# APPENDIX 5-17

***ONSHORE GRID CONSTRUCTION METHODOLOGY***

MWP

# Sceirde Rocks Onshore Grid Connection

## Construction Methodologies Report

H&MV Engineering

MARCH 2024
REVISED DECEMBER 2024

# Contents

## Tables



## Appendices

| Project No. | Doc. No. | Rev. | Date | Prepared By | Checked By | Approved By | Status |
|---|---|---|---|---|---|---|---|
| 24204 | 24204-MWP-XX-XX-RP-C-1400 | 01 | 10.07.2024 | M.M. | C.M. | I.B. | Information |
| 24204 | 24204-MWP-XX-XX-RP-C-1400 | 02 | 29.07.2024 | M.M. | C.M. | I.B. | Information |
| 24204 | 24204-MWP-XX-XX-RP-C-1400 | 03 | 05.09.2024 | M.M. | C.M. | I.B. | Information |
| 24204 | 24204-MWP-XX-XX-RP-C-1400 | 04 | 29.11.2024 | M.M. | C.M. | I.B. | Information |
| 24204 | 24204-MWP-XX-XX-RP-C-1400 | 05 | 05.12.2024 | M.M. | C.M. | I.B. | Information |
| 24204 | 24204-MWP-XX-XX-RP-C-1400 | 06 | 09.12.2024 | M.M. | C.M. | I.B. | Information |

# 1. Introduction

The purpose of this report is to outline the construction techniques and methodologies which will be implemented during construction of the Onshore Grid Connection (OGC). As shown below, Section A of the OGC is to connect the Sceirde Rocks Off-Shore Wind Farm to a 220kV Sceirde Rocks Substation located on the L6150 between Kilrush, Co. Clare and Moneypoint Power Station, Co. Clare. This section of OGC stretches approximately 19.30km from the above-mentioned substation to the outskirts of the coastal village of Doonbeg, Co. Clare on the western most coastline.

Section B of the Onshore Grid Connection (OGC) runs from the 220kV substation to Moneypoint Power Generation Plant, this section of the route is approximately 03.00km.

The OGC predominately utilises the existing public road network where possible. Where the public road network could not be utilized or it was uneconomical to do so, the OGC will pass-through third-party lands, this done in consultation with all relevant landowners throughout the design phase of the project.

The Onshore Grid Connection will consist of a single circuit - single trench along the entirety of the OGC. Each trench will consist of the installation of 6 No. ducts, 3 No. power cables, 2 No. fibre communications cables and 1 No. Earth Cable/duct.

This document is intended to be used as a reference document in order to develop an understanding of the construction methodologies to be employed during the construction stage of the project. This document should be read in conjunction with all other specifications, works requirements and specialist reports which accompany the planning application.

Please note that this document is in outline form only and will be revised and updated prior to commencement on-site.

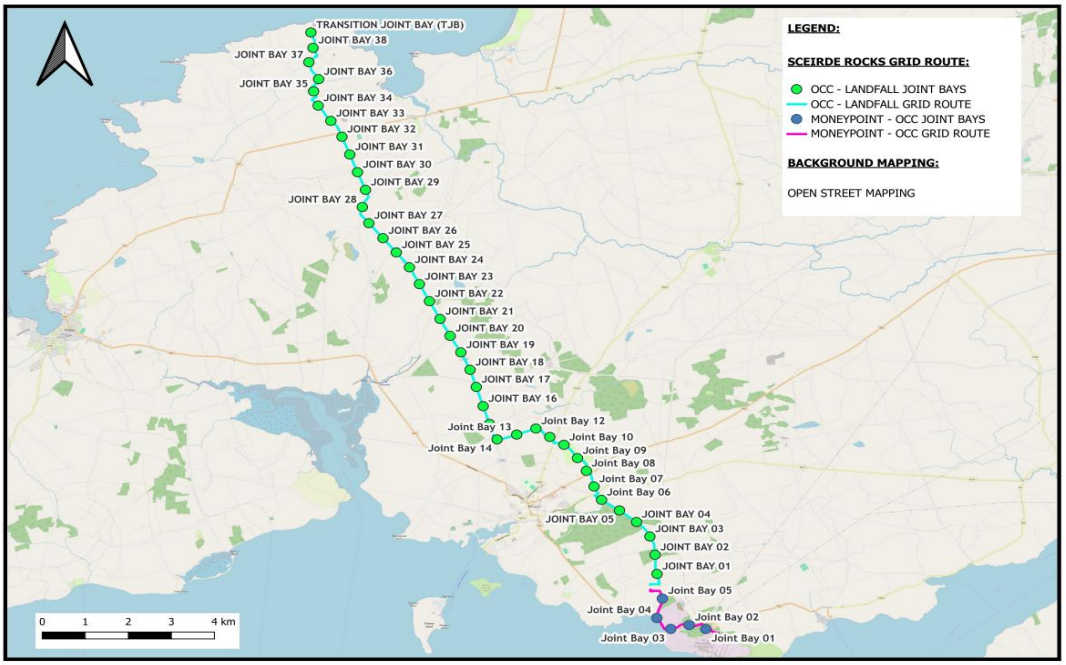



**Figure 1: Overview of Onshore Grid Connection**

## 2. 220kV Onshore Grid Connection

The following table outlines both sections of the Onshore Grid Connection looking at sections of the route within the public road, along with also looking at the sections of the route which pass through Third-Party Lands. Also, it is worth noting that engagement with Third-Party Landowners was sought early on in the design process.

| Cable Route Section | Public Roadway (km) | Road Verge (km) | Third Party Lands (km) | Total Length (km) |
|---|---|---|---|---|
| Section A - OCC-Land Fall Grid Route | 14.749km | _____ | 4.499km | 19.248km |
| Section B - Moneypoint-OCC Grid Route | 0.739km | 0.662km | 1.545km | 2.946km |

**Table 1: Route Options Tables**

## 3. Construction Works Programme

It can be assumed that through the construction works there may be the following make-up of Onshore Grid Connection works.

The construction works for the Onshore Site is 26 months. The onshore trenching and ducting for the OGC is estimated to take 14 months and the onshore cable installation is estimated to take 14 months. The construction and commissioning of the OCC will take 26 months. These activities will overlap with the total duration taking 26 months.

- Total Installation works in the public roadway – 16,150m
- Total Installation Works in Third Party Lands – 6,050m
- Total UGC Installation Works – 22,200m

The sequence of works for the construction phase of the Onshore Grid Connection can be broken into the following stages:

- Design Approval
- Setting-out works
- Installation works
    - Joint Bay Sections
    - Trenching and Ducting Works
    - Horizontal Directional Drilling (HDD) Works
    - Tie-in to Joint Bays, C2 Chambers and Link Box Chambers
- Duct Cleaning, Proving and Roping
- Install Power, Fibre, Earth Cables
- Jointing works of HV Cable and Fibre
- Reinstatement
- Cable Testing and Commissioning

# 4. Site Preparation

It is critical that all civil works associated with the cable trench are planned to ensure that the work is completed in the most efficient manner with the least disruption to the public.

This including the pre-planning of works such as traffic management, working hours, permits, public consultation, site access, site lay down, signage/cones and fencing etc. this pre-planning enables a safe efficient working environment where the potential for accidents or mistakes is minimised. (ESB International, 2012)

# 5. Pre-Construction Cable Route Survey

The contractor is expected to, prior to the works commencing, organise and undertake a re-surveying exercise along the OGC to ensure/reconfirm all existing services. All relevant bodies such as ESBN, EIRGRID, Gas Networks Ireland, EIR, Uisce Eireann and Clare County Council are to be contacted prior to commencement on-site to reconfirm and provide record drawings of all relevant services.

Prior to works commencing, a dilapidation and dash-cam survey will be carried out, photographing and noting any existing damage or defects to structures or road surfaces. A copy of this survey will be submitted to Clare County Council prior to works commencing. A condition survey will be carried out on the roads and bridge structures impacted by the development, both pre and post construction. This will include a video survey of the road extent with any significant dilapidations further recorded by photography and local surveying as required.

The contractor will also be required to scan the ground as works progress with a Cable Avoidance Tool (CAT Scanner) and Genie to ensure that services are not encountered unexpectedly, with this a visual inspection will also be carried out along the route as the works progress.

Road Opening Licences will also be required where any section of the route is along the public road, this is to be sought from Clare County Council in advance of any works being undertaken on the public road network.

# 6. Installation Works

## 6.1 General Requirements

Prior to works commencing on the Onshore Site, a Construction Environmental Management Plan (CEMP) in accordance with the permitted plans and a Construction Traffic Management Plan (CTMP) must be developed, reviewed and agreed with Clare County Council. The CEMP sets out how the works will be completed, the sequence of works and sets out how progress will be made along each section of the route. It is envisaged that approximately 240m of trenching will be completed per day, subject to local topography, efficient access and storage of material and road width.

The Construction Traffic Management Plan (CTMP) is to be updated prior to commencement on-site to address any relevant planning conditions that may arise, this including any additional mitigation measures, which are conditioned and will be submitted to Clare County Council for written approval.

On appointment of a main contractor, it is their responsibility to produce a detailed Construction Resource & Waste Management Plan (R&WMP) which is to be a live document updated throughout the project lifecycle by the main contractor as appropriate.

## 6.2 Trenching Works

The first stage of the trenching works involves the trench extent being saw cut along the road surface with excavation works taken place thereafter, usually two crews would be able to complete approximately 240m per day (120m per day per crew). As material is removed from the trench, it is to be removed off-site by a licensed haulier and brought to a licensed facility for disposal in-line with Resource & Waste Management Plan (R&WMP). Records of any materials taken off-site are to be maintained and recorded throughout the project. Receipts from the licensed waste disposal facility are to be included in the project safety file upon completion (Refer to Section 8 below).

Following excavation of the trench section, a concrete bedding layer of Cement Bound Granular Material Type B (CBGMB) is placed on the base of the trench. The ducting can then be placed within the trench section and surrounded by CBGMB material as per EIRGRID approved design Specification. An As-Constructed record to EIRGRID standards of duct locations and other key features is to be maintained by a qualified engineer so that the location of the power cable can be identified at any time into the future.

Where necessary, Trench De-Watering may be required in order to mitigate any environmental impacts. De-Watering from the trench is to be undertaken through the use of a Vacuum Tank and hauled back to the nearest site compound where concrete wash-out areas are to be maintained.

Once the ducts are in place, appropriate engineered backfill or imported stone material in line with the *Guidelines for Managing Openings in Public Roads*. This is placed over the concrete surround. Suitable marker/warning tape is to be placed within the trench as per EIRGRID design specifications. Following this, the trench is to receive a temporary surface reinstatement as agreed with Clare County Council. Once the Onshore Grid Connection is completed, the surfaces are to receive asphalt surface layers to Clare County Council Standards. When the trench backfilling process is completed, the works are repeated along the following 120m sections of the route until installation works are complete.

Please note when backfilling the trench, it is to be done in layers ensuring proper compaction of backfilling material is achieved in order to ensure excessive settlement does not occur.

All trenching and reinstatement works are to be in line with EIRGRID specifications and feedback/consultation with Transport Infrastructure Ireland (TII) and Clare County Council, design in accordance with Guidelines for Managing Openings in Public Roads and TII Requirements for the Reinstatement of Openings in National Roads where appropriate.

## 6.3 Conflict with Third Party Services

Conflicts with Third-Party Services is somewhat unavoidable when installing cables within the public roadway. When installing a cable trench parallel to an existing underground service a minimum of 300mm clearance must be maintained from the edge of the ducts to the edge of the third-party duct. This distance may increase depending on the size and depth of third-party services.

When crossing third-party services, a 300mm clearance is to be always maintained. It is good practice to route high voltage cables under existing services whenever possible as this reduces the possibility of cable faults from third-party excavations.

## 6.4 Conflict with Water Courses

When encountering water courses along the Onshore Grid Connection such as bridges, culverts and streams, the preferred method of installation is to place the cable ducts within the Bridge Deck where minimum cover

can be achieved, this done as outlined within section 6.2 of this report. This is not always possible and other solutions have been considered where this is the case. These alternative solutions include Trenchless Technologies such as Horizontal Directional Drilling (HDD) or replacement/upgrades of culverts. When assessing water courses along the Onshore Grid Connection, it is critical to identify the method of installation in line with any drawings and specifications supplied. All installation methods are to be in line with EIRGRID specifications and feedback/consultation with Transport Infrastructure Ireland (TII) and Clare County Council, design in accordance with Guidelines for Managing Openings in Public Roads and TII Requirements for the Reinstatement of Openings in National Roads where appropriate.

## 6.5 Construction of Joint Bays

The location of joint bays as detailed within the relevant drawings accompanying this document are selected in accordance with EIRGRID specifications. The locations chosen are determined by the density of existing services, likely disruption to traffic, consultation with residents and space requirements for cable drums and cable pulling equipment.

The joint bays, where possible have been located on or adjacent to the public roadway, where the location of the joint bay is not within the public roadway an easement has been obtained in line with EIRGRID requirements.

Excavation works are undertaken at the joint bay location with a blinding layer of compacted material to EIRGRID Specification, the precast joint bay is then placed into the excavation, a drainage/outfall pipe is to be fed out of the joint bay.to prevent water build up within the Joint Bay. The locations of all joint bay are to be surveyed by a qualified engineer and included on the As-Constructed Records.

C2 Communication Chambers are to be installed adjacent to each joint bay along the cable route. The communication ducts are installed within the trench above the power cable ducts from C2 Chamber to C2 Chamber. This allowing for associated communications fibre cable to be installed along the cable route.

Once installed the surface is temporarily reinstated until they are opened again to allow for the pulling of cables through the ducts and jointing the cables. Cable pulling and jointing will not occur until the duct laying and trenching works have been completed in full. Traffic Management signage will be erected to show un-bound road surface material in agreement with Clare County Council Roads Engineer. The joint bays will then be permanently backfilled and reinstated with a finish to at least pre-existing conditions as agreed with Clare County Council.

Figure 2: 220kV Joint Bay

Figure 3: Joint Bay with Cable Joints

Figure 4: Joint Bay Backfilling Process

## 6.6 Duct Installation in Peat Areas

Along the Onshore Grid Connection, there are two sections of the route where the cable passes through peat lands. A series of site investigation works were conducted in order to determine the depths of peat that will be encountered along with informing the design process. Stemming from the site investigation works Section 01 (North of OCC) has approx. depths of 1.0m below ground level with Section 02 (by Clare Motor Club) has approx. depths of 4.0m below ground level. The latter being critical to the design due to the depths of peat involved. See Figures overleaf.

Further exploration of potential methods of dealing with these peat areas is as detailed within Section 9 of this report. Outlining the potential methodologies which may be utilised, this considering the hydrological interaction and peat stability and mitigating these where possible.

Along with the above constraints, per EIRGRID/ESBN Specifications, underground cables shall, as a standard be routed within the reserve of public roadways. Often times these grid connections are travelling through rural areas with poor quality road infrastructure such as Bog Rampart Roads and/or Legacy Roads, these road networks within peat lands are often times not built to today's standards thus leading to conventional trench installation methodology becoming uneconomical and carry a high environmental risk. This meaning that alternative installation methods must be utilised considering not only the cable installation but also taking account of environmental and economic constraints along with ensuring that the resultant design is of benefit to all parties involved. The long-term effects of routing a cable through these areas must also be considered through the design and construction of such works.

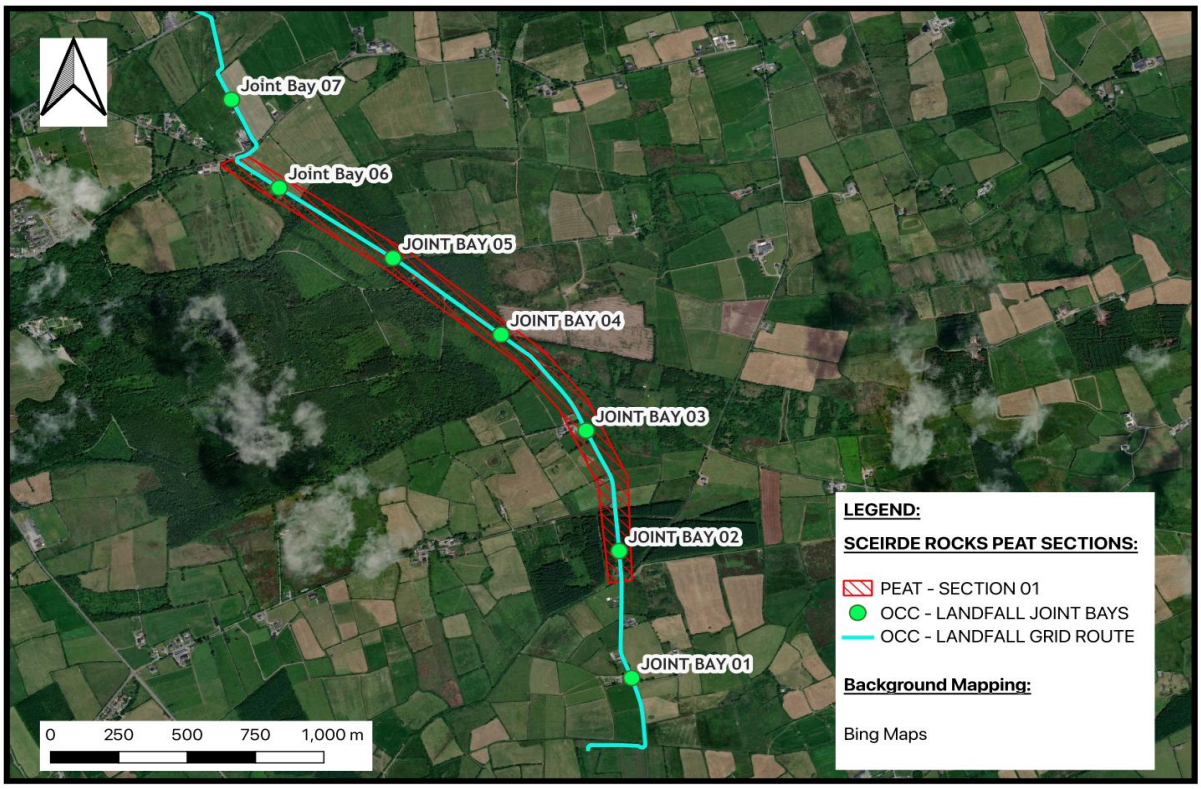



Figure 5: Sceirde Rocks Peat Section 01

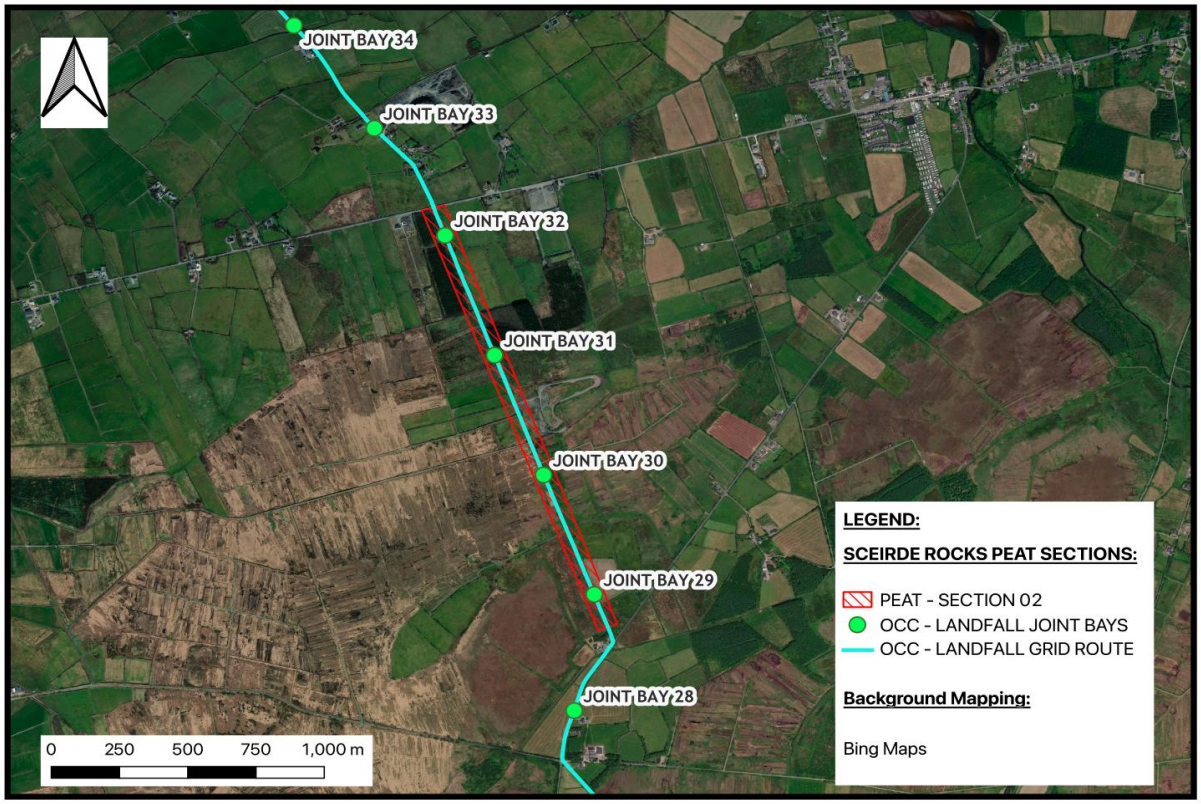



Figure 6: Sceirde Rocks Peat Section 02

## 6.7 Trenchless Installation Methods

Where necessary, trenchless installation methods have been assessed as part of the Onshore Grid Connection (OGC), the use of trenchless installation methods is determined after exhausting all other methods before determining Trenchless Installation as the most viable option. This is to be done using the Horizontal Directional Drilling (HDD) method.

HDD is to be used where there is insufficient cover or road profile depth on bridge crossings to allow the OGC to be placed within the bridge in a standard trefoil or flat formation. The launch and receptor pits are to be located on or adjacent to public roadways or along the grass margin as indicated in the relevant drawings. The locations of any HDD will be reinstated with a finish to a least pre-existing conditions.

Please see section 09 of this document for detailed information on Horizontal Directional Drilling.

## 6.8 Power Cable Installation

Once the underground cable ducts have been installed from joint bay to joint bay it is necessary to carry out a test to ensure that they have been installed to EIRGRID standards. To do this the ducts are to be thoroughly cleaned, brushed and a propriety mandrel is to be pulled through the ducts in accordance with EIRGRID specification. The contractor must provide signed proof that these tests were carried out successfully.

Once duct proving is completed the cable drums are then brought to site on a suitable transporter. They are then to be positioned in line with the back of the joint bay by utilising drum lifting equipment, a cable winch is to be attached to the cable which is then pulled through the ducts.

Once the power cables are pulled through the ducts, they are then to be jointed to each other by a cable joint. This is to be done by a suitable contractor within a clean dry environment for jointing which will help to prevent contamination of the joint by foreign bodies.

On completion the three joints are to be supported in the joint chamber on a number of sandbags. Permanent reinstatement can then take place whereby the joints are surrounded by thermal sand with the remainder of the joint bay backfilled using appropriate material as required by the site conditions and relevant road authority.

**Figure 7: Joint Bay showing cable joints prior to backfilling**

## 6.9 As-Constructed Drawings

As part of the works on the OGC, As-Constructed (As-Built) drawings are to be maintained in line with EIRGRID Specification. Any variation from EIRGRID specification will not be accepted. The contractor is responsible for ensuring that all As-Constructed drawings meet EIRGRID requirements.

These As-Constructed drawings are to record Cable Locations, Joint Bay locations and any other key features as the works progress.

## 6.10 Grid Works - Construction Compounds

To facilitate the construction works, Site Compounds will be established, these being utilised for construction material storage, safe and secure machinery parking, site offices and welfare facilities. These construction compounds will take the form of Temporary Construction Compounds located at the Onshore Compensation Compound (OCC), Kilrush Golf Club and Land Fall Locations.

These Temporary construction compounds would as above accommodate welfare facilities, Contractor/Client Offices, Meeting Rooms, Canteens, Drying Rooms, Storage Units and Multiple Car Parking Facilities for on-site staff and visitors.

### 6.10.1 Onshore Compensation Compound (OCC) – Temporary Construction Compound

This compound is located within the Onshore Compensation Compound and will facilitate offices, welfare facilities, car parking for both the Onshore Grid Connection Works as well as the Substation works. This compound is to be 76x62m and is to consist of the below:

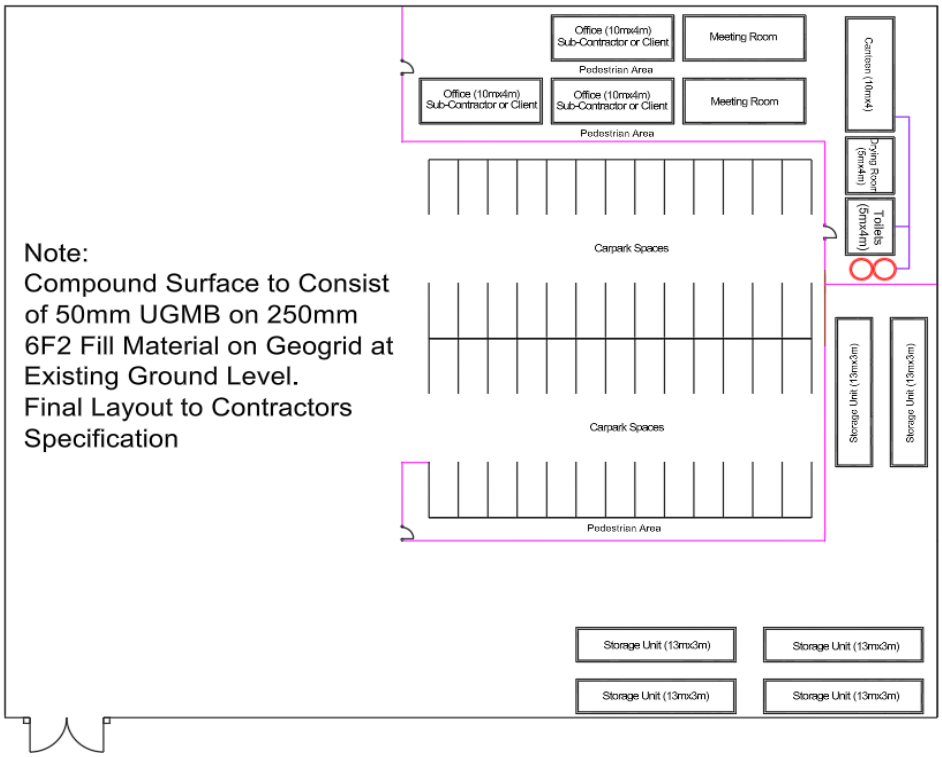



Figure 8: OCC Temporary Construction Compound

### 6.10.2 Kilrush Golf Club – Temporary Construction Compound

This compound located within Kilrush Golf Club is to facilitate the Onshore Grid Connection (OGC) works, providing storage facilities along the route along with canteen, welfare facilities and car parking. This compound is to be 25x32.5m.


**Figure 9: Temporary Compound at Kilrush Golf Club**

### 6.10.3 Landfall – Temporary Construction Compound

This compound is the largest of the three compounds and is located at the landfall location. The size of this compound is to include the offices, welfare units, drying rooms and storage facilities for the Onshore Grid Connection whilst also facilitating the landfall HDD process, providing material storage and the like. The compound as shown below is 105x52m:

**Figure 10: Temporary Construction Compound at the Landfall Location**

# 7. Traffic Management Plan

The contractor is to prepare a detailed Construction Traffic Management Plan (CTMP) with all works what interface with the existing public road network and obtain all required road opening/road closure licences. The CTMP is to be in accordance with the principles outlined below and shall comply with the requirements of:

1. Department of Transport Traffic Signs Manual 2010.
2. Department of Transport Guidance for the Control and Management of Traffic at Road Works 2010.
3. Any additional requirements detailed in the Design Manual for Roads and Bridges (DMRB) & Design Manual for Urban Roads & Streets (DMURS).

# 8. Waste Management

This section outlines the measures that will be taken to minimise the quantities of waste produced as a result of the project along with the measures to deal with said waste in such a manner as to minimise the effects on the environment. A site-specific Construction Resource & Waste Management Plan (R&WMP) will be employed to ensure sustainable and effective waste management throughout the construction of the project.

Adherence to the R&WMP prepared for the construction works will ensure that the management of waste arisings is dealt with in compliance with the provisions of the Waste Management Acts 1996 – 2015 and amendments.

## 8.1 Waste Minimisation

Waste minimisation measures proposed are summarised as follows:

- Materials to be correctly stored and handled to minimise the generation of damaged materials.
- Materials will be ordered in an appropriate sequence to minimise materials stored on-site.
- A waste tracking log is to be maintained on-site.
- Materials to be ordered on an “as-needed” basis to prevent over supply.

## 8.2 Records

A written record of all quantities and nature of wastes removed from the site will be maintained on-site in a waste file.

It is the responsibility of the construction manager or delegate that all contracted waste haulage drivers hold an appropriate waste collection permit for the transport of waste loads and that all waste materials are delivered to an appropriately licensed waste facility in compliance with the relevant regulations.

The contractor, as part of regular site inspection audits, will determine the effectiveness of the waste management strategy and will assist the project manager in determining the best methods for waste minimisation, reduction, re-use, recycling and disposal as the construction phase progresses and waste materials are generated.

## 8.3 Invasive Species Management

Regarding the introduction of highly invasive plant species, the intended construction methodology of the client shall contain measures for avoiding the introduction and spread of non-native invasive species and will follow best practice guidance documents. The control measures shall be in accordance with “The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads”. The measures outlined in “The Horticulture Code of Good Practice ‘22” and the “IFI Biosecurity Protocol for Field Survey Work ‘23” should be adhered to.

Quarries supplying materials for the project should be able to provide confirmation to the client that materials from their depot is free of non-native species and noxious weeds.

## 8.4 Estimated Volumes of Materials

**24204 - SCEIRDE ROCKS**

**TRENCH EXCAVATION QUANTITIES**

CIVIL WORKS — By: M. Moriarty
DATE: 04/11/2024 — Check: C. Murphy

**SCEIRDE ROCKS PROPOSED GRID ROUTE**

OCC - LANDFALL - TOTAL = 19.248km (Approx.) = 13.254km (Public Roadway), 4.499km (Private Lands) & 1.495 (Peat HDD Section)

**OCC - LANDFALL**

| MATERIAL | WIDTH (m) | DEPTH (m) | AREA (m2) | LESS (m2) | LENGTH (m) | TOTAL - VOLUMES (m3) |
|---|---|---|---|---|---|---|
| ***EXCAVATION WORKS*** | | | | | | |
| Excavation - Public Roadway | 1.100 | 1.250 | 1.375 | _____ | 13,054.00 | 17949.250 |
| Excavation - Third-Party Lands | 1.100 | 1.250 | 1.375 | _____ | 4427.000 | 6087.125 |
| Excavation - Joint Bays Public Road | 2.500 | 2.300 | 5.750 | _____ | 200.000 | 1150.000 |
| Excavation - Joint Bays Private Lands | 2.500 | 2.300 | 5.750 | _____ | 72.000 | 414.000 |
| Excavation - Joint Bays Peat Area | Refer to drawing | | Refer to drawing | | _____ | 1392.416 |
| **TRENCH REINSTATEMENT** | | | | | | |
| **PUBLIC ROADWAY:** | | | | | | |
| CBGM B | 1.100 | 0.575 | 0.633 | 0.131 | 13,054.00 | 6546.581 |
| UGMB | 1.100 | 0.575 | 0.633 | _____ | 13,054.00 | 8256.655 |
| Asphalt | 1.500 | 0.100 | 0.150 | _____ | 13,054.00 | 1958.100 |
| **THIRD-PARTY LANDS** | | | | | | |
| CBGM B | 1.100 | 0.575 | 0.633 | 0.131 | 4427.000 | 2220.141 |
| UGMB | 1.100 | 0.575 | 0.633 | _____ | 4427.000 | 2800.078 |
| Topsoil | 1.100 | 0.100 | 0.110 | _____ | 4427.000 | 486.970 |

***NOTE: ALL VALUES ABOVE ARE ESTIMATIONS BASED ON TYPICAL DETAILS AND ARE TO BE USED AS AN INDICATIVE GUIDE IN INFORMING THE DESIGN PROCESS***

Table 2: Indicative Material Quantities (LF – OCC)

MWP

**24204 - SCEIRDE ROCKS**

**TRENCH EXCAVATION QUANTITIES**

CIVIL WORKS — *BY: M. Moriarty*
DATE: 04/11/24 — *Check: C. Murphy*

**SCEIRDE ROCKS PROPOSED GRID ROUTE**

OCC - MONEYPOINT - TOTAL = 2.946km (Appox.) = 0.739km (Public Roadway), 0.662km (Road Verge) & 1.545km (Private Lands)

**MONEYPOINT - OCC GRID ROUTE**

| *MATERIAL* | *WIDTH (m)* | *DEPTH (m)* | *AREA (m2)* | *LESS (m2)* | *LENGTH (m)* | TOTAL - VOLUMES (m3) |
|---|---|---|---|---|---|---|
| ***EXCAVATION WORKS*** | | | | | | |
| Public Roadway | 1.100 | 1.250 | 1.375 | _____ | 731.000 | 1005.125 |
| Road Verge | 1.100 | 1.250 | 1.375 | _____ | 646.000 | 888.250 |
| Third-Party Lands | 1.100 | 1.250 | 1.375 | _____ | 1529.000 | 2102.375 |
| Joint Bays Public Road | 2.500 | 2.300 | 5.750 | _____ | 40.000 | 230.000 |
| **TRENCH REINSTATEMENT** | | | | | | |
| **PUBLIC ROADWAY:** | | | | | | |
| CBGM B | 1.100 | 0.575 | 0.633 | 0.131 | 731.000 | 366.597 |
| UGMB | 1.100 | 0.575 | 0.633 | _____ | 731.000 | 462.358 |
| Asphalt | 1.500 | 0.100 | 0.150 | _____ | 731.000 | 109.650 |
| **ROAD VERGE:** | | | | | | |
| CBGM B | 1.100 | 0.575 | 0.633 | 0.131 | 646.000 | 323.969 |
| UGMB | 1.100 | 0.575 | 0.633 | _____ | 646.000 | 408.595 |
| Topsoil | 1.100 | 0.100 | 0.110 | _____ | 646.000 | 71.060 |
| **PRIVATE THIRD-PARTY LANDS:** | | | | | | |
| CBGM B | 1.100 | 0.575 | 0.633 | 0.131 | 1529.000 | 766.794 |
| UGMB | 1.100 | 0.575 | 0.633 | _____ | 1529.000 | 967.093 |
| Topsoil | 1.100 | 0.100 | 0.110 | _____ | 1529.000 | 168.190 |

***NOTE: ALL VALUES ABOVE ARE ESTIMATIONS BASED ON TYPICAL DETAILS AND ARE TO BE USED AS AN INDICATIVE GUIDE IN INFORMING THE DESIGN PROCESS***

Table 3: Indicative Excavation Quantities (Moneypoint – OCC)

# 9. Crossings Locations

To best inform the design approach to be utilized when undertaken the design of the Onshore Grid Connection (OGC), As part of the Preliminary investigations undertaken by Malachy Walsh & Partners (MWP) Inspections of Crossing Locations was undertaken to determine any constraints that may be present so to allow for consideration of these areas throughout the design process. A series of crossing locations were assessed based on desktop information received, these then being verified on-site with a summary of findings outlined in Section 9.3


LEGEND:
SCEIRDE ROCKS GRID ROUTE
CROSSING LOCATIONS
MONEYPOINT GRID ROUTE
LANDFALL GRID ROUTE
BACKGROUND MAPPING
BING MAPS
LF-C-30 (HDD 14)
LF-C-29 (UNDERCROSSING)
LF-C-28 (UNDERCROSSING)
LF-C-27 (HDD 18)
LF-C-26 (HDD 17)
LF-C-25 (HDD 16)
LF-C-24 (HDD 15)
LF-C-23 (HDD 14)
LF-C-22 (OVERCROSSING)
LF-C-21 (HDD 13)
LF-C-20 (HDD 12)
LF-C-19 (HDD 11)
LF-C-18 (HDD 10)
LF-C-17 (OVERCROSSING)
LF-C-16 (UNDERCROSSING)
LF-C-15 (HDD 09)
LF-C-14 (HDD 08)
LF-C-13 (HDD 07)
LF-C-08 (REPLACEMENT)
LF-C-10 (HDD 05)
LF-C-09 (REPLACEMENT)
LF-C-07 (UNDERCROSSING)
LF-C-12 (OVERCROSSING)
LF-C-11 (HDD 06)
LF-C-06 (OVERCROSSING)
LF-C-05 (OVERCROSSING)
LF-C-04 (HDD 04)
LF-C-03 (HDD 03)
LF-C-02 (HDD 02)
LF-C-01 (OVERCROSSING)
0
1
2
3
4 km

Figure 11: Crossing Locations – OCC to Landfall

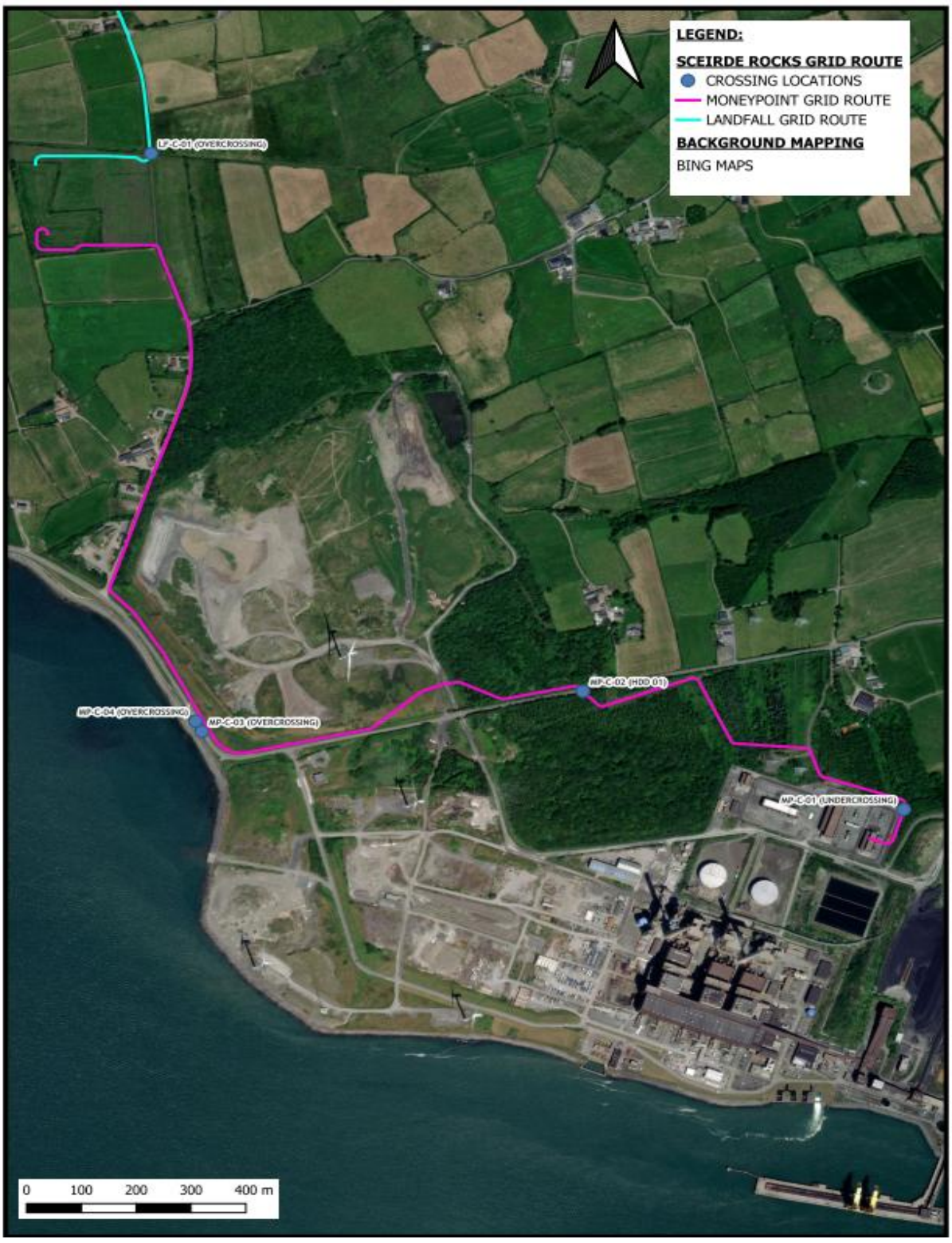



Figure 12: Crossing Locations - Moneypoint to OCC

## 9.1 Grid Installation in Peat Lands

### 9.1.1 Option 1 – Conventional Trench Methodology

The preferred method of installing UGC would be to utilise standard trenching methods which would be the most practical and economical solution in most instances. Conventional trenching methods become problematic when dealing with deep peat sections as deeper peat may not have the geotechnical characteristics to support the standard trench details in this environment. One would be required to excavate out substantial amounts of the peat, reaching solid formation and then backfill the excavation to create a solid formation for the UGC.

With this, one would also be required to consider the constraints from an environmental perspective in conjunction with the engineering challenges. One of the potential issues with conventional trench solutions within peat is that one could inadvertently introduce a drainage channel into the peat which may have potential impacts on this sensitive habitat.

Along with the above constraints, as designers we are also required to look at the long-term effects of any proposed solution, looking at conventional trenching through peat sections, one would have to consider the effects of settlement over time.

The two sections of peat we are assessing as part of the Onshore Grid Connection would be as detailed above “Section 01” and “Section 02”. Section 01 which is just north of the Carrowdotia Onshore Compensation Compound (OCC), from SI Data obtained is of shallow nature and therefore does not become critical in the design process as this can be managed through typical design techniques being utilised as described above. In depths which exceed the standard trench depths through peat, one can utilise a regulation layer of CBGM B which can be used as an upfill layer to trench formation level.

Section 02 provides a greater challenge in design as the depths of peat are much greater, Section 02 of the peat has depths on average of approximately 4.0m, thus ruling out the option of utilising conventional trenching techniques. The environmental considerations become key within this area and a method of UGC installation must be determine which considers all the above outlined issues.

In conclusion, due to the relatively shallow depths of peat within Section 01 conventional trench installation may be utilised in some form considering the whole life cycle of the project and any environmental constraints that may be present. However, within Section 02 of the peat, one will have to utilise alternative methods of UGC installation to ensure the environmental impact, economic impact and constructability are all considered.

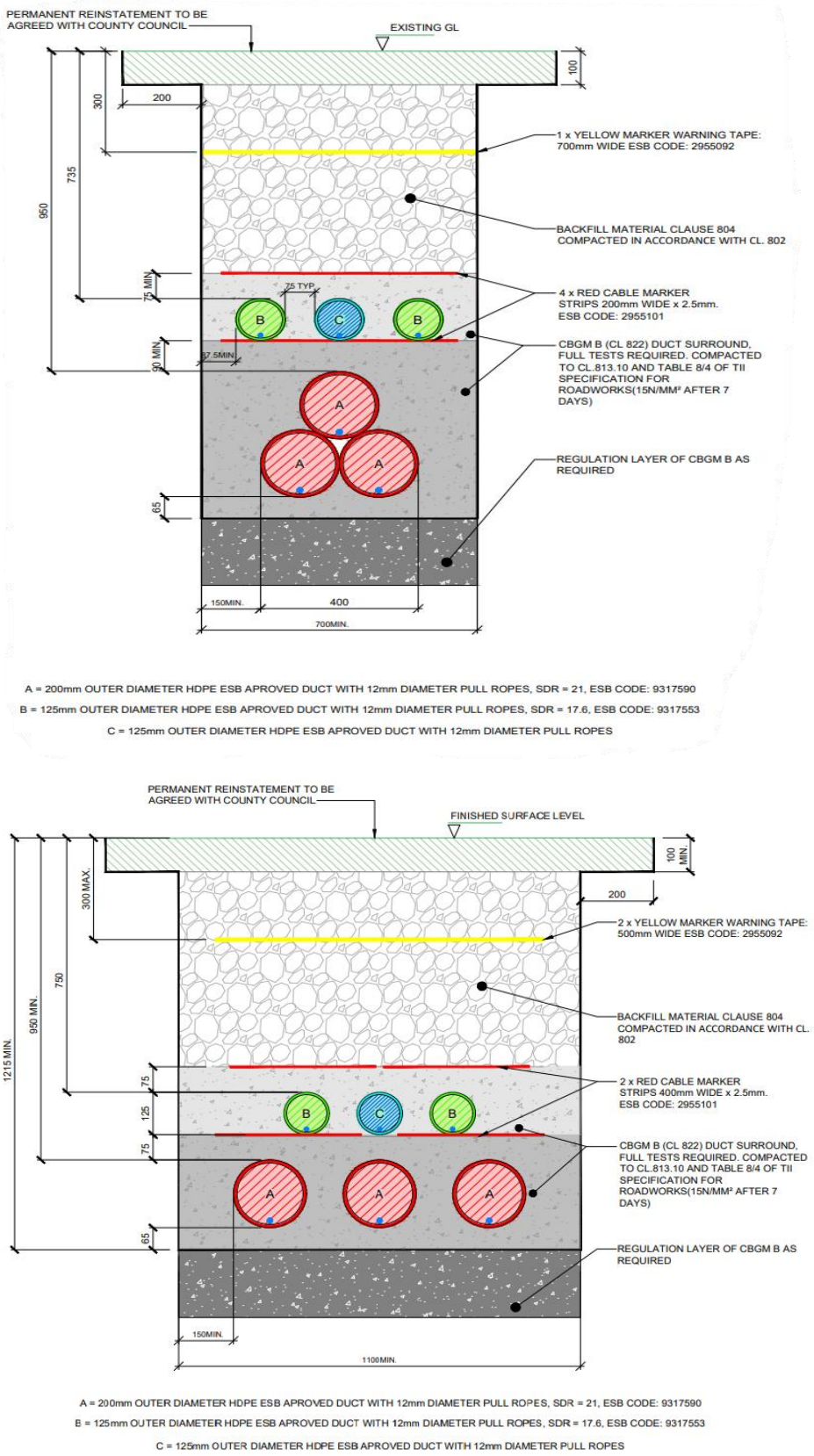



**Figure 13: 220kV Trench Details**

### 9.1.2 Option 2 – Trenchless Technologies

Trenchless Technologies can be a beneficial method of installation for underground cables especially when looking to cross watercourses, bridges and culverts whereby traditional trench installation methods cannot be utilised. Trenchless Technologies can allow for minimal impact to the watercourse and/or structures associated with said crossing.

Trenchless Technologies, namely Horizontal Directional Drilling (HDD) is to be utilised at a number of watercourse crossings along the Onshore Grid Connection, along with these locations, HDD is proposed as the appropriate methodology option through section 02 of the peat. Utilising HDD in this location would allow the installation of the UGC to take place below the peat layer.

In undertaking HDD through the peat section, a longitudinal excavation would be avoided reducing the impact on the existing road. The only areas in which disturbance to the road structure would take place is at the Joint Bay Locations whereby a Cofferdam Construction approach could be utilised.

Following consultation with Clare County Council, destabilisation of the road structure was considered within the design and through utilising HDD in this section of the route, one would greatly reduce any impact on the road itself as the HDD is to go below the peat layer to competent rock (Depths of Approx. 8.0m below the road level). Thus, eliminating any impact of the road network and peat layers.

It is proposed that through section 02 of the peat, through the utilisation of HDD, the OGC is proposed to be installed at depths of approximately 8.0m (4.0m below bottom of peat layer). It is proposed to string the HDD from joint bay to joint bay along the route (approx. 500m). thus, minimising the impact along the route. The advantage of utilising this approach is that the Impact on the Bog Rampart/Legacy Road is greatly reduced, sterilisation of the road network is reduced due to cable depths.

The direction drill will be carried out as follows:

At each joint bay location, a sheet pile cofferdam will be installed and the peat removed and replaced with rockfill. The cofferdam technique of installing the rockfill jointing area will cut off any drainage of the surrounding peat.

The directional drilling machine will set up at a launch pit (to be established at the Joint Bay Locations). The drill will then bore under the peat from one joint bay to another as shown in Figure 8 below. Full and approved traffic management will be incorporated prior to mobilization and set up of the directional drilling rig.

The drill head will enter the mineral soil within the confines of the rockfill area and will progress at a minimum of 4m below the peat clay interface.

The drilling head of the boring tool has a series of nozzles that feed a liquid bentonite mix along the bore direction, which provides both lubrication and support to the bore.

Once the bore reaches the far side, the duct is then attached to the drill head and the duct is pulled back along the Section to the original drilling point.

Any bentonite mix is deposited within the bore shaft and is collected at either end of the bore within the dedicated launch/receiver pits; all excavated material and excess bentonite will be removed from site and brought to an authorised waste facility.

Once the duct is in place under the peat sections and the transition section completed, the normal process of road trenching can continue from either side of the HDD sections.

The launch and reception pits will then become Joint Bay Locations constructed to EIRGRID standards with the surrounding road network filled back up to the ground level with a finish to at least pre-existing conditions as

agreed with Clare County Council. Suitable warning tapes will also be installed in the pits as per ESBN approved design specifications.

**Figure 14: Horizontal Directional Drilling Equipment**

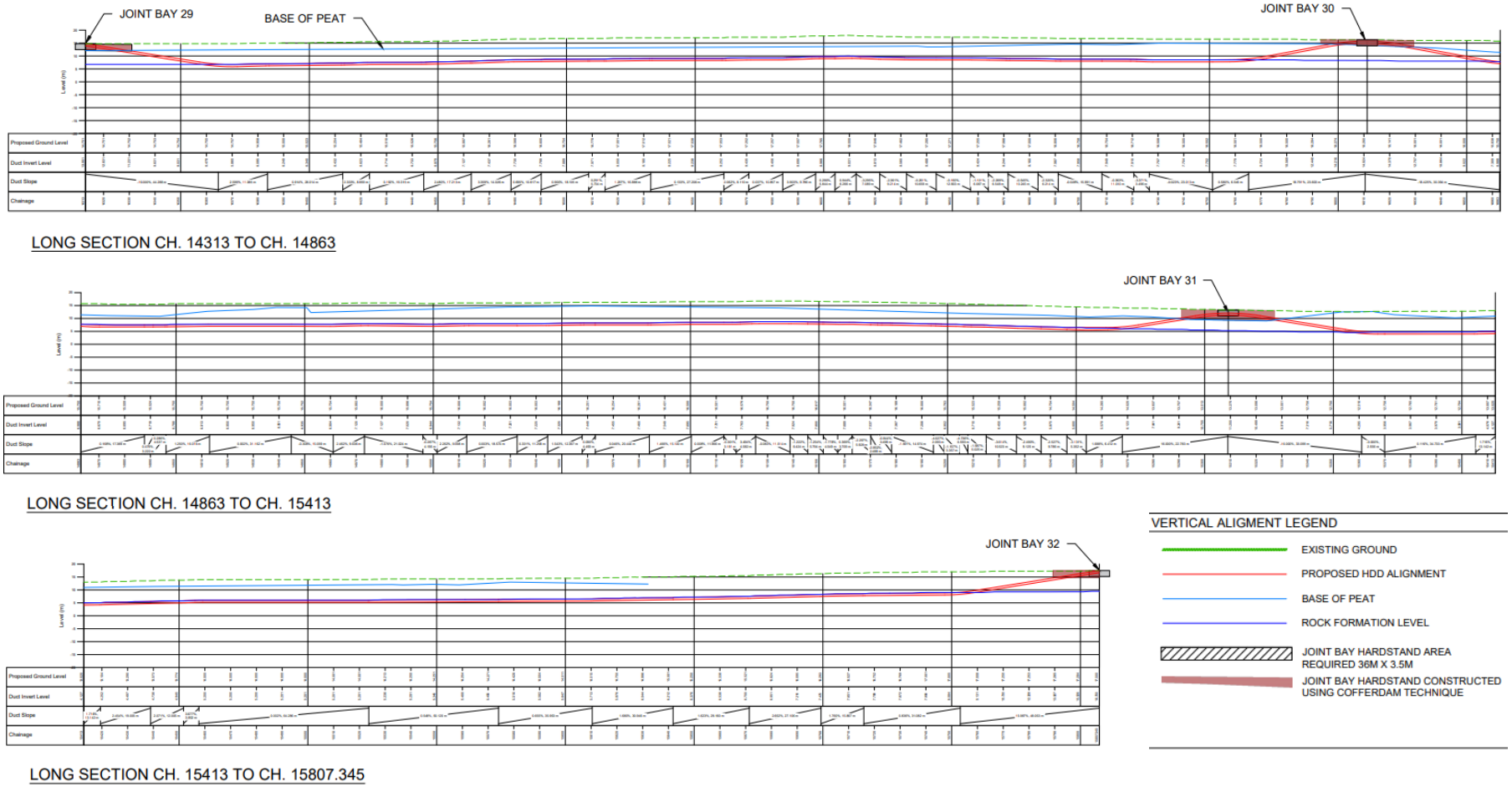



**Figure 15: HDD Solution Through Section 02 of Peat**

## 9.2 Water Course Crossings

Further developing on section 5 of this report. There are a large number of watercourse crossings along the route of the onshore site. The proposed methodologies for the provision of the development at these locations are set out in Table 2 below which provides a summary of bridge survey results.

A description of each crossing option is provided below:

### 9.2.1 Option 1 – Crossings over Bridges using Standard Trefoil Formation

Watercourses will not be directly impacted as no in-stream works or bridge alterations are proposed. Where adequate cover exists within a given bridge, a standard trefoil arrangement will be used where the ducts will pass over the bridge without any contact with the top of the bridge or watercourse.

### 9.2.2 Option 2 – Flatbed Formation over Bridges

Where ducts are to be installed over an existing bridge and sufficient cover cannot be achieved by installing a standard trefoil arrangement, the ducts will be laid in a much shallower trench. The ducts will be laid in a flatbed formation over the existing bridge and encased in a concrete surround with galvanised steel protection plates over the cables. It may be necessary to locally raise the level of the existing road in order to achieve the required cover over the ducts. The increased road level will be achieved by overlaying the existing road with a new wearing course where any addition of new pavement will be tied back onto the existing road. Any works to locally raise the level of the existing road and potentially the bridge parapets are to be agreed with Clare County Council prior to commencement with all works and reinstatement carried out to their satisfaction. Once the ducts have crossed the bridge the ducts will resume to the standard trefoil arrangement.

### 9.2.3 Option 3 – Directional Drilling under Bridges and Watercourses

In the event that none of the above methods are appropriate, directional drilling will be utilised, which will require a service trench (launch pit) for the drill in the road either side of the watercourse. The directional drill process will require that the depth of the service trench will deepen in a defined slope as it approaches the watercourse crossing on either side.

As detailed previously, the direction drill will be carried out as follows:

The directional drilling machine will set up at a launch pit (an enlarged portion of on-road trench, i.e. a service trench on either side of the crossing point at approx. 25m back from the watercourse). The drill will then bore in an arc under the watercourse feature. Full and approved traffic management will be incorporated prior to mobilization and set up of the directional drilling rig.

The drilling head of the boring tool has a series of nozzles that feed a liquid bentonite mix along the bore direction, which provides both lubrication and support to the bore.

Once the bore reaches the far side, the duct is then attached to the drill head and the duct is pulled back along the Onshore Grid Connection of the bore to the original drilling point.

Any bentonite mix is deposited within the bore shaft and is collected at either end of the bore within the dedicated launch/receiver pits; all excavated material and excess bentonite will be removed from site and brought to an authorised waste facility.

Once the duct is in place under the watercourse, the normal process of road trenching can continue from either side of the watercourse structure.

The launch and reception pits will be backfilled with appropriate engineered backfill and filled back up to the ground level with a finish to at least pre-existing conditions as agreed with Clare County Council. Suitable warning tapes will also be installed in the pits as per ESBN approved design specifications.

## 9.3 Summary of Findings (Crossing Locations)

Overleaf, find a detailed summary of findings as a result of inspection of Crossing locations along the Onshore Grid Connection. Please refer to Appendix 1 at the back of this report for crossing reference drawings along the Onshore Grid Connection.

The following naming convention has been utilized

MP-C-01 → Moneypoint Grid Route Section (MP) – C (Crossing) – 01 (Section A)

LF-C-01 → Landfall Grid Route Section (LF) – C (Crossing) – 01 (Section B)

| ONSHORE GRID CONNECTION – CROSSING LOCATIONS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Crossing No. | Culvert Description | Dimension FRL to Invert | Wall/Crown Thickness | Available Cover (Allowing 300mm Separation) | Proposed Crossing Methodology | Carriageway Widths at HDD Locations | Parapets | Section 50 | Notes | Image |
| MP-C-01 | Open Drain Crossing | TBC | N/A | N/A | Undercrossing | _____ | N | Y | Running along the back of 220kV substation at Moneypoint<br>Reference Drawing: IRE1-HMV-ONC-EL-PD-6000 |  |
| MP-C-02 | N67 National Roadway | N/A | N/A | N/A | HDD 01 | Approx. 6.500m | N/A | N/A | HDD Under National Roadway to avoid traffic disruption and to limit future potential service sterilisation.<br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7011 |  |
| MP-C-03 | Piped Watercourse Crossing from Fly Ash Disposal Area piped to shore outfall | 4.0m Approx. TBC | N/A | 3.7m Approx | Overcrossing | _____ | N/A | Y | 900mm Steel Pipe at Outfall, Pipe is marked as 300mm dia. in planning drawings, Chamber Partially full of beech stone on inspection.<br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |
| MP-C-04 | Box Culvert Outfall | TBC | N/A | 3.7m Approx. | Overcrossing | _____ | N | N | Maybe Redundant - TBC by Local Authority Records<br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |
| LF-C-01 | Piped Watercourse 1050mm Ogee Type RC Pipe | 3.0m | 0.1m | 1.55m | Overcrossing | _____ | N | Y | Multiple Cracked Pipes<br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LF-C-02 | Stone Culvert Approx 700mm High and 1000mm Wide | 1.8m | 0.1m | 0.7m | HDD 02 | 3.140m | N | Y | Dry Stone Construction<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7007 |  |
| LF-C-03 | Double Arch Masonry Bridge each Arch Approx 3.0m Wide and 1.6m High | 2.4m | 0.5m | 0.3m | HDD 03 | 4.980m | 0.3m High | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-7006 |  |
| LF-C-04 | N68 National Road Crossing | N/A | N/A | N/A | HDD 04 | Approx. 9.500m | N/A | N/A | Reference Drawing: IRE1-HMV-ONC-EL-PD-7010 |  |
| LF-C-05 | Concrete Piped Crossing | TBC | N/A | N/A | Overcrossing | _____ | N | Y | Within KGC<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |
| LF-C-06 | Concrete Piped Crossing | TBC | N/A | N/A | Overcrossing | _____ | N | N | Within KGC<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LF-C-07 | Open Field Drain | 1.8m | N/A | N/A | Undercrossing | _____ | N/A | N | Reference Drawing: IRE1-HMV-ONC-EL-PD-6000 |  |
| LF-C-08 | Stone Culvert 0.3m x 0.3m | 1.2m | 0.15 | 0.6 | CULVERT REPLACEMENT | 2.515m | N | N | Partially Collapsed<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7002 |  |
| LF-C-09 | Stone Culvert 0.3m x 0.3m | 1.2m | 0.15m | 0.6m | CULVERT REPLACEMENT | 2.550m | N | N | Hidden in Overgrowth<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7002 |  |
| LF-C-10 | Stone Culvert 0.3m x 0.3m | 0.9m | 0.15 | 0.45m | HDD 05 | 2.450m | N | Y | Damaged/Partially Collapsed<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LF-C-11 | 375mm RC Pipe Crossing | 0.8m | 0.04m | 0.085m | HDD 06 | 2.440m | N | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-700 |  |
| LF-C-12 | 450mm RC Pipe Crossing | 2.1m | 0.05m | 1.3m | Overcrossing | _____ | N | Y | 1st Section of Pipe Damaged<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |
| LF-C-13 | Stone Culvert | 1.6m | TBC | TBC | HDD 07 | _____ | Y | Y | Drain Partially Blocked<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |
| LF-C-14 | Stone Culvert Approx 600mm Wide and 500mm High | 1.8m | 0.15 | 0.85m | HDD 08 | 5.325m | N | Y | RC Pipe Installed on Downstream Side<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LF-C-15 | Masonry Bridge, Overlain with Concrete Slab Arch 2.4m High | 4.3m | 0.4m | 0.8m | HDD 09 | 5.085m | 0.75m High | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-7003 |  |
| LF-C-16 | 300mm Twin Wall Plastic Pipe | 1.75m | 0.55m | 0.6m | Undercrossing | _____ | N | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-7000 |  |
| LF-C-17 | 2nr 1200mm Concrete Pipes | 2.7m | 0.1m | 1.1m | Overcrossing | _____ | 0.7m High | Y | Parapets in Poor Condition and Partially Collapsed<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |
| LF-C-18 | Assumed Stone Culvert | 2.1m | TBC | 1.3m | HDD 10 | 4.870m | N | N | Flooded at time of Survey & Possibly Blocked<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LF-C-19 | 2nr 600mm Concrete Pipes | 1.5m | 0.05m | 0.55m | HDD 11 | 4.315m | N | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-7009 |  |
| LF-C-20 | 600mm Concrete Pipe | 1.5m | 0.05m | 0.55m | HDD 12 | 4.100m | N | N | RC Pipe Possibly installed in old stone culvert<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7009 |  |
| LF-C-21 | Stone Culvert 0.6m High | 1.6m | 0.15m | 0.55m | HDD 13 | 4.600m | N | N | 450mm Concrete Pipe installed on upstream side<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |
| LF-C-22 | 2nr 1200mm Concrete Pipes | 3.4m | 0.1m | 0.9m | Overcrossing | _____ | 0.9m High | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-7001 |  |

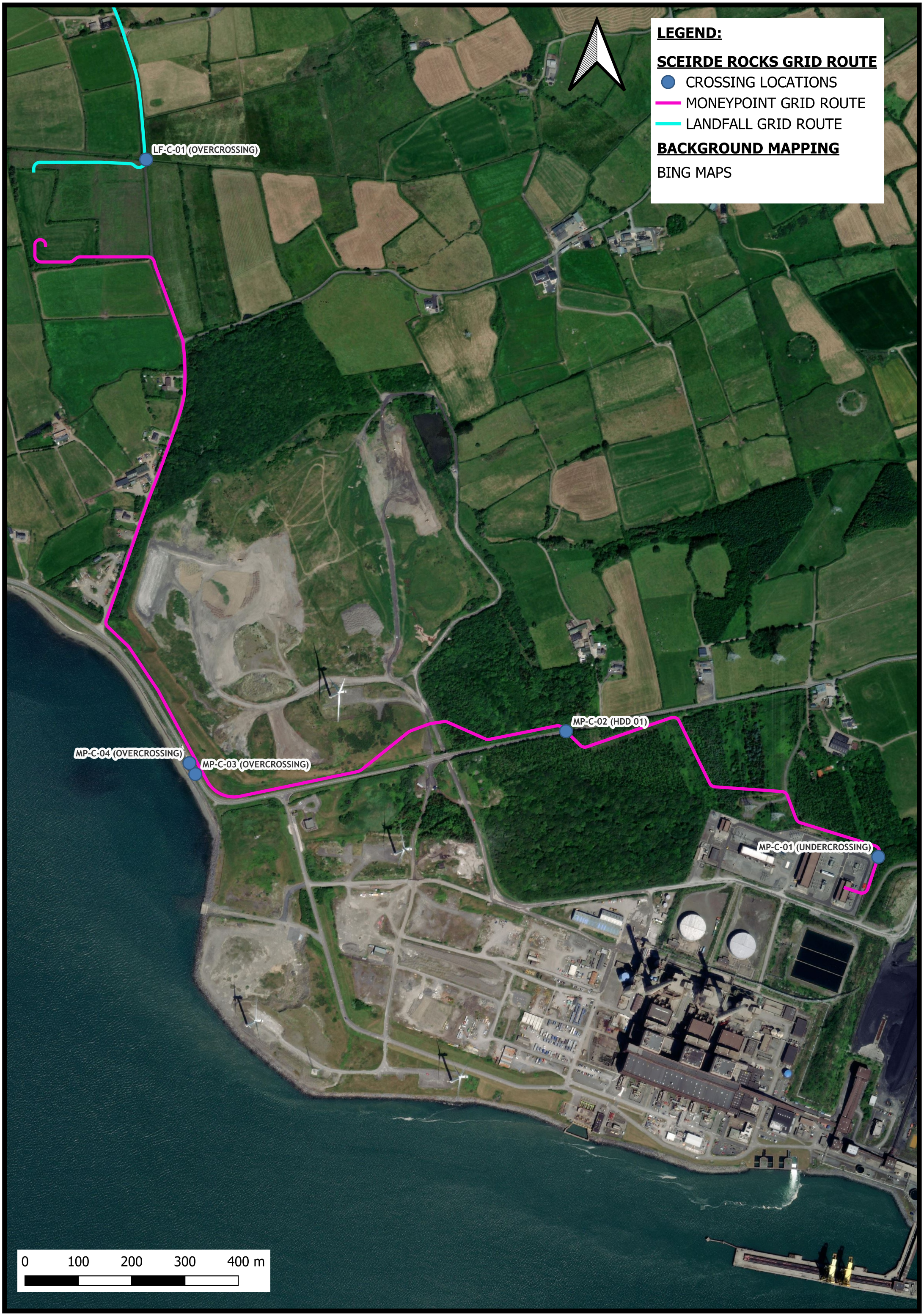
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LF-C-23 | Twin Stone Culvert 0.7m High | 2.2m | 0.15m | 1.05m | HDD 14 | 3.000m | 0.4m High | Y | 300mm Concrete Pipes Installed on upstream Side<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7005 |  |
| LF-C-24 | N57 National Road Crossing | N/A | N/A | N/A | HDD 15 | Approx. 7.500m | N/A | N/A | Reference Drawing: IRE1-HMV-ONC-EL-PD-7010 |  |
| LF-C-25 | 0.35H x 0.7w Stone Culvert | 1.6m | 0.15m | 0.8m | HDD 16 | 5.300m | N | N | Collapsed / Blocked with stone<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7007 |  |
| LF-C-26 | Stone Culvert 0.7m High | 1.1m | 0.15m | 0m | HDD 17 | 2.620m | N | Y | 300mm Concrete Pipe Installed within culvert<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |
| LF-C-27 | Stone Culvert 0.6m Wide 0.4m High | 1 | 0.15 | 0.15 | HDD 18 | 2.515m | N | N | Dry at time of Survey<br><br>Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LF-C-28 | Open Field Drain | 1.2m | N/A | N/A | Undercrossing | _____ | N/A | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-6000 |  |
| LF-C-29 | Open Field Drain | TBC | N/A | N/A | Undercrossing | _____ | N/A | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-6000 |  |
| LF-C-30 | Stone & 450mm Pipe Culvert | 1.2m Approx. | 0.05 | 0.5 | HDD 19 | 3.375m | N | Y | Reference Drawing: IRE1-HMV-ONC-EL-PD-7008 |  |

**Table 4: Crossing Locations - Summary of Findings**

# Appendix 1

## Site Layout Plan


LEGEND:
SCEIRDE ROCKS GRID ROUTE
CROSSING LOCATIONS
MONEYPOINT GRID ROUTE
LANDFALL GRID ROUTE
BACKGROUND MAPPING
BING MAPS
LF-C-01 (OVERCROSSING)
MP-C-04 (OVERCROSSING)
MP-C-03 (OVERCROSSING)
MP-C-02 (HDD 01)
MP-C-01 (UNDERCROSSING)
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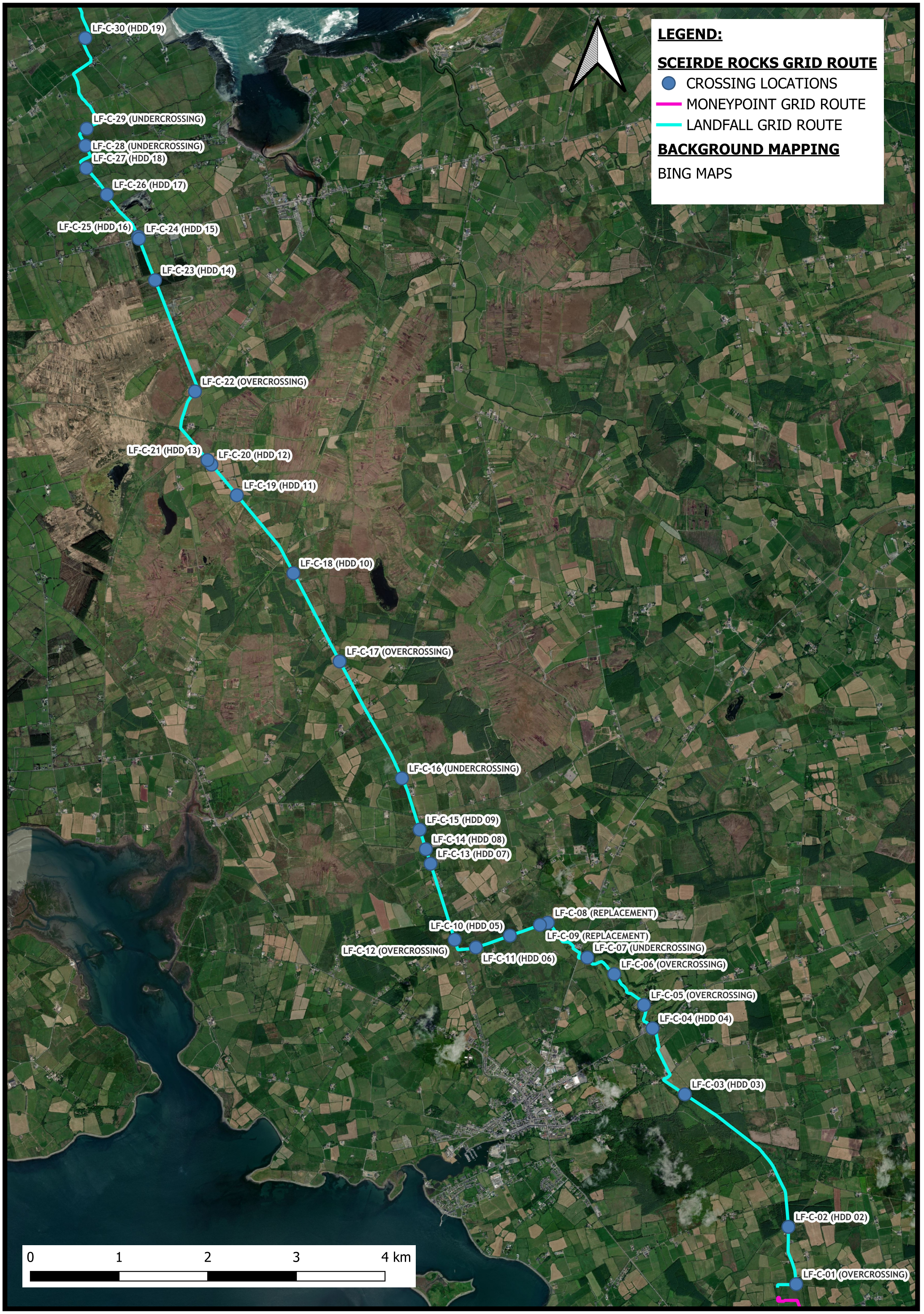
300
400 m


LF-C-30 (HDD 19)
LF-C-29 (UNDERCROSSING)
LF-C-28 (UNDERCROSSING)
LF-C-27 (HDD 18)
LF-C-26 (HDD 17)
LF-C-25 (HDD 16)
LF-C-24 (HDD 15)
LF-C-23 (HDD 14)
LF-C-22 (OVERCROSSING)
LF-C-21 (HDD 13)
LF-C-20 (HDD 12)
LF-C-19 (HDD 11)
LF-C-18 (HDD 10)
LF-C-17 (OVERCROSSING)
LF-C-16 (UNDERCROSSING)
LF-C-15 (HDD 09)
LF-C-14 (HDD 08)
LF-C-13 (HDD 07)
LF-C-08 (REPLACEMENT)
LF-C-10 (HDD 05)
LF-C-09 (REPLACEMENT)
LF-C-12 (OVERCROSSING)
LF-C-11 (HDD 06)
LF-C-07 (UNDERCROSSING)
LF-C-06 (OVERCROSSING)
LF-C-05 (OVERCROSSING)
LF-C-04 (HDD 04)
LF-C-03 (HDD 03)
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LEGEND:
SCEIRDE ROCKS GRID ROUTE
CROSSING LOCATIONS
MONEYPOINT GRID ROUTE
LANDFALL GRID ROUTE
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BING MAPS
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