) from drainage effects will also require consideration. Where the UGC route is located off-road, (in particular at river crossings), the sensitivity of ecological habitats in conjunction with other technical and environmental constraints will inform the locations of temporary works areas. Key areas which will require off-road crossings on Route B are identified below:

- East of Cummeennabuddoge (CMBG) wind farm Route C leaves the forestry track and travels overland until it reaches Ballyvouskill substation. The habitat over which it traverses includes coniferous plantation, wet grassland, improved agricultural grassland, wet heath/blanket bog and hedgerows.

There are five proposed alternative routes along the forestry track section of Route C (See Figure 7.1), off road sections on these Alternative routes traverse the following habitats;

- **Alternative Route C1-** this section leaves the forestry track and travels approximately 344m on conifer plantation planted atop blanket bog and passes over a tributary of the Clydagh River itself a tributary of the River Flesk.
- **Alternative Route C2-** this section leaves the forestry track and travels approximately 345m conifer plantation planted on blanket bog and crosses over two tributaries of the Clydagh River (Flesk).
- **Alternative Route C3-** this section leaves the forestry track and travels approximately 419m on mature conifer plantation planted on blanket bog and crosses over a tributary of the Clydagh River (Flesk).
- **Alternative Route C4**- this section leaves the forestry track and travels approximately 613m on mature conifer plantation planted on blanket bog, from an examination of available mapping there are no water crossings associated with this route.
- **Alternative Route C5-** this section travels approximately 640m on the Curragh Wind Farm site access road before travelling off-road to Ballyvouskill wind farm traversing over wet grassland, improved agricultural grassland, treelines, hedgerows and semi-mature coniferous plantation. From an examination of available mapping there are no watercourse crossings associated with this route.

For the off-road sections of Route C direct impacts are likely to arise resulting in loss of habitats including coniferous plantation, wet grassland, improved agricultural grassland, blanket bog/wet heath, riparian habitat, hedgerows/treelines. These impacts are likely to be permanent to allow maintenance of a clearway to facilitate cable maintenance and fault repair. There is also a risk of pollution and disturbance (albeit temporary) to habitats during the construction phase and an ongoing risk of pollution and disturbance during operation if faults arise and further excavation works are

required. The majority of the off road sections along Route C are located on commercial coniferous plantation which are of relatively low ecological value (apart from the open canopy stage for hen harrier) however there are other habitats present which are of potential value e.g. blanket bog and wet heath. Habitat and botanical surveys will be required particularly in upland habitats to establish whether these off-road areas support protected red listed plant species or any EU Habitat Directive Annex I habitats such as Annex I Priority habitat, Active Blanket Bog (7130) or Annex I Northern Atlantic Wet Heath with *Erica tetralix* (4010).
Habitats on the off-road sections of the route to the east near Ballyvouskill may be of importance to hen harriers from the Mullaghanish to Musheramore Mountains SPA, this will be discussed in further detail in Section 7.4.4. Habitats of potential importance to foraging hen harriers and which could be potentially lost due to the development include wet grassland, blanket bog/wet heath and open canopy coniferous plantation.

7.5.4 Birds- Route C

For the sections of Route C located within the existing road network and forestry tracks direct loss of habitat of value to birds is deemed to be low in these areas. Roadside fringe habitats including hedgerows, treelines and grassland verges may be impacted at some locations via direct loss from the development footprint or through temporary disturbance due to construction work activities. The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Species-specific surveys may be required in order to inform specific mitigation measures and timing of certain works outside of the breeding season can be employed to avoid impact.

7.5.4.1 Conservation Species

A number of birds of conservation interest occur in the receiving environment of Route D including Annex I Hen harrier, Merlin in upland habitats and the Annex I Kingfisher and red listed grey wagtail and dipper along the rivers. The Annex I White tailed sea eagle is also known to occur occasionally in the wider area e.g. Gouganebarra Lake and the Gearagh/Lee valley area as does the Peregrine falcon. Other birds which have been recorded in the 10km grid squares (W18 and W28) include the BoCCI red listed red grouse and curlew and amber listed Kestrel and snipe and the Annex I whooper swan. Species specific surveys of proposed works areas will be required to fully confirm the abundance and distribution of bird species as well as to inform general bird and species specific mitigation measures where needed.

<u>Hen Harrier</u>
Hen harriers are known to occur in the study area and breed in the Mullaghanish to Musheramore Mountains SPA. The national hen harrier survey in 2005 resulted in 5 confirmed breeding pairs in this SPA, which represented over 3% of the national total. However since then the population has dropped to 1 confirmed pair in 2015, which represents a significant decline of 80%. The SPA site also supports a breeding population of Merlin (1-2 pairs), a further Annex I listed species which utilises similar habitats to that of the hen harrier.

- **Route C Off-road section (Ballyvouskill)-** the off-road section at the eastern end of Route C near Ballyvouskill is outside of the Mullaghanish to Musheramore Mountains SPA however it runs parallel to and comes within 82m of the SPA boundary in places. This section of Route C is located on habitats of potential value to foraging hen harrier including wet grassland, blanket bog/wet heath, and open canopy 2nd rotation coniferous plantation. Hen Harrier's core foraging range is 2km (SNH, 2016) but they have been known to forage between 5 km-10km from the nest site, utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Indirect impacts on hen harriers from the SPA may arise with the loss of habitat of potential value to the hen harrier which could be used by foraging and breeding hen harrier from the SPA.
- **Alternative Routes C1 to C4**- the majority of the alternative routes along Route C travel off-road over commercial conifer plantation, this is outside the SPA albeit within 300m in places.

Hen harrier forage and nest on open canopy conifer plantation although this is for a limited period from (<11 years old) of the forest life-cycle after which the canopy closes over and is of limited use to the hen harrier.

- **Alternative Route C5**- this section travels approximately 640m along the Curragh Wind Farm site access road before travelling off-road to Ballyvouskill wind farm traversing over wet grassland, improved agricultural grassland, treelines, hedgerows and semi-mature coniferous plantation. Habitat of potential value to the hen harrier includes wet grassland and open canopy immature conifer plantation if present (to be confirmed by surveys).

Hen harrier surveys will be required to establish the location of nest sites in relation to the location of Route C works as well as roosting and foraging activity, this will inform the route design and appropriate mitigation. Based on these survey results redesign/relocation of the route and/or timing of works outside of the bird breeding season may be needed to avoid impact. As outlined previously, please note planning case precedent here regarding ABP refusal of the Upperchurch Wind Farm underground grid connection route in relation to the Slievefelim to Silvermines Mountains SPA for hen harriers.

7.5.5 Other Fauna- Route C

7.5.5.1 Conservation Species- mammals

Protected species requiring particular consideration in relation to the underground grid connection Route C include:

- Otter - listed on Annex II of the E.U. Habitats Directive; and
- Bat species – Listed on Annex IV of the E.U. Habitats Directive.

Disturbance impacts potentially affecting otter during construction include direct impacts to breeding/resting sites (if present) and indirect impacts due to visual and noise disturbance. This could result in the loss of resting, foraging or breeding sites, and potentially a temporary decline in extent of the range of this species. Bat roosts (within bridges/mature trees) have the potential to be impacted during river crossing construction works and overland grid route works that traverse through treelines.
Otter and bat breeding sites will require consideration in the vicinity of river crossings to minimise potential disturbance effects, in particular during construction.
Mammals including Pine Marten, red squirrel and Badger are dispersed throughout the study area and may require mitigation consideration for potential disturbance effects.

<u>Bats</u>
Route C is located within 25 km of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC. Of particular note with regards to bats and this SAC is the occurrence of the E.U. Habitats Directive Annex II species: Lesser Horseshoe Bat, with a total population of about 300 individuals distributed at several locations within the SAC, including both nursery and hibernation sites. NPWS have mapped the significant roost locations and the closest is greater than 16km from Route C. Five species of Bat have been recorded within the 10km grid squares through which Route C runs including;

- Pipistrelle (*Pipistrellus pipistrellus sensu lato*)
- Lesser Noctule (*Nyctalus leisleri*)
- Lesser Horseshoe Bat (*Rhinolophus hipposideros*)
- Brown Long-eared Bat (*Plecotus auritus*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)

Bat surveys will be required at suitable habitat (trees, bridges, old buildings) along Route C to establish the locations of roosts, should bats be found, an application for a derogation licence to legally allow works on or near a bat roost, which is a notifiable action under current legislation, will be made to National Parks and Wildlife Service.

Kerry Slug
The Kerry Slug (Annex II listed species) is known to be resident in the general area, including throughout the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC and pNHA (site code 000365). The preferred habitat of the Kerry slug includes deciduous woodland, blanket bog or unimproved oligotrophic open moor and lake shores (McDonnell & Gormley 2011). The potential impact on this species is considered low for the most part due to the location of Route C largely on public roads and forestry tracks including near the SAC. The off road section of Route C travels through an area of blanket bog/wet heat which may have potential for the Kerry slug. Alternative Routes along Route C that travel off-road do not appear to located on habitat suitable for the Kerry slug however more detailed habitat surveys are required to confirm this as remnant patches of blanket bog which could support Kerry slug may be located on off-road sections.

7.6 Environmental Review- Route D

Route D is a short route approximately 3.7km long between the proposed Cummeennabuddoge (CMBG) wind farm site and the Ballyvouskill substation. This route would be implemented if route C is not implemented in the scheme. Route D initially follows the same route as Route C, exiting the proposed wind farm site traveling east over mature conifer plantation and forestry track for approximately 448m before going off-road over 2nd rotation immature conifer plantation for 1.13km. Route D then joins the third class public road and travels along this for 1.8km before entering Ballyvouskill Substation via its access road. There is just one stream crossing apparent from an examination of the available mapping, and that is over a small tributary of the Garrane (Lee) stream which itself is a tributary of the Foherish River.

7.6.1 Designated Sites- Route D

The designated sites within 15km of Route D are similar to Route C (See Section 7.4.1 and Figure 7.2) however unlike Route C the 3.7km of Route D is not hydrologically linked to the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC, SPA & pNHA and at its closest is 2.7km away. Route D does run through an EU designated site and that is the Mullaghanish to Musheramore Mountains SPA but only along a public road where the SPA boundary overlaps with the public road. Route D does not travel off-road within the SPA but does travel within 46m to 550m of the SPA boundary overland. Route D is hydrologically linked to the Mullaghanish to Musheramore Mountains SPA however there are no aquatic qualifying interests or aquatic species of special conservation interest associated with this SPA.

7.6.2 Aquatic Ecology- Route D

Route D is located in hydrometric area 19 Lee, Cork harbour and Youghal Bay and Foherish subcatchment. Route D has one stream crossing over a small tributary of the Garrane (Lee) stream (labelled SCC12 in Figure 7.3)which is a tributary of the Foherish River, the Foherish River becomes part of the Sullane further downstream at a confluence approximately 4km upstream of Macroom town.

7.6.2.1 Conservation Species

Two Annex II aquatic species are present within the Foherish/Sullane subcatchments, namely the Freshwater Pearl Mussel (*Margaritifera margaritifera*) and the Atlantic salmon (*Salmo salar*).

Freshwater pearl Mussel- Foherish River
Route D crosses a tributary of the Foherish River- the Garrane stream. Moorkens (2007) recorded Freshwater Pearl Mussel in the Foherish River. The closest population of freshwater pearl mussel to the Route D stream crossing according to Moorkens study (2007) is located over 11km downstream at Clondrohid.

Atlantic Salmon
The Sullane River and its main tributaries the Foherish and Laney Rivers discharge into the upper Lee Reservoir (Carrigadrohid reservoir) downstream of Macroom. The presence of the Carrigadrohid and Iniscarra hydroelectric dams on the River Lee downstream, means that the Sullane and its tributaries

have no natural migration run of the species, despite extensive areas of suitable habitat. A salmon restocking programme by the ESB releases thousands of juveniles into the catchment above Carrigadrohid annually and some juveniles have been recorded from time to time in the river during electrofishing surveys. It is known from a recent IFI survey (2014) that there are juvenile salmon in the Sullane, with 46 individuals recorded at Sullane Bridge upstream of Macroom in 2014 and it is possible that small numbers of salmon occur more widely within the system. However, the population is not believed to be self-sustaining, is currently below its conservation limits and no salmon angling is permitted within this part of the River Lee system. The stream closest to Route D, the Garrane stream is rated as Good Quality (Q4) by the EPA, there are no records of Atlantic Salmon for this stream however it is likely to contain suitable habitat for salmonids and trout are likely to be present. Aquatic surveys including electrofishing will be required to establish the composition of fish species present and to inform mitigation measures for the works associated with Route D.

7.6.3 Habitats- Route D

Route D is located primarily within the existing road network and forestry tracks apart from a section that runs off-road across immature 2nd rotation conifer plantation and a stream crossing of the Garrane tributary (See Figure 7.4). Roadside fringe habitats including hedgerows, treelines and grassland verges may be impacted at some locations via direct loss from the development footprint. Direct permanent habitat removal may occur at or close to riparian habitats where the cable is routed through private lands off-road, in order to cross the Garrane stream. The indirect effects to wetlands from drainage effects will also require consideration.

7.6.4 Birds- Route D

The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Route D does not travel off-road within the Mullaghanish to Musheramore Mountains SPA (of special conservation interest for the Annex I hen harrier) but does travel within 46m to 550m of the SPA overland. Species-specific surveys may be required in particular for the hen harrier and other species of conservation interest to confirm activity (nesting, roosting, foraging) in order to inform specific mitigation measures (if required). Redesign of the route and/or timing of works outside of the breeding season may be needed to avoid impact. As outlined previously, please note planning case precedent here regarding ABP refusal of the Upperchurch Wind Farm underground grid connection route in relation to the Slievefelim to Silvermines Mountains SPA for hen harriers.

7.6.4.1 Conservation Species

A number of birds of conservation interest occur in the receiving environment of Route D including Annex I Hen harrier, Merlin in upland habitats and the Annex I Kingfisher and red listed grey wagtail and dipper along the rivers. The Annex I White tailed sea eagle is also known to occur occasionally in the wider area e.g. Gouganebarra Lake and the Gearagh/Lee valley area as does the Peregrine falcon. Other birds which have been recorded in the 10km grid square (W28) include the BoCCI red listed red grouse and curlew and amber listed Kestrel and snipe and the Annex I whooper swan. Species specific surveys of proposed works areas will be required to fully confirm the abundance and distribution of bird species as well as to inform general bird and species specific mitigation measures if needed.

<u>Hen Harrier</u>

Hen harriers are known to occur in the area in and around the Mullaghanish to Musheramore Mountains SPA. Route D passes through the SPA along the public road and close to the SPA on its overland section. The overland section is located on immature 2nd rotation conifer plantation. This habitat type is of potential value to foraging and nesting hen harrier for the period of time it is in the open canopy stage albeit recent literature suggests that it may also act as an ecological trap for the species (Wilson *et al.*, 2009). As this section is located within 2km of the SPA boundary it is potentially within the core foraging range of hen harriers from the SPA. It is also within 500m of the SPA boundary therefore there is potential for hen harrier nest sites within the SPA to be within 500m of the proposed Route D grid works.

Route D has the potential for a direct impact to the species of special conservation interest (SCI) for this SPA through habitat loss and disturbance. Hen harrier surveys will be required to establish the location of nest sites in relation to the location of Route D works as well as roosting and foraging activity, this will inform the route design and appropriate mitigation. Based on these survey results,

redesign/relocation of the overland section of Route D that runs close to and within the SPA may be required. Timing of works outside of the bird breeding season may also be needed to avoid impact. As outlined previously, please note planning case precedent regarding ABP refusal of the Upperchurch Wind Farm underground grid connection route in relation to the Slievefelim to Silvermines Mountains SPA for hen harriers.

7.6.5 Other Fauna- Route D

7.6.5.1 Conservation Species- mammals

Protected species requiring particular consideration in relation to the underground grid connection Route D include:

- Otter - listed on Annex II of the E.U. Habitats Directive; and
- Bat species – Listed on Annex IV of the E.U. Habitats Directive.

Disturbance impacts potentially affecting otter during construction include direct impacts to breeding/resting sites (if present) and indirect impacts due to visual and noise disturbance. This could result in the loss of resting, foraging or breeding sites, and potentially a temporary decline in extent of the range of this species. Bat roosts (within bridges/mature trees) have the potential to be impacted during river crossing construction works and overland grid route works that traverse through treelines. NBDC holds two records for bat species including :

- Lesser Horseshoe Bat (*Rhinolophus hipposideros*)
- Brown Long-eared Bat (*Plecotus auritus*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)

Otter and bat breeding sites will require consideration in the vicinity of the stream crossing to minimise potential disturbance effects, in particular during construction.
Mammals including Pine Marten and Badger are dispersed throughout the study area and may require mitigation consideration for potential disturbance effects.

7.7 Route E

Route E runs between Gortyrahilly Windfarm and Inchamore Windfarm (waypoints P-Q-R-S-T). Route E is typically proposed to be installed along existing local roads with a section on the south-eastern end running through agricultural land and a short section at the northern end running along a forestry track.

The route is typically adjacent to farmland, with rushes frequently present which suggests a soft peaty soil underlies the area, although areas with till, weathered rock and rock outcrops were also observed. In areas of peat, either a geotextile membrane should be incorporated into the floor of the trench to support the ducts or the peat should be excavated down to the top of the till/weathered rock stratum. No special measures are anticipated for areas of till, weathered rock or road hardcore, which should be excavatable. In areas where rock is present along the edge of the road the trench excavation process may be hindered by this rock

The road is a narrow boreen with a poorly paved surface between waypoints P and Q, typically with gentle cross slopes. There are some steeper vertical gradients and sharp bends in the section around the junction at waypoint Q. These factors may prevent access by larger plant to this stretch of the road. The existing roads in the middle section of the route (waypoints Q-R) are typically adjacent to reasonably level farmland. The road runs directly alongside a stream for 200m between waypoints Q and R. The roads are narrow in places with trees also noted along the road boundaries. The route along waypoints R and S, west of the bridge crossing is a narrow paved road with an open drain on the southern side of the road and frequent rock outcrops along the northern side of the road. To the east of the bridge, the cross-slope falls south to north with trees present along the southern side of the road. The route along the northern section of waypoints S and T is a narrow paved road with a cross-slope dipping from east to west. Some scarping of the slopes was noted along the section with

steep slopes between waypoints S and T and trees were also noted along both sides of the road. Outcrops are noted to frequent the central section between waypoints S and T. The route is along a narrow boreen at the southern end of the route within 600m of waypoint T with a cross-slope dipping from north to south on this section of the route. Some scarping of the slopes was noted along the southernmost section of the road within 600m of waypoint S although rock outcrops were noted in adjacent slopes and ditches, suggesting rock is likely shallow in the area. From waypoint T the route turns southward towards the Gortyrahilly windfarm, through agricultural/forestry land.

There are three existing bridge crossings along Route E, and the route will likely have to cross a stream at two further points between waypoint T and the Gortyrahilly windfarm. The worst-case scenario of directional drilling should be assumed to cross beneath the watercourses at bridge/river crossing locations. Pending further on-site investigation, it may be possible to traverse some of these watercourses via alternative methods. These include in flat formation within the bridge itself, where the trenches will be surrounded with reinforced concrete protection, or, via dedicated cable bridges. These methods may reduce costs, however, the feasibility of such can only be determined following further investigations.

7.8 Environmental Possible Mitigation Measures

7.8.1 Hen harrier

based on planning cases (e.g. Upperchurch) all off-road cable routes within the SPA and on lands that have suitable foraging and nesting habitat near the SPA that could be used by SPA hen harriers should be avoided if possible. The core foraging range of Hen Harriers is 2km (SNH, 2016) however they will generally forage up to c. 5 km from the nest site (and foraging up to 9km has been recorded), utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. For areas within the core foraging range (i.e. within 2-5km) of the SPA the grid route should go within existing roads to reduce planning risk.
For within road grid works there may still need to be some potential mitigation, an awareness of where historical hen harrier nest sites/winter roosts are located in relation to the proposed grid works is important to inform the design of the grid route and to fully avoid impact. If historical nest sites are present within 500m of grid works that are within a road, works can still go-ahead but with mitigation as follows; A pre-construction survey would be required to identify hen harrier nests (during breeding season)/roosts (in winter). If a nest is within 500m of within road grid works then works would have to proceed outside the hen harrier breeding season or until chicks had fledged/nest failed- pre-construction and during construction hen harrier survey of the grid route works would be required throughout this period.

Possible differences to Upperchuch are the lower number of nest sites in the Mullaghanish to Musheramore Mountains SPA and it could be argued that if nests never historically have occurred in the area of the grid works then impact is potentially low. However the precautionary principle may be cited here and it may be claimed that if suitable habitat is present (foraging/nesting//wintering habitats) permanent impacts upon this would not be acceptable in the SPA (See Grace and Sweetman c. An Bord Pleanála case (C164/17) as at some point they could be used by the hen harrier and the same approach could be taken for 2-5km (hen harrier foraging zone) outside the SPA as there is potential for adverse ex-situ impacts upon the qualifying interest of the SPA i.e. the hen harrier.

To summarise- where possible to reduce planning risk go within road for grid works when in the SPA and also within 2-5km of the SPA- if there is a pinch point where within road works are not possible (e.g. landowner issues etc) then a closer look at the habitat type on nearby off-road sections could be merited to see if this is of value to the hen harrier and/or where local hen harrier nests are located but this strategy would come with a higher planning risk.

7.8.2 Kerry Slug

For the design stage avoidance of suitable Kerry Slug habitat as far as possible is the preferred mitigation option. Suitable habitat includes deciduous woodland, blanket bog or unimproved

oligotrophic open moor and lake shores, exposed rock and in more recent times they have been found in coniferous plantations also. If suitable habitat cannot be avoided then the amount taken up by the development should be kept to a minimum, EIS Stage Kerry Slug Surveys need to be conducted to confirm presence. During construction mitigation is generally as per the below measures if suitable habitat is being impacted upon;

- Areas of suitable habitat that occur outside of the footprint of the development will be avoided during the course of construction, thereby minimising the loss and disturbance of Kerry Slug habitat.
- Immediately prior to undertaking works in areas of suitable habitat, the Project Ecologist will check for the presence of Kerry Slug. Should slugs be discovered then they will be transferred to suitable habitat in the surroundings. Similar ongoing monitoring of suitable habitat within works areas will continue throughout the construction phase. Such monitoring will be undertaken during periods of wet weather when slugs are most active and feeding on the surface and therefore at greater risk of impacts by movement of machinery.
- If disturbance to Kerry Slug is unavoidable , a derogation license will be sought from the NPWS prior to the commencement of construction. Works will be carried out in compliance with any conditions set by such license.

7.8.3 Otter

EIS Surveys for otters should be carried out, where possible the design should avoid impacting upon Otter Holts. A pre-construction survey for Otter will be carried out within 10 months prior to construction. This should be supplemented by inspection of development area immediately prior to site clearance to ensure no holts or couches have been created in the intervening period. If any holts are found within the development footprint appropriate steps will be taken and a derogation licence will be applied for from NPWS. In order to mitigate identified construction impacts on Otter the following mitigation measures will be implemented:

- Trenching works shall not create confined areas where Otter may get trapped. However, if such areas are created, the area will be fitted with an escape ramp (no more than 45°) to allow trapped animals to escape when the area is not in operation. These areas must be made safe before leaving site each day;
- Design mitigation will ensure lighting will be minimised during hours of darkness and will not illuminate areas near the riverbank and the area of the flood plain, to ensure no adverse effects on Otter.
- No works should be undertaken within 150m of any holts at which breeding females or cubs are present. Following consultation with NPWS, works closer to such breeding holts may take place - provided appropriate mitigation measures are in place, e.g. screening and/or restricted working hours on site.
- No wheeled or tracked vehicles (of any kind) should be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance should also not take place within 15m of such holts, except under licence.

7.9 Environmental Review- Route E

Route E grid connection route connects Gortyrahilly to Incahmore and is approximately 7km long. Route E initially travels overland across improved agricultural grassland and newly planted commercial forestry for approximately 0.913 km as it leaves the Gortytrahilly site before joining the public road which it follows for approximately 6.1km before entering Inchamore site along the south eastern boundary.

Route E is not located in or adjacent to an environmentally designated site, the closest protected areas are Silahertane Bog NHA (c3.1km to the west) and Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC (c 3.5km to the north) however it has no hydrological connections to these sites. St Gobnets Wood SAC is located approximately 5.2km to the north east of Route E and there is a hydrological connection to this SAC via the Sullane River which runs through this SAC. From

a review of available mapping and the EPA Rivers Dataset there are six stream/bridge crossings along Route E, all of these watercourses are tributaries of the River Sullane.

From an examination of aerial imagery and CORINE Landcover mapping the landscape surrounding Route E is largely composed of established upland conifer forestry plantation interspersed with blanket bog, wet heat, wet grassland and improved agricultural grassland (See Figure 7.5). Landuse is primarily commercial forestry along with sheep and cattle.

7.9.1 Designated Sites- Route E

The designated sites within 15km of Route E are summarised in the below Table 7.15 and illustrated in Figure 7.2. Route E does not run through or adjacent to any designated sites however it is hydrologically linked to the following

St. Gobnet's Wood SAC (code 0106) and pNHA (code 0106): St. Gobnet's Wood SAC includes St. Gobnet's Wood itself and an area of woodland to the north, called Cascade Wood. St. Gobnet's Wood is situated on the north-east side of a hill immediately south of Ballyvourney village in Co. Cork. Cascade Wood is situated immediately to the north of Ballyvourney. Together they form a relatively large but fragmented stand of woodland. The site supports old oak woodland (Annex 1 Code 91A0), as well as a small area of alluvial woodland alongside the Sullane River. Route E underground cable route is located approximately 5.2km away from St Gobnets Wood SAC however there is a hydrological connection via the Sullane River which runs through the SAC.
Other than the aforementioned site, there are no Natura 2000 sites present with a hydrological connection to the underground cable Route E within 15 km of any part of the site. The next closest Natura site with a hydrological connection is to the east, the Great Island Channel SAC (Site Code 004030) in Cork Harbour which is over 50km away. Further detail on the qualifying interests/special conservation interests and conservation objectives of the Natura 2000 sites within 15km can be found at https://www.npws.ie/protected-sites.

Table 7.15 List of EU and Nationally Designated sites within 15km of Route E.

Designated Site	Site Code	Distance (km)	Source-Pathway-Receptor Links
St Gobnets Wood SAC	000106	5.2	Yes- Route E is hydrologically connected.
The Gearagh SPA	004109	13.9	No, due to the distance and absence of hydrological or habitat connectivity.
Mullaghanish Bog SAC	001890	9.1	No, due to the absence of hydrological or habitat connectivity
Mullaghanish to Musheramore Mountains SPA	004162	6.6	No, due to the distance and absence of hydrological or habitat connectivity.
The Gearagh SAC	000108	13.9	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC	000365	3.5	No hydrological or habitat connectivity
Blackwater River (Cork/Waterford SAC)	002170	9.2	No hydrological or habitat connectivity
Old domestic building, Curraglass Wood SAC	002041	9.6	No, due to distance and the absence of hydrological or habitat connectivity
Silahertane Bog NHA	001882	3.1	No hydrological or habitat connectivity
Prohus Wood pNHA	001248	11.1	No, due to distance and the absence of hydrological or habitat connectivity

Ballagh Bog pNHA	**001886**	8.6	No, due to distance and the absence of hydrological or habitat connectivity
Gouganebarra Lake pNHA	**001057**	9.3	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment pNHA	**000365**	3.5	No hydrological or habitat connectivity
Kilgarvan wood pNHA	**001787**	11.5	No, due to distance and the absence of hydrological or habitat connectivity
Lough Allua pNHA	**001065**	6.3	No, due to distance and the absence of hydrological or habitat connectivity
The Gearagh SPA	**004109**	13.9	No, due to distance and the absence of hydrological or habitat connectivity
The Gearagh NHA	**000108**	13.9	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House SAC	**000364**	10.7	No, due to distance and the absence of hydrological or habitat connectivity
Kilgarvan Ice House pNHA	**000364**	10.7	No, due to distance and the absence of hydrological or habitat connectivity
Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SPA	**004038**	3.5	No hydrological or habitat connectivity. There is a remote connection to the SPA special conservation interest (SCI), the Greenland White-fronted goose, if they occur along the grid route. Route E however is outside the species core foraging range (5-8km) (SNH, 2016) therefore potential significant impact to the SPA SCI is not likely.
Kilgarvan Wood pNHA	**001787**	11.4	No, due to distance and the absence of hydrological or habitat connectivity
Roughty River pNHA	**001376**	7.3	No, due to distance and the absence of hydrological or habitat connectivity
Conigor Bog NHA	**002386**	11.9	No, due to distance and the absence of hydrological or habitat connectivity
Glenlough Woods SAC	**002315**	13.7	No, due to distance and the absence of hydrological or habitat connectivity
Slaheny River Bog NHA	**000383**	12.9	No, due to distance and the absence of hydrological or habitat connectivity
Derrycloher Bog SAC	**001873**	13.7	No, due to distance and the absence of hydrological or habitat connectivity

7.9.2 Aquatic Ecology- Route E

The route of the UGC from Gortyrahilly to Inchamore (Route E) is located in hydrometric area 19 Lee, Cork harbour and Youghal Bay and traverses the Sullane River Subcatchment. There are a total of six watercourse crossings along Route E, including five bridge crossings along the public road. These watercourses are small tributaries of the Sullane river, some are unnamed (See table 7.16). The locations of the watercourse crossings are indicated in Figure 7.3.

Table 7.16 Route E water course crossings and their catchments/rivers and their Water Framework Directive Water Quality Status Data for River Waterbodies 2013-2018 (EPA).

Site Name	Catchment/Stream	WFD Status
Stream Crossing (SCE1)	Na Foithri (Sullane)	Good

Stream Crossing (SCE2)	Na Foithri (Sullane)	Good
Bridge Crossing (SCE1)	Sullane River	Good
Bridge Crossing (SCE2)	Barr Duinse (Sullane)	Good
Bridge Crossing (SCE3)	Unnamed (Sullane)	Good
Stream Crossing (SCE3)	Unnamed (Sullane)	Good

7.9.2.1 **Conservation Species**

Two Annex II aquatic species are present within the Sullane catchments, namely the Freshwater Pearl Mussel (*Margaritifera margaritifera*) and the Atlantic salmon (*Salmo salar*).

Freshwater pearl Mussel- Sullane River

An extensive survey of the species was undertaken on the Sullane, the Foherish and the Laney in 2007 (Moorkens, 2007) and this is the benchmark study of the species in that catchment. A more recent study (RPS, 2014) concentrating on a shorter stretch around Ballyvourney, confirmed that the population was stable in the intervening 7 years since the Moorkens study. The survey report would suggest that suitable pearl mussel habitat on the Sullane is fairly localised and that in many places a combination of filamentous algae, heavy macrophyte cover and silt are all contributing to reducing its suitability. The overall estimated numbers by Moorkens (2007) for the surveyed stretches came to 684 and the Moorkens (2007) report concluded that the total population for the main channel of the Sullane was unlikely to exceed 2,000. A number of crossings are proposed along Route E on the Sullane river channel itself and tributaries of the Sullane including the Na Foirthi, Barr Duinse and other innamed tributaries. In the Moorkens (2007) study the highest density within the 15 study sections of the Sullane River was noted (i.e. 300 mussels per 1 km) about 1.2 km downstream of Coolea. The closest Route E stream crossing to this study section with the highest density of water pearl mussels in the Sullane is approximately 3.4km upstream.

Conclusion- Freshwater pearl mussel

Populations of the Annex II freshwater pearl mussel exist downstream of Route E therefore works in and around watercourses will need to ensure adequate control measures are in place of sufficient standard to prevent any impact on the freshwater pearl mussel downstream. Avoidance of instream works where possible and pollution control will be required at all stream, river and drainage ditch crossings. Detailed and potentially species-specific surveys will be required for aquatic fauna in order to inform specific mitigation measures (if required).

Atlantic Salmon

The Sullane River discharge into the upper Lee Reservoir (Carrigadrohid reservoir) downstream of Macroom. The presence of the Carrigadrohid and Iniscarra hydroelectric dams on the River Lee downstream, means that the Sullane and its tributaries have no natural migration run of the species, despite extensive areas of suitable habitat. A salmon restocking programme by the ESB releases thousands of juveniles into the catchment above Carrigadrohid annually and some juveniles have been recorded from time to time in the river during electrofishing surveys. An IFI survey (2014) recorded juvenile salmon in the Sullane, with 46 individuals recorded at Sullane Bridge upstream of Macroom in 2014 and it is possible that small numbers of salmon occur more widely within the system. However, the population is not believed to be self-sustaining, is currently below its conservation limits.

The Sullane system has a healthy trout population with extensive areas of suitable habitat throughout the main channel and in the tributaries. The Sullane has only been surveyed once under the WFD monitoring programme (in 2014) at Sullane Bridge near Lissacresig approximately 6 km upstream of Macroom. The survey recorded 180 brown trout, 46 salmon, 5 minnow, 4 stickleback, and 4 stone loach.

The streams and rivers along Route E are likely to contain habitat suitable for trout and they are likely to be common in these waters, Atlantic Salmon may also be present in some of these watercourses. Both these species require clean gravel for spawning therefore works in and around watercourses will need to ensure adequate water pollution control and in particular silt control measures are in place of sufficient standard to prevent any impact on these species.

7.9.3 Habitats- Route E

Route E is located primarily within the existing public roads with the exception of a small section in the southeast as it leaves the Gortyrahilly site (See Figure 7.5 CORINE Habitat Map) located on improved agricultural grassland and commercial conifer plantation. Roadside fringe habitats including hedgerows and grassland verges may be impacted at some locations. Three off-road stream crossings are apparent from an appraisal of available mapping along Route E (SCE1, SCE2, SCE3). Direct permanent habitat removal may occur at or close to riparian habitats where the cable is routed through private lands off the public road, in order to cross streams and rivers. The indirect effects to semi natural habitats such as wetlands (bogs in particular) and riparian zones from drainage effects will also require consideration. Where the UGC route is located off-road, (in particular at stream crossings), the sensitivity of ecological habitats in conjunction with other technical and environmental constraints will inform the locations of temporary works areas.

7.9.4 Birds- Route E

Route E is located primarily within the existing road network and runs through habitat that is highly managed e.g. improved agricultural grassland and commercial forestry therefore direct loss of habitat of value to birds is deemed to be low in these areas. Roadside fringe habitats including hedgerows, treelines and grassland verges may be impacted at some locations via direct loss from the development footprint or through temporary disturbance due to construction work activities. The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Species-specific surveys may be required in order to inform specific mitigation measures (if required) and timing of works outside of the breeding season can be employed to avoid impact. The early open canopy stage of coniferous forestry is known to be used by Annex I species such as the hen harrier for breeding and foraging, while only a small section of Route E traverses off-road on commercial forestry species specific surveys will be needed to identify any potential constraints on both off-road and in suitable habitat adjacent to the public road.

7.9.4.1 Conservation Species

A number of birds of conservation interest occur in the receiving environment of Route E including Annex I Hen harrier and Merlin in upland habitats and the Annex I Kingfisher and red listed grey wagtail and dipper along the rivers. The Annex I White tailed sea eagle is also known to occur occasionally in the wider area e.g. Gouganebarra Lake and the Gearagh/Lee valley area as does the Peregrine falcon. Other birds which have been recorded in the 10km OSI grid square (W17) include the BoCCI red listed red grouse and curlew and amber listed Kestrel and snipe. Species specific surveys of proposed works areas will be required to fully confirm the abundance and distribution of bird species as well as to inform general bird and species specific mitigation measures if needed.

7.9.5 Other Fauna- Route E

7.9.5.1 Conservation Species- mammals

Protected species requiring particular consideration in relation to the underground grid connection include:

- Otter - listed on Annex II of the E.U. Habitats Directive; and
- Bat species – Listed on Annex IV of the E.U. Habitats Directive.

Disturbance impacts potentially affecting otter during construction include direct impacts to breeding/resting sites (if present) and indirect impacts due to visual and noise disturbance. This could result in the loss of resting, foraging or breeding sites, and potentially a temporary decline in extent of the range of this species. Bat roosts (within bridges/mature trees) have the potential to be impacted during river crossing construction works. Otter and bat breeding sites will require consideration in the vicinity of river crossings to minimise potential disturbance effects, in particular during construction.

Mammals including Pine Marten, Red Squirrel and Badger are dispersed throughout the study area and may require mitigation consideration for potential disturbance effects.

Bats
Six bat species have been historically recorded in the 10km grid square which overlaps Route E, these km include;

- Lesser Horseshoe Bat (*Rhinolophus hipposideros*)
- Brown Long-eared Bat (*Plecotus auritus*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)
- Common Pipestrelle (*Pipistrellus pipistrellus sensu lato*)
- Leisler bat/Lesser Noctule (*Nyctalus leisleri*)
- Nathusius's Pipistrelle (*Pipistrellus nathusii*)

Bats are expected to be widespread throughout the cable route corridor, especially in the low-lying section along Route E in areas where hedgerows and woodland are frequent and along the Sullane River. Buildings, stone bridges and mature trees provide potential roosts for bats.

7.9.5.2 Invertebrates and Amphibians

NBDC records for the 10km grid square which overlap Route E (W17) hold records for a number of butterflies including the endangered Wall, Annex II Marsh Fritillary (*Euphydryas aurinia*) classed as vulnerable and a number of near threatened butterfly species such as the Small Heath, Grayling and Gatekeeper. The only butterfly protected under European law is the Marsh Fritillary which has been recorded historically in this area along with there records for its larval food plant Devils bit scabious so there may be potential for this Annex II butterfly to be present along the development footprint of Route E. No butterfly species is legally protected in the Republic of Ireland under the Wildlife Act, 1976 or the Wildlife (Amendment) Act, 2000. More detailed invertebrate survey field work including species specific surveys where appropriate e.g. Marsh Fritillary larval surveys will be needed to inform route design and avoid/minimise impact on invertebrate species.
There are historical records for the common frog within the 10km grid square (W17) that overlaps Route E and is likely to be present along the development footprint particularly along streams and rivers, at stream crossings, in drains along forestry tracks and in areas of wet grassland, heath and blanket bog.

Table 7.17 Butterfly species of conservation interest historically recorded in grid square W17 which overlaps Route E.

Common Name	Scientific Name	10km grid square	Red List Protection Status (Marnell *et al.*, 2009)
Wall	*Lasiommata megera*	W17	Endangered
Marsh Fritillary	*Euphydryas aurinia*	W17	Vulnerable
Small Heath	*Coenonympha pamphilus*	W17	Near threatened
Grayling	*Hipparchia semele*	W17	Near threatened
Gatekeeper	*Pyronia tithonus*	W17	Near threatened

Kerry Slug
The Kerry Slug (Annex II listed species) is known to be resident in the general area and has been historically recorded in the 10km grid square which overlaps Route E. The potential impact on this

species is considered low for the most part due to the location of Route E largely on public roads. The preferred habitat of the Kerry slug includes deciduous woodland, blanket bog or unimproved oligotrophic open moor and lake shores (McDonnell & Gormley 2011). However, the species has also been recently discovered on both granite outcrops within blanket bog and from a Conifer plantation in County Galway (Kearney 2010). Further records of the species from Conifer Plantations suggest that this may also be a suitable habitat for the species (McDonnell et al. 2013). A possible explanation put forward to explain the recent discovery of the species in County Galway is an inadvertent introduction (during forestry operations) (McDonnell et al. 2013). However this has not yet been determined (Reich et al. 2012).
Route E which is located off road may have some potential for Kerry slug presence as it traverses commercial conifer plantation. Specific surveys for the Kerry slug may need to be considered at this location if they are to be progressed.

7.9.5.3 Invasive Species

The NBDC database holds records within the 10km grid square W17 for a number of non-native invasive plant species many of which are listed in the Third Schedule Part I under Regulations 49 and 50 of the European Communities (Birds and natural Habitats) Regulations 2011 (See Table 7.18). Further Invasive species surveys to identify the location of invasive species and inform specific mitigation and invasive species controls, will need to be considered as part of the route design process. Appropriate management of construction and operational grid route works will be required to avoid the spread of invasive species particularly upstream of and where there is a hydrological connection to Natura 2000 Sites.

Table 7.18 NBDC records for non-native invasive plant species within the 10km grid square W17 and their invasive risk rating according to NBDC and Kelly et al., 2013.

Common Name	Scientific Name	Listed in Third Schedule Part I * (Y/N)	Risk Rating (Kelly *et al.*, 2013) and/or NBDC Risk rating
Japanese Knotweed	*Fallopia japonica*	Y	High
Rhododendron	*Rhododendron ponticum*	Y	High
Cherry laurel	*Prunus laurocerasus*	N	High
Indian Balsam	*Impatiens glandulifera*	Y	High
Himalayan knotweed	*Persicaria wallichii*	Y	Medium
Nuttalls waterweed	*Elodea nuttallii*	Y	High
Montbretia	*Crocosmia pottsii x aurea = C. x crocosmiiflora*	N	N/A
Sycamore	*Acer pseudoplatanus*	N	Medium

7.10 Possible mitigation measures

Hen harrier- based on planning cases (e.g. Upperchurch) all off-road cable routes within the SPA and on lands that have suitable foraging and nesting habitat near the SPA that could be used by SPA hen harriers should be avoided if possible. The core foraging range of Hen Harriers is 2km (SNH, 2016) however they will generally forage up to c. 5 km from the nest site (and foraging up to 9km has been recorded), utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. For areas within the core foraging range (i.e. within 2-5km) of the SPA the grid route should go within existing roads to reduce planning risk.

For within road grid works there may still need to be some potential mitigation, an awareness of where historical hen harrier nest sites/winter roosts are located in relation to the proposed grid works is important to inform the design of the grid route and to fully avoid impact. If historical nest sites are present within 500m of grid works that are within a road, works can still go-ahead but with mitigation as follows; A pre-construction survey would be required to identify hen harrier nests (during breeding season)/roosts (in winter). If a nest is within 500m of within road grid works then works would have to proceed outside the hen harrier breeding season or until chicks had fledged/nest failed- pre-construction and during construction hen harrier survey of the grid route works would be required throughout this period.

Possible differences to Upperchuch are the lower number of nest sites in the Mullaghanish to Musheramore Mountains SPA and it could be argued that if nests never historically have occurred in the area of the grid works then impact is potentially low. However the precautionary principle may be cited here and it may be claimed that if suitable habitat is present (foraging/nesting//wintering habitats) permanent impacts upon this would not be acceptable in the SPA (See Grace and Sweetman c. An Bord Pleanála case (C164/17) as at some point they could be used by the hen harrier and the same approach could be taken for 2-5km (hen harrier foraging zone) outside the SPA as there is potential for adverse ex-situ impacts upon the qualifying interest of the SPA i.e. the hen harrier.

To summarise- where possible to reduce planning risk go within road for grid works when in the SPA and also within 2-5km of the SPA- if there is a pinch point where within road works are not possible (e.g. landowner issues etc) then a closer look at the habitat type on nearby off-road sections could be merited to see if this is of value to the hen harrier and/or where local hen harrier nests are located but this strategy would come with a higher planning risk.

Kerry Slug- For the design stage avoidance of suitable Kerry Slug habitat as far as possible is the preferred mitigation option. Suitable habitat includes deciduous woodland, blanket bog or unimproved oligotrophic open moor and lake shores, exposed rock and in more recent times they have been found in coniferous plantations also. If suitable habitat cannot be avoided then the amount taken up by the development should be kept to a minimum, EIS Stage Kerry Slug Surveys need to be conducted to confirm presence. During construction mitigation is generally as per the below measures if suitable habitat is being impacted upon;

- Areas of suitable habitat that occur outside of the footprint of the development will be avoided during the course of construction, thereby minimising the loss and disturbance of Kerry Slug habitat.
- Immediately prior to undertaking works in areas of suitable habitat, the Project Ecologist will check for the presence of Kerry Slug. Should slugs be discovered then they will be transferred to suitable habitat in the surroundings. Similar ongoing monitoring of suitable habitat within works areas will continue throughout the construction phase. Such monitoring will be undertaken during periods of wet weather when slugs are most active and feeding on the surface and therefore at greater risk of impacts by movement of machinery.
- If disturbance to Kerry Slug is unavoidable , a derogation license will be sought from the NPWS prior to the commencement of construction. Works will be carried out in compliance with any conditions set by such license.

Otter
EIS Surveys for otters should be carried out, where possible the design should avoid impacting upon Otter Holts. A pre-construction survey for Otter will be carried out within 10 months prior to construction. This should be supplemented by inspection of development area immediately prior to site clearance to ensure no holts or couches have been created in the intervening period. If any holts are found within the development footprint appropriate steps will be taken and a derogation licence will be applied for from NPWS. In order to mitigate identified construction impacts on Otter the following mitigation measures will be implemented:

- Trenching works shall not create confined areas where Otter may get trapped. However, if such areas are created, the area will be fitted with an escape ramp (no more than 45°) to allow trapped animals to escape when the area is not in operation. These areas must be made safe before leaving site each day;
- Design mitigation will ensure lighting will be minimised during hours of darkness and will not illuminate areas near the riverbank and the area of the flood plain, to ensure no adverse effects on Otter.
- No works should be undertaken within 150m of any holts at which breeding females or cubs are present. Following consultation with NPWS, works closer to such breeding holts may take place - provided appropriate mitigation measures are in place, e.g. screening and/or restricted working hours on site.
- No wheeled or tracked vehicles (of any kind) should be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance should also not take place within 15m of such holts, except under licence.

7.11 Conclusion & Summary

Table 7.19 Summary of Biodiversity Considerations for the Proposed Routes Options A, B, C, D and E.

Ecological receptor	Summary of Potential Constraints/Impacts				
	Route A	**Route B**	**Route C**	**Route D**	**Route E**
Designated Sites	Travels along public roads within St Gobnets Wood SAC and is hydrologically connected. Travels within the Mullaghanish to Musheramore Mountains SPA mainly within roads/tracks but some off-road sections within the SPA are proposed. Direct potential impact to the SPA due to loss of habitat within the SPA that is of value to the hen harrier from off-road sections of Route A.	Hydrological connectivity to Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC. Route B does not run through or adjacent to any designated sites apart from the sections in common with Route A.	Route C does not run through designated site but is close to and hydrologically connected to Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC and travels within 82m of the Mullaghanish to Musheramore Mountains SPA.	Route D travels along public roads within the Mullaghanish to Musheramore Mountains SPA. Off road sections are within 500m of the SPA.	Route E does not run through or adjacent to a designated site but is hydrologically connected to St Gobnets Wood SAC & pNHA.
Aquatic Ecology	Drains to Sullane and Foherish catchments. There are fourteen stream crossings along Route A. Annex II Freshwater pearl mussel and Atlantic salmon present within both river systems.	Drains to River Flesk, the Sullane River and the Foherish River. River Flesk is part of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC. Annex II Freshwater pearl mussel and Atlantic salmon present in all three rivers. In total nine potential stream crossings along Route B. Alternative Route B1 stream crossing may be located in area with highest concentration of freshwater pearl mussel in the Sullane.	Drains to River Flesk and the Foherish River. River Flesk is part of the Killarney National Park, Macgillicuddy Reeks and Caragh River Catchment SAC. Annex II Freshwater pearl mussel and Atlantic salmon present within both river systems. In total thirteen potential stream crossings along Route C.	Drains to Garrane stream a tributary of the Foherish River. Route D has one stream crossing over a small tributary of the Garrane stream. Annex II Freshwater pearl mussel and Atlantic salmon present downstream in the Foherish.	Drains to the Sullane River, there are six stream crossings along Route E. Annex II Freshwater pearl mussel and Atlantic salmon present downstream
Habitats	Majority of the route is proposed along the existing road network and forestry tracks meaning significant impacts are focused at river crossings and off-road sections. Potential Annex I habitat on Alternative Route A2 off-road section- blanket bog, dry heat, wet heath. Alternative Route A2 is	Majority of the route is proposed along the existing road network and forestry tracks meaning significant impacts are focused at river crossings and off-road sections. Route B off-road section is on upland habitats (blanket bog, wet heath) and	Majority of the route is proposed along the existing road network and forestry tracks meaning significant impacts are focused at river crossings and off-road sections. Off road sections are located on wet grassland, wet heath/blanket bog close to the	Majority of the route is proposed along the existing road network and forestry tracks meaning significant impacts are focused at river crossings and off-road sections. Off road sections are located on immature conifer plantation close to the Mullaghanish to Musheramore	Majority of the route is along the existing road network meaning significant impacts are focused at river crossings and off-road sections. Off road sections are located on immature conifer plantation and in its early years this forestry type has potential value to hen harriers.

	also within the Mullaghanish to Musheramore Mountains SPA and there is potential for loss of habitat of value to the hen harrier, the SPA's species of special conservation interest.	riparian zones which may support EU Habitat Directive Annex I habitats. Alternative Route B1 stream crossing has potential for loss of riparian woodland in sensitive freshwater pearl mussel area.	Mullaghanish to Musheramore Mountains SPA and have potential value to hen harriers.	Mountains SPA and in its early years this forestry type has potential value to hen harriers.	
Birds	The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Annex I hen harrier, merlin and kingfisher are present. Alternative Route A2 has potential for loss of habitat within the Mullaghanish to Musheramore Mountains SPA of value to the hen harrier.	The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Annex I hen harrier, merlin and kingfisher are present. Alternative Route B1 stream crossing of the Sullane River potential for impact on riparian bird species.	The largest potential for impact to birds is at stream crossings and from the off-road sections of the route. Annex I hen harrier, merlin and kingfisher are present. Off-road sections of Route C are located on wet grassland, wet heath/blanket bog close to the Mullaghanish to Musheramore Mountains SPA and have potential value to hen harriers.	Off road sections are located on immature conifer plantation close to the Mullaghanish to Musheramore Mountains SPA and in its early years this forestry type has potential value to hen harriers.	Off road sections are located on immature conifer plantation and in its early years this forestry type has potential value to Annex I hen harriers. The closest hen harrier SPA Mullaghanish to Musheramore Mountains SPA is located over 6km to the east of Route E. Areas of blanket bog and wet heath that lie adjacent to the road sections of Route E may also have potential for hen harrier and other Annex I species e.g. Merlin. Species specific surveys are required along route to fully identify birds constraints.
Other Fauna	Records for a seven species of bat, Annex II Otter and Kerry Slug. The key concern is the potential for disturbance impacts to Otter and bat species (breeding sites) at and in the vicinity of river crossings. Potential presence of Annex II Marsh Fritillary butterfly will also have to be considered.	Records for a seven species of bat, Annex II Otter and Kerry Slug. The key concern is the potential for disturbance impacts to Otter and bat species (breeding sites) at and in the vicinity of river crossings. Kerry slug preferred habitat is present on off-road sections of Route B. Potential presence of Annex II Marsh Fritillary butterfly will also have to be considered.	Records for five species of bat. The key concern is the potential for disturbance impacts to Otter and bat species (breeding sites) at and in the vicinity of river crossings. Kerry slug preferred habitat is present on off-road sections of Route C.	Records for three species of bat. The key concern is the potential for disturbance impacts to Otter and bat species (breeding sites) at and in the vicinity of river crossings. Kerry slug preferred habitat is present on off-road sections of Route D.	The key concern is the potential for disturbance impacts to Otter and bat species (breeding sites) at and in the vicinity of river crossings. Kerry slug habitat is present on off-road sections of Route E. Potential presence of Annex II Marsh Fritillary butterfly will also have to be considered.

7.12 References

Mc Donnell, R.J. and Gormally, M.J. (2011a). Distribution and population dynamics of the Kerry Slug, *Geomalacus maculosus* (Arionidae). Irish Wildlife Manuals, No. 54. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland
Kearney, J., (2010). Kerry slug (*Geomalacus maculosus* Allman 1843) recorded at Lettercraffroe, Co. Galway. – Irish Naturalists' Journal 31: 68-69.
Mc Donnell, R., O'Meara, K., Nelson, B., Marnell, F., and Gormally M. (2013). Revised distribution and habitat associations for the protected slug *Geomalacus maculosus* (Gastropoda, Arionidae) in Ireland. Basteria (Journal of the Netherlands Malacological Society) 77 (1-3): 33-37
Reich, I., O'Meara, K., Mc Donnell, R.J. and Gormally, M.J. (2012). An assessment of the use of conifer plantations by the Kerry Slug (*Geomalacus maculosus*) with reference to the impact of forestry operations. Irish Wildlife Manuals, No. 64. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
Wilson, M.W., Irwin, S., Norriss, D.W., Newton, S.F., Collins, K., Kelly, T.C. & O'Halloran, J. (2009). The importance of pre-thicket conifer plantations for nesting Hen Harriers *Circus cyaneus* in Ireland. Ibis 151: 332-343. Wilson, M.W., Irwin,

8 Routes preliminary costing

Provided below is a high-level preliminary costing for the various route options. The cost is based on per meter for a standard trench 110kv trench with a depth of 1.2m and a width of 0.6m. This is a high-level cost detail and is indicative of the most advantageous routes and is only indicative on costs and should only give the ratio of costs between routes. A detailed assessment of ground conditions would need to be carried out to give a more accurate cost on all the routes. Table 1 below is based on a previous gridline project. The cable size cannot be called off as the output from the windfarm is unknown. Costing is based on constructability of the route and does not include installation of cable, cable pulling and unforeseen site constraints etc. This report highlights the major pinch points for the proposed routes after a visual inspection. More detail surveys/GPR would need to be carried out to determine a more accurate cost figure. The routes are broken up into different sections to allow for the combination of the routes to determine the most cost effective combined route options for each of the wind farm sites to Ballyvouskill substation

As the route approach the Ballyvouskill Substation there are three possible routes that can be common to all chosen (except Route A). The options contained within the costing takes account of these three options.

8.1 Estimations and Assumptions

It should be noted that as this report is based on a visual site visit assessment, all references to the topography of the land, number of existing services,
The costing for each route assesses each route on the following:

a) Overall Length (m)
b) Standard Trench on Route (m)
c) Non Standard Trench (DPM) (m)
d) Drainage Crossings
e) Joint Bays + Coms & Links Box
f) Directional Drilling / Bridge Crossing
g) Crossing Esb Line
h) Crossing Major Services

The joint bay locations will have to be assessed in more detailed and there location will need to be determined based on the cable design, ground conditions and the practical locations where they can be located without having significant traffic management requirements.

8.2 Possible Routes

The grid connection has been broken down into five possible routes/sub routes. Refer to figure 8.2 for routes lcoations. The five routes are labelled as follows:

- Route A -route outlined in red
- Route B- route outlined in purple
- Route C -route outlined in green
- Route D- route outlined in brown/green and orange (three possible options were reviewed)
- Route E- route outlined in brown

These routes are combined to form and overall route for various options that are discussed further (refer to section 8.3. In order to allow for more options and allow flexibility for future options to be assessed, the above routes have been costed individually along with part of the routes. These routes costs are as follows:

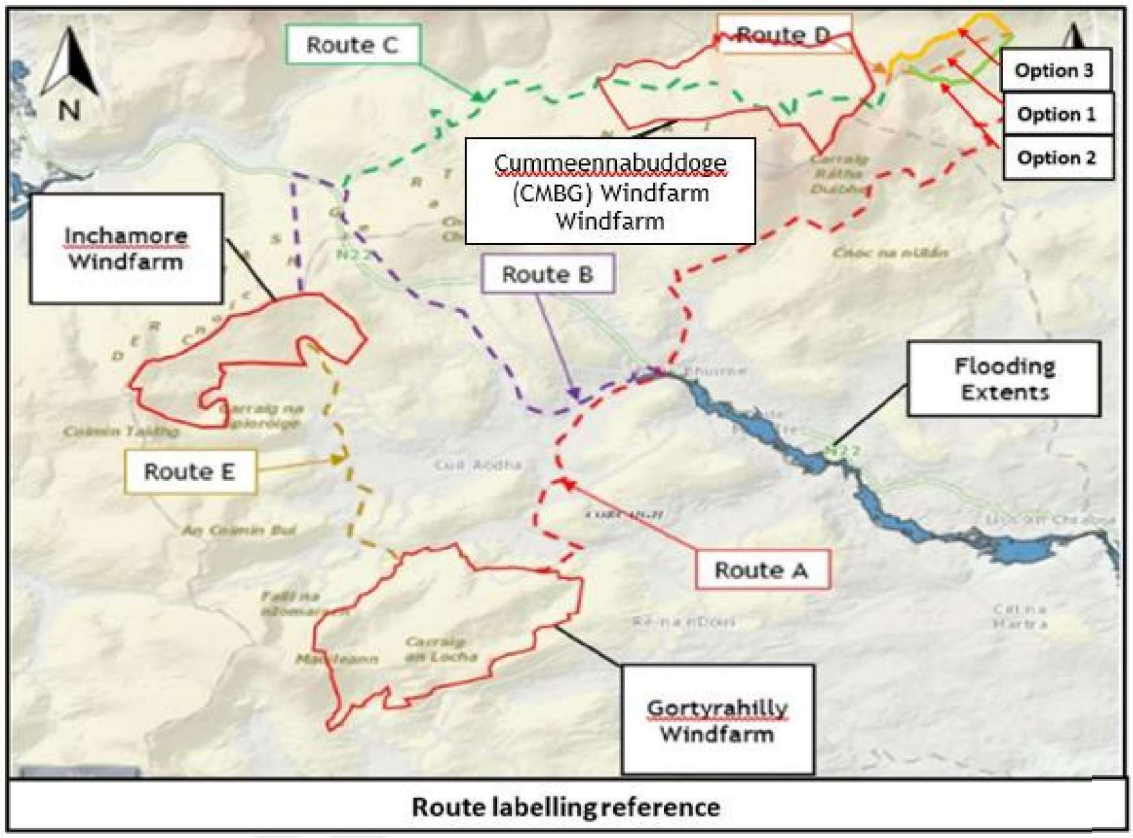


Figure 9-2 - Windfarm locations and Bridge crossing locations

These routes/sub routes have been combined into the following options and are viewed the most advantageous routes for the various options required by Coillte

- **Option 1:** Route A Cost From Gortyrahilly wind farm to Ballyvouskill Substation
- **Option 2:** Route from Inchamore to Cummeennabuddoge (CMBG) to Ballyvouskill Substation
- **Option 3:** Route from Inchamore to Gortyrahilly to Ballyvouskill Substation and Cummeennabuddoge (CMBG) to Ballyvouskill Substation
- **Option 4:** Route from Gortyrahilly and Inchamore to Cummeennabuddoge (CMBG) to Ballyvouskill Substation

The following table give the cost for each of the routes. For the options refer to section 9.0 which combines the relevant routes or sections to route to give the overall cost of the options noted above.

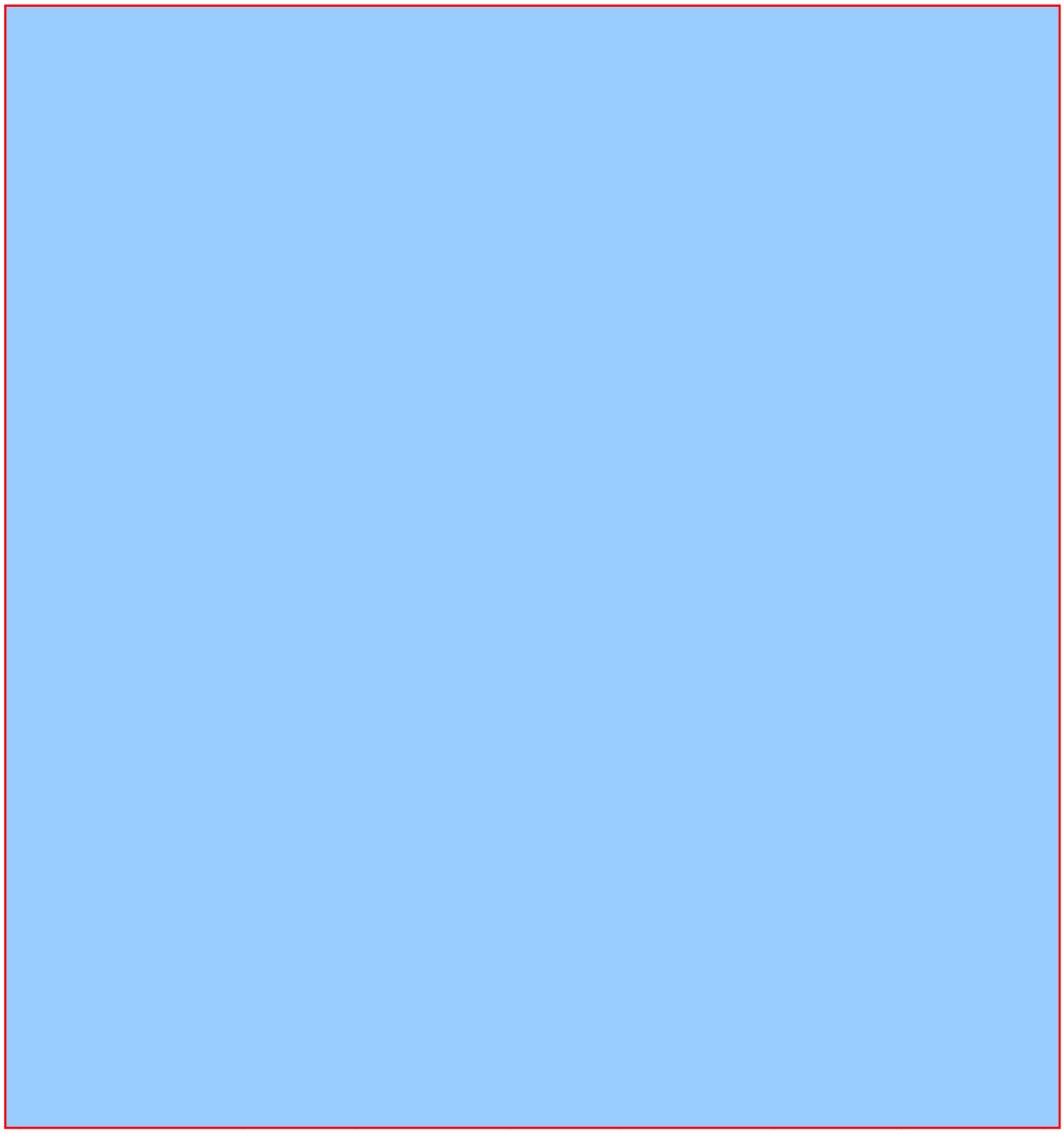


Table 1: Costing table for each of the routes
***Refer to Figure 1 and Figure 5-1 for route extents as reference in each route*

9 Combined Route Options

The following reviews the various combinations of routes cost as discussed in section 8. The primary function of this is to assess the various options. The cost table includes reference to routes as labelled on Figure 1.0 and Figure 5.1. Each of the following figures will contain these two figures for ease of reference, the route being assessed and the cost for the route.

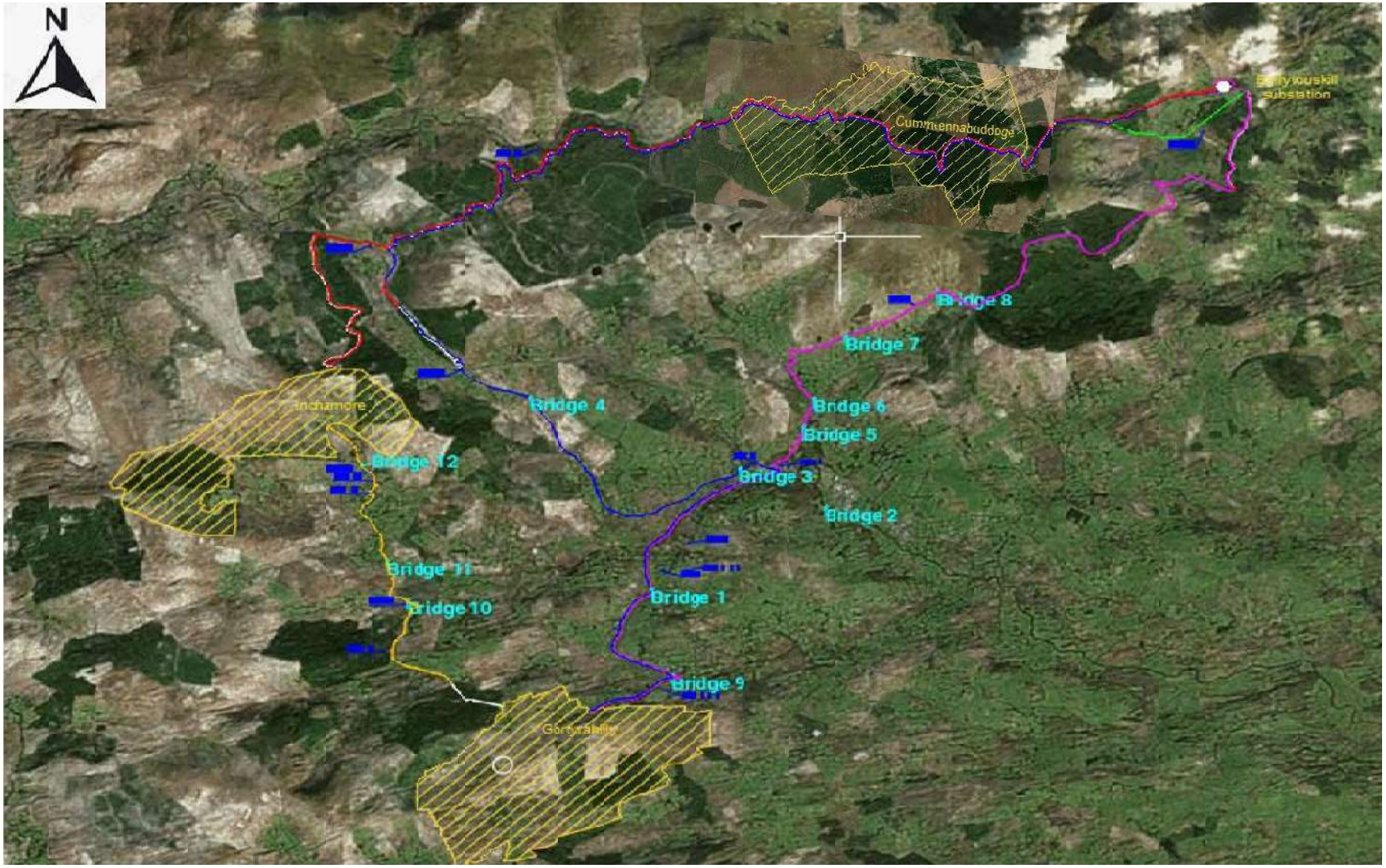


Figure 9-2 – Windfarm locations and Bridge crossing locations (Refer to Appendix D for reports and images of the Bridges)

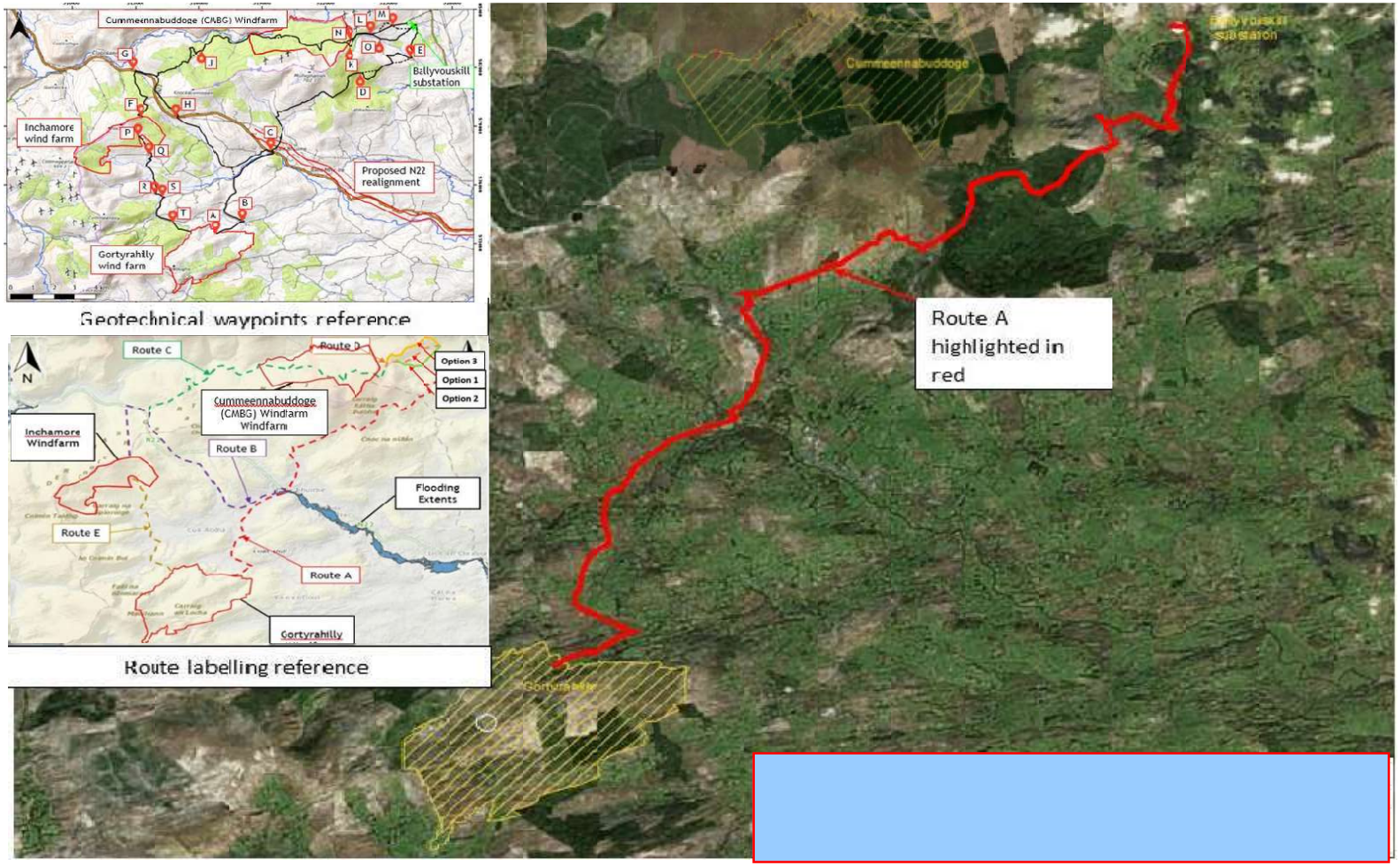


Figure 9-3 – Option 1: Route A Cost From Gortyrahilly wind farm to Ballyvouskill Substation

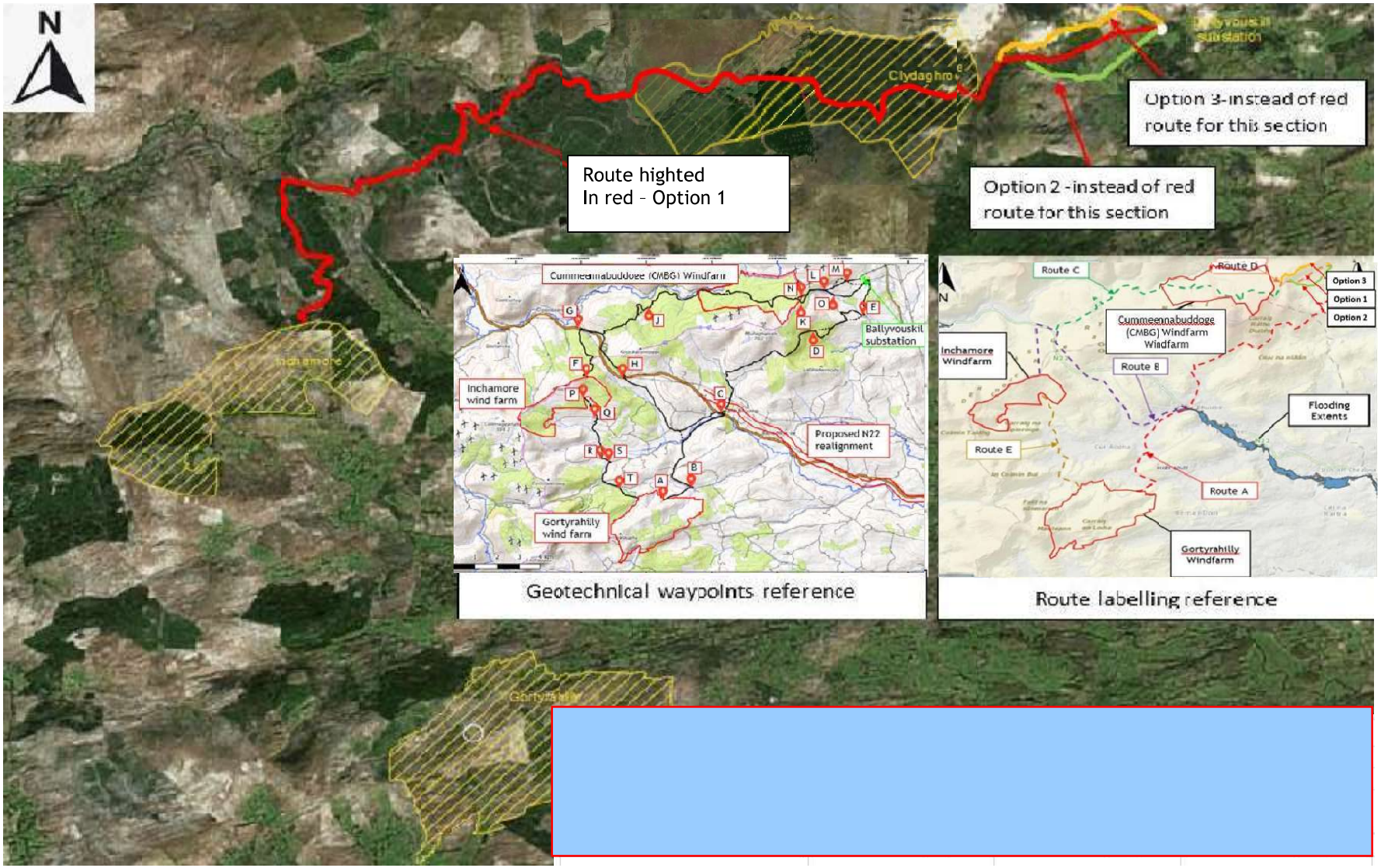


Figure 9-4 – Option 2: Route from Inchamore to Cummeennabuddoge (CMBG) to Ballyvouskill Substation

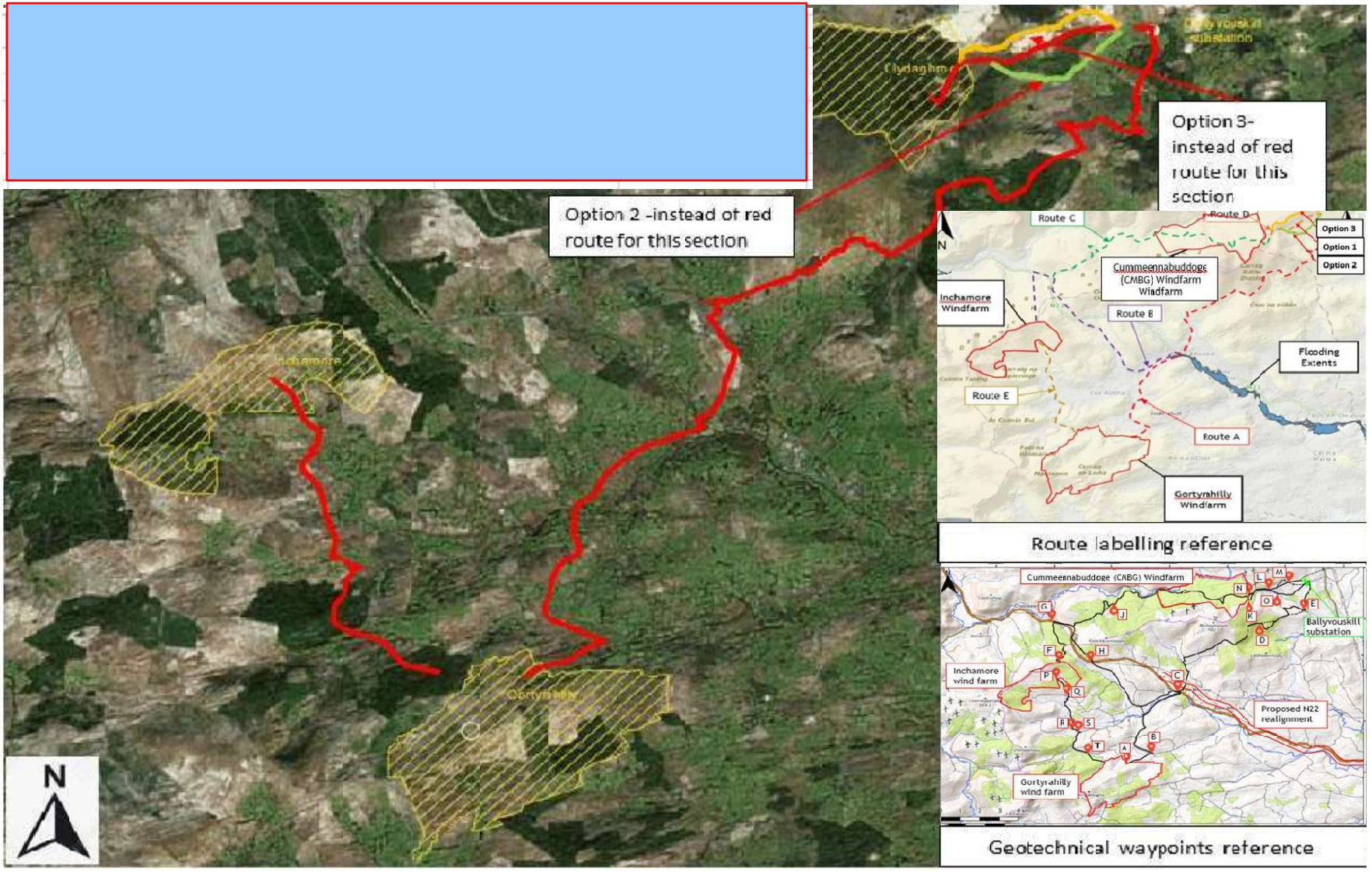


Figure 9-5 – Option 3: Route from Inchamore to Gortyrahilly to Ballyvouskill Substation and Cummeennabuddoge (CMBG) to Ballyvouskill Substation

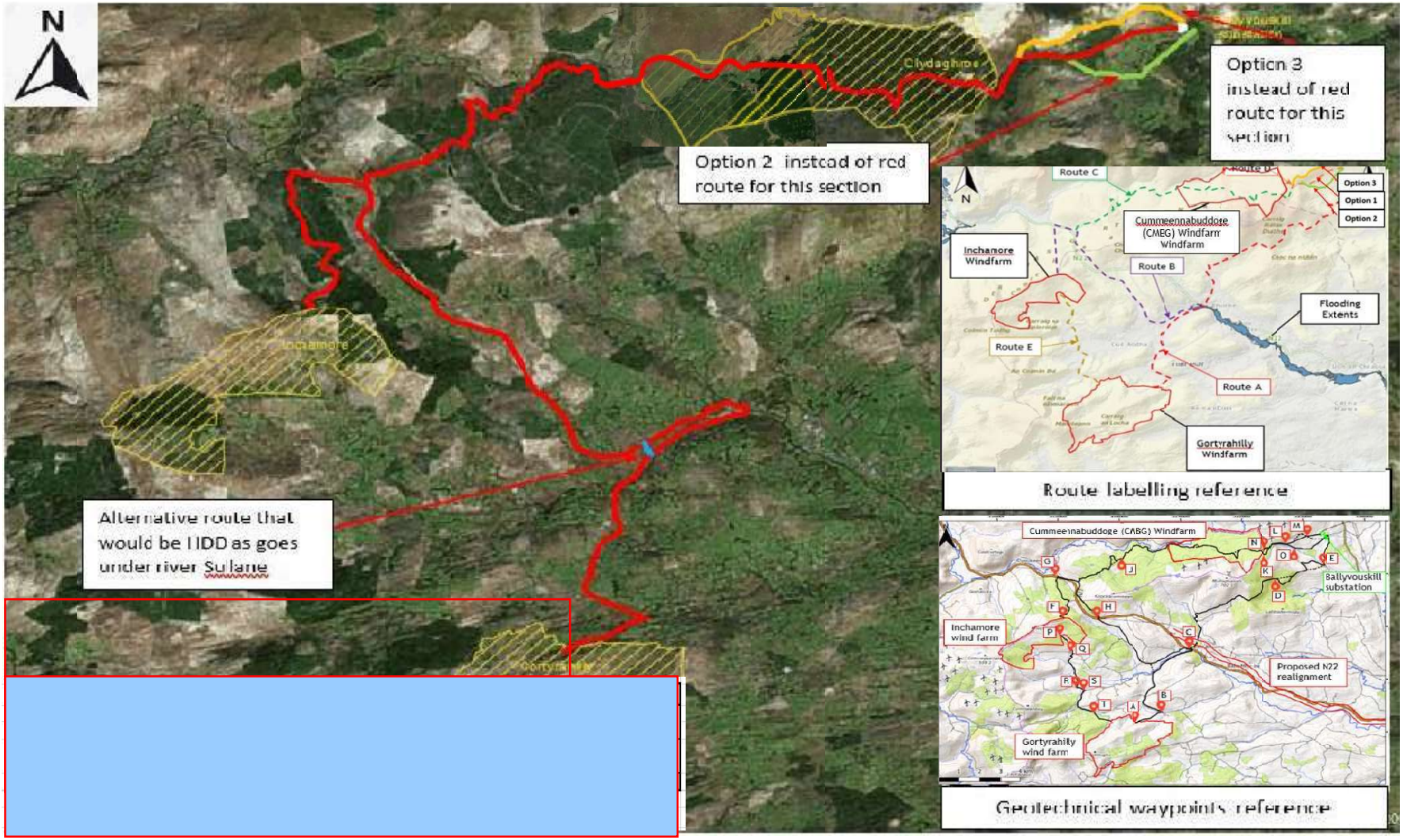


Figure 9-6– Option 4: Route from Gortyrahilly and Inchamore to Cummeennabuddoge (CMBG) to Ballyvouskill Substation

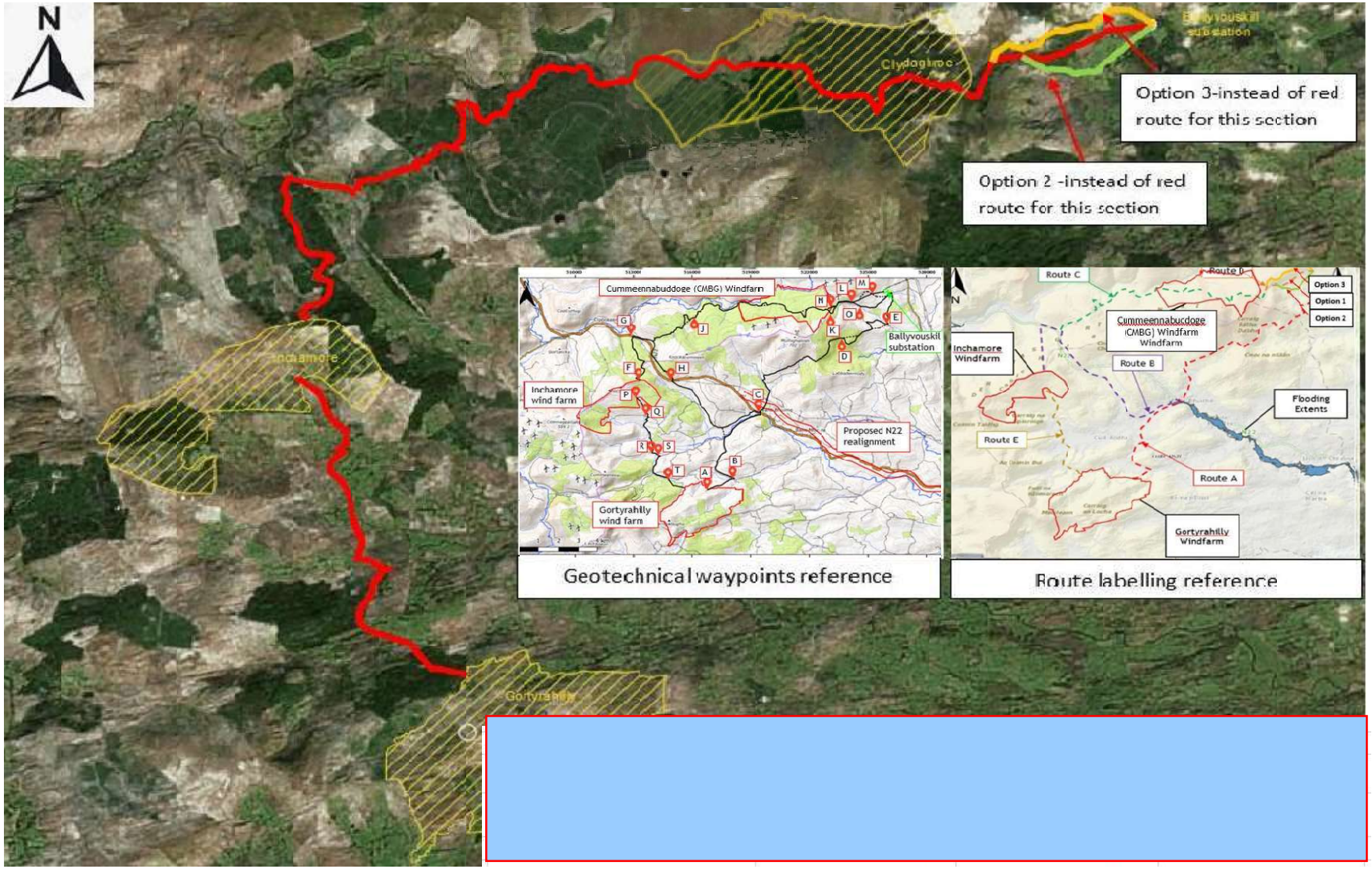


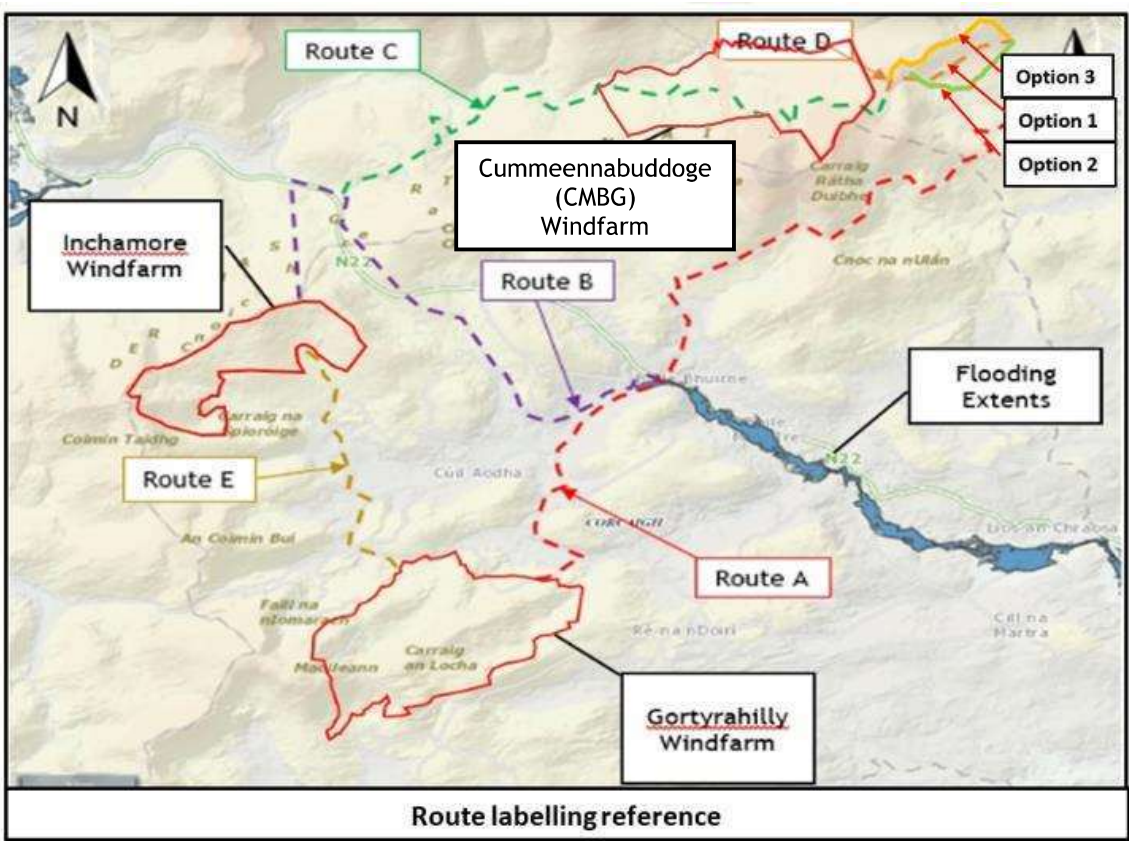
Figure 9-6– Option 5: Route from Gortyrahilly to Inchamore to Cummeennabuddoge (CMBG) to Ballyvouskill Substation

10 Conclusion and Recommendations

Following our site investigation and a review of the information obtained, we conclude that the most feasible routes are as follows. Please see the below in respect to drawing No. 201-164-001/005 (Refer to Appendix A). Figure 10.1 gives a sketch of the routes as discussed below.

The grid connection has been broken down into five possible routes

- Route A
- Route B
- Route C
- Route D
- Route E



Each route is assessed separately. As noted previously the combination of these routes give the five options as discussed above. The options of the combined routes are costs in section 9.0. These options combined routes which are then assessed through a risk matrix.

Route A:

This is the second longest route of the five options. There are 6 bridge crossing along the route which will subject to further investigation have to be crossed by directional drilling. The Macroom to Milstreet bypass will pass over this route just beyond the village of Ballyourney. Services associated to these works

have not appeared on the record drawings obtained but are visible after walking the route. Based on a visual inspection of the route, we identified 5 notable drainage crossings. A detailed survey would need to be carried out to determine a more accurate figure. Due to the overall length and the surrounding ground conditions this route is not the most feasible out of the five but is still a possibility.

Risks associated with Route A

The main risks associated with the constructability of Route A is the Macroom to Milstreet bypass, although the drawings suggest there is a fly over at the location where the route is proposed it would cause some difficulty. There are also existing cables on the route which would require adequate separation from the trench and would also depend on what service is in the trench for separation distances. Although there are sections of this route with steep gradients, it is not anticipated to affect the constructability of the route. A separate assessment would be needed for maximum pulling tensions on the cable and that would be confirmed with a level survey.

Route B:

This is the longest option out of the five. There are 6 bridge crossings located along this route, which, subject to further investigation, will require directional drilling to route the cable under them. There appears to be bog present along sections of the route which may require a geotextile material to be incorporated into the trench design, thus increasing the overall cost. Based on a visual inspection of the route, we identified 10 notable drainage crossings. Again, a more detailed survey would need to be carried out to determine a more accurate figure. In terms of construction feasibility, there is an existing ESB HV underground cable which will require crossing. This may arise to constructability issues. One of the bridge crossings is listed as a protected structure (Bridge 2) and due to the road layout may be difficult to directional drill.

Risks associated with Route B

The main risks associated with the constructability of ROUTE B are the 6 no. bridge crossings and the potential for bog when ducting through the Coillte forestry tracks. One of these crossings is listed as a protected structure and would pose difficulties working on or adjacent to it. One bridge crossing has a significant elevation change from one side to the other making directional drilling difficult to achieve. Please see Appendix D for detail bridge reports. To make this route the most feasible the use of private lands would be needed as shown in alternative routes to avoid the village of Ballyvourney and the listed bridge in the town.

Route C

This route only provides an outlet for the cable of the Inchamore windfarm and does not include Gortyrahilly. There is one small bridge where directional drilling will be required. The capacity of this bridge is unknown, therefore, pending further investigation and inspection, this bridge may need to be replaced to accommodate construction traffic see bridge reports in Appendix D This may be an issue during construction unless the required separation can be achieved.

Risks associated with Route C

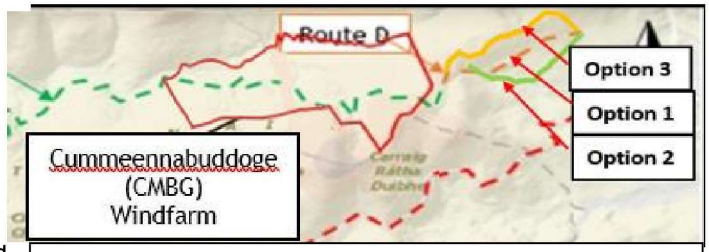
The main risks associated with the constructability of ROUTE C is that is not future proofing the windfarms around it and is a standalone cable route. Please see drawing 201-164-001/005 for details (Refer to Appendix A).

Route D

This is a direct route from the proposed Cummeennabuddoge (CMBG) windfarm to Ballyvouskill substation. To make this route feasible you would require approx. 533m of a wayleave to be purchased. If this deal is not possible you will have to run the cable down the existing road which already has cables feeding into Ballyvouskill Substation see images 2-6.

Risks associated with Route D

Main risks associated with Route D are the existing cables in the road. This is If an agreement is not made with the adjacent landowners to go directly to Ballyvouskill substation.



Routes D - three route options to Ballyvouskill substation

There are three options for route D that connect into the Ballyvouskill substation. While all options have relatively the same cost and risk rating it should be noted that there other factors that would need to be take out. This were considered during PUNCH assessment but would need further investigation to determine the magnitude of the risk and impact on cost. The option (red route) would require the existing road from Clydaghoe. As this is more than likely an existing the cable from the current power station the option of having two cable in this narrow road would be a significant risk. The other option is to keep the route with the green option which would not be as congested. An alternative to both options is Option 3 (orange route). A more detail location of the route is shown in Figure 10.2.1 below by the blue dotted line. This map was taken from land direct and shows that there is an existing wayleave for part of this route. Further investigation into ownership and is the Cummeennabuddoge (CMBG) existing windfarm is using this route.

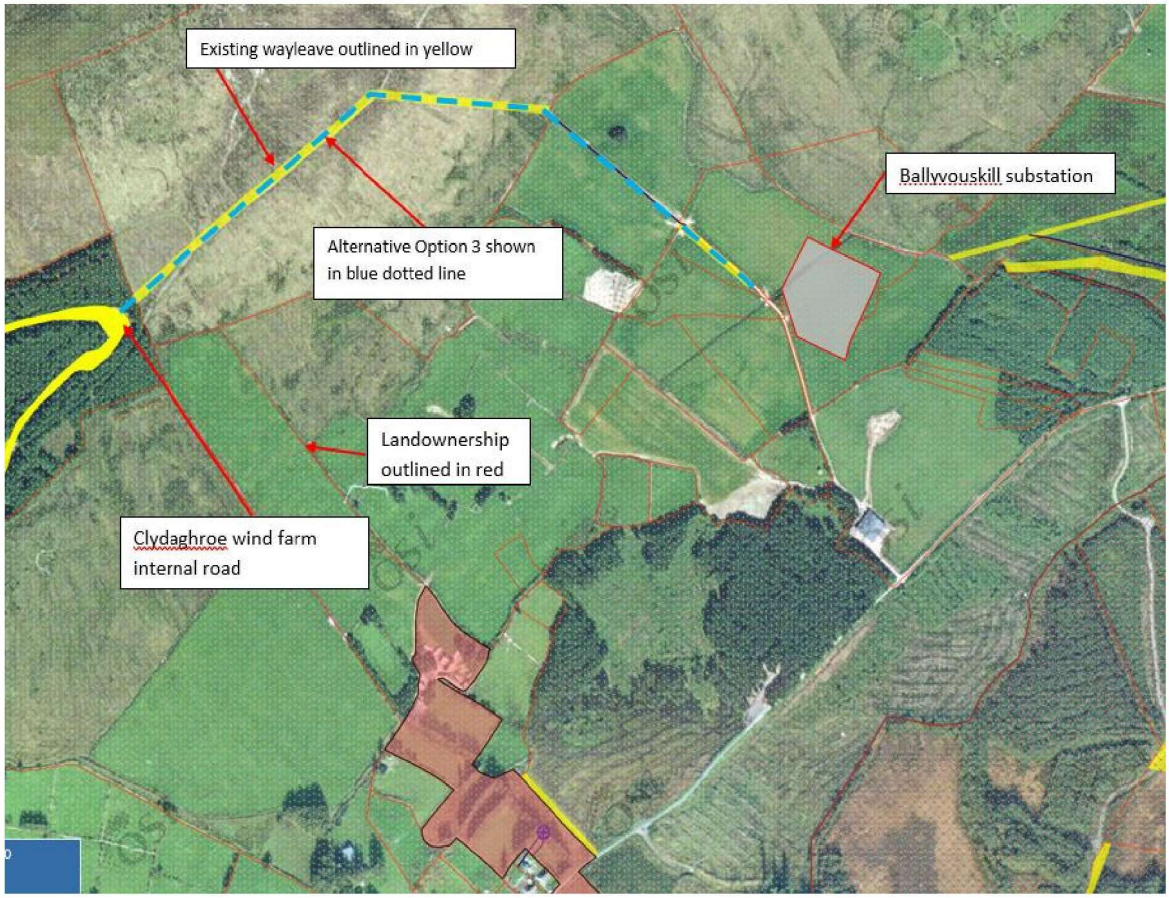


Figure 10.2.1– Route noted Option 3 in Figure 9-2 to 9-5 Aerial view (From Cummeennabuddoge (CMBG) to Ballyvouskill Substation)

Route E

This route is an option if Gortyrahilly windfarm could be built in conjunction with Inchamore. There is 3 bridge crossing along the route which will have to be crossed by directional drilling. The roads are very narrow in places and may require additional road widening to accommodate construction vehicles.

Risks associated with Route E

Main risks are the existing cables in the road as highlighted in images 52 to 54 and will only work if there is a substation built in Inchamore to take the cable before eventually going to Ballyvouskill substation through the Coillte lands.

10.1 Bridge Inspection Reports (Refer to Appendix D)

As part of the preliminary assessment PUNCH carried out a Bridge Inspection report for each of the bridges that would be crossing the proposed grid line route. The detailed report outlines the condition of the bridge and includes measurements of the key features. Each bridge is visual inspected and an Eirspan rating for each component is included in the report. There are 12 bridges in total that were inspected. The location of these bridges can be found in the layout drawings in Appendix A of this report. The number of bridges on each of the roots are indicated in the following table:

	Route A	Route B	Route C	Route D	Route E
Substation Destination	Ballyvouskill	Ballyvouskill	Ballyvouskill	Ballyvouskill	Ballyvouskill
Bridge number on route	6	4	0	0	3

Table 10.1-1 Number of bridges on each route

10.2 Risk Matrix Table

A review of the information gathered during the survey has been complied into the following risk table.

		Route A	Route B	Route C	Route D	Route E
Substation Destination		Ballyvouskill	Ballyvouskill	Ballyvouskill	Ballyvouskill	Ballyvouskill
No. Protected Bridge Crossings	Number: Rating:	1 12	0	0	0	0
No. Bridge Crossings	Number: Rating:	6 15	2 15	0 0	0 0	3 11
Significant Culvert Crossings	Number: Rating:	5 5	5 7	7 7	0 5	5 1
HV Cable Crossings	Number: Rating:	5 7	11	0	5	8 7
Assumed Steepness Gradient (Rating)		8	10	12	10	10
Existing Services (Rating)		8	0	0	0	8
Road Width & Access (Rating)		11	11	8	8	12
Bog Present (Rating)		4	7	12	12	6
Environmental		11	11	15	11	11
TOTAL		81	61	54	46	66

Rating ---------> low / High	Severity			
	Low	Medium	High	Very high
	1	6	11	16
	2	7	12	17
	3	8	13	18
	4	9	14	19
	5	10	15	20

To compare to overall risk ratings for each option that combines the different routes reference should be made to table 10.2.1 below. This also gives an indication of the cost for each option relative to the to rating.

10.2.1 Cable Route Recommendation

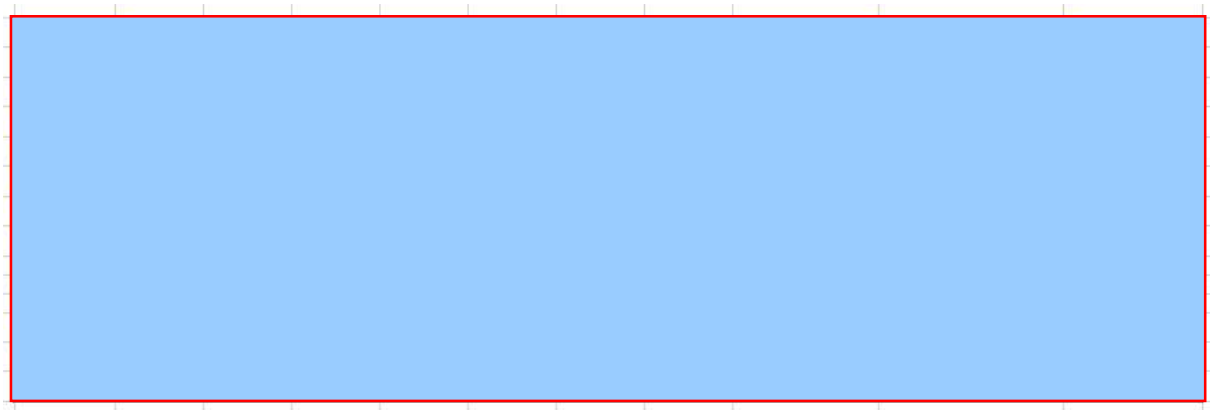


Table 10.2-1 Options cost and Risk rating Comparisons

On review of the above the main Option that delivers on connecting all windfarms, cost and relative risk is Option 5. While option 5 (similar to the other routes) has high environmental risk from the desktop study, a more detailed field study would need to be carried out to determine the realisation of these risks. There is the option to move the route labelled C further south and form a cut through the forestry if the Hen harrier habitat is near the route. However, this would increase costs.
This in combination with a detail geotechnical appraisal of the route to better quantify the trench details and cost along with working in close proximity to steep slopes. There are also less bridges on this route and a lot of the route is within Coillite lands. Refer to drawings of route in Appendixes.
In order to ensure that Option 5 is the most viable route to meet the clients brief additional testing and surveys will need to be carried out to ensure the risk identified and outline costs assumed are correct.

Disclaimer

1. This report is based on a visual inspection only, and the publicly accessible information from utility providers and government sources.

2. No form of opening up works and/or uncovering or exposing of any surfaces was undertaken and therefore, we are unable to report that such parts are free from defect.

3. This report and its contents have been prepared and is intended solely for use by Brookfield Renewable Energy Group and should not be used or relied upon wholly or partly by any third party without the prior written consent and approval of the report writer.

4. The report is solely based on the condition of the route at the time of the inspection and therefore, no liability is accepted for any deterioration or otherwise, of the route thereafter.

5. The report does not address any items whatsoever with regard to planning permission, site boundary conditions, legal maps and/or rights of way and therefore, is deemed to be outside the scope of this report.

6. The report does not address a detailed flood risk assessment with regard to flood risk due to rainfall events or the proximity to natural features and therefore, is deemed to be outside the scope of this report.

7. The preliminary costing is based on similar grid connections from windfarms to substations but are high level costing and should only be used as a preliminary guide to route selection as the figures are subject to change with the latest ESBN and EirGrid spec. The costing associated with the constructability of the proposed routes is not included in this document. I.e. road width, traffic management etc. This may affect the total cost associated with each route.

11 Conditions of Engagement

This survey and report were undertaken under the conditions of engagement Agreement RA9101 For the Appointment of Consulting Engineers for Report and Advisory Work Published in agreement with The Association of Consulting Engineers of Ireland

12 References

Environmental Protection Agency, 2020. Online mapping portal - Water from https://gis.epa.ie/EPAMaps/Water [Accessed 09/07/2020].

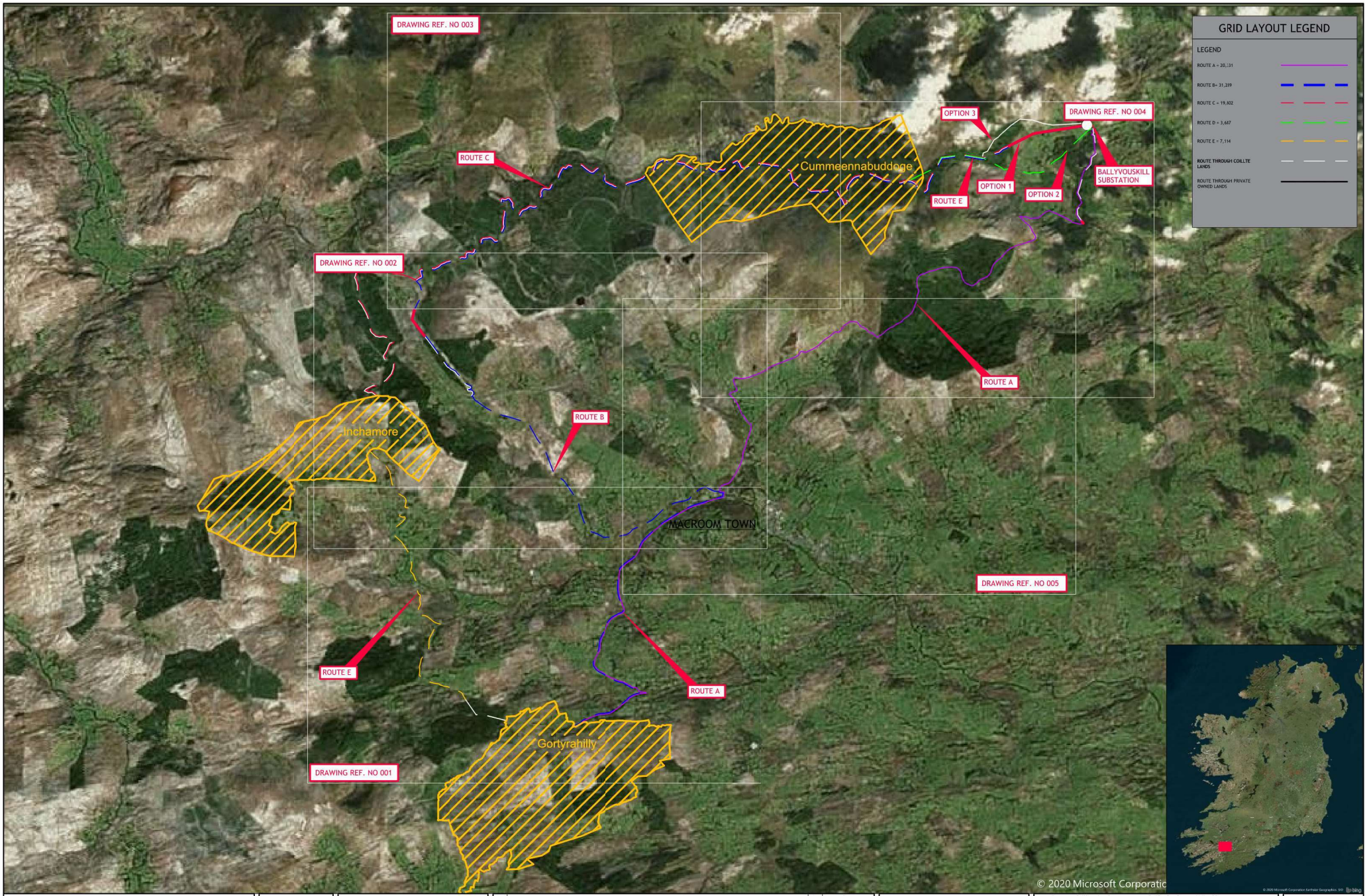
Geological Survey Ireland, 2020. Online mapping portal from https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [Accessed 09/07/2020]

Office of Public Works, 2020a. Online flood mapping portal from http://www.floodmaps.ie/View/Default.aspx [Accessed 09/07/2020].

Office of Public Works, 2020b. Online mapping portal - Flood maps from https://www.floodinfo.ie/map/floodmaps/ [Accessed 09/07/2020].

Office of Public Works, 2020c. Online mapping portal - Flood plans from https://www.floodinfo.ie/map/floodplans/ [Accessed 09/07/2020].

Appendix A Cable Route Drawings



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Drawn By:	C.NGan
Date Issued:	2021-01-05
Issued By:	C.NGan

Rev.	Amendment	By	Date

Client:

Job: Gortyrahilly, Inchamore and Clydaghroe Windfarms
Title: OVERVIEW

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Engineer Check:	A. O CONNELL
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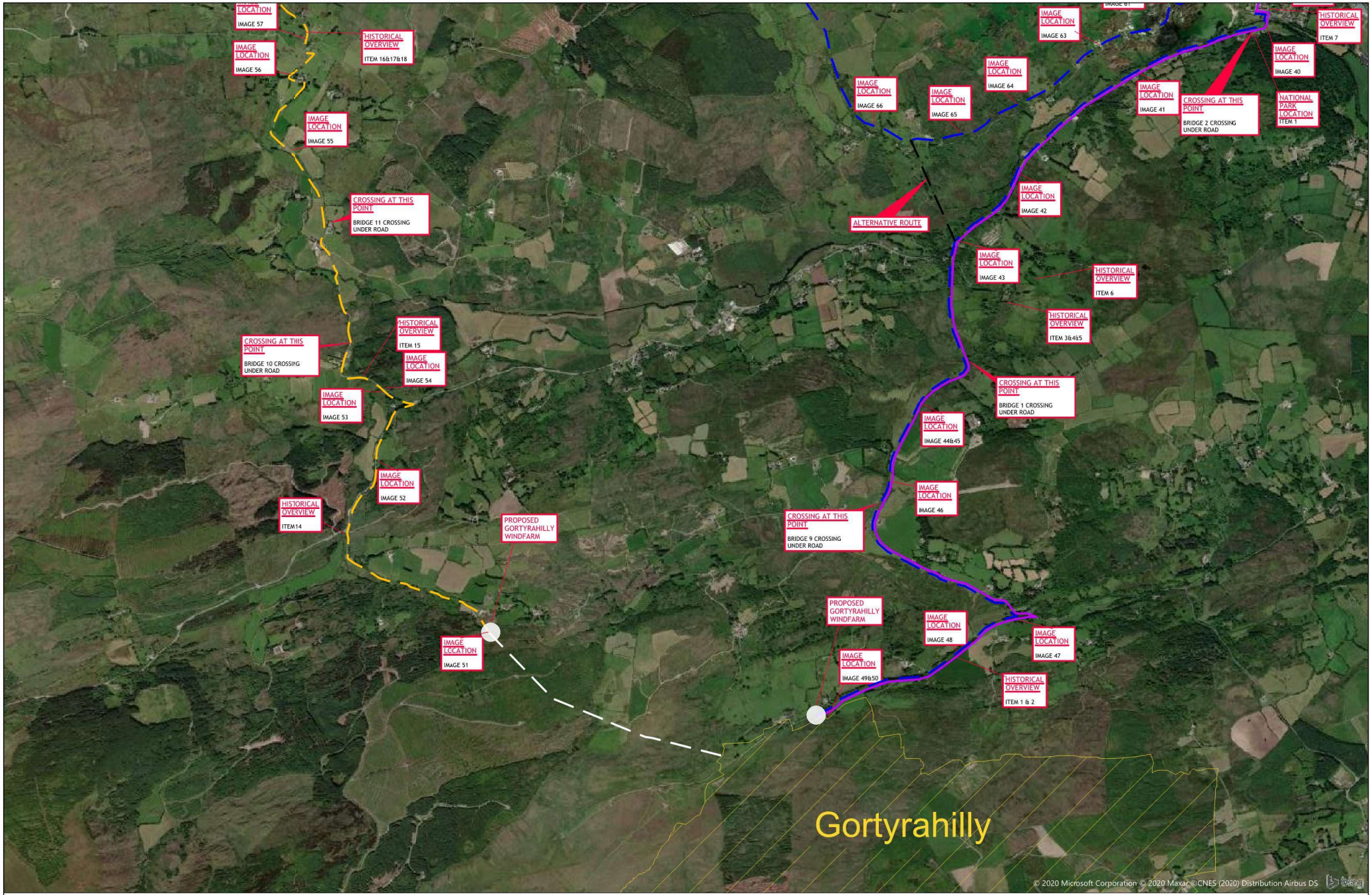
Drawing No:	201-164-008
Rev:	PR0



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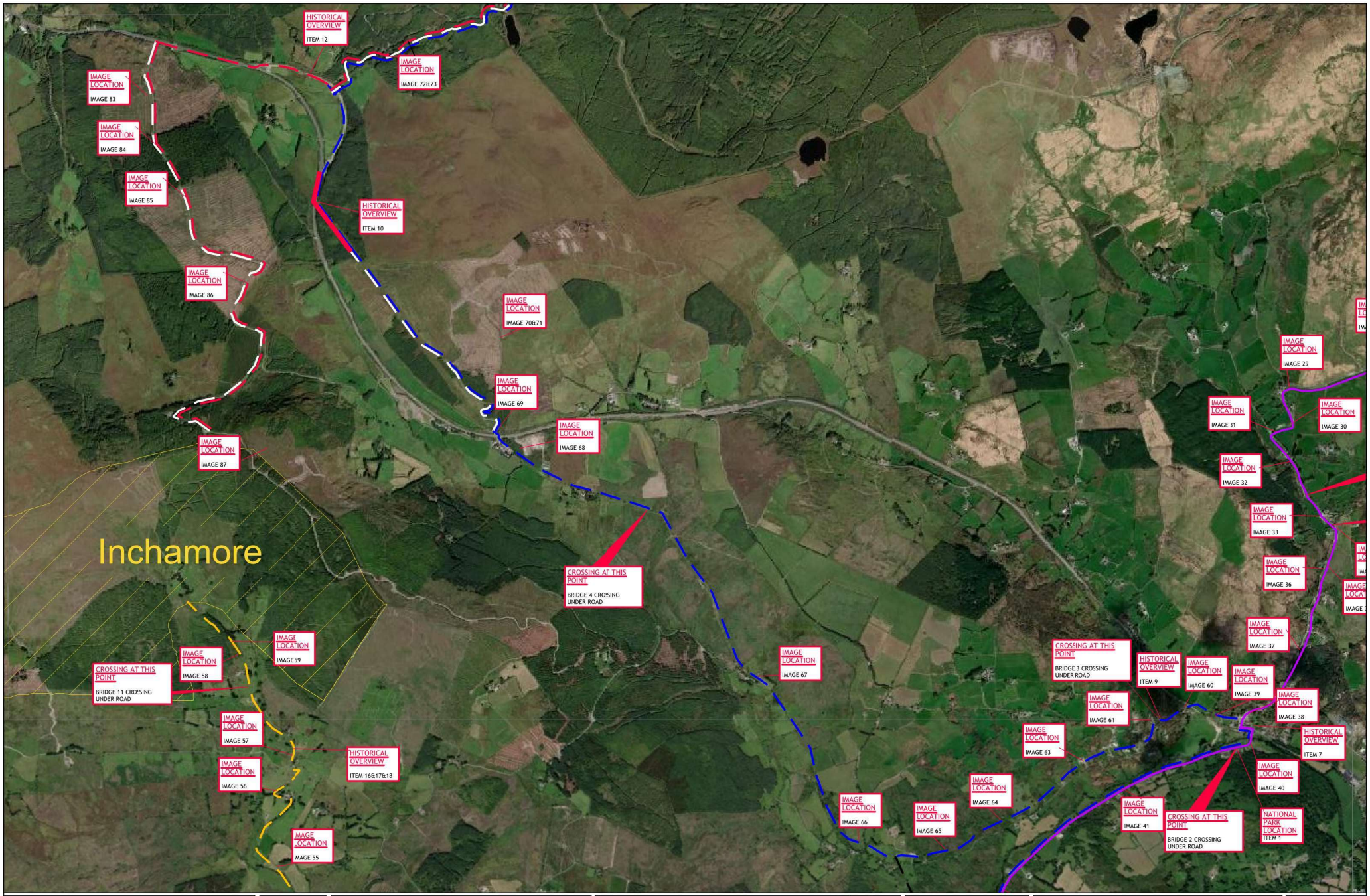

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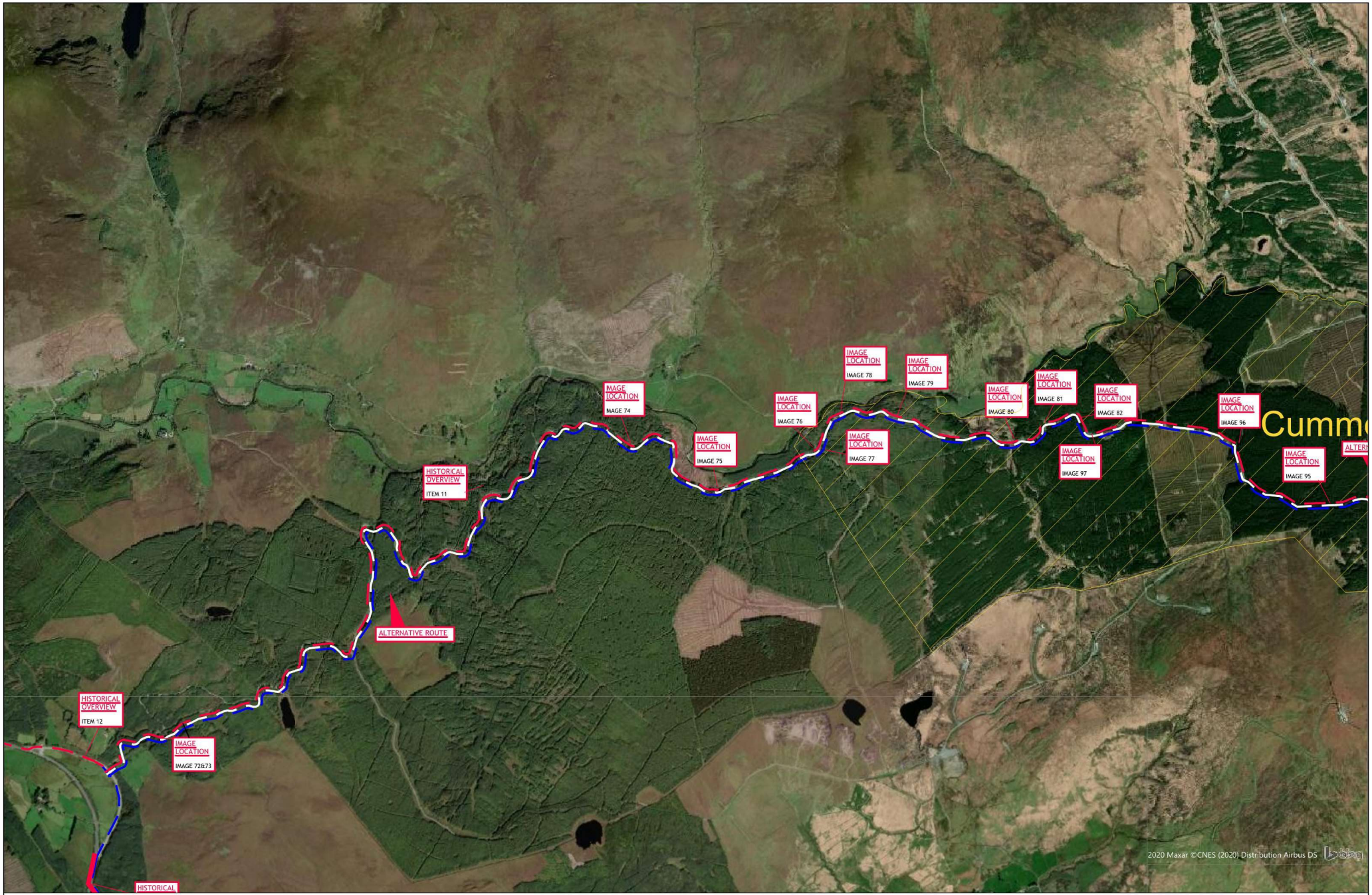

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Job: Gortyrahilly, Inchamore and Cummeennabuddoge Windfarms

Title: DUE DI..LENGENCE CABLE OVERVIEW SHEET 3/5

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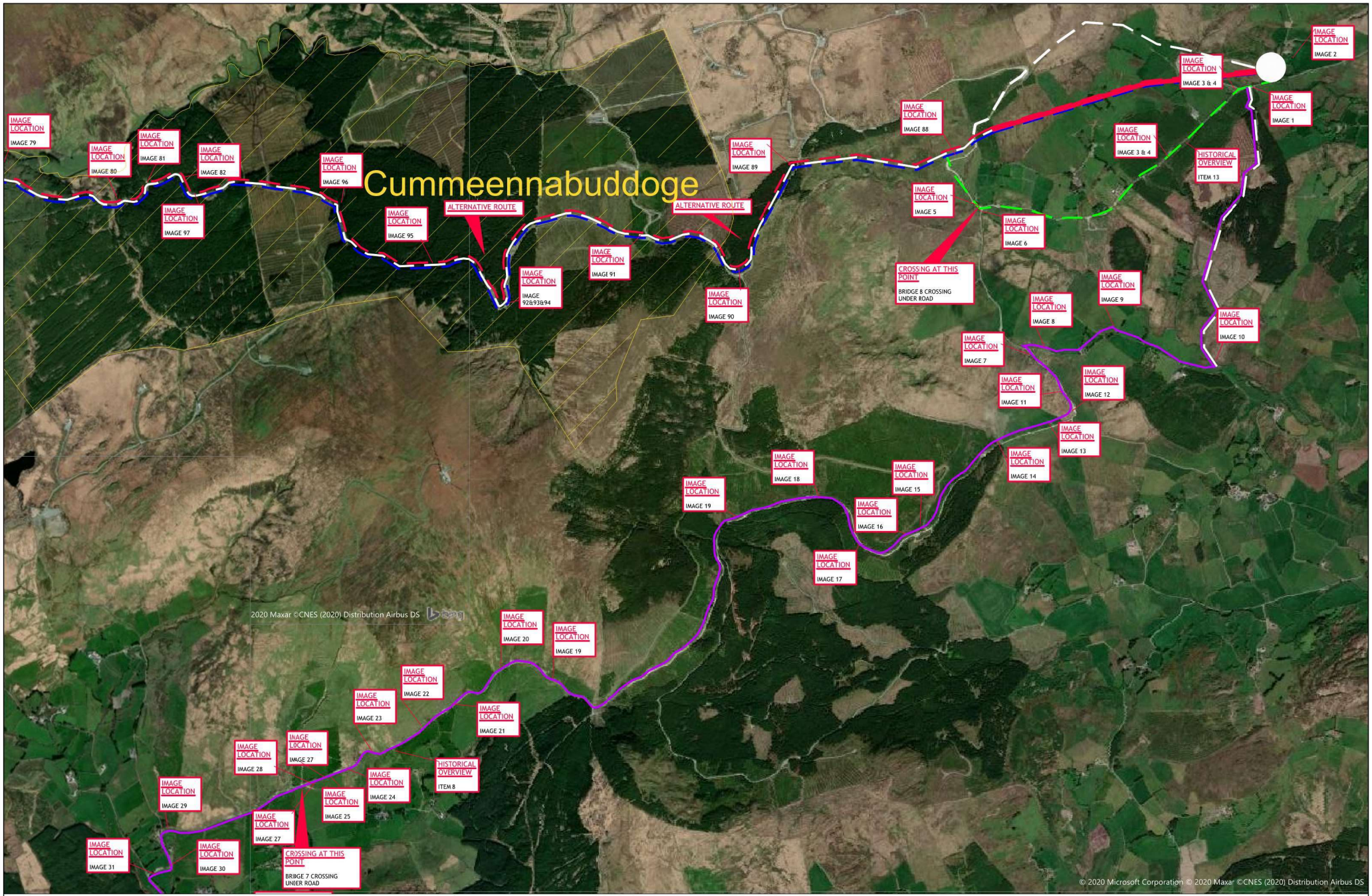

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Client:

Job: Gortyrahilly, Inchamore and Cummeennabuddoge Windfarms

Title: DUE DI..LENGENCE CABLE OVERVIEW SHEET 4/5

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Engineer Check:	A. O CONNELL
Approved:	D. Gallery
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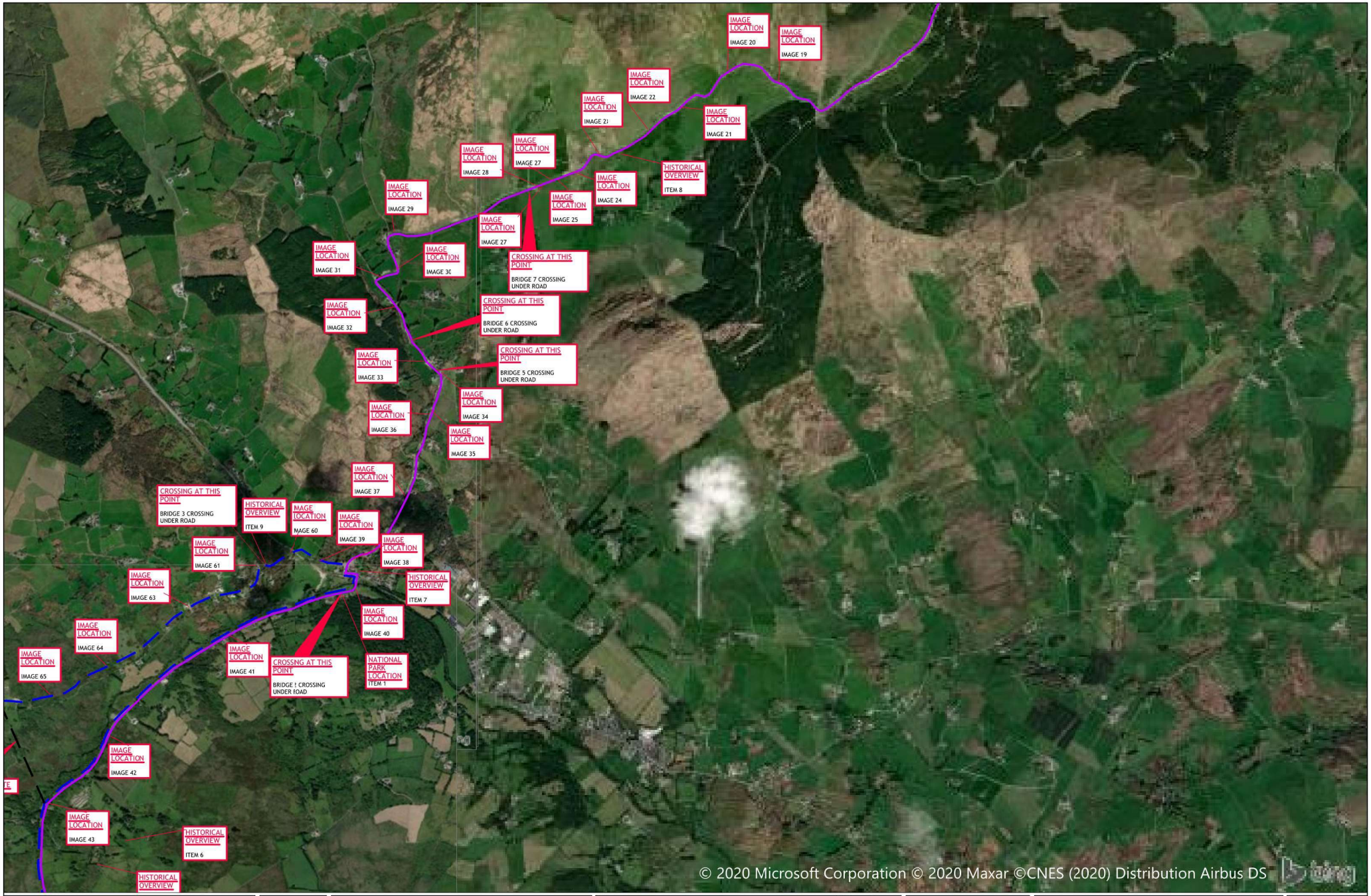
Rev:	PR1



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Rev	Amendment	By	Date
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Client:

Job: Gortyrahilly, Inchamore and Cummeennabuddoge Windfarms

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Technician Check:	P.J. Mulcahy
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Approved:	D. Gallery
Drawing No:	201-164-005
Rev:	PR1

Appendix B Route Photographs (Refer to drawings 201-164-001/005 for location)

Image : 1
Coillte forestry Track

Image : 2
Water course crossing beneath the road.

Image : 3
Existing cable running down road

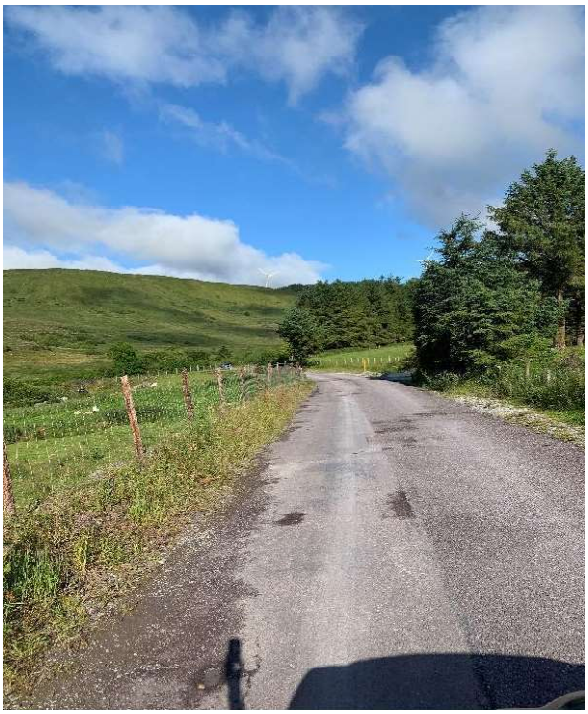


Image : 4
Existing cable crosses road to RHS before entrance to the existing windfarm entrance

Image : 5
Entrance to existing windfarms

Image : 6
Stream crossing under road at this point

Image : 7

Image : 8

Image : 9
Mature trees and unmaintained hedgerows either side of the road

Image : 10
Private land crossing river into Coillte owned property

Image : 11
Possible joint bay location of existing cable running in the road

Image : 12
Joint bay on the road here with a links box and communications chambers visible.

Image : 13
Possible location of joint bay which has had the covers tarred over.

Image : 14
Two twin wall drainage pipes crossing under road. Depth of cover approx. 500mm

Image : 15
Ebs marker post pictured along road edge before another possible joint bay location

Image : 16
Joint bay on the road here with a links box and communications chambers visible.

Image : 17
Joint bay located at this point

Image : 18
Joint bay on the road here with a links box and communications chambers visible.

Image : 19
Storm water pipe crossing under road at this location

Image : 20
Storm water pipe crossing under road at this location

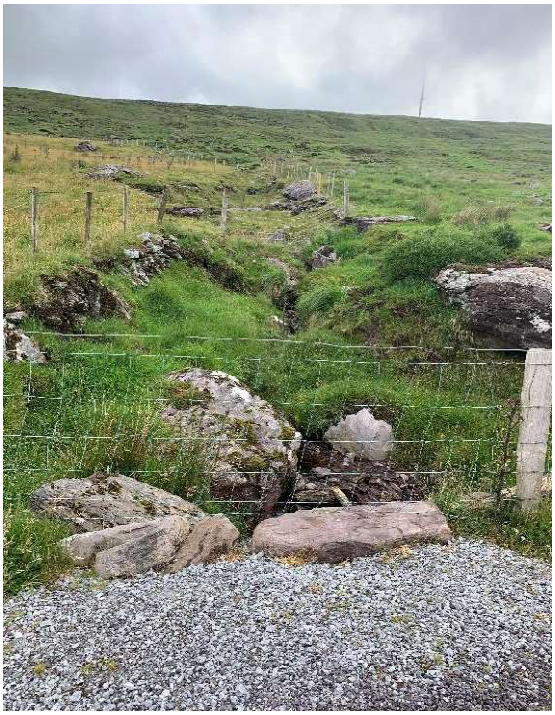


Image : 21
Storm water pipe crossing under road at this location

Image : 22
Joint bay visible at this location

Image : 23
Storm water pipe crossing under road at this location

Image : 24
Storm water pipe crossing under road at this location

Image : 25
Storm water pipe crossing under road at this location

Image : 26

Image : 27
Esb cable maker visible on the RHS of the road edge.

Image : 28
Joint bay on the road here with a links box and communications chambers visible.

Image : 29
Storm water pipe crossing under road at this location

Image : 30
Joint bay on the road here with a links box and communications chambers visible.

Image : 31
Joint bay on the road here with a links box and communications chambers visible

Image : 32
Storm water pipe crossing under road at this location.

Image : 33
Esb cable maker visible on the RHS of the road edge.

Image : 34
Esb cable maker visible on the LHS of the road edge.

Image : 35
Storm pipe crossing under road as this location

Image : 36
Visible trench scar crossing road at this location

Image : 37
Joint bay on the road here with a links box and communications chambers visible.

Image : 38
Visible services in the village of Ballvourney

Image : 39
Visible services in the village of Ballvourney

Image : 40
Bridge crossing over the River Sullane heading towards Gortyrahilly

Image : 41
Joint bay on the road here with a links box and communications chambers visible.

Image : 42
Joint bay on the road here with a links box and communications chambers visible.

Image : 43
Road goes from double carriageway to single as proposed cable route deviates to the right

Image : 44
Mature trees on the RHS of the road here

Image : 45
Mature trees on the RHS of the road at this location

Image : 46
Proposed cable route to travel down the RHS of the road at this junction

Image : 47
Switch back along the purposed cable route

Image : 48
Mature trees along either side of the road

Image : 49
Site Notice for Mast at Gortyrahilly dated March 2019

Image : 50
Approx. location of Gortyrahilly windfarm

Image : 51
Approx. start of Route E

Image : 52
Joint bay on the RHS of the road at this location with a links box and communications chambers visible.

Image : 53
Stone wall to LHS of the road as there is a significant elevation change from the roads surface to the existing ground

Image : 54
Joint bay on the RHS of the road at this location with a links box and communications chambers visible.

Image : 55
Box stone culvert crossing at this location

Image : 56
Existing farm buildings on both sides of the road at this location

Image : 57
Existing farm track that leads to the Inchamore Site

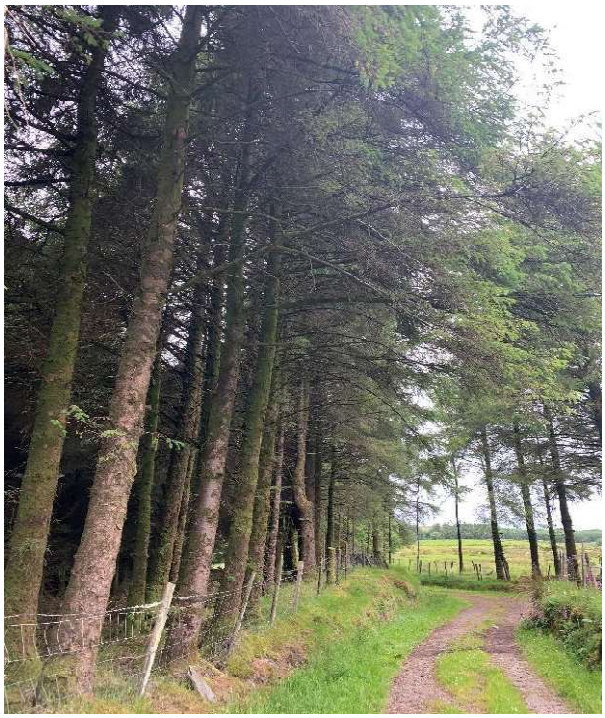


Image : 58
Trees either side of the farmtrack at this location

Image : 59
Approx. location of Inchamore windfarm

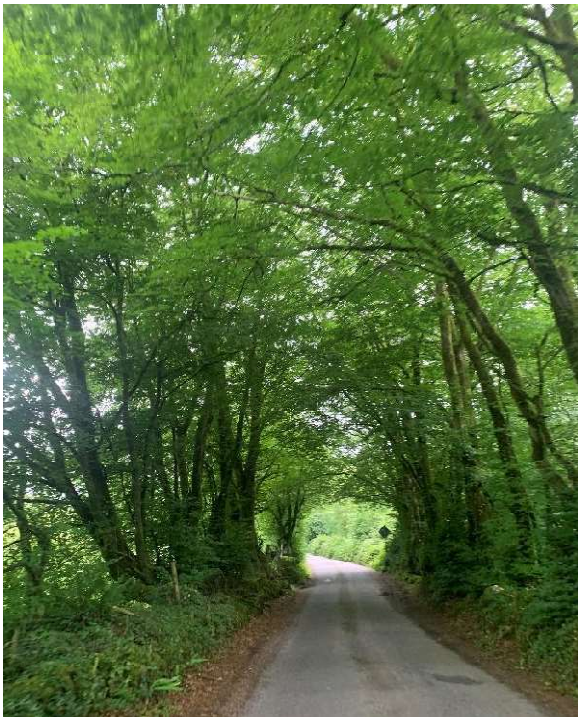


Image : 60
Trees either side of the road at this location

Image : 61
Storm pipe crossing road at stone wall parapet

Image : 63
Storm pipe crossing road at stone wall parapet

Image : 64
Topography of the lands for the alternative route

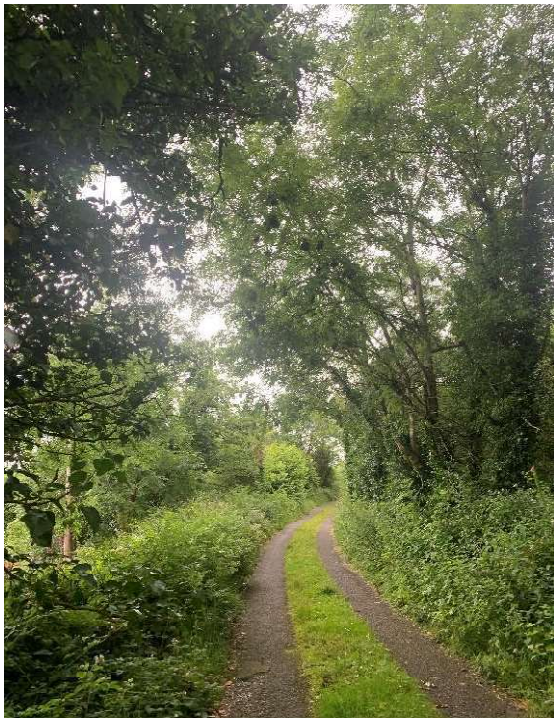


Image : 65
Road has mature hedgerows and trees on either side of the road

Image : 66
Proposed route to follow the RHS at this Y junction

Image : 67
Farm yard in close proximity to the road

Image : 68
Farm house and out buildings in close proximity just before you cross the N22

Image : 69
Entrance to Coillte owned land

Image : 70
Forestry track on Coillte lands

Image : 71
Entrance to Coillte owned land just off N22

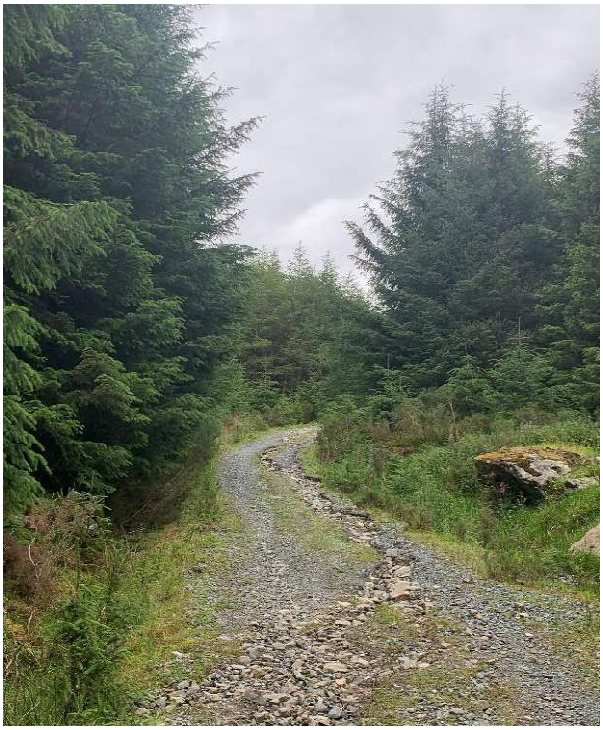


Image : 72
Forestry track on Coillte lands very step and heavily rutted

Image : 73
Forestry track on Coillte lands very step and heavily rutted

Image : 74
Forestry track on Coillte lands

Image : 75
Storm pipe crossing existing forestry track at this location

Image : 76
Box culvert crossing under road

Image : 77
Twin wall UPVC storm pipe crossing under road

Image : 78
Stream crossing track at this location

Image : 79
Twin wall UPVC storm pipe crossing under road

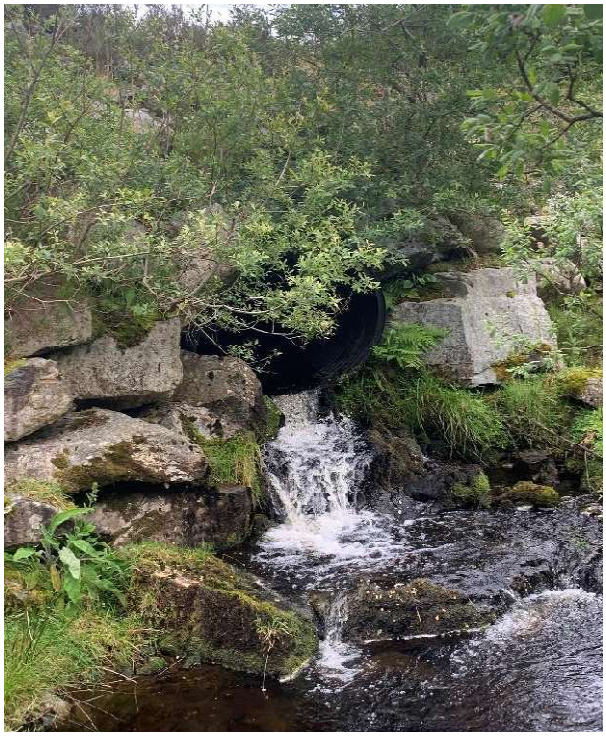


Image : 80
Stream crossing track at this location with a partial collapsed storm pipe

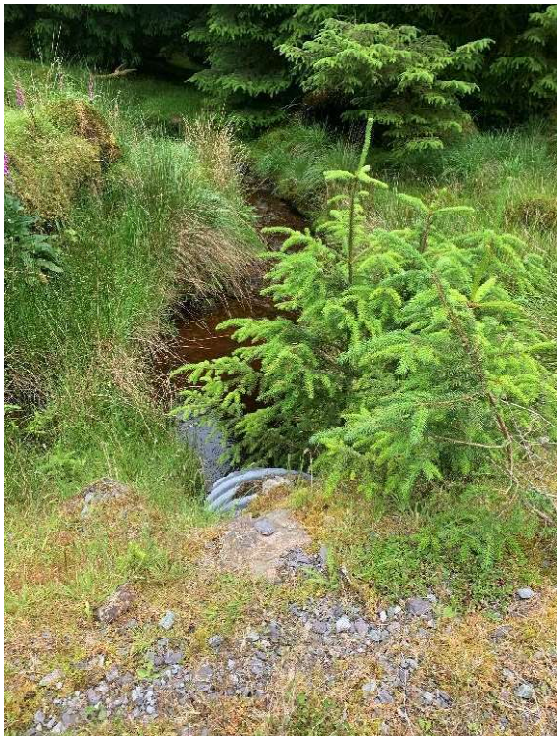


Image : 81
Twin wall UPVC storm pipe crossing under road

Image : 82
Stream crossing track at this location with a partial collapsed storm pipe

Image : 83
Coillte track at the Inchamore site

Image : 84
Coillte track at the Inchamore site

Image : 85
Coillte track at the Inchamore site

Image : 86
Coillte track at the Inchamore site

Image : 87
Approx. site location of Inchamore

Image : 88

Ballyvouskill substation to the north of this image

Image : 89
Coillte track at the Cummeennabuddoge (CMBG) site

Image : 90
Coillte track at the Cummeennabuddoge (CMBG) site

Image : 91
Coillte track at the Cummeennabuddoge (CMBG) site

Image : 92
Storm crossing at the Cummeennabuddoge (CMBG) site

Image : 93
Storm crossing at the Cummeennabuddoge (CMBG) site

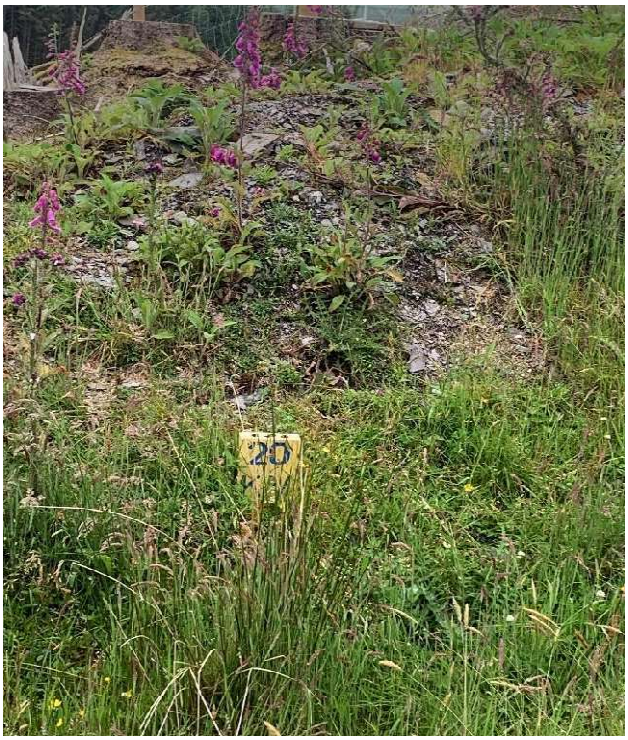


Image : 94
Cable marking post at the Cummeennabuddoge (CMBG) site

Image : 95
Coillte track at the Cummeennabuddoge (CMBG) site

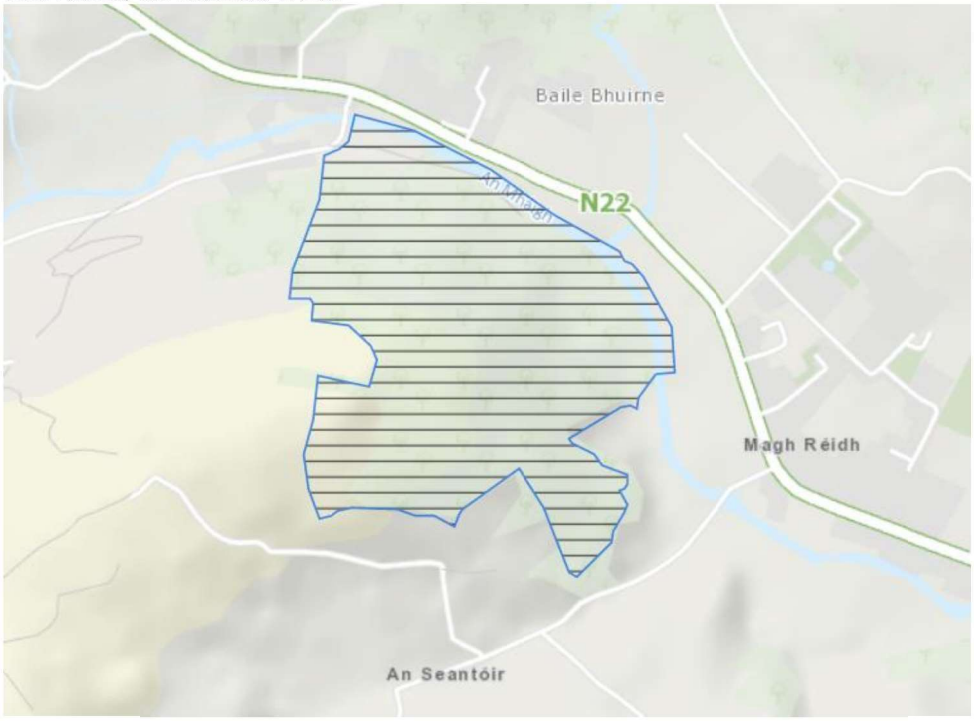
Image : 96
Coillte track at the Cummeennabuddoge (CMBG) site

Image : 97
Coillte track at the Cummeennabuddoge (CMBG) site

Appendix C Information from National Parks and Wildlife Services

12.1 National Parks & Wildlife Services Route Overview

Item 1 - Proposed Natural Heritage Area
Site Name: St. Gobnets Wood



Appendix D Bridge Inspection Reports

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Bridge No. 1 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-01

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

Table of Contents

1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 1 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located south-west of the village of Ballyvourney, Co. Cork just off the N22, refer to Figure 1. The bridge carries a local road over a tributary of the River Sullane.

ITM Grid reference E: 517766, N: 577460.

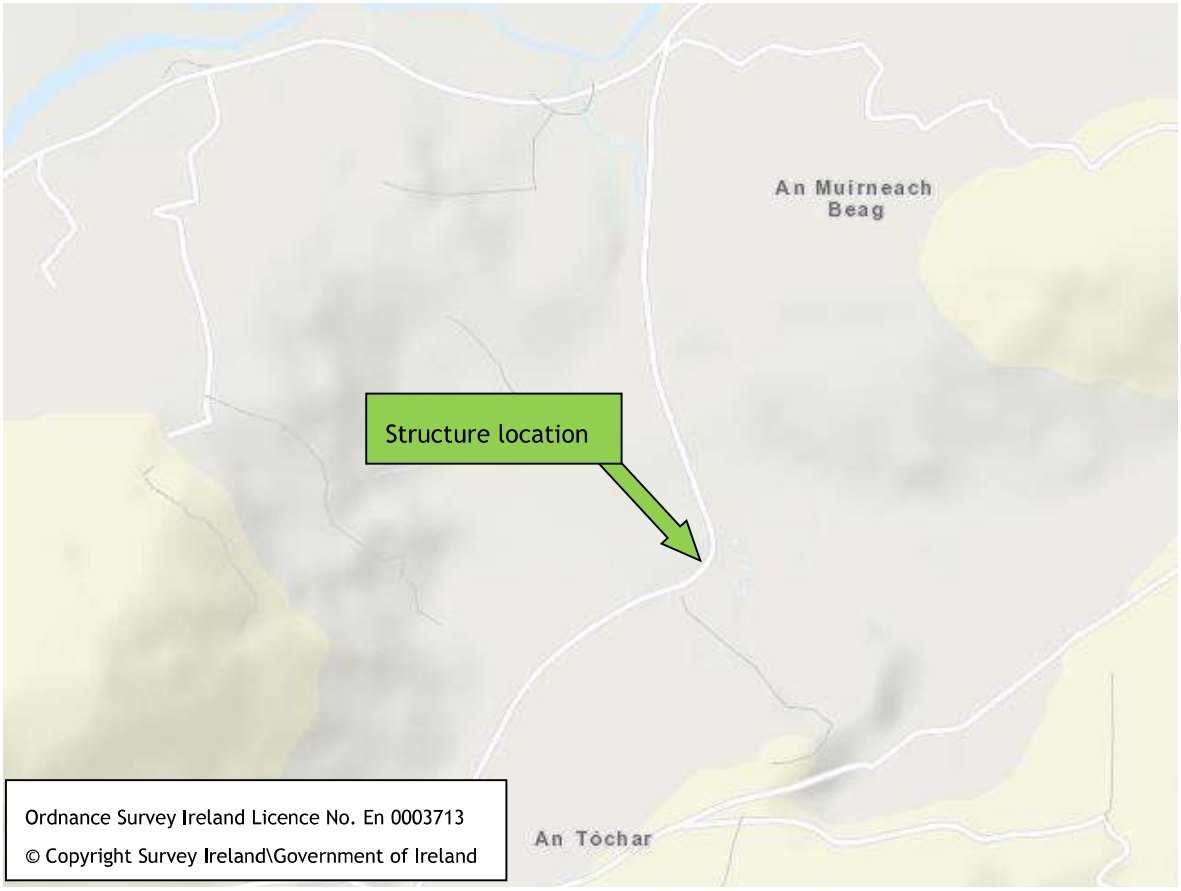

Figure 1 - Bridge Location

3.0 Bridge details

The bridge is a two span stone masonry "clapper" structure with spans of 0.85m (square). The bridge is at a skew of approximately 20 degrees to the road.

The original wing & parapet walls are of stone masonry construction. The upstream (east) parapet has been reconstructed in 140mm solid concrete blockwork.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge Surface

The existing bridge surface consists of tar & chip wearing course with a grassed median and is in good order generally. Some minor surface wear and abrasion is evident.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge, with 600mm grass verges existing on either side of the road surface. The grassed verges encourage water ingress to the bridge structure.

Eirspan Rating: 2

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The upstream parapet is constructed in 140mm solid concrete blockwork and is 900mm high and 140mm thick.

The downstream parapet is of stone masonry construction and is 800mm high and 500mm thick.

The downstream parapet is covered in vegetation. Local removal of the vegetation suggests there are open joints throughout. The upstream parapet is in good condition.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

Wing walls are of dry stone construction. Some missing stones were noted.

There are stone masonry spandrels on both elevations. The south end of the west spandrel has collapsed locally over a damaged section of the bridge deck.

Eirspan Rating: 3

4.7 Abutments

Stone masonry abutments are generally in good condition. Some open joints are evident.

Eirspan Rating: 2

4.8 Piers

The pier is generally in good condition through the bridge. Some open joints are evident. Some stones are missing from the east end of the pier.

Eirspan Rating: 2

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck \ Slab\ Arch

The deck of the bridge consists of a composite 100mm deep solid stone masonry slab which spans abutment to pier and is simply supported.

The outermost slab on the west end of the south span has collapsed underneath the parapet.

A single slab has broken and dropped under the centre of the road in the north span.

No damage is evident at the surface above either of these locations.

Eirspan Rating: 4

4.11 Riverbed

A depth of approximately 950mm from the soffit of the deck to the river bed was recorded. The bed is gravelly generally with some larger stones through the bridge. No significant defects were noted.

Eirspan Rating: 1

4.12 Other Elements & Structure in General

A portion of the south span has been repaired with a 450mm diameter concrete pipe for a length of 1850mm toward the east side of the span. The pipe has been installed at bed level and fully surrounded with stone / rubble.

Significant damage is evident in the deck in both spans and in the eastern spandrel wall. Repair works should be executed without delay.

Maintenance repairs involving vegetation removal and general repointing of masonry elements should be completed.

Consideration should be given to sealing the bridge surface.

Eirspan Rating: 4

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of bridge surface

Stone masonry wall on the D/S side of the bridge in poor condition and very overgrown with vegetation. Masonry block wall on the U/S side of the bridge as seen in previous image,

Soffit of bridge deck/box stone culvert. Flag stone is damaged and has collapsed as seen viewed from U/S (north span).

Soffit of bridge deck – viewed from D/S. Collapsed Flagstone (north span)

Repair to existing culvert with a 450mm concrete drainage pipe (south span).

View of south span from the west

General view of the east elevation

Collapsed stones at the west end of the south span

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Bridge No. 2 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-02

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

Table of Contents

1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 2 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located south-west of the village of Ballyvourney, Co. Cork just off the N22, refer to Figure.1. The bridge carries a local road over a tributary of the River Sullane.

ITM Grid reference E: 520184, N: 577015.

Figure 1 – Bridge Location

3.0 Bridge details

The structure is a three span stone masonry arch bridge with three equal spans of 6.0m. The wing & parapet walls are stone masonry construction.

The bridge carries a local road, connecting to the N22, over the River Sullane.

The overall length of the bridge is 34m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge Surface

The existing bridge surface consists of a dense bitumen macadam wearing course. Sirface wear and abrasion is evident throughout. Some rutting is developing towards the edges of the road surface on the approaches.

Eirspan Rating: 2

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median\ Verges

There are no footways or median. The surfacing extends to the stone masonry parapets and seals the verges. Some minor vegetation is present.

Eirspan Rating: 1

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The existing parapets are constructed of stone masonry and are between 1100mm and 1200mm high above the road surface. Both parapets are approximately 620mm thick.

The condition of the parapets is generally good. Minor vegetation is present and localised loss of mortar was noted.

Eirspan Rating: 1

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

There were no obvious signs of bulging, loss of stones or significant cracking to suggest there is a problem with the wing walls to the abutments.

Vegetation is present on the spandrel walls on both faces. There is a watermain across the south elevation.

Eirspan Rating: 0

4.7 Abutments

The abutments are founded on bedrock. The face of both abutments has been repaired with gunite. Some minor vegetation growth is present. Minor cracks are noted in the gunite, however, no bulging or movement of the abutments is evident. The abutment footings have been protected with grout bags.

Eirspan Rating: 2

4.8 Piers

The piers are founded on bedrock. The pier faces have been repaired with gunite and the footings have been protected with grout bags. Some washout of the grout bags has occurred, however, no washout or undermining of the piers is evident.

Eirspan Rating: 2

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch

The arch barrels have been repaired with gunite. Minor defects such as water ingress, calcite staining, and leaching are noted. Some of the gunite has deteriorated in the most western span and the original stones are exposed.

Eirspan Rating: 2

4.11 Riverbed

The riverbed is formed through bedrock with some silt and gravel deposits. Floating debris has gathered at the upstream ends of both piers and is contributing to locally turbulent flows through the bridge.

Eirspan Rating: 2

4.12 Other elements & Structure in General

Overall the structure is in good condition with few defects found. Maintenance repairs to the masonry elements and historical protection works to the pier and abutment footings are required. Debris should be removed from the riverbed.

Eirspan Rating: 2

APPENDIX A

STRUCTURE PHOTOGRAPHS

Road surface showing wear, abrasion and some rutting

Road surface showing wear, abrasion and some rutting

General view of the eastern span, looking upstream

General view of the middle span, looking downstream

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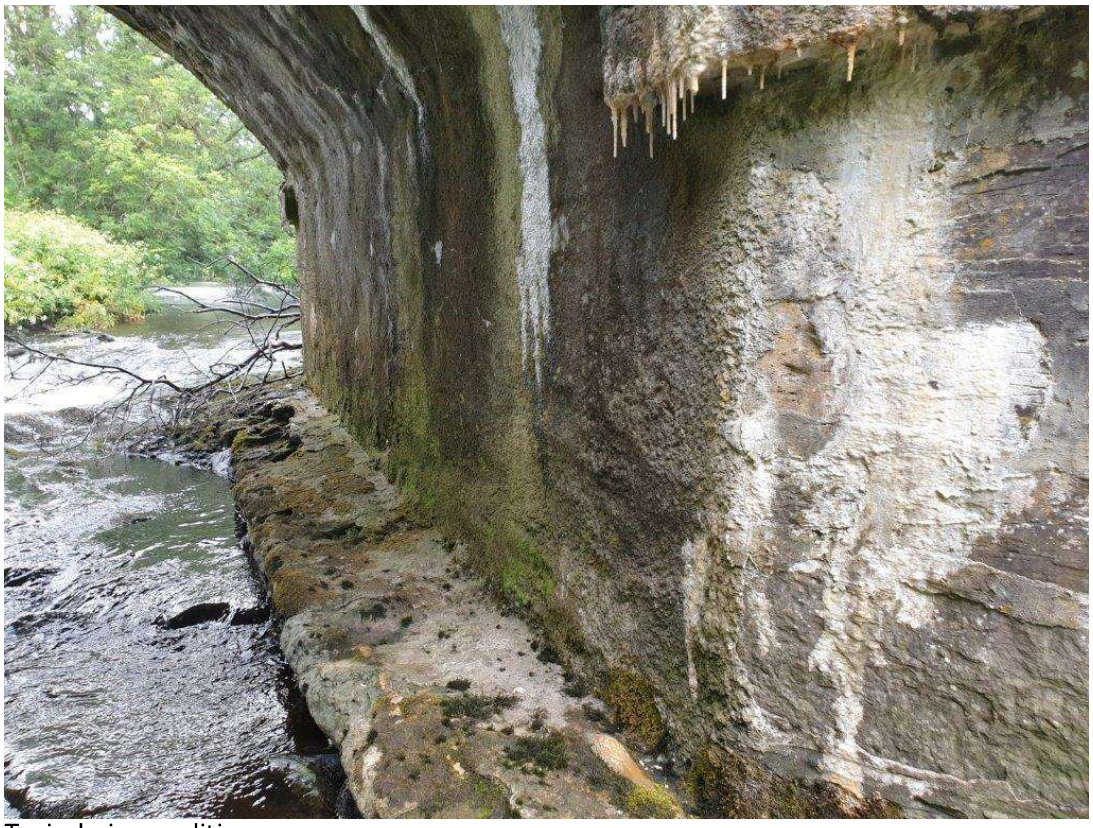
Western abutment



Typical pier condition

General view of the south elevation

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Bridge No. 3 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-03

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

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1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 3 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located south-west of the village of Ballyvourney, Co. Cork just off the N22, refer to Figure.1. The bridge carries a local road over a tributary of the River Sullane.

ITM Grid reference E: 518977, N: 577707.

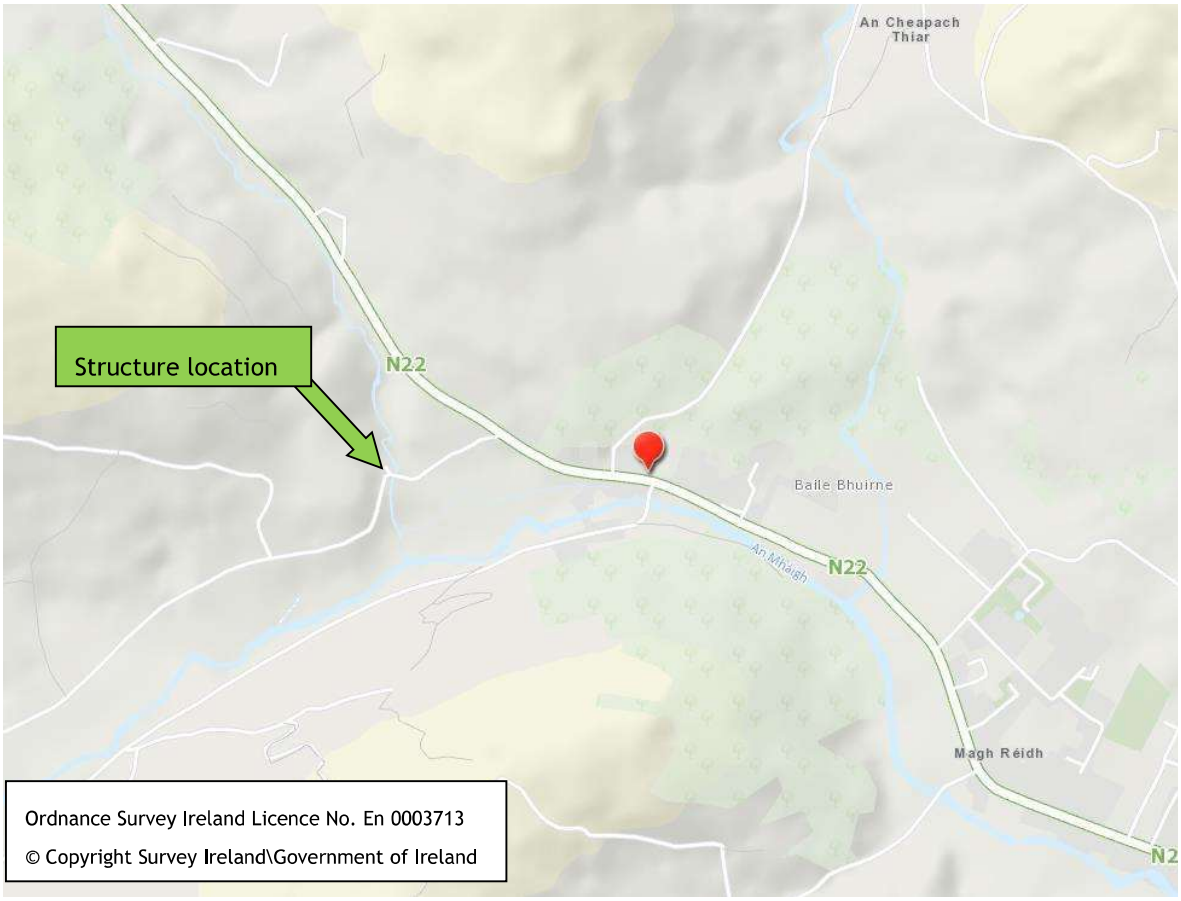

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a single span concrete and stone masonry arch structure with a span of 5.48m. The parapet walls are in concrete construction and the wing walls are both concrete and stone masonry construction.

The bridge carries a local road, connecting to the N22, over the River Sullane.

The overall length of the bridge is 11.0m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of dense bitumen macadam wearing course and is in good order generally. Some minor potholing, wear and abrasion are evident.

Eirspan Rating: 2

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. Soft verges on both sides of the carriageway are 600mm to 700mm wide with minor vegetation present. The bridge is therefore not sealed as the bitumen surfacing does not extend to the stone masonry parapets.

Eirspan Rating: 2

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The existing parapets are constructed in concrete and are between 800mm and 900mm high above the road surface. Both parapets are approximately 400mm thick.

Light vegetation is present on both parapets.

A large portion of the south parapet has partially collapsed and is unsafe.

Eirspan Rating: 4

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

There were no obvious signs of bulging, loss of stones or significant cracking to suggest there is a problem with the wing walls to the abutments.

The damage to the west end of the south parapet extends to the west spandrel on the south elevation. The spandrel walls are otherwise in good condition.

Eirspan Rating: 4

4.7 Abutments

The abutments appear to be stone masonry construction with some shuttered concrete repairs. No obvious problems were noted on either of the abutments.

Eirspan Rating: 1

4.8 Piers

There are no piers on the bridge.

Eirspan Rating: N/A

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch

The arch appears to be in concrete construction. No details of the construction were available, but there are no obvious defects and the arch barrel appears to be in good condition overall. Some water ingress has occurred and the concrete is voided in places exposing rounded aggregate, no reinforcement is evident.

Eirspan Rating: 1

4.11 Riverbed

The watercourse flows on a gravel bed with some larger boulders. No significant damage was noted.

Eirspan Rating: 1

4.12 Other elements & Structure in General

The south parapet and spandrel wall require taking down and reconstruction where a partial collapse has occurred.

The structure is otherwise in good condition.

Eirspan Rating: 4

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface

South parapet showing partial collapse extending from the centre of the bridge

General view of the north verge and parapet

General view of the north elevation, looking downstream

General view of the arch soffit

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General view of the south elevation, note damage to parapet and west spandrel

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Bridge No. 4 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-04

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K O Kelly	D Walsh	A O'Connell

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1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 4 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located west of the village of Ballyvourney, Co. Cork just off the N22, refer to Figure.1. The bridge carries a local road over a tributary of the River Aughboy.

ITM Grid reference E:516026, N: 578961.

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a single span concrete deck structure with a span of 3.64m. The parapet walls are concrete and concrete blockwork construction. Wing walls are concrete construction.

The bridge carries a local road, connecting to the N22, over the River Aughboy.

The overall length of the bridge is 5.0m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course and is generally in good condition. Some wear and abrasion is evident.

Eirspan Rating: 2

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footways at the bridge. There are grassed verges on both sides of the bridge and a grassed median in the centre of the carriageway.

Eirspan Rating: 1

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The east parapet is concrete construction and is 800mm high and 300mm thick. The west parapet has been reconstructed in solid concrete blockwork and is 800mm high and 225mm thick.

Both parapets are in good condition generally. Historical damage possibly due to vehicle impact is evident at the south end of the east parapet, however, displacement of the parapet has not occurred.

Eirspan Rating: 1

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

The wing walls are in good condition. There are no spandrel or retaining walls.

Eirspan Rating: 1

4.7 Abutments

The abutments are concrete construction. No obvious problems were noted on either of the abutments.

Eirspan Rating: 1

4.8 Piers

There are no piers on the bridge.

Eirspan Rating: N/A

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck\ slab\ arch

The deck of the bridge consists of a composite 300mm deep concrete slab.

No information to the exact construction detail of the was available and no structural steel or reinforcing steel elements were evident. Some water ingress and calcite staining is evident generally along with some local scaling of the soffit surface. No significant structural defects were noted.

Eirspan Rating: 1

4.11 Riverbed

A depth of approximately 1550mm from the soffit to the river bed was recorded. The bed is paved with rubble stone through the bridge and is in good condition.

Eirspan Rating: 1

4.12 Other elements & Structure in General

Overall the structure is in good condition with few defects noted. General maintenance is required.

Eirspan Rating: 2

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface looking south

General view of bridge surface and west parapet

General view of bridge surface and east parapet

General view of east elevation, looking downstream

General view of the soffit of the bridge deck showing typical condition

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Local scaling of the soffit of the bridge deck

General view of the west elevation

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Bridge No. 5 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-05

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R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

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1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 5 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located North of the village of Ballyvourney, Co. Cork just off the N22, refer to Figure.1. The bridge carries a local road over a tributary of the River Bohill.

ITM Grid reference E: 519969, N: 583215.

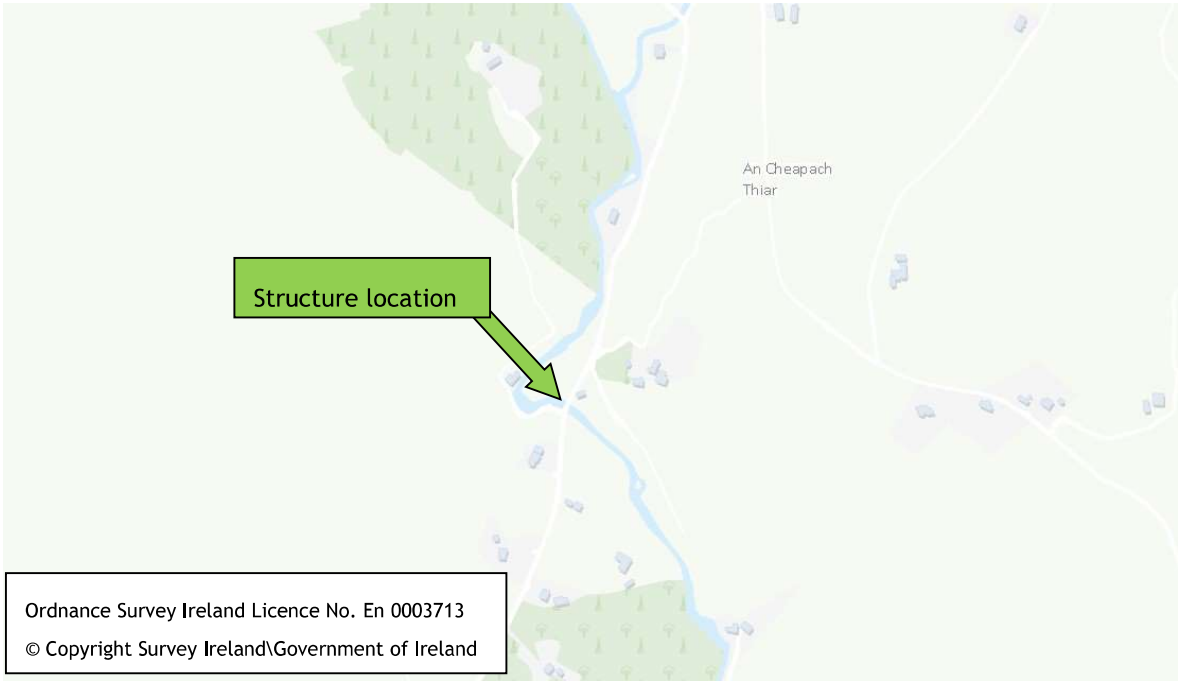

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a single span concrete and masonry arch bridge with a span of 6.0m. The parapet walls are stone masonry construction.

The bridge carries a local road, connecting to the N22, over the River Bohill.

The overall length of the bridge is 12.70m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course and is in good order generally.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. There are 500mm – 600mm wide soft verges on both sides of the carriageway.

Eirspan Rating: 1

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The existing parapets are of stone masonry construction and are between 600mm and 800mm high above the road surface. Both parapets are approximately 400mm thick.

Light vegetation is present on both faces of both parapets. A 1.50m section at the north end of the east parapet is missing. The top course of stonework is missing over a 1.50m length of the north end of the west parapet. A stepped crack is evident towards the south end of the east parapet, the section between the end of the parapet and the crack has moved.

Vegetation removal is required for a full inspection of the parapets to be carried out.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: n\a

4.6 Wingwalls \ Spandrel \ Retaining Walls

There were no obvious signs of bulging, loss of stones or significant cracking to suggest there is a problem with the wing walls to the abutments.

There are no retaining walls.

There is a continuous crack between the arch barrel and spandrel walls on both elevations. This appears to be historical and is possibly due to differential movement between the solid concrete arch section and the spandrel walls.

Eirspan Rating: 1

4.7 Abutments

The abutments appear to be of concrete construction. There is a concrete plinth along the footing of both abutments. Some water ingress and calcite staining was noted. No significant structural defects were evident.

Eirspan Rating: 1

4.8 Piers

There are no piers on the bridge.

Eirspan Rating: N/A

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch

The arch barrel is of concrete construction. Some water ingress and calcite staining is evident. No obvious structural defects were noted.

Eirspan Rating: 1

4.11 Riverbed

A depth of approximately 2.60m from the crown of the arch to the river bed was recorded. The bed is paved with cobble stones through the bridge and is in good condition.

Eirspan Rating: 1

4.12 Other elements & Structure in General

Overall the structure is in good condition with few defects found. Maintenance repairs to the parapet walls should be undertaken.

Eirspan Rating: 2

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface looking south

Local damage to the west parapet

General view of the south end of the east parapet

General view of the west elevation, looking downstream

General view of the arch barrel

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Vegetation growth on the west elevation

General view of the north abutment

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Bridge No. 6 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-06

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

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1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 6 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located North of the village of Ballyvourney, Co. Cork just off the N22, refer to Figure.1. The bridge carries a local road over a tributary of the River Bohill.

ITM Grid reference E: 520038, N: 578913.

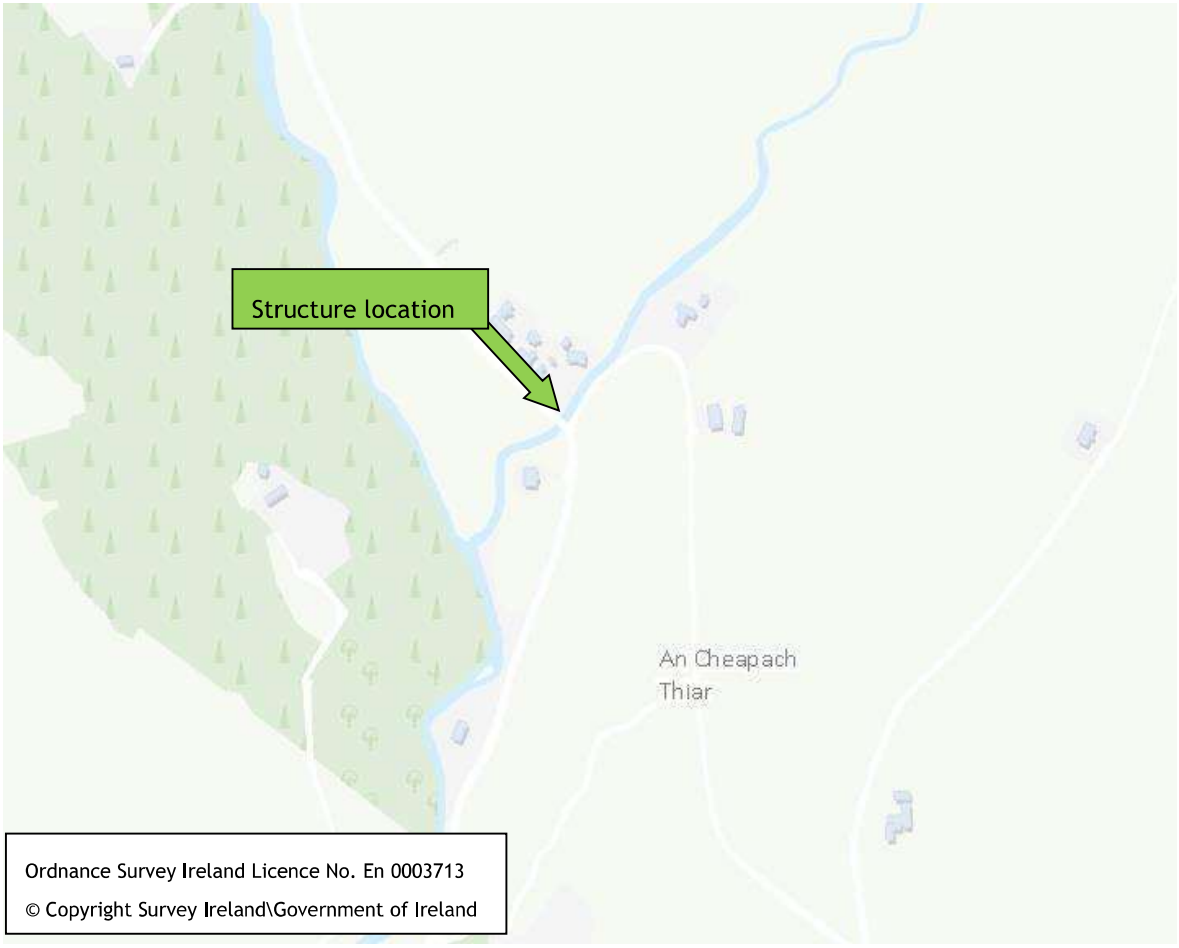

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a double span masonry arch structure with two equal spans of 3.67m. The wing & parapet walls are stone masonry construction. The parapets are rendered with a concrete topping.

The bridge carries a local road, connecting to the N22, over the River Bohill.

The overall length of the bridge is 12.5m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course and is in good order generally.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge, with 650mm soft verges on both sides of the carriageway. The bridge is therefore not sealed as the bitumen surfacing does not extend to the stone masonry parapets.

Eirspan Rating: 1

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The existing parapets appear to be of masonry construction with concrete render and topping. Some cracking of the render and capping is evident but there are no significant structural defects. The parapets are 740mm - 840mm high and are both 500mm thick.

Light vegetation is present on both faces of the parapets.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wing Walls \ Spandrel Walls \ Retaining Walls

Wing walls are of dry stone construction. Vegetation growth is present on all sides of the bridge.

Vegetation growth is present on both spandrels, however, no significant defects are evident.

Eirspan Rating: 1

4.7 Abutments

The abutments are of masonry construction with some concrete repairs. Minor defects including localised mortar loss, light vegetation, water ingress and calcite staining are evident.

Eirspan Rating: 2

4.8 Piers

The pier is of masonry construction with some concrete repairs. Minor defects including localised mortar loss, light vegetation, water ingress and calcite staining are evident.

Eirspan Rating: 2

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch Barrel

Both arch barrels appear to be of concrete construction. Minor defects including localised water ingress and calcite staining are evident.

Eirspan Rating: 1

4.11 Riverbed

A depth of approximately 1750mm from the soffit to the river bed was recorded. The bed is paved with cobbles through the bridge with some larger boulders and is in good condition.

Eirspan Rating: 2

4.12 Other elements & Structure in General

Overall the structure is in good condition with few defects found. General maintenance repairs are required.

Eirspan Rating: 2

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface looking east

North parapet, west end

South parapet, east end

General view of the west elevation

View through east arch, looking south

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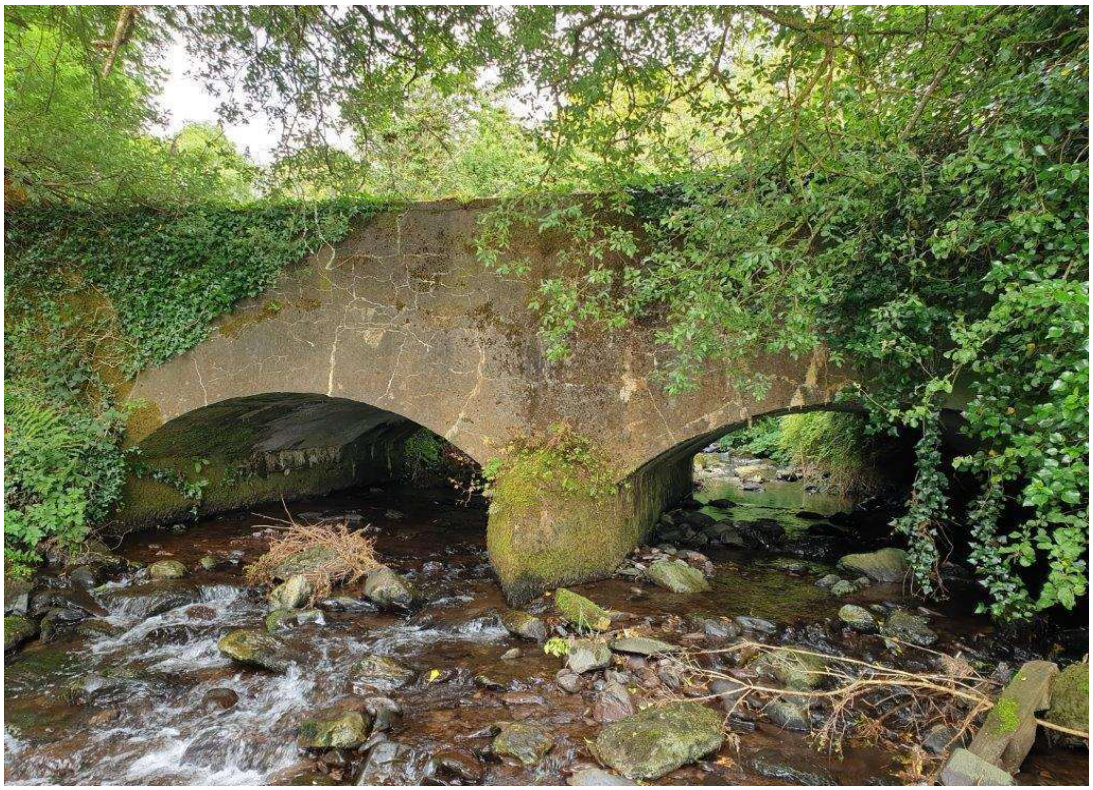
Typical condition of abutment & arch barrel



General view of south elevation

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Bridge No. 7 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-07

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

Table of Contents

1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 7 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located North of the village of Ballyvourney, Co. Cork just off the N22, refer to Figure.1. The bridge carries a local road over a tributary of the River Bohill.

ITM Grid reference E: 520513, N: 579989.

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a single span masonry arch bridge with a span of 3.0m. The wing & parapet walls are stone masonry construction.

The bridge carries a local road, connecting to the N22, over the River Bohill.

The overall length of the bridge is 8.0m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course and is in good order generally.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: n\a

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. There are soft verges on both sides of the carriageway. The north verge is 1300mm wide and the south verge is 650mm wide.

Eirspan Rating: 2

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The existing parapets are of stone masonry construction and are between 500mm and 600mm high above the road surface. Both parapets are approximately 450mm thick.

A short section (approx. 1m long) at the east end of the north parapet has been knocked. Two to three capping stones are missing from the centre of the north parapet.

Light vegetation and a minor loss of pointing was noted generally.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are stone revetments on both sides of the river upstream of the bridge. The revetments are in good condition, some light vegetation growth was noted.

Eirspan Rating: 1

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

The spandrel and wing walls are in fair condition. Some minor vegetation and mortar loss is evident.

There are no retaining walls.

Eirspan Rating: 2

4.7 Abutments

The abutments are in good condition generally. A stepped crack mid-way in the east abutment extends to mid height, recent movement is not apparent. Some light vegetation was present.

Eirspan Rating: 2

4.8 Piers

There are no piers on the bridge.

Eirspan Rating: N/A

4.9 Bearings

There are no bearings on the bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch Barrel

There are extensive open joints throughout the arch barrel, some of these appear to be open for the full depth of the barrel.

Several stones are missing from the barrel towards the north face of the bridge.

Water ingress and light vegetation were also noted.

Eirspan rating: 3

4.11 Riverbed

A depth of approximately 2720mm from the soffit to the riverbed was recorded. The bed is gravelly with larger loose stones. No significant defects were noted.

Eirspan rating: 1

4.12 Other Elements & Structure in General

The arch barrel is in poor condition and requires reinstatement of missing stones and repointing. Consideration should be given to removing the soft verges and sealing the bridge surface to limit water ingress to the structure. Vegetation removal and repointing of masonry elements is required throughout.

Eirspan rating: 3

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface from the east

General view of the north parapet

General view of the south parapet

North elevation

General view of the arch barrel from the north

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General view of the west abutment and arch barrel

Dropped / missing stones in the arch barrel towards the north face of the bridge

General view of the south elevation

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Bridge No. 8 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-08

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

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1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 8 (PUNCH project specific reference). The inspection was completed on 30/06/2020 by Declan Walsh and Kevin O'Kelly of PUNCH.

2.0 Location

The existing structure is located west of the R582 Milstreet to Macroom Rd, Co. Cork. Refer to Figure.1. The bridge carries a local road over a tributary of the River Bohill.

ITM Grid reference E: 521822, N: 586734.

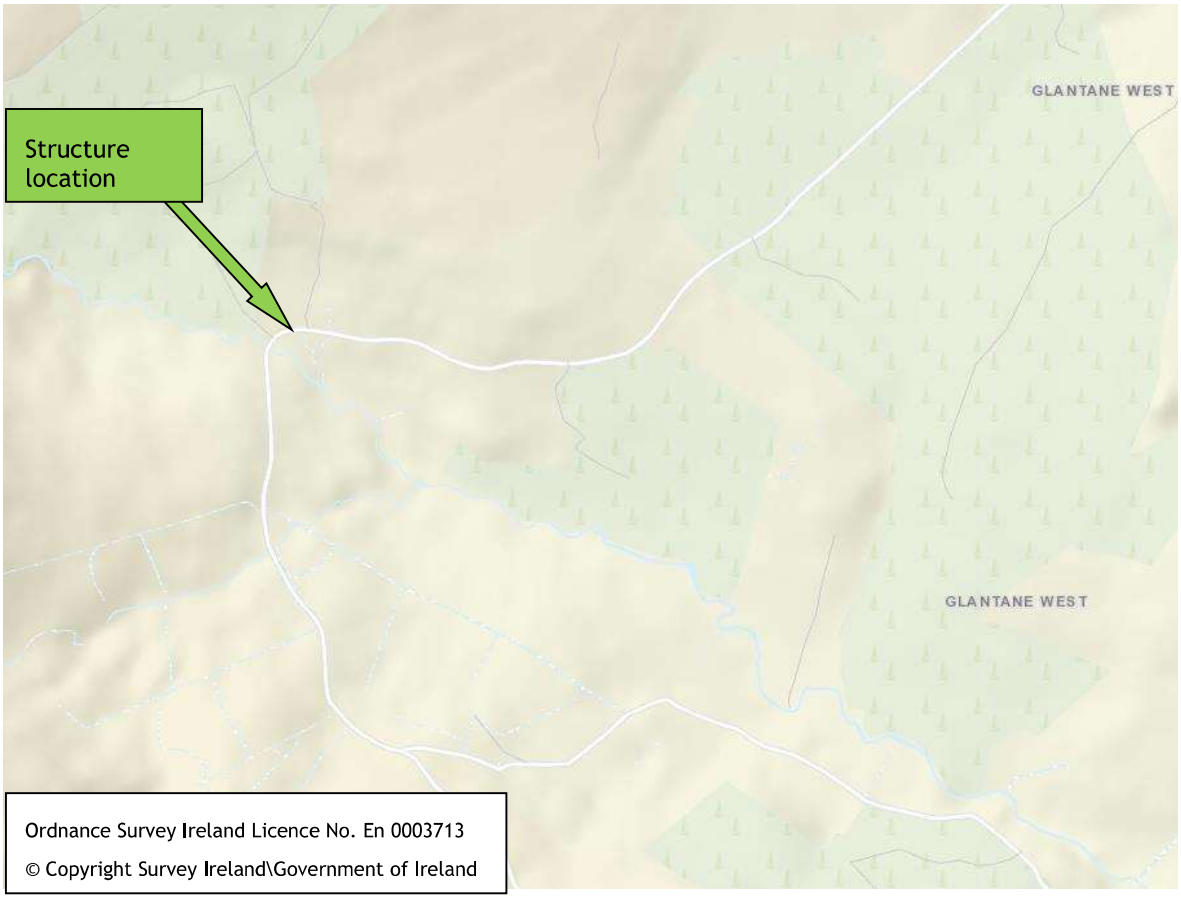

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a single span masonry arch bridge with a span of 3.0m. The wing & parapet walls are stone masonry construction.

The bridge carries a local road, connecting to the R582, over the River Foherish.

The overall length of the bridge is 7.50m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course which has been recently overlaid and is in good condition.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. There are soft verges on both sides of the carriageway. The west verge is 1100mm wide and the east verge is 660mm wide.

Eirspan Rating: 2

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The existing parapets are of stone masonry construction with a concrete capping and are between 800mm and 840mm high above the road surface. Both parapets are approximately 500mm thick.

There is one stepped vertical crack in the centre of the west parapet. There are three stepped vertical cracks in the east parapet.

Light vegetation and a minor loss of pointing was noted generally.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

The wing and spandrel walls are covered in vegetation. A loss of pointing in the spandrel walls was evident.

There are no retaining walls.

Eirspan Rating: 2

4.7 Abutments

The abutments are generally in good condition. Vegetation removal and repointing works are required.

Eirspan Rating: 2

4.8 Piers

There are no piers on the bridge.

Eirspan Rating: 0

4.9 Bearings

There are no bearings on the bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch Barrel

A substantial portion of the arch barrel has been repaired with a concrete plug between the quarter points, starting at the west face of the bridge and extending approx. two thirds of the length of the arch.

Open joints are evident in the masonry sections. Water ingress and light vegetation are noted.

Eirspan Rating: 2

4.11 Riverbed

A depth of approximately 2600mm from the soffit to the river bed was recorded. The bed is gravelly with larger loose stones. No significant defects were noted.

Eirspan rating: 1

4.12 Other Elements & Structure in General

Overall the structure is in fair condition. Maintenance repairs including vegetation removal and repointing of open joints should be carried out. Consideration should be given to sealing the bridge surface by removing the soft verges.

Eirspan Rating: 2

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface, looking north

General view of the west parapet

General view of the east parapet

General view of the east elevation

General view of the south abutment

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General view of the arch barrel from the east

General view of the arch barrel from the east

General view of the west elevation

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Bridge No. 9 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-09

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

Table of Contents

1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 9 (PUNCH project specific reference). The inspection was completed on 31/06/2020 by Kevin O'Kelly and Tadhg McEllistrem of PUNCH.

2.0 Location

The existing structure is located in Gortnascarty East to the south-west of Ballvourney village, Co. Cork. Refer to Figure.1. The bridge carries a local road over a tributary of the River Douglas.

ITM Grid reference E: 518757, N: 573841.

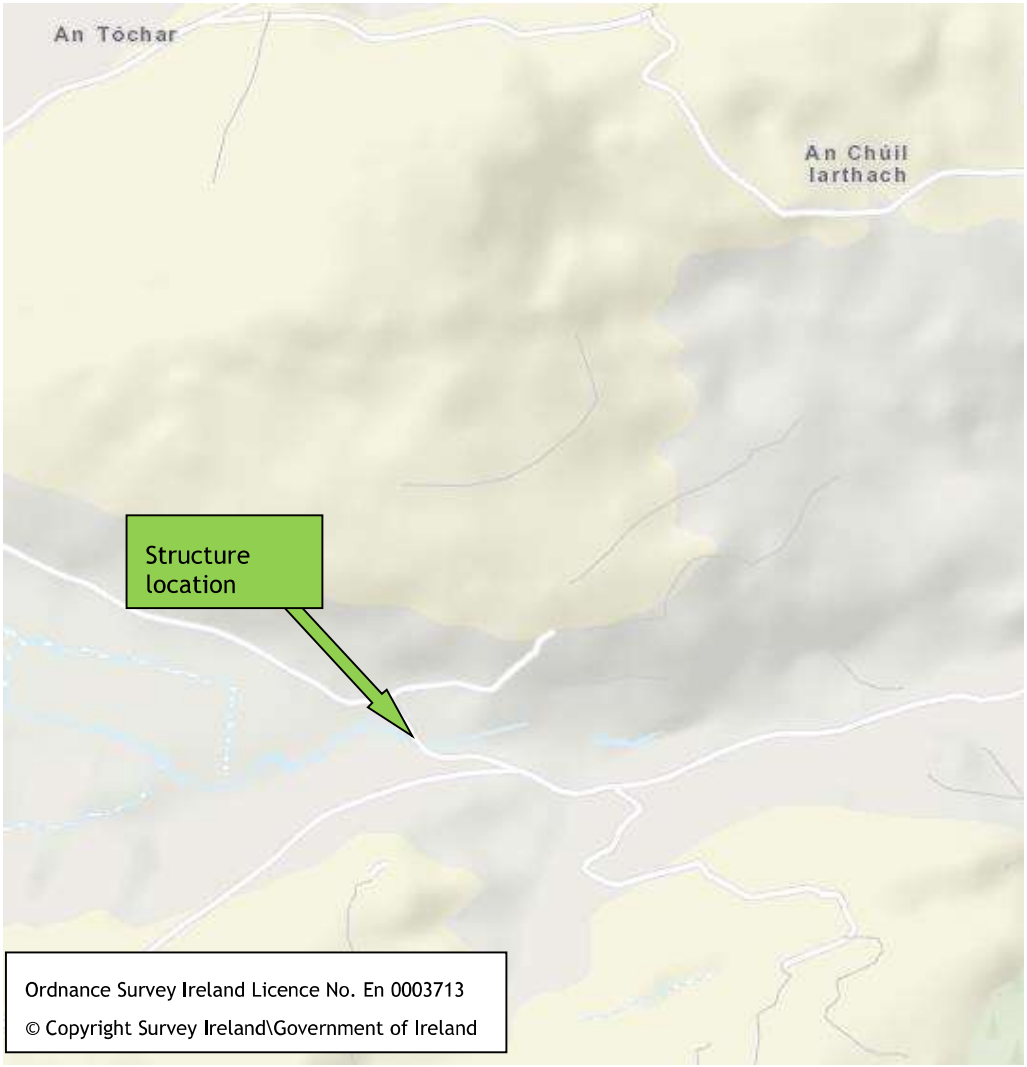


Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a single span concrete deck structure with a span of 4.30m. The wing & parapet walls are both formed in concrete.

The bridge carries a local road, connecting to the R582, over the River Douglas.

The overall length of the bridge is 6.10m.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course and is in good order generally.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: n\a

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. There are 800mm wide soft verges on either side of the carriageway.

Eirspan Rating: 1

4.4 Parapet \ Safety Barrier

There are no safety barriers in the vicinity of the bridge structure.

The existing parapets are of concrete construction and are between 850mm and 950mm high above the road surface. Both parapets are approximately 300mm.

Vegetation is present on both faces of the parapets, no significant defects are evident in the areas that could be viewed.

Eirspan Rating: 1

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

Minor vegetation is present on the wing walls. No significant structural defects were noted.

There are no retaining walls.

Eirspan Rating: 1

4.7 Abutments

The abutments are of concrete construction and appear to be in good condition generally.

Eirspan Rating: 1

4.8 Piers

There are no piers on the bridge.

Eirspan Rating: 0

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch Barrel

The deck of the bridge consists of a 250mm deep concrete slab.

No information to the exact construction detail of the slab was available, but no significant structural defects were noted and the deck appears to be in good condition.

Some minor water ingress is evident locally at the junction between the slab and abutments.

Eirspan Rating: 1

4.11 Riverbed

A depth of approximately 1400mm from the soffit to the river bed was recorded. The bed is gravelly with larger loose stones. No significant defects were noted.

Eirspan rating: 1

4.12 Other Elements & Structure in General

Overall the structure is in good condition with few defects found.

The source of the water ingress between the concrete deck and abutments should be investigated.

Eirspan Rating: 1

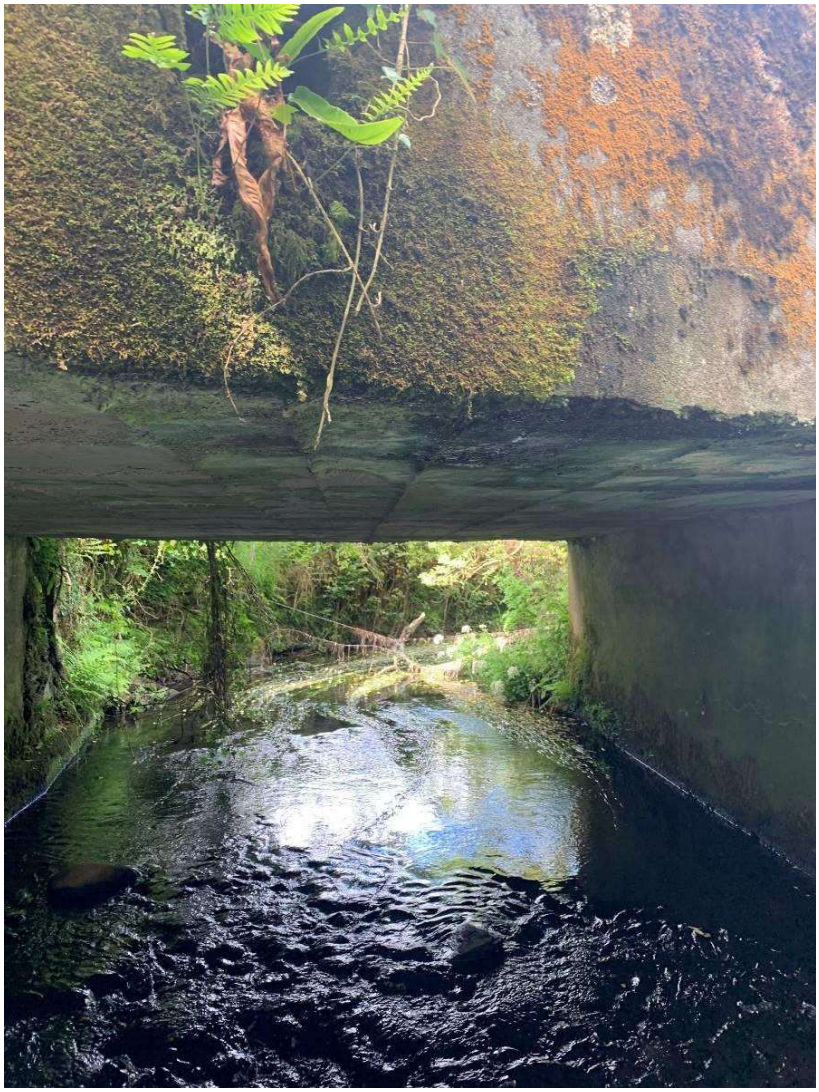
APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface looking south

General view of the east parapet

General view of the bridge elevation



General view of the deck soffit

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Bridge No. 10 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-10

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

Table of Contents

1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 10 (PUNCH project specific reference). The inspection was completed on 31/06/2020 by Kevin O'Kelly and Tadhg McEllistrem of PUNCH.

2.0 Location

The existing structure is located to the west of the village Coolea Co. Cork. Refer to Figure.1. The bridge carries a local road over a tributary of the River Sullane.

ITM Grid reference E: 514235, N: 575454.

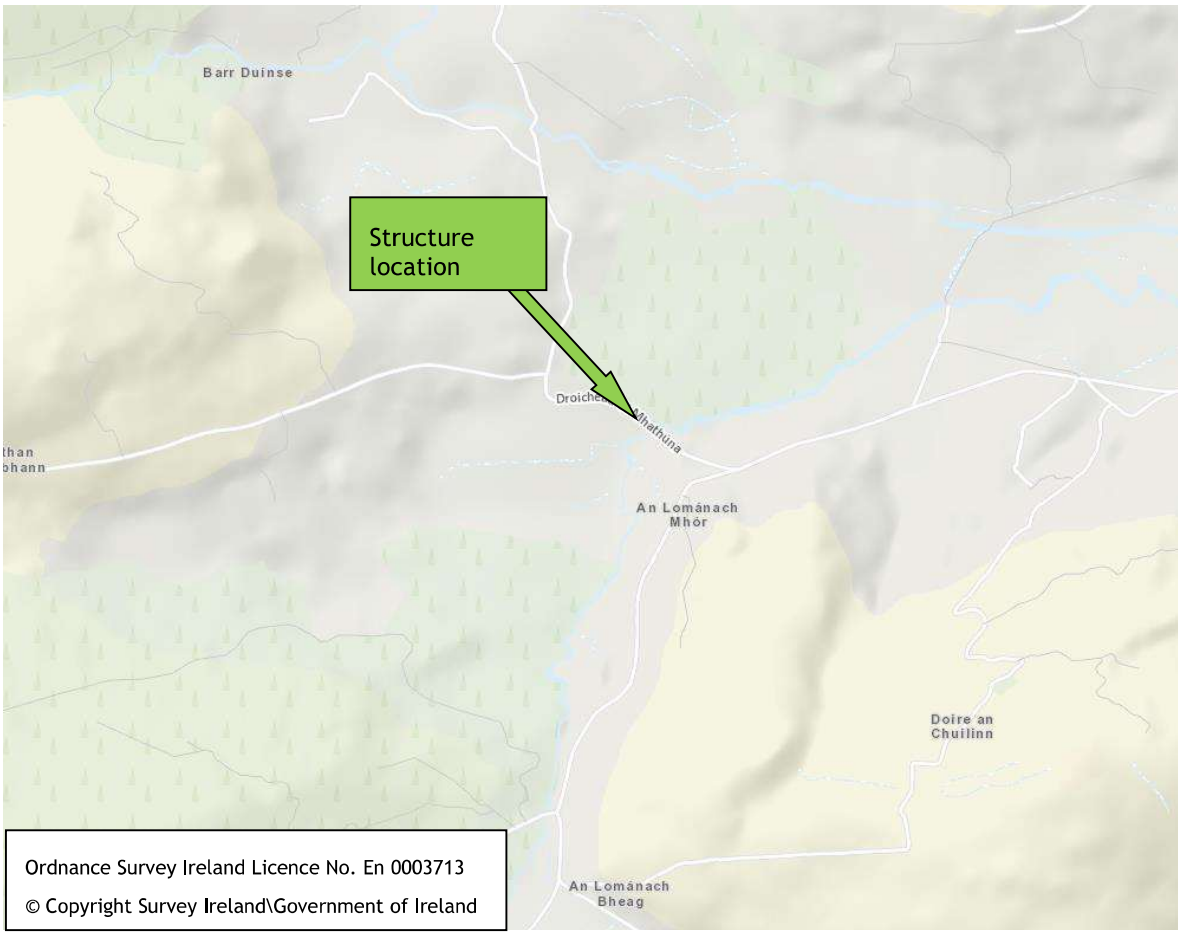

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a twin span masonry arch bridge. There are rectangular stone masonry flood relief culverts at both ends of the arch bridge.

The parapet walls are constructed in concrete and masonry on the approaches with an Armco barrier on concrete posts over the arches.

The bridge carries a local road, connecting to the N22, over the River Sullane.

The overall length of the bridge is 16.3m to end of the parapet on each side of the bridge.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course and is in good order generally.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. There are 500mm wide soft verges on both sides of the carriageway.

Eirspan Rating: 2

4.4 Parapet \ Safety Barrier

There is a safety barrier supported on concrete posts across the length of the central arches on both sides of the bridge surface.

The existing parapets are constructed in stone masonry with a concrete capping and some concrete repairs. The parapets are between 800mm and 900mm high above the road surface and are approximately 450mm thick.

Vegetation is present on both external faces of the parapets. A loss of mortar was noted in the visible areas.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

The spandrels over the masonry arches have been replaced with mass concrete construction and are in good condition.

There are masonry retaining walls on both approaches to the bridge. The retaining walls are overgrown with vegetation. A loss of pointing was noted in the visible areas.

There are no wing walls.

Eirspan Rating: 2

4.7 Abutments

The arch abutments are constructed in stone masonry. Some light vegetation and minor mortar loss was noted.

Eirspan Rating: 2

4.8 Piers

The pier is constructed in stone masonry. Some light vegetation and minor mortar loss was noted.

Eirspan Rating: 2

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch Barrel

The arch barrels are generally in good condition. Full access to the culverts was not possible due to vegetation growth and dropped masonry, however, the areas that could be inspected appeared to be in poor condition with damaged and missing stones noted.

Eirspan Rating: 3

4.11 Riverbed

A depth of approximately 1360mm from the soffit to the river bed was recorded. The riverbed is paved with cobbles through both arches and no significant structural defects were noted.

Eirspan Rating: 1

4.12 Other Elements & Structure in General

The culverts are in poor condition and further investigation is required to confirm the full extent of the damage noted. This investigation should include removal of vegetation from the retaining walls.

General cleaning of vegetation and repointing of the masonry elements is required.

Eirspan Rating: 3

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface

Parapet with concrete coping and repairs, open joints in exposed masonry

General view of bridge elevation, relief culvert shown to the left

General view through arch barrel

General view through arch barrel

General view of bridge elevation

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Bridge No. 11 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-11

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

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1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 11 (PUNCH project specific reference). The inspection was completed on 31/06/2020 by Kevin O'Kelly and Tadhg McEllistrem of PUNCH.

2.0 Location

The existing structure is located to the north-west of the village Coolea Co. Cork. Refer to Figure.1. The bridge carries a local road over the River Sullane.

ITM Grid reference E: 513210, N: 576134.

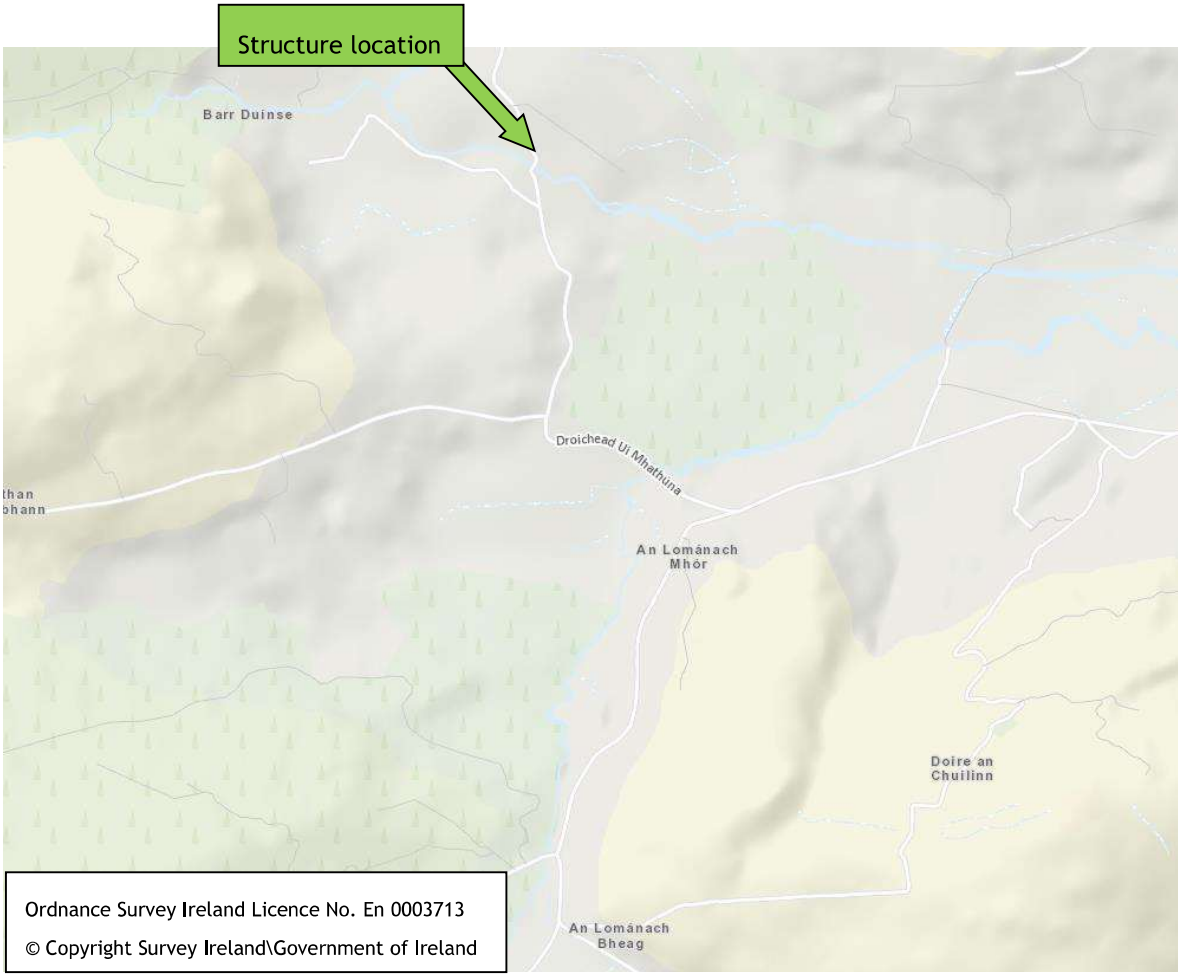


Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a twin span concrete arch bridge. The parapet walls are formed in concrete.

The bridge carries a local road, connecting to the N22, over the River Sullane.

The overall length of the bridge is 16.5m to end of the parapet on each side of the bridge.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of tar & chip wearing course and is in good order generally.

Eirspan Rating: 1

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. There are 500mm wide soft verges on both sides of the carriageway.

Eirspan Rating: 2

4.4 Parapet \ Safety Barrier

There are no safety barriers on the bridge.

The existing parapets are constructed in concrete. The parapets are between 800mm and 900mm high above the road surface and are approximately 350mm thick.

The parapets are generally in good condition. Local damage to the concrete capping was noted.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

The spandrel walls are constructed in concrete and are in good condition.

Wing walls are overgrown with vegetation.

Eirspan Rating: 1

4.7 Abutments

The abutments are generally in good condition. Some minor washout of the concrete is evident towards the abutment footings; however, no undermining or significant loss of material has occurred.

Eirspan Rating: 2

4.8 Piers

The pier is generally in good condition. Some minor washout of the concrete is evident towards the pier footing; however, no undermining or significant loss of material has occurred.

Eirspan Rating: 2

4.9 Bearings

There are no bearings on this bridge

Eirspan Rating: n\a

4.10 Deck \ Slab \ Arch Barrel

Both arches are constructed in concrete. No significant structural defects were noted.

Eirspan Rating: 1

4.11 Riverbed

There is a bed of rubble though the south span. The north span was dry at the time of the inspection. No significant structural defects were noted.

Eirspan Rating: 1

4.12 Other Elements & Structure in General

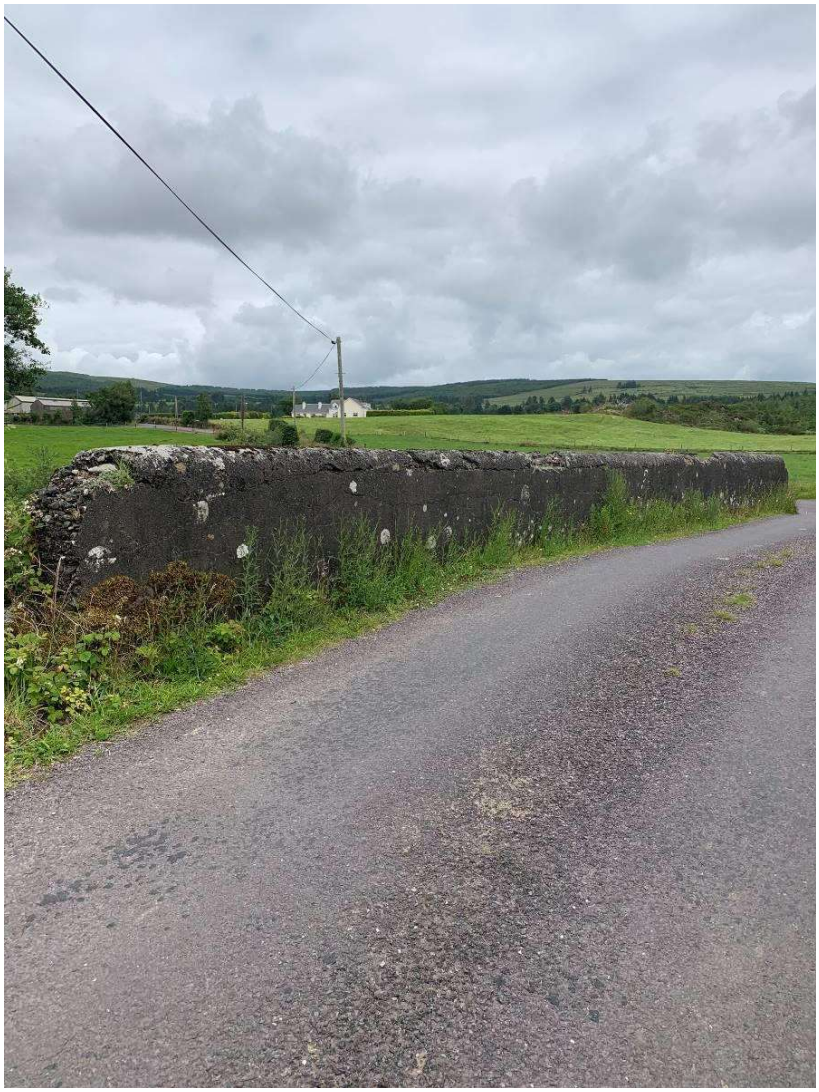
Overall the structure is in good condition with few defects found. General maintenance works are required, including concrete repairs to the abutments, piers and parapets.

Eirspan Rating: 2

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface



General view of the bridge parapet

Close up of parapet showing concrete damage

General view of bridge elevation – viewed from downstream.

General view of bridge span showing typical condition of arch barrel and abutment

General view of bridge span showing typical condition of arch barrel and abutment

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Bridge No. 12 Inspection Report

Coillte CGA & SSE 110kV Grid Route at Gortyrahilly, Inchamore and Cummeennabuddoge (CMBG)

July 2020

Document Control

Document Number: 201-164-BIR-12

Revision	Date	Prepared	Checked	Approved
R0 (1st issue)	July 2020	K. O'Kelly	D. Walsh	A. O'Connell

Table of Contents

1.0 Introduction

PUNCH Consulting Engineers have been commissioned to undertake a Civil and Structural Due Diligence Report for the proposed cable routes at Gortyrahilly, Inchamore & Cummeennabuddoge (CMBG) , Millstreet, for Coillte Group.

The proposed cable routes include a number of watercourse crossings. These crossings have been visited and assessed by PUNCH as part of the due diligence study.

This report sets out the findings of a visual inspection of Bridge No. 12 (PUNCH project specific reference). The inspection was completed on 31/06/2020 by Kevin O'Kelly and Tadhg McEllistrem of PUNCH.

2.0 Location

The existing structure is located to the south-east of the village of Clonkeen Co. Cork. Refer to Figure.1. The bridge carries a local road over a tributary to the River Sullane.

ITM Grid reference E: 513612, N: 577815.

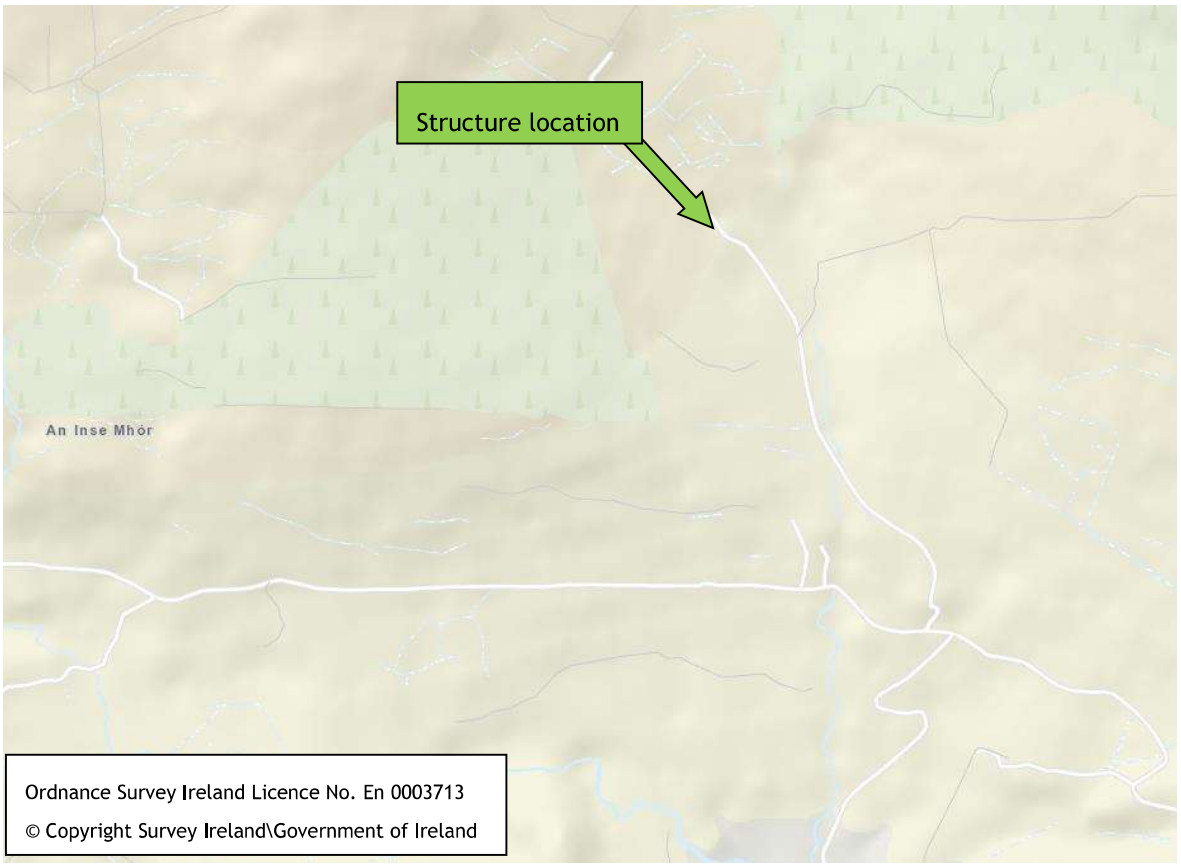

Figure 1 – Bridge Location

3.0 Bridge details

The bridge is a single span bridge made up of a concrete deck structure with a span of 3.0m. The wing & parapet walls are constructed in concrete.

The bridge carries a local road, connecting to the N22, over a tributary to the River Sullane.

The overall length of the bridge is 3.0m to end of the parapet on each side of the bridge.

4.0 Principal Inspection - Eirspan

The inspection carried out is based on the Principal Inspection proforma of the TII's Eirspan bridge management system. The Principal Inspection system is a systematic visual-only check of all elements of the bridge structure. A total of fourteen components of the bridge are considered as part of the inspection with each component assigned a rating number depending on its condition. The bridge is then assigned an overall rating number.

The condition rating is based on the table below. There is no invasive investigation carried out as part of the inspection.

Rating	Comment on damage, repairs etc.
0	No or insignificant damage.
1	Minor damage but no need of repair.
2	Some damage, repair needed when convenient. Component is still functioning as originally designed. Observe the condition development.
3	Significant damage, repair needed very soon. i.e. within next financial year.
4	Damage is critical and it is necessary to execute repair works at once, or to carry out a detailed inspection to determine whether any rehabilitation works are required.
5	The component has failed or is in danger of total failure, possibly affecting the safety of traffic. It is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the introduction of load limitation measures.

4.1 Bridge surface

The existing bridge surface consists of mainly gravel and has not been maintained in some time.

Eirspan Rating: 2

4.2 Expansion Joints

There are no expansion joints on the bridge.

Eirspan Rating: N/A

4.3 Footway \ Median \ Verges

There are no footpaths provided on the bridge. There are 200mm wide soft verges on both sides of the road surface.

Eirspan Rating: 2

4.4 Parapet \ Safety Barrier

There are no safety barriers at the bridge.

The parapets are constructed in concrete 800mm high above the road surface and approximately 200mm thick.

Both parapets have been damaged with parts missing and structural cracking noted.

Eirspan Rating: 2

4.5 Embankment \ Revetments

There are no embankments or revetments associated with this structure.

Eirspan Rating: N/A

4.6 Wingwalls \ Spandrel Walls \ Retaining Walls

No significant structural defects were noted.

Eirspan Rating: 1

4.7 Abutments

The abutments are constructed in stone masonry. Concrete repairs are evident. Some washout of joints has occurred along the base of both abutments.

Eirspan Rating: 2

4.8 Piers

There are no piers on the bridge.

Eirspan Rating: N/A

4.9 Bearings

There are no bearings on the bridge

Eirspan Rating: N/A

4.10 Deck \ Slab \ Arch Barrel

The deck of the bridge consists of an approx. 300mm deep concrete slab.

No information to the exact construction of the deck slab was available. No significant structural details were noted. Water ingress and calculi staining was evident.

Eirspan Rating: 1

4.11 Riverbed

The riverbed is paved through the bridge and there are no signs of scouring.

Eirspan Rating: 1

4.12 Other Elements & Structure in General

Overall the structure is in fair condition with the defects mentioned above. Repairs to the parapets and abutments are required. The waterproofing of the bridge deck should be investigated with consideration to given to removing the soft verges to limit water ingress to the structure.

Eirspan Rating: 2

APPENDIX A

STRUCTURE PHOTOGRAPHS

General view of the bridge surface

Upstream parapet with knocked section and structural cracking

Knocked section of the downstream parapet

General view of the bridge elevation

General view through the bridge showing the deck and abutments