Sure Partners Limited

ARKLOW BANK WIND PARK PHASE 2
ONSHORE GRID INFRASTRUCTURE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

VOLUME II

Chapter 5 Description of Development

ARUP

sse Renewables

Contents

5 Description of Development

5.1 Introduction

The Arklow Bank Wind Park (ABWP) is an offshore wind farm, located off the coast of County Wicklow, on the east coast of Ireland. A Foreshore Lease was granted for the development of a wind park on the Arklow Bank in 2002. Arklow Bank Wind Park Phase 1 was constructed in 2003 – 2004 consisting of seven wind turbines. Phase 1 is owned and operated by Arklow Energy Limited under a sublease to the Foreshore Lease. Sure Partners Limited (SPL), a wholly owned subsidiary of SSE plc, the Developer, is now proposing to develop the remainder of the Project, Arklow Bank Wind Park Phase 2.

The proposed development, which is the subject of this EIAR, comprises the Arklow Bank Wind Park Phase 2 Onshore Grid Infrastructure (OGI) to be developed as part of the Project. This chapter provides a description of the proposed development, including details of the site, location, design, size and other relevant features.

5.2 Arklow Bank Wind Park Phase 2

The Foreshore Lease for Arklow Bank Wind Park covers an area approximately 27km long and 2.5km wide, on an approximately north-south alignment, 6km - 13km offshore, in the Irish Sea, to the east of Arklow town.

The Foreshore Lease provides for up to 200 wind turbines, with an export capacity of 520MW. Advances in turbine technology over the past 15 years mean that it is possible to achieve the export capacity with the installation of up to 62 turbines in the same Foreshore Lease area, depending on the final turbine unit selected. Phase 2 of the wind park will transmit power from new offshore substation platform(s) via two new 220kV offshore export cable circuits, installed along cable routes identified within the Foreshore Lease.

An application has been submitted to the Minister for Housing, Local Government and Heritage (DHLGH) to extend the Long Stop Dates in the Foreshore Lease to allow the construction of the proposed Arklow Bank Wind Park Phase 2.

The Developer now proposes to build out the remainder of the Arklow Bank Wind Park under the existing Foreshore Lease. This overall Arklow Bank Wind Park Phase 2 Project comprises three distinct elements:

- Offshore Infrastructure;
- Onshore Grid Infrastructure (the proposed development); and
- Operations and Maintenance Facility (OMF)

The OMF will require additional statutory consents, with a planning application to Wicklow County Council (for onshore and nearshore infrastructure) and a Foreshore Lease application to the Minister for Housing, Local Government and Heritage for nearshore infrastructure required in the marine environment.

5.3 Overview of the Proposed Development

The proposed development will comprise the onshore grid infrastructure including 220kV onshore export cable circuits and fibre optic cables, from the landfall of the offshore export cable circuits at Johnstown North, to a proposed new 220kV substation at Shelton Abbey and an overhead line connection from the new substation to the National Electricity Transmission Network (NETN). An overview of the proposed development is shown in **Figure 5.1**, providing a schematic showing the connection of the Arklow Bank Wind Park Phase 2 to the transmission network, via the new 220kV substation.

The proposed development will provide:

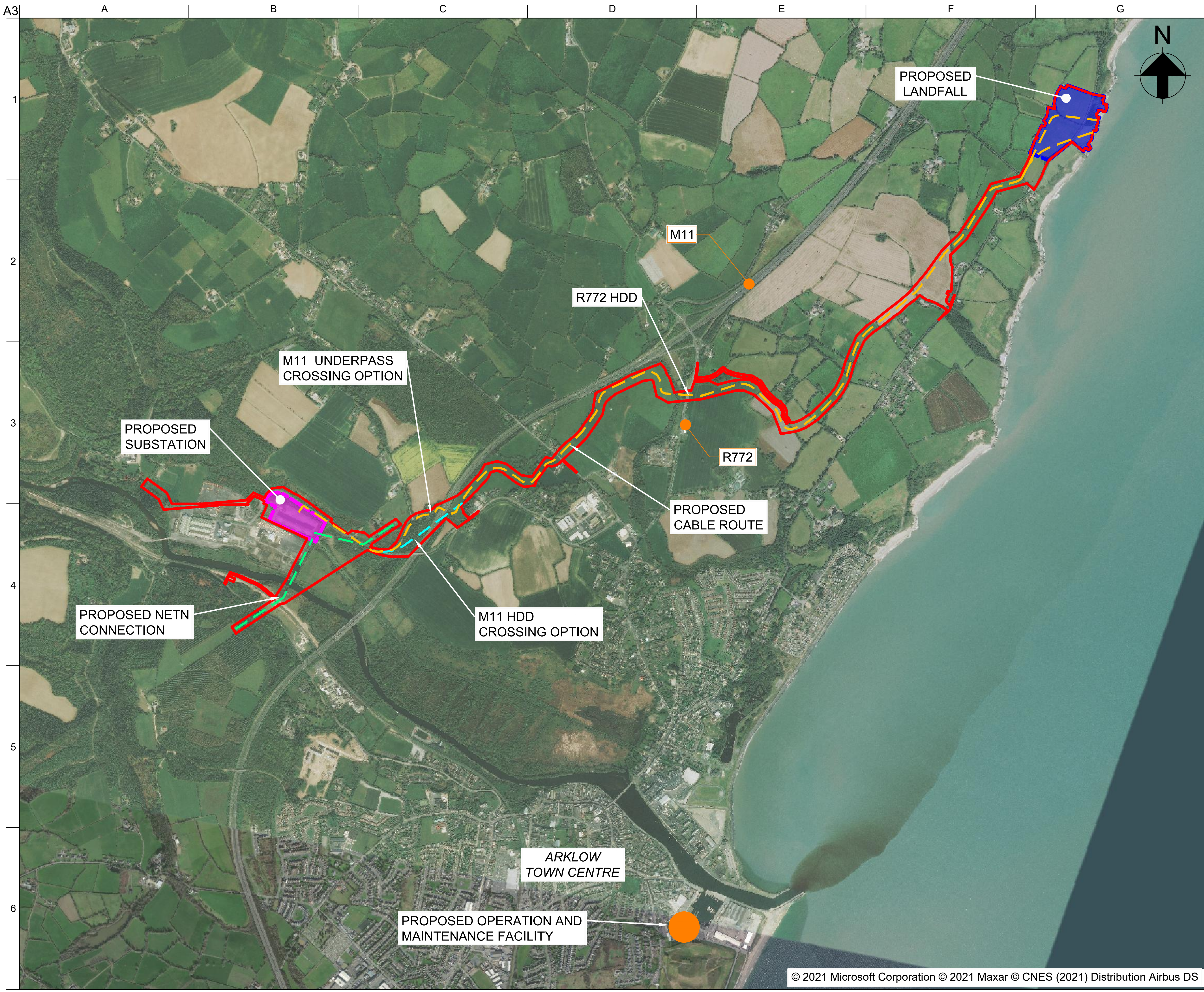
- Landfall for two offshore export cable circuits from the High Water Mark (HWM) to two Transition Joint Bays (TJB) at Johnstown North, located approximately 4.5km northeast of Arklow Harbour,
- Connection by two underground 220kV high voltage alternating current cable circuits, and fibre optic cables over a distance of c. 6km, from the landfall to the new onshore 220kV substation,
- A new onshore 220kV substation, to be located at Shelton Abbey, north of the Avoca River, approximately 2.1km northwest of Arklow town consisting of two connected compounds:
    1. The transmission compound with the infrastructure to physically connect to the NETN, and
    2. The connection compound with the infrastructure to allow the connection of the windfarm in accordance with EirGrid grid code requirements.
- Flood defence improvement works to the existing Avoca River Business Park flood defences located c. 500m west of the substation site;
- A 220kV overhead line connection from the new 220kV substation at Shelton Abbey to the existing 220kV transmission network located c. 200m from the substation site.

This chapter of the EIAR has been prepared in accordance with Part 1 of Annex IV of the EIA Directive and has been structured to describe the following:

- The design of the proposed development;
- Associated aspects of the proposed development of relevance;
- The operation of the proposed development; and
- The decommissioning of the proposed development.

This section of the EIAR describes the proposed development as it will be following completion of all construction activities.

A full description of the construction of the proposed development is presented in **Chapter 6** *Construction Strategy*.



LEGEND:

- PROPOSED LANDFALL
- PROPOSED SUBSTATION SITE
- PROPOSED CABLE ROUTE
- PROPOSED M11 CROSSING HDD OPTION
- PROPOSED NETN CONNECTION
- RED LINE BOUNDARY
- PROPOSED OPERATION AND MAINTENANCE FACILITY

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Project Title
Arklow Bank Wind Park
Phase 2
Onshore Grid Infrastructure

Drawing Title
Overview of the Proposed Development

Scale at A3 1:20,000
Role Civil
Suitability For Information
Arup Job No **271715-00** Rev **P1**
Name
Figure 5.1

Do not scale

5.4 Land Requirements

5.4.1 Landfall

The Developer will acquire lands at the landfall at Johnstown North, to facilitate the development and construction of the Transition Joint Bays and Horizontal Directional Drilling (HDD) operations and to allow permanent access to the Transition Joint Bays for future maintenance activities.

The lands will also be used for biodiversity enhancement planting to ensure that there is no net-loss of habitat as a result of the proposed development.

All lands required for this purpose are included within the planning (red line) boundary, which extends from the foreshore to c. 280m onshore, with these lands encompassing agricultural lands.

5.4.2 Cable Route Wayleaves and Construction Corridor

The Developer will require a permanent wayleave along the cable route to allow access for future maintenance. Most of the cable route is routed across agricultural land whereby the width of the permanent wayleave will be c. 15m and the temporary cable construction corridor will be c. 30m. The cable will be routed within the permanent wayleave corridor. The c. 30m temporary cable construction corridor will give sufficient area for the excavation of two proposed 0.8 – 1.825m wide trenches, storage of topsoil and subsoil arisings plus a haul road for the movement of excavation equipment and general installation vehicles for the delivery of materials such as ducting, protective covers and bedding.

A planning corridor of up to 50m, as shown in **Figure 5.1**, is proposed to accommodate the c. 30m temporary working corridor. Once construction is complete, the permanent cable wayleave will encompass a c. 15m wide corridor. For cable rating purposes, the spacing between the cable circuits will need to increase at HDD locations so both the temporary cable construction corridor and the corresponding permanent wayleave at these locations will need to increase to c. 50m. Further, where joint bays are located, the permanent wayleave will also need to increase to c. 20m in width. Where the cables cross over existing services and utilities, crossing agreements will be secured with the respective utility provider.

The proposed centreline between two cable circuits is shown on the **Figure 5.5**. In the unlikely event of unforeseen circumstances arising during construction, it may be necessary for the cable to deviate from the centreline position, and the cable may be positioned anywhere within the planning corridor (red line boundary) shown on the planning drawings.

Within the permanent wayleave where it crosses farmland, the wayleave agreement allows the planting of crops and shallow rooted plants, to facilitate ongoing agricultural use, during operation of the proposed development. Planting of deep-rooted plants or construction of buildings is precluded.

5.4.3 Land Acquisition at Substation Site

The land at the proposed substation site will be permanently acquired for the purposes of the proposed development.

5.4.4 Overhead Line Tie-In Wayleaves

A permanent wayleave corridor of c. 53m for the overhead line tie-in connection will be established. A permanent 4m corridor within this wayleave, directly under the overhead line, will be kept clear at all times for access.

All lands required for this purpose are included within the planning (red line) boundary.

5.5 Landfall

The landfall is where the two offshore export cable circuits from the offshore wind farm come onshore, with the boundary for planning purposes being at the foreshore (i.e. high-water mark of ordinary or medium tides, shown as HWM on Ordnance Survey maps).

The landfall comprises:

- Two 220kV export cable circuits, approximately 100 to 180m in length, from HWM, under the R750, to two onshore Transition Joint Bays;
- Transition Joint Bays to allow connection between onshore and offshore circuits;
- A temporary HDD compound and associated access track, in one of two potential locations;
- Fibre optic cables, for operation and control purposes, laid underground with the export circuits.

As detailed in **Chapter 4** *Consideration of Alternatives*, there are two adjacent site options for the export cable circuits and associated Transition Joint Bays. The Developer wishes to retain flexibility to use either of these options, dependent on the final offshore export cable route(s) chosen for the Project. Whichever option is chosen, the other option will be used to accommodate a temporary construction compound for the onshore cable route. Details of the compounds and construction methodology are provided in **Chapter 6** *Construction Strategy*.

5.5.1 Landfall Location and Context

The landfall location is in the townland of Johnstown North, Co. Wicklow, approximately 4.5km northeast of Arklow Harbour, approximately centred on Ordnance Survey Ireland Grid Reference N726779, E677108, adjacent to the regional road R750.

The landfall consists of undulating pasture fields located behind sea cliffs. The surrounding area is farmland in pasture, with relatively few dwellings and no holiday developments in the vicinity.

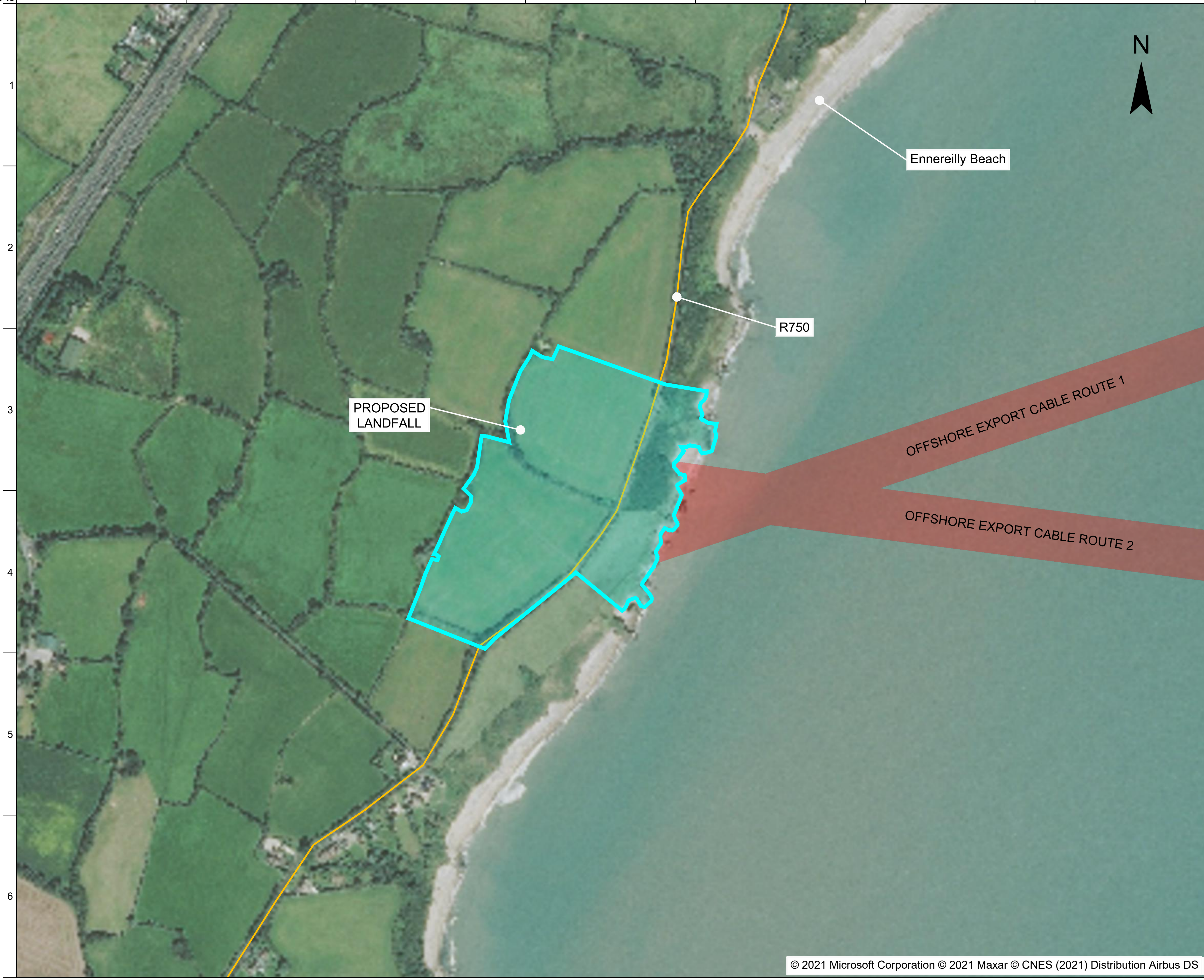
There is access to Ennereilly Beach from the R750 approximately 350m to the north of the landfall. The M11 motorway lies c. 1km to the west.

The coastline at the landfall consists of relatively low sea cliffs (c. 10 m in height) and small coves. The small coves (each with a steeply sloping shingle beach) are inaccessible at this location, as shown in **Figure 5.2**.

The location of the landfall is shown on **Figure 5.3**.

Figure 5.2 Photo of typical cliffs at the landfall at Johnstown North

A3



LEGEND:

- PROPOSED LANDFALL
- OFFSHORE EXPORT CABLE ROUTE

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Project Title
Arklow Bank Wind Park
Phase 2
Onshore Grid Infrastructure

Drawing Title
Landfall Location

Scale at A3: 1:5,000

Role: Civil

Suitability: For Information

Arup Job No: **271715-00**

Rev: **D1**

Name: **Figure 5.3**

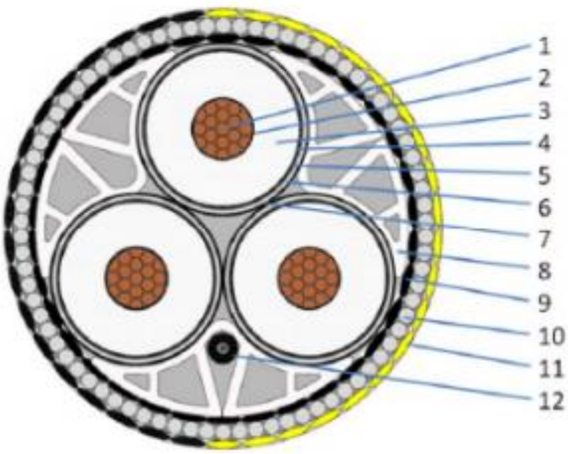
Do not scale

5.5.2 Landfall Cable Details

A feasibility assessment determined that HDD was the preferred method to bring the two offshore export cable circuits ashore. The HDD method of construction at the landfall is described in **Chapter 6** *Construction Strategy*.

The two offshore cable circuits will be High Voltage Alternating Current (HVAC) circuits. Each circuit, of up to 266mm outside diameter (OD), will consist of a three-core cable i.e. three electrical conductors within the one cable, to ease installation, similar to that shown in **Figure 5.4**. The cable will also contain two fibre optic cables. The separation distance of the two offshore cable circuits is up to 50m and both will have a minimum depth of cover at the base of the cliffs of 5.5m (and a maximum of 15m).

At the joint between the onshore and offshore cable circuits, the three-core offshore cable is split out and each conductor is jointed to three separate onshore single-core cables at the Transition Joint Bay. Onshore, each set of three cables is normally installed, in flat or trefoil formation, as shown on **Figure 5.7** and **Figure 5.8**. **Section 5.6.2** provides more information on the onshore cables.



Not to scale – indicative only

No.	Description	Details
1	Conductor	Copper
2	Conductor screen	Extruded bonded semi conductive compound
3	Insulation	XLPE
4	Insulation screen	Extruded semi-conductive compound
5	Water blocking	Semi-conductive water-swelling tape
6	Metal sheath	Lead alloy
7	Inner sheath	Extruded semi-conductive polyethylene
8	Fillers	Extruded shaped plastic or polypropylene string filler
9	Armour bedding	Polypropylene yarns
10	Armouring	One layer of galvanized steel wires
11	Double serving	Polypropylene yarns
12	OF cable	1 x Optical fibre Cable with 48 single mode fibres

Figure 5.4 Indicative HVAC Offshore Export Cable

5.5.3 Transition Joint Bays

A Transition Joint Bay is required to enclose and protect the joints between the offshore and onshore export cables. The Transition Joint Bays are buried chambers comprising a concrete plinth, where the cables and joints are anchored, with concrete walls.

The Transition Joint Bays will be located a short distance inland of where the offshore export cables make landfall, approximately 100 to 180m from the HWM. Each Transition Joint Bay will be approximately 20m in length, 5m wide and 2.5m deep. There will be two Transition Joint Bays, one for each cable circuit.

Each Transition Joint Bay comprises the jointing chamber, a communications chamber and an earth link box. The communications chamber and earth link box are covered by manhole covers which need to be accessed at regular intervals for maintenance purposes during the operational phase of the proposed development. Where possible, the joint bays and manhole covers (4 manhole covers in total, 2 for each joint bay) will be positioned near to field boundaries.

Each Transition Joint Bay is backfilled with a layer of stabilised material, typically Cement Bound Granular Mixture (CBGM), for about 600mm around the cables, with suitably excavated material used to backfill above the CBGM material.

Once construction is completed, the only visible structures at the landfall will be two manhole covers for each cable circuit and small cable marker posts, which will indicate the location of the underground cable circuits.

5.5.4 Permanent Access

There will be a permanent access track, consisting of crushed stone, approximately 4.5m wide constructed to the Transition Joint Bays from the existing access point on the R750 (See **Figure 5.5**).

An entrance gate will be set back from the public road and a bituminous bellmouth will be formed at the junction where the permanent access track meets the public road, to facilitate safe vehicular access and egress.

5.5.5 Maintenance of the Cables at the Landfall

Maintenance of the cables at the landfall will comprise an inspection, once every year, by means of the earth link box and communication chambers located in the Transition Joint Bay.

5.5.6 Decommissioning of Cables at the Landfall

The cables will be decommissioned when the project ceases operation, at the same time as decommissioning of the substations.

On decommissioning, the cables and associated ducts will most likely remain in-situ as there would be more environmental impact in removing these than can be justified by the recycle value of cable material and as is standard industry practice.

However, all above ground infrastructure will be removed and these areas fully reinstated.

Chapter 4 *Consideration of Alternatives* provides further details on the various decommissioning options for the cables.

5.5.7 Biodiversity Enhancement Planting

It is intended that the land along the cable route will be reinstated and returned to its current use post-construction. Where habitat cannot be reinstated, 16,000m^2 of biodiversity enhancement planting will be provided at the landfall to ensure that there is no net-loss of habitat as a result of the proposed development.

The objective of the planting scheme within the biodiversity enhancement area is to create a semi-natural habitat with a diverse woodland structure. This will be achieved by using a mixture of native species to provide a canopy, subcanopy and ground layer as the woodland matures.

5.6 Onshore Cable from Landfall to 220kV Substation

Two 220kV HVAC cable circuits with associated fibre optic communication and earthing cables will be laid underground from the landfall at Johnstown North, to the proposed onshore 220kV substation at Shelton Abbey.

The onshore cable route is c. 6km long, with joint bays positioned at strategic locations along the cable route to facilitate the installation and later the operation and maintenance of the cable circuits during the operational lifetime of the proposed development.

Further detail in respect of the onshore cable route and the cable technology to be utilised, is provided below.

5.6.1 Onshore Cable Route Location and Context

The proposed cable route, as shown in **Figure 5.5**, originates at the Transition Joint Bays at the landfall in Johnstown North and initially heads south-west, crossing a minor road, the L95115, before running adjacent to the R750 in agricultural lands, for c. 2000m until it reaches Ballymoney.

From this point the route continues in a north-westerly direction through agricultural lands, close to field boundaries, for c. 600m.

The route then crosses the Dublin Road (R772) and passes north of the existing Arklow Substation. The route then runs parallel to the M11 for c. 400m and then in a south-westerly direction for c. 500m, close to field boundaries in agricultural lands. The route then crosses the L2180 Beech Road, north west of the Kilbride Industrial Estate.

The route changes to a north-westerly direction, for c. 250m, before continuing in a south-westerly direction alongside the M11 for c. 300m and then crosses the

M11. At this point, the route has two options (both of which are assessed in this EIAR). One option will utilise an existing underpass to cross the M11 and join and continue along the L6179 Kilbride Road.

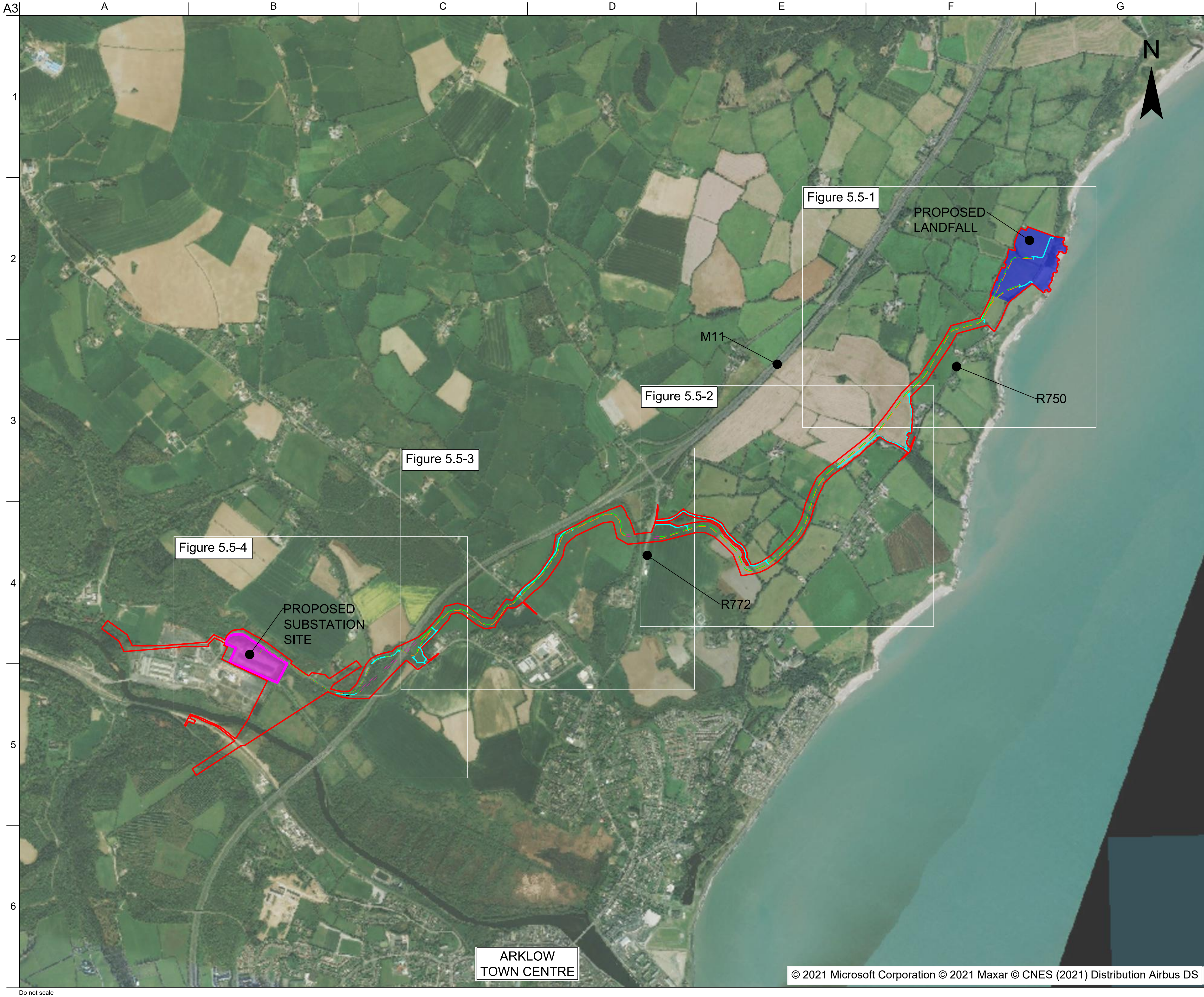
The other option involves crossing the M11 by HDD. Both options meet the L6179 Kilbride Road near the entrance to the Avoca River Business Park before arriving at the proposed new substation at Shelton Abbey. The proposed cable route will be accessible from both ends of the route and, following consultation with landowners, via strategic existing property entrances located along the public road.

The total corridor length is c. 6km and requires five public road crossings, one being the M11 motorway crossing. The route also crosses eight watercourses, namely the Johnstown North, Johnstown South, Ticknock, Coolboy, Templerainy, Kilbride, Kilbride Church and Sheepwalk Streams. Three of these have been identified as permanent flow watercourses (Johnstown North, Templerainy and Kilbride Streams), as shown in **Figure 5.5** and described in **Chapter 12** *Biodiversity*.

The cable route will traverse agricultural lands, off-road where practicable, to minimise disruption to traffic during cable construction and to avoid, in so far as possible, areas of congested utilities and proximity to residential areas. Where the cable route traverses farmland, the cable route will be adjacent to field boundaries, where feasible. For some sections, where following the boundary would result in much longer cable runs or would produce excessive cable bends, a more direct route has been selected within the red line boundary and adhering to the principle of minimising environmental constraints.

The land along the cable route will be reinstated and returned to its current use post-construction, although future access for inspection and maintenance purposes will be required. The chosen route reduces the crossings of roads and watercourses to a practical minimum and avoids significant environmental constraints.

Once construction is completed, the only visible above ground structures along the cable route will be small marker posts to indicate the location of the cables and manhole covers associated with joint bays.



LEGEND:

- PROPOSED LANDFALL
- PROPOSED SUBSTATION SITE
- RED LINE BOUNDARY
- PROPOSED CIRCUIT 1
- PROPOSED CIRCUIT 2
- M11 / R772 HDD CROSSING
- RED LINE BOUNDARY
- PROPOSED PERMANENT JOINT BAY ACCESS TRACK

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Drawing Title
Proposed Cable Route
Keyplan

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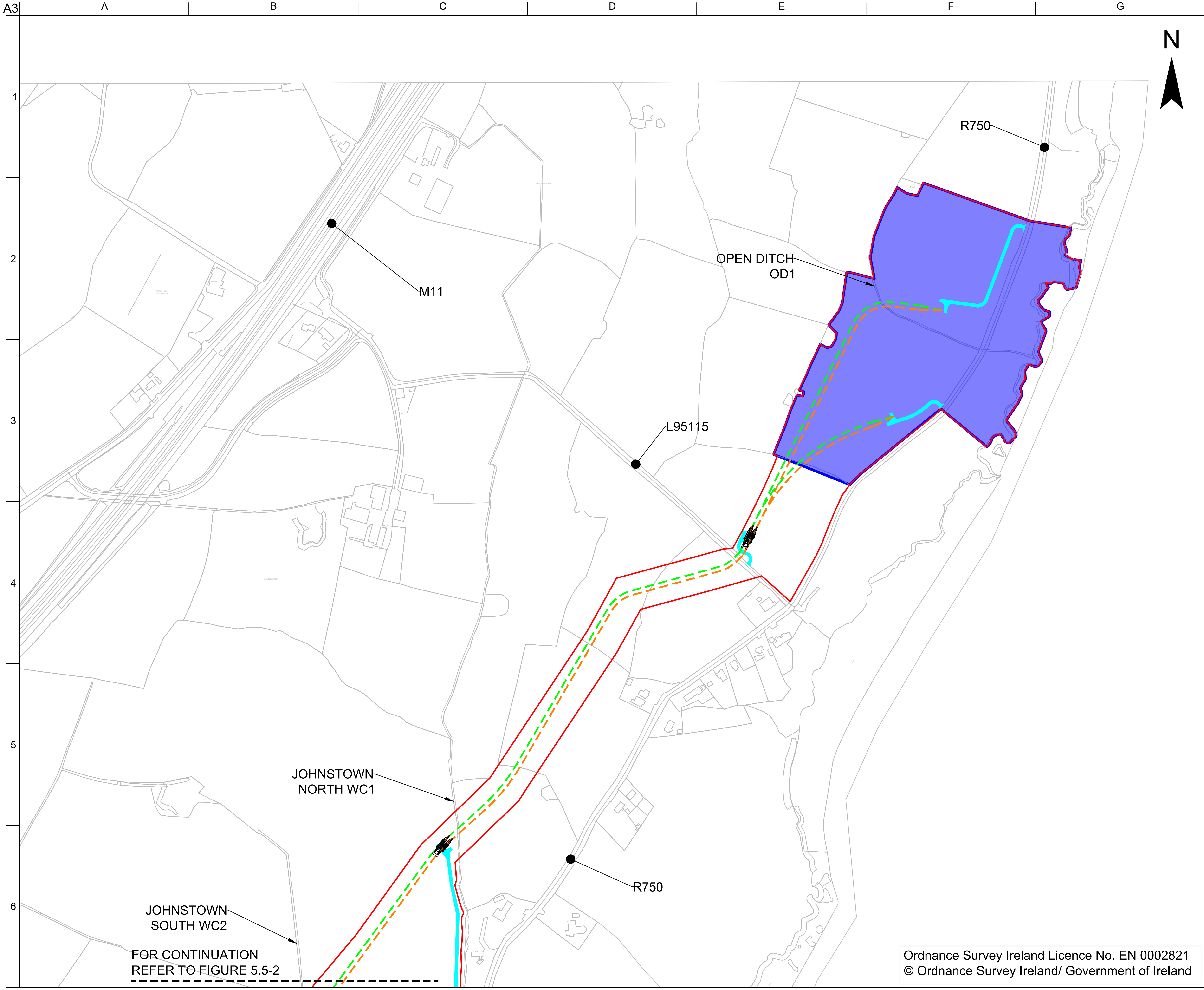
Role Civil
Suitability For Information
Arup Job No **271715-00**
Rev **D1**
Name
Figure 5.5



LEGEND:

- PROPOSED LANDFALL
- PROPOSED CIRCUIT 1
- PROPOSED CIRCUIT 2
- RED LINE BOUNDARY
- PROPOSED PERMANENT JOINT BAY ACCESS TRACK
- INDICATIVE PROPOSED STAGGERED JOINT BAY (TREFOIL)
- INDICATIVE PROPOSED PARALLEL JOINT BAY (FLAT FORMATION)

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Drawing Title
Proposed Cable Route
Sheet 1 of 4

Scale at A3: 1:5,000
Role: Civil
Suitability: For Information

Arup Job No: **271715-00**
Rev: **D1**

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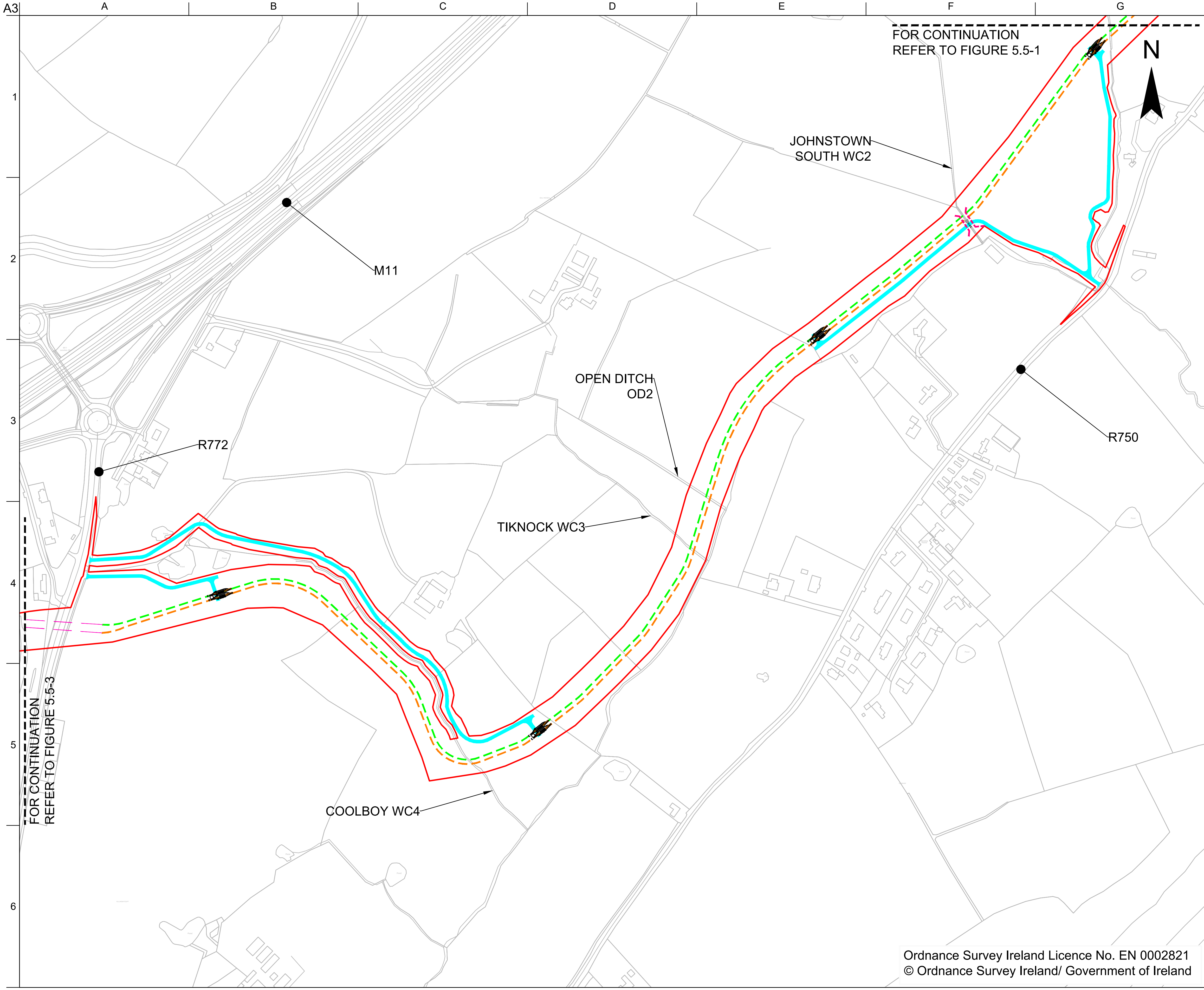

LEGEND:

- PROPOSED CIRCUIT 1
- PROPOSED CIRCUIT 2
- M11 & R772 HDD CROSSING OPTION
- RED LINE BOUNDARY
- PROPOSED PERMANENT JOINT BAY ACCESS TRACK
- INDICATIVE PROPOSED STAGGERED JOINT BAY (TREFOIL)
- INDICATIVE PROPOSED PARALLEL JOINT BAY (FLAT FORMATION)
- PROPOSED PERMANENT CULVERT

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Drawing Title
Proposed Cable Route
Sheet 2 of 4

Scale at A3: 1:5,000
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Suitability: For Information
Arup Job No: 271715-00
Rev: D1
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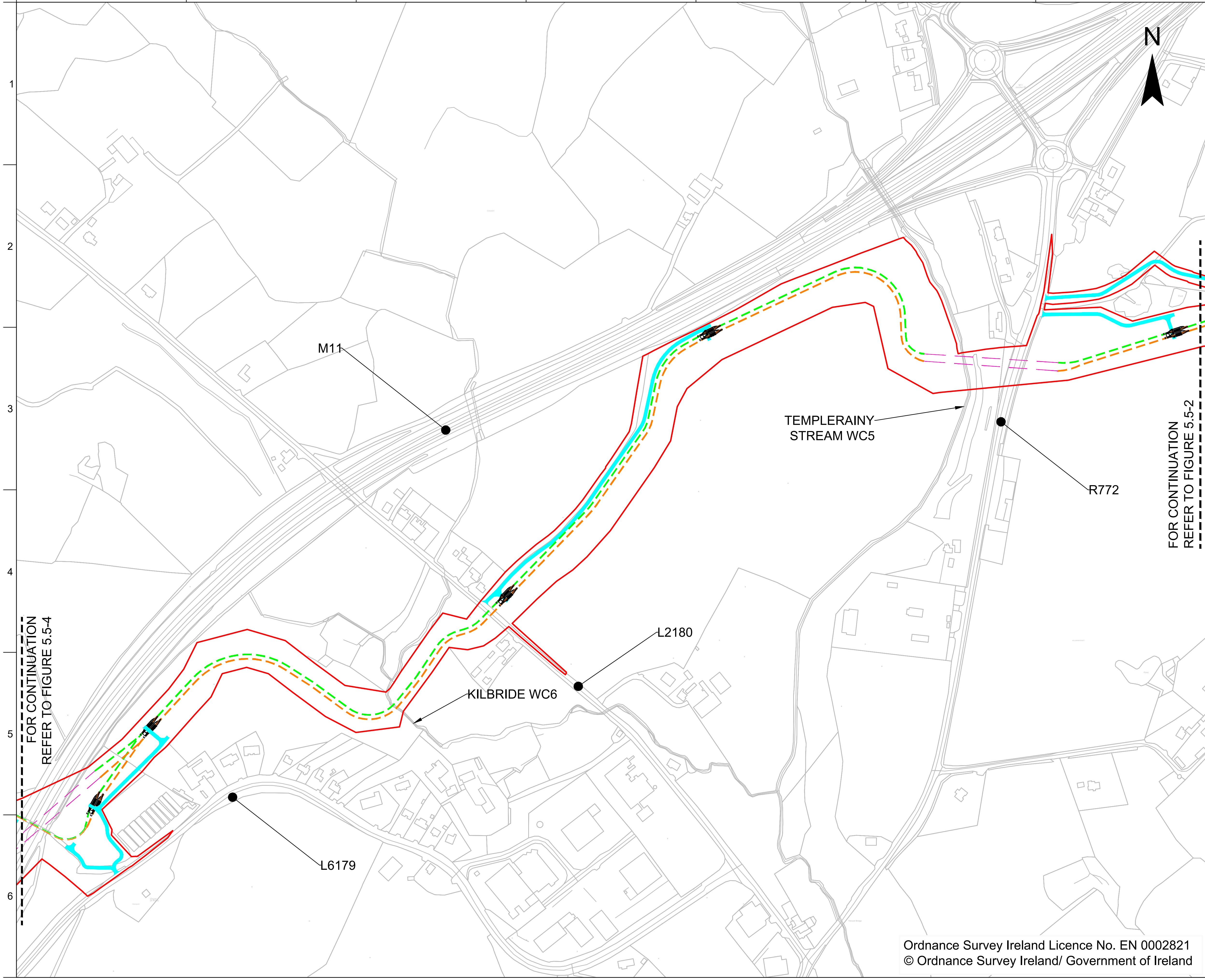

LEGEND:

- PROPOSED CIRCUIT 1
- PROPOSED CIRCUIT 2
- M11 & R772 HDD CROSSING OPTION
- RED LINE BOUNDARY
- PROPOSED PERMANENT JOINT BAY ACCESS TRACK
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Role: Civil
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Arup Job No: 271715-00
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Name
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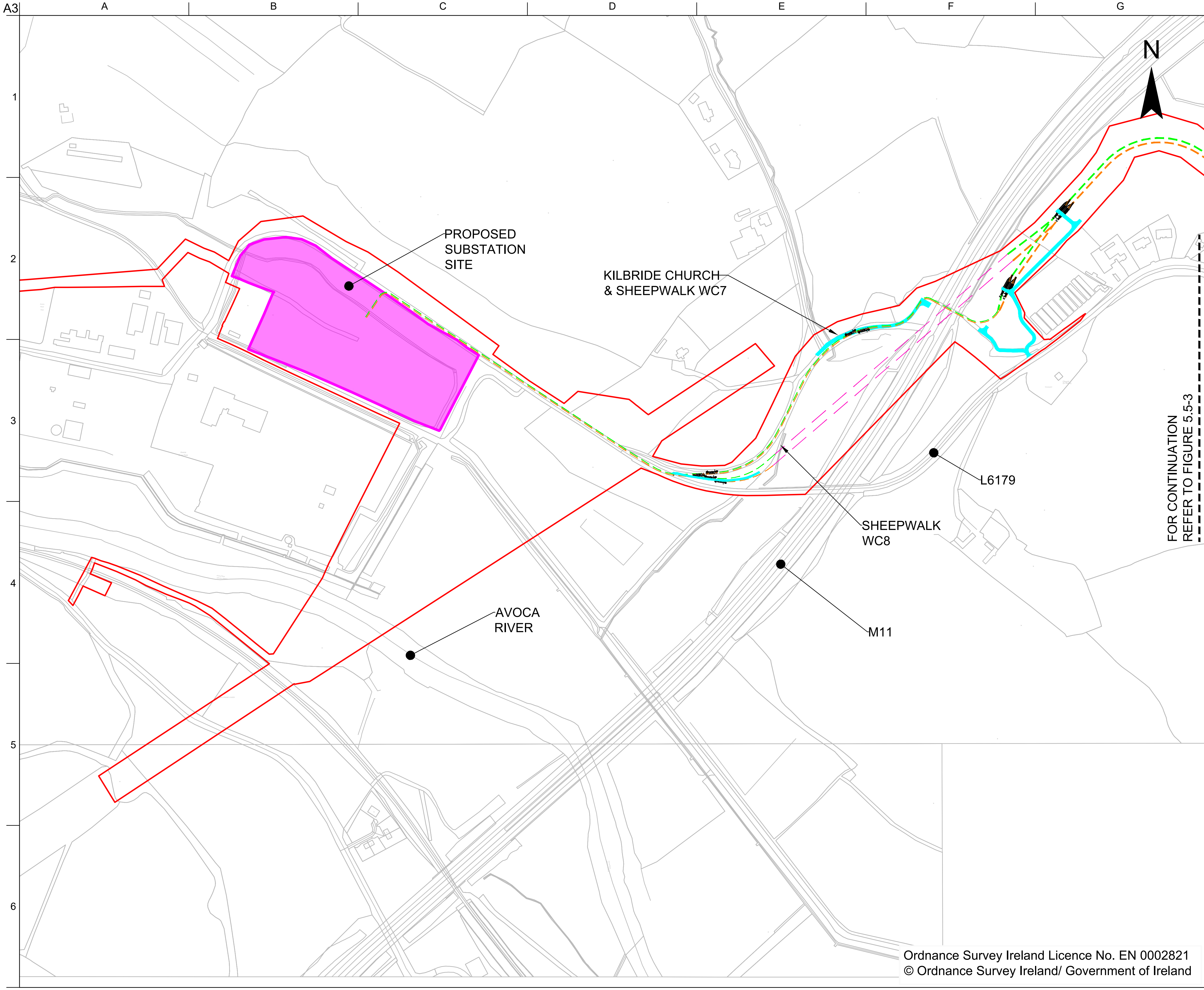

LEGEND:

- PROPOSED SUBSTATION SITE
- PROPOSED CIRCUIT 1
- PROPOSED CIRCUIT 2
- M11 HDD CROSSING OPTION
- RED LINE BOUNDARY
- PROPOSED PERMANENT JOINT BAY ACCESS TRACK
- INDICATIVE PROPOSED STAGGERED JOINT BAY (TREFOIL)
- INDICATIVE PROPOSED PARALLEL JOINT BAY (FLAT FORMATION)

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Sheet 4 of 4

Scale at A3: 1:5,000
Role: Civil
Suitability: For Information
Arup Job No: 271715-00
Rev: D1
Name: **Figure 5.5-4**

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5.6.2 Onshore Cable Details

Each of the two cable circuits comprises three power cables, one earthing conductor plus two fibre optic cables. In total therefore, there are six export cables, two earthing conductors plus four fibre optic cables.

The power cables will be single core triple-extruded dry cured cross-linked polyethylene insulated design. The metal sheath will be either lead, corrugated copper or corrugated aluminium or welded aluminium. The proposed cable detail is shown in **Figure 5.6**.

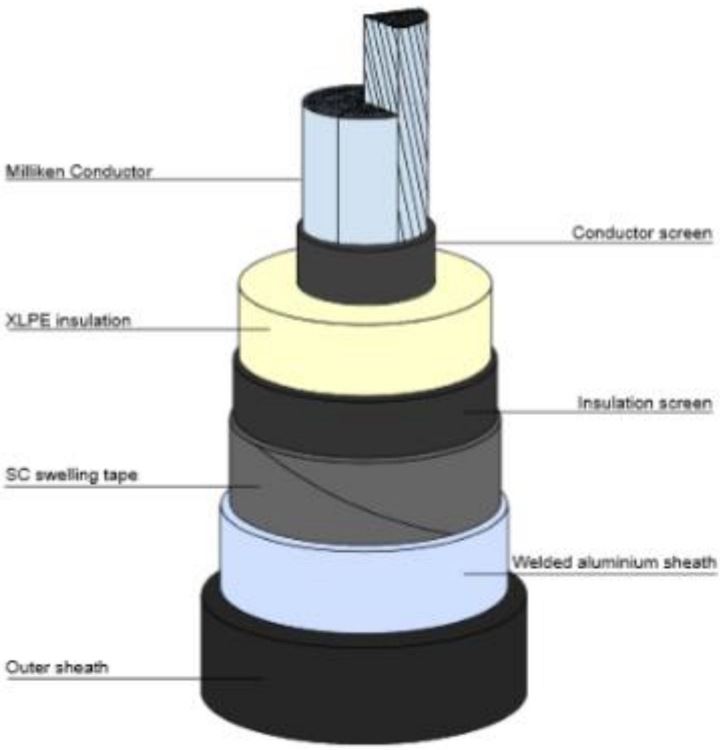


Figure 5.6 Single Core Onshore Cable

The three cables of each cable circuit will be positioned in a trefoil formation (see **Figure 5.7**), for HDD road crossings and the roads from the M11 crossing to the substation. For most of the route, however, the cables will be laid in flat formation separated by sufficient spacing (see **Figure 5.8**) to achieve the required electrical rating.

As shown in **Figure 5.7** and **Figure 5.8**, the minimum spacing between the two cable circuits is typically four metres. The minimum spacing will be less than four metres at the pinch points along the cable route, the M11 underpass (if this option is chosen) and the roads from the M11 crossing to the substation. The spacing may be increased for the HDD crossings of the M11 (if this option is chosen) and R772 as explained in **Section 5.6.6.1**.

5.6.3 Ducts and Protective Measures

The cables will be supplied to site on large reels. For the cables laid in a trench, when the ducts have been installed and the trench has been backfilled, the cables will be winched through the ducts.

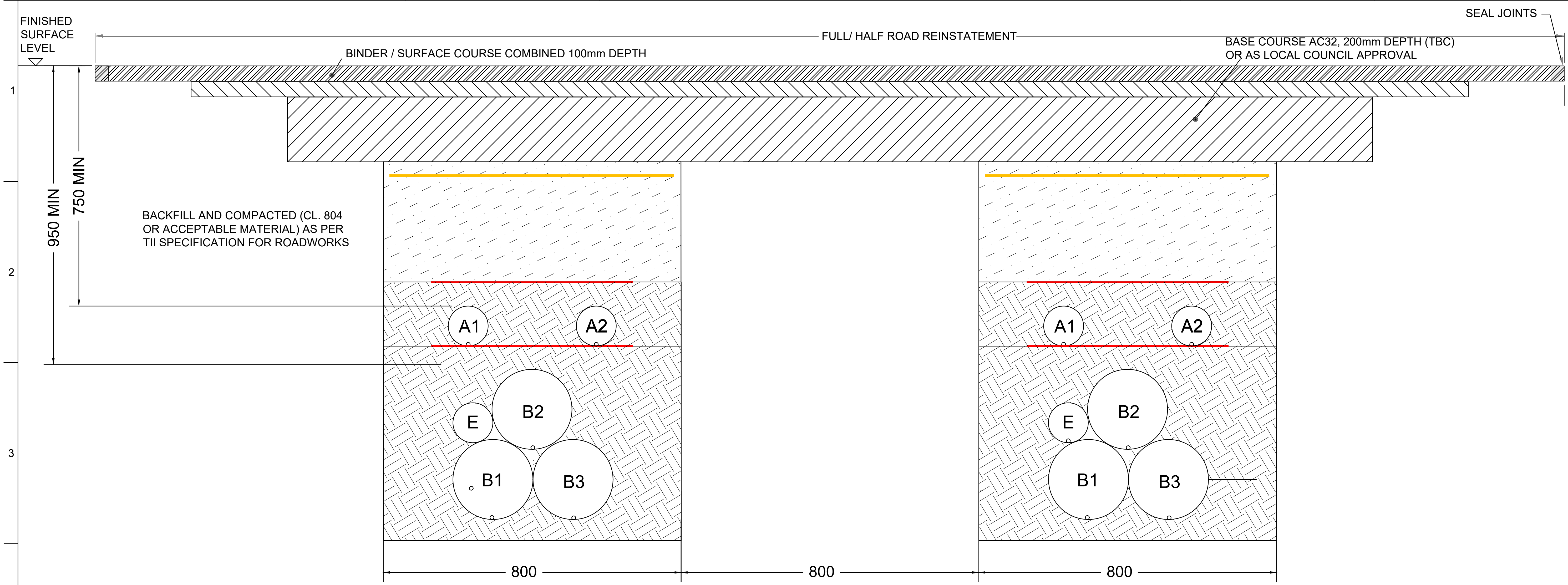
The cable ducts will be plastic, either Polyvinyl Chloride (PVC) or High Density Poly Ethylene (HDPE). It is anticipated that each power cable duct will have a diameter of approximately 250mm. The minimum width per cable trench will be 800mm and the maximum will be 1825mm. The width of the trench will vary with depth of cover (the deeper the cables are buried, the wider the trench may become). The typical maximum trench depth will be 2000mm, except at crossings where the trench will be deeper.

The proposed trench cross sections are shown in **Figure 5.7** and **Figure 5.8**.

The protection measures required for the cables are listed below:

- Around the cable ducts there will be a thermally suitable compactable granular material such as Cement Bound Granular Mixture (CBGM or weak concrete mix) providing mechanical protection;
- Above the cable surround (for both cable circuits and fibre optic cables) there will be 2.5mm red cable marker strips for the full trench width;
- Above the red cable marker strips and trench backfill, there will be a yellow warning tape, c. 300mm below ground level;
- At joint-bays, a concrete slab will be positioned at the bottom of each joint-bay;
- At joint-bays, above the joints and the thermal backfill there will be protective covers fitted across the full joint-bay;
- At road crossings the cable ducts will be embedded in cement bound granular mixture;
- At watercourse crossings there will be a concrete slab, below bed level for the full stream width, providing protection to the cables beneath;
- Above ground marker posts will be placed at regular intervals such as at field boundaries, road crossings and watercourse crossings.

The protective measures at trenchless (HDD) locations will be the HDPE duct and the depth of cover as described in **Section 5.6.6.1.**



TYPICAL ON ROAD CROSS SECTION INDICATING TRENCH FOR 220KV CIRCUIT TREFOIL

SCALE NTS

A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS, SDR=17.6
B= 250mm O.D. HDPE DUCT FOR HV CABLE, SDR=21
E= 125mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR, SDR=17.6

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE

- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822). COMPACTED TO CL 813.10
- BACKFILL COMPACTED (CL. 802 OR ACCEPTABLE MATERIAL)
- TOP SPOIL
- ACCEPTABLE REINSTATEMENT MATERIAL

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.

Rev	Date	By	Chkd	Appd
D1	17.02.21	SB	EO'G	MW

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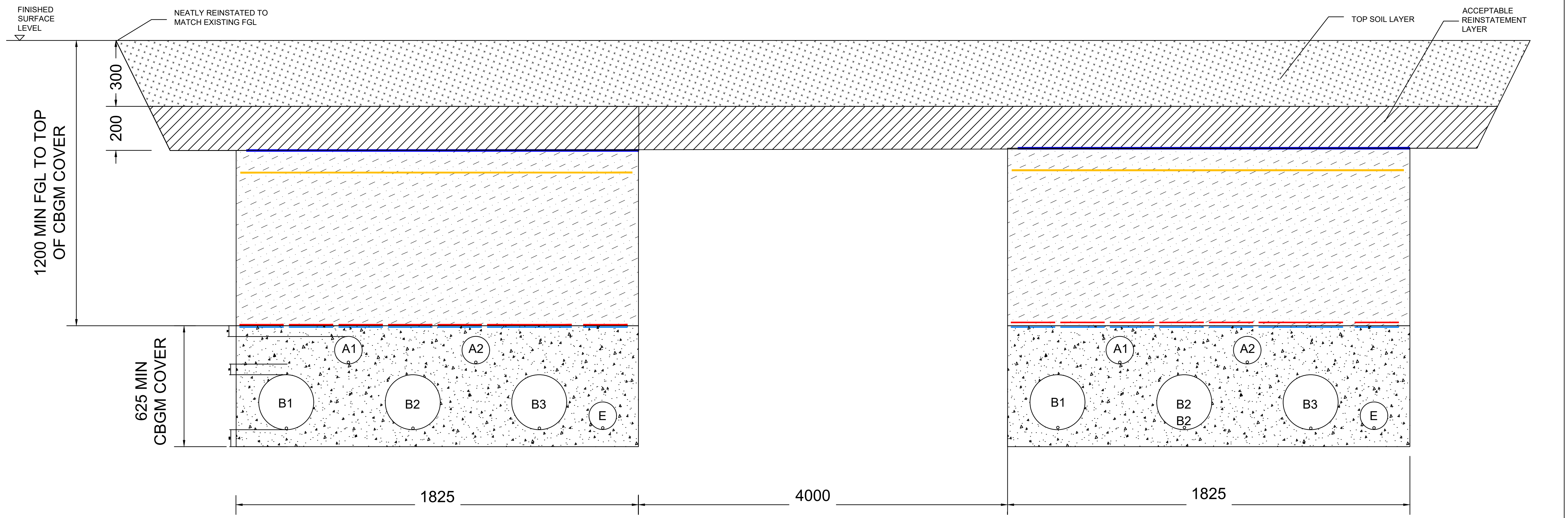
Project Title: Arklow Bank Wind Park Phase 2 Onshore Grid Infrastructure

Client: Sure Partners Limited

Drawing Title: Trench Cross Section Trefoil Arrangement

Scale at A3: NTS
Role: Civil
Suitability: For Information
Arup Job No: 271715-00
Rev: P1
Name: Figure 5.7

Do not scale



TYPICAL OFF ROAD CROSS SECTION INDICATING TRENCH FOR 220KV CIRCUIT FLAT FORMATION

SCALE NTS

A= 125mm O.D. HDPE DUCT FOR COMMUNICATIONS, SDR=17.6
B= 250mm O.D. HDPE DUCT FOR HV CABLE, SDR=21
E= 125mm O.D. HDPE DUCT FOR EARTH CONTINUITY CONDUCTOR, SDR=17.6

- RED MARKER STRIP
- YELLOW MARKER WARNING TAPE
- EXISTING SERVICE MARKER STRIP
- 6mm GALVANISED STEEL PLATE

- RAPID HARDENING WET CONCRETE C25/30
- CBGM B (CL. 822). COMPACTED TO CL 813.10
- BACKFILL COMPACTED (CL. 802 OR ACCEPTABLE MATERIAL)
- TOP SPOIL
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NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.

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D1	17.02.21	SB	EO'G	MW

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Project Title: Arklow Bank Wind Park Phase 2 Onshore Grid Infrastructure

Client: Sure Partners Limited

Drawing Title: Trench Cross Section Flat Arrangement

Scale at A3: NTS

Role: Civil

Suitability: For Information

Arup Job No: 271715-00

Rev: P1

Name: **Figure 5.8**

Do not scale

Duct/Cable Surround Material

Material for duct bed and surround, and trench backfill will be an inert, granular and well-compacted thermally suitable material (e.g. cement bound granular mixture) up to the red cable marker strip above the fibre optic cable ducts. This material will provide mechanical protection to the cable and will have the required thermal properties (i.e. a thermal resistivity of approximately 1.0Km/W). For HDD locations, it is not possible to have a specified backfill around the cables and therefore the ducts may be installed at a greater spacing to improve heat dissipation.

The trench backfill above the red cable marker strips will also need to be well compacted and thermally suitable. Most types of soil will be thermally suitable. However, ground types and material that will generally not be thermally suitable are as follows:

- Fuel ash;
- Made ground and rubble; and
- Peat.

The suitability of the cable route will be confirmed by ground investigation works and detailed design, and it is considered there is sufficient scope for micro-routing of the cables, within the planning (red line) boundary, to achieve a route through suitable material.

5.6.4 Joint Bays

The cables will be supplied to site on large reels, with 600m to 800m of cable being carried on a single reel. This results in two joint bays, one joint bay per cable circuit, being required every c. 700m of a cable installation and in places, at a closer spacing depending on the complexity of the route and the preferences of the landowners.

The joints between the three cables for each cable circuit will be made at a joint bay. A maximum of 20 joint bays (10 per cable circuit) will be required along the cable route.

Each joint bay comprises of:

- a joint chamber;
- a communications chamber; and
- an earth link box.

At each joint bay, the communications chamber and earth link box are covered by manhole covers which need to be accessed at regular intervals for maintenance purposes over the lifetime of the project.

Joint bay locations have been chosen within the planning boundary such that they are located in areas of suitable terrain, close to field boundaries and are easily accessible.

It is considered there is sufficient scope for micro-siting of the joint bays, within the planning (red line) boundary. Refer to **Figure 5.5** for indicative locations of joint bays. **Figure 5.9** shows a joint bay general arrangement similar to that which will be used on the proposed development.

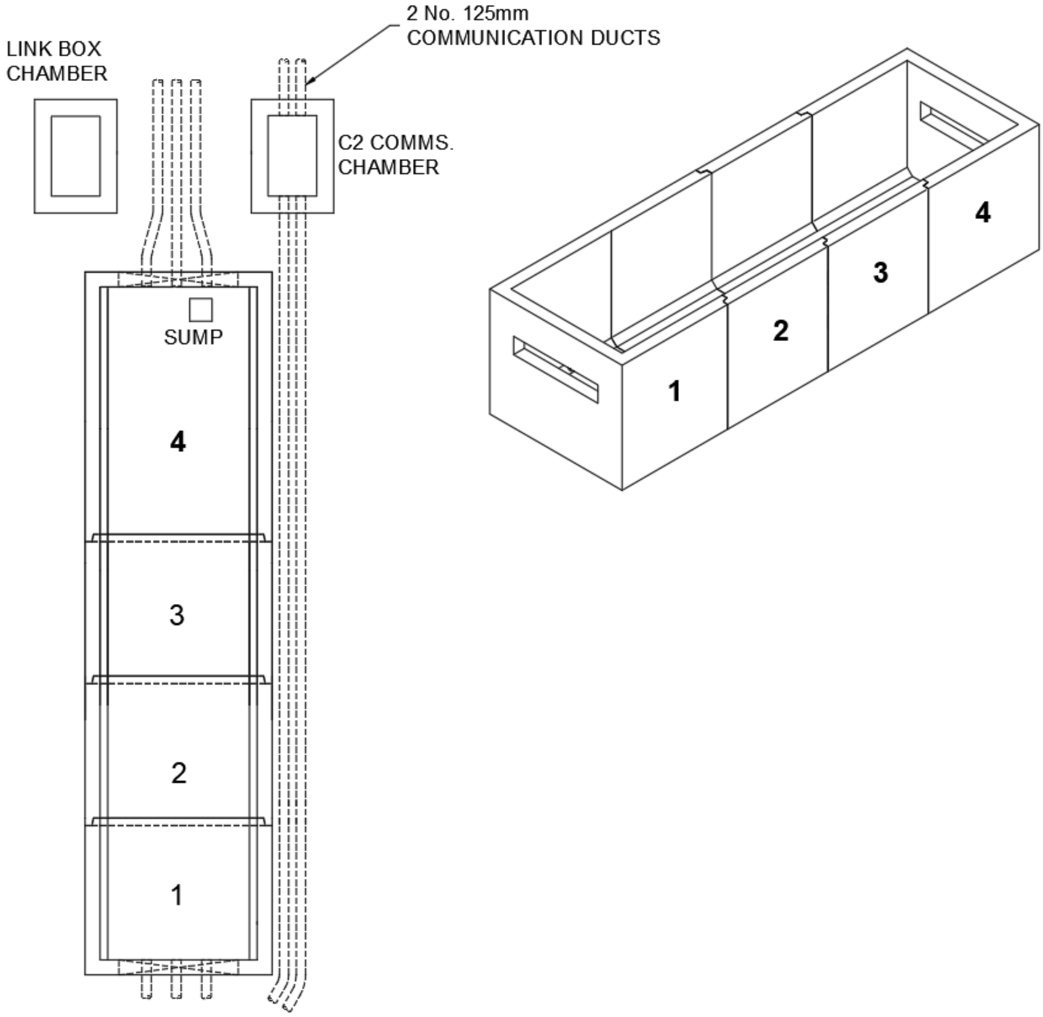


Figure 5.9 Joint Bay General Arrangement Drawing

Joint Chamber

The dimensions of each joint chamber along the cable route will be approximately 6m long x 2.5m wide x 2m deep. The joint chamber is a concrete chamber placed, or blockwork chamber constructed, in the ground where cable sections are jointed together. There will be three cable joints in each joint chamber for each cable circuit.

Link Box Chamber

A link box per cable circuit will be located along the route close to the joint chambers.

Link boxes are used at cable joints and terminations to provide easy access for cable testing and fault location purposes. Indicative dimensions for each link box chamber are 1.3m long x 0.8m wide x 1.2m deep.

There will be an earthing strip around the periphery of each joint bay. The earthing strip is typically a copper tape, approximately 25mm^2 in area, which provides an interface to ground via joint bay earth rods. The earth strip connects the conductor screen to earth via the link box.

There will be bonding leads (i.e. lower voltage cables) running from the link box to the joint chamber. **Figure 5.10 Link Box Chamber General Arrangement** illustrates a typical link box. An inspection chamber with manhole cover is required at each of the link boxes as they will need to be accessed occasionally (i.e. approximately once every year) to allow the outer polyethylene layer of the cable to be tested for integrity.

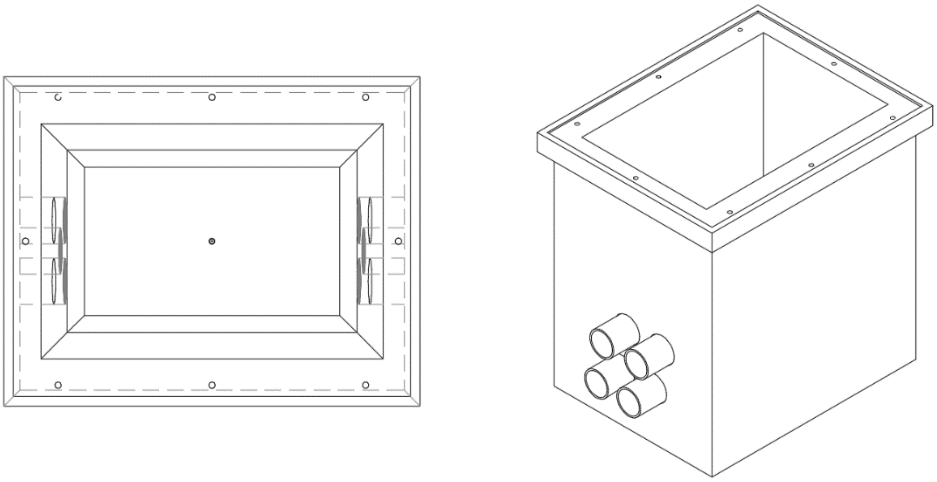


Figure 5.10 Link Box Chamber General Arrangement

Communication Chamber

At each joint bay a communication chamber is required. The fibre optic cables are jointed in the communication chamber. Indicative dimensions for the communication chamber are 1.3m long x 0.8m wide x 1.2m deep. **Figure 5.11 Communications Chamber General Arrangement** illustrates a typical communication chamber. An inspection chamber with manhole cover is required at each of the communication chambers as they will need to be accessed occasionally (i.e. approximately once every year) to allow the fibre optic cable to be tested for integrity.

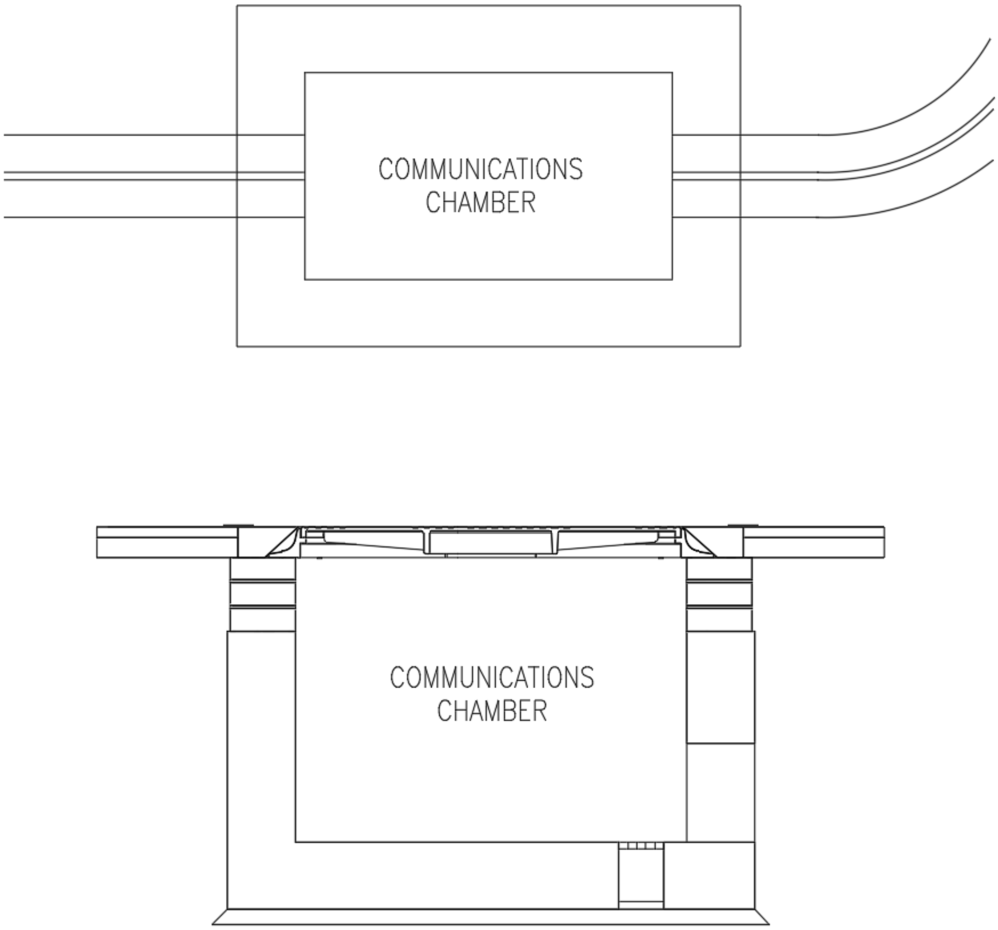


Figure 5.11 Communications Chamber General Arrangement

5.6.5 Marker Posts

Marker posts will be put in place at the following locations:

- At road crossings;
- In agricultural land, where the marker posts will be located at field edges where cables enter and leave the field;
- At watercourse crossings; and
- At changes in direction of the cable route.

Marker posts will be similar to that shown in **Figure 5.12 Typical Marker Post**. Marker posts will be installed with approximately 750mm of the post above ground and 600mm below ground.

Figure 5.12 Typical Marker Post

5.6.6 Cables Crossings of Obstacles

5.6.6.1 HDD Crossings

HDD works will be required for crossing below certain obstacles where open cut trenching is impractical.

A HDD will be required for the crossing of the R772 (including the Templerainy watercourse) and a second HDD may be required for the crossing of the M11 (including the Sheepwalk watercourse). Should a HDD not be utilised for crossing the M11, the cables will be laid within an existing underpass as detailed in **Section 5.6.6.2.**

Table 5.1 provides information on the proposed HDD crossings. Further detail on the HDD methodology is provided in **Chapter 6** *Construction Strategy*.

Table 5.1 Indicative HDD Parameters

Description	Approximate Length of HDD	Maximum Depth of HDD
R772 incl. Templerainy Watercourse (WC5)	200m	20m

Description	Approximate Length of HDD	Maximum Depth of HDD
M11 incl. Sheepwalk Watercourse (WC8)	500m	25m

When cables are installed at a greater depth than a typical trench it may be necessary to increase the cable spacing to maintain the rating of the cables. The depth of the HDD will be dependent on the ground profile and the cable spacing will be dependent upon the cable ratings. The cable axial spacing at various depths is dependent upon the conductor size selected. The axial spacing between the HDD ducts will be in the range of 4m to 20m. The expected outer diameter of the HDD duct will be a maximum of 800mm.

5.6.6.2 Cable Crossings of Other Obstacles

Other crossings including of watercourses, roads and one gas pipeline will be constructed using open cut trenched techniques. In the case of road crossings, these will be accompanied by traffic management measures to ensure access to dwellings or premises is maintained. For watercourses, water flow is maintained by damming the watercourse and over pumping or using temporary flume pipes.

Open cut construction methodology is described in **Chapter 6**, *Construction Strategy*. **Table 5.2** and **Figure 5.5** provides information on the types of crossings along the cable route and their location.

Table 5.2 Other Cable Crossing Types

Description	Crossing Type
L95115 Road	Temporary Open Cut
Johnstown North Watercourse (WC1)	Temporary Open Cut
Johnstown South Watercourse (WC2)	Permanent Culvert
Ticknock Watercourse (WC3)	Temporary Open Cut
Coolboy Watercourse (WC4)	Temporary Open Cut
L2180 Road	Temporary Open Cut
Kilbride Watercourse (WC6)	Temporary Open Cut

Description	**Crossing Type**
Kilbride Church Watercourse (if using M11 underpass) (WC7)	Temporary Open Cut
Sheepwalk Watercourse (if using M11 underpass) (WC7)	Temporary Open Cut
L6179 Road	Temporary Open Cut
2no. Unnamed Open Ditches (OD1 & OD2)	Temporary Open Cut
1no. 4bar Gas Pipeline	Temporary Open Cut

Should a HDD not be utilised for crossing the M11, the cables will be laid within an existing underpass, which was originally constructed as a service tunnel between agricultural fields. The cables would be laid on the base of the underpass in ducts and encased in concrete.

5.6.7 Permanent Access

Suitable access is required to facilitate safe access of plant and equipment to joint bay locations over the lifetime of the proposed development.

Where a joint bay cannot be accessed by an existing track, a new 4.5m wide permanent access track will be constructed using crushed stone to the joint bay locations. Any access tracks required will be within the planning (red line) boundary (Refer to **Figure 5.5**).

A permanent access track crosses the Johnstown South watercourse, as shown in **Figure 5.5**. A precast culvert, minimum diameter of 900mm and 7.5m long, will be installed at this crossing point. Refer to **Section 6.5.3.8** of **Chapter 6** *Construction Strategy* for further detail.

An entrance gate will be set back from the public road and a bituminous bellmouth will be formed at the junction where the permanent access track meets the public road, to facilitate safe vehicular access and egress.

Existing field drainage regimes will be maintained along joint bay access tracks, so access tracks do not adversely affect adjacent lands.

5.6.8 Maintenance of the Cables

Maintenance of the cables will comprise an inspection, once every year, by means of the link box and communication chambers, which will be located at every joint bay.

5.6.9 Decommissioning of Cables

The cables will be decommissioned when the project ceases operation, at the same time as decommissioning of the substations.

On decommissioning, the cables and associated ducts will most likely remain in-situ as there would be more environmental impact in removing these than can be justified by the recycle value of cable material and as is standard industry practice. However, all above ground infrastructure will be removed and these areas fully reinstated.

Chapter 4 *Consideration of Alternatives* provides further details on the various decommissioning options for the cables.

5.7 Onshore 220kV Substation

5.7.1 Substation Site Location and Context

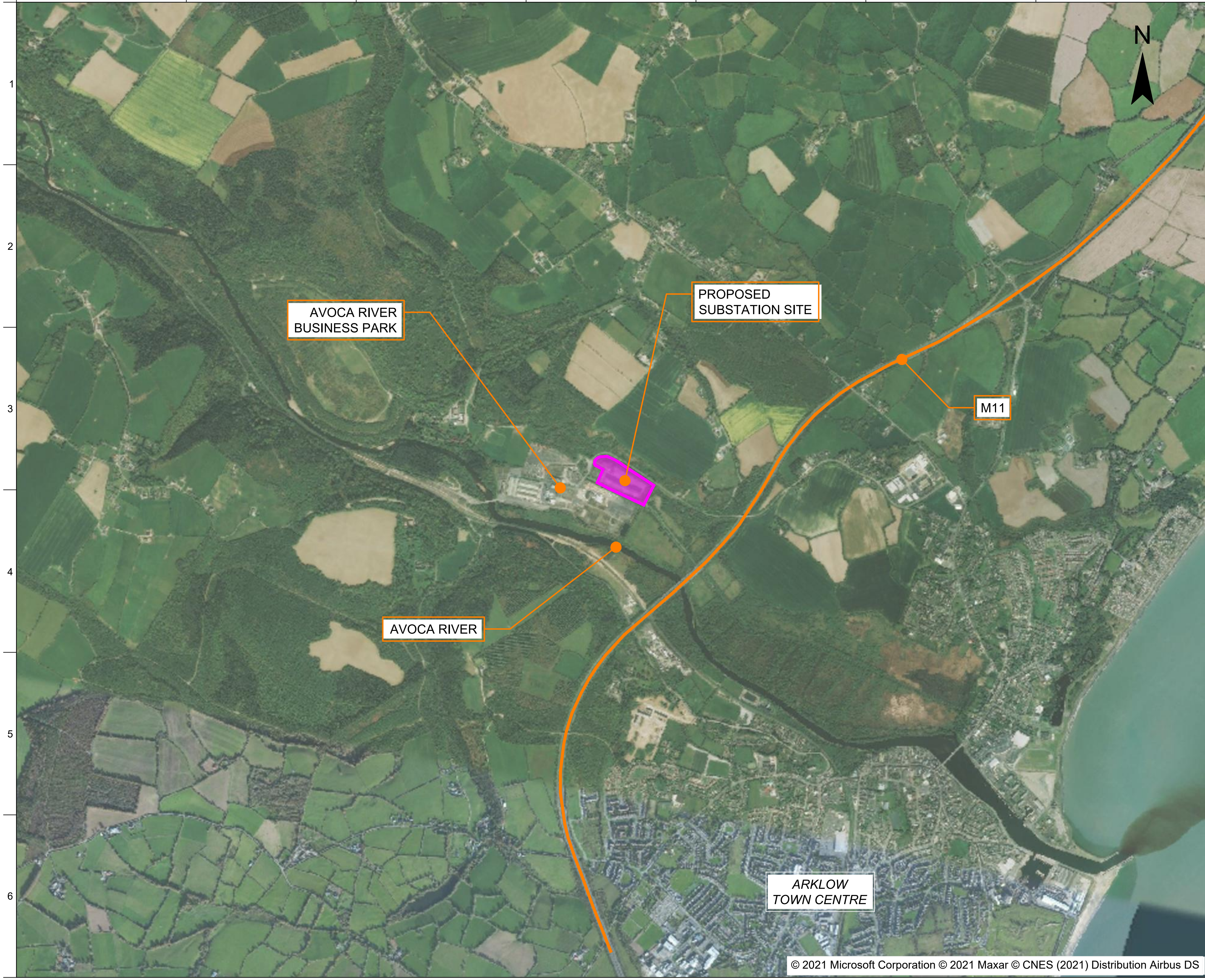
The site at Shelton Abbey for the proposed onshore 220kV substation is located 2.1km to the west of Arklow town. The site covers an area of approximately four hectares and is part of the Avoca River Business Park. The Avoca River forms the southern boundary of the Avoca River Business Park. The site is currently owned by Crag Digital Avoca Ltd, which has planning permission to develop a data centre on the site and an adjacent area (planning reference 18940). Another application has also been made by Crag Digital Avoca Ltd for this site (Planning Reference 201285).

It is a brownfield site and consists primarily of made ground with most of the site paved with asphalt. The Shelton Abbey Canal and Right of Way track are along the southern boundary. The Right of Way track consists of a mixture of soil and gravel. There is a small area of woodland between the site and the public road.

The Avoca River Business Park was occupied by the Irish Fertiliser Industries (IFI) manufacturing plant until 2003. The IFI plant was the subject of an EPA licence (Register Number: P0031-02). The Avoca River Business Park including, the site of the proposed substation, was removed from the licence through a partial licence surrender and the manufacturing plant was demolished. No licence obligations remain applicable to the proposed substation site. An adjacent area to the east of the Avoca River Business Park remains licensed by the EPA due to presence of a historic landfill.

Figure 5.13 shows the context of the site and **Figure 5.14** shows the proposed site layout.

A3 | A | B | C | D | E | F | G



LEGEND:

PROPOSED SUBSTATION SITE

D1	17.02.21	SB	EO'G	MW
Rev	Date	By	Chkd	Appd

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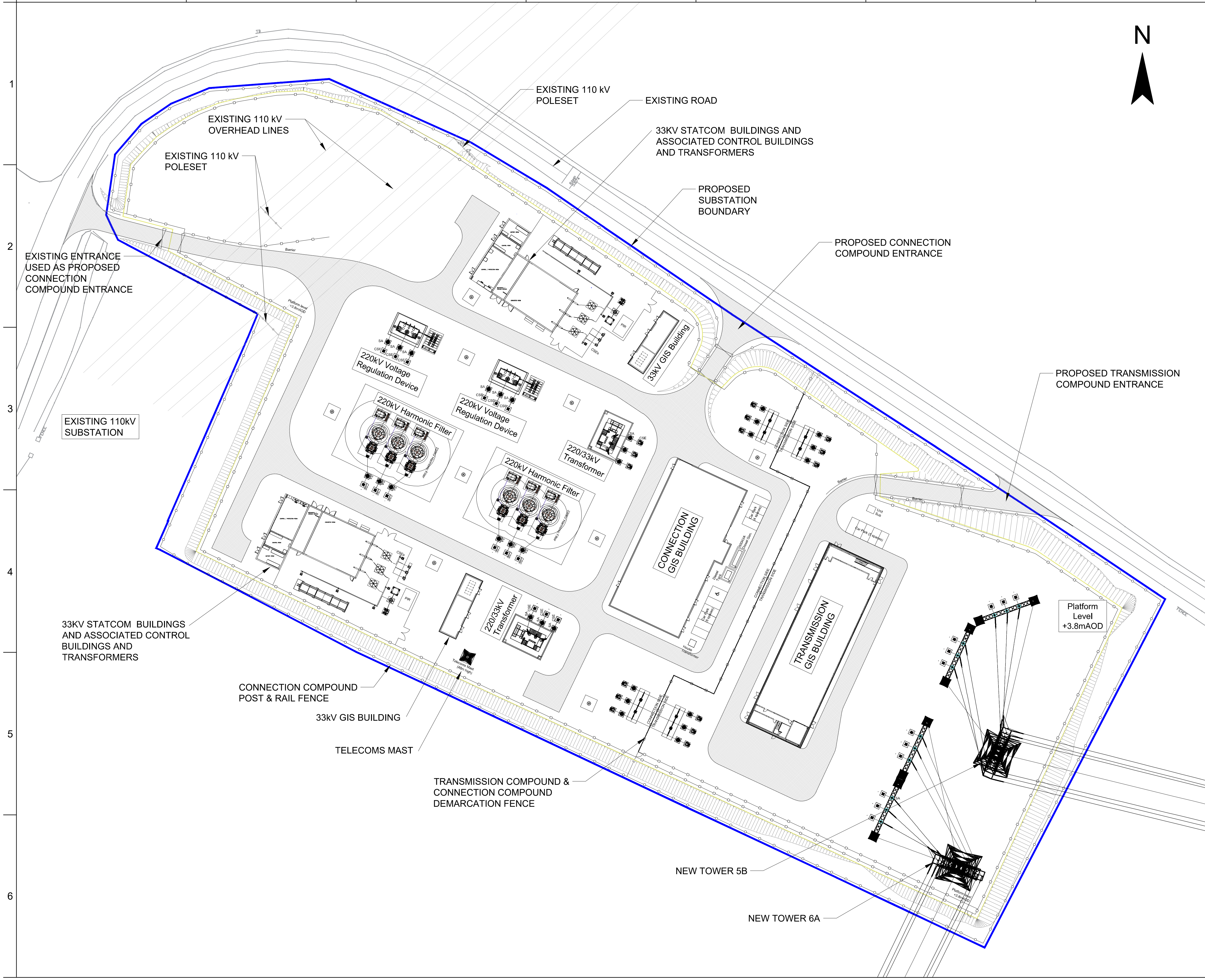
Client
Sure Partners Limited

Project Title
Arklow Bank Wind Park
Phase 2
Onshore Grid Infrastructure

Drawing Title
Proposed Substation Site

Scale at A3 1:20,000
Role Civil
Suitability For Information
Arup Job No **271715-00**
Rev **D1**
Name
Figure 5.13

Do not scale



LEGEND:

- SUBSTATION PLATFORM BOUNDARY
- SUBSTATION BOUNDARY
- PROPOSED EQUIPMENT, OHLs & NEW OHL TOWERS
- EXISTING 110 kV OHLs & POLES
- PALISADE FENCE LINE
- POST & RAIL FENCE LINE
- PROPOSED SUBSTATION COMPOUND ROAD
- INDICATIVE CUT/FILL EARTHWORKS
- PROPOSED LIGHTNING PROTECTION MONOPOLES

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D1	17.02.21	SB	EO'G	MW

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www.arup.com

Client
Sure Partners Limited

Project Title
Arklow Bank Wind Park
Phase 2
Onshore Grid Infrastructure

Drawing Title
Proposed Substation Layout

Scale at A3: NTS
Role: Civil
Suitability: For Information
Arup Job No: 271715-00
Rev: D1
Name: **Figure 5.14**

Do not scale

5.7.2 Substation Compound (Buildings and Equipment)

As outlined in **Chapter 4** *Consideration of Alternatives*, Gas Insulated Switchgear (GIS) technology was selected for the proposed substation.

The substation consists of two connected compounds:

- The transmission compound, with the infrastructure to physically connect to the NETN, including:
    - 2 no. new 220kV overhead line towers;
    - 220kV GIS substation building;
    - house transformer;
    - diesel generator; and
    - medium voltage (MV) unit substation.
- The connection compound, with the infrastructure to allow the connection of the windfarm in accordance with EirGrid Grid Code requirements, including:
    - 220kV GIS substation building;
    - 2 no. STATCOM buildings, associated control buildings and transformers;
    - 2 no. harmonic filters;
    - 2 no. voltage regulation devices;
    - telecommunications mast;
    - house transformer;
    - diesel generator; and
    - lightning arrester masts.

Figure 5.14 presents the layout plan of the proposed substation.

Underground cables will be used to connect the various pieces of electrical equipment within the substation. The underground cables will terminate at a cable sealing end (CSE) and connection to the piece of electrical equipment will be via a surge arrestor (SA) to help protect the equipment.

The overall design and external finishes of the substation buildings will, in so far as possible, conform with the architectural design of the adjacent buildings in the Avoca River Business Park.

A 'loop-in' connection will be made to the existing Lodgewood-Arklow 220kV overhead transmission line via the two new overhead line towers located adjacent to the GIS building in the transmission compound.

5.7.3 Transmission Compound Infrastructure

5.7.3.1 Transmission System 220kV Loop-In Connection

There will be two new 220kV overhead line towers in the transmission compound to loop-in the Lodgewood-Arklow 220kV line. An indicative tower layout and arrangement is shown in **Figure 5.15**.

The maximum height of each of the towers will be 40m.

The connection from the two towers into the transmission substation building will be via gantries and underground cables.

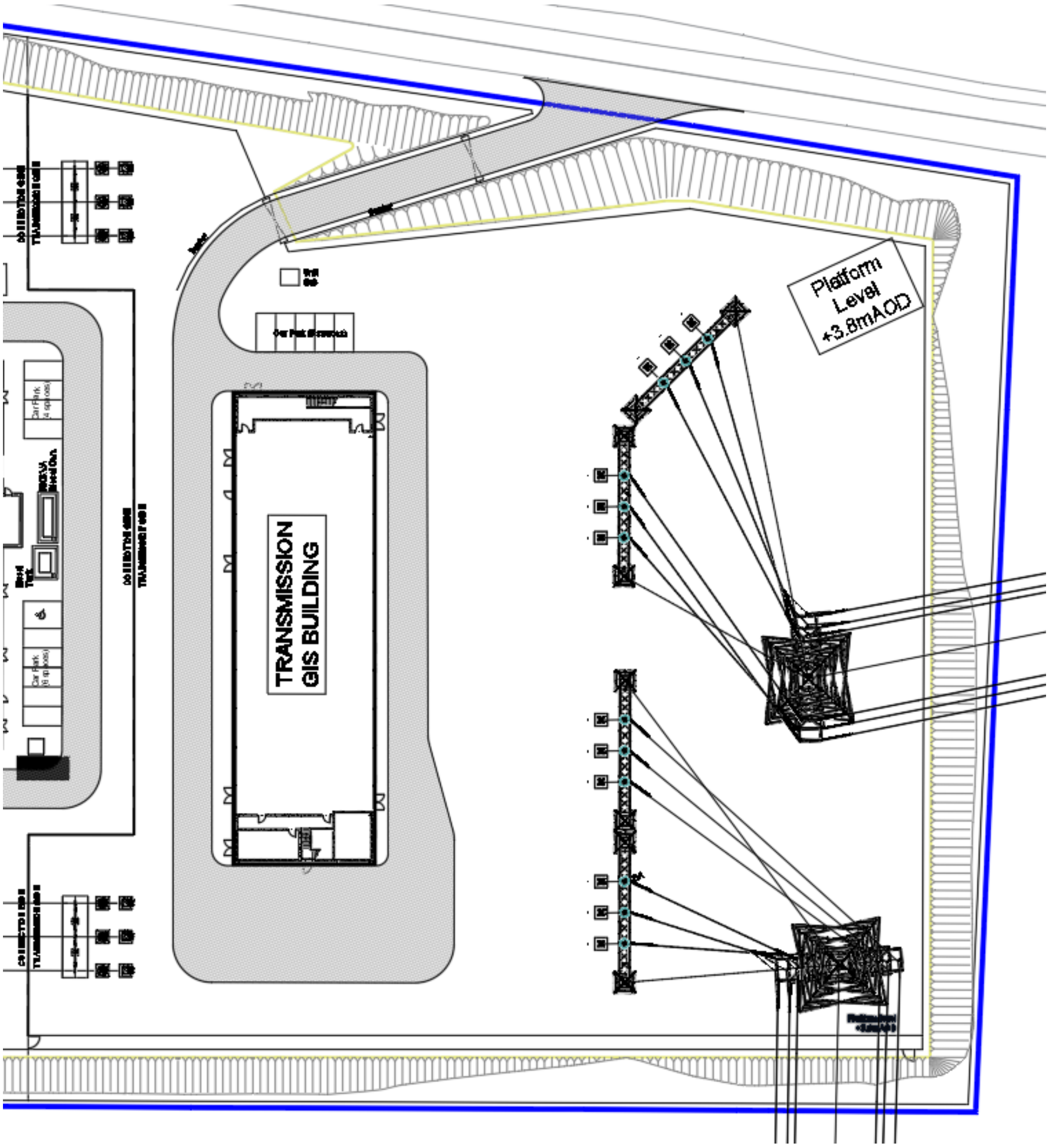


Figure 5.15 Transmission Compound Plan

5.7.3.2 Transmission System 220kV GIS Substation Building

The transmission system GIS substation building will be a two-storey building. The ground floor of the building will contain the control and protection room, battery room, welfare facilities, workshop, store-room and cable pit. The first floor of the building will contain the 220kV GIS equipment.

The dimensions of the building will be 61m long x 18.5m wide x 17m high. The external finish of the transmission system GIS building will be selected insulated metal wall cladding, or similar approved, in a matt dark grey/green colour as described in **Chapter 14** *Landscape and Visual*.

The transmission substation building will also accommodate a diesel tank and diesel standby generator, as described in **Section 5.7.5** below.

5.7.3.3 Medium Voltage Unit Substation

A back-up electricity supply is required for the transmission compound. This will be via a small unit substation and underground cable circuit from the existing 110kV substation that is immediately adjacent to the new onshore 220kV substation of the proposed development.

The unit substation will be a metal enclosure containing a transformer and switchgear to step down the Medium Voltage (MV) back-up supply from the existing 110kV substation to Low Voltage (LV) required at the transmission GIS building. The typical dimensions for the unit substation will be 3m long x 3m wide x 3m high.

5.7.4 Connection Compound Infrastructure

5.7.4.1 Connection 220kV GIS Substation Building

The Connection GIS substation building will consist of a two-storey building. The ground floor of the building will contain the control and protection room, battery room, welfare facilities, workshop, meeting room, store-room and cable pit. The first floor of the building will contain the 220kV GIS equipment.

The dimensions of the building will be 50m long x 23.75m wide x 17m high. The external finish of the connection 220kV GIS building will be selected insulated metal wall cladding, or similar approved, in a matt dark grey/green colour as described in **Chapter 14** *Landscape and Visual*.

5.7.4.2 STATCOM Buildings and Associated Control Buildings and Transformers

Two STATCOM (Static Synchronous Compensator) buildings housing equipment and control panels with an adjacent compound and 220/33kV transformer will be provided per 220kV export cable circuit to ensure the proposed development will comply with the EirGrid Grid Code requirements. The indicative STATCOM buildings and compound layout are shown in **Figure 5.16 STATCOM Building and Compound Layout** below.

The STATCOM building will contain the valve module Insulated Gate Bipolar Transistor (IGBT) assembly. The valve modules will consist of power electronics (IGBTs), a Direct Current (DC) capacitor integrated with cooling fluid and fibre interfaces.

The STATCOM compound will contain the pre-insertion resistors (PIR) to limit the current on charging the DC capacitors in the valve module. Also contained in the compound will be the air core current regulators, 33kV air insulted busbars and cooling fan assembly.

The STATCOM control building will contain the control and protection panels required to operate and control the STATCOM devices.

The STATCOM 220/33kV transformer will step down the transmission system voltage from 220kV to the operating voltage of the STATCOM, typically 33kV.

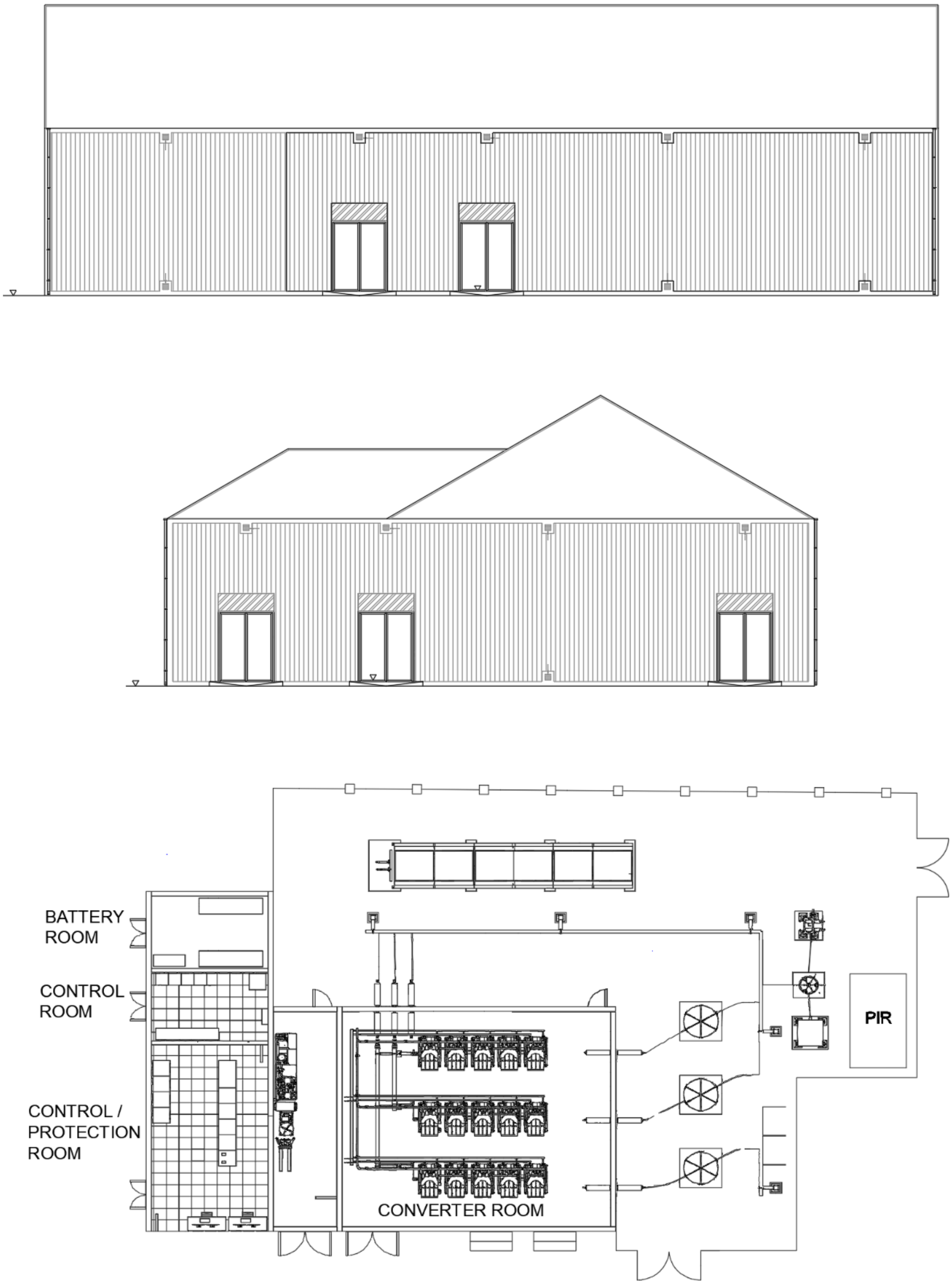


Figure 5.16 STATCOM Building and Compound Layout

The dimensions of the STATCOM buildings will be approximately 30m long x 23m wide x 10m high at the ridge of 30° pitched roof. The external finish of the building will be plastered render, in a matt dark grey/green colour as described in **Chapter 14** *Landscape and Visual*.

5.7.4.3 Voltage Regulation Device

A voltage regulation device will be provided for each 220kV export cable circuit to ensure the Project will comply with the EirGrid Grid Code requirements. The typical voltage regulation device layout is shown in **Figure 5.17 Voltage Regulation Device Layout** below.

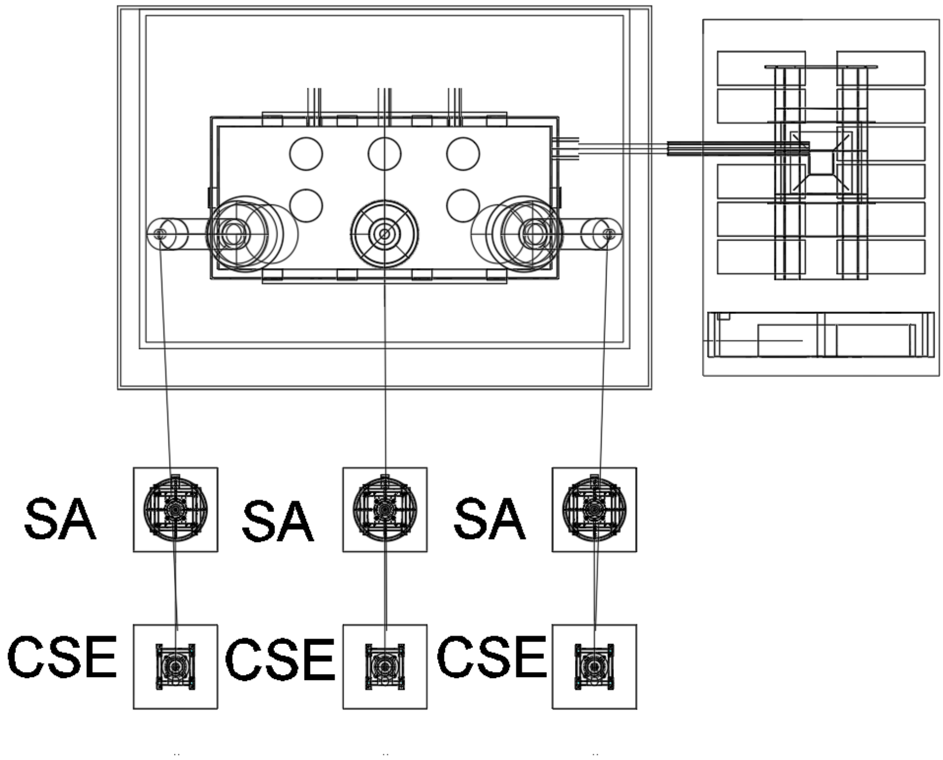


Figure 5.17 Voltage Regulation Device Layout

The voltage regulation device will be approximately 5m long x 2.6m wide x 3.7m high, weighing up to 53t.

5.7.4.4 Harmonic Filter

A harmonic filter will be provided for each 220kV export cable circuit to ensure the proposed development will comply with the EirGrid Grid Code requirements. A typical harmonic filter layout is shown in **Figure 5.18** below.

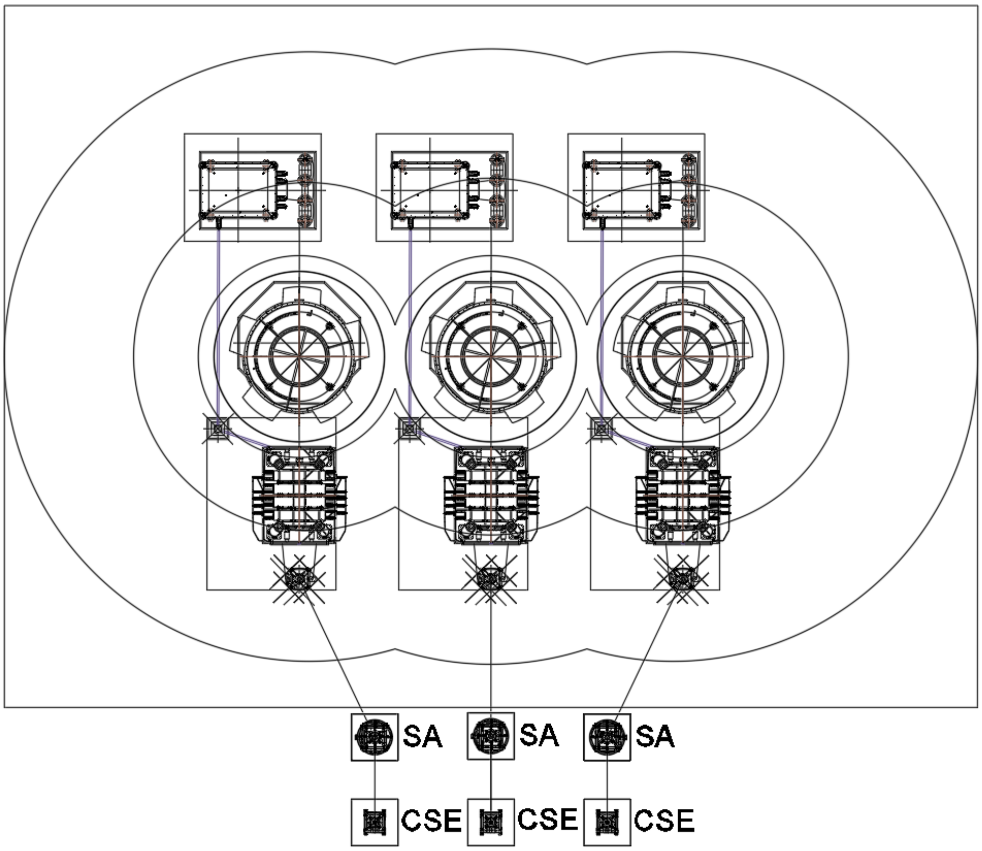


Figure 5.18 Harmonic Filter Layout

The harmonic filter will consist of three lines of interconnected pieces of equipment, a capacitor bank, resistor and reactor. The installed dimensions (approximate) will be:

- Capacitor bank – 12m long x 3.5m wide x 3.5m high
- Resistor – 6m long x 3m wide x 3m high
- Reactor – 7m long x 5m wide x 5m high

The equipment will be surrounded by a c. 2m high fence to restrict access.

5.7.4.5 House Transformer

A house transformer, approximately 500kVA in size will be located adjacent to the connection GIS building. The house transformer will provide a LV electricity supply to the connection compound. The house transformer will be approx. 2.5m long x 2.5m wide x 3m high.

5.7.4.6 Lightning Arrestor Mast

Lightning arrestor masts, maximum 30m high, will be provided in the connection compound. This will ensure the external electrical equipment will be protected from lightning strikes throughout the lifetime of the proposed development. The proposed masts are shown on the substation layout in **Figure 5.14** above.

5.7.5 Common Site Infrastructure

5.7.5.1 Storage of Liquids and Gases

The transformers (STATCOM and house) will be oil filled. Each transformer and the diesel oil fuel tank (for the standby generator) will be located within its own impermeable oil tight concrete-walled containment bund. Each containment bund will have a capacity of not less than 110% of the volume of the liquid capacity of the equipment it is supporting.

Rainwater accumulation in each oil containment bund will be drained to a sump and then on to a respective class 1 full retention oil separator for treatment before joining the site main surface water drainage system.

The cooling of the STATCOM valve modules will be administered by a closed loop liquid to air cooling system equipped with a water to air heat exchanger. The coolant, which will be a glycol-based coolant will be the only liquid stored in bulk on site, apart from the fuel storage for the standby diesel generator. Coolant will be stored in special bunded standby tanks located in the STATCOM building.

The transmission compound and connection compound equipment will contain Sulphur Hexafluoride SF6, with design and manufacture of the equipment following industry best practice to contain the gas.

5.7.5.2 Standby Diesel Generator

A standby diesel generator, approximately 500kVA in capacity will be located adjacent to the Connection GIS building. The generator will be in a waterproof enclosure and located on an impermeable containment bund. A double skinned diesel tank with up to 3 days of fuel storage will be located beside the generator.

A second diesel generator and double skinned diesel tank with similar storage capacity will be located within the transmission GIS building.

The diesel generators will be approx. 6m long x 2.5m wide x 3m high.

5.7.5.3 Landscaping

Low level native planting will be incorporated in undeveloped areas, within the overall substation site, to provide soft landscaping.

5.7.5.4 Utilities

The substation will have the following utilities:

- Potable Water;
- Foul Drainage;
- Surface Water Drainage
- Telecoms and IT; and

- Electricity.

Potable water

Potable water for the site will be provided by a new watermain, which will connect to the existing watermain outside the perimeter of the site. This will be laid along the proposed site access track, to the welfare facilities in the connection GIS substation and transmission GIS substation buildings.

A pre-connection enquiry has been made to Irish Water, which has confirmed that a connection can be made to the public water supply, to the southeast of the substation site. Irish Water has advised that the existing 2.3km watermain will be upgraded to facilitate this and other developments at the Avoca River Business Park.

Foul Drainage

There will be infrequent visits by personnel to the substation, therefore, foul wastewater generated will be minimal. Foul wastewater will be collected independently from the welfare facilities in both the transmission 220kV GIS substation building and the connection 220kV GIS substation building.

Foul wastewater will be stored temporarily in respective, appropriately sized, foul wastewater holding tanks and removed from site periodically, by a licensed service provider, to a licensed wastewater treatment facility.

Surface Water Drainage

Surface water drainage infrastructure is already in place on the site, at the Avoca River Business Park. Surface water from the existing site drains to a ditch around the western and northern boundary of the site, and to the canal near the southern boundary of site.

A new surface water drainage network will be constructed to accommodate the proposed development. Appropriately sized hydrocarbon interceptors will be installed at strategic locations along the proposed surface water drainage network to prevent any hydrocarbons from leaving the site of the proposed substation.

The surface water drainage network has been designed to ensure that no flooding or surcharging of the system will occur for all storm events up to and including the 1 in 30 year return period storm event. All buildings and equipment within the site boundary will be protected against flooding for all storm events up to and including the 1 in 200 year return period storm event. The proposed surface water drainage network design includes an allowance for climate change.

There may also be a requirement for the pumping arrangement (used to control the discharge of surface water to the Avoca River) to be replaced. Further, on the northern side of the flood defence embankment, a hydrobrake will be installed to the existing attenuation pond outfall, limiting the existing gravity fed outfall to a maximum greenfield discharge rate of the existing facilities and planned developments within Avoca River Business Park.

Further details are provided in **Chapter 10** *Water*.

Telecoms and Electrical Supply

A new telecommunications mast, maximum 50m high, will be required in the connection compound.

Standby diesel generators will be provided in both the connection and transmission substation compounds. A house transformer will be provided in the connection compound.

The transmission substation compound will also have a Medium Voltage supply as described in **Section 5.7.3.3**.

Security Fencing

Facilities will be provided to ensure adequate security including a secure perimeter around both compounds. These include:

- Boundary Palisade Fencing
- Posts and Railings
- Entrance gates
- Site lighting and CCTV security measures.

External Lighting

The lighting system will provide directional illumination within the substation to allow personnel to move without risk to health and safety and to prevent light spill. Security lighting will be installed against the building and Glass Reinforced Polymer lighting poles of maximum 6m height will be installed for illuminating the external area within the perimeter fencing.

Under normal operating conditions, external lighting will be switched off during the hours of darkness, to avoid creating any unnecessary glare in the night sky. The exception would be for emergency repairs to outdoor equipment, where high-level illumination would be switched on. Motion sensor technology will be used to control lighting at access doors and security gates.

Lighting will be designed to provide minimum lux levels, for security and for safety reasons.

The lighting will comply with EirGrid requirements, which include for outdoors at ground level horizontal illuminance of not less than 2 lux. Lights will be controlled to automatically switch on at 55 lux and off at 110 lux, with manual override.

For emergency lighting, a minimum illumination of not less than 30 lux will be provided in all areas to ensure safe movement of personnel, and safe access to, and egress from any part of the substation buildings.

5.7.6 Permanent Access

Access to both the transmission compound and connection compound will be via the existing road network, from the R772, which is c. 2km to the east, to the

L6179 Kilbride Road leading to the private Avoca River Business Park access track. This access route will be used for both construction activities and as the permanent access during the operational phase.

As indicated in **Figure 5.14**, the transmission compound will have a separate site access from the connection compound. Both access roads will be located along the northern boundary of the proposed site, with new junctions proposed from the private Avoca River Business Park access road.

As shown on **Figure 5.14**, there will be a number of areas around the substation site which will be finished in an unbound surface.

These unbound surfaces will consist of a natural, suitably graded granular crushed stone, generally comprising a maximum particle size of between 30-50mm, to a minimum compacted thickness of 200mm.

Site surfacing will be spread after installation of services and cables. Filter drains, connected to the surface water drainage system will collect surface water run-off from the site road and yard areas.

It is proposed to have 10 car parking spaces in the connection compound and 5 spaces in the transmission compound, for use by the maintenance staff.

5.7.7 Substation Site Remediation

The substation site is currently covered by asphalt underlain by made ground which ranges in thickness from 0.8 to 2.3m. The made ground is underlain by silts and clays which in places include organic peat like material. A gravel aquifer underlies the silts/clay layer, which vary from c. 9.0 to 14.5m thick. This layer is underlain by the shale bedrock which is classified as a Locally Important Aquifer.

Site investigations have found that the composition of the made ground varies throughout the site, from inert to material with elevated levels of heavy metals as described in **Chapter 9** *Land and Soils*.

The proposed remediation strategy for the site, following removal of the asphalt, is to cap the made ground with a barrier layer. The barrier layer will minimise the percolation of rainwater through the contaminated material which will minimise leachate generation, act as a gas barrier and also form a physical barrier for site users to prevent dermal contact with the heavy metals in the made ground during site operation.

The current ground level across the site is between 1.38m OD and 2.4m OD. The platform will be built up to a maximum level of 3.8m OD, which meets the minimum recommended level for flood protection and also facilitates the installation of underground services, to ensure that the design objectives and function of both the remedial measures and buried services are met.

In addition to the removal of the existing asphalt, relatively small volumes of made ground in localised areas will be excavated to facilitate the construction of footings, cable duct basements and the installation of drainage pipes.

The excavation of made ground and installation of the capping system at the substation site is described in **Chapter 6** *Construction Strategy*.

5.7.8 Improvement Works to Flood Defences

A flood defence embankment protects the Avoca River Business Park from flooding of the Avoca River. Approximately 500m to the west of the substation site, a low point in the existing flood defences requires improvement works to protect the substation buildings, and associated ancillary external equipment, from a mid-range future scenario 1 in 1000 return period flood event. Refer to **Chapter 10** *Water* and **Appendix 10.1** for the Flood Risk Assessment.

The substation site flood defence improvement works will include localised raising of the existing flood defence embankment level from c. 5.8m OD to 6.5m OD over a distance of up to 75m (using either cohesive soils, placed and suitably compacted in layers and/or sheet piling as shown in **Figure 5.19**).

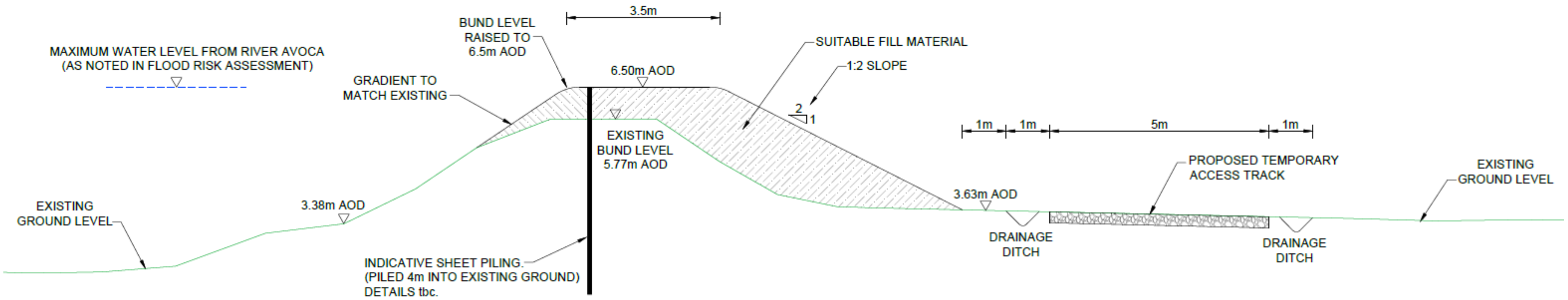


Figure 5.19 Flood Defence Embankment Works - Indicative Cross Section

5.7.9 Operation and Maintenance

The substation will be operated remotely and will be unmanned during operation. It will receive occasional visits for inspection and maintenance.

The transmission compound and connection compound have both been designed to accommodate up to eight people during operation and maintenance. Each compound will require routine operational checks to be carried out six to eight times per month, as well as quarterly inspection visits and further visits for maintenance as and when required (typically once a year in each case).

For typical visits to a compound, it is expected that one or two vehicles may attend, and these visits would take place within normal working hours.

Maintenance visits to a compound will typically require six vehicles per day. This work may be undertaken on a shift pattern to allow 24-hour working.

The standby diesel generators will be available for operation in the event the normal electrical supply is lost, with up to 3 days of fuel storage being located on site. This would be expected to be used once every 5 years for up to 3 days and will be tested for one hour every month as part of routine maintenance.

5.7.10 Decommissioning

The normal asset life of a substation is c. 50 years but it may be extended beyond this, as part of the national grid infrastructure. When the proposed development reaches the end of its useful life, it may be either refurbished and replaced, or it will be decommissioned.

If decommissioned, all buildings and above ground structures on the substation site will be removed.

5.8 Connection to the National Electricity Transmission Network (NETN)

An overhead line (OHL) connection from the new proposed 220kV transmission compound to the existing 220kV NETN will be required. This connection will be via a 'loop in' arrangement consisting of a northern tie-in to the transmission network of approximately 270m and a southern tie-in to the transmission network of approximately 350m in length.

The connection is shown in **Figure 5.20**.

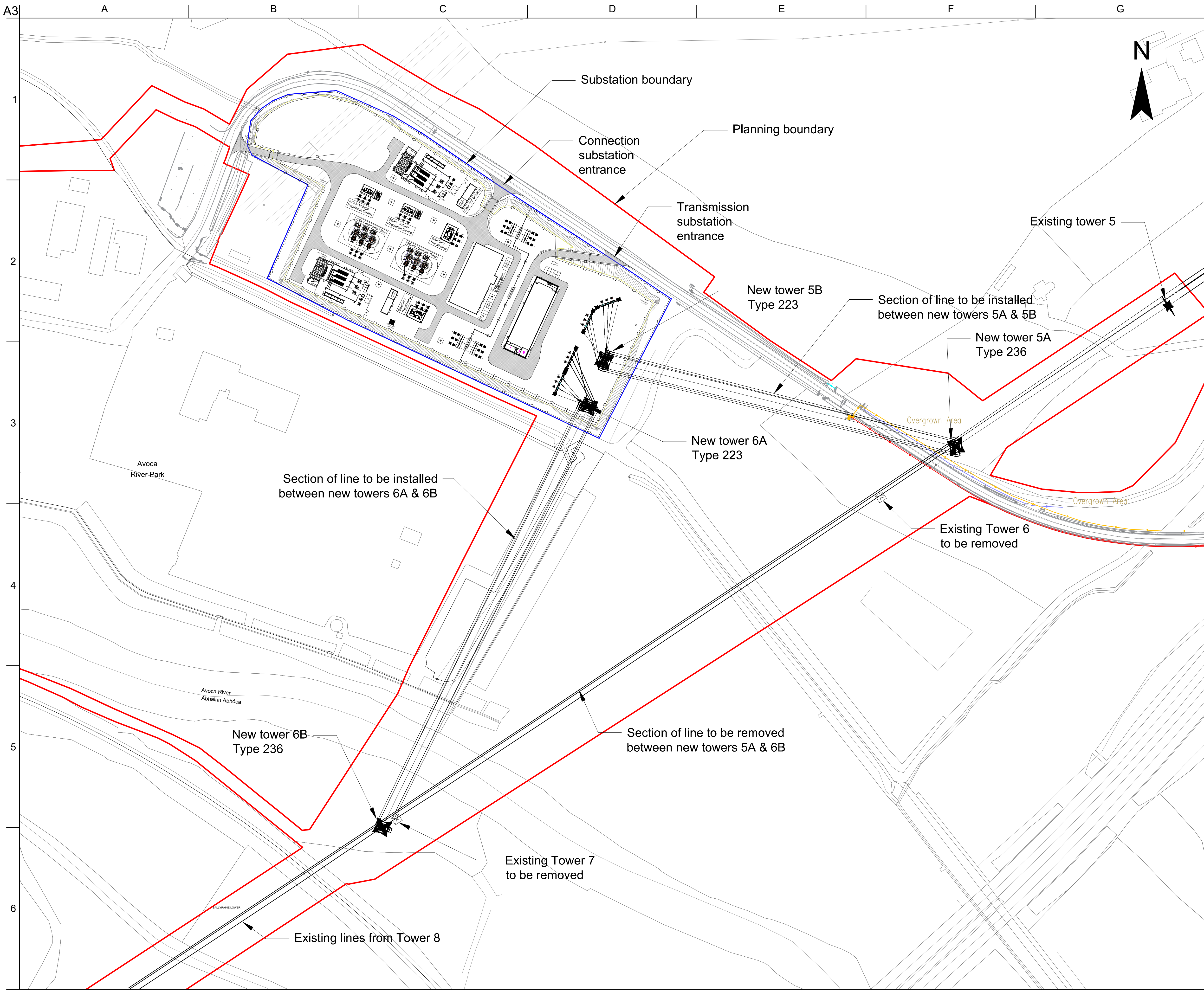
The 'loop in' connection will consist of:

- Building a new double circuit lattice steel angle tower (See **Figure 5.21**), Tower 5A (with maximum height 40m), to the east of the new substation and northeast of the existing Tower 6, and re-stringing the OHL from the existing Tower 5 to this new Tower 5A.
- Stringing a new OHL from the new Tower 5A into the transmission compound to a new tower. The OHL will consist of up to six conductors (three conductors on either side of the towers) and one shield wire with fibre optic wrap. The shield wire is the top wire and is connected to the top of the towers.
- Building a new double circuit lattice steel angle tower, Tower 6B (with maximum height 40m), south of the new substation and the Avoca River and re-stringing the OHL from the existing Tower 8 to this new Tower 6B.
- Stringing a new OHL from the new Tower 6B into the transmission compound to a new tower. The OHL will consist of up to six conductors (three conductors on either side of the towers) and one shield wire with fibre optic wrap. The shield wire is the top wire and is connected to the top of the towers.
- The existing Towers 6 and 7, to the east and south of the new substation, and the existing OHL span between the new Towers 5A and 6B will be decommissioned. Tower 6 will be removed with the foundation being left in situ to avoid any disturbance of lands as the tower is within a licensed landfill. Tower 7 will be removed including the foundation to c. 1m below ground level.

In terms of maintenance, the NETN will be maintained by ESB Networks as part of the ongoing maintenance arrangements for the Arklow to Lodgewood 220 kV circuit.

If the substation is refurbished or replaced, then it is likely that no changes will be required to the overhead line loop-in and it will remain in place. If however, the substation is decommissioned, then there will be minor changes to the overhead line, to reinstate the existing Lodgewood-Arklow-Carrickmines 220kV line. This would be subject to consultation with EirGrid at the appropriate time but is likely to require one new tower adjacent to the substation site as well as necessary re-stringing of overhead line.

A3



LEGEND:

- RED LINE BOUNDARY
- SUBSTATION BOUNDARY
- PROPOSED SUBSTATION COMPOUND ROAD

Rev	Date	By	Chkd	Appd
D1	17.02.21	SB	EO'G	MW

ARUP

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Client
Sure Partners Limited

Project Title
Arklow Bank Wind Park
Phase 2
Onshore Grid Infrastructure

Drawing Title
Proposed Loop-In Connection to NETN

Scale at A3: NTS

Role: Civil

Suitability: For Information

Arup Job No: 271715-00

Rev: D1

Name
Figure 5.20

Do not scale

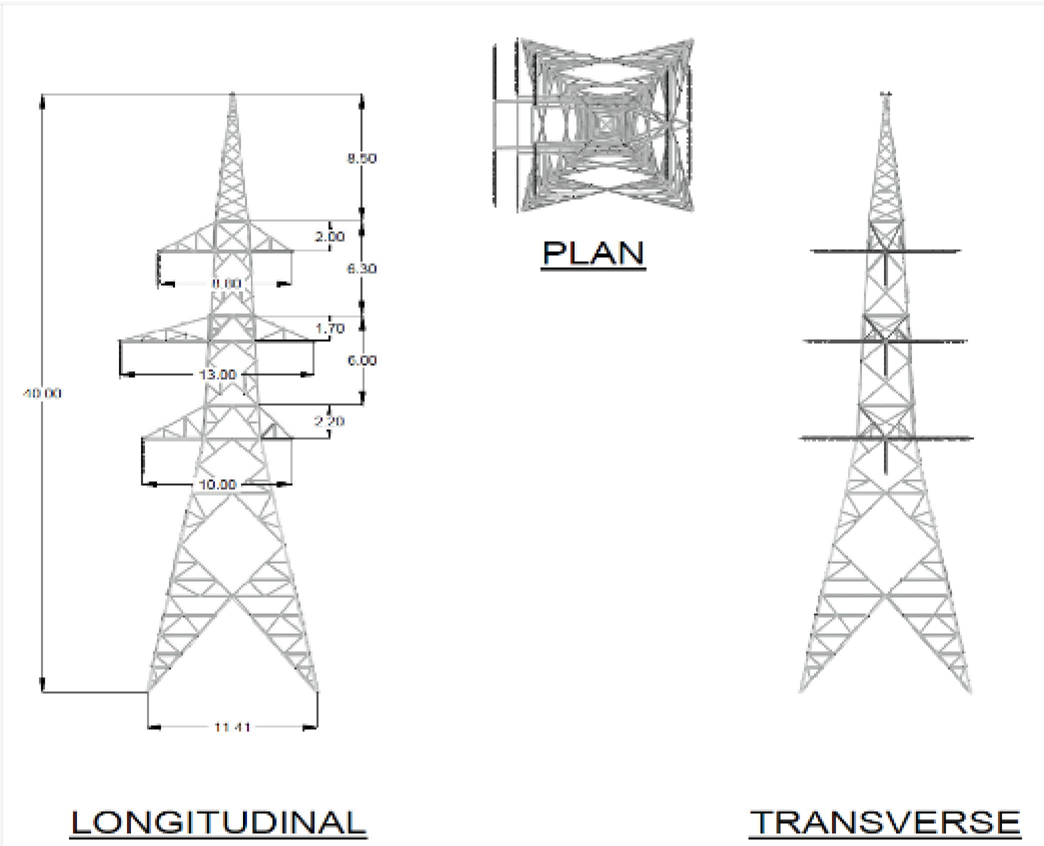

Figure 5.21 Typical Lattice Tower

5.9 Community Gain

SSE (SPL is a wholly owned subsidiary of SSE) has been in Ireland for 12 years and employs more than 1,000 people here. SSE estimates that a development of the scale (assuming 520MW maximum export capacity) of Arklow Bank Wind Park Phase 2 could lead to the creation of around 80 direct long term jobs in operation and maintenance work. In addition, the project will support companies in the operation and maintenance supply chain, including vessel services, water and fuel, technical inputs, and loading and unloading of project cargoes. The development of a new service base and associated long-term employment represents an opportunity for significant new investment and ongoing economic activity at Co. Wicklow’s existing maritime facilities.

SSE has significant experience in delivering community funds, on a voluntary basis, to communities associated with wind farms across the UK and Ireland. In Ireland in particular, SSE Renewables and Greencoat Renewables have been administering the award winning, Galway Wind Park Community Fund since the site became operational in 2018. At over €400,000 annually, the fund is the largest of its kind in Ireland. Because of its scale, the fund has been divided into three subsets:

1. The Local Fund: supports projects focused on energy efficiency, safety, environmental sustainability, social sustainability, recreation and tourism, and education and skills development.

In 2019, over €235,000 in funding was provided to 86 community groups based near the wind park, bringing to almost half a million euro the total amount of funding that has been presented so far since the Local Fund was established in 2018.

2. Major Projects Fund: Launched in 2018 following a period of community consultation, the first two years of the fund saw a major energy efficiency project established for homes close to the wind park. A total of 47 homes in Seanaphaesteen, Fermoyle and Bunagippaun, communities located close to Galway Wind Park, were included and received a number of energy efficiency improvements.
3. Scholarship Fund: Established in 2019, this is Ireland's first wind-power scholarship. This fund is designed to support students located within a 20km radius of Galway Wind Park. Typically worth approximately €50,000 per annum, it provides 50% grant support towards a student's annual fees for a maximum of three years. 33 scholarships were awarded to recipients in 2019/20 with over €130,000 awarded."

With the Arklow Bank Wind Park project, a multi-million euro community benefit fund will be established once the project is operational to support communities near the wind farm. This will be in addition to any commercial rates payable to Wicklow County Council for any onshore infrastructure.

SSE will pay community benefit in accordance with the offshore RESS Terms and Conditions. While the Department of Environment, Climate and Communications have yet to define the requirements for Community Benefit, it appears likely that the rate of payment will mirror that of the recent onshore RESS auction at €2/MWh for the duration of RESS support, with coastal communities and stakeholders as the targeted beneficiaries of the fund. As with RESS 1, this fund is likely to be made available once the wind farm becomes operational, and is likely to be available for 15 years.

5.10 Cumulative Developments

A tiered approach to the cumulative assessment has been undertaken, in which the proposed development is considered cumulatively with other projects as follows:

Tier 1 -

- Arklow Bank Wind Park (ABWP) Phase 2 Offshore Infrastructure;
- ABWP Phase 2 Operations and Maintenance Facility (OMF);
- EirGrid Grid Upgrade Works; and
- Irish Water Upgrade Works.

Tier 2 -

- Other relevant projects currently under construction;
- Other relevant projects with consent;
- Other relevant projects in the planning process; and

- Other existing projects that were not operational when baseline data were collected.

Refer to **Chapter 3** *EIA Methodology*, which describes the approach adopted in choosing the projects to be included in the assessment of cumulative effects.

5.10.1 Tier 1 Projects

Offshore Infrastructure

The Arklow Bank Wind Park Phase 2 project proposes a maximum of 62 wind turbines with an export capacity of 520MW, with wind turbines connected to each other and the offshore substation platforms via inter-array cables. The offshore wind farm project is situated on and around Arklow Bank in the Irish Sea, approximately 6 to 13 km to the east of Arklow in County Wicklow. The Foreshore Lease area covers an area approximately 27km long and 2.5km wide) for the installation of the offshore infrastructure.

The exact wind turbine unit will be selected following an EU regulated procurement process. Each wind turbine will have a maximum tip height of 201.28m above Mean High Water (MHW). The proposed offshore transmission works will comprise up to two HVAC offshore substation platforms (OSPs) within the Lease Area, which will connect to shore via two offshore export cables.

The key components of Phase 2 of the ABWP comprise:

- Up to 62 wind turbine foundations (monopiles or tripod jackets) attached to the seabed, plus ancillary equipment such as J-tubes, platforms, davit cranes and access facilities;
- Up to 62 wind turbines (each comprising a tower section, nacelle and three rotor blades);
- Up to two OSP foundations (monopiles or tripod jackets) attached to the seabed, plus ancillary equipment such as J-tubes and access facilities;
- Up to two OSP topsides housing electrical infrastructure (for the purposes of this EIAR, the term OSP is used to refer collectively to the platform structure and the topside equipment);
- A network of inter-array cabling, including back-feeds between collector strings;
- Two offshore export cable circuits;
- Scour protection and cable protection, if required, and
- Seabed preparation activities will be required in advance of installation activities. This will include boulder clearance and seabed feature clearance, followed by a pre-lay grapnel run.

Operations and Maintenance Facility

The Arklow Bank Wind Park Phase 2 will require an Operations and Maintenance Facility (OMF) for servicing the offshore wind farm, and as a base for employees working on its operation.

The location of the OMF will be Arklow South Dock. The OMF will comprise onshore infrastructure, located off South Quay Road and on the quayside, and nearshore infrastructure within Arklow South Dock. The expected timing for the OMF construction is 2023 – 2025.

The OMF will service and operate the ABWP project, 24hrs/day and 7days/week, over its operational lifetime.

The onshore infrastructure will support the operation of nearshore infrastructure facilities for the safe transfer of personnel and equipment to the offshore environment.

The OMF onshore infrastructure will include:

- Three to four-storey building (up to 3,050m^2 Gross Floor Area) with stores, offices, mess facilities, and warehousing;
- Up to 40m high communication mast;

The OMF quayside infrastructure will include:

- Davit cranes for equipment lifting;
- Pontoon brow attachments;
- Storage tanks, including fuel (100,000l) and oil (5000l) storage;
- Associated services and connections including for water, wastewater and fuel; and
- Fencing, security gates and cameras.

The OMF nearshore infrastructure will include:

- One pontoon to provide berthing facilities for four crew transfer vessels;
- Up to eight circular piles of maximum diameter of 914mm;
- Installation of a new quay wall and/or local refurbishment of the existing quay wall; and
- Associated services and connections including water, wastewater and fuel.

Enabling works for the OMF onshore and nearshore infrastructure will include:

- Onshore demolition of an existing two-storey office building;
- Nearshore geotechnical investigation up to six boreholes;
- Removal of an existing synchrolift and sunken vessels;
- Dredging of up to 6,000m^3 of material from the South Dock; and
- The dredged material may require dewatering, depending on disposal option, with a discharge of up to 4,200m^3 into Arklow Harbour.

The OMF will be the subject of separate applications for approval to both Wicklow County Council for the onshore and nearshore infrastructure, and to the Department of Housing, Local Government and Heritage for the nearshore infrastructure located on the foreshore.

EirGrid Grid Upgrade Works

In 2019 EirGrid published a report titled the East Coast Generation Opportunity Assessment detailing their study to identify opportunities for connecting new power generation sources in the East coast region of Ireland from a grid capacity perspective. The study assessed the capacity available for up to 800MW of offshore wind generation at each of the study locations.

EirGrid found that in order to connect offshore wind generation of a comparable size to the Project, in the Arklow area, it will be necessary to change the operating voltage of the existing Arklow-Ballybeg-Carrickmines 110kV circuit to 220kV. This circuit is part of a double-circuit transmission corridor (two circuits on the one set of towers) between Arklow and Carrickmines. This circuit, located on one side of the towers, operates at 110kV and the existing Arklow - Carrickmines 220kV circuit is on the other side of the towers. The 110kV side of the circuit is built to 220kV transmission standards and could be operated at 220kV without the need to upgrade the towers or conductors.

In order to operate this circuit at 220kV, a new connection for the existing Ballybeg 110kV station, near Wicklow town, would be required. As outlined in EirGrid’s East Coast Generation Opportunity Assessment, a new Ballybeg 220kV substation could be “looped” into the existing Arklow-Carrickmines 220kV circuit. A separate study, commissioned by the Developer with EirGrid, found that there is enough space to construct this 220kV substation as a GIS station adjacent to the existing 110kV station at Ballybeg should this be EirGrid’s preferred solution.

Separately to the East Coast Generation Opportunity Assessment, the Developer has been in regular consultation with EirGrid. The new 220kV substation, as part of the proposed development, will ‘loop-in’ to the existing 220kV Lodgewood-Arklow-Carrickmines OHL. As part of the grid upgrade works, EirGrid will consider stringing new conductors on the currently unused side of the 220kV towers, between the new 220kV loop-in transmission substation of this proposed development and the existing Arklow 220kV substation. This 220kV OHL circuit would either terminate in the existing Arklow 220kV substation or this circuit may be connected to an existing circuit at the Arklow 220kV substation and ‘by-pass’ the substation. There may be the need for an additional tower to bypass the Arklow 220kV substation with the new 220kV OHL circuit.

The above-mentioned upgrade works will not form part of the proposed development and will be the subject of a separate development consent application by EirGrid in their role as Ireland’s Transmission System Operator (TSO). The upgrade works have been considered in terms of potential cumulative effects in this EIAR.

It should be noted that in EirGrid's East Coast Generation Opportunity Assessment, EirGrid highlighted that further network studies would be required to ensure that there are no system stability issues associated with connecting 800MW to this part of the network in the Arklow area. Subsequent to the study, the Developer engaged EirGrid to perform these grid stability studies which confirmed that the issues can be managed operationally. This result stands for the Project at its proposed 520MW capacity.

Irish Water Connection

To connect the proposed development to Irish Water's water network approximately 2.3km of existing c. 50mm (2 inch) watermain is required to be upsized to 100mm. The watermain runs from Arklow town in a north-westerly direction towards Shelton Abbey. The works will be carried out by Irish Water.

5.10.2 Tier 2 Projects

There has been a number of permitted and proposed projects identified which have the potential to give rise to cumulative effects with the proposed development. These projects include the following:

- Crag Digital Avoca Ltd (Planning Reference 18940) has received planning permission for a data centre adjacent to the proposed development. Another application has been made recently by Crag Digital Avoca Ltd for a data centre on this site (Planning Reference 201285). If the proposed development is granted approval, one data hall, located on the substation site, will not be built.
- The Arklow Waste-Water Treatment plant has received planning permission (Planning Reference SI201801) to provide foul water treatment in the town of Arklow.
- Crag Digital Avoca Ltd has submitted an application for a 110kV gas insulated switchgear (GIS) substation, double circuit 110kV underground transmission line and associated site works within the Avoca River Business Park, beside the permitted data centre facility.
- The Arklow Flood Relief Scheme is proposed by Wicklow County Council and the Office of Public Works to address recurrent flooding in the town of Arklow. This scheme is still in the planning stages but if permitted has the potential to give rise to cumulative effects with the proposed development.
- Avoca River Business Park Flood Embankment – possible maintenance and repair works to the existing flood embankment around the business park as part of a regular inspection, maintenance and repair programme, to manage residual risk of flooding from a potential breach of the embankment. The nature and extent of these maintenance and repair works will be confirmed by site investigation works, but if required, have the potential to give rise to cumulative effects with the proposed development.

Further to these, a number of consented projects, in the vicinity of the onshore grid infrastructure, have been considered.

The projects considered are described in **Chapter 21** *Summary of Cumulative Effects*.

5.11 References

EirGrid (2019) *East Coast Generation Opportunity Assessment*

EPA Maps [online] available at: www.gis.epa.ie [Accessed January 2021]