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## APPENDIX 4-7

**TLI GROUP – SESKIN WIND FARM  
38KV GRID CONNECTION –  
CONSTRUCTION  
METHODOLOGIES FOR CARLOW  
AND KILKENNY**

# Outline Construction Methodology

## Seskin Wind Farm

### 38kV Underground Cable Route Grid Connection

#### Kilkenny Report



**Report Ref:** 05908-R02-01

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## 1.0 Introduction

The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during construction of the proposed Seskin Wind Farm 38kV grid connection to the existing ESB owned Kilkenny 110kV substation. The grid connection will consist of an underground cable (UGC). The UGC works will consist of the installation of 4 no. ducts in an excavated trench to accommodate 3 no. power cables, and 1 no. fibre communications cable to allow communications between the Seskin Wind Farm Substation and Kilkenny 110kV substation. This document is intended to be used as an aid to understand the methodologies to be employed during construction and should be read in conjunction with all other specialist reports which accompany the planning application. In addition, this document is in outline form only and will be revised and updated prior to the commencement of any construction activities, and detailed Method Statements will be prepared in respect of each aspect of the proposed development.

## 2.0 Proposed Grid Route

The proposed UGC is approximately 20.1km in length and runs in a north-easterly direction from the existing ESB Kilkenny 110kV substation to the proposed Seskin Wind Farm. The proposed route is located within the Seskin Wind Farm site, the carriageway of regional and local roads and access track on approach to the ESB Substation. The exact location of the underground cable within the proposed site boundary is subject to minor modification following a further detailed assessment to be undertaken prior to construction and following consultation with Kilkenny County Council and all other relevant stakeholders, having regard to all environmental constraints outlined in the planning application.

Figure 1, below, outlines the proposed UGC route, with each section of the route being discussed in detail at Table 1.





Figure 1 - Grid Connection Route Layout

Tables 1 and 2 of this report outline the preliminary design features of the UGC and proposed route.

Table 1 – Approximate Route Location of Preliminary Design:		
Private Lands (UGC)	Public Roads (UGC)	ESB Access Track (UGC)
274m	19853m	TBC m

Table 1: Seskin Wind Farm Substation to Kilkenny 110kV Substation – UG Cable Location Summary

Table 2 separates the UGC route into a number of sections and describes the specific construction requirements of each individual section and identifies access routes to the work areas. All plant and equipment employed on the proposed works will be subject to good site organisation and hygiene, particularly during construction activities.

**Table 2 - Summary of Proposed Interconnector Design Route**

Section	Description
<b>Section 1</b>  UGC 5569m	<p><b>UGC from Kilkenny 110kV SS to Bridge 1</b></p> <p>The first section initially begins within the 110kV Kilkenny substation compound, exiting the station from the southwest. The proposed route vacates the compound on accessing the regional road (R712) before the proposed route heads along the road network in a north easterly direction.</p> <p>The UGC utilises this regional road route (R712) for approx. 1,750m. It continues on a relatively flat carriageway until reaching a crossroads junction where the UGC will be required to turn left onto a local roadway L6657. The proposed route follows this local road network north for approx. 3,696m where it meets the first of three bridges, located at chainage 5,570m. It is proposed to utilise Horizontal Direct Drilling (HDD) to pass beneath this obstacle.</p> <p><u>Features</u></p> <p>Section 1 contains 5 no. joint Bay/bays. Joint Bays/bays will be located below ground and finished/reinstated to the required roads specification. Joint Bays will have associated communication chambers which will have a surface access hatch which will match existing ground levels.</p> <ul style="list-style-type: none"> <li>Joint Bay 01 (JB01) will be located approx. 19m south of the Kilkenny 110kV SS boundary, positioned along the proposed route within the hard shoulder of the R712 regional road network. <u>[Chainage – 25m]</u></li> <li>Joint Bay 02 (JB02) will be located approx. 1133m northeast of JB01, positioned along the proposed route within the hard shoulder of the R712 regional road network. <u>[Chainage – 1150m]</u></li> <li>Joint Bay 03 (JB03) will be located approx. 1145m northeast of JB02, within the local secondary road network (L6657). <u>[Chainage – 2300m]</u></li> <li>Joint Bay 04 (JB04) will be located approx. 1118m north of JB03, within the local secondary road network (L6657). <u>[Chainage – 3410m]</u></li> <li>Joint Bay 05 (JB05) will be located approx. 1150m north of JB04, within the local secondary road network (L2627). <u>[Chainage – 4560m]</u></li> </ul> <p>One bridge crossing has been located along this section of the route, Bridge 1. It is proposed to cross this bridge via HDD, as on site surveys revealed it contains insufficient cover to support the proposed 38kV UGC. Please refer to the accompanying drawing 05908-DR-131 for crossing details.</p>
<b>Section 2</b>  UGC 5925m	<p><b>UGC from Bridge 1 to the Revenagh Water Reservoir</b></p> <p>Section 2 continues the UGC route from the end of Section 1, following the traversal of Bridge 1. This section will encounter a subsequent 2 further bridges within the L2627 local road, all of which</p>



	<p>will utilise HDD to pass. Bridge 2 is approx. 1,700m north of Bridge 1, whilst Bridge 3 is approx. 700m north of Bridge 2.</p> <p>There is an additional bridge traversed along this section, Bridge 4. The proposed crossing method of Bridge 4 is HDD. The UGC route encounters Bridge 4 approx. 290m north of Bridge 3. The UGC route follows the local roadway (L2627) north for an additional segment, circa 3,635m in length before reaching the Revenagh Water Reservoir at chainage 11,490m.</p> <p><u>Features</u></p> <p>Section 2 contains 6 no. joint Bay/bays. Joint bays will be located below ground and finished/reinstated to the specification of the required road. Joint Bay/bays will have associated communication chambers which will have a surface access hatch that will match existing ground levels.</p> <ul style="list-style-type: none"> <li>• Joint Bay 06 (JB06) will be located approx. 1118m northwest of JB05, within the local secondary road network (L2627) inside of a junction where the road curtilage widens. <u>[Chainage – 5660m]</u></li> <li>• Joint Bay 07 (JB07) will be located approx. 1100m northwest of JB06, within the local secondary road network (L2627). <u>[Chainage – 6755m]</u></li> <li>• Joint Bay 08 (JB08) will be located approx. 1121m northeast of JB07, within the local secondary road network (L2627). <u>[Chainage – 7880m]</u></li> <li>• Joint Bay 09 (JB09) will be located approx. 1149m northeast of JB08, within the local secondary road network (L2627). <u>[Chainage – 9025m]</u></li> <li>• Joint Bay 10 (JB10) will be located approx. 1147m northeast of JB09, within the local secondary road network (L2627) inside of a junction where the road curtilage widens. <u>[Chainage – 10175m]</u></li> <li>• Joint Bay 11 (JB11) will be located approx. 1148m northeast of JB10, within the local secondary road network (L2627). <u>[Chainage – 11330m]</u></li> </ul> <p>This Section encounters five bridge crossings, Bridge 2, Bridge 3 and Bridge 4, all of which are located in the L2627 local road. The proposed crossing method for all these bridges is HDD. Ref Drawing numbers, 05908-DR-132, 05908-DR-133 &amp; 05908-DR-134.</p> <p>There are 3 no. culvert crossings within this section. It is proposed to cross beneath the culverts in flat formation. Ref Drawing Number 05908-DR-126.</p> <p>Existing Irishwater services will be encountered within this section, Watermain 01 (WM01) and Watermain 02 (WM02). It is proposed that both of these watermains will be undercrossed in flat formation. Please refer to the accompanying drawing 05908-DR-128.</p>
<p><b>Section 3</b></p> <p>UGC</p> <p>6591m</p>	<p><b>UGC from Revenagh Water Reservoir to Bridge 6</b></p> <p>Section 3 of the proposed route continues northeast along the L2627 after the Revenagh Water Reservoir for approx. 2,450m before reaching Bridge 5. The UGC route maintains this heading, on a predominantly upward trajectory within the local roads network for circa 4,140m. Section 2 finishes at Bridge 6, prior to crossing the county border at chainage 18,079m.</p>

	<p><u>Features</u></p> <p>Section 2 contains 5 no. joint Bay/bays. Joint bays will be located below ground and finished/reinstated to the specification of the required road. Joint Bay/bays will have associated communication chambers which will have a surface access hatch that will match existing ground levels.</p> <ul style="list-style-type: none"> <li>• Joint Bay 12 (JB12) will be located approx. 1145m northeast of JB11, within the local secondary road network (L2627). <u>[Chainage – 12475m]</u></li> <li>• Joint Bay 13 (JB13) will be located approx. 1150m northeast of JB12, within the local secondary road network (L2627) outside an agricultural gated entrance to a field parcel. <u>[Chainage – 13625m]</u></li> <li>• Joint Bay 14 (JB14) will be located approx. 1146m northeast of JB13, within the local secondary road network (L2627) outside an agricultural gated entrance to a field parcel. <u>[Chainage – 14775m]</u></li> <li>• Joint Bay 15 (JB15) will be located approx. 1145m northeast of JB14, within the local tertiary road network (L30371) outside a gated entrance to a forestry access track. <u>[Chainage – 15920m]</u></li> <li>• Joint Bay 16 (JB16) will be located approx. 1108m northeast of JB15, within the local tertiary road network (L30371) outside an agricultural gated entrance to a field parcel. <u>[Chainage – 17025m]</u></li> </ul> <p>This Section encounters two bridge crossings, Bridge 5 and Bridge 6, located within the L-2627 and L-30371 local roads, respectively. The proposed crossing method for these bridges is HDD. Ref Drawing numbers 05908-DR-135 &amp; 05908-DR-136.</p>
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**Table: Summary of Proposed Interconnector Design Route**

### 3.0 Preliminary Site Investigations

It would be proposed to carry out Preliminary site investigations along the cable route prior to construction to confirm design assumptions.

The following items may be carried out:

#### 3.1 UG Cable Route:

Slit trenches at locations of major service crossings (Full road width).

5 No. trial holes along the route to ascertain ground conditions and thermal resistivity of the soil.

**Traffic Management** – Single lane Closure with Stop/Go system in place.

#### Equipment:

- 4x4 vehicle
- Concrete vibrator
- Wheeled dumper
- Soil compactor
- 360° tracked excavator (only rubber tracked machines will be allowed on public roads)

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## 4.0 UGC Construction Methodology

The proposed UGC will consist of 3 no. 110mm diameter HDPE power cable ducts and 1 no. 110mm diameter HDPE communications duct to be installed in an excavated trench, typically 600mm wide by 1,220mm deep, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings. The power cable ducts will accommodate 3 no. power cables. The communications duct will accommodate a fibre cable to allow communications between the Seskin Wind Farm substation and Kilkenny 110kV substation. The ducts will be installed, the trench reinstated in accordance with Kilkenny County Council specification, and then the electrical cabling/fibre cable is pulled through the installed ducts in approximately 1000/1150m sections. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements and specifications of ESB Networks.

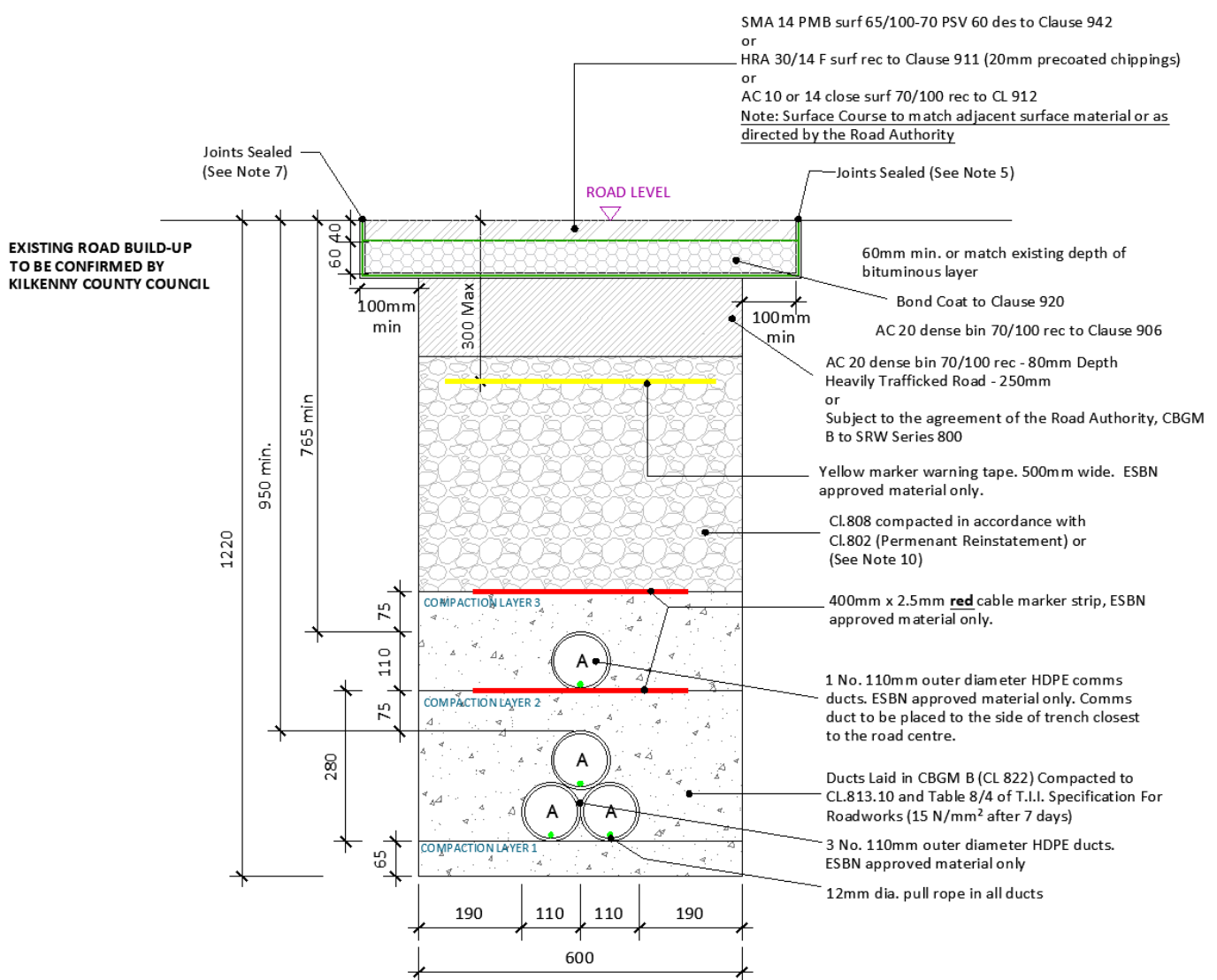
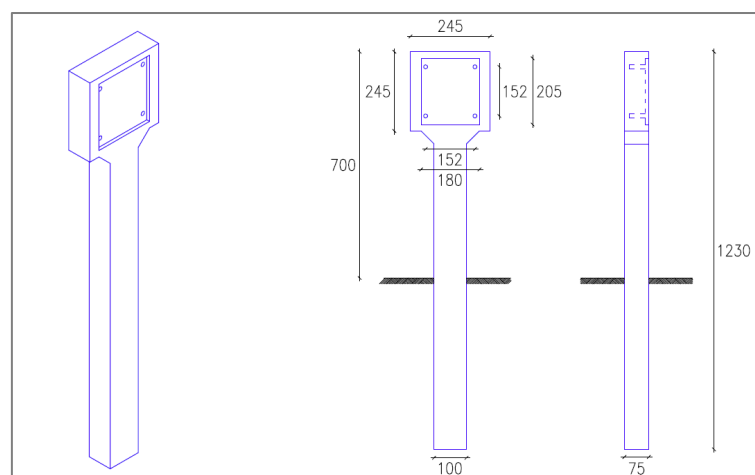


Figure 2 - Typical Trench in Roadway Section



Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with ESB standards.

Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions. Corrosion proof aluminium triangular danger signs, with a 700mm base, and with centred lightning symbol, on fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker posts shall also be placed in the event that burial depth is not to standard. The precise siting of marker posts will be dictated by ESNB as part of the detailed design process.



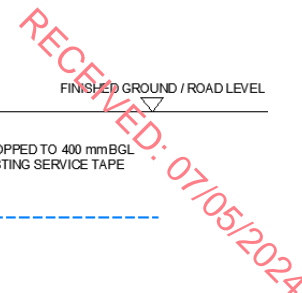
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## 4.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works:-

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all control measures included within the Section 5 application and accompanying reports where relevant;
- The base of the excavated trench will be lined with sand bedding to be imported to site from a local licensed supplier. The 110mm diameter HDPE cable ducting will be placed into the prepared trench, inspected and backfilled as per Figure 2 & Figure 3;
- Any existing underground services shall be identified on-site before the commencement of construction works through a Ground Penetrating Radar (GPR) survey;
- The proposed cable route adjoins 2 no. culvert structures. These culverts will remain in place and the ducting will be installed beneath / adjacent to these culverts to provide minimum separation distances in accordance with ESB and Irish Water specifications;
- None of the identified culverts require removal for ducting installation, it is proposed that a suitable method of damming the water source whilst the installation of cable ducts are placed beneath the culverts. Works of this nature will be carried out in line with Inland Fisheries Ireland guidelines. See Figure 5 for reference;
- Traffic management measures will be implemented in accordance with those included in the Traffic Management Report, and a detailed Traffic Management Plan will be prepared and agreed with Kilkenny County Council;
- The excavated trench will be approximately 600mm in width and approximately 1220mm deep both within the public road network and within private lands;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features.
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported off site and disposed of at a fully authorised soil recovery site;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100-metre section of trench will be opened at any one time. The second 100 metres will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Works will only be conducted in normal working hours of Monday to Friday 08:00 to 20:00 and Saturday 08:00 to 18:00, with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 no. day.



**Figure 5 - Typical Service/Culvert undercrossing detail**

**Equipment:**

- 360° tracked excavator (wheeled excavator where required)
- 1 no. dumper or tractor and trailer.

### Materials:

- Sand for pipe bedding;
- Ready-mix Concrete where necessary (delivered to site);
- Trench backfilling material (excavated material and aggregates) to relevant specifications;
- Cable ducting;
- Permanent Surface Reinstatement Asphalt Material.
- Temporary Surface Reinstatement Materials.
- ESB Marker tape
- ESB Approved Marker Post



**Figure 6 - Typical 38kV Underground Duct Installation**

#### **4.2 Managing Excess Material from Trench**

All excavated material will be temporarily stored adjacent to the trench prior to re-use in the trench reinstatement (where applicable). Stockpiles will be restricted to less than 2m in height. Where excess material exists will be disposed of to a licensed facility.

#### **4.3 Storage of Plant and Machinery**

All plant, machinery and equipment will be stored on site within the works area or within the temporary construction compound to be located within the proposed Seskin Wind Farm. Oils and fuels will not be stored on site and will be stored in an appropriately bunded area within the temporary storage compound.

#### **4.4 Joint Bays and Associated Chambers**

Joint Bays are to be provided approximately every 1000m - 1150m along the UGC route to facilitate the jointing of 2 no. lengths of UGC. Joint Bays are typically 2.03m x 4.5m x 1.475m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between the Seskin Wind Farm substation and the existing Kilkenny 110kV substation. Earth Sheath Link Chambers are also required approximately every second joint bay along the cable route. Communication Chambers will typically be pre-cast concrete structures with an access cover at finished surface level.

The precise siting of all Joint Bays and Communication Chambers is subject to approval by ESNB. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions. The marker posts will consist of a corrosion proof aluminium triangular danger sign, with 750mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background. They will be installed in adequately sized concrete foundations and will also be placed where the cable has not been buried to the standard depth, due to existing road conditions.

Mitigation measures will be implemented throughout the construction process to ensure the installation and construction of the joint bays does not impact nearby protected structures and/or watercourses.

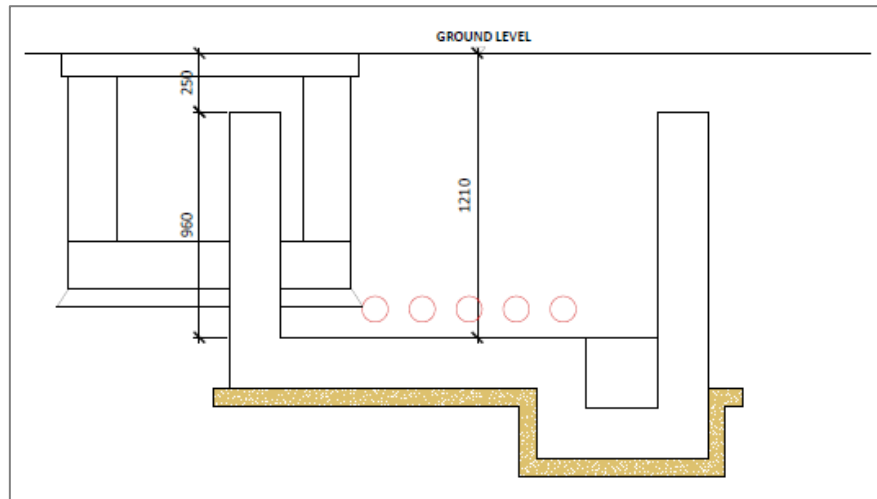


Figure 7 - Typical Section Through Joint Bay

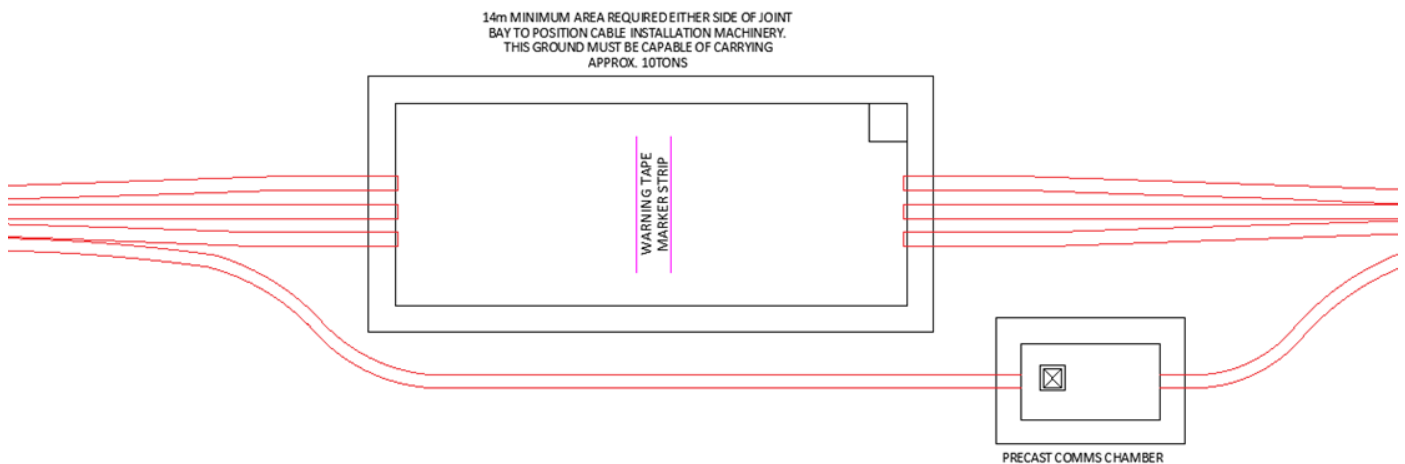
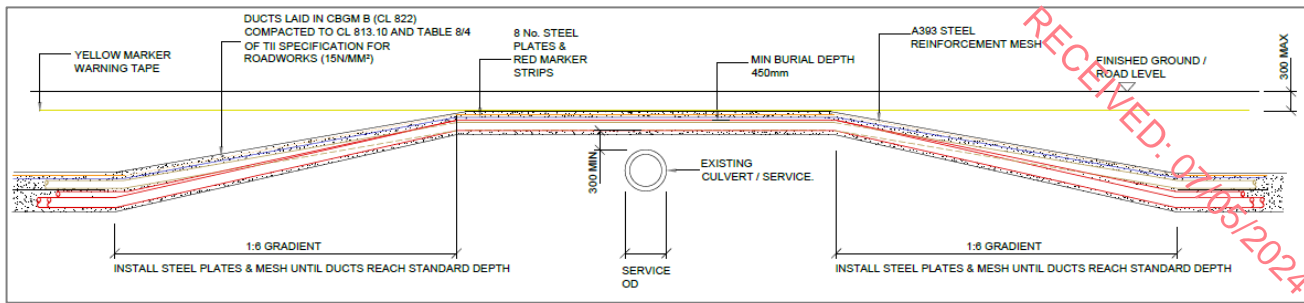


Figure 8 - Typical Joint Bay Plan details







**Figure 11 - 110kV UGC Culvert Overcrossing**

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites', and these guidelines will be adhered to during the construction of the development.

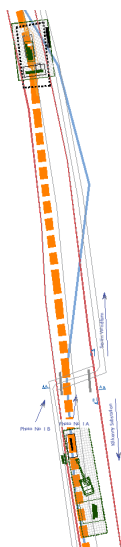
### 5.1 Bridge 1 – Horizontal Directional Drilling [Chainage - 5,570m]

ITM Coordinates: 657305.22,658650.49

Bridge 1 is located within the L-2627 at chainage 5,570m and has insufficient room to install the cable to ESB specifications and the suitability of the bridge is inadequate to accommodate the works. Executing a horizontal directional drill (HDD) approximately 1500mm beneath the waterway and bridge foundations will be required. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. Ref drawing 05908-DR-131.



**Figure 12 - Bridge 1 within L-2627**



**Figure 13 - Bridge 1 drawing extract**

## 5.2 Bridge 2 – Horizontal Directional Drilling [Chainage - 7,280m]

ITM Coordinates: 656840.75,660164.58

Bridge 2 is located on the L-2627 at chainage 7,280m. The Bridge has insufficient room to install the cable to ESNB specifications and the suitability of the bridge is inadequate to accommodate the scope of works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. The methodology for HDD is outlined in Section 6 below. Ref drawing 05908-DR-132.



Figure 14 - Bridge 2 within L-2627

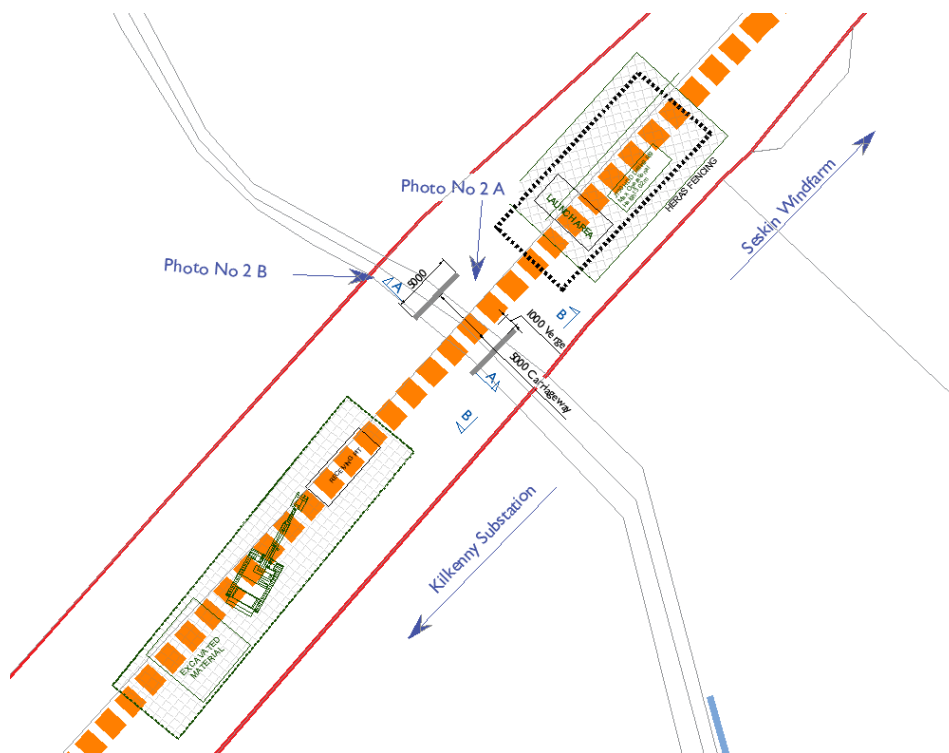


Figure 15 - Bridge 2 drawing extract

### 5.3 Bridge 3 – Horizontal Directional Drilling [Chainage – 7,560m]

ITM Coordinates: 656960.04,660378.32

Bridge 3 is located on the L-2627 at chainage 7,560m. The Bridge has insufficient room to install the cable to ESNB specifications (300mm cover) and the suitability of the bridge is inadequate to accommodate the scope of works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. The methodology for HDD is outlined in Section 6 below. Ref drawing 05908-DR-133.



Figure 16 - Bridge 3 within L-2627

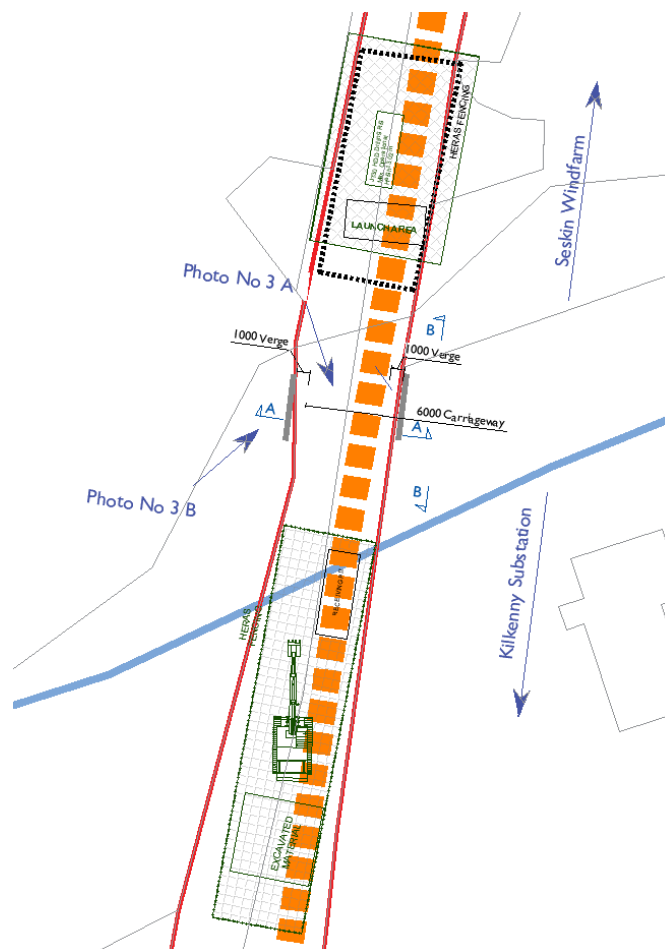


Figure 17 - Bridge 3 drawing extract

#### 5.4 Bridge 4 – Horizontal Directional Drilling [Chainage - 7,850m]

ITM Coordinates: 657094.21,660621.68

Bridge 4 is located on the L-2627 at chainage 7,850m. The Bridge has insufficient room to install the cable to ESBN specifications (450mm cover) and the suitability of the bridge is inadequate to accommodate the scope of works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. Ref drawing 05908-DR-134.



Figure 18 - Bridge 4 within the L-2627

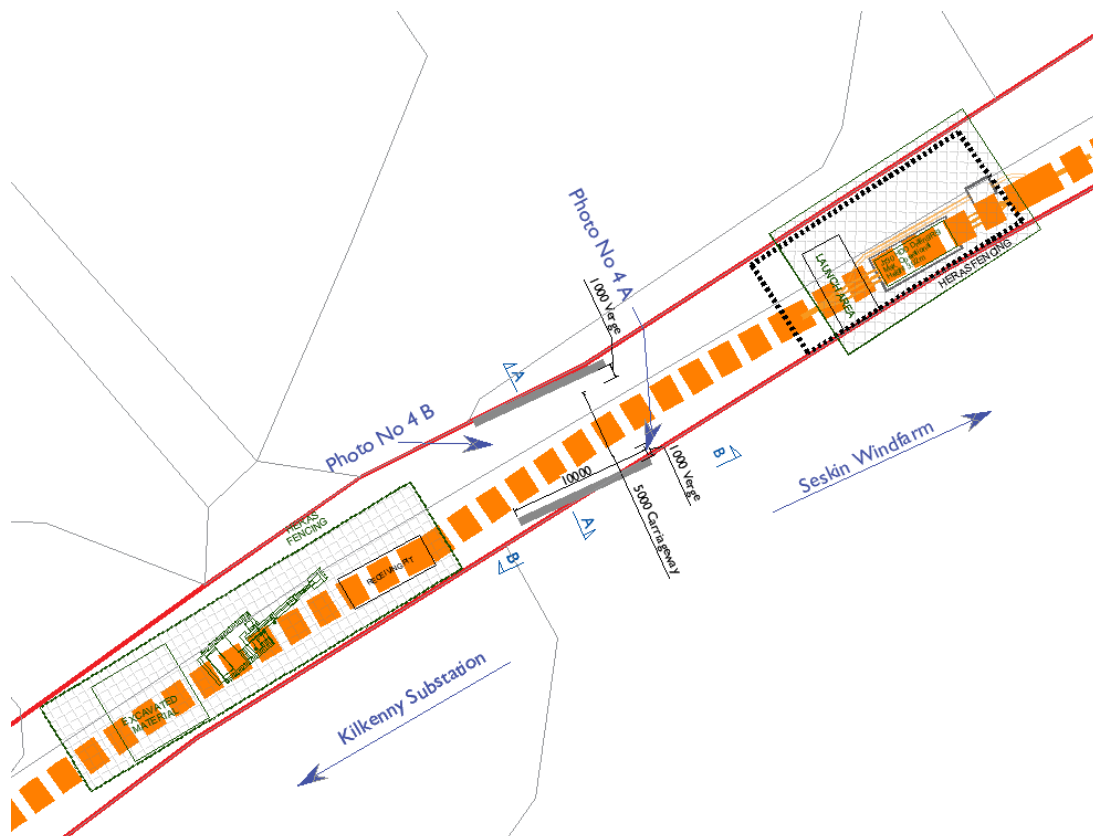


Figure 19 - Bridge 4 drawing extract



## 5.5 Bridge 5 – Horizontal Directional Drilling [Chainage - 13,945m]

ITM Coordinates: 659304.12,666093.96

Bridge 5 (Kane's Bridge) is located on the L-2627 at chainage 13,945m. The Bridge has insufficient room to install the cable to ESNB specifications and the suitability of the bridge is inadequate to accommodate the scope of works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. Ref drawing 05908-DR-134.



Figure 20 - Bridge 5 within the L-2627

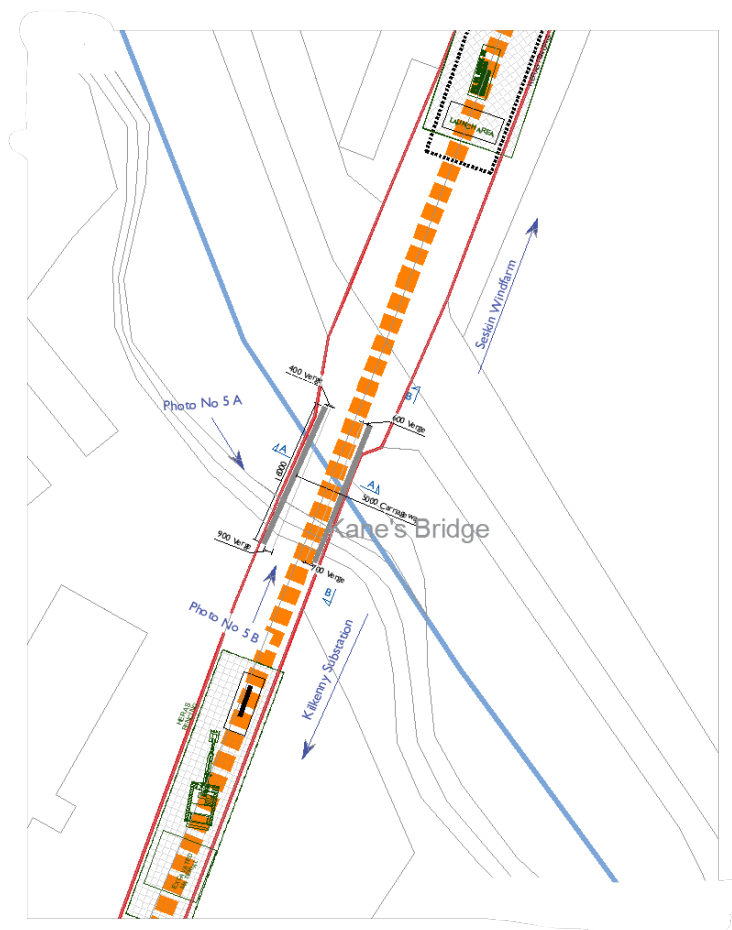


Figure 21 - Bridge 5 drawing extract



## 5.6 Bridge 6 – Horizontal Directional Drilling [Chainage – 18,079m]

ITM Coordinates: 661963.515,669095.881

Bridge 6 (Philips Bridge) is located within the L-30371 at chainage 18,079m and has insufficient room to install the cable to ESB specifications and the suitability of the bridge is inadequate to accommodate the works. Executing a horizontal directional drill (HDD) approximately 1500mm beneath the waterway and bridge foundations will be required. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. Ref drawing 05908-DR-136.



Figure 22 - Bridge 6 within the L-30371

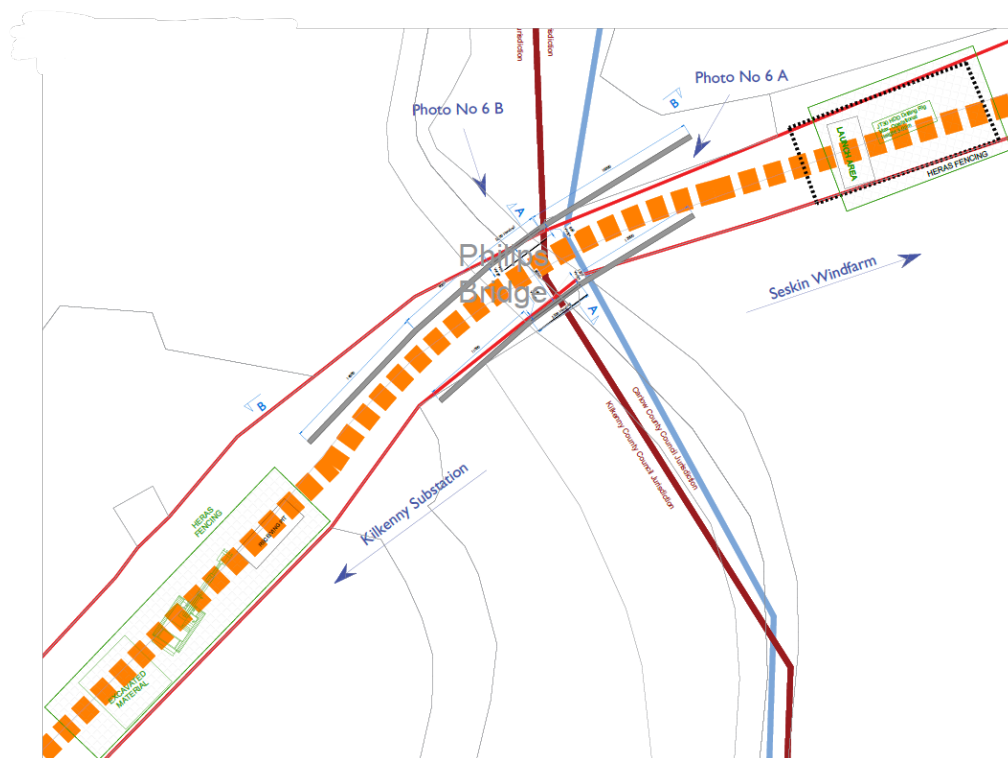


Figure 23 - Bridge 6 drawing extract

## 6.0 Horizontal Directional Drilling

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. There are a number of bridges on this UGC route which will require HDD due to there being insufficient cover and depth in the bridge to cross within the bridge deck. The drilling methodology is as follows: -

1. A works area of circa. 40m<sup>2</sup> will be fenced on both sides of the river crossing,
2. The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
3. Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
4. A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
5. The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
6. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
7. The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
8. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
9. Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
10. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
11. The ducts will be cleaned and proven and their installed location surveyed.
12. The entry and exit pits will be reinstated to the specification of ESN and Kilkenny County Council.
13. A transition coupler will be installed at either side of the bridge/ following the horizontal directional drilling as per ESB requirements, this will join the HDD ducts to the standard ducts.

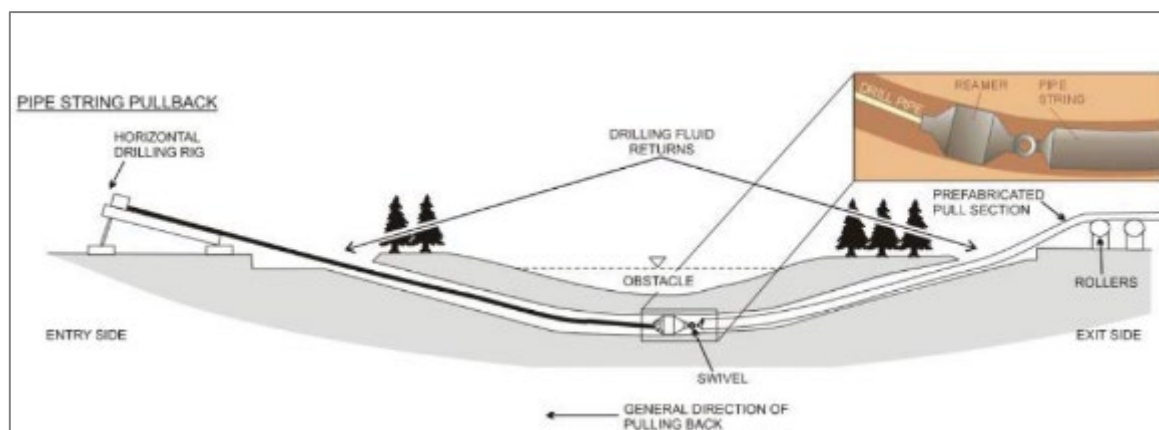


Figure 24 - Typical HDD Installation

## 7.0 Assessment of Proposed Route and Construction Requirements

The table below separates the transmission line route into a number of sections and describes the specific construction requirements of each individual section.

Table 2 - Summary of Preliminary Grid Connection Design Route	
Section	Description
<b>Section 1</b>  UGC  5569m	<p><b>UGC from Kilkenny 110kV SS to Bridge 1</b></p> <p>The proposed UGC from the Kilkenny 110kV substation to Bridge 1 will be routed through the local primary and secondary roadway and located in the carriageway of the road.</p> <p>The UGC will exit the Kilkenny 110kV Station via its southern periphery and continue onto the R712 regional road. The UGC route will continue in a north easterly direction until it meets the L6657. The UGC route turns north and utilizes two local roads, L6657 and L2627, maintaining this heading prior to reaching Bridge 1, located at chainage 5,570m.</p> <p><u>Features</u></p> <p>Section 1 contains 5 no. joint bays. Joint bays will be located below ground and finished/reinstated to the required national roads specification.</p> <ul style="list-style-type: none"> <li>Joint Bay 01 (JB01) will be located approx. 19m south of the Kilkenny 110kV SS boundary, positioned along the proposed route within the hard shoulder of the R712 regional road network. <u>[Chainage – 25m]</u></li> <li>Joint Bay 02 (JB02) will be located approx. 1133m northeast of JB01, positioned along the proposed route within the hard shoulder of the R712 regional road network. <u>[Chainage – 1150m]</u></li> <li>Joint Bay 03 (JB03) will be located approx. 1145m northeast of JB02, within the local secondary road network (L6657). <u>[Chainage – 2300m]</u></li> <li>Joint Bay 04 (JB04) will be located approx. 1118m north of JB03, within the local secondary road network (L6657). <u>[Chainage – 3410m]</u></li> <li>Joint Bay 05 (JB05) will be located approx. 1150m north of JB04, within the local secondary road network (L2627). <u>[Chainage – 4560m]</u></li> </ul> <p>One bridge crossing has been located along this section of the route. It is proposed to cross this bridge via HDD, as on site surveys revealed it contains insufficient cover to support the proposed 38kV UGC. Please refer to the accompanying drawing 05908-DR-131 for crossing details.</p> <p>There is 1 No. culvert crossing within this section. It is proposed to cross beneath the culverts in flat formation. Ref Drawing Number 05908-DR-126.</p>
<b>Section 2</b>  UGC  5925m	<p><b>UGC from Bridge 1 to Revenagh Water Reservoir</b></p> <p>Section 2 initiates after the HDD crossing of Bridge 1, continuing the route with a north-eastern heading along the local secondary roadway (L2627) for an additional section, before arriving at the Revenagh Water Reservoir at chainage 11,490m.</p>

	<p><u>Features</u></p> <p>Section 2 contains 6 no. joint Bay/bays. Joint bays will be located below ground and finished/reinstated to the specification of the required road. Joint Bay/bays will have associated communication chambers which will have a surface access hatch that will match existing ground levels.</p> <ul style="list-style-type: none"> <li>Joint Bay 06 (JB06) will be located approx. 1118m northwest of JB05, within the local secondary road network (L2627) inside of a junction where the road curtilage widens. <u>[Chainage – 5660m]</u></li> <li>Joint Bay 07 (JB07) will be located approx. 1100m northwest of JB06, within the local secondary road network (L2627). <u>[Chainage – 6755m]</u></li> <li>Joint Bay 08 (JB08) will be located approx. 1121m northeast of JB07, within the local secondary road network (L2627). <u>[Chainage – 7880m]</u></li> <li>Joint Bay 09 (JB09) will be located approx. 1149m northeast of JB08, within the local secondary road network (L2627). <u>[Chainage – 9025m]</u></li> <li>Joint Bay 10 (JB10) will be located approx. 1147m northeast of JB09, within the local secondary road network (L2627) inside of a junction where the road curtilage widens. <u>[Chainage – 10175m]</u></li> <li>Joint Bay 11 (JB11) will be located approx. 1148m northeast of JB10, within the local secondary road network (L2627). <u>[Chainage – 11330m]</u></li> </ul> <p>This Section encounters four bridge crossings, Bridge 2, Bridge 3, Bridge 4 and Bridge 5, all of which are located in the L2627 local road. The proposed crossing method for all these bridges is HDD. Ref Drawing numbers 05908-DR-132, 05908-DR-133, 05908-DR-134 &amp; 05908-DR-135.</p> <p>There are 3 no. culvert crossings within this section. It is proposed to cross beneath the culverts in flat formation. Ref Drawing Number 05908-DR-126.</p> <p>Existing Irishwater services will be encountered within this section, Watermain 01 (WM01) and Watermain 02 (WM02). It is proposed that both watermains will be undercrossed in flat formation. Please refer to the accompanying drawing 05908-DR-128.</p>
<p><b>Section 3</b></p> <p>UGC</p> <p>6591m</p>	<p><b>UGC from Revenagh Water Reservoir to Bridge 6</b></p> <p>Continuing with a north-eastern heading, the UGC remains within the public roadway following the L2627 and L30371 local secondary and tertiary roads on approach to Bridge 6. This section concludes upon reaching Bridge 6, prior to crossing the county border at chainage 18,079m.</p> <p><u>Features</u></p> <p>Section 3 contains 5 no. joint Bay/bays. Joint bays will be located below ground and finished/reinstated to the specification of the required road. Joint Bay/bays will have associated communication chambers which will have a surface access hatch that will match existing ground levels.</p> <ul style="list-style-type: none"> <li>Joint Bay 12 (JB12) will be located approx. 1145m northeast of JB11, within the local secondary road network (L2627). <u>[Chainage – 12475m]</u></li> <li>Joint Bay 13 (JB13) will be located approx. 1150m northeast of JB12, within the local secondary road network (L2627) outside an agricultural gated entrance to a field parcel. <u>[Chainage – 13625m]</u></li> </ul>

	<ul style="list-style-type: none"> <li>Joint Bay 14 (JB14) will be located approx. 1146m northeast of JB13, within the local secondary road network (L2627) outside an agricultural gated entrance to a field parcel. [<u>Chainage – 14775m</u>]</li> <li>Joint Bay 15 (JB15) will be located approx. 1145m northeast of JB14, within the local tertiary road network (L30371) outside a gated entrance to a forestry access track. [<u>Chainage – 15920m</u>]</li> <li>Joint Bay 16 (JB16) will be located approx. 1108m northeast of JB15, within the local tertiary road network (L30371) outside an agricultural gated entrance to a field parcel. [<u>Chainage – 17025m</u>]</li> </ul> <p>This Section encounters two bridge crossings, Bridge 5 and Bridge 6, located within the L-2627 and L-30371 local roads, respectively. The proposed crossing method for these bridges is HDD. Ref Drawing numbers 05908-DR-135 &amp; 05908-DR-136.</p>
	<p>Refer to Figure 1 and to the planning drawings submitted for location details.</p> <p>Note: The precise location of the proposed route within the planning Section 5 boundary is subject to change as result of existing services/utility locations, ground conditions and any environmental constraints.</p>

**Table 2: Summary of Preliminary Grid Connection Design Route**



## 8.0 Design and Construction Management Methodology

Prior to commencement of construction works the contractor will draw up detailed Method Statements which will be informed by this Outline Construction Methodology and the guidance documents and best practice measures listed below. This method statement will be adhered to by the contractors and will be overseen by the Project Manager and Site Manager.

The following documents will contribute to the preparation of the method statements in addition to those measures proposed below:-

- Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland, Dublin,
- *National Roads Authority (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects*. Technical guidance (C648). CIRIA;
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects*. Site guide (C649). CIRIA.
- Murphy, D. (2004) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*. Eastern Regional Fisheries Board, Dublin;
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532);
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines*;
- Law, C. and D'Aleo, S. (2016) *Environmental good practice on site pocket book*. (C762) 4th edition. CIRIA;
- CIRIA *Environmental Good Practice on Site (fourth edition) (C741) 2015*.

## 9.0 Access Routes to Work Area

The proposed grid connection will be all UGC. The majority of the proposed underground cable will be installed within the public road network and therefore will be accessed via the existing road network. Where the cable route is located on private lands, contractor(s) will be required to utilise the local public road network in the vicinity of the work area and from there utilise private farm tracks, where appropriate.

Prior to the commencement of development, precise access arrangements will be agreed with the respective landowners.

A detailed Traffic Management Plan will be prepared, and agreed with Kilkenny County Council, prior to the commencement of construction. Some work areas will require a road closure where it is not possible to safely implement a Stop/Go system. Where road closures are necessary, a suitable diversion will be implemented using appropriate signage, following consultation with Kilkenny County Council whereby the necessary road closure license will be obtained prior to any works.

Access routes will be carefully selected to avoid any damage to land. Local consultation will be carried out with all relevant landowners to ensure that any potential disturbance will be minimised. Prior to the commencement of construction, the contractor will assess all access routes and determine the requirement for bog mats. Any such requirements will be incorporated into the relevant method statement.

## 10.0 Traffic Management

Traffic management and road signage will be in accordance with the Department of Transport: Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works (2019) and in agreement with Kilkenny County Council. All work on public roads will be subject to the approval of a road opening license application. The contractor will prepare detailed traffic management plans for inclusion as part of the road opening applications.

Where road widths allow, the UGC installation works will allow for one side of the road to remain open to traffic at all times by means of an automated 'Stop/Go' traffic management system, where a minimum 2.5m-3m roadway will be maintained at all times. The 'Stop/Go' system will be implemented along the L6657, L2627, and L30371. Temporary traffic signals will be implemented, on the approach and through the works area, to allow road users safely pass through the works area by channelling them onto the open side of the road.

Typically, the UGC will be installed in 200m sections, and no more than 100m will be excavated without the majority of the previous section being reinstated. Where the construction requires the crossing of a road, works on one carriageway will be completed before the second carriageway is opened, to maintain traffic flows.

All construction vehicles will be parked within the works area so as not to cause additional obstruction or inconvenience to road users or residents. The traffic signals will be in place prior to the works commencing and will remain in place until after the works are completed. The public road will be checked regularly and maintained free of mud and debris. Road sweeping will be carried out as appropriate to ensure construction traffic does not adversely affect the local road condition.

In the event of emergency; steel plates, which will be available on site, can be put in place across the excavation to allow traffic to flow on both sides of the road, if required.

All traffic management measures will comply with those outlined in the accompanying Traffic Management Report and will be incorporated into a detailed Traffic Management Plan to be prepared, in consultation with Kilkenny County Council, prior to the commencement of development.

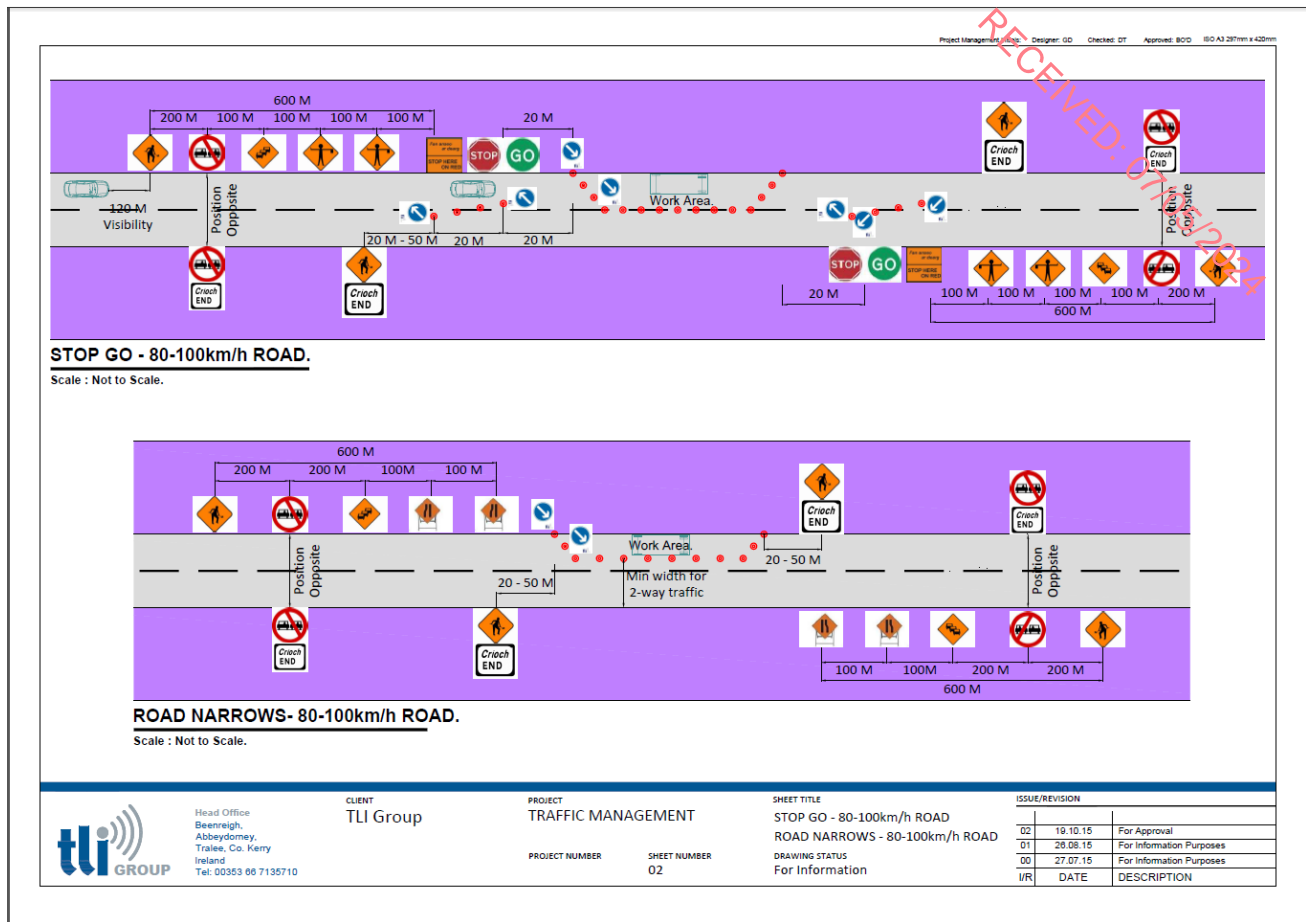


Figure 25 - Sample Traffic Management Layout

The proposed UGC works will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from Kilkenny County Council. A Traffic Management Plan (TMP) will be agreed with Kilkenny County Council prior to the commencement of the development. This TMP will outline the location of traffic management signage, together with the location of any necessary road closures and the routing of appropriate diversions. Where diversions are required, these will be agreed with Kilkenny County Council in advance of the preparation of the TMP.

## 11.0 Relocation of Existing Services

In order to facilitate the installation of the proposed UGC, it may be necessary to relocate existing underground services such as water mains, gas networks or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

### 9.1 Underground Cables

If existing underground cables are found to be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, with the underground cables will then be re-energised.

## 9.2 Gas Networks

Consultation with Gas Networks Ireland must take place before starting works where gas pipes are present. Gas Networks Ireland will advise on the safety measures required and will arrange for the exact location of the pipe to be marked out on site.

## 9.3 Water Mains

The water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the utility standards.

## 12.0 Invasive Species Best Practice Measures

Invasive species can be introduced into a location by contaminated plant, machinery and equipment which were previously used in locations that contained invasive species. Good site organisation and hygiene management shall be maintained always on site, and best practice measures will be implemented, as follows:

- The contractor will prepare an Invasive Species Action Plan to be implemented during construction, and all personnel will be made aware of the requirements contained within;
- Plant and machinery will be inspected upon arrival and departure from site and cleaned/washed as necessary to prevent the spread of invasive aquatic / riparian species such as Japanese knotweed *Fallopia japonica* and Himalayan Balsam *Impatiens glandulifera*. A sign off sheet will be maintained by the contractor to confirm the implementation of measures;
- Site hygiene signage will be erected in relation to the management of non-native invasive material.

## 13.0 Waste Management

All waste products (general waste, plastic, timber, etc.) arising during the construction phase will be managed and disposed of in accordance with the provisions of the Waste Management Act 1996 and associated amendments and regulations, and a Waste Management Plan will be prepared by the contractor prior to the commencement of construction. All waste material will be disposed of at a fully licensed facility.

# Outline Construction Methodology

## Seskin Wind Farm

### 38kV Underground Cable Route Grid Connection

#### Carlow Report



**Report Ref:** 05908-R03-01

**Clients:** EDF Renewables

Revision:	Designer:	Checked:	Date:	Notes:
00	JVDP	DB	26.05.23	Issued for Planning
01	JVDP	DB	14.07.23	Issued for Planning

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## 1.0 Introduction

The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during construction of the proposed Seskin Wind Farm 38kV grid connection to the existing ESB owned Kilkenny 110kV substation. The grid connection will consist of an underground cable (UGC). The UGC works will consist of the installation of 4 no. ducts in an excavated trench to accommodate 3 no. power cables, and 1 no. fibre communications cable to allow communications between the Seskin Wind Farm Substation and Kilkenny 110kV substation. This document is intended to be used as an aid to understand the methodologies to be employed during construction and should be read in conjunction with all other specialist reports which accompany the planning application. In addition, this document is in outline form only and will be revised and updated prior to the commencement of any construction activities, and detailed Method Statements will be prepared in respect of each aspect of the proposed development.

## 2.0 Proposed Grid Route

The proposed UGC is approximately 20.1km in length and runs in a north-easterly direction from the existing ESB Kilkenny 110kV substation to the proposed Seskin Wind Farm. The proposed route is located within the Seskin Wind Farm site, the carriageway of regional and local roads and access track on approach to the ESB Substation. The exact location of the underground cable within the proposed site boundary is subject to minor modification following a further detailed assessment to be undertaken prior to construction and following consultation with Carlow County Council and all other relevant stakeholders, having regard to all environmental constraints outlined in the planning application.

Figure 1, below, outlines the proposed UGC route, with each section of the route being discussed in detail at Table 1.



**Figure 1 - Grid Connection Route Layout**

**Tables 1 and 2** of this report outline the preliminary design features of the UGC and proposed route.

Table 1 – Approximate Route Location of Preliminary Design:		
Private Lands (UGC)	Public Roads (UGC)	ESB Access Track (UGC)
274m	19870m	TBC m

**Table 1: Seskin Wind Farm Substation to Kilkenny 110kV Substation – UG Cable Location Summary**

Table 2 describes the specific construction requirements of each individual UGC section and identifies access routes to the work areas. All plant and equipment employed on the proposed works will be subject to good site organisation and hygiene, particularly during construction activities.

**Table 2 - Summary of Proposed Interconnector Design Route**

Section	Description
<b>Section 1</b>	<b>UGC from Bridge 6 to the proposed Seskin Wind Farm substation</b>
UGC 2155m	<p>The second UGC section begins at the Bridge 6 crossing, located at chainage 0m, within the L-30371. The proposed route heads northeast for approx. 2,000m on a predominantly upward trajectory within the local roads network, traversing a junction and maintaining its trajectory before encountering the wind farm substation site location to the right-hand side. The UGC will continue south along a relatively flat gradient over grassland for circa 125m until reaching the location of the wind farm substation at chainage 2010m.</p> <p><u>Features</u></p> <p>Section 1 contains 2 no. joint Bay/bays. Joint Bays/bays will be located below ground and finished/reinstated to the required roads specification. Joint Bays will have associated communication chambers which will have a surface access hatch which will match existing ground levels.</p> <ul style="list-style-type: none"> <li>Joint Bay 16 (JB17) will be located approx. 1103m northeast of JB15, within the local tertiary road network (L30372). <u>[Chainage – 50m]</u></li> <li>Joint Bay 17 (JB17) will be located approx. 1146m east of JB16, within the local tertiary road network (L30372). <u>[Chainage – 1200m]</u></li> </ul> <p>This Section encounters two bridge crossings, Bridge 6 and Bridge 7, located within the L-30371 and L- 30372 local roads, respectively. The proposed crossing method for these bridges is HDD. Ref Drawing numbers 05908-DR-136 &amp; 05908-DR-137.</p>

**Table 2: Summary of Proposed Interconnector Design Route**

### 3.0 Preliminary Site Investigations

It would be proposed to carry out Preliminary site investigations along the cable route prior to construction to confirm design assumptions.

The following items may be carried out:

#### 3.1 UG Cable Route:

Slit trenches at locations of major service crossings (Full road width).

5 No. trial holes along the route to ascertain ground conditions and thermal resistivity of the soil.

**Traffic Management** – Single lane Closure with Stop/Go system in place.

#### Equipment:

- 4x4 vehicle
- Concrete vibrator
- Wheeled dumper
- Soil compactor
- 360° tracked excavator (only rubber tracked machines will be allowed on public roads)

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## 4.0 UGC Construction Methodology

The proposed UGC will consist of 3 no. 110mm diameter HDPE power cable ducts and 1 no. 110mm diameter HDPE communications duct to be installed in an excavated trench, typically 600mm wide by 1,220mm deep, with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings. The power cable ducts will accommodate 3 no. power cables. The communications duct will accommodate a fibre cable to allow communications between the Seskin Wind Farm substation and Kilkenny 110kV substation. The ducts will be installed, the trench reinstated in accordance with Carlow County Council specification, and then the electrical cabling/fibre cable is pulled through the installed ducts in approximately 1000/1150m sections. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements and specifications of ESB Networks.

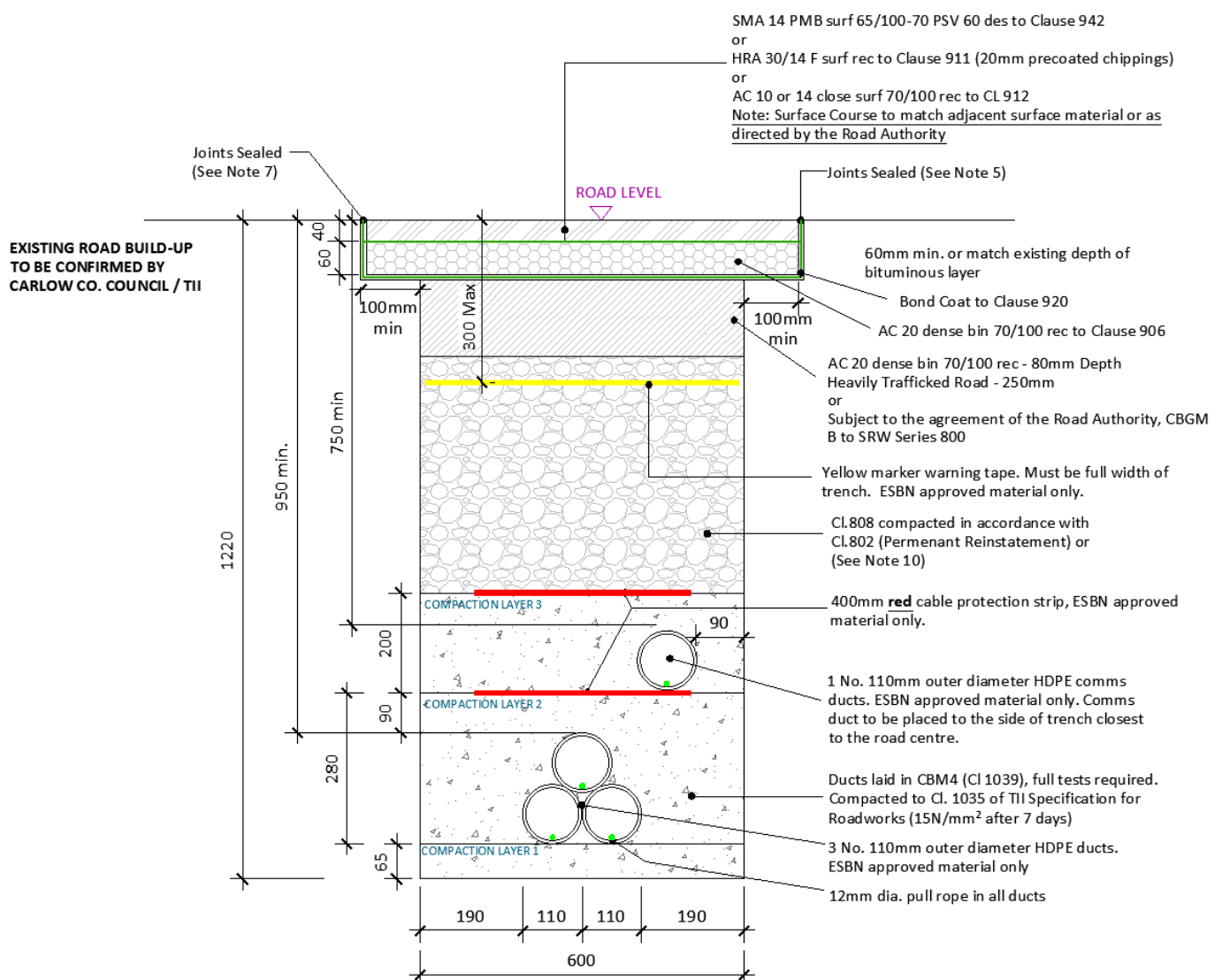


Figure 2 - Typical Trench in Roadway Section

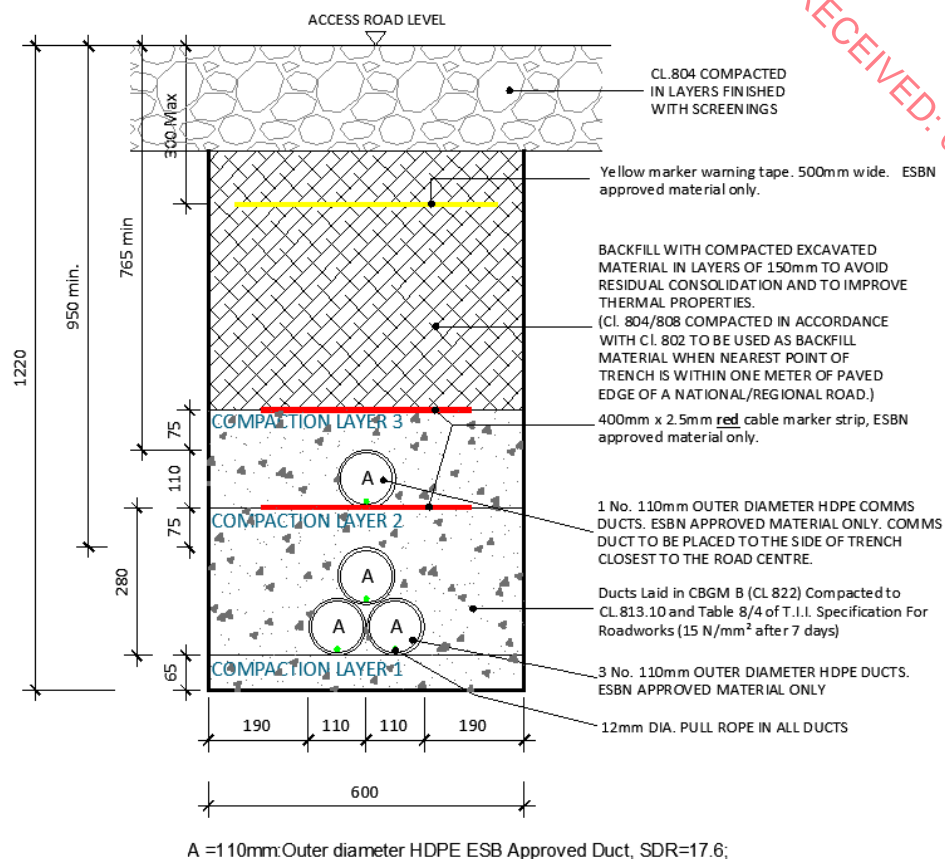


Figure 3 - Typical Trench in Access Road Section

Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with ESB standards.

Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions. Corrosion proof aluminium triangular danger signs, with a 700mm base, and with centred lightning symbol, on fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker posts shall also be placed in the event that burial depth is not to standard. The precise siting of marker posts will be dictated by ESBN as part of the detailed design process.

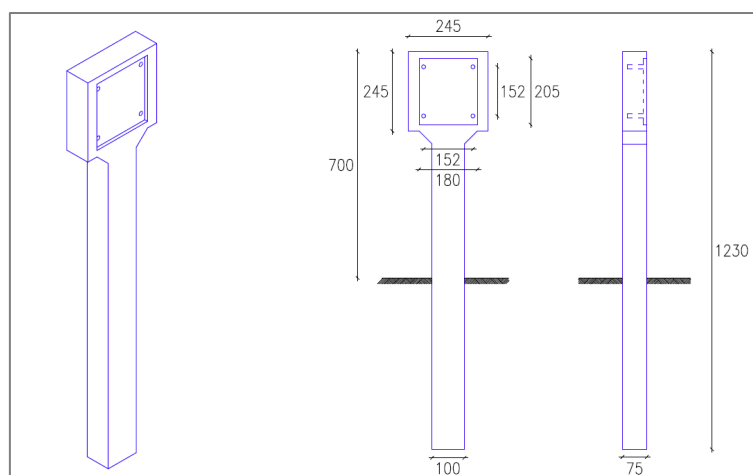


Figure 4 - Typical ESB Marker Posts Example

## 4.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works:-

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all control measures included within the Section 5 application and accompanying reports where relevant;
- The base of the excavated trench will be lined with sand bedding to be imported to site from a local licensed supplier. The 110mm diameter HDPE cable ducting will be placed into the prepared trench, inspected and backfilled as per Figure 2 & Figure 3;
- Any existing underground services shall be identified on-site before the commencement of construction works through a Ground Penetrating Radar (GPR) survey;
- The proposed cable route adjoins 2 no. culvert structures. These culverts will remain in place and the ducting will be installed beneath / adjacent to these culverts to provide minimum separation distances in accordance with ESB and Irish Water specifications;
- None of the identified culverts require removal for ducting installation, it is proposed that a suitable method of damming the water source whilst the installation of cable ducts are placed beneath the culverts. Works of this nature will be carried out in line with Inland Fisheries Ireland guidelines. See Figure 5 for reference;
- Traffic management measures will be implemented in accordance with those included in the Traffic Management Report, and a detailed Traffic Management Plan will be prepared and agreed with Carlow County Council;
- The excavated trench will be approximately 600mm in width and approximately 1220mm deep both within the public road network and within private lands;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features.
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported off site and disposed of at a fully authorised soil recovery site;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100-metre section of trench will be opened at any one time. The second 100 metres will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Works will only be conducted in normal working hours of Monday to Friday 08:00 to 20:00 and Saturday 08:00 to 18:00, with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 no. day.

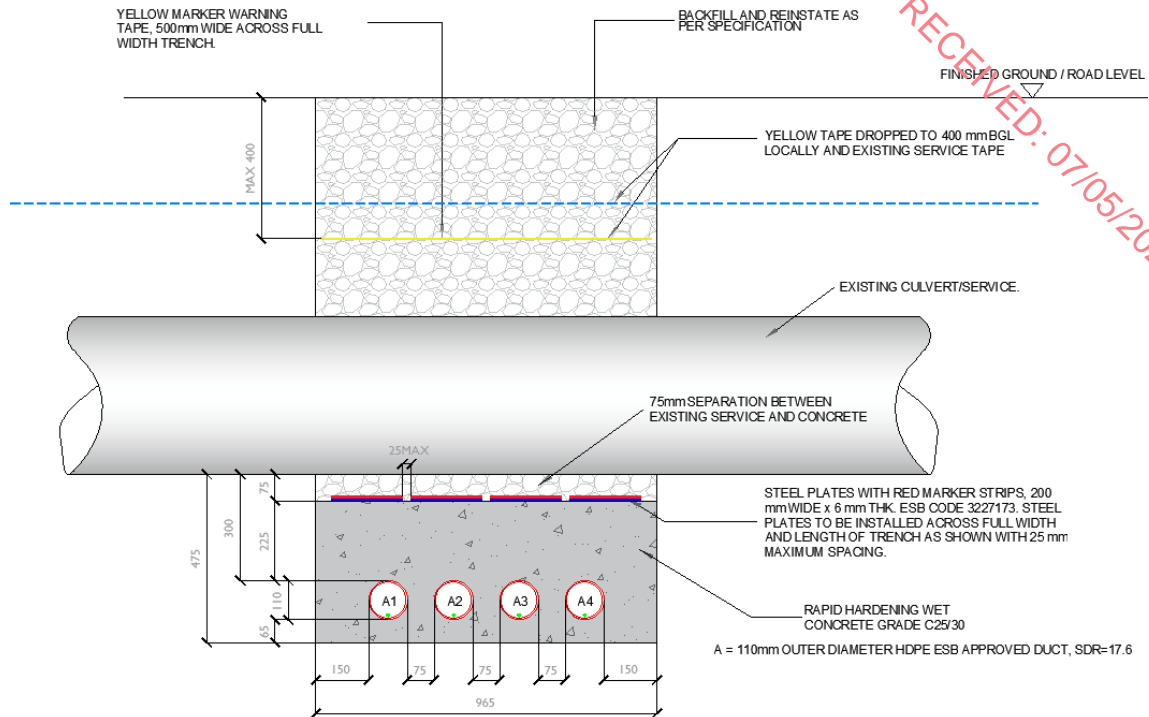


Figure 5 - Typical Service/Culvert undercrossing detail

#### Equipment:

- 360° tracked excavator (wheeled excavator where required)
- 1 no. dumper or tractor and trailer.

#### Materials:

- Sand for pipe bedding;
- Ready-mix Concrete where necessary (delivered to site);
- Trench backfilling material (excavated material and aggregates) to relevant specifications;
- Cable ducting;
- Permanent Surface Reinstatement Asphalt Material.
- Temporary Surface Reinstatement Materials.
- ESB Marker tape
- ESB Approved Marker Post



**Figure 6 - Typical 38kV Underground Duct Installation**

#### **4.2 Managing Excess Material from Trench**

All excavated material will be temporarily stored adjacent to the trench prior to re-use in the trench reinstatement (where applicable). Stockpiles will be restricted to less than 2m in height. Where excess material exists will be disposed of to a licensed facility.

#### **4.3 Storage of Plant and Machinery**

All plant, machinery and equipment will be stored on site within the works area or within the temporary construction compound to be located within the proposed Seskin Wind Farm. Oils and fuels will not be stored on site and will be stored in an appropriately bunded area within the temporary storage compound.

#### **4.4 Joint Bays and Associated Chambers**

Joint Bays are to be provided approximately every 1000m - 1150m along the UGC route to facilitate the jointing of 2 no. lengths of UGC. Joint Bays are typically 2.03m x 4.5m x 1.475m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between the Seskin Wind Farm substation and the existing Kilkenny 110kV substation. Earth Sheath Link Chambers are also required approximately every second joint bay along the cable route. Communication Chambers will typically be pre-cast concrete structures with an access cover at finished surface level.

The precise siting of all Joint Bays and Communication Chambers is subject to approval by ESNB. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions. The marker posts will consist of a corrosion proof aluminium triangular danger sign, with 750mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background. They will be installed in adequately sized concrete foundations and will also be placed where the cable has not been buried to the standard depth, due to existing road conditions.

Mitigation measures will be implemented throughout the construction process to ensure the installation and construction of the joint bays does not impact nearby protected structures and/or watercourses.

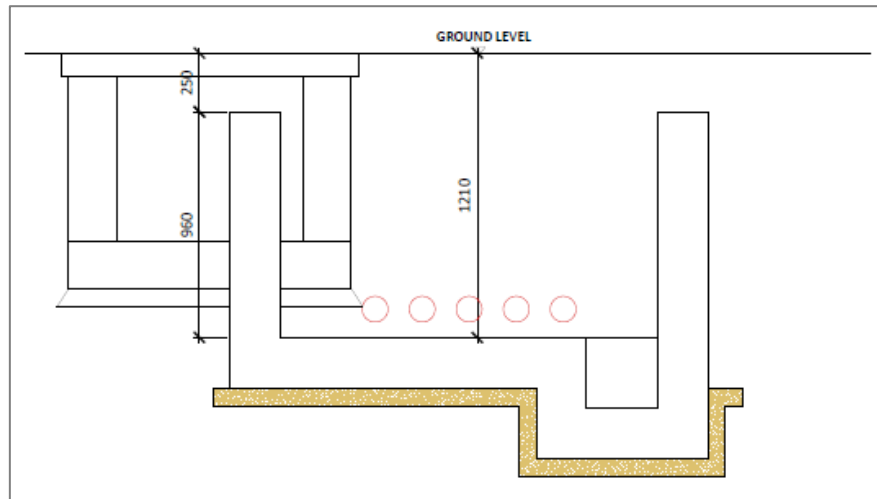


Figure 7 - Typical Section Through Joint Bay

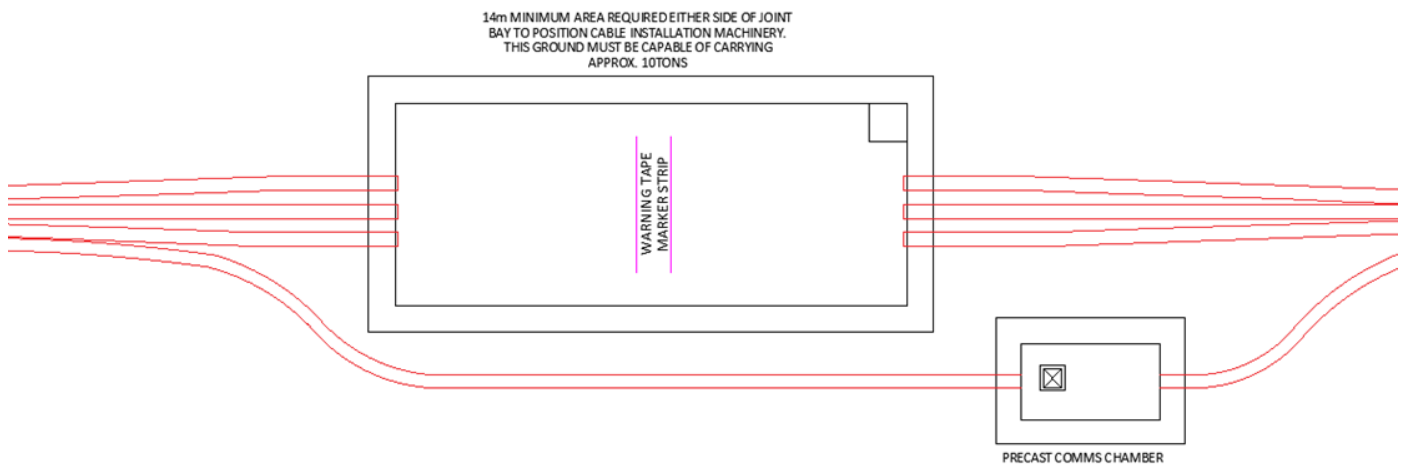


Figure 8 - Typical Joint Bay Plan details



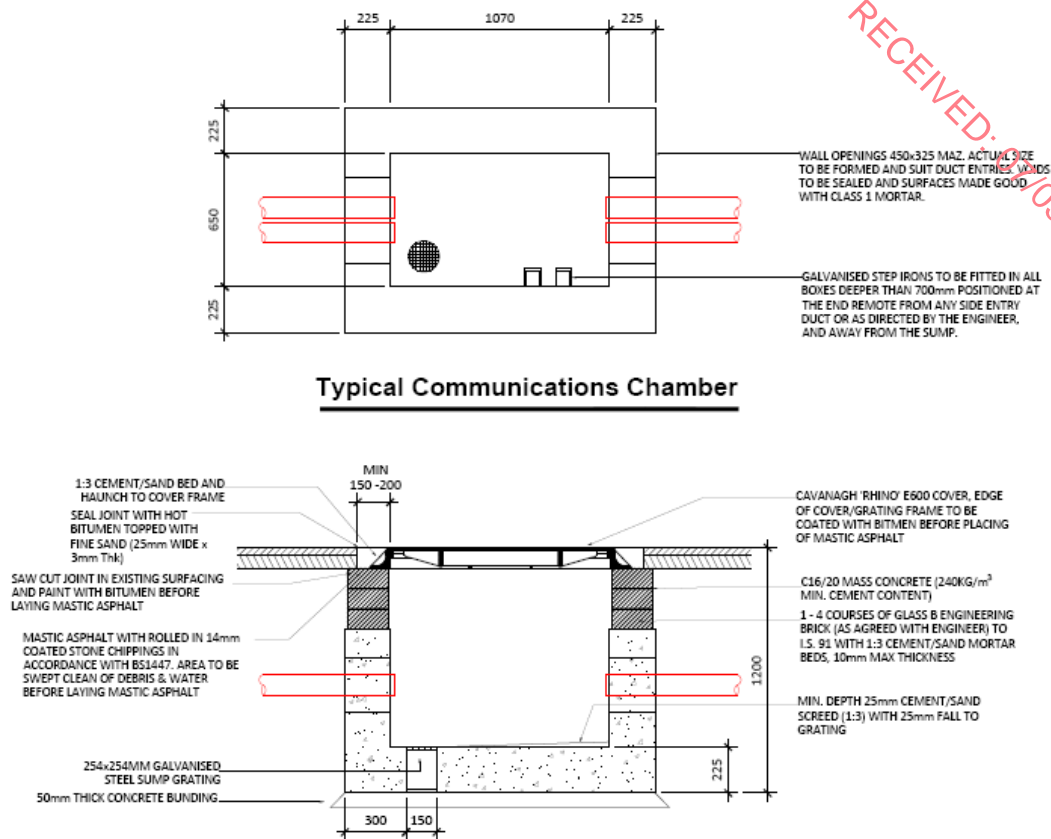


Figure 9 - Typical Communications Chamber detail

## 5.0 Major Watercourse Crossings

The cable route will involve 2 No. bridge crossings. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. The cable will be located within the bridge deck where there is sufficient depth and width available on the bridge, where there is insufficient depth and width available horizontal directional drilling (HDD) may be employed as an alternative.

### 5.1 Bridge 6 – Horizontal Directional Drilling [Chainage - 0m]

ITM Coordinates: 661963.515,669095.881

Bridge 6 (Philips Bridge) is located at chainage 0m, within the L-30371 and has insufficient room to install the cable to ESB specifications and the suitability of the bridge is inadequate to accommodate the works. Executing a horizontal directional drill (HDD) approximately 1500mm beneath the waterway and bridge foundations will be required. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. Ref drawing 05908-DR-136.



Figure 10 - Bridge 6 within the L-30371

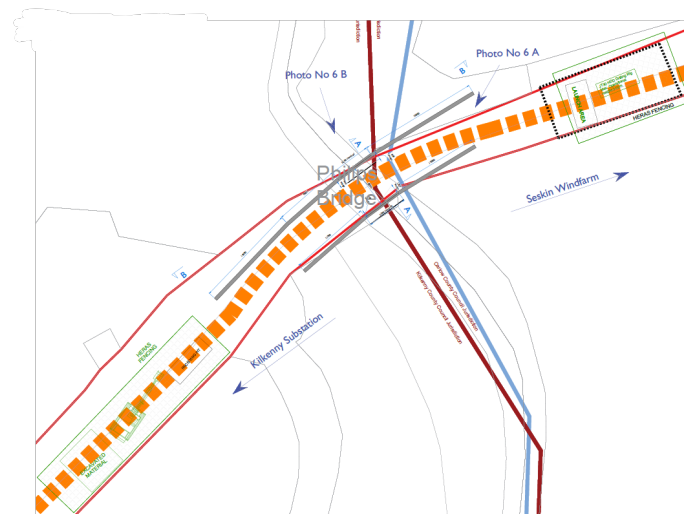


Figure 11 - Bridge 6 drawing extract

### 5.1 Bridge 7 – Horizontal Directional Drilling [Chainage - 330m]

ITM Coordinates: 662256.490,669114.511

Bridge 7 is located on the L-30371 at chainage 330m. The Bridge has insufficient room to install the cable to ESNB specifications (500mm cover) and the suitability of the bridge is inadequate to accommodate the scope of works. Horizontal directional drilling (HDD) will be implemented to bore approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway. The methodology for HDD is outlined in Section 6 below. Ref drawing 05908-DR-137.



Figure 12 - Bridge 7 within the L-30371

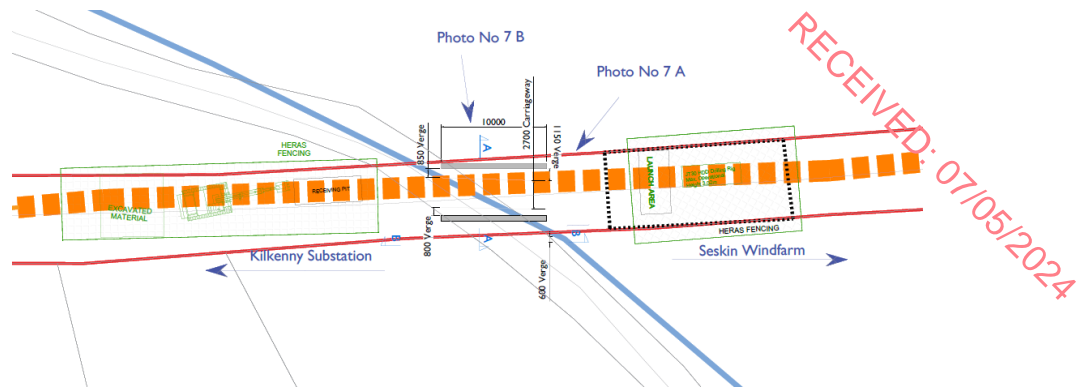


Figure 13 - Bridge 7 drawing extract

## 6.0 Horizontal Directional Drill (HDD)

Horizontal Directional Drilling (HDD) is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. There are a number of bridges on this UGC route which will require HDD due to there being insufficient cover and depth in the bridge to cross within the bridge deck. The drilling methodology is as follows: -

1. A works area of circa. 40m<sup>2</sup> will be fenced on both sides of the river crossing,
2. The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
3. Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
4. A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
5. The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
6. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
7. The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
8. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
9. Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
10. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
11. The ducts will be cleaned and proven and their installed location surveyed.
12. The entry and exit pits will be reinstated to the specification of ESNB and Carlow County Council.
13. A transition coupler will be installed at either side of the bridge/ following the horizontal directional drilling as per ESB requirements, this will join the HDD ducts to the standard ducts.

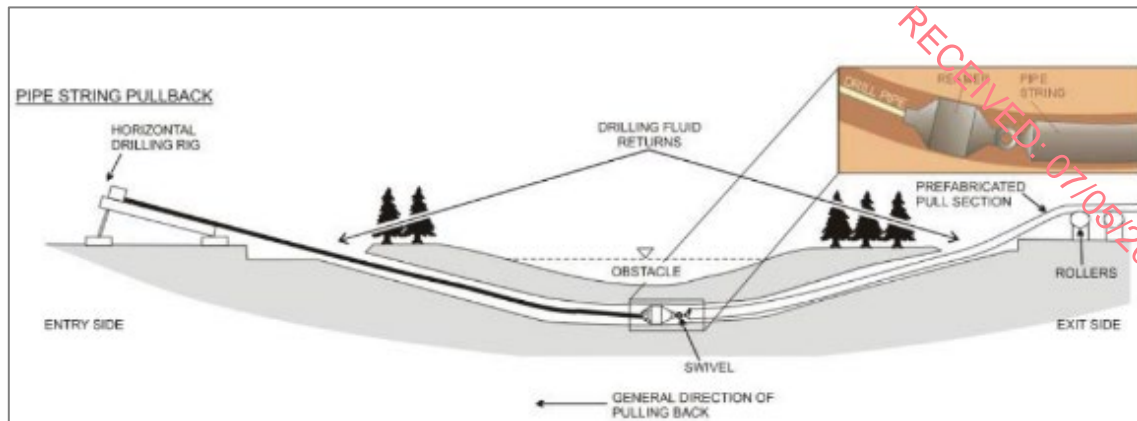


Figure 14 - Typical HDD Installation

## 7.0 Assessment of Proposed Route and Construction Requirements

The table below separates the transmission line route into a number of sections and describes the specific construction requirements of each individual section.

Table 2 - Summary of Preliminary Grid Connection Design Route	
Section	Description
<b>Section 1</b>	<b>UGC from Bridge Crossing 06 to Seskin Wind Farm substation</b>
UGC 2309m	<p>The proposed UGC section from the Bridge 6 crossing to the proposed Seskin WF substation location will be routed northeast through the L-30731, L-3037 and L-30372 local roads and will be located within the carriageway of the road.</p> <p>The route continues in this direction until it leaves the public roadway, utilizing the internal wind farm access track to reach the proposed Seskin WF substation at chainage 2010m.</p> <p><u>Features</u></p> <p>Section 1 contains 2 no. joint Bay/bays. Joint Bays/bays will be located below ground and finished/reinstated to the required roads specification. Joint Bays will have associated communication chambers which will have a surface access hatch which will match existing ground levels.</p> <ul style="list-style-type: none"> <li>Joint Bay 16 (JB17) will be located approx. 1103m northeast of JB15, within the local tertiary road network (L30372). <i>[Chainage – 50m]</i></li> <li>Joint Bay 17 (JB17) will be located approx. 1146m east of JB16, within the local tertiary road network (L30372). <i>[Chainage – 1200m]</i></li> </ul> <p>This Section encounters two bridge crossings, Bridge 6 and Bridge 7, located within the L-30371 and L-30372 local roads, respectively. The proposed crossing method for these bridges is HDD. Ref Drawing numbers 05908-DR-136 &amp; 05908-DR-137.</p>
Refer to Figure 1 and to the planning drawings submitted for location details.	
Note: The precise location of the proposed route within the planning Section 5 boundary is subject to change as result of existing services/utility locations, ground conditions and any environmental constraints.	

Table 2: Summary of Preliminary Grid Connection Design Route

## 8.0 Design and Construction Management Methodology

Prior to commencement of construction works the contractor will draw up detailed Method Statements which will be informed by this Outline Construction Methodology and the guidance documents and best practice measures listed below. This method statement will be adhered to by the contractors and will be overseen by the Project Manager and Site Manager.

The following documents will contribute to the preparation of the method statements in addition to those measures proposed below:-

- Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland, Dublin,
- *National Roads Authority (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects*. Technical guidance (C648). CIRIA;
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects*. Site guide (C649). CIRIA.
- Murphy, D. (2004) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*. Eastern Regional Fisheries Board, Dublin;
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532);
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines*;
- Law, C. and D'Aleo, S. (2016) *Environmental good practice on site pocket book*. (C762) 4th edition. CIRIA;
- CIRIA *Environmental Good Practice on Site (fourth edition) (C741) 2015*.

## 9.0 Access Routes to Work Area

The proposed grid connection will be all UGC. The majority of the proposed underground cable will be installed within the public road network and therefore will be accessed via the existing road network. Where the cable route is located on private lands, contractor(s) will be required to utilise the local public road network in the vicinity of the work area and from there utilise private farm tracks, where appropriate.

Prior to the commencement of development, precise access arrangements will be agreed with the respective landowners.

A detailed Traffic Management Plan will be prepared, and agreed with Carlow County Council, prior to the commencement of construction. Some work areas will require a road closure where it is not possible to safely implement a Stop/Go system. Where road closures are necessary, a suitable diversion will be implemented using appropriate signage, following consultation with Carlow County Council whereby the necessary road closure license will be obtained prior to any works.

Access routes will be carefully selected to avoid any damage to land. Local consultation will be carried out with all relevant landowners to ensure that any potential disturbance will be minimised. Prior to the commencement of construction, the contractor will assess all access routes and determine the requirement for bog mats. Any such requirements will be incorporated into the relevant method statement.

## 10.0 Traffic Management

Traffic management and road signage will be in accordance with the Department of Transport: Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works (2019) and in agreement with Carlow County Council. All work on public roads will be subject to the approval of a road opening license application. The contractor will prepare detailed traffic management plans for inclusion as part of the road opening applications.

Where road widths allow, the UGC installation works will allow for one side of the road to remain open to traffic at all times by means of an automated 'Stop/Go' traffic management system, where a minimum 2.5m-3m roadway will be maintained at all times. The 'Stop/Go' system will be implemented along the L30371 and L30372. Temporary traffic signals will be implemented, on the approach and through the works area, to allow road users safely pass through the works area by channelling them onto the open side of the road.

Typically, the UGC will be installed in 200m sections, and no more than 100m will be excavated without the majority of the previous section being reinstated. Where the construction requires the crossing of a road, works on one carriageway will be completed before the second carriageway is opened, to maintain traffic flows.

All construction vehicles will be parked within the works area so as not to cause additional obstruction or inconvenience to road users or residents. The traffic signals will be in place prior to the works commencing and will remain in place until after the works are completed. The public road will be checked regularly and maintained free of mud and debris. Road sweeping will be carried out as appropriate to ensure construction traffic does not adversely affect the local road condition.

In the event of emergency; steel plates, which will be available on site, can be put in place across the excavation to allow traffic to flow on both sides of the road, if required.

All traffic management measures will comply with those outlined in the accompanying Traffic Management Report and will be incorporated into a detailed Traffic Management Plan to be prepared, in consultation with Carlow County Council, prior to the commencement of development.



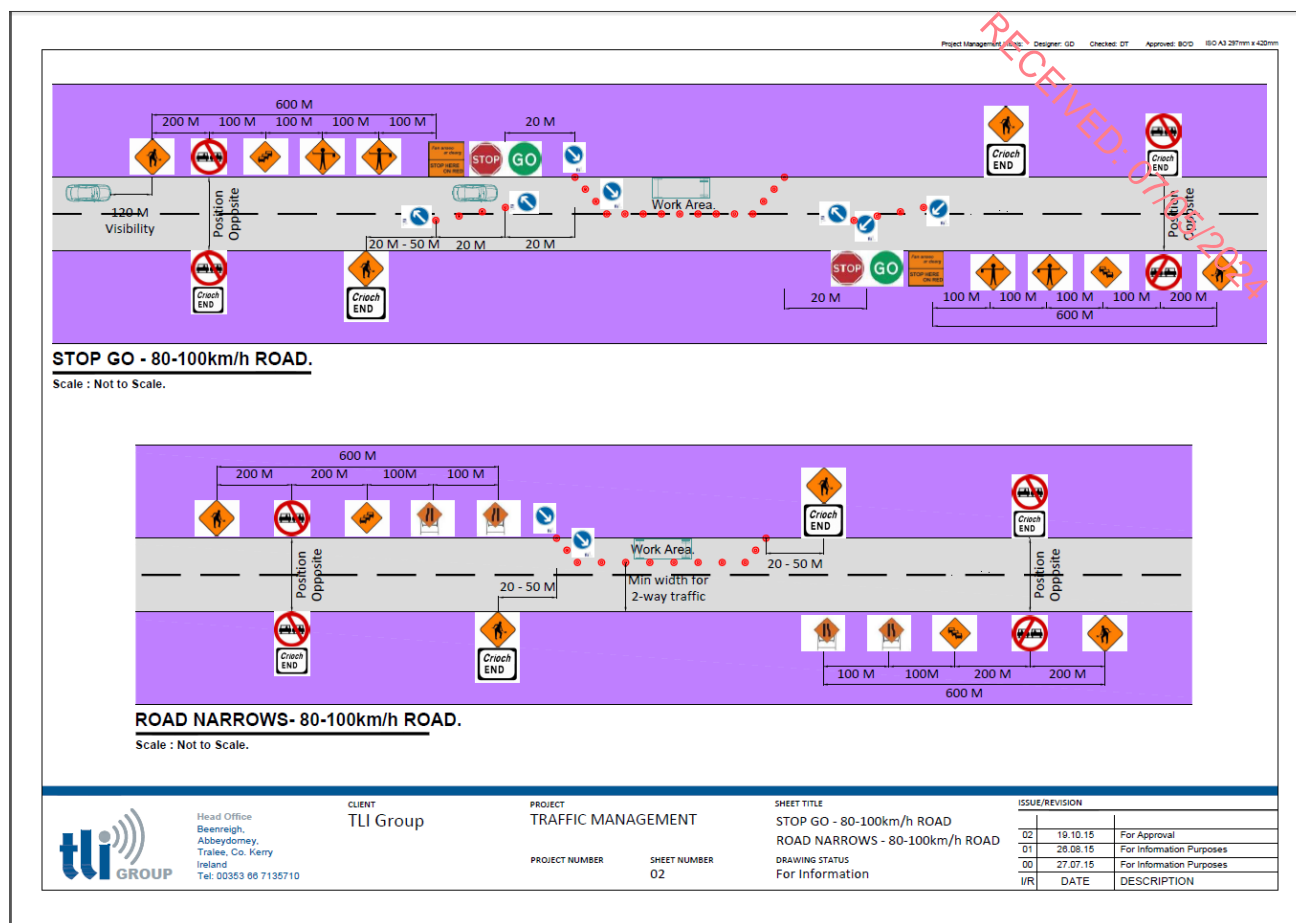


Figure 15 - Sample Traffic Management Layout

The proposed UGC works will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from Carlow County Council. A Traffic Management Plan (TMP) will be agreed with Carlow County Council prior to the commencement of the development. This TMP will outline the location of traffic management signage, together with the location of any necessary road closures and the routing of appropriate diversions. Where diversions are required, these will be agreed with Carlow County Council in advance of the preparation of the TMP.

## 11.0 Relocation of Existing Services

In order to facilitate the installation of the proposed UGC, it may be necessary to relocate existing underground services such as water mains, gas networks or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

### 11.1 Underground Cables

If existing underground cables are found to be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, with the underground cables will then be re-energised.

## 11.2 Gas Networks

Consultation with Gas Networks Ireland must take place before starting works where gas pipes are present. Gas Networks Ireland will advise on the safety measures required and will arrange for the exact location of the pipe to be marked out on site.

## 11.3 Water Mains

The water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the utility standards.

## 12.0 Invasive Species Best Practice Measures

Invasive species can be introduced into a location by contaminated plant, machinery and equipment which were previously used in locations that contained invasive species. Good site organisation and hygiene management shall be maintained always on site, and best practice measures will be implemented, as follows:

- The contractor will prepare an Invasive Species Action Plan to be implemented during construction, and all personnel will be made aware of the requirements contained within;
- Plant and machinery will be inspected upon arrival and departure from site and cleaned/washed as necessary to prevent the spread of invasive aquatic / riparian species such as Japanese knotweed *Fallopia japonica* and Himalayan Balsam *Impatiens glandulifera*. A sign off sheet will be maintained by the contractor to confirm the implementation of measures;
- Site hygiene signage will be erected in relation to the management of non-native invasive material.

## 13.0 Waste Management

All waste products (general waste, plastic, timber, etc.) arising during the construction phase will be managed and disposed of in accordance with the provisions of the Waste Management Act 1996 and associated amendments and regulations, and a Waste Management Plan will be prepared by the contractor prior to the commencement of construction. All waste material will be disposed of at a fully licensed facility.