

Aglish Solar Farm Electrical Infrastructure - Construction Methodology

AGLISH SOLAR FARM LIMITED

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Local Authority: Cork County Council

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Revision	Date	Author	Checked	Notes
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1 Introduction

1.1 Overview

The purpose of this document is to set out the construction techniques and methodologies which will be implemented during the construction of the electrical infrastructure proposed as part of the Aglish Solar Farm in County Cork.

A summary of the electrical infrastructure associated with the solar farm is provided below:

Substation and Grid Connection

The substation will be a 110kV AIS electricity substation with 33kV customer compound. The substation will consist of the EirGrid and Independent Power Producers (IPP) control room buildings, a transformer, security fencing, security lighting, drainage infrastructure, temporary construction compound and high voltage electrical equipment. The substation will include a 'loop-in / loop-out' underground 110kV cable grid connection which will connect into the existing Inniscarra-Macroom overhead transmission line via 2 no. new Interface Towers.

Underground Cable Electrical Interconnectors

There are 6 no. separate parcels of land within the proposed solar farm. Inverter/transformer stations located in each parcel will be connected to the proposed substation via 33kV underground AC electrical interconnections (hereafter referred to as 33kV UGC Interconnectors). These are to be placed on private lands and within the public road network, with 7 no. separate Interconnectors. The number of ducts and cables, and therefore the trench width, will vary depending on the section of the 33kV UGC Interconnector.

This document is intended as an aid to understand the construction methods and timelines of the project and should be read in conjunction with all other specialist reports pertaining to the project. This document will be updated prior to the commencement of any construction activities by the electrical infrastructure construction contractor. The final Construction Method Statement will be agreed with the Planning Authority in advance of commencement of construction.

1.2 Planning Context

Aglish Solar Farm will be subject to a planning application to Cork County Council. The proposed development will consist of ground mounted panels on frames, inverter/transformer stations and all ancillary development works. The solar farm planning application includes the 33kV UGC Interconnectors as described in this report.

The proposed substation, interface towers and grid connection will be subject to a Strategic Infrastructure Development (SID) application to An Bord Pleanála in accordance with section 182A of the Planning and Development Act 2000. For completeness purposes, this infrastructure is considered in this report as well as other technical reports informing the solar farm planning application to Cork County Council.

This report will be updated to reflect the final substation and grid connection details in support of its future SID application to An Bord Pleanála.

1.3 Structure of Report

The structure of the remainder of this report is as follows:

- Section 2: provides a description of the proposed electrical infrastructure works;
- Section 3: provides information on the preliminary site investigations to be undertaken;
- Section 4: provides details of the substation construction methodology;
- Section 5: provides details of the grid connection construction methodology;
- Section 6: provides details of the underground cable construction methodologies for 33kV Interconnectors;
- Section 7: provides details on the Emergency Response Plan;
- Section 8: provides information on relevant best practice design and construction mitigation; and
- Section 9: provides a summary of the report.

2 Description of Proposed Electrical Infrastructure

2.1 Substation

As described previously, the substation will be subject to a SID application to An Bord Pleanála. The substation will be based on EirGrid design specifications. The substation compound will consist of EirGrid and IPP Control Room buildings, High Voltage (HV) electrical equipment and associated infrastructure including palisade fences and concrete post and rail fences. The installation of HV electrical equipment will include a transformer with associated equipment along with:

- Cable Sealing End (CSE);
- Surge Arrestor (SA);
- Earth Disconnect (DA, DB, DL, DT);
- Current /Voltage Transformer (CT/VT);
- House Transformer (HoT);
- Circuit Breaker (CB);
- Lightning Masts (LM);
- Back-Up Diesel Generator;
- Harmonic filters if required by EirGrid;
- Capacitor Bank if required by EirGrid;
- Fire/Blast Wall;
- Telecoms Pole;
- 110kV underground cable which will connect into the existing Inniscarra Macroom overhead line via 2 no. new Interface Towers.

The substation compound has a total area of 11,996m². Earthworks will be undergone so the compound is level, with a finish compound level of 123.2m. Figure 1 shows the layout of the substation and all associated works.

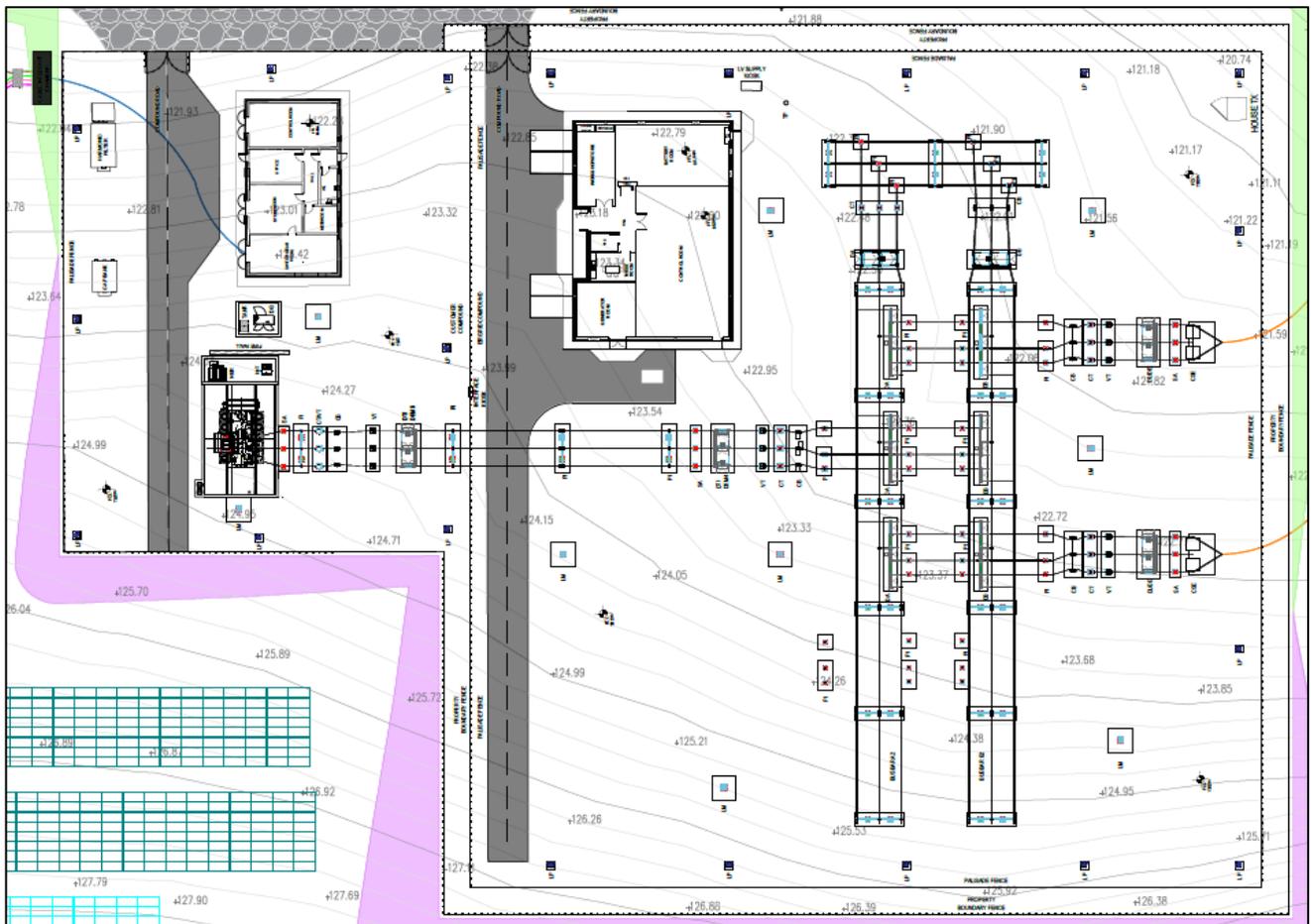


Figure 1: Proposed 110kV Loop-In Substation

2.2 Grid Connection

The substation will connect into the national grid via a ‘loop-in / loop-out’ underground 110kV cable grid connection which will connect into the existing Inniscarra Macroom overhead line. Two new interface towers are required to achieve this. The interface towers are approximately 75 metres apart, therefore the similar length of the existing 110kV Inniscarra Macroom overhead line will need to be decommissioned, along with an existing 110kV portal wood pole set. The proposed substation will connect into each interface tower via an underground 110kV cable. This cable is comprised of 3 no. power ducts, 2 no. telecom ducts and 1 no. earth continuity duct. The cables to each interface tower are 790 and 880 metres in length.

2.3 33kV UGC Interconnectors

The 33kV Interconnector cables are required to transport the electricity generated at each land parcel to the proposed substation. The Interconnectors link electricity from each of the inverter/transformer stations to the substation. The locations of the inverter/transformer stations are detailed on the

planning application site layout drawings. The inverter/transformer stations convert the direct current (DC) electricity which is generated by the solar panels to alternating current (AC) which is used in the electrical grid, and outputs at a voltage of 33kV which is appropriate for carrying the produced electricity across the site. The Interconnectors will also connect into Ring Main Units (RMU) which are located next to selected inverter/transformer stations. An RMU is a type of medium voltage (MV) switchgear which will allow for greater circuit control. The 33kV UGC Interconnectors will be located within the solar farm access tracks, within private land lands and within the public road network.

An image of the separate land parcels and the 33kV Interconnector route can be seen below.



Figure 2: Solar Farm Layout and Parcel Locations

Interconnector 1: Cable from Parcel 1 to Parcel 2

Interconnector 1 will transport the electricity generated from Parcel 1 to an inverter/transformer station in Parcel 2. Interconnector 1 is a proposed single circuit arrangement. The route begins in Parcel 1 where 560m of cabling is proposed within the solar farm access tracks. Following this the cable will leave Parcel 1, turning east and entering the public road L2031. The cable will follow the L2031 for 457m and then turn east onto the L6203. The cable will run along this road for 1.63km before turning

north-east into the access track of Parcel 2. The cable will run within the access tracks of Parcel 2 before for 1.05km before entering the nearest inverter/transformer station.

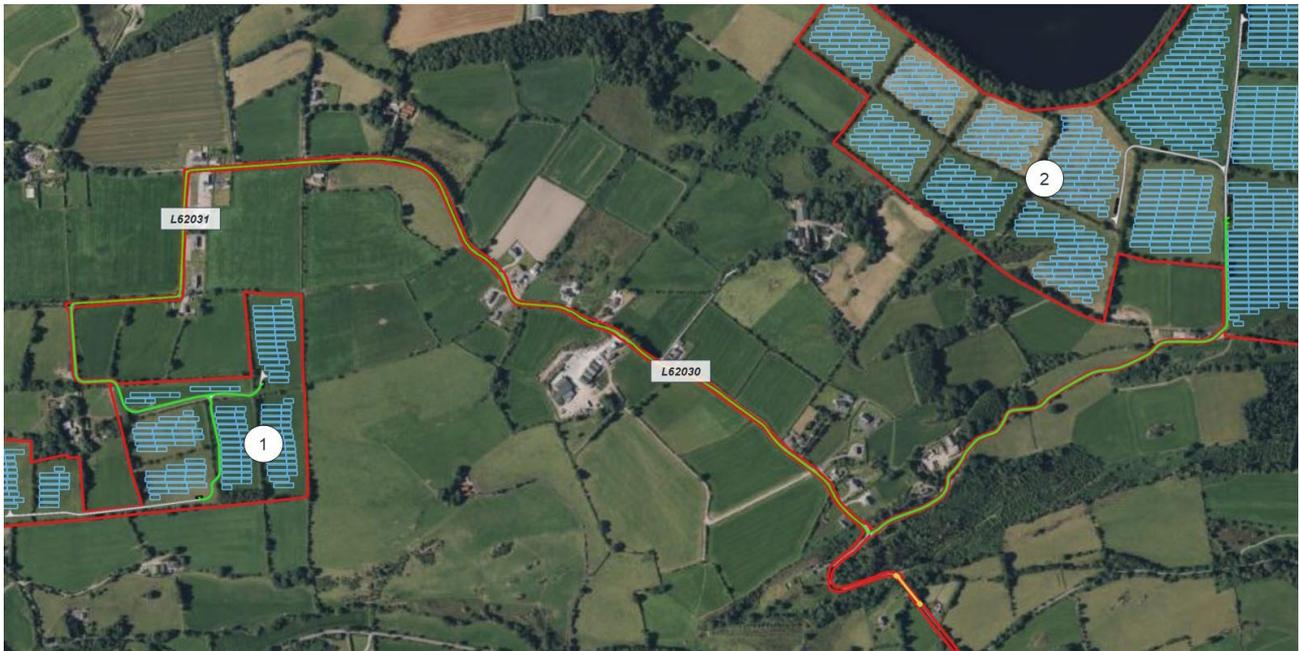


Figure 3: Interconnector 1 Route

A summary of the route for Interconnector 1 is detailed in the following table;

Location of Interconnector	Interconnector Length (m)
Public Roads	2090
Privately Owned Solar Farm Lands	1609

Interconnector 2: Cable from Parcel 2 to Cable Interface Chamber in Parcel 6

The electricity generated from Parcel 1 and Parcel 2 will be transported to the cable interface chamber adjacent to the proposed 110kV substation, located on Parcel 6 via Interconnector 2. The cable interface chamber which is an underground chamber installed outside the IPP compound entrance of the substation to act as the common interface point for the 33kV interconnector cables coming from the solar farm inverter/transformer stations going into the substation. The solar farm contractor will be typically responsible for routing all the interconnector cables into this chamber and then the separate substation contractor will manage the short connection of the 33kV cables from this chamber into the switchgear housed in the IPP control building.

Interconnector 2 is a proposed double circuit arrangement. The route begins at an inverter/transformer station within the solar farm boundary in Parcel 2 where the Interconnector will travel for 1.76km within the access tracks of Parcel 2. 1.05km of this will be adjacent to the single circuit Interconnector 1, as such this trench section will accommodate three circuits. The Interconnector will then enter the public road L62030 and travel for 265m. A Horizontal Direction Drill (HDD) will then be used to cross a bridge and watercourse on the L6230. The HDD is approximately 65m in length. Following this, the Interconnector will continue on the L62030 for 148m before entering the R619. The Interconnector will continue on the R619 for 1.79km before entering the L2204 at Leary's Crossroads. The cables will travel along the L2204 for 513m before crossing a watercourse via HDD. The HDD is approximately 85m long. Another HDD watercourse crossing is needed after a further 1.12km on the L2204. This HDD is approximately 57m in length. Interconnector 2 will travel for a further 1.01km on the L2204 before a final HDD is used to cross into Parcel 6. The cables will then travel for 75m before entering the cable interface chamber, located next to the proposed 110kV substation.



Figure 4: Interconnector 2 Route

A summary of the route for Interconnector 2 is detailed in the following table;

Location of Interconnector	Interconnector Length (m)
Public Roads	5053
Privately Owned Solar Farm Lands	1835

Interconnector 3: Cable from Parcel 3 to Parcel 4

Interconnector 3 will transport the electricity generated from Parcel 3 to an inverter/transformer station in Parcel 4. Interconnector 3 is a proposed single circuit arrangement. The route begins at an inverter/transformer station in Parcel 3. The Interconnector will be located within the proposed access tracks of Parcel 3 for 173m before entering the public road L22012. The cable will follow this road for 976m before turning east onto the L6207. The cable will then run within this road for 420m, then turning east onto the L6398. The Interconnector will travel within the L6398 road for 275m before entering the solar farm lands at Parcel 4. Here, the cable will run within the access tracks for 503m before connecting into the nearest inverter/transformer station.

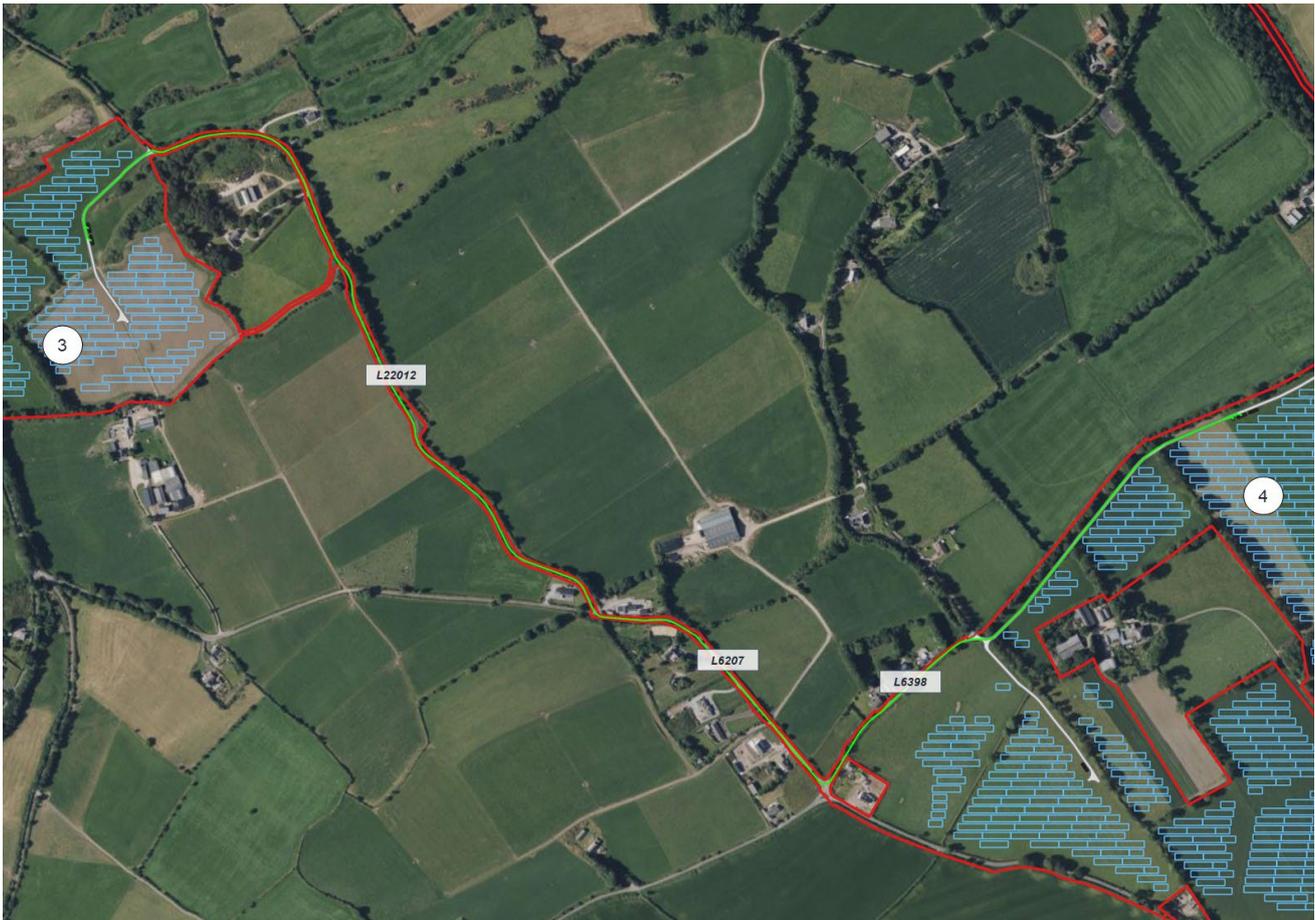


Figure 5: Interconnector 3 Route

A summary of the route for the Interconnector 3 is detailed in the following table;

Location of Interconnector	Interconnector Length (m)
Public Roads	1671
Privately Owned Solar Farm Lands	676

Interconnector 4: Cable from Parcel 4 to Cable Interface Chamber in Parcel 6

The electricity generated from Parcel 3 and Parcel 4 will be transported to the cable interface chamber adjacent to the proposed 110kV substation, located on Parcel 6 via Interconnector 4.

Interconnector 4 is a proposed double arrangement. The route begins at an inverter/transformer station within the solar farm boundary in Parcel 2 where the Interconnector will travel for 1.03km within the access tracks of Parcel 2. 503m of this will be adjacent to the single circuit Interconnector 3, as such this trench section will accommodate three circuits. The Interconnector will then enter the public road L6398 and travel adjacent to Interconnector 3 for 420m. The Interconnector will then turn east onto the L6207 and travel for 78m. A Horizontal Direction Drill (HDD) will then be used to cross a

watercourse on the L6207. The HDD is approximately 55m in length. Following this, the Interconnector will continue on the L6207 for 300m before turning north onto the R619. The Interconnector will continue on the R619 for 666m before entering the L2204 at Leary’s Crossroads. From here, Interconnector 4 will follow the same route as Interconnector 2 into the cable interface chamber in Parcel 6 and as such the trench section will accommodate four circuits.



Figure 6: Interconnector 4 Route

A summary of the route for the Interconnector 4 is detailed in the following table;

Location of Interconnector	Interconnector Length (m)
Public Roads	4304
Privately Owned Solar Farm Lands	1105

Interconnector 5: Cable from Parcel 5 to Cable Interface Chamber in Parcel 6

Interconnector 5 will transport the electricity generated from Parcel 5 to the cable interface chamber adjacent to the proposed 110kV substation, located on Parcel 6 via Interconnector 5. Interconnector 5 is a proposed single circuit arrangement. The route begins at an inverter/transformer station in Parcel 5. The Interconnector then travel within grasslands of Parcel 5 for start located within grasslands of Parcel 5 for 301m. A HDD will then be used to cross a watercourse and the L2204 into Parcel 6. The HDD is approximately 42m in length. The cable will then travel within grassland of Parcel 6 for 330m before entering the cable interface chamber.



Figure 7: Interconnector 5 Route

A summary of the route for the Interconnector 5 is detailed in the following table;

Location of Interconnector	Interconnector Length (m)
Public Roads (HDD)	7
Privately Owned Solar Farm Lands	666

Interconnector 6: Cable from Parcel 6 to Cable Interface Chamber in Parcel 6

Interconnector 6 will transport the electricity generated from Parcel 6 to the cable interface chamber adjacent to the proposed 110kV substation, located on Parcel 6 via Interconnector 6. Interconnector 6 is a proposed single circuit arrangement. The route begins is entirely within the privately owned solar farm lands in Parcel 6. The route begins at an inverter/transformer station where the cable will then travel for 653m before entering the cable interface chamber.

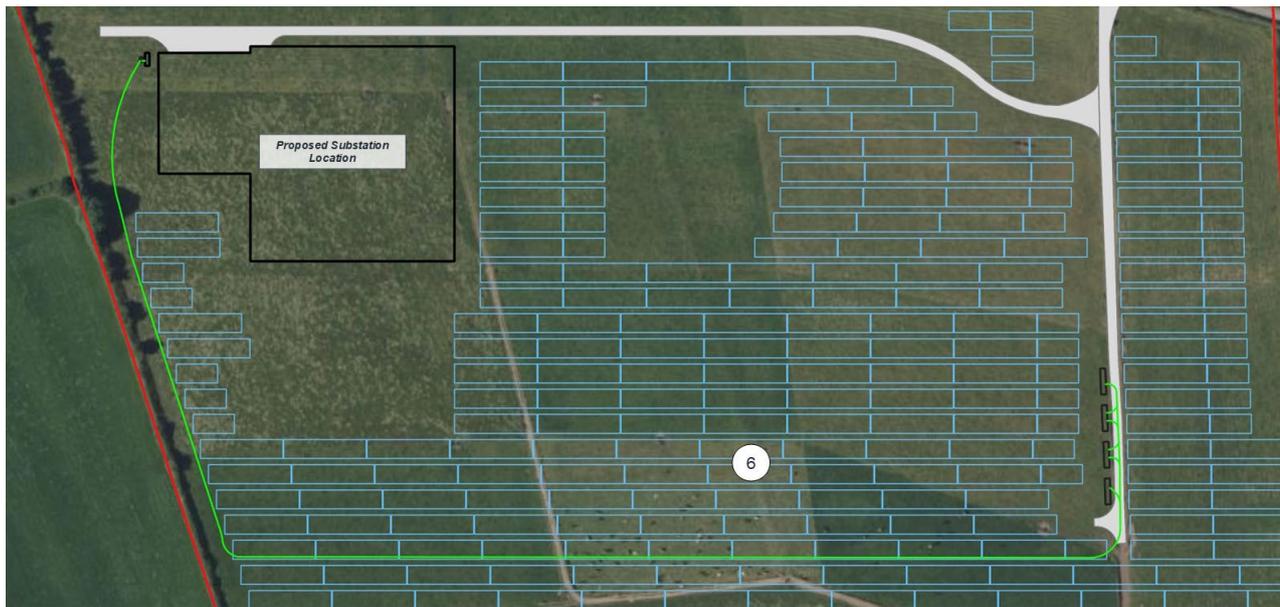


Figure 8: Interconnector 6 Route

A summary of the route for the Interconnector 6 is detailed in the following table;

Location of Interconnector	Interconnector Length (m)
Privately Owned Solar Farm Lands	653

Interconnector 7: Cable Interface Chamber to IPP Building

Interconnector 7 will transport all the electricity generated within the solar farm into the IPP building within the proposed 110kV substation. The route is entirely within privately owned solar farm lands. Interconnector 7 is a proposed 6 circuit arrangement. The route is 31m in length.



Figure 9: Interconnector 7 Route

A summary of the route for the Interconnector 7 is detailed in the following table;

Location of Interconnector	Interconnector Length (m)
Privately Owned Solar Farm Lands	31

3 Site Investigations

3.1 Substation & Grid Connection

Site Investigations will be required for the detailed design of foundations and compound build-ups prior to construction and to inform project costs prior to detailed design.

The site investigation works will be scoped and specified by a geotechnical engineer during detailed design but will generally include the following:

- Boreholes: will be carried out at the location of EirGrid and IPP Buildings to determine the depth of bedrock.
- Trial holes: will be carried out in order to obtain information on the ground conditions and measure the thermal resistivity of the soil.
- Dynamic probes: will be carried out to determine soil strength/density characteristics.
- Dynamic Cone Penetrometers and Pavement Cores: will be carried out for pavement design.

It is anticipated that these site investigation works will take approximately 2-3 weeks to complete.

3.2 33kV UGC Interconnectors

Site Investigations will be required to confirm cable design assumptions made on the 33kV UGC Interconnectors prior to construction. The exact location of services will also be determined at this stage.

The following works generally comprise preliminary site investigations:

- Slit trenches: will be carried out at the location of service crossing based on the desktop utility search. The slit trench will cover the full road width; and
- Trial holes: will be carried out at the Joint Bay locations once they are determined the electrical contractor, in order to obtain information on the ground conditions and measure the thermal resistivity of the soil.

These preliminary site investigations will take place in advance of construction.

Traffic Management will be required on the public road to undertake these site investigation works.

The following temporary measures are proposed:

- L62031 - Single lane closure with a Stop/Go System in place;
- L62030 - Single lane closure with a Stop/Go System in place
- R619– Single lane closure with a Stop/Go System in place.
- L2204 - Single lane closure with a Stop/Go System in place;
- L22012 - Single lane closure with a Stop/Go System in place

- L6207– Single lane closure with a Stop/Go System in place.
- L6398 - Single lane closure with a Stop/Go System in place;

Where temporary road closures are necessary, a suitable diversion will be implemented using appropriate signage, following consultation and agreement with Cork County Council.

All excavations in the road will be carried out in a manner that avoids undue damage or would inhibit the laying of other known or earmarked future services and will be undertaken and supervised by properly qualified personnel meeting the training and competency requirements contained within the DTTAS Purple Book.

All works will be subject to a road opening licence from Cork County Council. Where diversions are required, these will be agreed with Cork County Council in advance of the preparation of the Traffic Management Plan.

It is anticipated that these preliminary site works associated with 33kV the UGC Interconnectors will take approximately 3-5 weeks to complete.

4 Substation Construction Methodology

4.1 Substation Compound

The proposed substation compound area is approximately 11,996m² including the surrounding fence. The substation area will be secured by a 2.6m high palisade fence. An indicative layout of the substation compound can be found in Appendix A. The construction sequence will be as follows;

- Any mitigation measures or conditions of the planning permission will be implemented.
- An Assigned Certifier will be appointed in accordance with Building Control Regulations.
- The AF2 Commencement Notice will be submitted upon completion of a comprehensive Preliminary Safety and Health Plan (PSHP) by the PSDP. This Health and Safety Plan will be built up from the Preliminary Plan;
- A temporary construction compound with appropriate mobile sanitary facilities will be set up to facilitate the construction process. The location of this temporary construction compound is shown in on the site location drawings, with further details shown in drawing AGLSH-SD-DR-07 submitted with this planning application. Sanitary facilities will be pumped to a holding tank which will be monitored and disposed off-site by a suitably licensed waste contractor;
- The extents of substation compound and drainage will be marked out by a qualified engineer.
- Earthworks will be undertaken in order to create a level compound level across the entire substation footprint. The cut material is unlikely to be suitable for reuse as fill under EirGrid standards and therefore it will be transported off site to a suitably licensed facility. The amount of cut to be transported off site is expected to be ca. 11,733m³. Similarly, the necessary amounts of fill material will be transported onto site. This is expected to be ca. 11,110m³.
- A drainage system will be excavated and installed around the compound area.
- Topsoil and subsoil will be removed from the footprint of the compound using an excavator.
- A layer of geotextile material will be laid over the footprint of the compound.
- Using an excavator, a base layer of Clause 804 material will be laid followed by a 6F2 capping layer which will provide the finished surface.
- Each layer will be compacted using a vibrating roller.
- Earthing cable will be laid underground around the substation for connection to the various electrical components during the electrical fit out phase.
- The construction of the substation compound comprising of EirGrid substation control building, IPP Control building and all associated outdoor electrical equipment, including 1 no. transformer, associated internal access track, 2.6m high station perimeter fencing and concrete post and rail property boundary fence will be built.

- The construction of the substation control building will begin by setting out the foundations. The building foundations will consist of reinforced concrete rafts or footings. Pre-formed works will be constructed to the specifications of the detailed design. The concrete will be mixed off site and transported in on cement trucks where the foundations will be poured in-situ in the preformed works.
- Adequate lighting will be installed around the compound on the lighting columns.
- Lightning protection masts will be installed to protect the station from direct lightning strike.
- A 110kV cable sealing end and associated cable equipment will be required to connect the 110kV incoming underground cables into the existing 110kV Inniscarra Macrooom overhead line.
- An underground cable chamber will be installed outside the IPP compound entrance to act as the common interface point for the 33kV interconnector cables coming from the solar farm inverter/transformer stations going into the substation. The solar farm contractor will be typically responsible for routing all the interconnector cables into this chamber and then the separate substation contractor will manage the short connection of the 33kV cables from this chamber into the switchgear housed in the IPP control building.

Following the completion of construction works, the electrical infrastructure can be installed. The following electrical installation works will take place.

- Delivery and installation of transformer. The delivery of the transformer will be managed in accordance with regulations governing the movement of abnormal loads. In advance of undertaking abnormal load deliveries necessary permitting, approvals and infrastructure accommodation works will be agreed with An Garda Síochána and implemented accordingly. Delivery vehicles will only follow agreed routes and where possible will be delivered overnight to minimise potential for delay and obstruction to general traffic.
- Delivery and installation of all other HV equipment.
- Wiring and cabling of HV/LV equipment, protection and control cabinets.
- Commissioning of all newly installed equipment.

The following equipment is required for the construction of the substation compound:

- Tracked Excavators;
- 360° tracked excavators (13 ton normally, 22 ton for rock breaker);
- Tracked dumpers / tractors and trailers;
- Vibrating rollers;
- Power Tools;

- Scaffolding;
- Crane;
- Hoist; and
- Generator.

4.2 Access Track

Construction access to the substation will be provided by private lands, with an entrance from the public road L2204. A traffic management plan will be implemented for the delivery of the transformer. This access track will be permanent and will also be used for operational access.

4.3 Drainage

4.3.1 Surface Water

Surface water drainage proposals for the proposed substation compound have been designed to mimic the natural drainage patterns of the site and thereby be in accordance with the Best Management Practices (BMPs) of Sustainable Drainage Systems (SuDS).

This is achieved when the following parameters are considered:

- The compound construction is formed with permeable stone thus mimicking a soakaway scenario. ESB compound stone is single sized for the first 150mm for safety purposes. It then changes to a graded 6F2 material. The area of this permeable surface is circa 11,996m².
- The main areas to be drained includes the roofs and the compound road. These equate to approximately 663m². These areas are modest in themselves and in comparison to the overall compound area. The compound road will be drained via series of road gullies.
- Assuming even the most basic of infiltration rates down through the permeable compound stone, the existing greenfield situation is easily maintained.

The surface water generated in the hardstanding areas and in the bunded areas within the substation compound will discharge to soakaway via Class 1 Full Retention Oil Separators. The electrical transformer in the substation is oil filled equipment and, as such, is protected with impermeable bunds. Surface water generated in this bund will be pumped out by an oil sensitive pump ensuring that only non-contaminated water enters the site drainage network.

4.3.2 Foul Water

There are no existing foul sewer water drains on or near the proposed substation site.

The foul drainage proposal must cater for the wastewater generated in the welfare facilities of the proposed substation. These welfare facilities include a toilet and wash hand basin both the EirGrid

and IPP control buildings. The station will be unmanned in normal operation so demand for facilities which generate foul flows will be low.

Onsite treatment and disposal of foul waste was considered by using a suitable septic tank and intermittent filter system and polishing unit or packaged wastewater treatment system and polishing unit. This option would be subject to the results of the site characteristic testing as part of detailed pre-construction site investigations. However, the low volumes of foul waste that will be generated and consequently the low biological loading may impact on the successful continual operation of a treatment system reliant on bacterial action. For this reason, the alternative of a foul holding tank to be emptied periodically is proposed. Foul holding tanks are normally used in EirGrid and ESB substations.

The foul holding tanks will have a capacity of 5m³ which is a multiple of the foul water generated over three months of normal operation of the station. The foul holding tank will also be inspected by a suitably qualified and indemnified person at these intervals and records of inspections will be held on site for inspection by the local authority. A freeboard of 300mm will be provided for and the foul holding tank will be fitted with a high-level alarm. This alarm will be connected to a manned control station via the substation's Supervisory Control and Data Acquisition (SCADA) telecom relay system. This will allow for non-scheduled maintenance and emptying of the tank between the regular three monthly intervals in the unlikely event that this is required. The foul holding tank will also be vented to the atmosphere to avoid the buildup of noxious and dangerous gases.

The proposed station will be unmanned and as such will generate small quantities of foul waste. There will be visits to the station for scheduled and unscheduled inspections, maintenance and repairs as necessary. It is anticipated that this will result in a contribution of 60 litres of foul waste per week. In the unlikely event that such a high visitation rate would be extrapolated throughout the year, this would result in 6,323 litres per annum. While such a consistently high visitation is improbable, there is the possibility of increased numbers of staff being present on site for short durations during the commissioning of electrical elements of the station from time to time. It is envisaged that these extraordinary occurrences would balance out with the ordinary operation of the unmanned station to produce foul flows no greater than the 6,323 litres per annum as a "worst-case" scenario.

It is common for much lower usage of the facilities on unmanned stations and therefore a much lower foul loading. A common problem on such unmanned stations is odours in the toilet areas due to the drying out of the water trap in the WC through evaporation resulting from the lack of use. For this reason, it is proposed to use self-flushing toilets in the station, which would flush automatically twice a week. The station will include two 6 litre flush WCs so a minimum weekly foul flow of 24 litres can be expected. The self-flushing WCs will therefore contribute 1,248 litres per annum.

Combining the automatic flush and maximum user demand figures would result in a maximum annual generation of 7,571 litres (7.5m³) of foul sewer water waste. The 5m³ tank proposed will be emptied approximately every three months. As outlined, the capacity provided is well in excess of what is required.

4.4 Water Supply

It is proposed to provide the required potable water demand of the station with a bored well on site. The potable water demand within the site will be low as the proposed station is to be unmanned. To avoid issues like stagnation in the water supply line and problems resulting from this, there will be a continual water demand of 24 litres per week from automatically flushing WCs within the station.

The water demand within the proposed development will be low and will be similar to the figures for foul sewer water generation as set out above in this report.

4.5 Earthworks

Topographical data for the location the proposed substation shows moderate slopes.

Analysis of available topographic data suggest that cutting and filling of the existing terrain will be required to establish a level platform for the substation compound. Cutting into the existing terrain and the requirement to relocate soil has been minimised by establishing the compound level to 123.2 m.

It is estimated that approximately 11,733 m³ of soil will need to be removed to form a level substation compound. Similarly, the necessary amounts of fill material which must be to ESB Networks specification. will be transported onto site. This is expected to be 11,110m³.

5 Grid Connection Construction Methodology

5.1 110kV Underground Grid Connection Cables

A 'loop-in / loop-out' underground 110kV cable grid connection will be constructed which will connect the substation into the existing 110kV Inniscarra Macrooom overhead line via 2 no. new Interface Towers.

The 110kV cable grid connection will consist of two underground cables which will run from each of the Interface Towers into the EirGrid Compound of the substation. The cables will be approximately 809m and 899m in length and will be mainly situated in private lands within the confines of the solar farm. The cable will cross underneath the L2204 public road via horizontal direction drill. A typical trench for a 110kV cable is 825mm wide and 1315mm, consisting of 3 no. 160mm HDPE ducts in trefoil formation. The construction of the underground grid connection will use the same approach as for the 33kV interconnector cables which is set out in Section 6.2. See Figure 10 below for details of the single circuit 110kV underground cable trench.

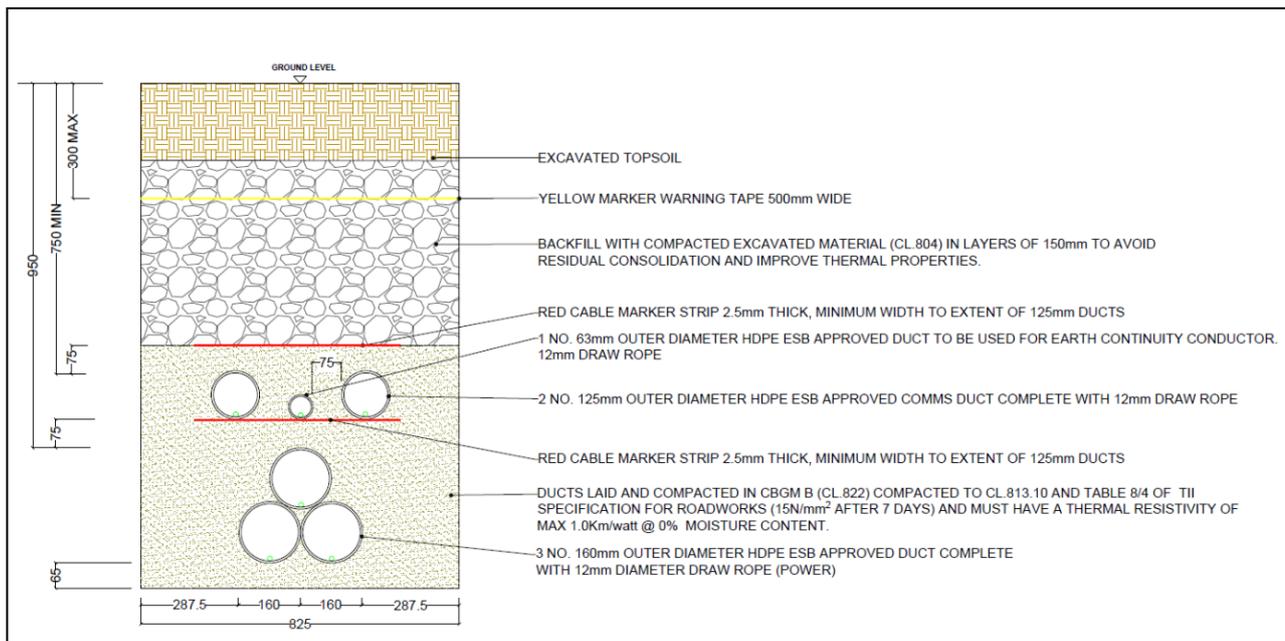


Figure 10: Typical 110kV Underground Cable

5.2 Interface Towers Construction Methodology

The Interface towers will be 16 meters in height and approximately 5.75 metres in width. The construction of the Interface Towers will be as follows;

- Site levelling and clearance works;
- The foundation of the interface tower will be set out;
- The ground will be excavated to the foundation footprint;
- If required, any water will be drained from the excavated area;
- Concrete will be poured in the excavated area to create the foundation for the interface tower. If concrete cannot be poured directly into the excavation, the concrete will either be pumped or transported via dumpers;
- The foundations will be backfilled with the excavated material and compacted;
- The existing OHL will be de-energised by Systems Operator so the body of the towers can be constructed;
- The conductor will be moved off centre using stay wire that is anchored to the ground;
- The body of the tower will be erected via crane using guide ropes;
- The sections of the tower body will be bolted and fixed into position;
- The conductor will be centred over the newly built towers and attached onto each tower. The section of conductor in between the two towers will be removed along with the existing 110kV portal wood pole set which is located between the two proposed interface towers
- Down dropper conductors (For Electrical Connections, Insulators, Surge arrestors) and shackles will be installed;
- All associated accessories required for transition from line to cable will be installed on the interface towers;
- The circuit will be tested and the line will be re-energised.

A typical design for the proposed interface tower is shown in Figure 11.

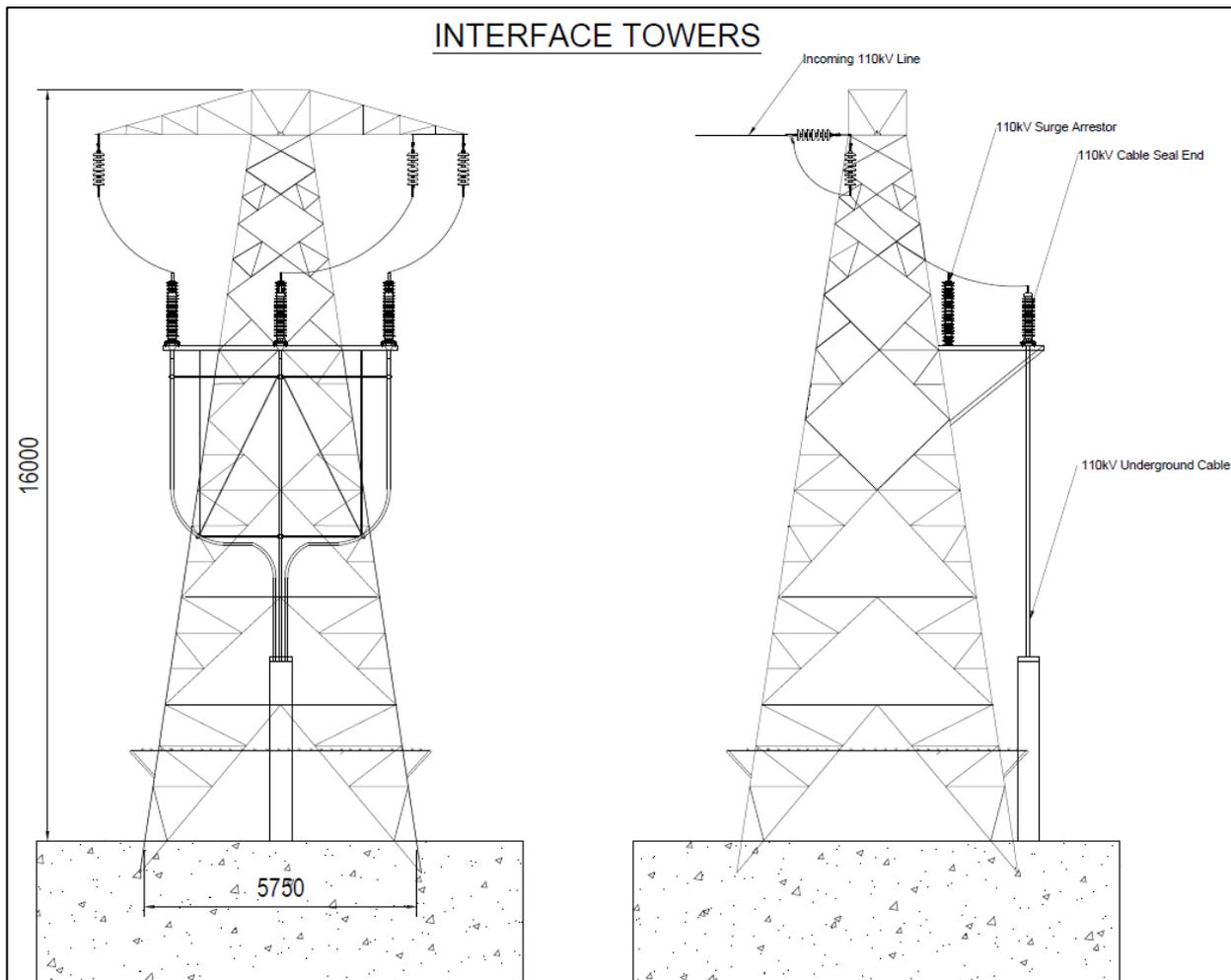


Figure 11: Typical Interface Tower

The expected duration of the above works is approximately 4 weeks. The erection of the Interface Towers is expected to take 5 days per tower. De-energisation of the existing OHL will be coordinated with the System Operator pending detailed design.

6 33kV UGC Interconnectors

6.1 33kV UGC Interconnectors Design Characteristics

6.1.1 Public Road

The proposed single circuit trench within the public road is planned to consist of 3 no. 110mm diameter HDPE power cable ducts in trefoil formation and is associated with Interconnector 1 and Interconnector 3. Ducts are also included in the trench to contain earthing and communications cabling.

The cable trench is typically 450mm wide by 1220mm deep, with variations on this design to adapt to service crossings and watercourse crossings. The power cable ducts will accommodate 3 no. power cables each. See Figure 12 below for details of the single circuit trench in the public road. This trench will be present in the L62031, L62030, L22012 and L6207. Full details of the single circuit trench section in the public road can be found on drawing AGLSH-ED-DR-01 submitted with this planning application.

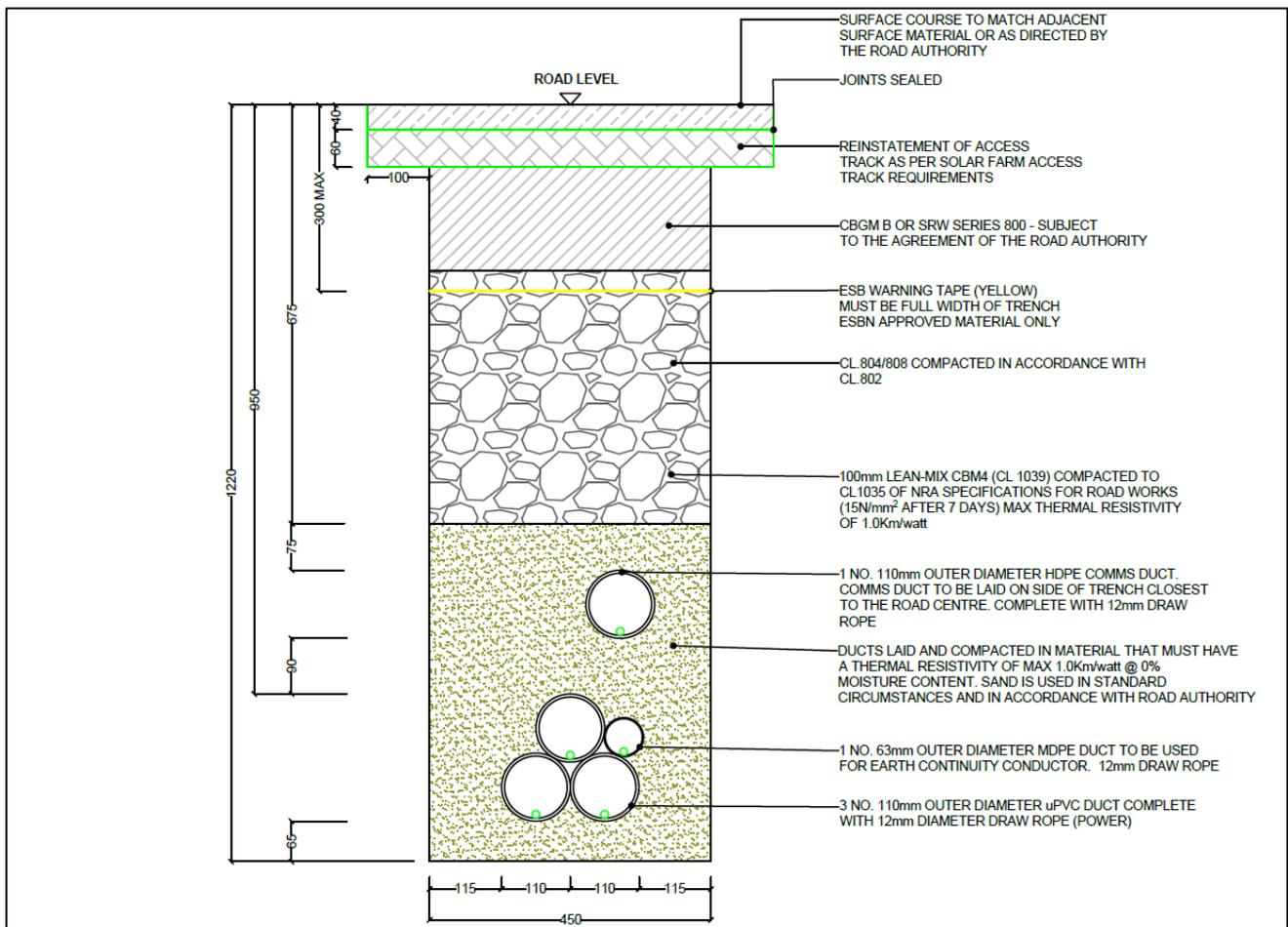


Figure 12: Single Circuit Trench Detail in Public Road

The proposed double circuit trench within the public road is planned to consist of 6 no. 110mm diameter HDPE power cable ducts in trefoil formation and is associated with Interconnector 2 and 4. The cables will be laid in a stacked formation.

The cable trench is typically 450mm wide by 1575mm deep, with variations on this design to adapt to service crossings and watercourse crossings. The installation of the electrical cabling will require cables to be pulled in approximately 600 - 700m sections. See Figure 13 below for details of the double circuit trench in the public road. This trench will be present in the L62030, L6207 and R619. Full details of the double circuit trench section in the public road can be found on drawing AGLSH-ED-DR-04 submitted with this planning application.

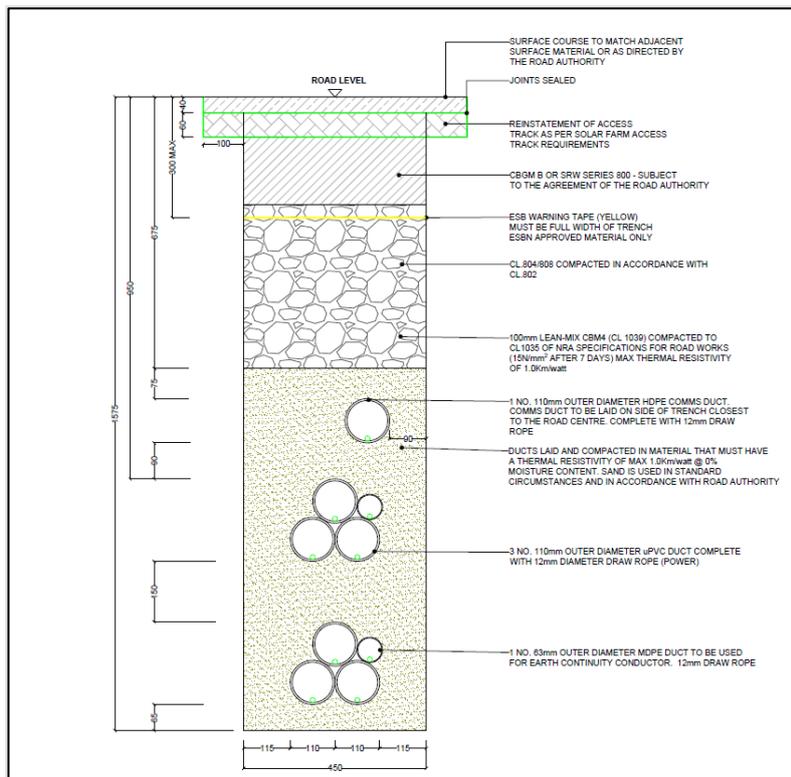


Figure 13: Stacked Double Circuit Trench Detail in Public Road

The proposed three circuit trench within the public road is planned to consist of 9 no. 110mm diameter HDPE power cable ducts in trefoil formation and is present when Interconnector 3 runs alongside Interconnector 4. Ducts are also included in the trench to contain earthing and communications cabling.

The cable trench is typically 1060mm wide by 1220mm deep, with variations on this design to adapt to service crossings and watercourse crossings. The power cable ducts will accommodate 1 no. power cables each. See Figure 14 below for details of the three-circuit trench in the public road. This trench will be present in the L6398 public road. Full details of the three-circuit trench section in the public road can be found on drawing AGLSH-ED-DR-06 submitted with this planning application.

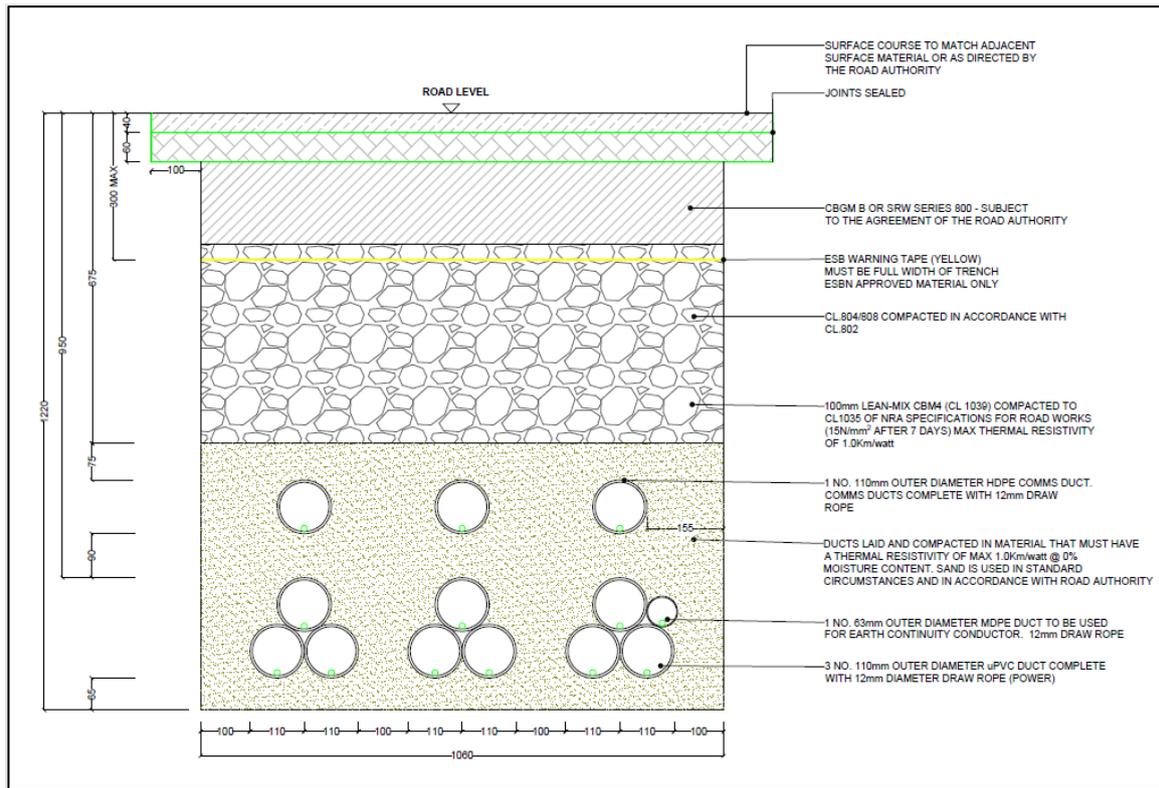


Figure 14: Three-Circuit Trench Detail in Public Road

The proposed four circuit trench within the public road is planned to consist of 12 no. 110mm diameter HDPE power cable ducts in trefoil formation and is present when Interconnector 2 runs alongside Interconnector 4. The cables will be laid in a stacked formation.

The cable trench is typically 740mm wide by 1575mm deep, with variations on this design to adapt to service crossings and watercourse crossings. The installation of the electrical cabling will require cables to be pulled in approximately 600 - 700m sections. See Figure 15 below for details of the four circuit trench in the public road. This trench will be present in the L2204. Full details of the four circuit trench section in the public road can be found on drawing AGLSH-ED-DR-08 submitted with this planning application.

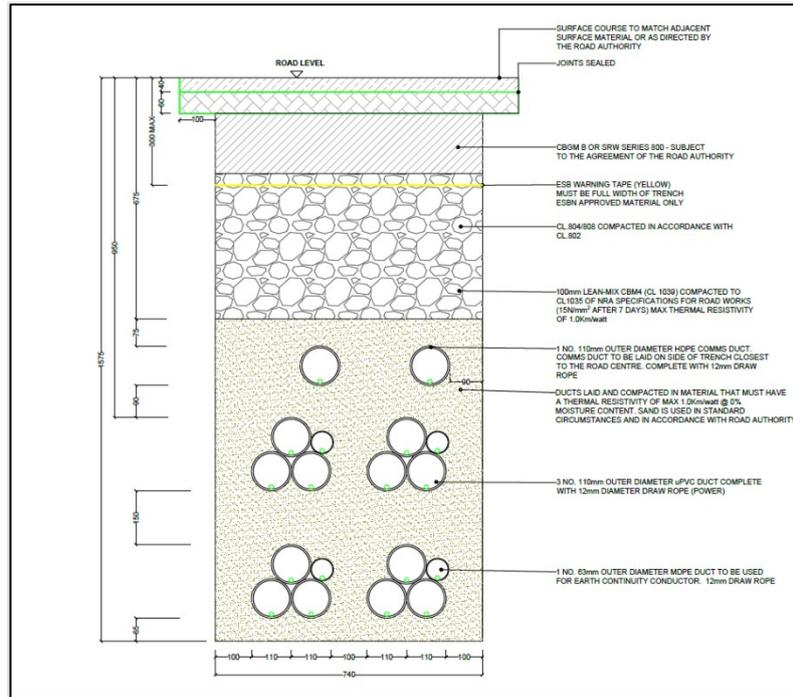


Figure 15: Stacked Four-Circuit Trench Detail in Public Road

6.1.2 Private Lands

The single circuit cable will also be located within the access tracks of Parcel 1, 3 and 6 for Interconnector 1, Interconnector 3 and Interconnector 6.

The single circuit within the access track will consist of a cable trench 420mm wide and 1220mm deep. See Figure 16 below for details of the single circuit trench within the access tracks. Full details of the single circuit trench section within the access tracks can be found on drawing AGLSH-ED-DR-02 submitted with this planning application.

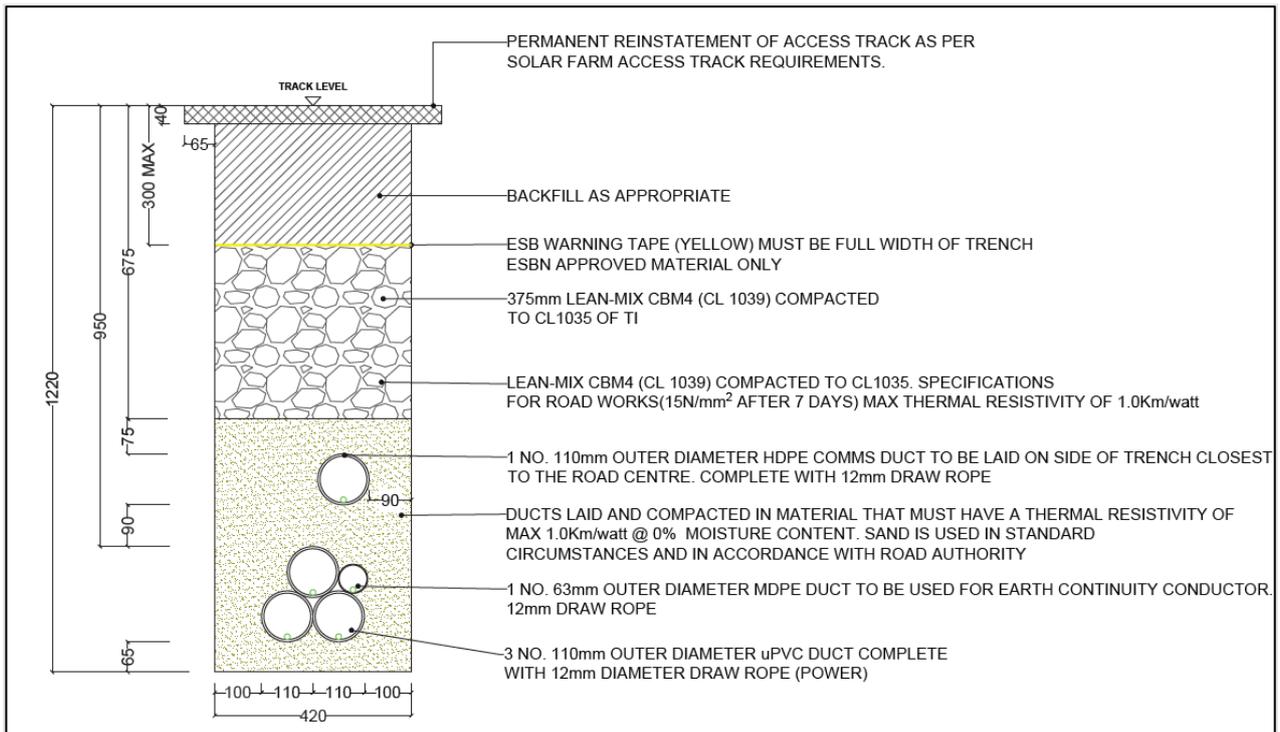


Figure 16: Single Circuit Trench within Access Track

A double circuit arrangement will be required within the access track in Parcel 2 and Parcel 4 for Interconnector 3 and Interconnector 4. This will consist of a cable trench 740mm wide and 1220mm deep. See Figure 17 for details of the double circuit trench. Full details of the double circuit trench section within the access tracks can be found on drawing AGLSH-ED-DR-05 submitted with this planning application.

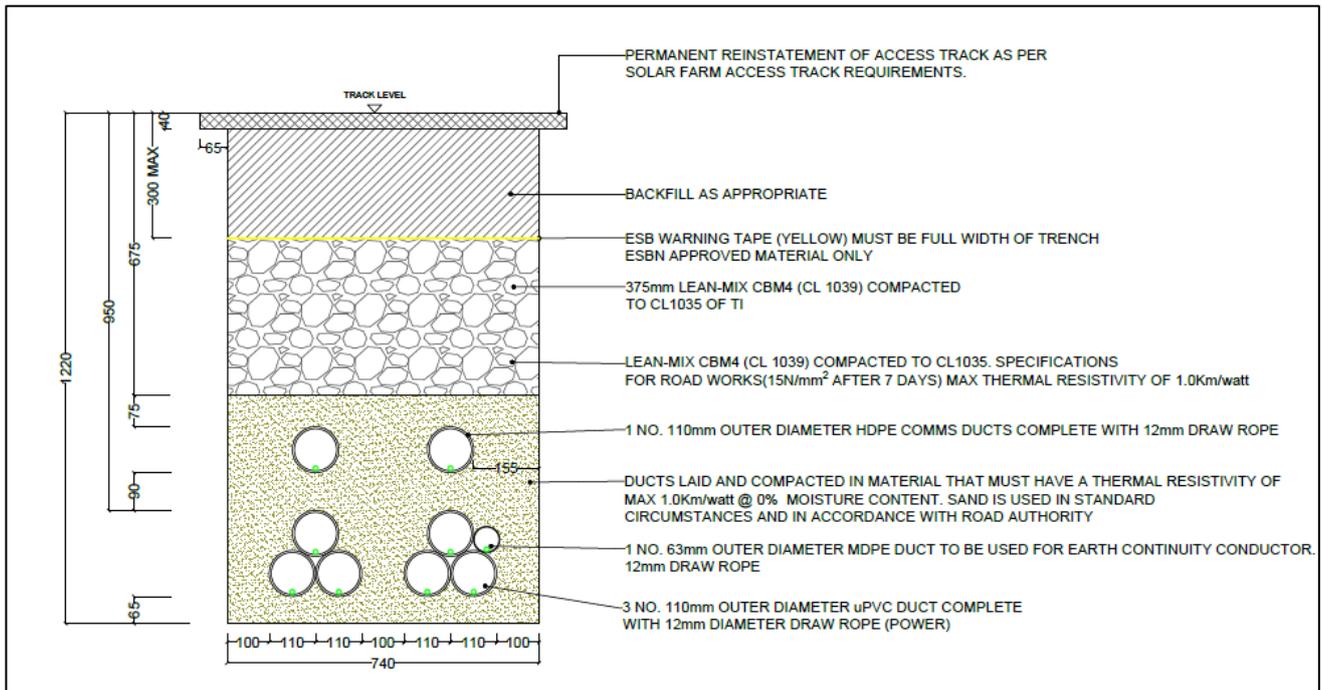


Figure 17: Double Circuit Trench within Access Tracks

A three-circuit arrangement will be required within the access track in Parcel 2 and Parcel 4. This will consist of a cable trench 1060mm wide and 1220mm deep. See Figure 18 for details of the three-circuit trench. Full details of the three-circuit trench section within the access tracks can be found on drawing AGLSH-ED-DR-07 submitted with this planning application.

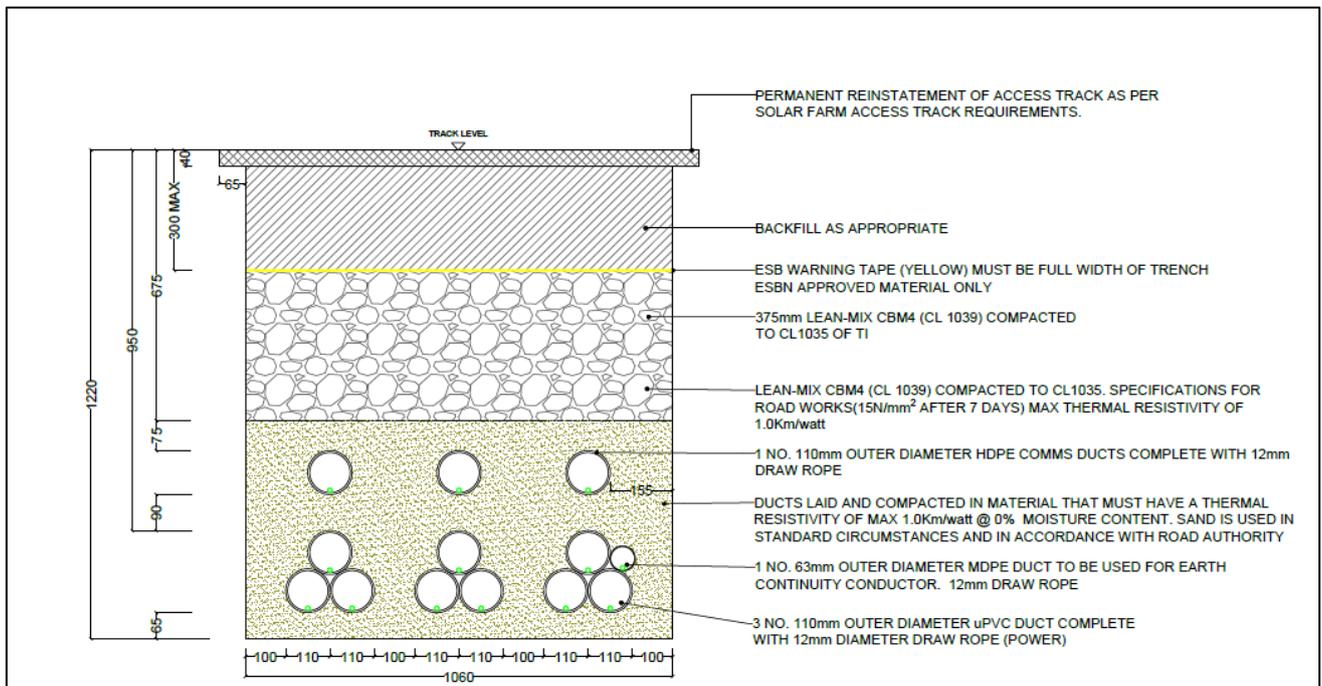


Figure 18: Three-Circuit Trench within Access Tracks

A single circuit arrangement is also proposed in grassland areas of the solar farm. The single circuit trench in grassland will consist of a cable trench 420mm wide and 1220mm deep. See Figure 19 below for details of the single circuit trench in grassland. This trench will be present in areas of Parcel 5 and 6 of the solar farm for Interconnector 5 and Interconnector 6. Full details of the single circuit trench section with grassland and off-road sections can be found on drawing AGLSH-ED-DR-03 submitted with this planning application.

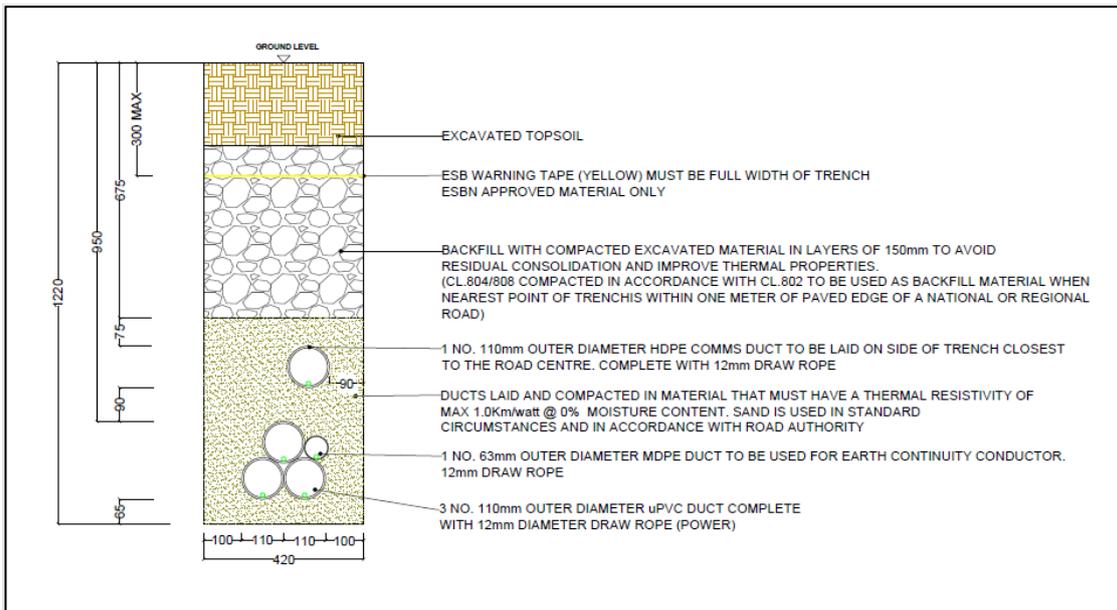


Figure 19: Single Circuit Trench in Grassland

A four-circuit arrangement is also proposed in grassland areas of the solar farm. The single circuit trench in grassland will consist of a cable trench 1380mm wide and 1220mm deep. See Figure 20 below for details of the four-circuit trench in grassland. This trench will be present in areas of Parcel 6 of the solar farm for Interconnector 2 and Interconnector 4 adjacent to one another. Full details of the four-circuit trench section with grassland and off-road sections can be found on drawing AGLSH-ED-DR-08 submitted with this planning application.

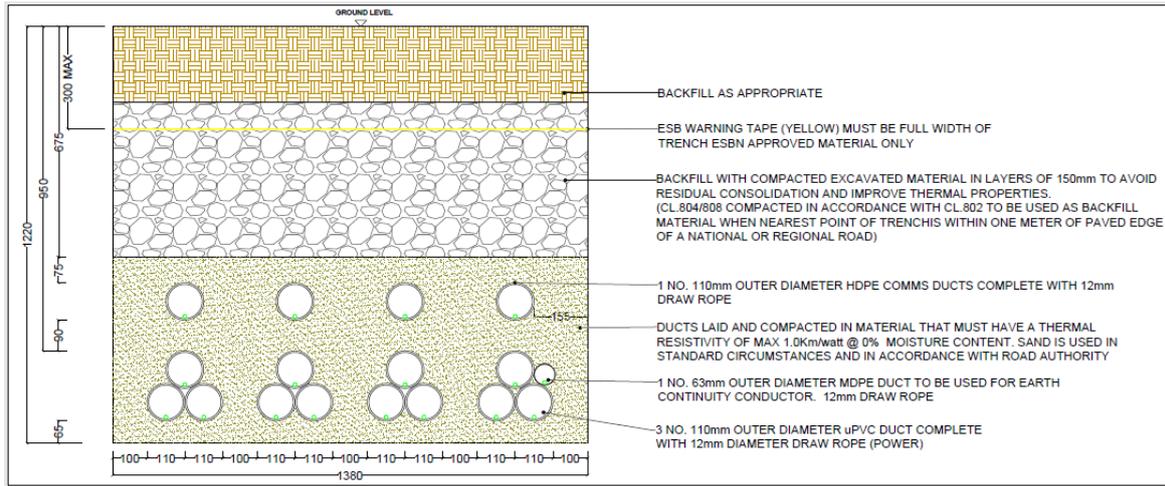


Figure 20: Four-Circuit Trench in Grassland

A six-circuit arrangement within grassland areas of the solar farm is also required. The trench will be 2020mm wide and 1220mm deep. See Figure 21 below for details of the six-circuit trench in grassland. This trench will be present in Parcel 6 of the solar farm for Interconnector 7. Full details of the double-circuit trench section within grassland and off-road sections can be found on drawing AGLSH-ED-DR-10 submitted with this planning application.

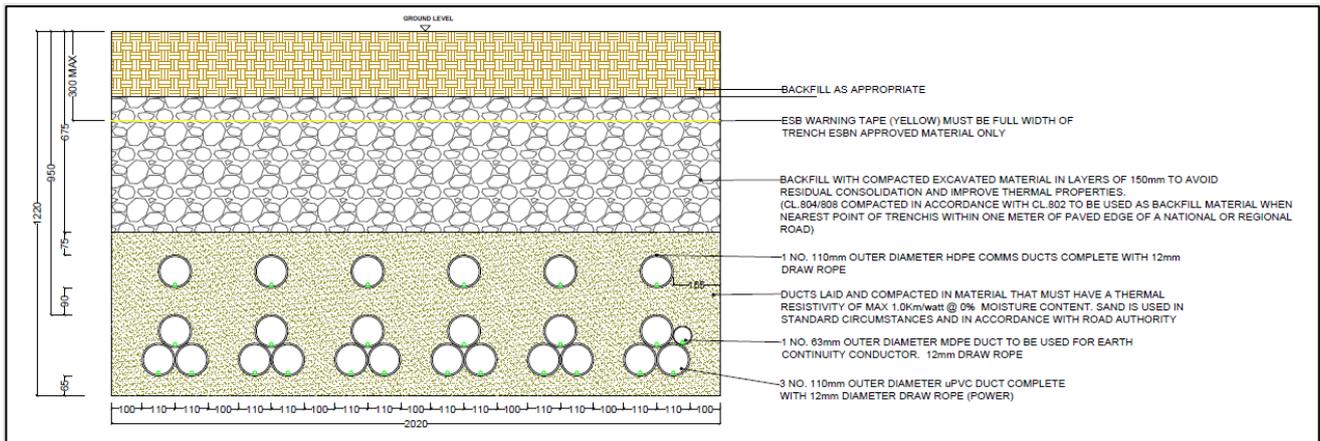


Figure 21: Six-Circuit Trench in Grassland

Cable depth may vary along the route due to existing services or shallow bedrock. Surface cable markers will be placed along the route where cable depth is unavoidably shallow. To indicate the precise location of the underground cabling, these markers will be metallic plates in accordance with ESB standards.

Marker posts will be used on non-roadway cable routes to set out the duct route and joint bay positions. Typically, corrosion proof aluminium triangular danger signs with a 700 mm base and with centred lightning symbol on fluorescent yellow background shall be installed in adequately sized concrete foundations. The precise siting of marker posts will be determined as part of the detailed design process. Figure 22 shows a typical Cable Marker Post.

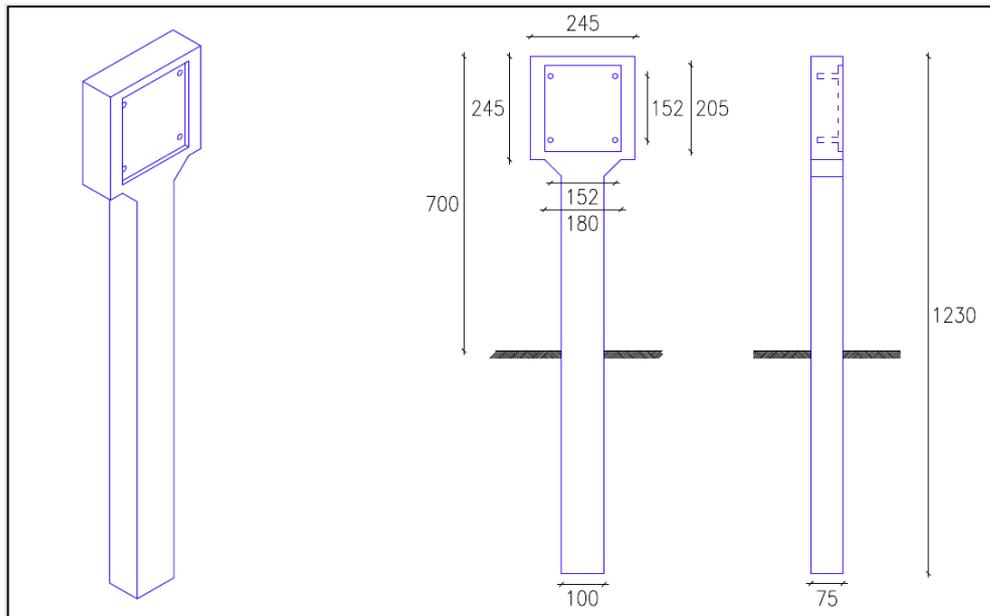


Figure 22: Typical ESB Cable Marker Posts

6.2 33kV UGC Interconnectors Construction Methodology

The bullet points below outline the construction methodologies to be used during trenching works for the underground 33kV Interconnector cables.

- Prior to construction the Contractor and the appointed Site Manager will prepare a detailed Method Statement for each section of the cabling based on the detailed design of same. The Method Statements will take into account any mitigation measures where required, or any planning conditions set out by Cork County Council;
- All works will be subject to a road opening licence from Cork County Council.
- A detailed traffic management plan will be prepared by the appointed contractor and agreed with Cork County Council at construction stage, outlining how traffic will be managed during the course of the works on the public road. Where road closures and diversions are required to facilitate the works, these will be agreed with Cork County Council and An Garda Síochána and the appropriate road closure licenses will be applied for.
- All existing underground services shall be identified on site prior to the commencement of construction works. Exact locations will be determined via slit trenches as mentioned in Section 3;
- 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 in suitably safe locations and all stockpiling locations will be subject to approval by the Site Manager;
- 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.
- The trench will be excavated in 100m sections;
- The trench will be laid with a bedding layer for the ducts. This layer will be compacted in accordance with the design specifications.
- The ducts will be lowered into the trench and laid in a trefoil formation. Spacers will be used where appropriate to ensure the ducts are centred within the trench section.
- The ducts will then be carefully covered with the bedding layer and compacted to the required standards, as per the detailed design. The layer will be levelled to the appropriate height. Care will be taken to not damage or displace the ducts.
- A backfill will be placed on top of the bedding layer and compacted as per the detailed design specifications.
- At the required level a yellow warning tape will be laid in accordance with the ESB Code 2955092.
- The ducts will then be cleaned and tested by pulling through a brush and mandrel. Following this a 12mm draw rope will be installed in each duct. The ducts will then be sealed using end seals, each fitted with rope attachment eyes to allow for cable installation.
- All the above works should be witnessed by ESN Clerk of Works as required.
- Public road trenching will be reinstated in line with Cork County Council requirements and as per the Guidelines for Managing Openings in Public Roads (Purple Book – April 2017);
- Cable lubricant will be applied to jacket (outer sheath) of the cables. This reduces friction between the cable and the rollers and also prevents the cable from snagging.
- The specialised winch will monitor the tension on the cables being pulled, ensuring the cables do not exceed their tensile limit.
- Works will only be conducted in normal working hours of Monday to Friday 08:00 to 18:00 and Saturday 08:00 to 13:00, with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency;
- The excavation, installation and reinstatement process typically take an average of 1 day to complete a 100m section; and
- 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 2 no. days.

The following equipment is required for trench construction:

- 2-3 General Operatives;
- 1 Excavator Operator;

- 1 no. tracked excavator (only rubber tracked machines will be allowed on public roads); and
- 1 no. dumper or tractor and trailer.

The following materials are required for trench construction:

- 110mm diameter HDPE ducting;
- Sand for pipe bedding;
- Ready-mix Concrete where necessary;
- Trench backfilling material to relevant specifications;
- Temporary Surface Reinstatement Materials; and
- Permanent Surface Reinstatement Materials to Carlow County Council specifications.

6.2.1 Joint Bays and Associated Chambers Construction Methodology

The final location and number of joint bays will be determined by the electrical contractor during the detailed design phase. Typically, joint bays are required every 600-700 metres for the 33kV UGC interconnectors. 33kV joint bays are typically 1.3m x 2.5m with a flat slab of concrete installed below finished ground level to facilitate the jointing of the cable. Joint bays will be fully reinstated as per Cork County Council requirements once jointing works are complete. A typical 33kV joint bay section is provided in Figure 23. Full details of the proposed joint bays can be found on drawing AGLSH-ED-DR-12 submitted with this planning application.

The location of joint bays for the proposed 110kV grid connection cables will be determined following site investigations. These will be located within the privately owned solar farm lands. Typical joint bays are 8 x 2.1m consists of a precast concrete unit with have link boxes and communication chambers located adjacent to them. These are required approximately every 400-600 metres. A typical joint bay section is provided in Figure 24 for a 110kV cable,

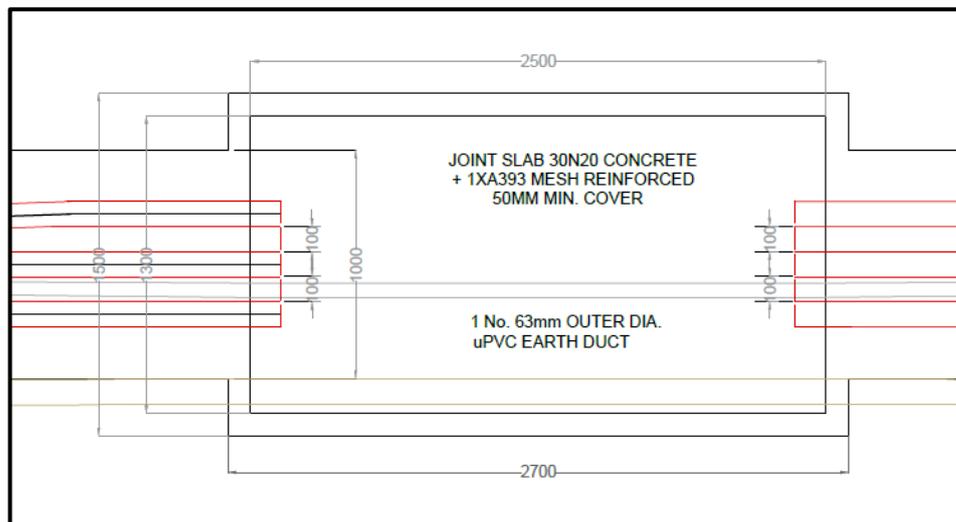


Figure 23: Typical 33kV Joint Bay

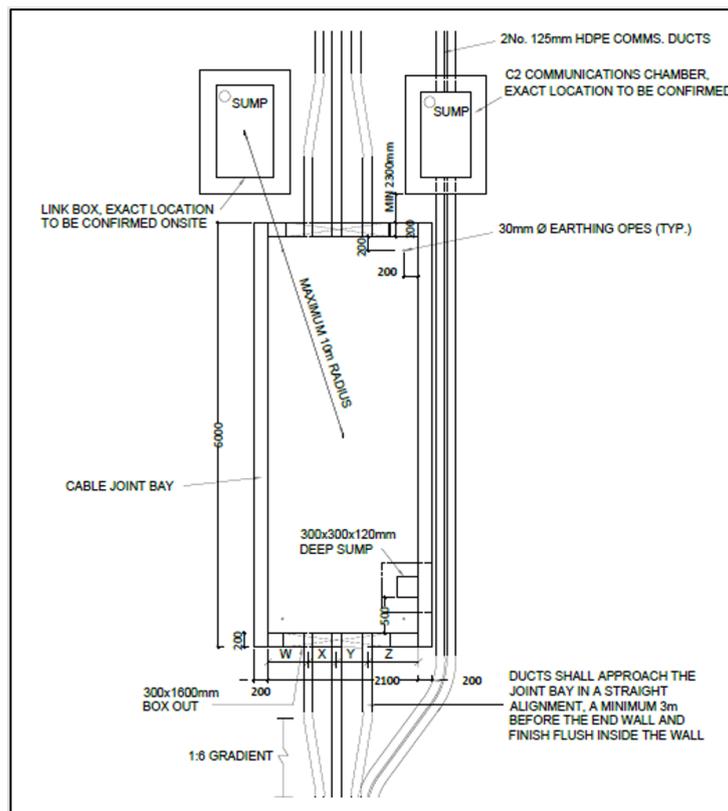


Figure 24: Typical 110kV Joint Bay

6.2.2 Utilities Crossings

A desktop utility search was conducted for the areas of the public road on which the 33kV Interconnectors (or 110kV transmission infrastructure) are proposed. No Uisce Eireann, gas or telecoms cable were shown with the area. Prior to construction, site investigations will determine if there are any existing service within the public roads in which the 33kV Interconnectors are proposed. An existing drain located south of the crossroads between the R619, L6214 and L2204 was identified. Interconnector 4 will cross this drain via a cable undercrossing/overcrossing, depending on the site investigations. Should any other existing services be identified, a cable undercrossing/overcrossing will be undergone, depending on as-built drawings and slit trenches. A typical service undercrossing and overcrossing are shown below in Figures 25 and 26. Full details of the service undercrossing/overcrossing can be found on drawing AGLSH-ED-DR-13 submitted with this planning application.

6.2.3 Watercourse Crossings

A topographical survey was conducted to identify any watercourses such as streams and open drains within the solar farm boundary. Where the 33kV electrical interconnector cable must cross open drains or a watercourse, either a pre-cast concrete bridge deck or HDD is used as the method of crossing. There will be no in-stream works associated with the installation of the bridge deck. Ducts and cabling will be laid in a flat formation within the bridge deck. A typical stream/drainage crossing is shown below

in Figure 27. Full details of the cable bridge crossing can be found on drawing AGLSH-ED-DR-11 submitted with this planning application.

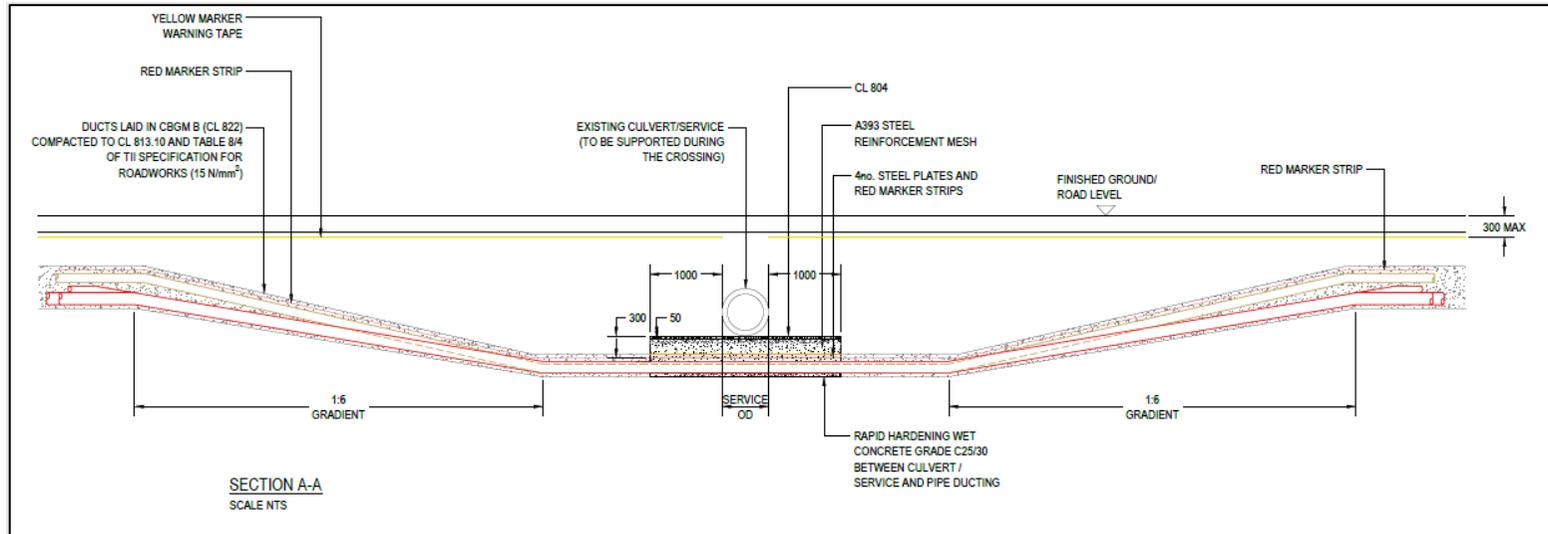


Figure 25: Typical Cable Service Pipe Undercrossing Detail

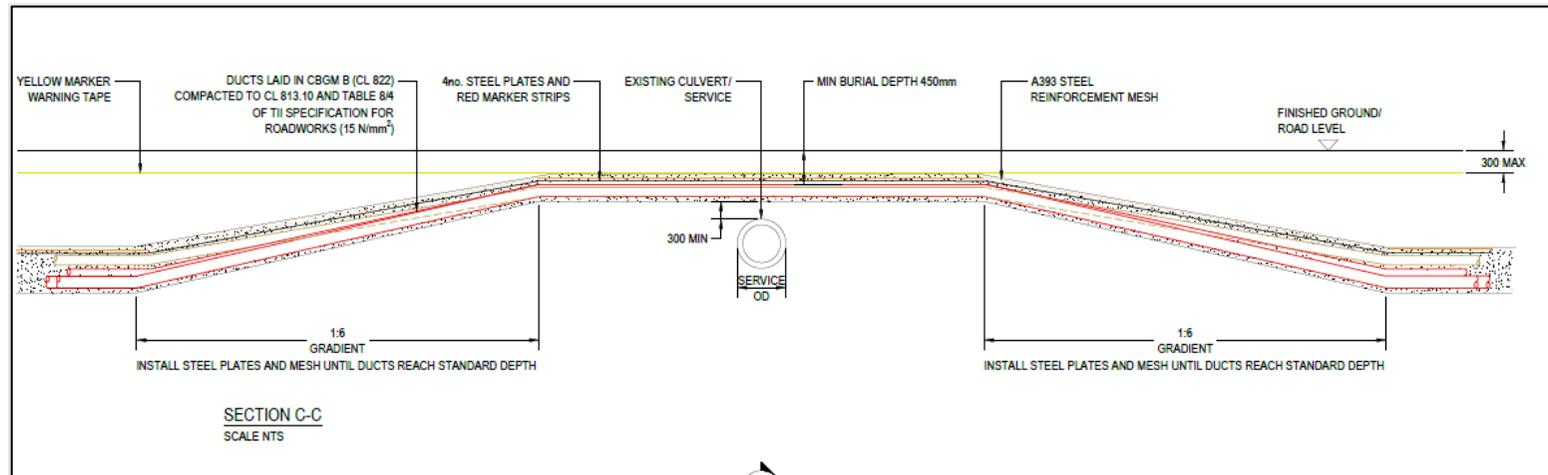


Figure 26: Typical Cable Service Pipe Crossing Detail

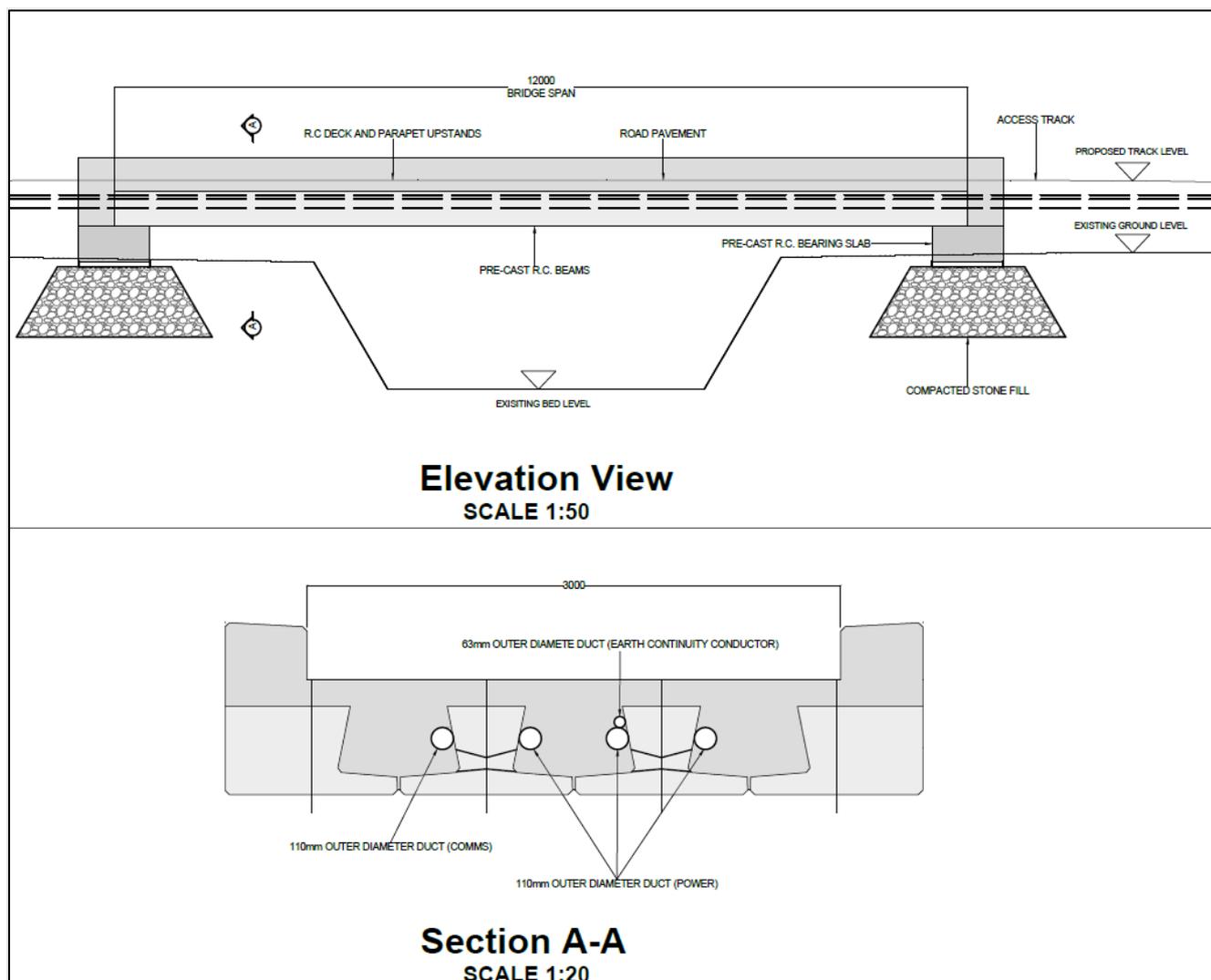


Figure 27: Typical Cable Bridge Crossing Detail

6.2.4 Horizontal Directional Drill Methodology

The proposed drilling methodology for each HDD is as follows:

- A works area of approximately 40m² will be fenced on both sides creating an easement/wayleave.
- The drilling rig and fluid handling units located on one side of the crossing will be stored on double bunded 0.5mm PVC bunds which will contain any accidental fluid spills and storm water run-off.
- Entry and exit pits (1m x 1m x 2m) will be excavated; the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
- A 1m x 1m x 2m steel box will be placed in each pit. This box will capture any drilling fluid returns from the borehole.

- 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 stream.
- A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
- 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.
- When 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.
- The steel boxes will be removed, and the drilling fluid disposed of to a licensed facility.
- The ducts will be cleaned and proven and their installed location surveyed.
- The entry and exit pits will be reinstated as per the landowners' requirements.

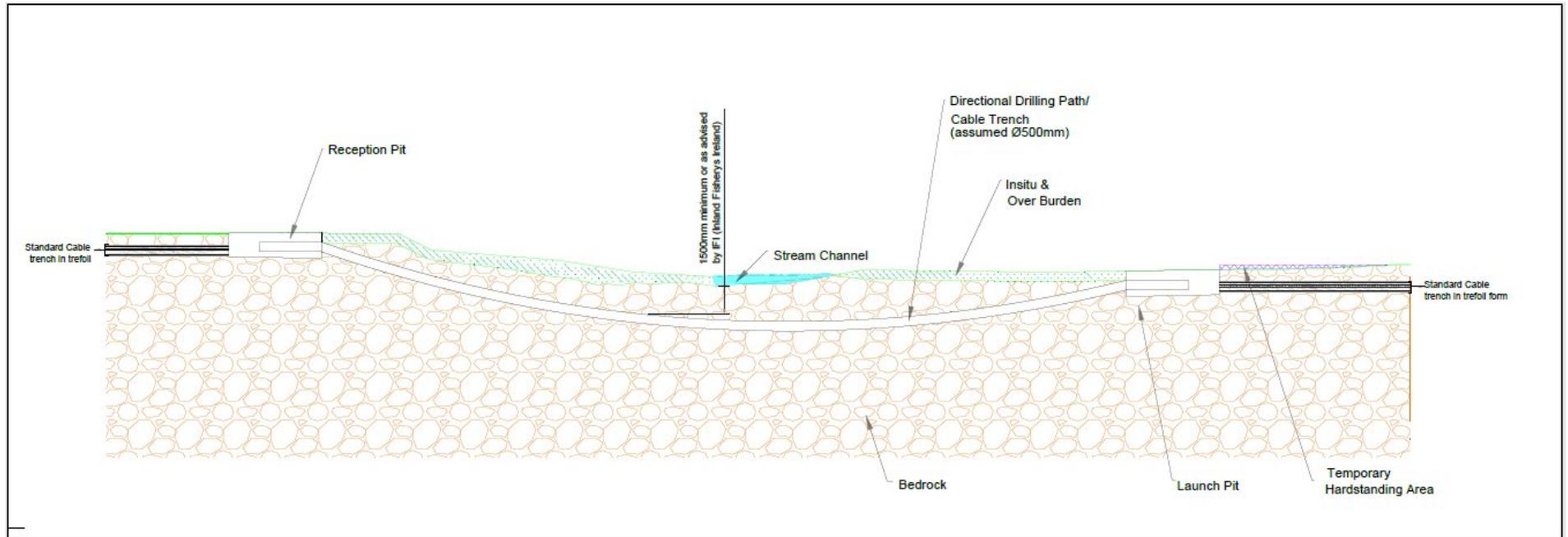


Figure 28: Typical Horizontal Directional Drill Water Crossing

6.2.5 Traffic Management

Road opening licenses will be submitted to cover the full extent of all underground cables within the public roads. In relation to the underground grid connection cable, the length of work exceeds 1000m of rural road and as such a T1 License Notification will be submitted through the MapRoadWorks licensing system to Cork County Council to facilitate coordination and planning of these works with the Roads department. T2 (Road Works) Licenses will be prepared and applied for under the overarching T1 Notification. It is not anticipated that a T1 Notification will be required for the 33kV Interconnectors.

Where road widths permit, the underground cable construction works will allow for one side of the road to be open to traffic at all times by means of a 'Stop/Go' type traffic management system, where a minimum 2.5m roadway will be maintained at all times. Temporary traffic signals will be implemented to allow road users safely pass through the works area by directing them onto the open side of the road. The underground cables will be installed in 100m sections with no more than 100m will be excavated without the majority of the previous section being reinstated.

Some work areas may require a temporary road closure where it is not possible to safely implement a Stop/Go system. Where temporary road closures are necessary, a suitable diversion will be implemented using appropriate signage, following consultation and agreement with Cork County Council.

Full details of any traffic management plan for these works will be developed as part of the Road Opening License application process with a Traffic Management provider and shall be in accordance with Chapter 8 of the Traffic Signs Manual, but the following considerations are identified at this stage:

- Statutory processes for road closures as outlined in Section 75 of the Roads Act 1993 and expanded in Section 8.6.3 of Traffic Signs Manual will be followed – i.e. any proposed road closure is to be approved/implemented by the local Road Authority with consultation of the public, and proposed diversions will need to be approved by the Road Authority.
- An information campaign (letter drop/notification on local radio/advance information signs etc.) will be undertaken to inform local residents of the works.
- The process for applying for, and securing a road closure is separate to that of applying for a Road Opening Licence, but both are to be in place and valid for the full period of

works. Cork County Council advise that a Road Closure Application must be submitted within 5 weeks of the proposed closure. It is intended to engage with the Roads Authority as early as possible due to the length of the works requiring road closures and road opening licenses to be in place.

- Provision of local access to residences along the active works area will be maintained with minimal disruption. This will be coordinated through signposted detour routes, advance notice to residents of anticipated works dates and details and facilitating access and egress of residences adjoining the works area during the periods where the UGC will be installed in the road outside these. The length of closure (as defined on site by signage/cones etc) is intended to be kept to the minimum length practicable for the works to be undertaken where homes are adjacent, and to avoid access restrictions to local residences being in place for multiple working days.
- Minimising the closure period of junctions with other local roads will dictate maximum length of any one closure (unless specified otherwise by Roads Authority) to avoid excessive disruption to the local area.
- Where ground conditions, weather, and third party services permit, approximately 100m of the route can be excavated, ducting installed, backfilled, and reinstated within one working day. This permits indicative time estimates for closures to be provided to locals, and will similarly permit works to be programmed so that restrictions on access to local houses can be kept to a minimum, such as by phasing works between driveways so that disruption to access from the works area is limited to the start or end of a single work day.

Temporary and Permanent Road Reinstatements are envisaged to be in accordance with the standard details provided in the Purple Book – namely SD1 & SD4 where the existing road consists of an Asphaltic Concrete build-up, or SD2 & SD5 in the event that the roads are surface dressed, unless otherwise directed by the roads authority during the T1 consultation period or approval process of specific T2 licenses. All longitudinal and transverse openings will be carried out in accordance with Purple Book drawings GA1 and GA2 respectively.

7 Emergency Response Plan

All site personnel will be inducted in the provisions of the Emergency Response Plan. The following outlines some of the information, on the types of emergencies, which must be communicated to site staff (list not exhaustive)

- Release of hazardous substance – Fuel or oil spill;
- Concrete spill or release of concrete;
- Flood event – extreme rainfall event;
- Environmental buffers and exclusion zones breach;
- Housekeeping of materials and waste storage areas breach; and
- Stop Works order due to environmental issue or concern.

The Emergency Response Plan will be completed by the appointed Contractor before the project begins.

8 Best Practice Design and Construction Mitigation

Prior to commencement of construction works the contractor will draw up a final Method Statement including a Construction Environmental Management Plan which will be based on established best practice measures. These documents will be adhered to by the contractors and will be overseen by the project representative/foreman.

The following documents will contribute to the preparation of the Method Statement and CEMP:

- 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 pocketbook*. (C762) 4th edition. CIRIA.
- CIRIA *Environmental Good Practice on Site (fourth edition) (C741) 2015*.

The final Construction Method Statement and CEMP will comply with any planning condition specified by the planning authority or An Bord Pleanála. The environmental measures to be included in the final CEMP will include the measures as set out in the following sections:

8.1 General

The environmental control measures for the solar farm include the following:

- Materials, plant and equipment shall be stored in the proposed site compounds.

- All hazardous liquid materials shall be stored in a bunded area and spill containment measures will be in place.
- Re-fuelling of machinery, plant or equipment will be carried out in the site compounds.
- Fuel pipes on plant, outlets at fuel tanks etc. will be regularly checked and maintained to ensure that no drips or leaks to ground occur. The following precautions will also be installed on fuel delivery pipes:
 - Any flexible pipe, tap or valve must be fitted with a lock where it leaves the container and be locked when not in use.
 - Flexible delivery pipes must be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use.
 - Warning notices including “No smoking” and “Close valves when not in use” shall also be displayed.
- Any pouring of concrete will only be carried out in dry weather. Washout of concrete trucks shall be strictly confined to designated and controlled impermeable wash-out areas remote from watercourses, drainage channels and other surface water features.
- Spill kits will be available within each plant/vehicle on site and located close to identified pollution sources or sensitive receptors (fuel storage areas, etc.).
- Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water. Plant and site vehicles are to be well maintained and any vehicles leaking fluids must be repaired or removed from site immediately. Any servicing operations shall take place over drip trays.
- Areas used to store fuel and oil on the site will be appropriately lined and bunded to prevent the downward percolation of contaminants to natural soils and groundwater.
- Fuel for construction vehicles will be stored on an impervious base within a bund able to contain at least 110% of the volume stored. Rainwater will not be allowed to accumulate within the bund and in any way compromise the required 110% volume capacity. No tanks or containers may be perforated or dismantled on site. A competent operator shall empty all contents and residues for safe disposal elsewhere.
- Suitable wheel wash facilities, complete with C/W silt traps will be put in place to ensure vehicles entering/exiting the site do not carry/transport debris.
- If very wet ground must be accessed during the construction process bog mats will be used to enable access to these areas by machinery.
- Daily environmental toolbox talks / briefing sessions will be conducted for all persons working to outline the relevant environmental control measures and to identify any environment risk areas/works.

8.2 Water Quality

- A buffer of 10 m from the closest drain or watercourse will be established and clearly marked out prior to the commencement of construction activities where possible. The buffer will be maintained with the exception of localised areas where fencing, access, crossing or cable trenching is required.
- Silt fencing will be installed within the works area for the proposed interconnector cables. The silt fence will provide protection from sediment and potential site water runoff.
- The silt fencing will be checked twice daily during construction and once per day thereafter to ensure that it is working satisfactorily until such time as the re-instated ground/material has been fully established.
- If dewatering is required as part of the proposed works e.g., in trenches for underground cabling or in wet areas, water must be treated prior to discharge. The Contractor shall employ best practice settling systems to ensure maximum removal of suspended solids prior to discharge of any surface water or groundwater from excavations to receiving waterbodies. This may include treatment via settlement tanks. There will be no direct pumping of water from the works to any watercourses or drains at any time.
- An emergency-operating plan will be established to deal with incidents or accidents during construction that may give rise to pollution within any nearby watercourses or drains. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (spill kits etc.).
- The contractor will ensure that good housekeeping is always maintained and that all site personnel are made aware of the importance of the nearby estuary/aquatic environments and the requirement to avoid pollution of all types.

8.3 Soils

- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height.
- No stockpiles associated with the excavation works associated with the proposed grid connection will be located within 10m of drains.
- Imported materials and any site won materials will be tested prior to use to determine its geotechnical and geo-environmental properties to assess their suitability for use
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement.

8.4 Ecology

- No removal of habitats or movement of construction machinery will occur outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked for associated site staff.
- The following best practice measures form part of the construction methodology and will help to contain and/or prevent the introduction of invasive species on the site as follows:
 - When deemed necessary, all plant and equipment employed on the proposed works (e.g., diggers, tracked machines, footwear etc.) will be thoroughly cleaned down using a power washer unit, and washed into a dedicated and contained area prior to arrival on site and on leaving site to prevent the spread of invasive aquatic / riparian species. A sign off sheet will be maintained by the contractor to confirm cleaning.
 - Material gathered in the dedicated and contained clean down area will need to be appropriately treated as contaminated material on site.
 - For any material entering the site, the supplier must provide an assurance that it is free of invasive species.
 - Ensure all site users are aware of invasive species management plan and treatment methodologies. This can be achieved through “toolbox talks” before works begin on the site.
 - Adequate site hygiene signage should be erected in relation to the management of non-native invasive material.
 - All excavations/trenches should be covered at night, or a suitable means of escape provided for nocturnal mammals.

8.5 Noise

All plant will be required to conform to the British Standards (BS) 5228 Code of practice for noise and vibration control on construction and open site. BS5228 provides a comprehensive guidance on construction noise including details of typical noise levels associated with various items of plant or activities, prediction methods and measures and procedures and is an accepted standard for construction practise in Ireland given the absence of statutory Irish guidelines.

8.6 Air Quality

The main activities that may give rise to dust emissions during construction include the following:

- Excavation and removal of earthworks.
- Materials handling and storage.
- Movement of vehicles (particularly HGV's) and mobile plant.
- Suspended solids in surface water runoff.

8.7 Waste Management

All waste arising during the construction phase will be managed and disposed of in a way that ensures the provisions of the Waste Management Act 1996 and associated amendments, and regulations of the Waste Management Plan are followed.

9 Summary

The construction of the proposed substation and grid connection to serve the proposed Aglish Solar farm can be summarised as follows:

- Construction of the substation will consist primarily of an electrical compound to house a transformer, high voltage equipment and separate EirGrid and IPP control buildings.
- All substation construction activities will take place within the extents of the proposed site boundary.
- Earthworks will be required to create a level compound area for the substation, with export of cut material and import of fill material required by truck from/to the site.
- The duration of the construction works will be confirmed and agreed with the Local Authority prior to construction. The construction programme for the entire of the electrical infrastructure works associated with the Aglish Solar Farm (including the substation) is estimated to be a total of 24 months. Further detail on this programme is provided in Appendix B.
- Prior to commencement of development, a detailed Construction Environment Management Plan (CEMP) shall be submitted to, and agreed in writing with, the planning authorities, following consultation with relevant statutory agencies.
- All planning conditions will be complied with in full and contractor(s) will be supervised and managed closely to ensure full compliance.

Appendices

Appendix A

Substation Layout



Appendix B

Solar Farm and Electrical Infrastructure Programme and Construction Vehicles

Estimated HGV Construction Programme & Vehicle Numbers		Construction Programme (Months)																							
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Substation Construction	Enabling Works	150	140	140																					
	Civil Works			20	20	20	20	20	20																
	Electrical Works									20	20	20	15	10	5										
Grid Connection Construction	Civil and Electrical Works											250	250	250	250	250	250	250	250						
Substation Electrical Commissioning	Pre-commissioning (Light Goods Vehicles)																								
	ESB Commissioning (Light Goods Vehicles)																								
Solar Farm Construction	Solar Farm Site Set Up & Installation						344	424	160	221	103	103	103	187	116	116	234	234	232	19	19	4	68	95	
Solar Farm Electrical Commissioning	Electrical Commissioning (Light Goods Vehicles)																								
	Close Out (Light Goods Vehicles)																								
	Estimated Vehicles Per Month	150	140	160	20	20	20	364.4	444.4	180.3	240.9	122.6	122.6	367.6	446.9	371.2	366.2	484.5	484.5	482.1	269.4	19.43	4.2	68	94.5
	Estimated Vehicles Per Week	37.5	35	40	5	5	5	91.1	111.1	45.08	60.23	30.66	30.66	91.91	111.7	92.8	91.55	121.1	121.1	120.5	67.36	4.856	1.05	17	23.63
	Estimated Vehicles Per Day (5.5 days)	7	6	7	1	1	1	17	20	8	11	6	6	17	20	17	17	22	22	22	12	1	0	3	4
	Peak Daily Vehicles	22																							
	Peak Hourly Vehicles	2.75																							
	Average Daily Vehicles	10																							
	Average Hourly Vehicles	1																							

