APPENDIX 4-5

TLI GROUP -LACKAREAGH WIND FARM 38KV GRID CONNECTION – CONSTRUCTION METHODLOGY

Outline Construction Methodology

Lackareagh Wind Farm

38kV Underground Cable Route Grid Connection

Report Ref: 05909-R02-01

Clients: EDF Renewables c/o McCarthy Keville O'Sullivan

Revision:	Designer:	Checked:	Date:	Notes:
00	JVDP	DB	14.07.23	Issued for Planning
01	JVDP	DB	02.10.23	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 Lackareagh Wind Farm 38kV grid connection to the existing ESB owned Ardnacrusha 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 Lackareagh Wind Farm Substation and Ardnacrusha 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 14.7km in length and runs in a north-easterly direction from the existing ESB Ardnacrusha 110kV substation to the proposed Lackareagh Wind Farm. The proposed route is located within the Lackareagh Wind Farm site, the carriageway of regional and local roads and access track on approach to the ESBN 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 Clare 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:	
Public Roads (UGC)	**ESB Access Track (UGC)**
14399m	327 m

Table 1: Lackareagh Wind Farm Substation to Ardnacrusha 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 Preliminary Grid Connection Design Route	
Section	**Description**
Section 1 UGC 5567m	**UGC from Ardnacrusha 110kV SS to Harold's Cross** The proposed UGC from the Ardnacrusha 110kV substation to Harold's Cross will be routed through the local primary and secondary roadway and located in the carriageway of the road. The UGC will exit the Ardnacrusha 110kV Station via its northern periphery and utilise internal access tracks within the Ardnacrusha generation plant to continue northwest. The UGC route will continue in this direction until it meets the L3056, turning east until reaching Barry's Cross. The route utilises two local roads, R463 and L3046, with a north-eastern heading prior to reaching Harold's Cross at chainage 5240m. Features Section 1 contains 5 no. joint bays. Joint bays will be located below ground and finished/reinstated to the required national roads specification. • Joint Bay 01 (JB01) will be located approx. 344m northwest of the Ardnacrusha 110kV SS boundary, positioned along the proposed route within the carriageway of the Castlebank local tertiary road. *[Chainage – 350m]* • Joint Bay 02 (JB02) will be located approx. 1146m northeast of JB01, carrying along the proposed route within the local secondary road network (L3056). *[Chainage – 1490m]* • Joint Bay 03 (JB03) will be located approx. 1139m northeast of JB02, within the local secondary road network (L3046). *[Chainage – 2630m]* • Joint Bay 04 (JB04) will be located approx. 1122m north of JB03, within the local secondary road network (L3046) outside an agricultural gated entrance to a field parcel. *[Chainage – 3750m]* • Joint Bay 05 (JB05) will be located approx. 1147m northeast of JB04, within the local secondary road network (L3046). *[Chainage – 4900m]*

	One bridge crossing has been located along this section of the route. It is proposed to cross this bridge via a Bridge Strapping, as on site surveys revealed it contains insufficient cover to support the proposed 38kV UGC and was unfeasible for the usage of HDD. Please refer to the accompanying drawing 05909-DR-111 for crossing details. There are 3 no. culvert crossings within this section. It is proposed to cross beneath the culverts in flat formation. Ref Drawing Number 05909-DR-126.
Section 2 UGC 4285m	**UGC from Harold's Cross to R466 Regional Road** Section 2 initiates at Harold's Cross, which the route traverses. Remaining within the L3046, the UGC maintains its north-eastern heading until arriving at a junction where the route joins the R466 at chainage 9500m. <u>Features</u> Section 2 contains 4 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. • Joint Bay 06 (JB06) will be located approx. 1150m north of JB05, within the local secondary road network (L3046). *[Chainage – 6050m]* • Joint Bay 07 (JB07) will be located approx. 1148m northeast of JB06, within the local secondary road network (L3046) outside an agricultural gated entrance to a field parcel. *[Chainage – 7200m]* • Joint Bay 08 (JB08) will be located approx. 1147m northeast of JB07, within the local secondary road network (L3046). *[Chainage – 8340m]* • Joint Bay 09 (JB09) will be located approx. 1138m northeast of JB08, within the local road network (L3046). *[Chainage – 9590m]* There are 3 no. culvert crossings within this section. It is proposed to cross beneath the culverts in flat formation. Ref Drawing Number 05909-DR-126.
Section 3 UGC 5234m	**UGC from the R466 Regional Road to Lackareagh WF SS** Continuing with a north-eastern heading, the UGC remains within the public roadway following the R466, L3022-8 and L7080 local secondary and tertiary roads on approach to the proposed Lackareagh WF SS. This section concludes upon reaching Lackareagh WF SS, located at chainage 14726m. <u>Features</u> Section 3 contains 4 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.

	• Joint Bay 10 (JB10) will be located approx. 1105m northeast of JB09, within the local secondary road network (L3022-8). *[Chainage – 10760m]* • Joint Bay 11 (JB11) will be located approx. 1150m northeast of JB10, within the local secondary road network (L3022-8) outside an agricultural gated entrance to a field parcel. *[Chainage – 11725m]* • Joint Bay 12 (JB12) will be located approx. 1115m northeast of JB11, within the local tertiary road network (L3022-8). *[Chainage – 12850m]* • Joint Bay 13 (JB13) will be located approx. 1150m northeast of JB12, within the local tertiary road network (L7080). *[Chainage – 14000m]* This Section encounters two bridge crossings, Bridge 2 and Bridge 3, located within the L2627 local road. The proposed crossing method for these bridges is outlined in the sections below. Ref Drawing numbers: 05909-DR-112 & 05909-DR-113. There are 2 no. culvert crossings within this section. It is proposed to cross beneath the culverts in flat formation. Ref Drawing Number 05909-DR-126.
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: 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)

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 Lackareagh Wind Farm substation and Ardnacrusha 110kV substation. The ducts will be installed, the trench reinstated in accordance with Clare 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.

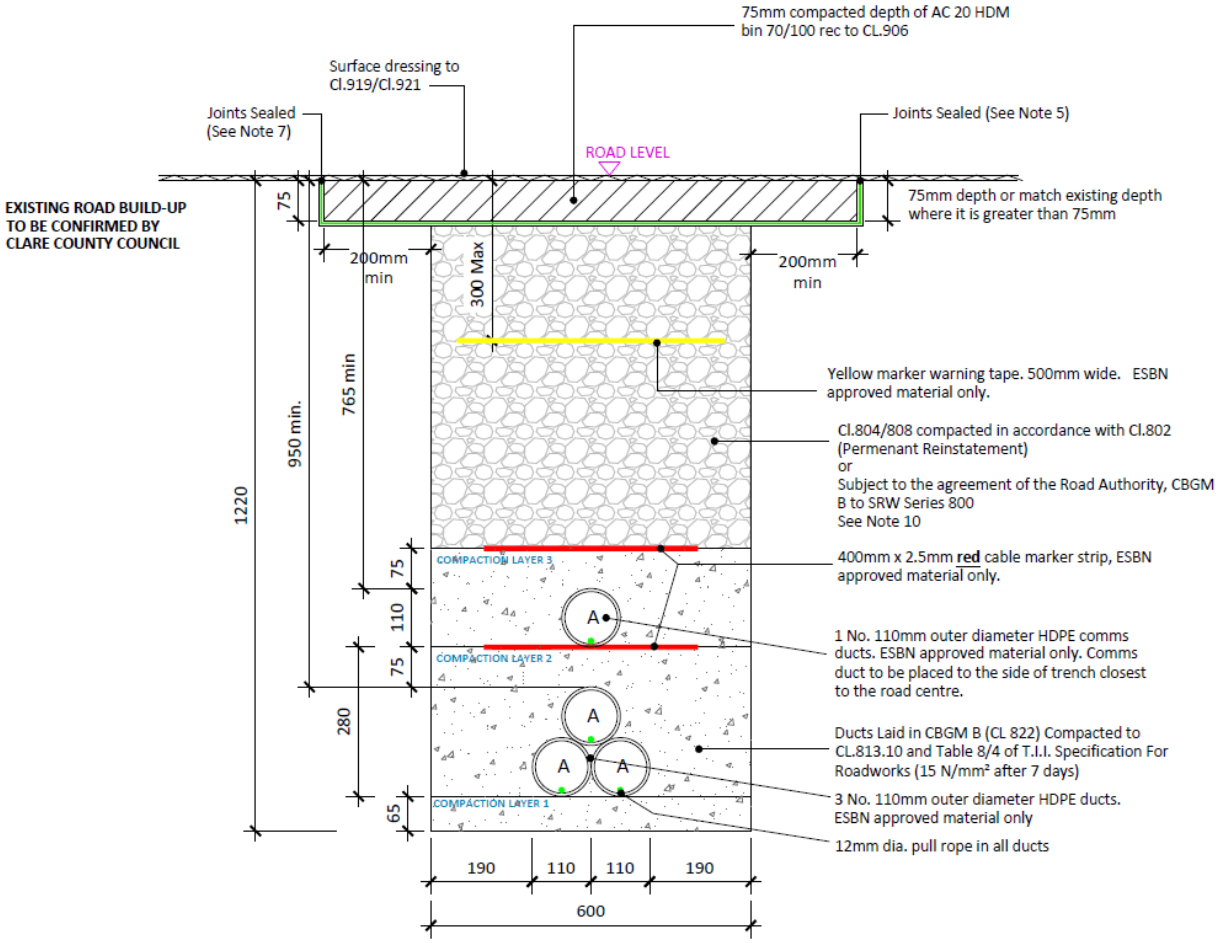


Figure 2 - Typical Trench in Roadway Section

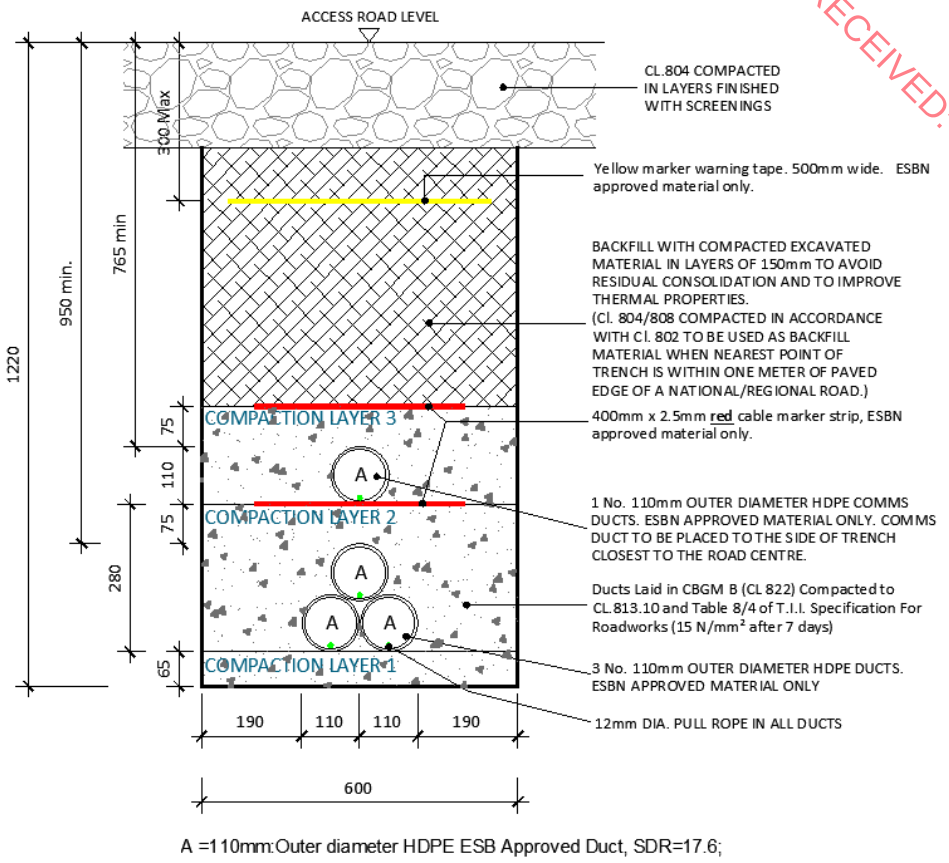


Figure 3 - Typical Trench in Access Road Section

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.

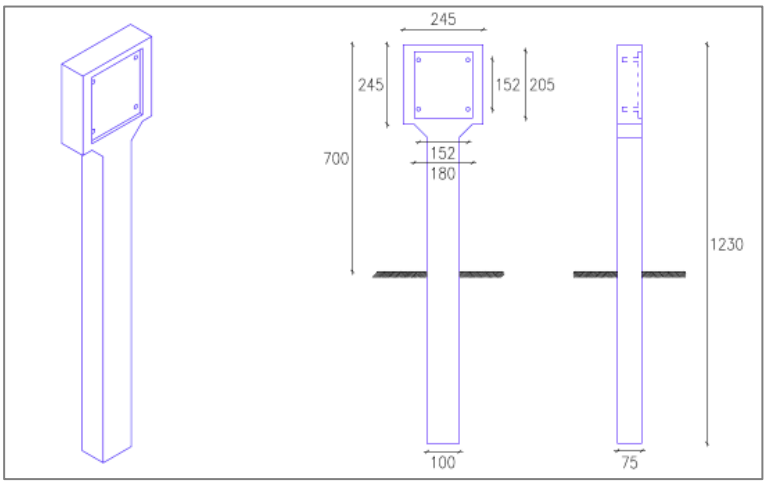


Figure 4 - Typical ESB Marker Posts Example

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 Clare 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.

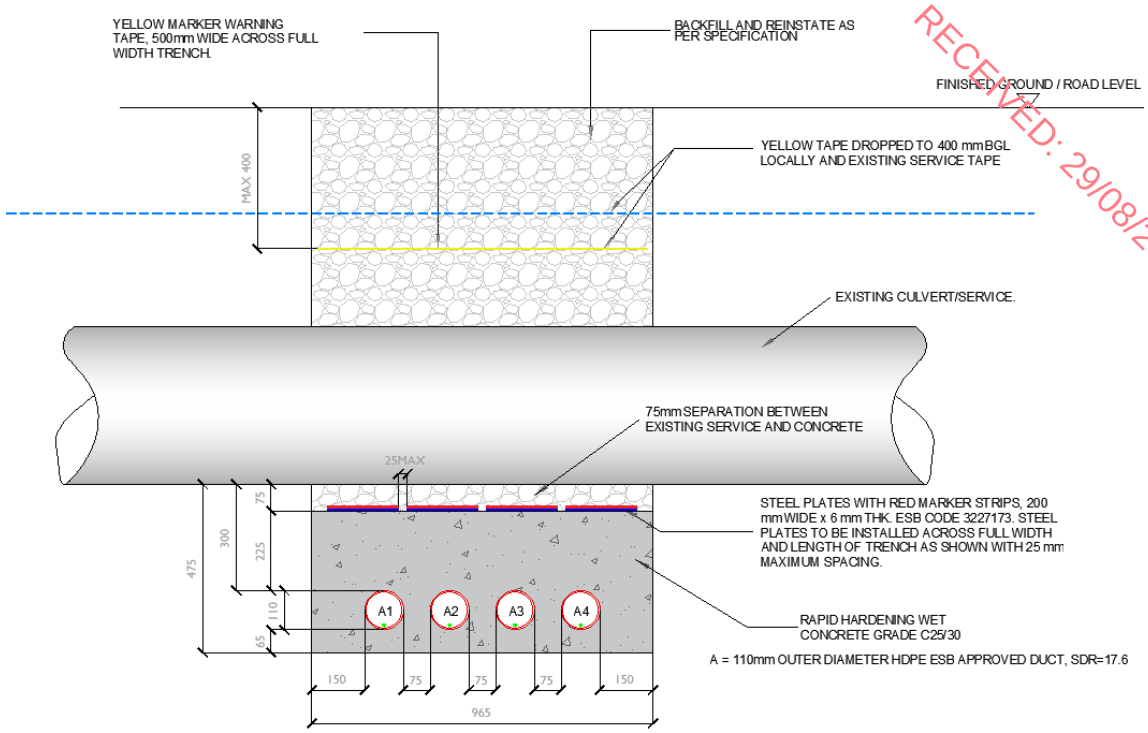


Figure 5 - Typical Service/Culvert undercrossing detail

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 Lackareagh 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

Joints 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 Lackareagh Wind Farm substation and the existing Ardnacrusha 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 ESBN. 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.

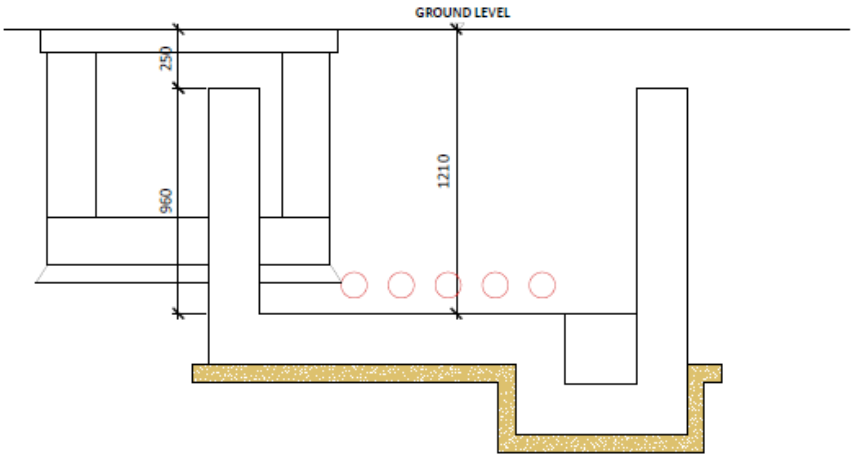


Figure 7 - Typical Section Through Joint Bay

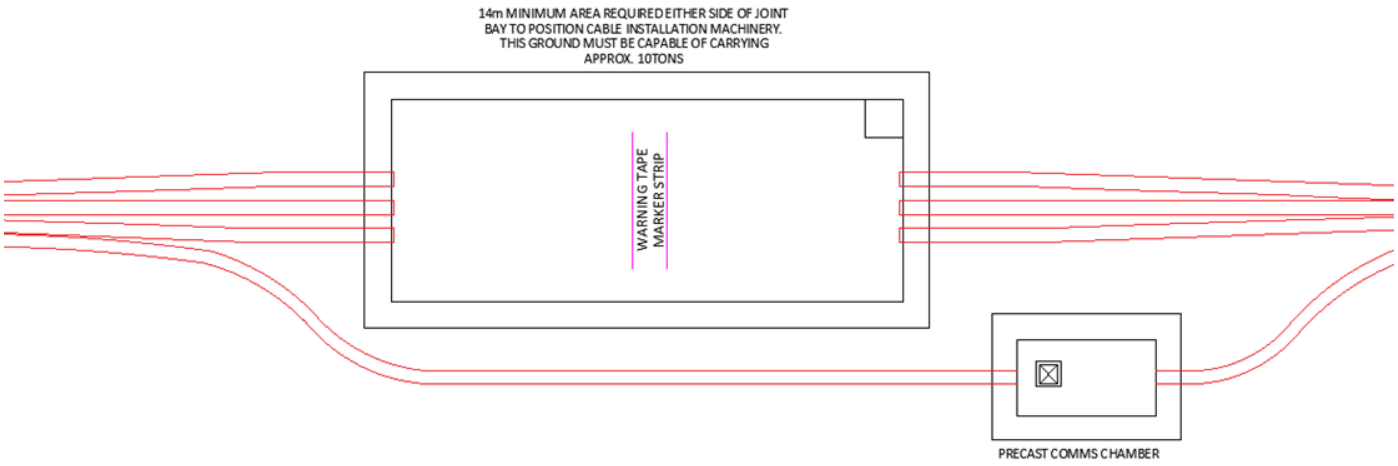
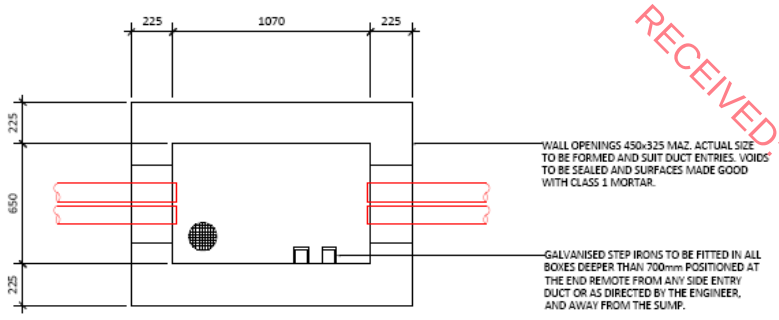


Figure 8 - Typical Joint Bay Plan details



Typical Communications Chamber

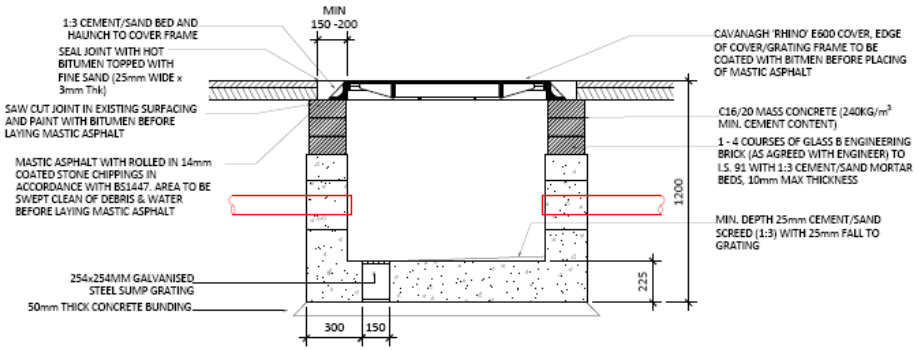


Figure 9 - Typical Communications Chamber detail

5.0 Major Watercourse Crossings

The cable route will involve 3 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.

Crossing existing culverts will be implemented using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert. The cable route will involve 8 No. culvert crossings locations which will be crossed via a flat formation undercrossing (Ref. 05909-DR-126). A schedule of the culverts has been identified at this stage where the crossing method to be implemented has be detailed. (Ref 05-909 Lackareagh WF Culvert Schedule). The culvert crossing methods are detailed in Figure 10 and Figure 11 below.

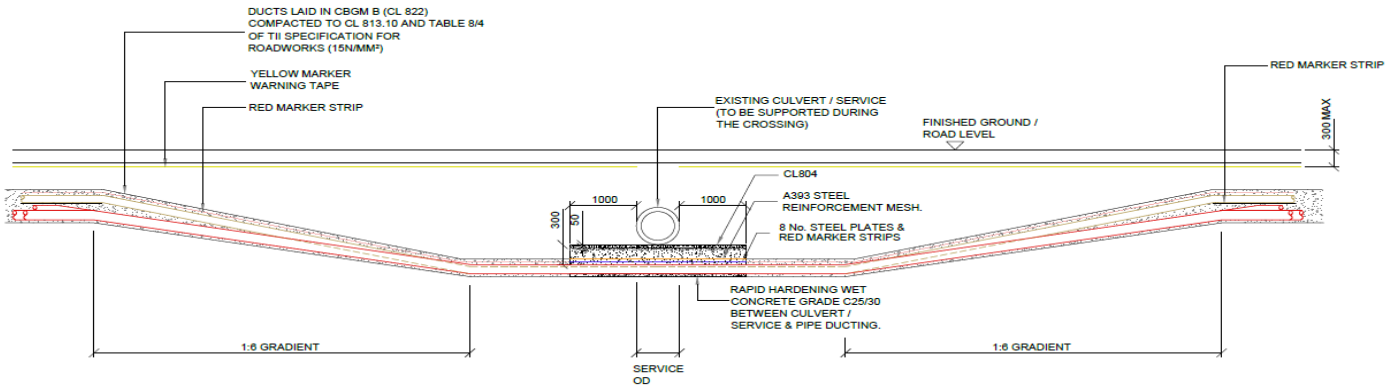


Figure 10 – 110kV UGC Culvert Undercrossing

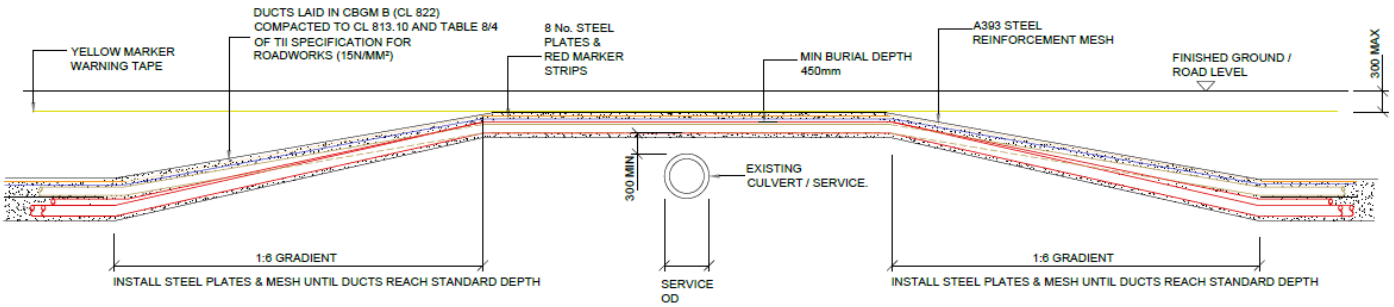


Figure 11 - 110kV UGC Culvert Overcrossing

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 – Stainless Steel Pipe fixture [Chainage - 1,800m]

ITM Coordinates: 559375.6247, 662468.7861

Bridge 1 is located within the L-3056 at chainage 1,800m and has insufficient room to install the cable to ESB specifications within the existing deck and the suitability of the bridge is inadequate to accommodate the ducts in the carriageway as a consequence. Executing a horizontal directional drill (HDD) was determined to be unfeasible, given the curvature of the road, significant elevation change which would be required and the ecology of the area where invasive species such as hog weed have been identified within the vicinity of the bridge. It is therefore proposed that this bridge will be crossed utilizing a stainless steel pipe fixture, strapped to the exterior of the bridge to encompass the grid cables. Ref drawing 05909-DR-111-P2.

Figure 12 - Bridge 1 within L-3056

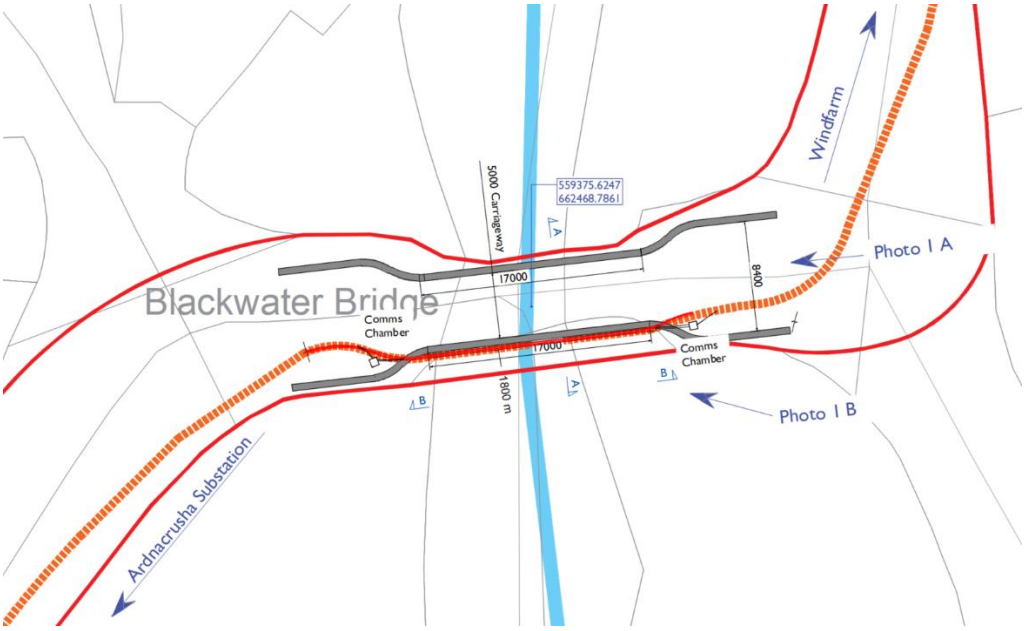


Figure 13 – Bridge No. 1 Site Layout Plan

5.1.1 Alteration of Existing Structures

In advance of the works to the existing structure, an underbridge access unit (Figure 14) will be required to carry out the installation of a metal clad stainless steel beam supported by cleats/ brackets at desired intervals to enclose ESB network cables across the bridge above the River Blackwater riverine feature. Requirements from ESB Networks for this engineering solution is a minimum 4mm wall thickness to fix this arrangement. This will all be done from the extents of the bridge, launching from a platform on the bridge, to carry out this traditional of works, without requiring instream works.

Weather conditions will be considered when planning construction activities with the works to be undertaken during low flows in the river.

Figure 14 - Underbridge Access Unit

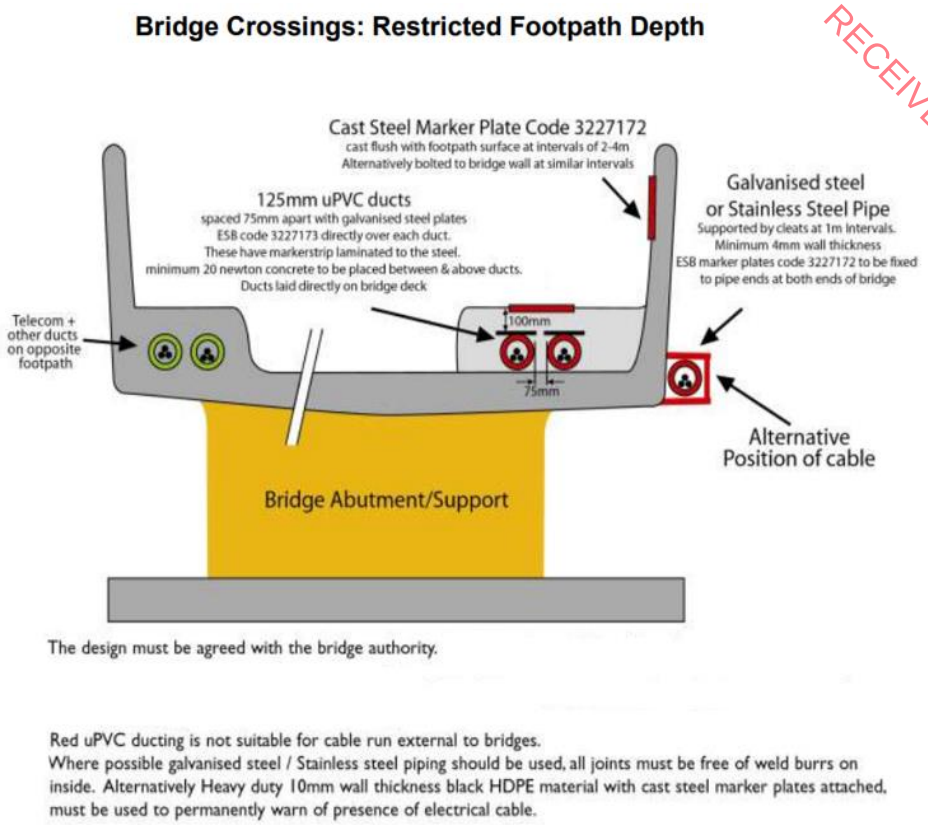


Figure 15 - ESB Networks approved Bridge crossing methods

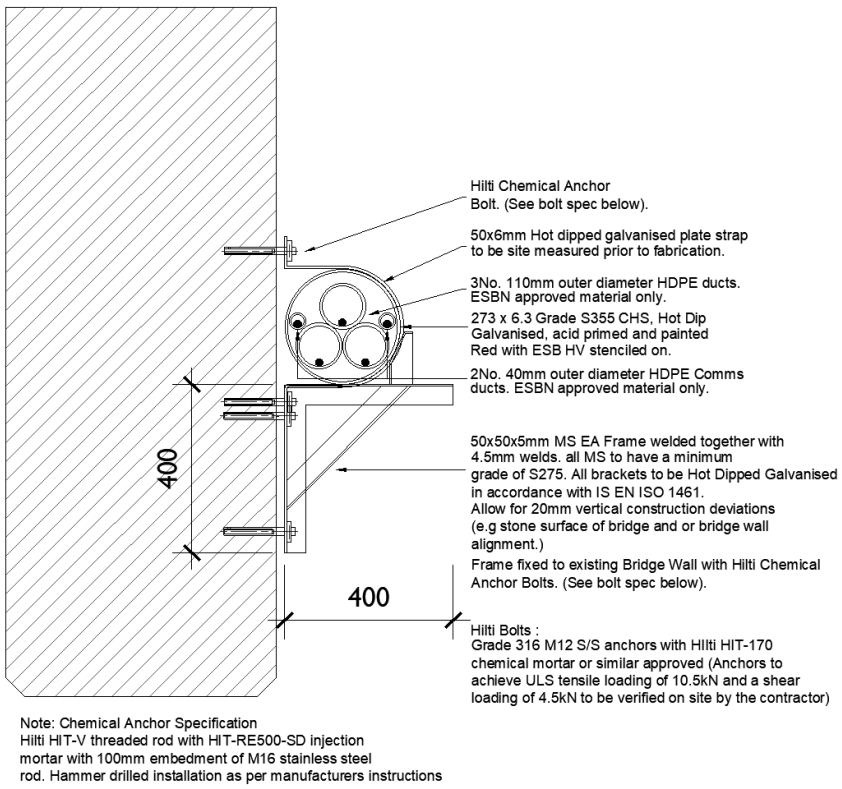


Figure 16 – Stainless steel parapet strapping detail extract

5.1.2 Installation of Prefabricated/ Preformed Structures

Construction of the new fixture will require transportation, handling and lifting of prefabricated elements. The use of prefabricated units facilitates the speed of construction and minimises the period of time required for works within a platform on the bridge structure.

The following gives an indication of the envisaged construction sequence:

1. Proposed open trenching with ducts to be pre-installed prior to works commencing on bridge exterior. Ducts to be exposed at the outer periphery of the walled parapets, dug in beneath to allow for coupling.
2. Hammer drill existing parapet exterior and fix Hot dipped "L" brackets at required intervals,
3. Fabricate metal clad stainless steel beam / girder (off site);
4. Metal clad stainless steel beam with ESB HV stenciled, to be laid across the aforementioned brackets once fixed. Galvanised straps will be used for reinforcement with anchored Hilti bolts;
5. Install ESBN ducting as required within metal clad beam and conjoin onto preinstalled ducting beneath bridge parapets;
6. Installation of anti-climb guard either side of bridge to restrict unauthorised access;
7. Maintain wall drainage and below ground waterproofing;
8. Permanent reinstatement of local road with surface dressing in accordance with local road engineer and County Council requirements;
9. Remove any debris (if required) and demobilise off site.

Equipment/ Crew:

- Underbridge Unit (on the Structure)
- Safety harnesses
- Abrasive wheel
- Rotary Hammer Drill
- Two-way intercom system
- Debris
- Platform operators
- General operatives

Materials:

- Hot dipped 50mm x 50mm x 5mm L Brackets;
- Metal clad stainless steel 273mm x 6.3 Grade pipework
- Hot dipped galvanised straps
- 110mm HDPE cable ducting;
- 40mm HDPE Comms ducting
- Hilti bolts
- 2 Nr. Anti-climb guard railings
- C2 Chamber

The proposed works will be carried out by employing accepted good work practices during construction, and environmental management measures. Please note that the following measures will be supplemented by further specific environmental protection measures that will be included in method statements prepared for specific tasks during the works and will form part of the detailed CEMP.

- Weather conditions will be considered when planning construction activities to minimise risk of run off from site into water networks,
- The contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, and the Contractor is required to prepare a contingency plan for before and after such events;
- The contractor will carry out visual examinations of local watercourses from the proposed works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted;
- Excavations will be temporarily reinstated for minimal periods to avoid acting as a conduit for surface water flows.
- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures.

5.2 Bridge 2 – Ducting in Trefoil within Bridge Deck [Chainage - 10,925m]

ITM Coordinates: 562355.614, 670800.826

Bridge 2 is located on the L-3022-8 at chainage 10,925m. The Bridge has sufficient room to install the cable to ESBN specifications. It is proposed that the UGC route will utilize the bridge deck to hold the ducts while remaining in trefoil formation. Ref drawing 05909-DR-112-P2.

Figure 17 - Bridge 2 within L-3022-8

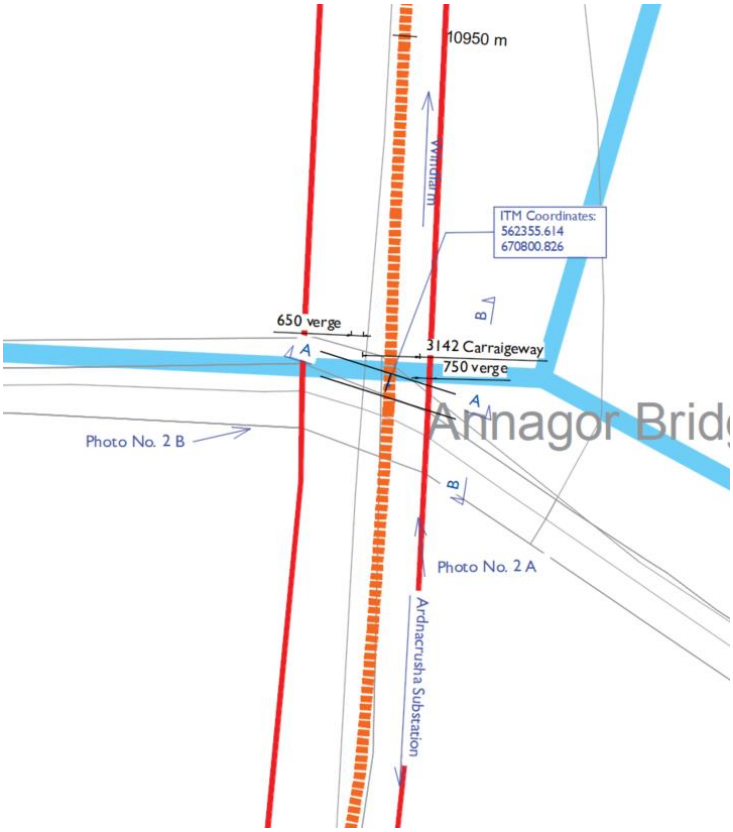


Figure 18 - Bridge No. 2 Site Layout Plan

5.3 Bridge 3 – Horizontal Directional Drilling [Chainage – 11,950m]

ITM Coordinates: 562390.14, 671848.21

Bridge 3 is located on the L-3022-8 at chainage 12,000m. The Bridge has insufficient room to install the cable to ESBN 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 05909-DR-113-P2.

Figure 19 - Bridge 3 within L-3022-8

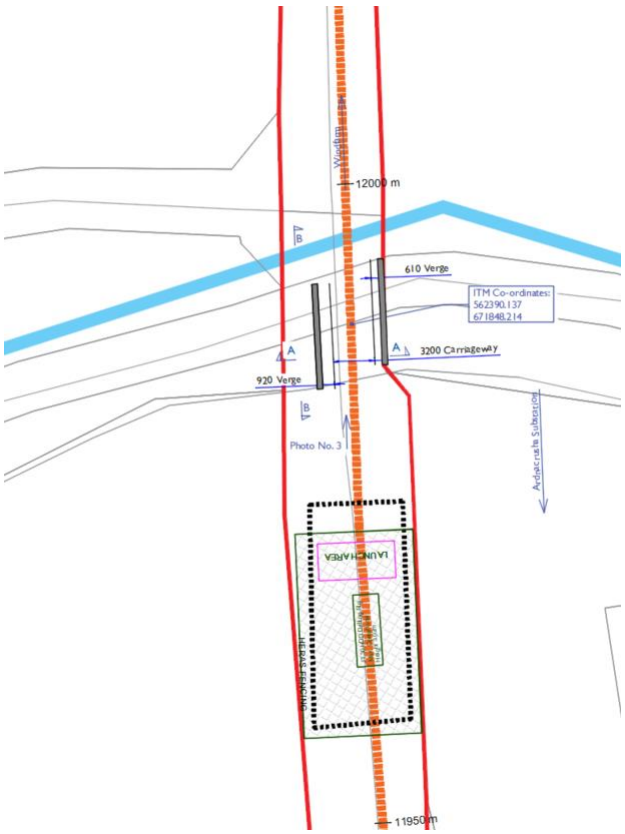


Figure 20 - Bridge No. 3 Site Layout Plan

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^2 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 ESBN and Clare 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.

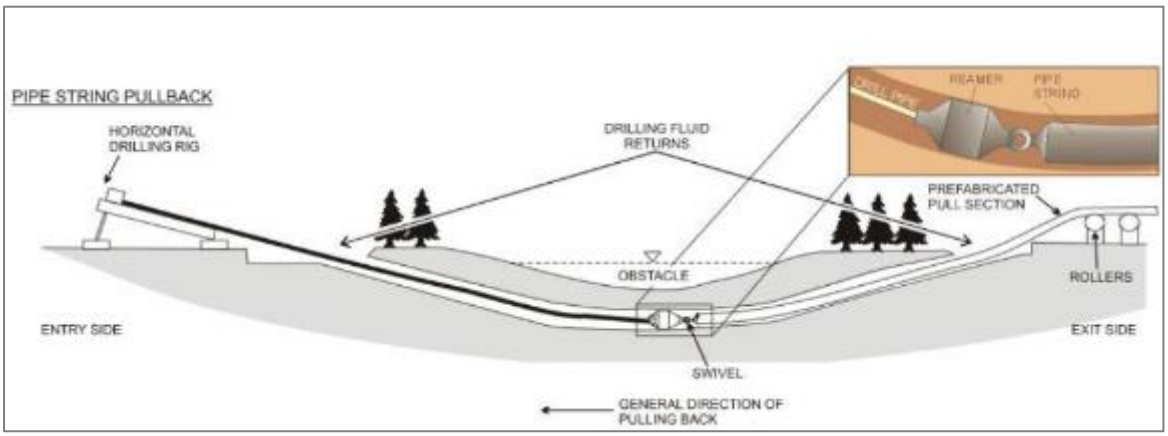


Figure 21 - Typical HDD Installation

7.0 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*.

8.0 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 Clare 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 Clare 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.

9.0 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 Clare 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 L3056, L3046 and L3022-8. 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 Clare County Council, prior to the commencement of development.

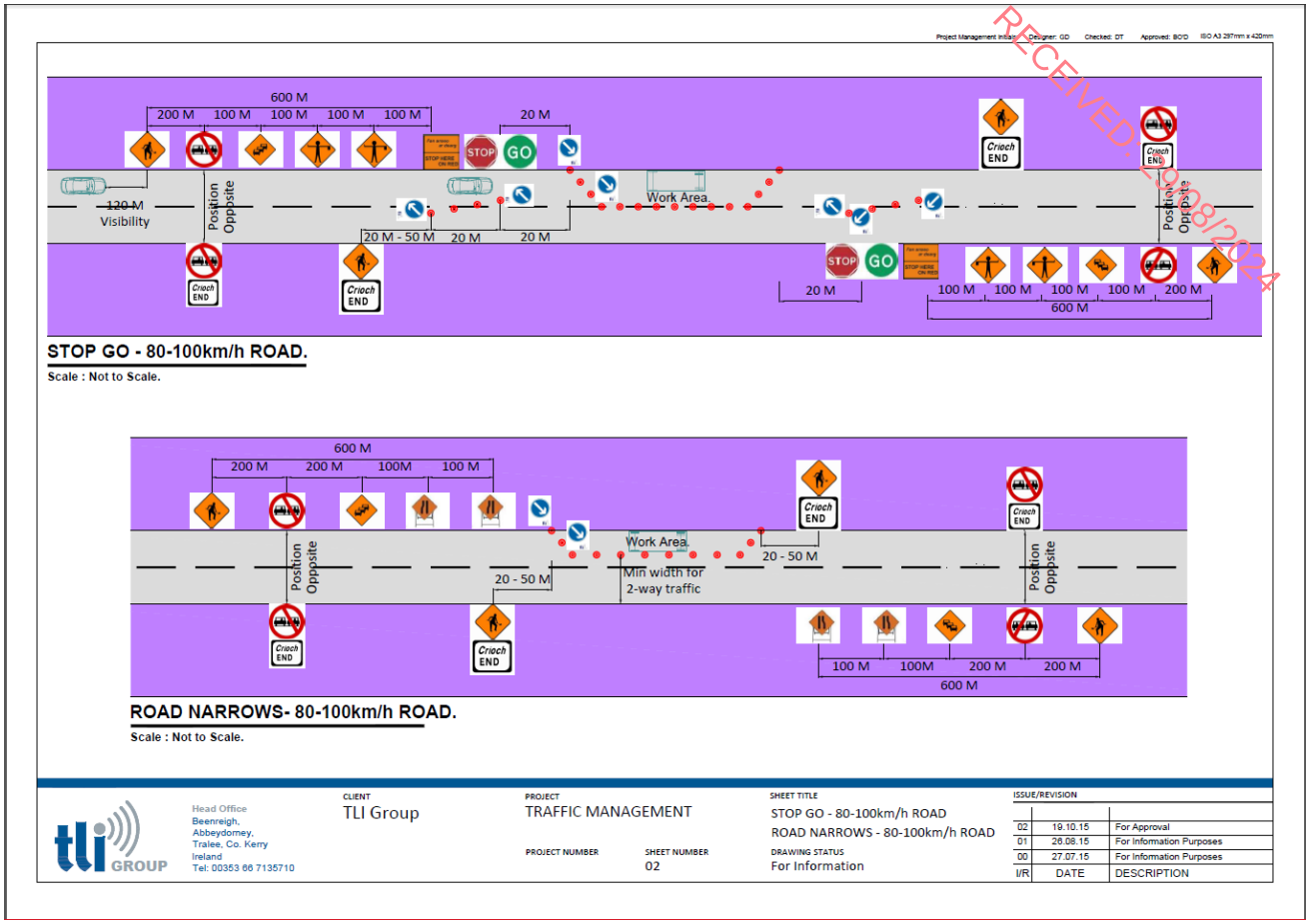


Figure 22 - Sample Traffic Management Layout

The proposed UGC works will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from Clare County Council. A Traffic Management Plan (TMP) will be agreed with Clare 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 Clare County Council in advance of the preparation of the TMP.

10.0 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.

10.1 Underground Cables

If existing underground cables are found 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.

10.2 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.

10.3 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.

11.0 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 Hogweed (*Heracleum mantegazzianum*), 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.

12.0 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.