East Meath - North Dublin Grid Upgrade Environmental Impact Assessment Report (EIAR): Volume 5

Preface and Contents

EirGrid

March 2024

Preface

The structure of this Environmental Impact Assessment Report (EIAR) for the East Meath – North Dublin Grid Upgrade (hereafter referred to as the Proposed Development) is summarised as follows:

Volume 1: Non-Technical Summary

Volume 1 provides a non-technical summary of the information contained in Volume 2 of the EIAR.

Volume 2: Main Environmental Impact Assessment Report

Volume 2 provides a general introduction, outlines the environmental impact assessment process, describes the scope of the Proposed Development, presents the consideration of reasonable alternatives and describes the environmental impacts specific to the Proposed Development.

Volume 3: Appendices

Volume 3 provides documentation and data that is supplemental to the information provided in Volume 2 of the EIAR.

Volume 4: Figures

Volume 4 provides drawings and large format images (labelled as 'Figures') that illustrate the information detailed in Volume 2 of the EIAR.

Volume 5: Supporting Documents

Volume 5 provides supporting documentation that were produced during the development of the Proposed Development.

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Needs Report

CP1021 North Dublin Corridor

November 2017

1 Table of Contents

2 Introduction

EirGrid's process on how to develop identified transmission network problems into viable technical solutions and further into construction and energisation is described in the document 'Have Your Say' published on EirGrid's website (www.eirgridgroup.com). On a high-level this process has six steps as shown below in figure 1. Each step has a distinct purpose with defined deliverables.

The Needs Report (this document) is a deliverable for Step 1. It will describe an identified transmission network problem. In this case the network problem is a shortage of capacity to transfer power along a corridor of 220 kV transmission lines in North Dublin. This corridor is between the Woodland 400 kV station to the north west of Dublin, the key load and generation centres at Finglas, Corduff, and Belcamp 220 kV stations, and load and generation in the city centre at Poolbeg and Shellybanks 220 kV stations.

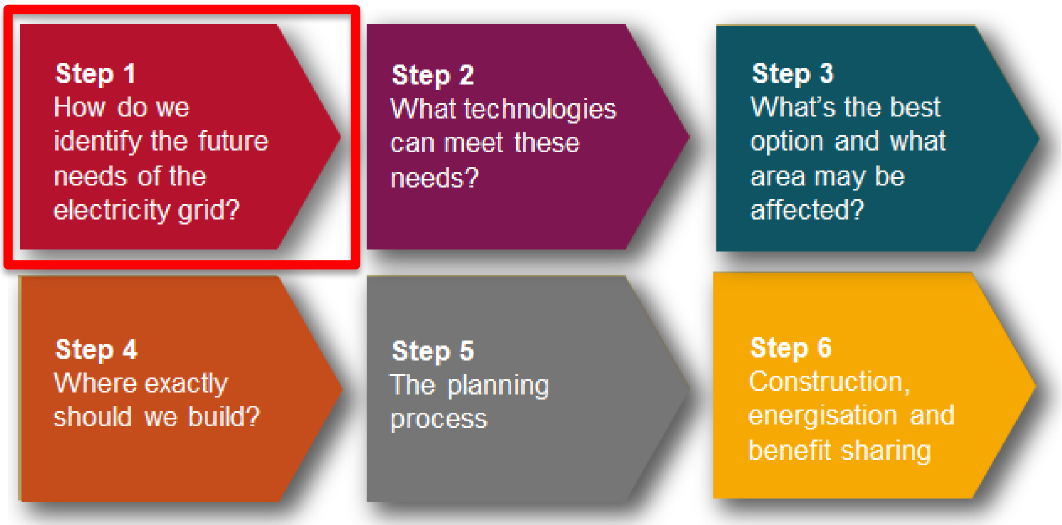

Figure 1 *High level project development process*

2.1 Our statutory role

EirGrid is the national electricity Transmission System Operator (TSO) for Ireland. Our role and responsibilities are set out in Statutory Instrument No. 445 of 2000 (as amended); in particular, Article 8(1) (a) gives EirGrid, the exclusive statutory function:

"To operate and ensure the maintenance of and, if necessary, develop a safe, secure, reliable, economical, and efficient electricity transmission system, and to explore and develop opportunities for interconnection of its system with other systems, in all cases with a view to ensuring that all reasonable demands for electricity are met and having due regard for the environment."

Furthermore, as TSO, we are statutorily obliged to offer terms and enter into agreements, where appropriate and in accordance with regulatory direction, with those using and seeking to use the transmission system. Upon acceptance of connection offers by prospective network generators and demand users, we must develop the electricity transmission network to ensure it is suitable for those connections.

3 Regulatory Targets and Policy

One of EirGrid's roles is to plan the development of the electricity transmission grid to meet the future needs of society. To do this we consider how electricity may be used and generated years from now and what this means for the electricity grid of today.

The key to this process is considering the range of possible ways that energy usage may change in the future. This means that we will analyse different scenarios that would represent this. Using this approach will allow us to efficiently develop the grid taking account of the uncertainties associated with the future demand for electricity and the future location and technology used to generate electricity.

3.1 EirGrid scenarios

To help us account for the uncertainties of the future, EirGrid have published a document titled *Tomorrow's Energy Scenarios 2017* to capture the range of possible future scenarios in energy production and usage. These scenarios were formed by EirGrid following a period of public consultation and with significant input from government departments and agencies, energy research groups, and industry representatives. Four future scenarios have been developed: Steady Evolution, Low Carbon Living, Slow Change and Consumer Action.

At the time of this need investigation the transition to Scenario Planning was not complete and the study cases required for analysis were not available. Bespoke study cases were created for this needs assessment.

When the input data for the Tomorrows Energy Scenarios became available the assumptions used in the study cases were compared with the scenarios. The assumptions were found to align with the three scenarios that have been developed for 2025. These are the Slow Change, Steady Evolution, and Low Carbon Living scenarios. Specific assumptions taken account of are:

- The demand levels in the cases, excluding data centre demand, were generally consistent with the demand levels presented in the Forecast Statement 2015-2024, which in turn takes information from the Generation Capacity Statement 2015-2024. These publications were the most up to date available at the time of the study. This assumption is very similar to the assumptions used in the Slow Change and Steady Evolution scenarios. However a number of new and existing customers in the Dublin region have requested new connections or increases in existing connection agreements.

- Connection of data centres has been accounted for in line with latest known information at this point in time. In total, just over 1200 MW of data centres have been assumed in the cases (see section 3.3 for more details). This figure is based on executed connection agreements and offered connection agreements. This assumption is in line with the assumed data centre demand figure used in the 2025 Low Carbon Living scenario, which is 1400 MVA.
- The connection of renewable generation to meet the Governance's renewable energy target of meeting 40% electricity demand from renewable generation by 2020 - covered by the Steady Evolution scenario.

In line with our statutory obligation the future scenarios are analysed to establish that the transmission system is in compliance with the Transmission System Security Planning Standards (TSSPS). If the system is in breach of any of these standards the issue must be addressed and a solution identified.

3.2 Study assumptions

The above mentioned assumptions were used to create the cases that were subsequently analysed. The year 2025 was chosen for analysis as it was deemed an appropriate point in time to assess the long term strategic needs of the system and to design reinforcement options to address those needs. Later years will be studied in Steps 2 and 3 solution option development, particularly when determining headroom created by the solutions. This year has been determined as the earliest stable point in the future to form a reliable development plan around. By this time it is expected that a number of network reinforcements will have been implemented, Gate 3 renewable generation will have been integrated into the system and a number of new loads will have been connected into the Dublin network.

Some of the reinforcements that have been assumed to be energised were:

- the series compensation of the existing 400 kV circuits,
- a 400 kV submarine cable across the Shannon Estuary between Moneypoint 400 kV station and Kilpaddoge 220 kV station,
- and reinforcement of the network between Dunstown and Woodland 400 kV stations.

A need to reinforce the network between Dunstown and Woodland 400 kV stations has been identified but the best performing solution option has not been selected at the time of this report. The solution option between Dunstown and Woodland assumed for the purposes of this study was the creation of a new 400 kV circuit between the stations. This new circuit is achieved by increasing the voltage of an existing 220 kV path between the stations to 400 kV using innovative tower reconstruction methods. The inclusion of this network solution will have little impact on the outcome of this study as the issues in the Kildare to Meath Reinforcement Project, and North Dublin are unrelated.

The existing Moyle Interconnector and East-West Interconnector (EWIC) were assumed available in 2025. Moyle and EWIC will be assumed to have 500 MW import/export capacity.

Two seasonal variations were studied to examine the effect of different load profiles and ratings: Winter Peak and Summer Peak. Winter and Summer Peak represent points in time when the system is most heavily loaded and therefore the time when there is most likely to be thermal issues on the system and low voltage risks. A minimum load case was not considered at this time because problems along the North Dublin Corridor are related to increases in demand. The minimum load is forecasted to grow due to the addition of substantial amounts of data centre demand which, unlike traditional demand, is time invariant. Therefore any problems associated with low load (such as the control of high voltages) are likely to improve. If new cables are planned as part of any solution option to high demand problems the need for minimum demand cases will be re-visited.

3.3 Demand Assumptions

Data centre load in Dublin is expected to grow substantially between now and 2025. At the time of this report some 338 MW of data centres are already connected in Dublin. Three phases of new data centre demand are assumed, based on requests for connection and offers for connection that have been accepted:

- Phase 1 – applicants that have accepted connection offers;
- Phase 2 – applicants with offers yet to be accepted;
- Phase 3 – additional possible future applicants (‘speculative’).

The volumes of new load and the expected connection points in each phase are shown in Table 1 below.

Project Name	Nearest Transmission Node	MIC (MW)
Phase 1		
Bancroft	Carrickmines County 110 kV	40
Jacobs	Inchicore 110 kV	70
Newbury	Belcamp 110 kV	27
Clonshaugh/Finglas	Belcamp 110 kV	40
Cloghran	Corduff 110 kV	49
Clonee	Corduff 110 kV	73
West Dublin	West Dublin 110 kV	108
Snugborough	Corduff 110 kV	22
Phase 1 Total		**429**
Phase 2		
Clonee	Corduff 110 kV	37
Cruiserath	Corduff 110 kV	267
Belcamp1	Belcamp 110 kV	56
Snugborough	Corduff 110 kV	40
Belcamp2	Belcamp 110 kV	46
Phase 2 Total		**446**
Phase 1 & 2 Total		**(875)**
Phase 3		
	Corduff 110 kV	135
	West Dublin 110 kV	135
	Belcamp 110 kV	135
Phase 3 Total		**405**

Table 1 *Data Centre Demand Assumed*

3.4 Generation Assumptions

The existing portfolio of large generation in Dublin was assumed to be available for these studies. The generators assumed are:

- Dublin Bay Unit 1, at Irishtown 220 kV station,
- Poolbeg Combined Cycle, at Shellybanks 220 kV station,
- Huntstown 1, at Finglas 220 kV station,
- Huntstown 2, at Corduff 220 kV station,
- North Wall Combined Cycle, at North Wall 220 kV station,
- Dublin Waste to Energy, at Poolbeg 220 kV station.

The generators that can have the greatest influence on power flows in North Dublin are Poolbeg Combined Cycle, Huntstown 1, and Huntstown 2. The availability and dispatch of these generators is a key input to this study.

Of the remaining generators, the following assumptions were made for this study:

- North Wall Combined Cycle was assumed to not run due to the running expense and age of the plant. It is assumed likely that this generator will be closed by the year of this analysis.

- Dublin Waste to Energy was assumed to always be running. This generator is relatively small and does not have the same influence on power flows in Dublin as the larger generators.

3.5 Study Cases

The study cases selected are outlined in Table 2 below.

Study Case		Data Centre Demand Assumptions	Key Generation in Dublin	Inter connection	Network	Wind
1a	Winter Peak	Phase 1 & 2	Dublin Bay (DB1, Huntstown 2 (HN2), Huntstown 1 (HNC), Poolbeg/Shellybanks (PBC)	EWIC Import Moyle Import	North South Interconnector In Regional Solution In Kildare – Meath Reinforcement In	All-Island 30% Winter Peak 20% Summer Peak
1b	Summer Peak					
2a	Winter Peak	Phase 1 & 2	3 large units in Dublin			
2b	Summer Peak					
3a	Winter Peak	Phase 1,2 & 3	DB1, HN2, PBC, HNC			
3b	Summer Peak					
4a	Winter Peak	Phase 1,2 & 3	3 large units in Dublin			
4b	Summer Peak					

Table 2 *Study Cases*

These study cases are designed to highlight issues associated with new large data centre loads emerging in Dublin (and North Dublin in particular) and identify resulting transmission constraints. To test the performance of the Woodland – Belcamp corridor generator dispatch patterns were set up to create power flows from west of Dublin towards the eastern side of the city. This was achieved with supply from Woodland via imports on the east-west interconnector (EWIC), low generation in north Dublin and increasing loads at Corduff, Finglas and Belcamp.

4 Statement of Need

There are two key drivers that highlight the need to develop the transmission system in North Dublin, shown in Figure 2, namely:

1. **Increased demand in North Dublin**. New data centre demand is concentrated around North Dublin. These data centres are located at, or near, the existing substations at Corduff, Finglas, and Belcamp. There are a limited number of circuits to supply these zones and constraints are likely as installed demand capacity increases.

2. **Low Generation in Dublin.** There are four generation stations in Dublin connected at Finglas, Corduff, Shellybanks, and Irishtown respectively. The generators at Finglas, Corduff, and Shellybanks can be used to supply the load in north Dublin and offset flows from Woodland towards Corduff. However, these generators are likely to be overtaken in the merit order by newer, more efficient, conventional generators and increasing levels of renewables. Renewable generation is generally built remote from Dublin and new power stations could be located outside Dublin. This means the power produced will have to be transported to get to where it is needed around Corduff, Finglas, and Belcamp.

These two factors drive the requirement for additional transmission network capacity in North Dublin diagnosed by non-compliance with the Transmission System Security Planning Standards (TSSPS).

The TSSPS contains a number of tests of the robustness of the transmission system. These are:

- N-1, the unplanned tripping of one item of transmission equipment at any time.
- N-G-1, the unplanned tripping of one item of transmission equipment at any time concurrent with a planned or unplanned outage of a generator.
- N-1-1, the unplanned tripping of one item of transmission equipment concurrent with a planned outage of one other item of transmission equipment during the maintenance outage season (between March and September).

Our analysis has shown that the N-G-1 test is breached. When one of the key generators in North Dublin is unavailable a subsequent unplanned loss of either of the existing two 220 kV circuits between Woodland, Corduff, and Finglas substations will overload the remaining parallel circuit. If the network is re-configured to re-route power away from these circuits then violations occur on the opposite end of the corridor on the Finglas – Poolbeg 220 kV and Finglas – Shellybanks 220 kV cable circuits.

Further reductions in available generation in Dublin, or increases in demand connections, are shown to make the overloads worse.

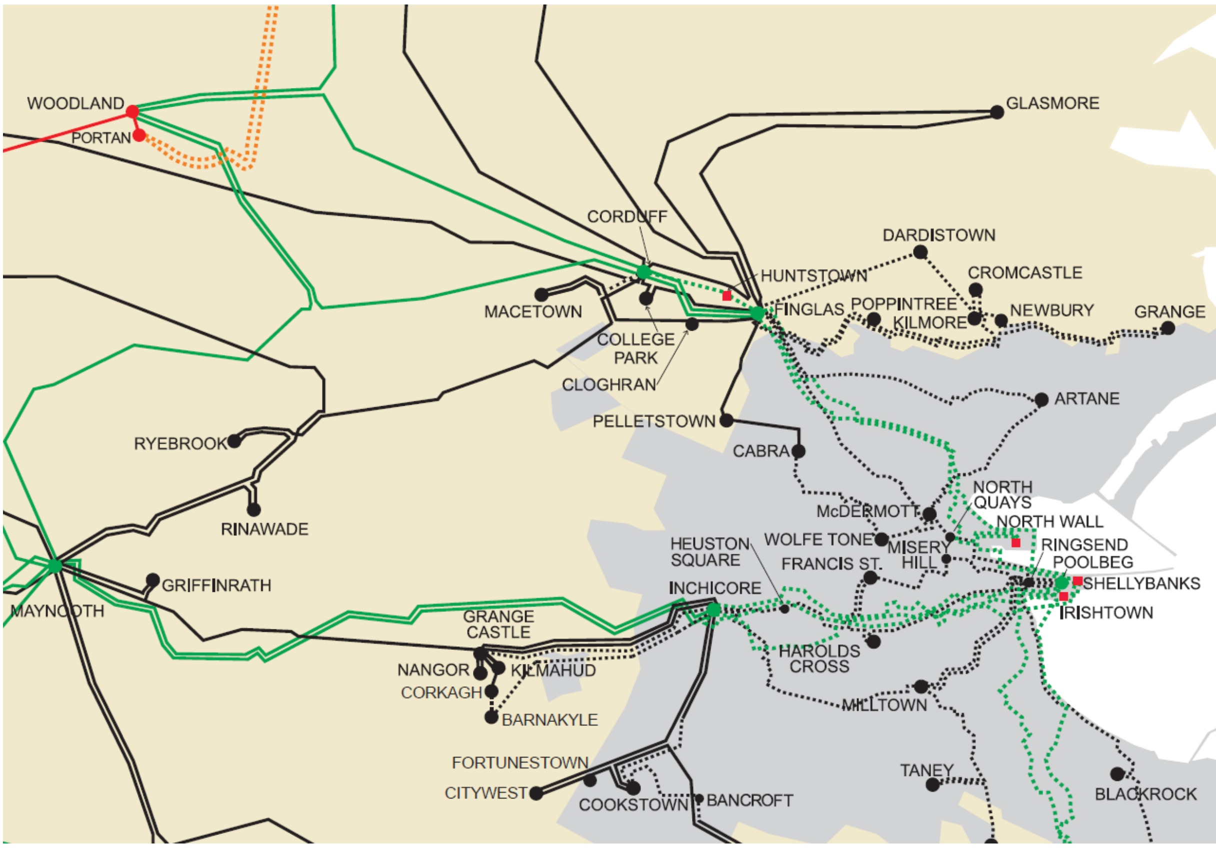

Figure 2 *Map of the North Dublin area showing the Transmission Network.*

5 Detailed Analysis

This chapter describes, in detail, the network problems which were identified for each of the four study cases.

Load flow results are shown for each study case in turn including problems identified from N-1, N-G-1, and N-1-1 tests.

The results of the Less Probable Contingency (LPC) assessments are shown where applicable. LPCs are where multiple items of transmission equipment are lost at the same time for the failure of a single item. For example, a double circuit tower failure removing two circuits from service simultaneously. These events are rare but are of interest where consequences are potentially severe.

The arrangement of the network in Dublin can be changed to help manage power flows and short circuit current levels. The normal arrangement is intended to provide the highest levels of security of supply but an alternative arrangement can be put in place following certain faults or in advance of planned outages.

5.1 Dublin network arrangement

The network in Dublin can be rearranged in response to changes in the pattern of dispatched generation to manage power flow and short circuit current levels.

Changing the network layout at Shellybanks 220 kV station is done in response to analysis carried out by Neartime and Realtime operations in support of the National Control Room.

The rearrangement can be put in place in response to an unplanned tripping on the network to ensure continued security of the network. The network can also be rearranged during planned outages to avoid system security concerns following a subsequent unplanned tripping of network equipment.

The normal and alternative arrangements are described below and the reasons why the different arrangements could be used are described.

5.1.1 Normal arrangement

The ‘normal’ running arrangement for Dublin with four large generator units dispatched is shown below. The network in Dublin is designed with a north-south split for power flow and short circuit current level management purposes. When four large generators are dispatched in Dublin short circuit current levels are a particular concern so this split is in place at those times.

The network split is made at the Poolbeg and Shellybanks 220 kV stations.

At Poolbeg 220 kV station the split is created using the inter-bus tie reactor to make either side of the split appear electrically far apart.

At Shellybanks 220 kV the substation is operated with a normally open point on the busbar. The three generation units that make up Poolbeg Combined Cycle generation are connected at Shellybanks. One of these units is usually connected to the north Dublin network and two to the south. This is shown in Figure 3.

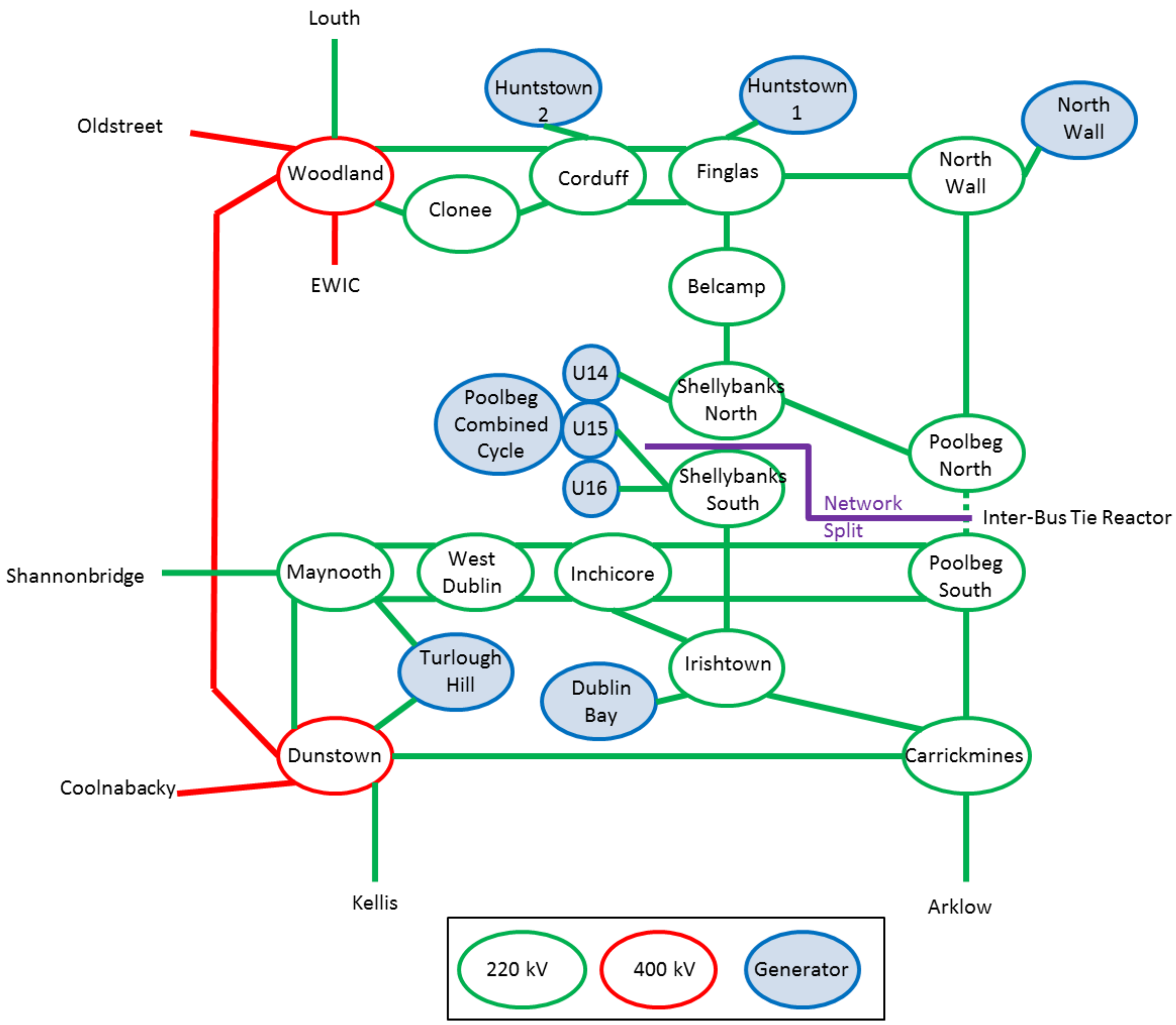

Figure 3 *Dublin Normal Running Arrangement*

5.1.2 Alternative arrangement

When one or more of the large generators in Dublin is not dispatched the network split at Shellybanks 220 kV station can be re-arranged, or closed.

When either of the Huntstown generators are unavailable power flows on the Corduff - Woodland and Corduff – Clonee – Woodland 220 kV circuits to the load at Corduff, Finglas, and Belcamp increase and can lead to overloads of the circuits. The Shellybanks 220 kV station split can be re-arranged to connect more Shellybanks generation to the north side of the Dublin network. This generation can then offset flows from Woodland to Corduff and achieve a better balance of power flow. All three units at

Shellybanks cannot be re-selected to the north side of the open-point when the units are at full output without overloading the cables north of Shellybanks. This leaves the option to rearrange Shellybanks to connect two of the PBC units to Belcamp and one unit to Poolbeg. This results in the three PBC units on the north side of the Dublin split but with reduced security of supply as the unplanned loss of one item of transmission equipment could lead to two of the PBC units being isolated from the network. This arrangement is shown below in Figure 4.

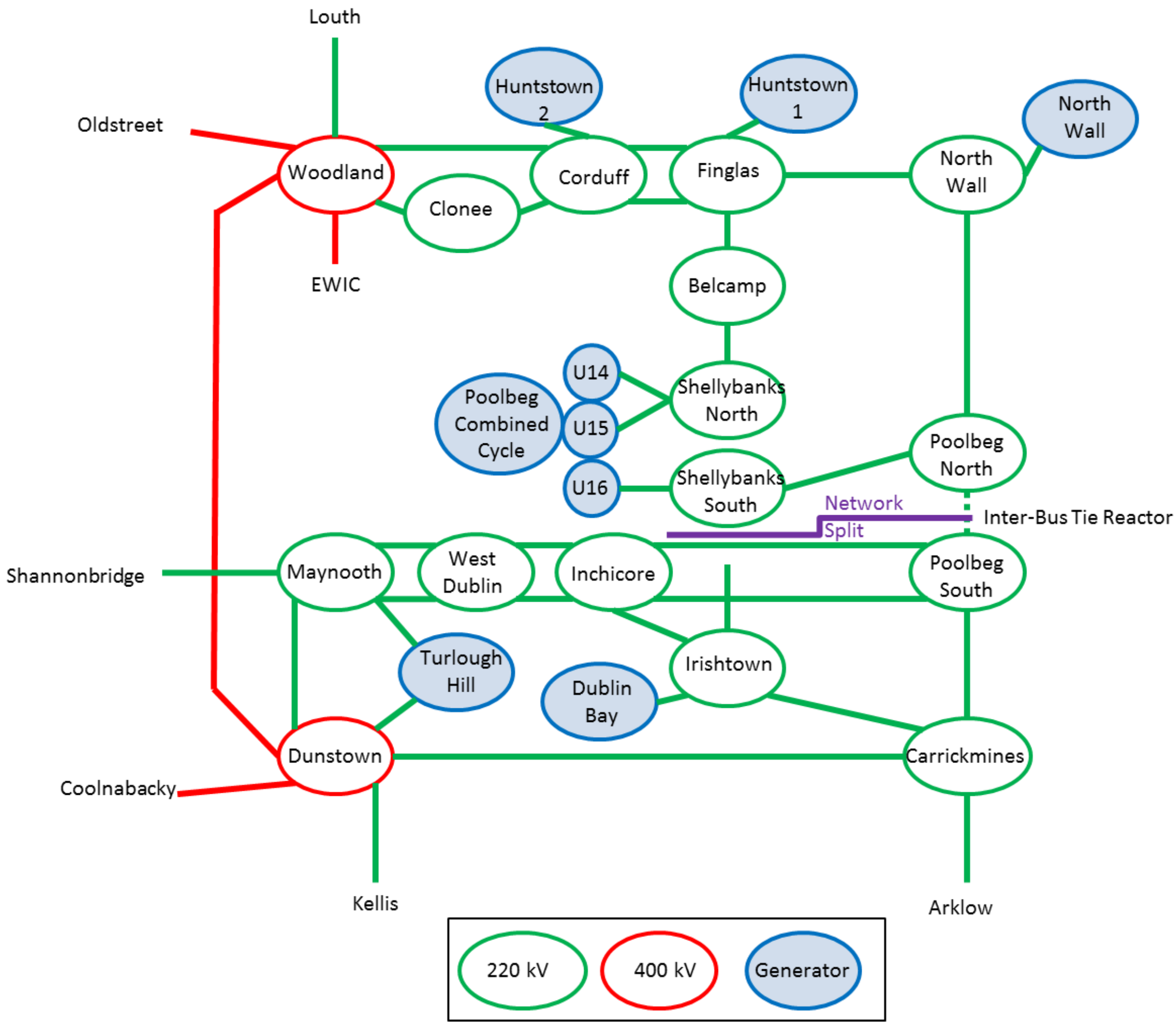

Figure 4 *Alternative Running Arrangement*

5.2 Case 1 – Base Case

5.2.1 *Description of the case*

This is the base case. It assumes no changes to the existing portfolio of generators in Dublin with 4 units, Dublin Bay 1, Huntstown 1, Huntstown 2, and Poolbeg Combined Cycle available for dispatch. This case is designed to identify network constraints associated with the connection of 875 MW of new data centre demand as offered.

<table>
<tr><th colspan="2">Study Case</th><th>Data Centre Demand Assumptions</th><th>Generation Participating in Market in Dublin</th><th>Inter connection</th><th>Network</th><th>Wind</th></tr>
<tr><td>1a</td><td>Winter Peak</td><td rowspan="2">Phase 1 & 2</td><td rowspan="2">Dublin Bay (DB1), Huntstown 2 (HN2), Huntstown 1 (HNC), Poolbeg/Shellybanks (PBC)</td><td rowspan="2">EWIC Import
Moyle Import</td><td rowspan="2">North South Interconnector In

Regional Solution In

Kildare – Meath Reinforcement In</td><td rowspan="2">All-Island

30% Winter Peak

20% Summer Peak</td></tr>
<tr><td>1b</td><td>Summer Peak</td></tr>
</table>

Table 3 *Summary of inputs to Case 1*

5.2.2 *Overview of problems*

An overview of compliance with the TSSPS for this case is shown in Table 4 below.

Season	N-1	N-G-1	N-1-1
Winter Peak	✓	✓	Not Applicable
Summer Peak	✓	✗	✓

Table 4 *Case 1 Compliance with TSSPS*

Case 1b fails on N-G-1 at Summer Peak. With one generator outage in the north Dublin area the network cannot cope with the unplanned loss of one circuit. This is explained in the following sections.

5.2.3 *TSSPS tests results*

5.2.3.1 Normal network

Results are shown in Table 5 below for analysis of the Dublin network with the normal running arrangement (shown in section 5.1.1).

Season	Network Contingency		Overloaded Circuit			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**74%**	**395**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**76%**	**330**	**434**
Winter Peak	N-G-1	'G' – HNC Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**98%**	**523**	**534**
Winter Peak	N-G-1	'G' – HN2 Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**102%**	**545**	**534**
Summer Peak	N-G-1	'G' – HNC Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**114%**	**495**	**434**
Summer Peak	N-G-1	'G' – HN2 Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**119%**	**516**	**434**

Table 5 *Results of TSSPS Tests for Case 1*

There are overloads for N-G-1.

There are no N-1 or N-1-1 problems.

The N-G-1 problems are for the unavailability of either HNC or HN2 and the subsequent unplanned loss of the Clonee – Woodland 220 kV line. This results in the unacceptable overload of the remaining Corduff - Woodland 220 kV line for summer peak. Overloads less than 110% are acceptable provided the overload can be removed within 30 minutes. Overloads on cable circuits are dependent on the design of the cable, and the pre-contingent loading, and are considered on a case-by-case basis.

5.2.3.2 Alternative network

To prepare for a planned generator outage (in this case, HN2 unavailable) the network can be rearranged to the configuration described in 5.1.2. The rearrangement was found not to be effective at removing the overloads.

5.3 Case 2 – Dublin generation unavailable

5.3.1 Description of the case

Of the four large generators in Dublin, three have a significant influence on power flows in North Dublin. These are the two Huntstown generators (HNC and HN2), and the Poolbeg combined cycle plant (PBC, consisting of three units). This case will focus on the impact of any one of these key generators being unavailable for any reason, resulting in three large units left available in the Dublin area.

This case is considered due to increasing penetration of renewables, new more efficient generators, changes to the energy market, and the advancing age of the generation in Dublin.

Generators in Dublin are also central to the need case for transmission reinforcement in North Dublin given their proximity to the new loads and ability to reduce the amount of network capacity required through offsetting flows along the North Dublin corridor. It is therefore vital to understand the networks ability to supply the contracted load changes should a generator unit become unavailable.

<table>
<tr><th colspan="2">Study Case</th><th>Data Centre Demand Assumptions</th><th>Generation Participating in Market in Dublin</th><th>Inter connection</th><th>Network</th><th>Wind</th></tr>
<tr><td>2a</td><td>Winter Peak</td><td rowspan="2">Phase 1 & 2</td><td rowspan="2">3 large units in Dublin</td><td rowspan="2">EWIC Import
Moyle Import</td><td rowspan="2">North South Interconnector In

Regional Solution In

Kildare – Meath Reinforcement In</td><td rowspan="2">All-Island

30% Winter Peak

20% Summer Peak</td></tr>
<tr><td>2b</td><td>Summer Peak</td></tr>
</table>

Table 6 *Summary of inputs to Case 2*

5.3.2 Overview of problems

An overview of compliance with the TSSPS for this case is shown in Table 7 below.

Season	N-1	N-G-1	N-1-1
Winter Peak	✓	✗	Not Applicable
Summer Peak	✗	✗	✗

Table 7 *Case 2 Compliance with TSSPS*

Case 2 fails on N-1, N-G-1, and N-1-1 at Summer Peak, and for N-G-1 at Winter Peak. A case with three generators in North Dublin cannot be made compliant for the concurrent loss of one generator and one item of transmission equipment. It follows that further outages of either lines or a generator make the situation worse. This is explained in the following sections.

5.3.3 TSSPS tests results

Each of the three generators, PBC, HNC and HN1, were removed in turn and studies repeated for N-1, N-G-1, and N-1-1. Results are shown in the following sections.

5.3.3.1 HN2 Unavailable

Huntstown 2 (HN2) is connected at Corduff 220 kV station. With this generator unavailable the network is re-arranged to the alternative layout shown in 5.1.2. This network rearrangement was used in this study in preparation for a contingency to help manage unacceptable overloads of the Corduff – Woodland and Clonee – Corduff 220 kV circuits identified with the network in the normal layout.

Season	**Network Contingency**		**Overloaded Circuit**			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff – Woodland 2 220 kV cct	**84%**	**448**	**534**
Winter Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**86%**	**460**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**100%**	**434**	**434**
Summer Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**103%**	**447**	**434**
Winter Peak	N-G-1	'G' – HNC Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**113%**	**603**	**534**
Summer Peak	N-G-1	'G' – HNC Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**144%**	**625**	**434**
Summer Peak	N-1-1	Corduff - Woodland 2 220V cct & Clonee – Woodland 1 220 kV cct	North Wall – Poolbeg 220 kV cct Finglas – North Wall 220 kV cct	**130%** **133%**	**429** **439**	**330** **330**

Table 8 *Results of TSSPS Tests for Case 2 – HN2 unavailable*

There are overloads for N-1, N-G-1, and N-1-1.

N-1 problems are for the loss of either Clonee – Woodland 220 kV line or Corduff – Woodland 220 kV line. This results in the overload of the remaining 220 kV line between Corduff and Woodland for summer peak. These overloads can be reduced post-fault by increasing the output on HNC and PBC to maximum and using up the margin left available for reserve.

Though increasing remaining generators to maximum is sufficient for N-1 there are more severe problems for N-G-1 and N-1-1 where this will not be enough. For a planned outage of HNC (on top of the unavailability of HN2) the overload for the loss of the Clonee – Woodland 220 kV line or Corduff – Woodland 220 kV line is made worse

(144% in Summer Peak). There is then not enough network capacity to feed the load in North Dublin even if the remaining generators are set to maximum.

For an N-1-1 involving the loss of Clonee – Woodland 220 kV line and Corduff - Woodland 220 kV line there are overloads on the North Wall – Poolbeg and Finglas – North Wall 220 kV cables.

5.3.3.2 HNC Unavailable

Huntstown 1 (HNC) is connected at Finglas 220 kV station. With this generator unavailable the network is re-arranged to the alternative layout shown in 5.1.2. This network rearrangement was used in this study in preparation for a contingency to help manage unacceptable overloads of the Corduff – Woodland and Clonee – Corduff 220 kV circuits identified with the network in the normal layout.

Season	Network Contingency		Overloaded Circuit			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**80%**	**427**	**534**
Winter Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**82%**	**438**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**95%**	**412**	**434**
Summer Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**97%**	**421**	**434**
Winter Peak	N-G-1	'G' – HN2 Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**113%**	**603**	**534**
Summer Peak	N-G-1	'G' – HN2 Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**144%**	**625**	**434**
Summer Peak	N-G-1	'G' – PBC Corduff - Finglas 1 220_kV cct	Corduff - Finglas 2 220 kV cct	**105%**	**456**	**434**
Summer Peak	N-1-1	Corduff - Woodland 2 220 kV cct & Clonee – Woodland 1 220 kV cct	North Wall – Poolbeg 220 kV cct Finglas – North Wall 220 kV cct	**140%** **145%**	**462** **479**	**330** **330**

Table 9 *Results of TSSPS Tests for Case 2 – HNC unavailable*

The loss of either Clonee – Woodland 220 kV line or Corduff - Woodland 220 kV line (with HNC and HN2 out) results in the overload of the remaining Corduff - Woodland circuit for summer peak. These overloads cannot be reduced post-fault by increasing the output on PBC to maximum and there is not enough network capacity to feed the load in North Dublin.

The Corduff – Finglas 220 kV lines are also affected in this case for an N-G-1 test. The loss of PBC at Shellybanks 220 kV station when HNC at Finglas 220 kV station is unavailable leads to an N-1 overload on the Corduff – Finglas 220 kV lines.

For an N-1-1 involving the loss of Clonee – Woodland and Corduff - Woodland 220 kV lines there are overloads on the North Wall – Poolbeg and Finglas – North Wall 220 kV cables.

5.3.3.3 PBC Unavailable

With all units at PBC, connected at Shellybanks 220 kV station, unavailable there is no need to re-arrange the network and the normal layout described in 5.1.1 is used.

Season	Network Contingency		Overloaded Circuit			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**87%**	**465**	**534**
Winter Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**88%**	**470**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**92%**	**399**	**434**
Summer Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**95%**	**412**	**434**
Winter Peak	N-G-1	'G' – HN2 Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**116%**	**619**	**534**
Summer Peak	N-G-1	'G' – HN2 Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**135%**	**586**	**434**
Summer Peak	N-1-1	Poolbeg 220_kV Reactor& Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**108%**	**356**	**330**

Table 10 *Results of TSSPS Tests for Case 2 – PBC unavailable*

There are no N-1 problems.

There are unacceptable overloads for N-G-1.

N-G-1 problems are for the loss of either Clonee – Woodland or Corduff - Woodland 220 kV lines (with HN2 out) which results in the overload of the remaining Corduff - Woodland 220 kV circuit. These overloads cannot be reduced post-fault by increasing the output on the single remaining generator in North Dublin (HNC) to maximum and there is not enough network capacity to feed the load in North Dublin.

An N-1-1 involving the loss of the Poolbeg 220 kV Inter-Bus Tie Reactor and Corduff – Woodland 220 kV line leads to overloads on the remaining Clonee – Woodland 220 kV line (108%).

5.3.3.4 Less Probable Contingency (LPC) Assessments

As available generation in the Dublin area is further reduced the issues described so far in section 5.3 worsen. In addition, the case begins to fail the Less Probable Contingency (LPC) test. LPC events are where multiple items of transmission equipment are lost at the same time for the failure of a single item, for example both circuits carried on the same double circuit tower.

The TSSPS does not permit any actions, before or after the event, to mitigate the effects of a LPC. The network must be designed to be robust enough to cope with these events.

5.3.3.4.1 Woodland – Corduff Double Circuit LPC

The Clonee – Corduff 220 kV and Woodland – Corduff 220 kV lines are hung on double-circuit towers for the last 2km towards Corduff 220 kV station. The failure of one of these towers can lead to the simultaneous loss of both Clonee – Corduff 220 kV and Woodland

– Corduff 220 kV lines. This can have catastrophic effects for certain load and generation combinations in Dublin.
In Summer Peak 2025, for example, when both Huntstown generators are not dispatched, or unavailable, the double-circuit loss of Clonee – Corduff 220 kV and Woodland – Corduff 220 kV lines can lead to cascading overloads and voltage collapse in the Dublin area.

5.3.3.4.2 Corduff – Finglas Double Circuit LPC

Corduff – Finglas 220 kV ‘1’ and ‘2’ circuits are hung on double-circuit towers for the majority of their 4km length. The failure of one of these towers can lead to the loss of both lines when the Shellybanks 220 kV network split is in place.
For Summer Peak 2025, with a north-south split at Shellybanks, if both HNC and PBC are unavailable then the double-circuit loss of Corduff – Finglas 220 kV leads to voltage collapse.

5.4 Case 3 – Additional speculative Dublin load

5.4.1 Description of the case

Case 3 has additional load in Dublin compared to the base case. An extra 150 MW was added at each of Corduff, Belcamp, and West Dublin 220 kV stations on top of that already issued with connection offers. These are considered likely locations for connections of further data centre loads. Loads were modelled at 0.95 p.f. leading (i.e. consuming reactive power). Case 3 assumes no changes to the existing portfolio of generators in Dublin and all four generators are available for dispatch. The purpose of this case is to identify network constraints should the connection of new data centre demand be increased further in the medium to long-term.

<table>
<tr><th colspan="2">Study Case</th><th>Data Centre Demand Assumptions</th><th>Generation Participating in Market in Dublin</th><th>Inter connection</th><th>Network</th><th>Wind</th></tr>
<tr><td>3a</td><td>Winter Peak</td><td rowspan="2">Phase 1,2 & 3</td><td rowspan="2">DB1, HN2, PBC, HNC</td><td rowspan="2">EWIC Import
Moyle Import</td><td rowspan="2">North South Interconnector In

Regional Solution In

Kildare – Meath Reinforcement In</td><td rowspan="2">All-Island

30% Winter Peak

20% Summer Peak</td></tr>
<tr><td>3b</td><td>Summer Peak</td></tr>
</table>

Table 11 *Summary of inputs to Case 3*

5.4.2 Overview of problems

An overview of compliance with the TSSPS for this case is shown in Table 12 below.

Season	N-1	N-G-1	N-1-1
Winter Peak	✓	✗	Not Applicable
Summer Peak	✗	✗	✗

Table 12 *Case 3 Compliance with TSSPS*

Case 3 fails on N-1, N-G-1, and N-1-1 at Summer Peak, and on N-G-1 at Winter Peak. With additional load in Dublin the network cannot be made N-1 compliant at Summer Peak. It follows that further outages of either lines of a generator make the situation worse. This is explained in the following sections.

5.4.3 TSSPS tests results

5.4.3.1 Normal network

Results are shown in Table 13 below for analysis of the Dublin network with the normal running arrangement (shown in section 5.1.1).

Season	**Network Contingency**		**Overloaded Circuit**			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**106%**	**566**	**534**
Winter Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**108%**	**577**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**118%**	**512**	**434**
Summer Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**120%**	**521**	**434**
Winter Peak	N-G-1*	'G' – HN2 Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**135%**	**721**	**534**
Summer Peak	N-G-1*	'G' – HN2 Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**165%**	**716**	**434**
Summer Peak	N-1-1*	Corduff - Woodland 2 220 kV cct & Poolbeg 220_kV Reactor	Clonee – Woodland 1 220 kV cct	**145%**	**478**	**330**
	***No Network Switching (see section 5.4.3.2 instead)**					

Table 13 *Results of TSSPS Tests for Case 3*

There are overloads for N-1, N-G-1, & N-1-1.

N-1 problems are for the loss of either Clonee – Woodland or Woodland – Corduff 220 kV lines. This results in unacceptable overloads of the remaining Corduff - Woodland 220 kV line for summer peak. For winter peak, these overloads are below 110% and can be reduced post-fault by increasing the output on the remaining generators in North Dublin.

There are more severe problems for N-G-1 and N-1-1. For a planned outage of HN2 the overload for the loss of Clonee – Woodland or Corduff - Woodland 220 kV line is made worse (165% in Summer Peak). There is now not enough network capacity to feed the load in North Dublin even if the output of the remaining generators is set to maximum. For an N-1-1 involving the loss of Corduff - Woodland 220 kV line and the Poolbeg 220 kV Inter-Bus Tie Reactor there are unacceptable overloads on the Clonee – Woodland 220 kV line.

5.4.3.2 Alternative network

To prepare for a planned generator or line outage the network can be rearranged to that shown in 5.1.2. The rearrangement was found not to be effective at removing the overloads.

5.5 Case 4 – Dublin generation unavailable & additional speculative load

5.5.1 Description of the case

Case 4 is the most onerous case and combines the sensitivities examined on a reduced generation portfolio in North Dublin (Case 2) and increased data centre load (Case 3). One generator in Dublin from the existing portfolio is assumed unavailable and an extra 150 MW of load is added at each of Corduff, Belcamp and West Dublin on top of those demand already issued with connection offers. The purpose of this case is to identify network constraints and remaining margins should the connection of new data centre demand be increased in the medium to long-term when combined with a reduced portfolio of generation in Dublin.

<table>
<tr><th colspan="2">Study Case</th><th>Data Centre Demand Assumptions</th><th>Generation Participating in Market in Dublin</th><th>Inter connection</th><th>Network</th><th>Wind</th></tr>
<tr><td>4a</td><td>Winter Peak</td><td rowspan="2">Phase 1,2 & 3</td><td rowspan="2">3 large units in Dublin</td><td rowspan="2">EWIC Import
Moyle Import</td><td rowspan="2">North South Interconnector In

Regional Solution In

Kildare – Meath Reinforcement In</td><td rowspan="2">All-Island

30% Winter Peak

20% Summer Peak</td></tr>
<tr><td>4b</td><td>Summer Peak</td></tr>
</table>

Table 14 *Summary of inputs to Case 4*

5.5.2 Overview of problems

An overview of compliance with the TSSPS for this case is shown in Table 15 below.

Season	N-1	N-G-1	N-1-1
Winter Peak	✗	✗	Not Applicable
Summer Peak	✗	✗	✗

Table 15 *Case 4 Compliance with TSSPS*

Case 4 fails on N-1, N-G-1, and N-1-1. A case with three generators in North Dublin cannot be made compliant for the concurrent loss of one generator and one item of transmission equipment. It follows that further outages of either lines of a generator make the situation worse. This is explained in the following sections.

5.5.3 TSSPS tests results

The extra load was added before each of the three key generators in North Dublin were removed in turn and studies repeated for N-1, N-G-1, and N-1-1. Results are shown in the following sections.

5.5.3.1 HN2 Unavailable

Huntstown 2 (HN2) is connected at Corduff 220 kV station. With this generator unavailable the network is re-arranged to the alternative layout shown in 5.1.2. This network rearrangement was used in this study in preparation of a contingency to help manage unacceptable overloads of the Corduff – Woodland 220 kV line identified with the network in the normal layout.

Season	Network Contingency		Overloaded Circuit			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**115%**	**614**	**534**
Winter Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**122%**	**651**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**145%**	**629**	**434**
Summer Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**147%**	**638**	**434**
Winter Peak	N-G-1	'G' – HNC Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**150%**	**801**	**534**
Summer Peak	N-G-1	'G' – HNC Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**190%**	**825**	**434**
Summer Peak	N-1-1	Corduff - Woodland 2 220 kV cct & Clonee – Woodland 1 220 kV cct	North Wall – Poolbeg 220 kV cct	**115%**	**380**	**330**

Table 16 *Results of TSSPS Tests for Case 4 – HN2 unavailable*

There are overloads for N-1, N-G-1, and N-1-1.

N-1 problems are observed for the loss of either Clonee – Woodland or Corduff - Woodland 220 kV lines. This results in unacceptable overloads on the remaining Corduff - Woodland 220 kV line for summer peak and winter peak. These overloads cannot be reduced below 100% by increasing the output on HNC and PBC to maximum and using up the margin left available for reserve.

For a planned outage of HNC (on top of the unavailability of HN2) the overload for the loss of Clonee – Woodland or Corduff - Woodland 220 kV line is made worse (190% in Summer Peak). There is now not enough network capacity to feed the load in North Dublin even if the output of the remaining generator is set to maximum.

For an N-1-1 involving the loss of Clonee – Woodland and Corduff - Woodland 220 kV lines there are overloads on the Poolbeg – North Wall – Finglas cables. Only two lines are left to feed the load in North Dublin (North Wall – Poolbeg and Belcamp - Shellybanks 220 kV cables) along with the two remaining generators (HNC and PBC). This is not enough to feed the expanded load in North Dublin.

5.5.3.2 HNC Unavailable

Huntstown 1 (HNC) is connected at Finglas 220 kV station. With this generator unavailable the network is re-arranged to the alternative layout shown in 5.1.2. This network rearrangement was used in this study in preparation of a contingency to help manage unacceptable overloads of the Clonee – Woodland 220 kV line identified with the network in the normal layout.

Season	Network Contingency		Overloaded Circuit			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**105%**	**560**	**534**
Winter Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**108%**	**577**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**140%**	**608**	**434**
Summer Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**142%**	**616**	**434**
Winter Peak	N-G-1	‘G’ – HN2 Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**150%**	**801**	**534**
Summer Peak	N-G-1	‘G’ – HN2 Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**190%**	**824**	**434**
Summer Peak	N-G-1	‘G’ – PBC Corduff - Finglas 1 220_kV cct	Corduff - Finglas 2 220 kV cct	**135%**	**586**	**434**
Summer Peak	N-1-1	Corduff - Woodland 2 220 kV cct & Clonee – Woodland 1 220 kV cct	North Wall – Poolbeg 220 kV cct	**115%**	**380**	**330**

Table 17 *Results of TSSPS Tests for Case 4 – HNC unavailable*

There are overloads for N-1, N-G-1, and N-1-1.

For N-1, the loss of either Clonee – Woodland or Corduff - Woodland 220 kV results in the unacceptable overload of the remaining line for summer peak. For winter peak, these overloads are below 110% and can be reduced post-fault by increasing the output on the remaining generators in North Dublin.

There are unacceptable overloads on Clonee – Woodland or Corduff - Woodland 220 kV circuit for the loss of the other and no remaining options to reduce these pre or post-fault.

For the arrangement (see section 5.1.2) to manage the unavailability of HNC there are unacceptable N-1 overloads on the Corduff – Finglas 220 kV lines should PBC at Shellybanks also be unavailable.

For an N-1-1 involving the loss of Clonee – Woodland and Woodland – Corduff 220 kV lines there are overloads on the North Wall – Poolbeg and Belcamp - Shellybanks 220 kV cables. Only two circuits are left to feed the load in North Dublin (North Wall – Poolbeg and Belcamp - Shellybanks 220 kV cables) along with the two remaining generators (HNC and PBC). This is not enough to feed the expanded load in North Dublin.

5.5.3.3 PBC Unavailable

With all units at PBC, which is connected at Shellybanks 220 kV station, unavailable there is no need to re-arrange the network and the normal layout shown in 5.1.1 is used.

Season	**Network Contingency**		**Overloaded Circuit**			
			Circuit	Loading (%)	Loading (MVA)	Rating (MVA)
Winter Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**120%**	**641**	**534**
Winter Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**122%**	**651**	**534**
Summer Peak	N-1	Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**135%**	**586**	**434**
Summer Peak	N-1	Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**137%**	**595**	**434**
Winter Peak	N-G-1	'G' – HN2 Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**155%**	**828**	**534**
Summer Peak	N-G-1	'G' – HN2 Clonee – Woodland 1 220 kV cct	Corduff - Woodland 2 220 kV cct	**190%**	**825**	**434**
Summer Peak	N-1-1	Poolbeg 220_kV Reactor & Corduff - Woodland 2 220 kV cct	Clonee – Woodland 1 220 kV cct	**160%**	**528**	**330**

Table 18 *Results of TSSPS Tests for Case 4 – PBC unavailable*

As per 5.3.3.1 and 5.5.3.2 there are unacceptable overloads for N-1, N-G-1 and N-1-1. For N-1, the loss of either Clonee – Woodland or Corduff - Woodland 220 kV results in the unacceptable overload of the remaining Corduff - Woodland 220 kV line for summer peak and winter peak.

N-G-1 problems are for the loss of either Clonee – Woodland or Corduff - Woodland 220 kV line (with HN2 also out) which results in the overload of the remaining Corduff - Woodland 220 kV line. These overloads cannot be reduced post-fault by increasing the output on the single remaining generator in North Dublin (HNC) to maximum and there is not enough network capacity to feed the load in North Dublin.

An N-1-1 involving the loss of the Poolbeg 220 kV Inter-Bus Tie Reactor and Corduff - Woodland 220 kV line leads to overloads on the remaining Clonee – Woodland 220 kV line (160%).

5.6 Fault level tests

Single phase to ground fault levels for a busbar fault at Finglas 220 kV substation are shown in the table below. This is the worst fault on the 220 kV system in Dublin and is used to summarise available margins.

Studies were done for screening of maximum fault levels and problems flagged at 90% of allowed Grid Code levels.

X/R ratios greater that 14 are highlighted in green. At those stations with an X/R ratio greater than 14 the TOT RMS break current must be compared against the switchgear rating.

Those stations with short circuit levels greater than 80% of rating are highlighted in red. A longer list of fault levels for important Dublin nodes for each case is shown in the appendix.

				Maximum SC Study						
				1 phase						
Network Arrangement	**Node**	**Voltage**	**Minimum SC rating (kA)**	**X/R**	**Peak Make**	**% of rating**	**RMS AC Break**	**% of rating**	**TOT RMS Break**	**% of rating**
Normal (*see 5.1.1*)	FINGLAS	220	40	14.1	81.7	82%	30.1	75%	33.5	84%
PBC Tailed with 4 units (*see 5.1.2*)	FINGLAS	220	40	14.1	89.1	89%	32.7	82%	36.5	91%
PBC Tailed with 3 units (see 5.1.2)	FINGLAS	220	40	13.5	82.3	82%	30.2	76%	33.4	84%
Shellybanks 220 kV Coupled with 2 units	FINGLAS	220	40	9.3	87.8	88%	33.5	84%	34.8	87%

Table 19 *Fault Level Results for Finglas 220 kV*

The results show that the network re-arrangements used in this study to manage power flows on the network are acceptable from a fault level perspective but that remaining margins are narrow. This will have an impact on the next phase of optioneering: any solution to capacity shortages that increases system strength could lead to fault level violations. This could either invalidate that solution option or force further mitigations to reduce fault levels at Finglas or elsewhere.

The normal arrangement (see section 5.1.1) has an open point at Shellybanks 220 kV substation with one unit on the north side and two on the south side. All other generators in Dublin are on. Under these circumstances a small margin of 6% remains.

The alternative arrangement (see section 5.1.2) with PBC tailed also maintains the north-south split at Shellybanks 220 kV substation but with all three PBC units on the north side. If all other generators in Dublin are on then this arrangement could be a problem with fault levels exceeding 90%. With one generator in Dublin unavailable and 3 units remaining the arrangement produce fault levels below 90%.

With no north-south split at Shellybanks 220 kV substation and two units on (HN2 and DB1) fault levels are close to 90% but with little margin (2%) left for increasing system strength.

5.7 Summary of network problems

The analysis of the transmission network indicates that there are a number of issues in breach of our Transmission System Security Planning Standards (TSSPS) that must be addressed.

5.7.1 North Dublin 220 kV corridor

Network needs were identified in the corridor of transmission network between the Woodland 400 kV station to the north west of Dublin, the key load and generation centres at Finglas and Corduff 220 kV stations, and load and generation in the city centre at Poolbeg and Shellybanks 220 kV stations.

The network needs are predominantly on the circuits between Corduff 220 kV and Woodland 400 kV stations. This is because much of the new load is located at Corduff (and between Woodland and Corduff) while Woodland is a strong node with EWIC behind it.

Network needs were also identified in the cable circuits between Finglas, and the Poolbeg and Shellybanks 220 kV stations. These needs were more prevalent as availability of generation in the North Dublin network is reduced, or demand in North Dublin increased.

5.7.1.1 TSSPS beaches by case

A summary of the performance of the network between Corduff and Woodland for all of the Cases analysed is shown in Table 20.

Case	N-1	N-G-1	N-1-1	N-LPC
1 Base Case	✓	✗	✓	✓
2 Low Dublin Generation	✗	✗	✗	✗
3 Extra Load	✗	✗	✗	✓
4 Low Dublin Generation and Extra Load	✗	✗	✗	✗

Table 20 *Results of TSSPS Tests for All Cases for the North Dublin Corridor.*

The table shows that for the base case, which requires EirGrid to supply the demand for which it has already issued offers, there is a requirement to reinforce the network. Should generation in Dublin become unavailable, or load increase further, the requirements for reinforcement become more pressing.

6 Plausible scale of solutions

Section 5 describes the drivers for power flows along the North Dublin corridor that are expected to exceed the capacity of the existing transmission network in that corridor.

Plausible candidate solutions to meet the need identified must either add more capacity to the North Dublin corridor or remove the drivers that cause the existing capacity to be used up.

To add capacity to the North Dublin corridor existing circuits must be uprated, additional circuits added, or a combination of these. Capacity could be freed up in the corridor by using power flow control devices to re-route power over those circuits with available capacity.

Adding an additional circuit could also be used to create opportunities to provide ppropriately staged increases in capacity in the future when further drivers for additional capacity in the corridor emerge. For example, a new circuit between Woodland and Corduff could meet the need identified in the short to medium term, but could also permit significant future planned outages on the existing circuits to allow thermal, or voltage, uprates. Constructing a new circuit will have significant challenges. North Dublin is a heavily developed area. There will be limited routes available for either an overhead line or underground cable circuit.

Conversely, uprating an existing circuit, or circuits, between Woodland and Corduff could meet the need. This would be in line with our commitments to make best use of existing assets before considering investing in new assets. Uprating the existing circuits would have its own challenges such as the outages required to carry out the uprating. The ability to respond to future changes in the drivers for additional capacity in the corridor could be limited due to the requirement for further outages.

Alternatively, to avoid needing to increase transmission capacity, it may be possible to develop systems or market products to encourage demand reduction, when needed, to avoid overloading the corridor following an unplanned tripping of an item of transmission equipment.

More permanent and unconventional solutions to avoid needing to increase transmission capacity include encouraging new large-scale, efficient, generation to locate at optimum points in the north Dublin corridor so that it can be used to off-set power flows along the corridor and avoid overloads. Equally, demand could be encouraged to locate elsewhere in the Irish power system where less constrained opportunities are available.

7 Conclusions

The analysis into the system needs in the North Dublin Corridor has highlighted increasing dependence on generation in the Dublin area to ensure continued security of supply if demand continues to grow.

A system need has been identified in the form of a transmission network constraint between Woodland 400 kV station and Corduff 220 kV station. This constraint arises from a case including all four Dublin generators but with a requirement to supply all data centre demand for which EirGrid has issued connection offers (as of August 2017). Under these conditions the existing network is non-compliant with the TSSPS for N-G-1; for an outage of a generator in North Dublin (HNC or HN2) the loss of one Corduff - Woodland 220 kV line overloads the other beyond acceptable post-fault limits. This problem is indicative of a shortage of transmission capacity in the area. To satisfy this need additional capacity between Woodland and Corduff, or the capability to re-route power to use spare capacity elsewhere, is required.

A Less Probable Contingency (LPC) event was identified. If Huntstown 1 at Finglas and Huntstown 2 at Corduff are not dispatched, or both are unavailable, then an unplanned double-circuit tower outage in the area can lead to cascading outages and voltage collapse.

Finally, fault level margins in the North Dublin Corridor are tight. Any reinforcement of the corridor that increases system strength (for example, a 3rd Corduff - Woodland 220 kV circuit) could lead to fault level violations. This will have an impact on optioneering and careful design will be needed.

Appendix 1 – Analysis Results

Appendix 1A – Fault Level Notes

X/R ratios greater that 14 are highlighted in green. At those stations with an X/R ratio greater than 14 the TOT RMS break current must be compared against the switchgear rating.

Those stations with short circuit levels greater than 80% of rating are highlighted in red. The TSSPS stipulates that any switchgear expected to experience a SCL greater than 90% of rating must be replaced or measures put in place to mitigate the short circuit current level. Ratings are included based on planned upgrades assumed complete by 2025.

The 10% margin is to allow for errors in the following key areas:

- **Transformer Taps:** The transformer taps have a significant effect on the fault current that passes through a transformer. With taps on the HV side the apparent impedance of the transformer winding is proportional to the tap ratio squared, as the tap ratio reduces the impedance reduces markedly. In some cases this may result in the impedance at certain tap steps being less than 80% of the nominal tap impedance and the potential fault current may be underestimated. The worst case will be when the tap is set to raise the LV voltage the most. The taps are normally set to provide the required system operating voltage profiles and are unlikely to be at the lowest settings. The margin allows for some variation from the nominal tap transformer impedance in the calculations. A very detailed fault study of a particular busbar should ensure that transformer impedance is correctly accounted for.
- **Uncertainty of Load Make Up:** The make up of certain distribution loads may be more onerous than the assumed 1MVA per MVA of aggregate winter load connected at 10kV or lower. There is not sufficient data available on the make up of load to make specific allocation for all loads. The margin allows for the possibility of some of the distribution industrial load either providing more than 1MVA per MVA of load or being directly connected at 38kV.
- **Plant Tolerances:** A certain allowance for the tolerances in the plant data should also be allowed for in the ratings, both for the impedances of the different network component models and for the switchgear ratings. True switchgear capability may deviate from nameplate due to aging or different conditions in the

network. The switchgear specification tests are based on an X/R ratio of 14 and the actual X/R ratios are likely to be different. The impact of the X/R ratio differences is not clear at present.

Other factors that contribute to the requirement for a margin include:

- Circuit impedance tolerances,
- Calculation methods and algorithms,
- Earthing points on the transmission system, and
- Age of equipment.

Appendix 1B – Fault Level Results: Normal Arrangement

See section 5.1.1

			Maximum SC Study													
			3 phase							1 phase						
Node	Voltage	Minimum SC rating (kA)	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating
BELCAMP	110	25	30.8	37.1	59%	12.6	51%	15.3	61%	28.5	28.9	46%	10.5	42%	12.3	49%
BELCAMP	220	40	12.4	64.9	65%	22.4	56%	24.6	62%	9.9	70.0	70%	26.9	67%	28.1	70%
CARRICKMINES	110	26.2	29.8	36.8	56%	12.3	47%	14.8	57%	23.7	38.3	58%	13.8	53%	15.5	59%
CARRICKMINES	220	40	12.5	58.5	58%	20.4	51%	22.5	56%	8.3	64.3	64%	25.4	64%	26.0	65%
CORDUFF	110	31.5	9.0	59.9	76%	22.2	71%	22.3	71%	10.6	61.6	78%	23.9	76%	24.1	77%
CORDUFF	220	40	14.4	72.9	73%	24.7	62%	28.1	70%	12.3	78.1	78%	29.2	73%	31.7	79%
DUNSTOWN	220	40	8.9	57.8	58%	21.9	55%	22.7	57%	9.2	62.7	63%	24.9	62%	25.8	64%
DUNSTOWN	380	50	5.1	33.5	27%	14.2	28%	14.3	29%	6.2	33.7	27%	14.4	29%	14.5	29%
FIN_URBAN	110	31.5	34.7	41.2	52%	13.7	43%	17.2	55%	30.4	49.6	63%	17.6	56%	20.9	66%
FINGLAS	220	40	15.3	71.8	72%	24.1	60%	27.9	70%	14.1	81.7	82%	30.1	75%	33.5	84%
FIN_RURAL	110	31.5	33.1	41.1	52%	13.2	42%	16.6	53%	27.4	43.0	55%	15.2	48%	17.7	56%
INCH_CITY	110	31.5	28.4	42.8	54%	14.2	45%	17.0	54%	24.6	52.1	66%	18.6	59%	21.1	67%
INCHICORE	220	40	12.3	70.4	70%	24.2	60%	26.5	66%	8.9	77.5	77%	30.0	75%	31.0	78%
INCH_COUNTRY	110	31.5	43.5	43.1	55%	13.9	44%	18.7	59%	32.8	52.4	67%	18.4	58%	22.4	71%
IRISHTOWN	220	40	13.6	66.5	66%	22.7	57%	25.5	64%	10.5	75.8	76%	28.8	72%	30.4	76%
WEST DUBLIN	110	31.5	22.2	49.2	63%	16.9	54%	18.9	60%	23.5	36.3	46%	13.3	42%	14.9	47%
WEST DUBLIN	220	40	9.7	65.8	66%	23.7	59%	24.9	62%	8.5	63.5	64%	25.2	63%	25.9	65%
MAYNOOTH A	110	31.5	10.1	36.7	47%	13.9	44%	14.1	45%	10.9	44.2	56%	17.3	55%	17.4	55%
MAYNOOTH B	220	40	8.5	51.6	52%	19.6	49%	20.2	50%	8.8	47.2	47%	18.9	47%	19.5	49%
MAYNOOTH B	110	31.5	7.4	44.3	56%	17.6	56%	17.6	56%	9.0	42.5	54%	17.1	54%	17.2	55%
MAYNOOTH A	220	40	8.5	54.7	55%	20.8	52%	21.4	54%	8.5	48.0	48%	19.3	48%	19.8	50%
POOLBEG	110	40	27.1	43.4	43%	14.6	36%	17.1	43%	21.4	52.0	52%	18.8	47%	20.7	52%
POOLBEG NORT	220	31.5	13.1	63.5	81%	21.9	69%	24.3	77%	6.6	55.2	70%	22.7	72%	22.9	73%
POOLBEG	110	40	27.0	43.3	43%	14.5	36%	17.1	43%	21.4	51.9	52%	18.8	47%	20.6	52%
POOLBEG SOUT	220	31.5	12.1	64.9	82%	22.5	72%	24.6	78%	8.8	66.1	84%	25.9	82%	26.7	85%
SHELLYBANKS	220	40	12.8	63.2	63%	21.8	55%	24.2	60%	8.0	60.4	60%	24.0	60%	24.5	61%
SHELLYBANKS	220	40	13.2	63.7	64%	21.9	55%	24.4	61%	9.1	70.4	70%	27.3	68%	28.3	71%
SHELLYBANKSB	220	40	13.2	63.7	64%	21.9	55%	24.4	61%	9.1	70.4	70%	27.3	68%	28.3	71%
WOODLAND	220	40	11.7	75.1	75%	27.2	68%	29.3	73%	11.7	74.1	74%	28.5	71%	30.5	76%
WOODLAND	380	40	11.4	44.3	44%	16.6	41%	17.8	44%	11.2	45.1	45%	17.6	44%	18.7	47%

Appendix 1C – Fault Level Results: Shellybanks Tailed Arrangement with 4 units ON in Dublin

See section 5.1.2

			Maximum SC Study													
			3 phase							1 phase						
Node	Voltage	Minimum SC rating (kA)	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating
BELCAMP	110	25	31.2	37.7	60%	12.8	51%	15.6	62%	29.8	29.4	47%	10.7	43%	12.5	50%
BELCAMP	220	40	12.1	68.7	69%	23.6	59%	25.9	65%	10.0	75.3	75%	28.8	72%	30.2	75%
CARRICKMINES	110	26.2	26.8	35.4	54%	11.9	45%	14.0	53%	22.1	36.9	56%	13.4	51%	14.8	56%
CARRICKMINES	220	40	11.4	52.5	52%	18.7	47%	20.1	50%	8.2	57.3	57%	22.7	57%	23.3	58%
CORDUFF	110	31.5	9.2	60.8	77%	22.6	72%	22.7	72%	10.8	62.3	79%	24.2	77%	24.4	78%
CORDUFF	220	40	14.3	78.5	78%	26.5	66%	30.2	75%	12.2	83.0	83%	31.1	78%	33.6	84%
DUNSTOWN	220	40	8.9	56.3	56%	21.4	53%	22.1	55%	9.2	33.5	33%	24.4	61%	25.2	63%
DUNSTOWN	380	50	5.1	33.2	27%	14.1	28%	14.1	28%	6.2	33.5	27%	14.3	29%	14.4	29%
FIN_URBAN	110	31.5	36.2	42.1	53%	14.0	44%	17.7	56%	31.4	50.5	64%	17.9	57%	21.5	68%
FINGLAS	220	40	15.6	78.6	79%	26.1	65%	30.5	76%	14.1	89.1	89%	32.7	82%	36.5	91%
FIN_RURAL	110	31.5	34.5	41.9	53%	15.5	49%	18.1	58%	28.2	43.7	55%	15.5	49%	18.1	58%
INCH_CITY	110	31.5	25.7	41.5	53%	13.9	44%	16.1	51%	23.2	50.6	64%	18.1	58%	20.3	64%
INCHICORE	220	40	11.2	63.6	64%	22.2	56%	23.9	60%	9.3	70.1	70%	27.2	68%	28.2	70%
INCH_COUNTRY	110	31.5	37.3	41.8	53%	13.6	43%	17.5	56%	30.2	51.0	65%	17.9	57%	21.4	68%
IRISHTOWN	220	40	11.9	56.9	57%	20.0	50%	21.7	54%	8.8	63.0	63%	24.7	62%	25.4	64%
WEST DUBLIN	110	31.5	21.2	48.1	61%	16.5	53%	18.3	58%	23.1	35.7	45%	13.1	42%	14.6	46%
WEST DUBLIN	220	40	9.5	62.0	62%	22.5	56%	23.5	59%	8.7	60.6	61%	24.0	60%	24.7	62%
MAYNOOTH A	110	31.5	10.0	36.4	46%	13.8	44%	13.9	44%	10.8	43.8	56%	17.1	54%	17.3	55%
MAYNOOTH B	220	40	8.5	50.0	50%	19.0	48%	19.6	49%	8.8	46.1	46%	18.5	46%	19.0	48%
MAYNOOTH B	110	31.5	7.3	44.2	56%	17.6	56%	17.6	56%	8.9	42.4	54%	17.1	54%	17.1	54%
MAYNOOTH A	220	40	8.4	53.6	54%	20.4	51%	21.0	52%	8.5	47.3	47%	19.1	48%	19.6	49%
POOLBEG	110	40	25.4	42.4	42%	14.2	36%	16.5	41%	20.8	50.9	51%	18.4	46%	20.1	50%
POOLBEG NORT	220	31.5	12.7	60.9	77%	21.2	67%	23.4	74%	6.4	53.8	68%	22.3	71%	22.5	71%
POOLBEG	110	40	25.3	42.3	42%	14.2	35%	16.4	41%	20.7	50.8	51%	18.4	46%	20.1	50%
POOLBEG SOUT	220	31.5	11.3	59.4	75%	20.9	66%	22.5	72%	9.2	61.4	78%	24.0	76%	24.8	79%
SHELLYBANKS	220	40	8.8	53.3	53%	19.4	49%	20.1	50%	7.6	57.7	58%	23.1	58%	23.5	59%
SHELLYBANKS	220	40	11.7	59.9	60%	21.1	53%	22.8	57%	25.0	27.6	28%	10.2	25%	12.8	32%
SHELLYBANKSB	220	40	8.8	53.3	53%	19.4	49%	20.1	50%	7.6	57.7	58%	23.1	58%	23.5	59%
WOODLAND	220	40	11.4	76.1	76%	27.6	69%	29.7	74%	11.5	74.8	75%	28.9	72%	30.8	77%
WOODLAND	380	40	11.4	44.3	44%	16.6	42%	17.8	44%	11.2	45.1	45%	17.6	44%	18.7	47%

Appendix 1D – Fault Level Results: Shellybanks Tailed Arrangement with 3 units ON in Dublin

See section 5.1.2

			Maximum SC Study														
			3 phase							1 phase						
Node	Voltage	Minimum SC rating (kA)	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating
BELCAMP	110	25	29.9	36.4	58%	12.3	49%	14.8	59%	29.0	28.6	46%	10.4	41%	12.1	49%
BELCAMP	220	40	11.9	63.2	63%	21.6	54%	23.6	59%	10.0	70.5	71%	26.9	67%	28.2	70%
CARRICKMINES	110	26.2	26.5	35.1	54%	11.8	45%	13.8	53%	22.0	36.5	56%	13.2	51%	14.6	56%
CARRICKMINES	220	40	11.4	51.8	52%	18.4	46%	19.8	49%	8.2	56.6	57%	22.4	56%	23.0	57%
CORDUFF	110	31.5	8.9	60.8	77%	21.7	69%	21.8	69%	10.5	60.7	77%	23.6	75%	23.8	76%
CORDUFF	220	40	13.1	69.8	70%	23.6	59%	26.3	66%	11.5	76.3	76%	28.6	71%	30.6	77%
DUNSTOWN	220	40	8.9	55.7	56%	21.1	53%	21.8	55%	9.2	33.2	33%	24.1	60%	25.0	62%
DUNSTOWN	380	50	5.1	32.9	26%	14.0	28%	14.0	28%	6.2	33.2	27%	14.2	28%	14.3	29%
FIN_URBAN	110	31.5	34.0	40.5	51%	13.4	43%	16.8	53%	29.9	48.8	62%	17.3	55%	20.5	65%
FINGLAS	220	40	14.7	71.3	71%	23.7	59%	27.2	68%	13.5	82.3	82%	30.2	75%	33.4	83%
FIN_RURAL	110	31.5	32.4	40.6	52%	15.0	48%	17.4	55%	27.1	42.5	54%	15.0	48%	17.4	55%
INCH_CITY	110	31.5	25.5	41.0	52%	13.7	43%	15.9	50%	23.0	50.1	64%	17.9	57%	20.0	64%
INCHICORE	220	40	11.2	62.6	63%	21.8	54%	23.4	59%	9.3	69.2	69%	26.7	67%	27.7	69%
INCH_COUNTRY	110	31.5	36.7	41.4	53%	13.4	42%	17.2	55%	29.8	50.5	64%	17.7	56%	21.1	67%
IRISHTOWN	220	40	11.8	56.1	56%	19.7	49%	21.4	53%	8.8	62.2	62%	24.3	61%	25.1	63%
WEST DUBLIN	110	31.5	21.0	47.5	60%	16.3	52%	18.0	57%	23.0	35.4	45%	13.0	41%	14.4	46%
WEST DUBLIN	220	40	9.5	61.0	61%	22.0	55%	23.0	58%	8.7	59.8	60%	23.6	59%	24.3	61%
MAYNOOTH A	110	31.5	10.0	36.1	46%	13.7	43%	13.8	44%	10.8	43.5	55%	17.0	54%	17.2	54%
MAYNOOTH B	220	40	8.5	49.4	49%	18.7	47%	19.3	48%	8.8	45.6	46%	18.3	46%	18.8	47%
MAYNOOTH B	110	31.5	7.3	43.5	55%	17.2	55%	17.3	55%	8.9	41.8	53%	16.8	53%	16.9	54%
MAYNOOTH A	220	40	8.4	52.5	53%	19.9	50%	20.5	51%	8.5	46.5	47%	18.7	47%	19.2	48%
POOLBEG	110	40	25.1	42.5	42%	14.2	36%	16.4	41%	20.6	51.0	51%	18.4	46%	20.1	50%
POOLBEG NORT	220	31.5	12.8	57.2	73%	19.8	63%	21.9	69%	6.6	51.5	65%	21.2	67%	21.4	68%
POOLBEG	110	40	25.1	42.4	42%	14.2	35%	16.4	41%	20.6	51.0	51%	18.4	46%	20.1	50%
POOLBEG SOUT	220	31.5	11.2	58.5	74%	20.5	65%	22.1	70%	9.1	60.6	77%	23.6	75%	24.5	78%
SHELLYBANKS	220	40	9.1	50.2	50%	18.1	45%	18.8	47%	7.8	54.9	55%	21.9	55%	22.3	56%
SHELLYBANKS	220	40	11.9	56.3	56%	19.6	49%	21.4	53%	24.6	26.8	27%	9.8	25%	12.3	31%
SHELLYBANKSB	220	40	9.1	50.2	50%	18.1	45%	18.8	47%	7.8	54.9	55%	21.9	55%	22.3	56%
WOODLAND	220	40	11.4	73.3	73%	26.4	66%	28.4	71%	11.5	72.6	73%	27.9	70%	29.8	75%
WOODLAND	380	40	11.2	43.8	44%	16.4	41%	17.5	44%	11.1	44.6	45%	17.5	44%	18.5	46%

Appendix 1E – Fault Level Results: Shellybanks Coupled Arrangement with 2 units ON in Dublin

See 5.3.3.4.2 – **Error! Reference source not found.**

			Maximum SC Study														
			3 phase							1 phase						
Node	Voltage	Minimum SC rating (kA)	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating	X/R	Peak Make	% of rating	RMS AC Break	% of rating	TOT RMS Break	% of rating
BELCAMP	110	25	26.1	37.2	59%	12.8	51%	14.8	59%	26.4	29.3	47%	10.7	43%	12.3	49%
BELCAMP	220	40	9.3	69.4	69%	24.4	61%	25.5	64%	7.8	80.8	81%	31.7	79%	32.4	81%
CARRICKMINES	110	26.2	27.0	37.0	56%	12.4	47%	14.6	56%	21.0	38.5	59%	14.0	54%	15.4	59%
CARRICKMINES	220	40	10.5	62.3	62%	21.9	55%	23.3	58%	6.7	68.8	69%	27.9	70%	28.2	71%
CORDUFF	110	31.5	8.8	58.3	74%	21.7	69%	21.8	69%	10.3	60.4	77%	23.5	75%	23.7	75%
CORDUFF	220	40	10.4	73.3	73%	25.5	64%	27.1	68%	9.4	80.1	80%	30.8	77%	32.0	80%
DUNSTOWN	220	40	8.6	56.1	56%	21.3	53%	21.9	55%	8.9	61.1	61%	24.3	61%	25.1	63%
DUNSTOWN	380	50	5.1	32.3	26%	13.7	27%	13.7	27%	6.1	32.8	26%	14.0	28%	14.1	28%
FIN_URBAN	110	31.5	28.0	40.8	52%	13.7	44%	16.3	52%	25.5	49.3	63%	17.7	56%	20.1	64%
FINGLAS	220	40	10.4	74.1	74%	25.6	64%	27.2	68%	9.3	87.8	88%	33.5	84%	34.8	87%
FIN_RURAL	110	31.5	26.8	40.7	52%	13.3	42%	15.7	50%	23.7	42.6	54%	15.2	48%	17.1	54%
INCH_CITY	110	31.5	25.1	42.0	53%	14.0	45%	16.2	52%	21.7	51.2	65%	18.4	58%	20.3	64%
INCHICORE	220	40	10.4	68.5	69%	23.7	59%	25.3	63%	7.0	76.1	76%	30.4	76%	30.8	77%
INCH_COUNTRY	110	31.5	36.3	42.3	54%	13.7	44%	17.6	56%	27.9	51.5	65%	18.2	58%	21.3	68%
IRISHTOWN	220	40	10.7	76.0	76%	26.0	65%	27.9	70%	8.7	89.5	89%	34.4	86%	35.5	89%
WEST DUBLIN	110	31.5	20.4	47.9	61%	16.5	52%	18.1	57%	21.7	35.5	45%	13.1	41%	14.4	46%
WEST DUBLIN	220	40	9.1	62.5	62%	22.6	56%	23.5	59%	7.8	61.1	61%	24.5	61%	25.0	62%
MAYNOOTH A	110	31.5	10.1	36.1	46%	13.7	43%	13.8	44%	10.8	43.5	55%	17.0	54%	17.2	54%
MAYNOOTH B	220	40	8.3	49.9	50%	18.9	47%	19.4	49%	8.5	45.9	46%	18.5	46%	19.0	47%
MAYNOOTH B	110	31.5	7.3	42.8	54%	17.0	54%	17.0	54%	8.9	41.4	53%	16.7	53%	16.7	53%
MAYNOOTH A	220	40	8.4	51.1	51%	19.3	48%	19.9	50%	8.3	45.8	46%	18.5	46%	18.9	47%
POOLBEG	110	40	23.9	42.3	42%	14.2	36%	16.3	41%	19.3	50.7	51%	18.4	46%	19.9	50%
POOLBEG NORT	220	31.5	10.3	74.9	95%	25.8	82%	27.4	87%	5.6	60.1	76%	25.4	81%	25.5	81%
POOLBEG	110	40	23.8	42.2	42%	14.2	36%	16.2	41%	19.3	50.7	51%	18.4	46%	19.9	50%
POOLBEG SOUT	220	31.5	10.1	61.2	78%	21.6	68%	22.8	72%	7.4	63.1	80%	25.3	80%	25.7	81%
SHELLYBANKS	220	40	10.7	75.7	76%	25.9	65%	27.7	69%	8.8	89.1	89%	34.2	86%	35.3	88%
SHELLYBANKS	220	40	10.7	75.7	76%	25.9	65%	27.7	69%	8.8	89.1	89%	34.2	86%	35.3	88%
SHELLYBANKSB	220	40	10.7	75.7	76%	25.9	65%	27.7	69%	8.8	89.1	89%	34.2	86%	35.3	88%
WOODLAND	220	40	11.0	70.5	71%	25.5	64%	27.3	68%	11.2	70.9	71%	27.4	68%	29.1	73%
WOODLAND	380	40	11.0	42.8	43%	16.0	40%	17.1	43%	10.9	44.0	44%	17.2	43%	18.2	46%

Options Report
Part A
CP1021 Strengthening the Grid in North Dublin

September 2019

1 Table of Contents

2 Introduction

EirGrid follow a six step approach when we develop and implement the best performing solution option to any identified transmission network problem. This six step approach is described in the document 'Have Your Say' published on EirGrid's website[1]. The six steps are shown on a high-level in Figure 1. Each step has a distinct purpose with defined deliverables.

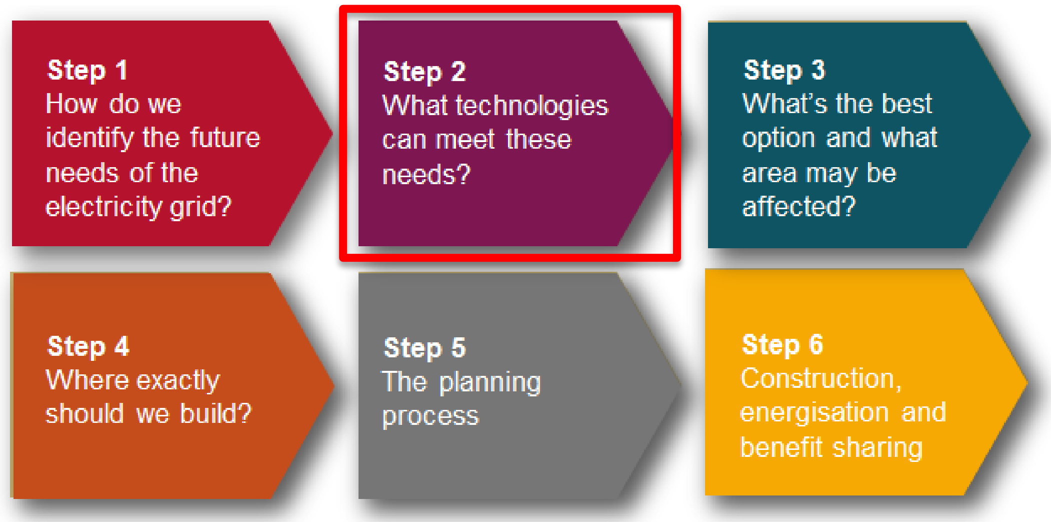

Figure 1 *High Level Project Development Process*

The transmission network problem was identified and described in previous Step 1 and was documented in the Need Report.

The Options Report Part A (this document) is a deliverable for Step 2. In Step 2, a technology overview will be carried out. This will determine the aspects that will be considered when creating any options. All the viable and technically acceptable options created will be shown in a list that is called 'the long list'. This list will be refined in a two-part approach with the aim to establish a shorter list of best performing solution options to bring forward for further investigation in Step 3. The outcome from the first part of refinement of the long list in Step 2 is presented in the Options Report Part A (this document) and the outcome of the second part of refinement of the list is presented in Options Report Part B.

The need, in this case, involves a transmission network problem relating to the transfer of power across the existing 220 kV transmission network from the Woodland 400 kV

[1] http://www.eirgridgroup.com/the-grid/have-your-say/

station to the north Dublin area. The issues encountered involve the capacity of the transmission system in the area.

3 Process followed and criteria

3.1 Description of process

The need to improve the transmission network is identified in Step 1. Following on from that step, the process of identifying viable and technically acceptable technology solution options starts. This involves a rigorous process spanning over two steps namely, Step 2 and Step 3. The outcome of Step 2 is a list of best performing solution options which will be taken to Step 3 for further investigation and evaluation. At the end of Step 3 we will have a best performing solution option which will be developed for construction and energisation.

Step 2 can further be broken down into a two-part approach, namely Part A and Part B. This report (Options Report Part A) details the findings of the first part (Part A) of the refinement of the long list. Part B will involve a second refinement of the options list and the findings of this assessment will be presented in the Options Report Part B at the end of Step 2. Between Part A and Part B stakeholder engagement will take place. The stakeholder engagement is project specific and generally at this stage in the development process it is intended to engage with national and regional stakeholders. A project specific web-site will be set up and relevant material about the project will be published. Figure 2 provides an overview of the process and different tasks in Step 2, excluding stakeholder engagement. A more detailed description of the individual tasks is provided below.

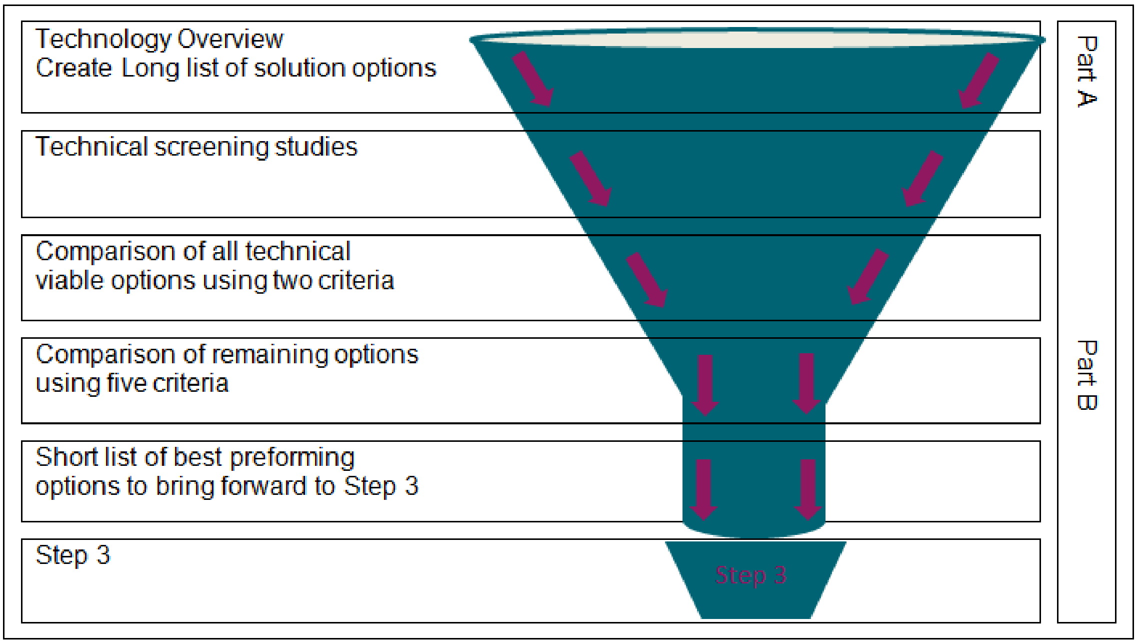

Figure 2 *Illustration of the process of developing of options in Step 2*

3.1.1 Part A

The initial development of viable and technically acceptable options starts with the Technology Overview. This involves consideration of technical aspects which will form the basis of developing the solution options, such as technologies, suitable voltage levels and potential connection points of the solutions. The reasoning and justification for any choices and decisions are outlined. This is discussed in section 4.1 Technology Overview in more detail. The findings of the technology overview are then used to create a long list of viable and technically acceptable solution options.

The second task involves high level technical screening studies of the identified solution options to determine if they have a potential to solve the identified need. The solution options will also be assessed on their technical ability, relative to each other, to solve the identified problem. This is discussed in section 4.2.1 Technical screening studies. Further more detailed technical analysis will be carried out later in Part B in Step 2 to determine technical details of options.

The third task involves a multi-criteria comparison of the solution options in the long list using two criteria namely, technical performance and economic performance. This task may involve reducing a vast number of solution options to a more refined list of options to be further investigated. This is discussed in Section 4.3 Comparison of solution options.

3.1.2 Part B

The option list is further refined, this time using a multi-criteria comparison against five criteria. The five criteria are technical performance, economic performance, environmental, deliverability and socio-economic aspects. Each remaining option is assessed against the five criteria. At the end of Step 2 the outcome of this assessment will be available in the Options Report Part B. The outcome of Step 2 is a shorter list of solution options which will be taken to Step 3 for further investigation and evaluation.

3.2 Criteria used for comparison of options

As described in previous section the multi-criteria comparison is carried out twice in Step 2. The first time (Part A) the performance matrix is used only two criteria are compared namely, technical performance and economic performance. The second time (Part B) the performance matrix is used five criteria are compared, namely technical performance, economic performance, environmental, deliverability and socio-economic. Descriptions of the all criteria are outlined below.

3.2.1 Technical performance

Technical performance in Part A is based on high level technical screening studies of the identified solution options. This will determine if they have a potential to solve the identified need. The solution options will also be assessed on their technical ability, relative to each other, to solve the identified problem. In this case the initial technical screening study is based on the worst contingencies identified in load flow as part of the need analysis.

The need analysis showed that:

- During winter and summer peaks the worst situation arises when a generator located at Huntstown (HNC) is unavailable. The worst single contingencies identified are one of the 220 kV circuits from Clonee – Woodland or Corduff – Woodland. (N-1 test).
- At summer peak, which happens during the maintenance season, a maintenance and trip combination contingency of the Clonee – Woodland and Corduff – Woodland 220 kV circuits is worst. (N-1-1 test).
- At winter peak if the second huntstown generator (HN2) is also unavailable for any reason the worst contingency is the loss of the Corduff – Woodland 220 kV circuit. (N-G-1).

The different options will be compared against identified indicators of the technical performance based on the need identified. This is further discussed in Section 4.2.1 Technical screening studies.

The second time (Part B) the technical performance is assessed the criteria is based on compliance with Transmission System Security and Planning Standards (TSSPS) and policies. Minimum technical requirements based on these have to be met to qualify an option for consideration, but options which extend technical performance margins beyond minimum acceptable levels are favoured over others. Operational flexibility will also be assessed. This will capture the complexity involved in operational switching and risks to operation during maintenance. The extent to which future reinforcement of, and/or connection to, the transmission network is facilitated will also be taken into account.

3.2.2 Economic performance

Economic performance in Part A will be based on high level estimated capital costs for each option for comparison purposes. The primary source for cost estimates have been developed with input from the Transmission Asset Owner (TAO) and are based on desktop designs and costings for similar works. Where costs were not available for a particular technology, the best most recent estimate will be used.

Economic performance in Part B will be based on estimated Total Project Cost (TPC) for comparison purposes. The TPC will comprise both estimated capital costs and an estimated cost for the Transmission System Operator (TSO) element for development the options. The primary source for cost estimates will be developed with input from the Transmission Asset Owner (TAO) and are based on desktop designs and costings for similar works. Where costs were not available for a particular technology the best, most recent estimate will be used.

3.2.3 Environmental

This criterion is used in Part B. Environmental issues are considered at a high level such as potential interactions with Natura 2000 sites (Special Areas of Conservation-SAC, or special Protection Areas-SPAs or other designated sites that may be in the zone of influence for the various options. Impacts on existing land use and landscape including cultural heritage is compared for the various options.

3.2.4 Deliverability

This criterion is used in Part B. Deliverability captures timelines as well as engineering and planning risks which could extend delivery timescales and costs.

3.2.5 Socio-Economic

This criterion is used in Part B. This criterion will consider the general location of the subject site of the proposed solution options and adjacent lands with regards to the nature of typical social impacts. This assessment is carried out in accordance with EirGrid's SIA Methodology.

3.3 Scale used to assess each criterion

The effect on each criterion parameter is presented along a range from "more significant"/"more difficult"/"more risk" to "less significant"/"less difficult"/"less risk". The following scale is used to illustrate each criterion parameter:

More significant/difficult/risk   Less significant/difficult/risk

In the text this scale is quantified by text for example mid-level (Dark Green), low-moderate (Green), low (Cream), high-moderate (Blue) or high (Dark Blue).

4 Long list and comparison of options

4.1 Technology Overview

This overview forms the pillars from which the solution options to resolve the identified need are developed. For the technology overview, EirGrid's approved technology toolbox has been used. To determine the possible solution options a number of aspects are considered. A brief discussion regarding these aspects and the decisions made are outlined below.

Prior to developing options for the identified need, it is important to analyse and understand the need. The need in this case, involves a strengthening of the network in the north Dublin region to facilitate increased demand in north Dublin and variability in generation output in Dublin.

New large scale energy users are concentrated around north Dublin. These large energy users are located near the existing transmission stations at Clonee, Corduff, Finglas and Belcamp. There are a limited number of circuits to supply these stations and a dependence on generation to manage power flows is likely as the large energy users avail of their Maximum Import Capacity.

Added to this, four large generators are connected in Dublin at Finglas, Corduff, Shellybanks and Irishtown stations respectively, and the East-West Interconnector is connected at Woodland. The generators can be used to supply load in north Dublin and to offset flows from Woodland towards Corduff, Finglas, and Belcamp. However these generators are likely to be overtaken in the merit order by newer more efficient conventional generators and increasing levels of renewables. Both these categories of generators are likely to belocated outside of Dublin and power will have to be transported into the north Dublin region where it is needed around Corduff, Finglas and Belcamp station.

The need assessment indicated that solutions with the best potential to solve the need are likely to involve connection points between the Woodland station in county Meath on the western side of the constrained area, and new, or existing, station along the constrained path towards the generator connection stations in central Dublin. Connecting these nodes will strengthen nodes in its vicinity and strengthen the path for power flowing into Dublin. The best performing solution needs to integrate with the existing network and provide a platform for the future expansion of the transmission network.

4.1.1 Technologies

The development of options may involve additional circuits or equipment which would allow for the more efficient use of existing transmission infrastructure on the system. EirGrid is committed to making best use of existing assets before considering investing in new assets. The 'do-nothing' option has been considered and shown in the needs assessment in Step 1 to retain reliance on generation in Dublin to offset power flows from Woodland towards Corduff, Finglas, and Belcamp.

Reconfiguration of the existing network, or possible use of powerflow management devices such as series reactors or phase shifting transformers, to ensure best use of the existing assets has also been examined in developing the needs assessment. During that assessment all practical network reconfigurations were tested to ensure any spare capacity on existing circuits could be used to alleviate the need.

New capacity will be required to accommodate additional demand connections and to allow flexibility in the market based optimal dispatch of generation in the Dublin area.

4.1.1.1 New Circuit Capacity.

High Voltage Alternating Current (HVAC) will be considered for all of the reinforcement options. HVAC is the same technology used in the existing network and would integrate well. Some of our options will look at uprating existing infrastructure.

High Voltage Direct Current (HVDC) technology was not considered for the reinforcement of the area due to the high cost for a relatively short length circuit, and the lack of flexibility for future connections into the new reinforcement.

In terms of new circuits, both HVAC underground cable (UGC) and overhead line (OHL) options will be considered. It should be noted that previous analysis has indicated that long lengths (more than 10 km) of AC 400 kV underground cable cannot be accommodated in the Irish transmission system. There are technical reasons why a longer AC underground cable cannot be accepted. The reasons include voltage control problems and electromagnetic transient phenomena associated with the capacitive characteristics of high voltage underground cables. The issues associated with long cables can only be determined by specialised system analysis and these studies are planned to be carried out if an AC cable option is brought forward to Step 3.

We have included a number of AC underground cable solution options along with AC overhead line options in the long list. The majority of the long list of options is at 220kV levels, with some options incorporating 400 kV circuits to help identify benefits that 400 kV circuits could provide. The cable options will be assessed on the same terms as the other options in Part A. If the cable options remain after the first refinement of the list their technical suitability and acceptability will be investigated further in Part B and in Step 3 if required.

Partial AC undergrounding of any overhead line solution using short lengths of underground cables will be considered as part of mitigation measures in Step 3 and/or Step 4.

4.1.1.2 Associated Additional Network Equipment.

Due to the electrical characteristics of underground cable circuits (they have a lower electrical impedance than overhead lines) they would carry a large share of the flow in a corridor of parallel overhead line circuits. Power flow management devices could be required to manage the flow along the new underground cable circuit within the thermal limits of the cable. Detailed analysis of requirements for power flow management will be covered in Step 2B, if required. Power flow management devices include series reactors, phase shifting transformers, or power electronic based technology, to manage the power flow through the new cables.

4.1.1.3 Offshore Circuit Routes.

The majority of the identified connection points, 220 kV stations and other strong nodes, are all located far inland. However one of the solution options which proposes to link Poolbeg, Carrickmines and Belcamp stations on the east of Dublin may require an offshore cable solution. The use of a partial offshore cable solution has not been specifically identified for the other solution options. The reason is that the onshore cable elements required to get to the coast would alone be longer than an entirely onshore cable option. In the event that subsequent detailed routing of cable options increases the route length sufficiently, the use of partial offshore cable will be reconsidered.

4.1.2 Voltage level

For the development of the options the voltage levels 220 kV and 400 kV will be considered. The magnitude of the need identified, namely thermal overloads on 220 kV circuits, indicates that a reinforcement using the voltage levels of 220 kV and 400 kV at a minimum is required. Using a 110 kV reinforcement would not contribute with the capacity required and is not considered appropriate.

4.1.3 Connection points

The identified network problems indicate issues with loss of high voltage circuits, in particular the two existing 220 kV circuits between Woodland and Corduff. The loss of one of these 220 kV circuits will force most of its power flow on to the remaining circuit. This will cause overloads on this remaining circuit. Similarly the concurrent loss of the

220 kV lines between Corduff - Woodland or Corduff – Clonee - Woodland will cause overloading on the Finglas to Poolbeg circuit.

Possible connection points for solution options include connections between the 220 kV stations at Woodland and Corduff, and these stations have been the focus of the options developed. Other strong connection points to be considered are Finglas, Belcamp, Poolbeg, Inchicore, Maynooth, Carrickmines and Castlebagot. A potential future new 220 kV station at Steelstown, between the towns of Rathcoole and Naas, was also considered. Figure 3 highlights the identified possible connection points which will be used when creating the potential options.

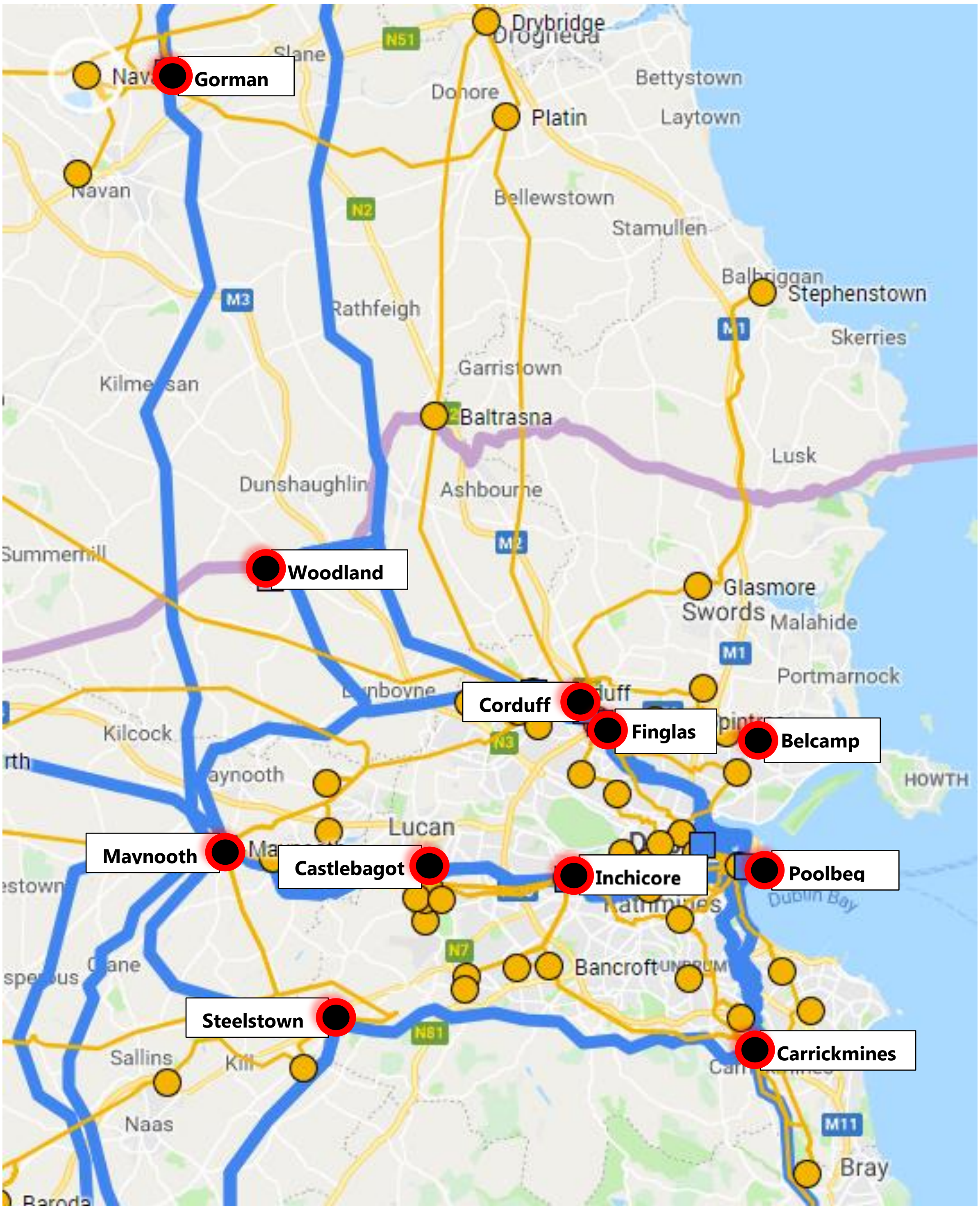

Figure 3 *Some the possible connection points for solutions*

4.2 Assessment of solution options in long list

The long list of solution options was established using the connection points, voltage levels and technologies described in previous section. Knowledge of the identified need and engineering judgement was also used when the long list was created. The long list consists of 21 technically viable and feasible solution options and they are listed in Table 2.

The solution options identified in the long list were assessed based on two criteria namely, technical performance and economic performance. The aim of this assessment is to be able to compare the options and reduce the number of solution options that would be brought forward for more detailed evaluation. The following sections of this report describe how these assessments were carried out and the outcome. The effect on each criterion parameter is presented along the following scale.

More significant/difficult/risk Less significant/difficult/risk

Long List	
1	Corduff - Woodland new 220 kV UGC circuit
2	Corduff - Woodland new 220 kV OHL circuit.
3	Corduff - Woodland new 400 kV UGC circuit
4	Corduff - Woodland new 400 kV OHL circuit
5	Corduff - Gorman new 220 kV OHL circuit
6	Corduff - Poolbeg new 220 kV UGC circuit
7	Corduff - Inchicore new 220 kV UGC circuit.
8	Corduff - Maynooth new 220 kV UGC circuit.
9	Corduff - Castlebagot new 220 kV UGC circuit
10	Corduff - Carrickmines new 220 kV UGC circuit.
11	Corduff - Poolbeg - Carrickmines 220 kV UGC circuit.
12	Corduff – Steelstown (New station) new 220 kV UGC circuit
13	Corduff - Castelbagot – Steelstown (New station) new 220 kV UGC circuit
14	Belcamp - Woodland new 220 kV UGC circuit.
15	Belcamp - Woodland new 220 kV OHL circuit.
16	Belcamp - Woodland new 400 kV UGC circuit.
17	Belcamp - Woodland new 400 kV OHL circuit.
18	Finglas - Woodland new 220 kV UGC circuit.
19	Finglas - Woodland new 220 kV OHL circuit.
20	Finglas - Woodland new 400 kV UGC circuit.
21	Finglas - Woodland new 400 kV OHL circuit.

Table 1 *List of the high level technical screening study options in Step 2 Part A for options in long list*

4.2.1 Technical screening studies

The technical performance of options, at this stage, is based on high level technical screening studies to determine if the options have a potential to solve the identified need. The solution options will also be assessed on their technical ability relative to each other. The aim of the high level technical screening studies is to reduce the number of solution options that would be brought forward for more detailed evaluation.

The high level technical screening studies are based on assessing the worst contingencies identified as part of the need analysis. The need analysis showed that the key technical issue to be considered as part of developing the solution options was thermal overloads.

It was decided to use this issue as the indicator for the technical performance of the options in the long list. This enabled an assessment of each option's technical ability to solve the identified issues in a concise way. It also allowed a comparison of each option's technical ability relative to each other.

Three basic subcriteria were used to compare the technical performance of the options. These were:

1. Overloads remaining after adding potential solution option
2. Effect of potential solution options on power flows
3. Additional network capacity provided by potential solution options

4.2.1.1 Overloads remaining after inclusion of solution options

This subcriterion examined each solution option's ability to remove the post contingent overloads identified in the needs analysis. Each solution option was added to the network, in turn, to determine if overloads remained on the circuits identified in the needs analysis, or if the new circuit in the solution option was overloaded. Solution options that most reduced the number of overloads, performed best.

4.2.1.2 Effect of solution options on power flows

This subcriterion examined the solution options to identify if they change the loading of the circuit that was recorded in the needs analysis. Each solution option was added to the network, in turn, to determine the effect on the circuit. A reduction in the circuit loadingwas considered beneficial, and solution options performed better the more the loading on the circuit was reduced.

4.2.1.3 Additional Network Capacity provided by solution options

The third subcriterion analysed the additional network capacity added by the solution option without the need for additional power flow controlling equipment. This was done by comparing the balance of power flows on the existing and new circuits for each solution option in turn. If the circuits are more balanced additional equipment may not be required to help balance the flows. This will allow the best use of existing and new circuits without the need for additional equipment.

4.2.2 Short Circuit analysis

In the needs assessment the expected short circuit current level for the different generation and demand scenarios was calculated. These levels were compared against those for the different solution options identified due to the knowledge that the North Dublin area has existing high short circuit levels. The short circuit level was analysed to develop an understanding of the effect each solution option may have on them. The short circuit level impact was not considered as an indicator of technical performance because the difference in impact between solution options was not large enough to compare.

4.2.3 Hight level technical screening studies

Each solution option in the long list was modelled in the winter and summer peak 2025 network situations and the worst contingencies identified in the needs assessment were applied. The impact that the solution options made on the thermal overloads was recorded and compared with a reference case. The reference case represents a network with no solution option included.

Table 3 highlights the high level technical performance of the options based on thermal overloads, compared to the reference case.

Options		Overloads remaining after adding solution option	Effect of potential solution option on power line	Additional capacity/Balance of flows	Overall Technical Performance
1	Corduff - Woodland new 220 kV UGC circuit				
2	Corduff - Woodland new 220 kV OHL circuit.				
3	Corduff - Woodland new 400 kV UGC circuit				
4	Corduff - Woodland new 400 kV OHL circuit				
5	Corduff - Gorman new 220 kV OHL circuit				
6	Corduff - Poolbeg new 220 kV UGC circuit				
7	Corduff - Inchicore new 220 kV UGC circuit.				
8	Corduff - Maynooth new 220 kV UGC circuit.				
9	Corduff - Castlebagot new 220 kV UGC circuit				
10	Corduff - Carrickmines new 220 kV UGC circuit.				
11	Corduff - Poolbeg - Carrickmines 220 kV UGC circuit.				
12	Corduff - Steelstown (New station) new 220 kV UGC circuit				
13	Corduff - Castelbagot - Steelstown (New station) new 220 kV UGC				
14	Belcamp - Woodland new 220 kV UGC circuit.				
15	Belcamp - Woodland new 220 kV OHL circuit.				
16	Belcamp - Woodland new 400 kV UGC circuit.				
17	Belcamp - Woodland new 400 kV OHL circuit.				
18	Finglas - Woodland new 220 kV UGC circuit.				
19	Finglas - Woodland new 220 kV OHL circuit.				
20	Finglas - Woodland new 400 kV UGC circuit.				
21	Finglas - Woodland new 400 kV OHL circuit.				

Table 2 *Result of the high level technical screening studies in Step 2 Part A for options in long list*

4.2.4 Economic performance

Economic Performance in Part A in Step 2 is based on estimated capital costs for each option for comparison purposes. **Error! Reference source not found.**4 summaries the estimated capital cost for the long list of options and provides a colour code relative to each other for comparison purposes.

	Options	Economic Performance
1	Corduff - Woodland new 220 kV UGC circuit	
2	Corduff - Woodland new 220 kV OHL circuit.	
3	Corduff - Woodland new 400 kV UGC circuit	
4	Corduff - Woodland new 400 kV OHL circuit	
5	Corduff - Gorman new 220 kV OHL circuit	
6	Corduff - Poolbeg new 220 kV UGC circuit	
7	Corduff - Inchicore new 220 kV UGC circuit.	
8	Corduff - Maynooth new 220 kV UGC circuit.	
9	Corduff - Castlebagot new 220 kV UGC circuit	
10	Corduff - Carrickmines new 220 kV UGC circuit.	
11	Corduff - Poolbeg - Carrickmines 220 kV UGC circuit.	
12	Corduff - Steelstown (New station) new 220 kV UGC circuit	
13	Corduff - Castelbagot - Steelstown (New station) new 220 kV UGC	
14	Belcamp - Woodland new 220 kV UGC circuit.	
15	Belcamp - Woodland new 220 kV OHL circuit.	
16	Belcamp - Woodland new 400 kV UGC circuit.	
17	Belcamp - Woodland new 400 kV OHL circuit.	
18	Finglas - Woodland new 220 kV UGC circuit.	
19	Finglas - Woodland new 220 kV OHL circuit.	
20	Finglas - Woodland new 400 kV UGC circuit.	
21	Finglas - Woodland new 400 kV OHL circuit.	

Table 3 *Economic Performance of options in long list*

4.3 Comparison of solution options

Table 5 provides a summary of the combined performance of each option against the two evaluation criteria (Technical Performance and Economic Performance).

Options		Technical Performance	Economic Performance	Combined Performance
1	Corduff - Woodland new 220 kV UGC circuit			
2	Corduff - Woodland new 220 kV OHL circuit.			
3	Corduff - Woodland new 400 kV UGC circuit			
4	Corduff - Woodland new 400 kV OHL circuit			
5	Corduff - Gorman new 220 kV OHL circuit			
6	Corduff - Poolbeg new 220 kV UGC circuit			
7	Corduff - Inchicore new 220 kV UGC circuit.			
8	Corduff - Maynooth new 220 kV UGC circuit.			
9	Corduff - Castlebagot new 220 kV UGC circuit			
10	Corduff - Carrickmines new 220 kV UGC circuit.			
11	Corduff - Poolbeg - Carrickmines 220 kV UGC circuit.			
12	Corduff - Steelstown (New station) new 220 kV UGC circuit.			
13	Corduff - Castelbagot - Steelstown (New station) new 220 kV UGC circuit.			
14	Belcamp - Woodland new 220 kV UGC circuit.			
15	Belcamp - Woodland new 220 kV OHL circuit.			
16	Belcamp - Woodland new 400 kV UGC circuit.			
17	Belcamp - Woodland new 400 kV OHL circuit.			
18	Finglas - Woodland new 220 kV UGC circuit.			
19	Finglas - Woodland new 220 kV OHL circuit.			
20	Finglas - Woodland new 400 kV UGC circuit.			
21	Finglas - Woodland new 400 kV OHL circuit.			

Table 4 *Multi criteria assessment based on two criteria in step 2 Part* A

In terms of technical performance, those options which added to the connectivity of Corduff station by terminating there but started at stations around the city, namely Castlebagot, Poolbeg, Carrickmines, and Steelstown, were not effective in meeting the need identified in Step 1.

Options which add capacity parallel to the existing path between Woodland, Corduff, Finglas, and Belcamp performed best. Of the options that add parallel capacity, those that start at Woodland 400 kV station and terminate at Finglas, Corduff or Belcamp 220 kV stations, or at new 400 kV stations at those sites, perform best. Those terminating at Finglas performed marginally better. Those terminating at Belcamp do not have a direct influence on the power flows on the Finglas – North Wall 220 kV circuit.

The analysis found that the 220 kV underground cable options would require additional powerflow management devices to avoid the new cable circuit carrying the majority of powerflow in the corridor and being heavily loaded, or overloaded, as soon as it is installed. Detailed analysis of the requirement for power flow controlling devices will be carried out in Step 2B. That analysis may determine a fixed device such as a series reactor, or a flexible device such as a phase shifting transformer, or a Flexible AC Transmission (FACTs) device with similar capabilities, to be appropriate.

Previous analysis has indicated that long lengths of AC 400 kV underground cable cannot be accommodated in the Irish transmission network. Although previous analysis identified issues we have for completeness included AC underground cable solution options in the long list at 400 kV and 220 kV. The cable options are assessed on the same terms as the other options in the high level screening studies in Part A. AC cable solutions will require very detailed specific technical analysis to determine if they are technically feasible. These detailed specific technical analyses will be carried out in Step 3 if the cable options remain. Partial AC undergrounding of any overhead line solution using short lengths of underground cables will be considered as part of mitigation measured in Step 3 and/or Step 4.

The economic performance has a dependence on the length of the proposed new circuit. Long circuits perform economically less favourably compared to the options which have a shorter length. New circuits at 400 kV were shown to be more expensive than the 220 kV candidate solutions due to the additional transformer requirements and higher circuit costs.

4.4 Proposed solution options to be brought forward

The proposed options that will be taken through for further investigation are marked with the colours **Cream** and/or **Light Green**, in **Error! Reference source not found.**5. The proposed options can be influenced by stakeholders if reasonable justification is provided for modification of the proposed list of options. Based on the analysis to date, below is a proposed refined list of solution options to be brought forward for more detailed evaluation in Part B:

- New Corduff – Woodland 400 kV OHL Circuit
- New Corduff – Woodland 400 kV UGC Circuit
- New Corduff – Woodland 220 kV OHL Circuit*
- New Finglas – Woodland 220 kV OHL Circuit
- New Finglas – Woodland 400 kV UGC Circuit
- New Finglas – Woodland 400 kV OHL Circuit
- New Belcamp – Woodland 400 kV OHL Circuit**

*The option of a New Corduff – Woodland 220 kV UGC circuit did not emerge from the refinement of the long list due to a poorer technical performance of the UGC option.

** The option of a New Belcamp – Woodland 400 kV UGC circuit did not emerge from the refinement of the long list due to the additional capital cost of the cable component.

If the New Corduff – Woodland 220 kV OHL circuit option or New Belcamp – Woodland 400 kV OHL circuit option proceeds through Step 2B and Step 3 a variation of those options using underground cable will be evaluated in line with EirGrid's commitment to evaluate UGC when OHL options are brought through the Framework.

5 Conclusion of Step 2 Part A

After completing a technology overview, a long list of 21 viable and technically feasible solution options was presented. The solution options identified in the long list were assessed based on two criteria namely, technical performance and economic performance.

The aim of the assessment in Part A is to be able to compare the options and reduce the number of solution options that would be brought forward for more detailed evaluation. Based on the analysis to date, below is a proposed refined list of solution options to be brought forward for more detailed evaluation in Part B:

- New Corduff – Woodland 400 kV OHL Circuit
- New Corduff – Woodland 400 kV UGC Circuit,
- New Corduff – Woodland 220 kV OHL Circuit,
- New Finglas – Woodland 220 kV OHL Circuit,
- New Finglas – Woodland 400 kV UGC Circuit,
- New Finglas – Woodland 400 kV OHL Circuit,
- New Belcamp – Woodland 400 kV OHL Circuit.

The proposed list of options can be influenced by stakeholders if reasonable justification is provided for modification of the refined list.

All options involve a new connection commencing at Woodland 400/220 kV station and reaching in towards the Nothern outskirts of Dublin.

In Part B the remaining options will be assessed under five criteria;

- Technical Performance
- Economic Performance
- Deliverability
- Environmental
- Socio-economic

This assessment will allow the refined long list to be further reduced to create a shorter list to bring forward to Step 3.

Options Report
Part B
Capital Project CP1021

January 2021

1 Table of Contents

2 Introduction

EirGrid follow a six step approach when we develop and implement the best performing solution option to any identified transmission network problem. This six step approach is described in the document 'Have Your Say' published on EirGrid's website[1] and is known as the framework for developing the grid. The six steps are shown on a high-level in Figure 1. Each step has a distinct purpose with defined deliverables.

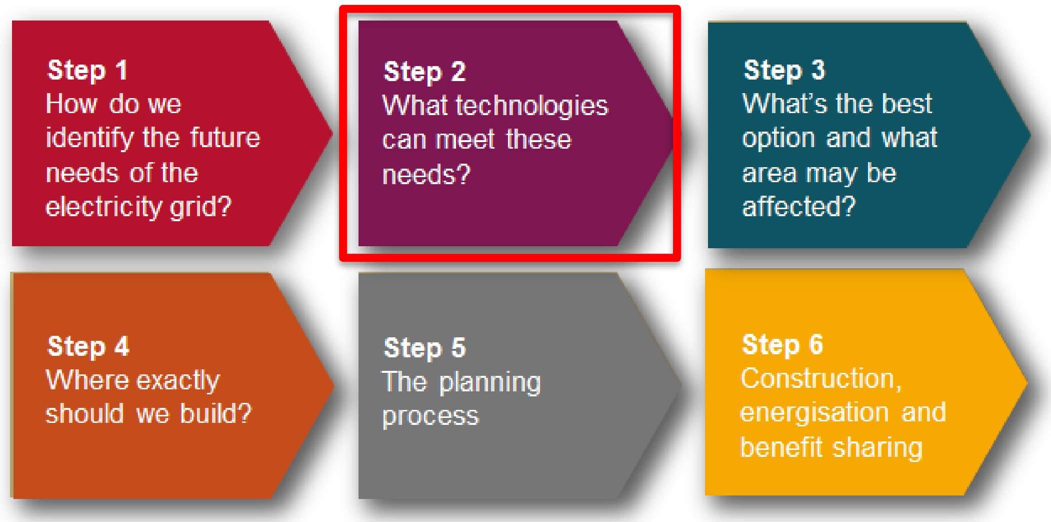

Figure 1 *High Level Project Development Process*

The transmission network problem was identified and described in previous Step 1 and was documented in the Need Report.

The need, in this case, involves a transmission network problem relating to the transfer of power across the existing 220 kV transmission network from the Woodland 400 kV substation to the north Dublin area. The issues encountered involve the capacity of the transmission system in the area.

In Step 2 there are two reports to be delivered, namely Options Report Part A and Options Report Part B. The Options Report Part A, covers the aspects that will be considered when creating the long list of options and the first refinement of this list. The outcome of the second part of refinement of the list is presented in Options Report Part B (this document).

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[1] http://www.eirgridgroup.com/the-grid/have-your-say/

3 Process followed and criteria

3.1 Description of process

The transmission network problem was identified and described in previous Step 1 and documented in the Need Report. Following on from Step 1, the process of identifying viable technology solution options starts. This involves a rigorous process spanning over two steps namely, Step 2 and Step 3. The outcome of Step 2 is a list of best performing solution options which will be taken to Step 3 for further investigation and evaluation. At the end of Step 3 we will have a best performing solution option which will be developed for construction and energisation. This report details the outcome of the second part of the refinement of the long list in Step 2.

Figure 2 provides an overview of the process and different tasks in Step 2. The first three tasks were covered in Options Report Part A. The outcome of these three first tasks was a refined long list.

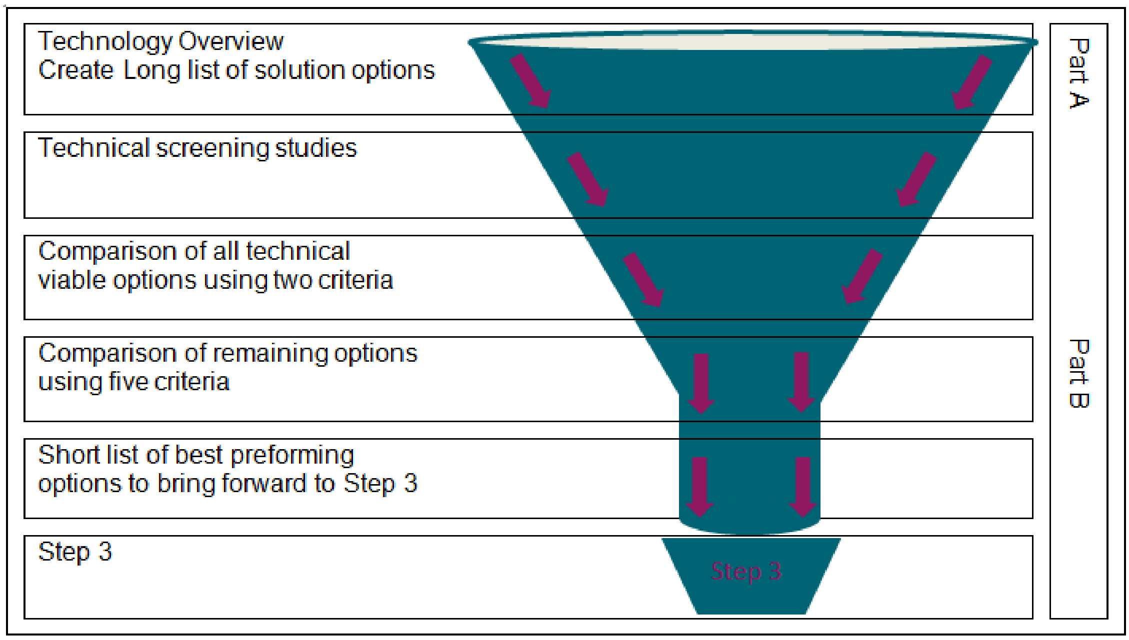

Figure 2 *Illustration of the process of developing of options in Step 2*

The list is further refined in Step 2, this time using a multi-criteria comparison against five criteria namely, technical performance, economic performance, environmental aspects, deliverability aspects and socio-economic aspects. Each remaining option is assessed against the five criteria. This is discussed in Section 7 Detailed evaluation of the options. The outcome of Step 2 is a short list of solution options which will be taken to Step 3 for further investigation and evaluation.

3.2 Criteria used for comparison of remaining options

The second time the performance matrix is used in Step 2, each remaining option is assessed against the five criteria. The five criteria are technical performance, economic performance, environmental aspects, deliverability aspects and socio-economic aspects. Descriptions of the five criteria are outlined below. It should be noted that the assessments provided are for comparison against each other and not absolute assessments of the individual options.

3.2.1 Technical performance

In Part B in Step 2 the technical performance criteria is based on compliance with Transmission System Security and Planning Standards (TSSPS) and compliance with current transmission investment policies. Only options that meet the minimum technical requirements set out in the TSSPS qualify for consideration in Step 2 Part B. Options which extend or enhance technical performance margins beyond minimum acceptable levels are favoured over others.

The options will be assessed against three technical performance criteria to be able to distinguish between their individual technical performances. The technical criteria in Step 2 Part B relate to the needs identified and are thermal overload, short circuit performance and performance during maintenance conditions. A short description of these is given below.

3.2.1.1 Thermal overload criteria

The need identified in Step 1 was related to thermal overload due to a number of drivers. For this reason the thermal overload criterion is a key indicator of the technical performance of the options.

The options are assessed for compliance with the Transmission System Security and Planning Standards (TSSPS). If thermal overload violations are identified additional potential reinforcements will be required in addition to the options to fully meet the TSSPS. For this technical criterion we have assessed the options based on the number and magnitude of thermal overloads remaining after the option has been added. This will provide an indication of how the options are performing in terms of adding thermal capacity.

3.2.1.2 Voltage

No voltage needs were identified in Step 1. However, underground cable is the technology choice for some of the options. Underground cables, through their predominately capacitive characteristic, can increase system voltages beyond allowed limits at times of light load and low availability of reactive power control from on-load generation. This means that additional equipment will be required, such as reactors or STATCOMs, to help control high voltages within limits. The Dublin area is already known to face high voltage challenges at low load periods. The options are assessed on their influence on increasing voltages outside allowed limits at times of low load.

3.2.1.3 Short circuit performance

The options are assessed based on the scale that they affect the existing short circuits levels in existing substations. Additional circuits and/or transformers connected into substations will create another path for the fault current to flow into the substation and as such the short circuit levels will increase in the substation. Similarly, if circuits are removed the number of paths for the fault current to flow has reduced and as such the short circuit levels will decrease in the substation.

3.2.1.4 Performance during maintenance conditions

The options are assessed based on their requirement for additional reinforcements to keep the network within standards following an unplanned loss of plant or equipment whilst another is out for planned maintenance. It should be noted that investments resulting from violations during planned maintenance are subject to an economic appraisal of the value in solving the identified problem compared to constraining generation. Before we would bring these forward as projects we will individually appraise whether each of these reinforcements could be financially justified. To ensure value for money, we will defer a decision until much closer to the required commissioning date of the best performing option. This will allow us to take account of new requirements for each reinforcement, which may include both local and regional needs which could have emerged in the meantime. As such, for the purpose of this assessment in Step 2, we have only assessed the number of indicated violations of thermal capacity for each option. It should be noted that these possible additional reinforcements are not included in the full solution list of the options in Section 4.3.

3.2.2 Economic performance

In Part B in Step 2, the economic performance is based on estimated Total Project Cost (TPC) for each option for comparison purposes. The TPC will comprise both estimated capital costs and an estimated cost for the Transmission System Operator (TSO) element for development of the options.

The primary source for capital cost estimates have been developed with input from the Transmission Asset Owner (TAO) and are based on desktop designs and costings for similar works. The capital cost includes all items to achieve a fully compliant solution with Transmission System Security and Planning Standards (TSSPS), but are excluding reinforcements driven by maintenance conditions as discussed in section 3.2.1.5. Where capital costs were not available for a particular technology the best, most recent estimates or quotes from manufacturers or assumed costs based on EirGrid or international experience have been used.

The TSO cost is the cost for the Transmission System Operator to develop the project during the planning and construction phase. The cost is made up of, among other things, project management, wayleaving and landowner engagements and cost attributed to developing the planning application. The estimated cost is based on experience of developing previous projects.

3.2.3 Environmental

This is a high-level consideration of environmental impacts in the context of the project. It is largely based on a desktop study. Under this criterion, consideration is given to biodiversity, soil and water, climatic factors, material assets and noise. Note that cultural heritage, landscape and visual are examined under the heading of Socio-economic and not repeated in this section.

3.2.4 Deliverability

Deliverability captures timelines until energisation (assesses significant differences) as well as engineering and planning risks which could extend delivery timescales and costs.

A high-level assessment of the impacts of any planned transmission equipment outages required to carry out the necessary work is also carried out.

Various permissions and wayleaves required to proceed to construction are also considered in this criteria.

3.2.5 Socio-Economic

This is a high-level consideration of social impacts in the context of the project. It is largely based on a desktop study. Under this criterion consideration is given to settlement and communities; recreation and tourism; landscape and visual; and cultural heritage and other relevant issues.

3.3 Scale used to assess each criterion

The effect on each criteria parameter is presented along a range from “more significant”/”more difficult”/“more risk” to “less significant”/”less difficult”/“less risk”. The following scale is used to illustrate each criteria parameter:

More significant/difficult/risk Less significant/difficult/risk

In the text this scale is quantified by text for example

high (Dark Blue),

high-moderate (Blue) or

mid-level/moderate (Dark Green),

low-moderate (Green),

low (Cream).

4 Development of a short list

In Step 2, the identified list of options are refined twice with the aim to establish a short list of best performing solution options to bring forward for further investigation in Step 3. The outcome from the first part of the refinement of the long list is presented in the Options Report Part A. The second time the list is refined, each remaining option will be assessed against the five criteria. The summary of this assessment is presented in this section and further details are given in section 7, Detailed evaluation of options.

4.1 Options brought forward from Part A of Step 2

The outcome of the first part of the refinement of the long list is presented in the Options Report Part A. This assessment identified seven solution options using two different technologies that would address the need identified. The technologies were:

- Overhead line (OHL)
- Underground cable (UGC)

All the seven remaining solution options reinforce the transmission network between the existing Woodland substation in County Meath and either the Corduff, Finglas, or Belcamp substations in County Dublin. The seven solution options in the refined list were:

- New Corduff – Woodland 400 kV OHL Circuit
- New Corduff – Woodland 400 kV UGC Circuit,
- New Corduff – Woodland 220 kV OHL Circuit,
- New Finglas – Woodland 220 kV OHL Circuit,
- New Finglas – Woodland 400 kV UGC Circuit,
- New Finglas – Woodland 400 kV OHL Circuit,
- New Belcamp – Woodland 400 kV OHL Circuit.

4.2 Summary of assessment of remaining options

The seven remaining solution options were assessed against the five criteria. Table 1 provides a summary of the performance of each option against the five evaluation criteria. The detailed assessment of each option is presented in section 7, Detailed evaluation of options.

The outcome of the multi criteria assessment in Step 2 is that the options that connect Woodland to Finglas or Belcamp perform the best overall and these will be brought forward into Step 3 for further more detailed assessment.

Options	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Combined Performance in Step 2 Part B
New Corduff – Woodland 400 kV OHL						
New Corduff – Woodland 400 kV UGC						
New Corduff – Woodland 220 kV OHL						
New Finglas – Woodland 220 kV OHL						
New Finglas – Woodland 400 kV UGC						
New Finglas – Woodland 400 kV OHL						
New Belcamp – Woodland 400 kV OHL						

Table 1 *Overall comparison of options using five criteria in Step 2 Part B*

In addition to the three indicated solution options (**Dark Green**) in Table 1 above, it was deemed prudent to include an UGC version of the Belcamp – Woodland 400 kV OHL option in Step 3.

This solution option was set aside in Step 2A as it overall provided a less favourable combined technical and economic performance compared to the other options. The reasons and justification for bringing the option back into the assessment is to take on board previous feedback from stakeholders for other new circuit development, and to allow for the fact that the new development will traverse a mix of urban and rural environments to connect the two substations where underground cable is deemed necessary. The Belcamp – Woodland 400 kV UGC option was therefore added to the short list.

This means that two technologies are still being investigated in Step 3 to choose the best performing solution option.

In Step 3, these technologies and the options using them will be investigated in even more detail. In Step 3 the five main criteria are broken down into sub-criteria, which the remaining options will be assessed against. It should be recognised that two of these technologies have features and technical aspects which have not yet been studied or investigated.

The underground cable technology (AC cable) requires very detailed specific technical analysis to determine if they are technically feasible. These studies include analysis to investigate Temporary Over Voltages (TOV) and harmonic distortion among other things. Previously, for other projects, the acceptable length of underground cable (AC) has varied depending on voltage and location of the cable within the network. A full investigation into these aspects will be completed in Step 3 for both remaining underground cable options. The result of these analyses may determine that some options are not technically feasible or that further investments are required to accommodate them. The best performing option determined in Step 3 may be a combination of the technologies in one circuit, a partial overhead and partial underground circuit, to maximise performance in relation to all the criteria evaluated.

4.3 Recommended short list of best performing options

The options in the refined list were assessed against the five criteria. This resulted in four solution options being brought forward for more detailed analysis in Step 3. All options involve a transmission network reinforcement centred on strengthening the network between existing Woodland 400 kV substation in County Meath and either the Finglas, or Belcamp substations in County Dublin. The four options are:

- New Finglas – Woodland 400 kV overhead line (OHL)
- New Finglas – Woodland 400 kV underground cable (UGC)
- New Belcamp – Woodland 400 kV overhead line (OHL)
- New Belcamp – Woodland 400 kV underground cable (UGC)

5 Stakeholder Engagement

The aim of stakeholder engagement in Step 2 is to transparently communicate our findings so far in the project to key stakeholders and receive feedback on chosen technologies and refined short list.

The stakeholder engagement for Capital Project 1021 in Step 2 was divided into two phases, phase A and phase B in order to ensure appropriate stakeholder feedback and inform our decision-making process during Step 2.

In phase A we have identified and consulted with relevant key strategic stakeholders such as the Government Departments, the Commission for Regulation of Utilities, Meath and Fingal County Council Chief Executives and Senior Executives, the IDA, Enterprise Ireland, the Eastern and Midlands Regional Assembly, and Meath and Fingal Chambers. This phase was completed between November 2019 and January 2020.

This engagement has enabled us to understand the spatial and economic planning that is underway at local and regional authority level, as well as the potential requirements for future investments by large energy users in the area. It has also allowed us to brief key stakeholders in the area, and to hear their view of the opportunities and challenges that exist for the project, as well as receive feedback on chosen technologies and the refined short list.

In phase B, an 8-week consultation period started in October 2020 and finished in December 2020. The consultation period covered a broad range of stakeholder engagement with the general public, local communities, and their elected representatives, as well as re-engagement with the key stakeholders from phase A.

A virtual meeting with Ratoath Municipal District Councillors was held to introduce them to the project. All Ashbourne Councillors were contacted with information on the project. All Councillors in Howth-Malahide and Blanchchardtown/Mulhuddart districts were contacted and introduced to the project along with all TD's & Senators in the Meath East, Dublin Fingal, and Dublin West Dáil constituencies.

A door-door letter drop to all residents within a 2km radius of Woodland Substation was conducted in early August 2020. The letter provided information on the status of the North South Interconnector project, CP966 Kildare Meath Grid Upgrade and provided an introduction to CP1021 East Meath to North Dublin Grid Reinforcement.

All stakeholders had the opportunity to provide feedback in relation to the assessment carried out to date and the solutions to be brought forward for further consideration in Step 3.

A small number of responses were received, and these were mostly enquiring about the relationship between this project CP1021 and other on-going projects around Woodland substation such as CP0966 Kildare – Meath Grid Upgrade, and the North South Interconnector. Many stakeholders also welcomed the opportunity for early engagement. No additional technology options were either removed or added as a result of the consultation period.

As part of the 8-week consultation period the following tasks were carried out:

- published project related material on the project website, including reports and project brochures (see Appendix 3 for a record of website traffic);
- issued a press statement to the media; and
- communicated details of our work on this project to local elected representatives and offering briefings.

6 Assessment of project complexity

Each project may be of a different scale and/or complexity. To reflect the unique features of each project, the framework for grid development introduced three categories of projects, called Tiers.

The Tier of a project indicates the required level of governance, external consultation and engagement, social impact assessment and analysis.

To decide the Tier for a project a number of factors have to be considered. An assessment should consider different aspects such as project complexity, customer impact, deliverability, health and safety, legacy issues, operational risks, stakeholder engagement, and technical risks.

Capital Project 1021 has been assigned a Tier 3 which is the most complex category with the highest level of governance. This is based on the most complex remaining options. In this case, it is a new 400 kV overhead line. New linear projects have the potential to traverse many different stakeholders and as such increasing the number of stakeholders that need to be considered. As well as this, the potential impact on society and the environment also require significant investigations and consideration. For this reason this project has been assigned a Tier 3.

7 Detailed evaluation of options

This section will describe in detail the assessment of each of the seven remaining options against the five criteria. The criteria are described in section 3.2 and the below assessment of the options require an understanding of these. All remaining solution options reinforce the transmission network between the existing Woodland 400 kV substation, and Corduff, Finglas or Belcamp 220 kV substations.

7.1 New Corduff - Woodland 400 kV OHL circuit

7.1.1 Description of option

This option involves a transmission network reinforcement to strengthen the network between the existing Woodland 400 kV substation in County Meath and the Corduff 220 kV substation in North County Dublin. The reinforcement consists of a new 400 kV overhead line linking the Woodland 400 kV substation to the Corduff 220 kV substation, and a new 400 kV busbar and 400/220 kV transformer at Corduff.

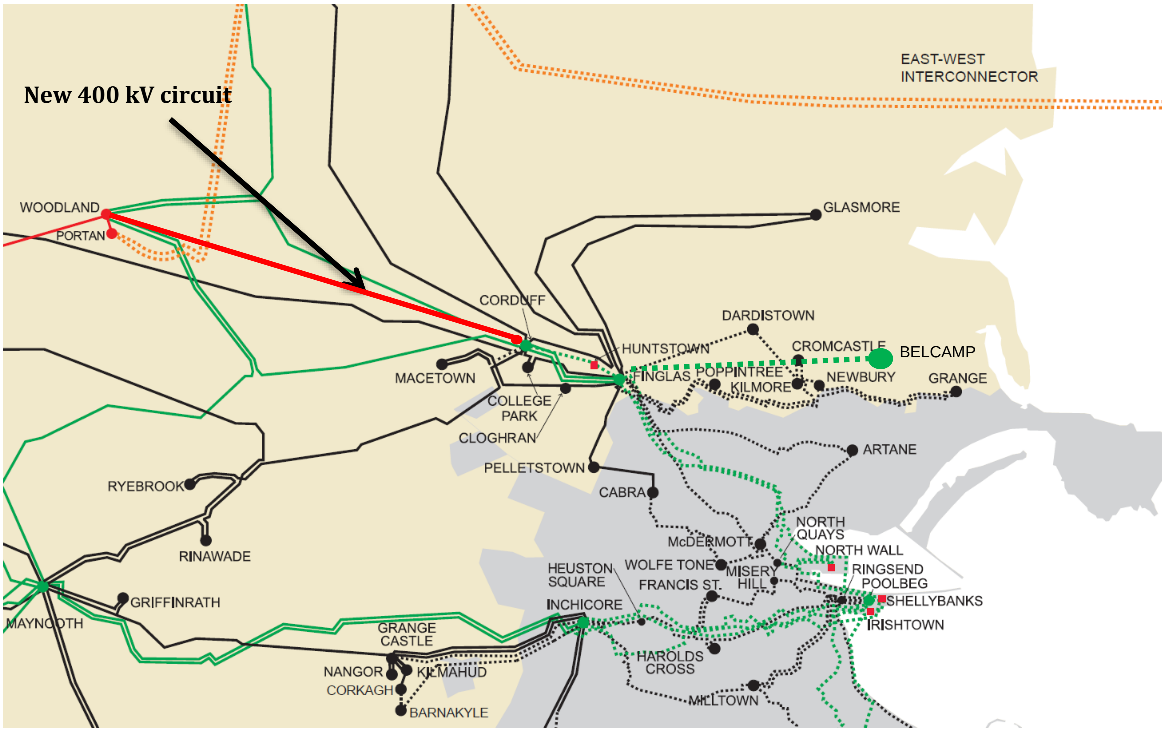

Figure 3 *New 400 kV overhead line circuit connecting the Woodland and Corduff substations.*

7.1.2 Technical Performance

7.1.2.1 Thermal overload

In comparison to the alternative options, the New Corduff - Woodland 400 kV OHL option performs poorly in terms of remaining thermal overloads that are required to be resolved to fulfil a fully compliant solution with the Transmission System Security and Planning Standards (TSSPS). (**Dark Blue**).

This option removes the overload of Clonee – Woodland 220 kV circuit seen when the system is intact. It is reduced to a post contingent overload of 107% following the unplanned loss of the Corduff – Woodland 220 kV circuit. The post contingent overload on the existing Corduff – Woodland 220 kV circuit following the unplanned loss of the Clonee – Woodland 220 kV circuit identified in Step 1, is reduced from 172% to 103%. However overloads of 131% remain on one Corduff – Finglas 220 kV circuit following the unplanned loss of the other Corduff – Finglas 220 kV circuit. This option has no influence on reducing power flows in those circuits. These circuits would require uprating to prevent overloads.

Dependence on generation in the North Dublin area is reduced by this option as the option will better manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations. In particularly the dependence on the generators at Huntstown generation station is reduced. Generation at Poolbeg generation station can be used to alleviate thermal problems, but its effect is limited by the capacity of the circuits between Poolbeg, North Wall, and Shellybanks and Finglas substations.

To further reduce dependence on generation in North Dublin and manage the power flows better, additional reinforcement will be required. For example, the existing Corduff – Finglas 1 & 2, Corduff – Woodland, Clonee – Woodland and Clonee – Corduff 220 kV circuits may need thermal uprating in the future, depending on the rate of demand increases and generation portfolio changes. Other potential solutions include new additional circuits in the area to add further network capacity, for example a new circuit between Corduff, Finglas or Belcamp substations in North Dublin and Poolbeg or Irishtown substations in the city centre.

7.1.2.2 Voltage

The management of voltage in the Dublin and Mid East[2] area is a known operational challenge.

This option is an overhead line option and so will not be expected to have a significant influence on increasing the voltage in the area. The analysis carried out has confirmed this. This option performs well in terms of voltage and has a low influence on the need for additional reactive power controlling equipment (**Cream**)

7.1.2.3 Short Circuit Analysis

The transmission network in North Dublin has relatively high short circuit current levels, but still with standards and Grid code levels. This option contributes to a moderate increase of short circuit current levels in the North Dublin area. All increases in short circuit level remain within Grid Code levels, but represent a reduction in available headroom. The results of the short circuit analysis can be found in Appendix 2. This option is considered to have a moderate impact in terms short circuit current levels (**Dark Green**).

7.1.2.4 Reinforcements to cater for maintenance conditions

This option will require additional reinforcements to keep the network within standards following a subsequent loss of plant and equipment whilst another is out for planned maintenance. In particular, a maintenance and trip combination that includes the new Corduff - Woodland 400 kV OHL and one of the existing 220 kV circuits between Corduff, Clonee, Finglas, and Woodland, result in overloads on remaining circuits in that corridor which is the same as the unplanned loss of a single piece of transmission equipment before the new circuit is added. This issue is common to all the options evaluated. These overloads can be managed using dispatch of existing thermal generation in North Dublin. To reduce dependence on these generators additional reinforcements will be required. The additional reinforcements range from thermal uprates of the existing 220 kV circuits, or new circuits to add further capacity to the network in the area.

This option is considered to have a moderate performance in terms of possible future reinforcements (**Dark Green**).

7.1.2.5 Conclusion of technical performance

The ability of each option to reduce thermal overloads in the network corridor is a key consideration for technical performance, and when combined with the other technical aspects this option is considered to have moderate to poor performance (**Blue)**.

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[2] NUTS Level 3 Region made up of counties Kildare, Wicklow, Meath, and Louth. https://ec.europa.eu/eurostat/web/nuts/background

Technical performance Corduff – Woodland 400 kV OHL	Thermal overloads	Voltage	Short circuit	Maintenance conditions	Combined Technical Performance

Table 2 *Summary of technical performance for the Corduff – Woodland 400 kV OHL option*

7.1.3 Economic Performance

The estimated capital costs for the full solution for the Corduff – Woodland 400 kV OHL option is approximately €38.8m. This includes new circuit bays, new 400 kV equipment at the existing substation, and new 400/220 kV transformer required. The estimated cost for the transmission system operator to develop the Corduff – Woodland 400 kV OHL option is approximately €22.8m. This option is considered to have low impact in terms of the cost (**Cream**).

7.1.4 Environmental

Having considered the potential environmental impacts of a 400kV OHL it is concluded that this option will have moderate environmental impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC options. The construction and operation of a 400kV or 220kV OHL would be similar. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts, they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.1.5 Deliverability

Having assessed high level deliverability aspects for a new 400 kV overhead line circuit it is concluded that this option could be associated with high planning risks. Based on experience on other similar OHL projects, permitting would be expected to be very challenging due to societal acceptance of such a development. This means that overall, the option could very likely experience delays in its development compared to the other options.

Furthermore, a high level assessment showed limited options for the development of a new 400 kV busbar adjacent to the existing Corduff 220 kV substation. An appropriate site may be located in the vicinity, however this would introduce additional project complexity and risk associated with new circuits required to connect the new 400 kV busbar to the existing 220 kV busbar.

It is considered that this option will have a low to moderate impact in terms of potential outages required as it is mostly a new build with only outages required for energisation.

All options presented in this paper will be new infrastructure and will require permits and wayleaves to some extent or another – this elevates the deliverability criteria for all options. Significant engagement with landowners and communities would be required in the delivery of a new overhead circuit, for such purposes as surveying, siting and construction. These parties may be new to accommodating electricity infrastructure on their landholdings and within their communities. New wayleaves would be required to facilitate construction of the new circuit. Based on recent precedent in terms of the provision of new 400 kV transmission infrastructure, there is the potential for significant landowner, community and public concerns with this option, with the likely consequence of project delays or difficulties in gaining access to land.

Overall, given the nature of this option the planning risks are considered difficult to mitigate and more dominant in delivering the project. Combining this with the wayleaving required for a new 400 kV OHL circuit, this option is considered to have an overall high to moderate impact on deliverability (**Blue**)

7.1.6 Socio-economic

Having considered the potential impacts of a 400 kV OHL it is concluded that this option will have moderate socio-economic impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400 kV or 220 kV OHL would be similar. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development. It performs better than the other OHL option to Belcamp as it only travels to the substations on the western fringes of Dublin City and avoids more constrained areas.

7.1.7 Summary of option

Overall performance Corduff – Woodland 400 kV OHL	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Overall Performance

Table 3 *Summary of performance of all criteria for Corduff – Woodland 400 kV OHL option*

7.2 New Corduff - Woodland 400 kV UGC circuit

7.2.1 Description of option

This option involves a transmission network reinforcement to strengthen the network between the existing Woodland 400 kV substation in County Meath and the Corduff 220 kV substation in North County Dublin. The reinforcement consists of a new 400 kV underground cable linking the Woodland 400 kV substation to the Corduff 220 kV substation, and a new 400 kV busbar and 400/220 kV transformer at Corduff.

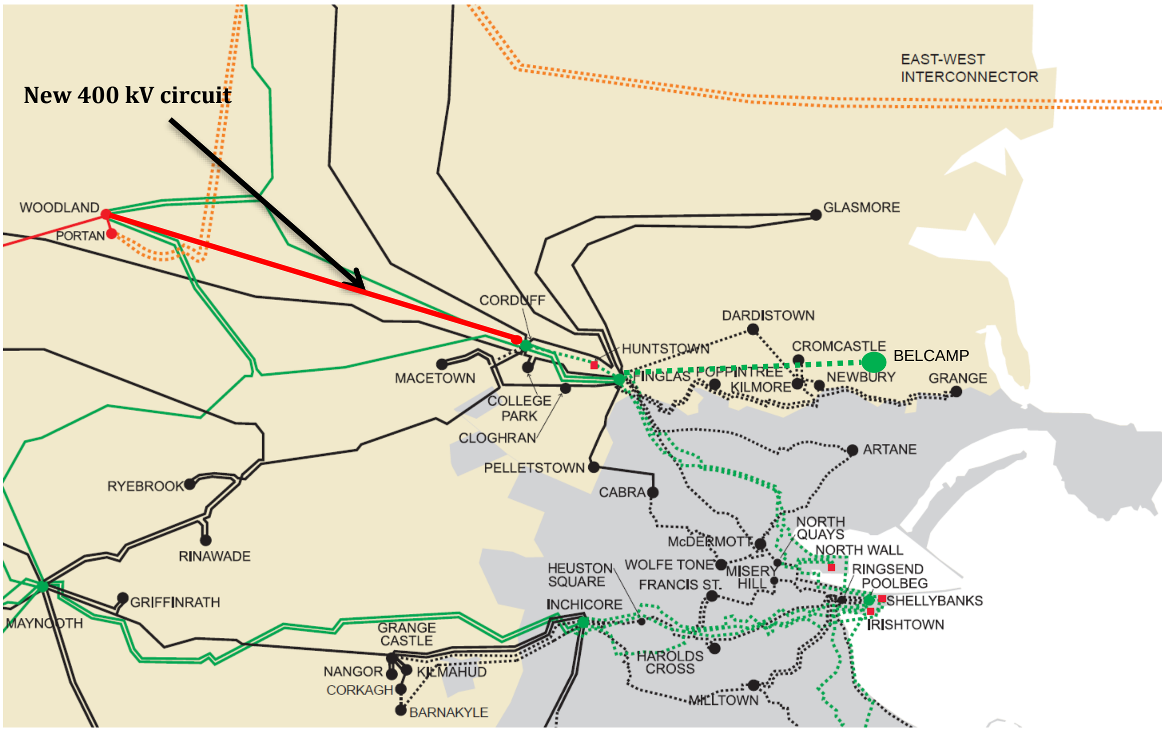


Figure 4: *New 400 kV underground cable circuit connecting the Woodland and Corduff substations.*

7.2.2 Technical Performance

7.2.2.1 Thermal overloads

In comparison to the alternative options, the New Corduff - Woodland 400 kV UGC option performs poorly in terms of remaining thermal overloads that are required to be resolved to fulfil a fully compliant solution with the Transmission System Security and Planning Standards (TSSPS). (**Dark Blue**).

This option removes the overload of Clonee – Woodland 220 kV circuit seen when the system is intact. It is reduced to a post contingent overload of 105% following the unplanned loss of the new circuit. The post contingent overload on the existing Corduff – Woodland 220 kV circuit following the unplanned loss of the Clonee – Woodland 220 kV circuit identified in Step 1, is reduced from 172% to below 100%. However overloads of

132% remain on one Corduff – Finglas 220 kV circuit following the unplanned loss of the other Corduff – Finglas 220 kV circuit. This option has no influence on reducing power flows in those circuits. These circuits would require uprating to prevent overloads.

Dependence on generation in the North Dublin area, particularly the generators at Huntstown, to manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations is reduced by this option, but some dependence remains.

The new 400/220 kV transformer at Corduff can be seen to be loaded above its continuous rating, but within its emergency rating, when one Huntstown generator trips while the other is unavailable. Additional 400/220 kV transformer capacity may be required at Corduff to accommodate these power flows. These power flows are higher than those shown for the 400 kV OHL options due to the lower impedance of the cable circuit between Woodland and Corduff.

Dependence on generation in the North Dublin area is reduced by this option as the option will better manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations. In particularly the dependence on the generators at Huntstown generation station is reduced. Generation at Poolbeg generation station can be used to alleviate thermal problems, but its effect is limited by the capacity of the circuits between Poolbeg, North Wall, and Shellybanks and Finglas substations.

To further reduce dependence on generation in North Dublin additional reinforcement will be required. For example, the existing Corduff – Finglas 1 & 2, Corduff – Woodland, Clonee – Woodland and Clonee – Corduff 220 kV circuits may need thermal uprating in the future, depending on the rate of demand increases and generation portfolio changes. Other potential solutions include new additional circuits in the area to add further network capacity, for example a new circuit between Corduff, Finglas or Belcamp substations in North Dublin and Poolbeg or Irishtown substations in the city centre.

7.2.2.2 Voltage

The management of voltage in the Dublin and Mid East area is a known operational challenge.

This option is an underground cable option and so will be expected to have a significant influence on increasing the voltage in the area. The analysis carried out has confirmed this identifying night time voltages above allowable limits that will require mitigation. If this option progresses to Step 3, further analysis will be undertaken to determine the mitigation required. This option has a moderate influence on the need for additional reactive power controlling equipment (**Green**)

7.2.2.3 Short Circuit analysis

The transmission network in North Dublin has relatively high short circuit current levels, but still with standards and Grid code levels. This option contributes to a moderate increase of short circuit current levels in the North Dublin area. All increases in short circuit level remain within Grid Code levels, but represent a reduction in available headroom. The results of the short circuit analysis can be found in Appendix 4. This option is considered to have a moderate impact in terms short circuit current levels (**Dark Green**).

7.2.2.4 Reinforcements to cater for maintenance conditions

This option will require additional reinforcements to keep the network within standards following a subsequent loss of plant and equipment whilst another is out for planned maintenance. In particular, a maintenance and trip combination that includes the new Corduff - Woodland 400 kV UGC and one of the existing 220 kV circuits between Corduff, Clonee, Finglas, and Woodland, result in overloads on remaining circuits in that corridor which are the same as the unplanned loss of a single piece of transmission equipment before the new circuit is added. This issue is common to all the options evaluated. These overloads can be managed using dispatch of existing thermal generation in North Dublin. To reduce dependence on these generators additional reinforcements will be required. The additional reinforcements range from thermal uprates of the existing 220 kV circuits, or new circuits to add further capacity to the network in the area.

This option is considered to have a moderate performance in terms possible future reinforcements (**Dark Green**).

7.2.2.5 Conclusion of technical performance

The ability of each option to reduce thermal overloads in the network corridor is a key consideration for technical performance, and when combined with the other technical aspects this option is considered to have moderate to poor performance (**Blue)**.

Technical performance Corduff – Woodland 400 kV UGC	Thermal overloads	Voltage	Short circuit	Maintenance conditions	Combined Technical Performance

Table 4 *Summary of technical performance for the Corduff – Woodland 400 kV UGC option*

7.2.3 Economic Performance

The estimated capital costs for the full solution for the Corduff – Woodland 400 kV UGC option is approximately €130.7m. This includes new circuit bays, new 400 kV equipment at the existing substation, and new 400/220 kV transformer required. The estimated cost for the transmission system operator to develop the Corduff – Woodland 400 kV UGC option is approximately €16.6m. This option is considered to have high impact in terms of the cost (**Dark Blue**).

7.2.4 Environmental

Having considered the potential environmental impacts of a 400 kV UGC it is concluded that this option will have low-moderate environmental impact (**Green**) – this is relative to the other options being considered and in particular the OHL. The construction of UGC however is not without its impacts and requires careful consideration of impacts on sensitive receptors. It should be possible to mitigate significant impacts. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.2.5 Deliverability

An UGC option may reduce the risk in attaining permits. This is largely due to the elimination of visual impacts and preference from the public for EirGrid to pursue UGC options generally. It is currently considered that the UGC options in this project, due to their size, scale and likely impact, are likely to require planning permission. While there is precedent for 220 kV UGC within the public road to comprise exempted development, it is considered that the scale of the overall UGC development, combined with the new associated infrastructure likely to be required as outlined above, will result in the overall development not comprising exempted development.

Additionally, some other elements of the option may require planning, such as reactive support requirements if required, so the option will still have moderate planning risks associated.

An UGC option would preferably be accommodated in the public road network. However with regards to permits and wayleaving, it should be recognised that it may not be possible to lay a 400 kV underground cable along existing roads due to the cable trench width required. If this is the case, a 400 kV underground cable option may have to be laid across open fields.

This brings its own significant challenges in terms of landowner engagement and concerns, environmental and land use impacts – in particular the inability to undertake certain types of agricultural activity thereon. It is assumed that significant engagement with landowners with properties along public roads would be required in the delivery of a new 400 kV UGC, for such purposes as surveying, siting and construction.

A high level assessment showed limited options for the development of a new 400 kV busbar adjacent to the existing Corduff 220 kV substation. An appropriate site may be located in the vicinity, however this would introduce additional project complexity and risk associated with new circuits required to connect the new 400 kV busbar to the existing 220 kV busbar.

It is considered that this option will have a low to moderate impact in terms of potential outages required as it is mostly a new build with only outages required for energisation.

Overall, this option is considered to have an overall mid-level/moderate impact on deliverability (**Dark Green**).

7.2.6 Socio-economic

Having considered the potential impacts of a UGC it is concluded that this option will have low-moderate socio-economic impact (**Green**) – this is relative to the other options being considered and in particular the OHL. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.2.7 Summary of option

Overall performance Corduff – Woodland 400 kV UGC	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Overall Performance

Table 5 *Summary of performance of all criteria for the Corduff – Woodland 400 kV UGC option*

7.3 New Corduff – Woodland 220 kV OHL circuit

7.3.1 Description of option

This option involves a transmission network reinforcement to strengthen the network between the existing Woodland 400 kV substation in County Meath and the Corduff 220 kV substation in North County Dublin. The reinforcement consists of a new 220 kV overhead line linking the Woodland 400 kV substation to the Corduff 220 kV substation.

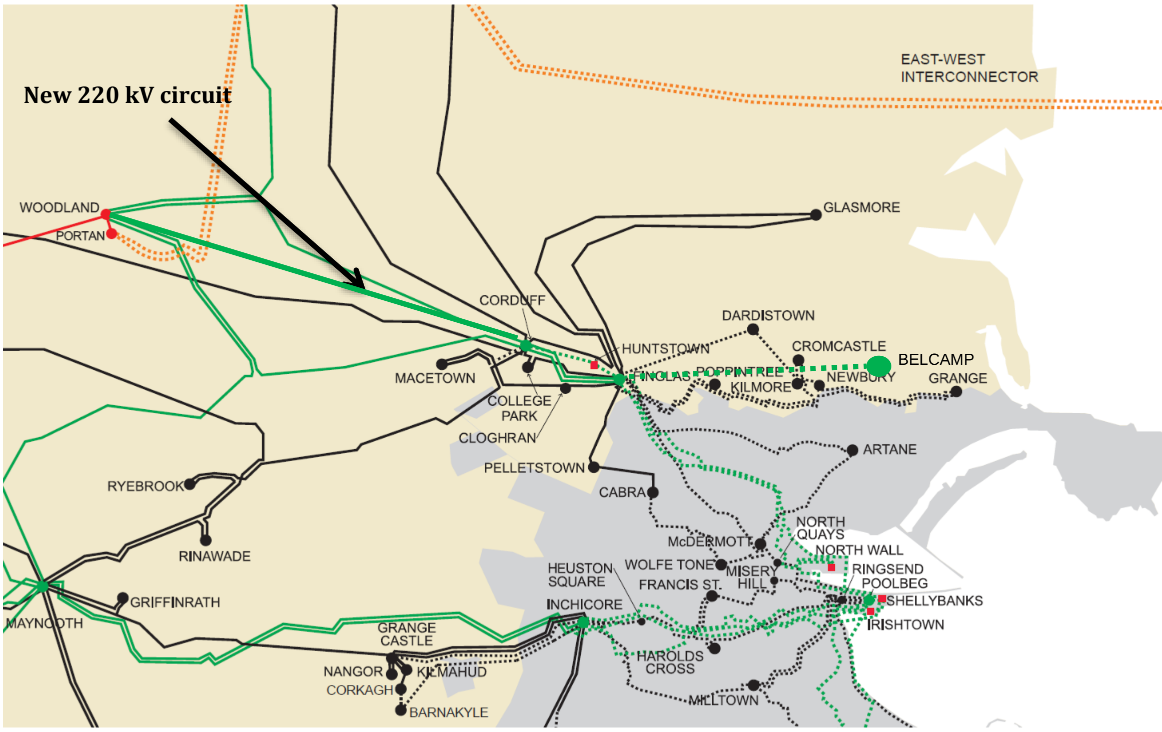


Figure 5: *New 220 kV overhead line circuit connecting the Woodland and Corduff substations.*

7.3.2 Technical Performance

7.3.2.1 Thermal overloads

In comparison to the alternative options, the New Corduff - Woodland 220 kV OHL option performs poorly in terms of remaining thermal overloads that are required to be resolved to fulfil a fully compliant solution with the Transmission System Security and Planning Standards (TSSPS) (**Dark Blue**).

This option removes the overload of Clonee – Woodland 220 kV circuit seen when the system is intact. It is reduced to a post contingent overload of 107% following the unplanned loss of the new circuit. The post contingent overload on the existing Corduff – Woodland 220 kV circuit following the unplanned loss of the Clonee – Woodland 220 kV circuit identified in Step 1, is reduced from 172% to 101%. However overloads of 123% remain on one Corduff – Finglas 220 kV circuit following the unplanned loss of the other

Corduff – Finglas 220 kV circuit. This option has no influence on reducing power flows in those circuits. These circuits would require uprating to prevent overloads.

Dependence on generation in the North Dublin area is reduced by this option as the option will better manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations. In particularly the dependence on the generators at Huntstown generation station is reduced. Generation at Poolbeg generation station can be used to alleviate thermal problems, but its effect is limited by the capacity of the circuits between Poolbeg, North Wall, and Shellybanks and Finglas substations.

This option increases the flows on the 400/220 kV transformers at Woodland. The thermal ratings of the transformers are not breached, however remaining capacity headroom is eroded.

To further reduce dependence on generation in North Dublin additional reinforcement will be required. For example, the existing Corduff – Finglas 1 & 2, Corduff – Woodland, Clonee – Woodland and Clonee – Corduff 220 kV circuits may need thermal uprating in the future, depending on the rate of demand increases and generation portfolio changes. Other potential solutions include new additional circuits in the area to add further network capacity, for example a new circuit between Corduff, Finglas or Belcamp substations in North Dublin and Poolbeg or Irishtown substations in the city centre.

7.3.2.2 Voltage

The management of voltage in the Dublin and Mid East area is a known operational challenge.

This option is an overhead line option and so will not be expected to have a significant influence on increasing the voltage in the area. The analysis carried out has confirmed this. This option performs well in terms of voltage and has a low influence on the need for additional reactive power controlling equipment (**Cream**)

7.3.2.3 Short Circuit Analysis

The transmission network in North Dublin has relatively high short circuit current levels, but still with standards and Grid code levels. This option contributes to a moderate to low increase of short circuit current levels in the North Dublin area. All increases in short circuit level remain within Grid Code levels, but represent a reduction in available headroom. The results of the short circuit analysis can be found in Appendix 4. This option is considered to have a moderate to low impact in terms short circuit current levels (**Green**).

7.3.2.4 Reinforcements to cater for maintenance conditions

This option will require additional reinforcements to keep the network within standards following a subsequent loss of plant and equipment whilst another is out for planned maintenance. In particular, a maintenance and trip combination that includes the new Corduff - Woodland 220 kV OHL and one of the existing 220 kV circuits between Corduff, Clonee, Finglas, and Woodland, result in overloads on remaining circuits in that corridor which are the same as the unplanned loss of a single piece of transmission equipment before the new circuit is added. This issue is common to all the options evaluated. These overloads can be managed using dispatch of existing thermal generation in North Dublin. To reduce dependence on these generators additional reinforcements will be required. The additional reinforcements range from thermal uprates of the existing 220 kV circuits, or new circuits to add further capacity to the network in the area.

This option is considered to have a high to moderate performance in terms possible future reinforcements (**Blue**).

7.3.2.5 Conclusion of technical performance

The ability of each option to reduce thermal overloads in the network corridor is a key consideration for technical performance, and when combined with the other technical aspects this option is considered to have moderate to poor performance (**Blue)**.

Technical performance Corduff – Woodland 220 kV OHL	Thermal overloads	Voltage	Short circuit	Maintenance conditions	Combined Technical Performance

Table 6 *Summary of the* technical performance for *220 kV OHL option*

7.3.3 Economic Performance

The estimated capital costs for the full solution for the Corduff – Woodland 220 kV OHL option is approximately €17.4m. This includes new circuit bays required. The estimated cost for the transmission system operator to develop the Corduff – Woodland 220 kV OHL option is approximately €23.2m. This option is considered to have low impact in terms of the cost (**Cream**).

7.3.4 Environmental

Having considered the potential environmental impacts of a 220kV OHL it is concluded that this option will have moderate environmental impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400kV or 220kV OHL would be similar. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.3.5 Deliverability

Having assessed high level deliverability aspects for a new 220 kV overhead line circuit it is concluded that this option could be associated with high planning risks.

A new OHL circuit will require permits and wayleaves – this elevates the deliverability risks. There is a public participation facet requiring extensive relationship building with individual landowners, the risk to the option is often in the time required to achieve wayleaving.

It is considered that this option will have a low to moderate impact in terms of potential outages required as it is mostly a new build with only outages required for energisation.

Given the nature of the project the planning risks are considered to more difficult to mitigate and more dominant in delivering the project. Combining the planning risks with the risks around permits and wayleaving, this option is considered to have an overall high to moderate impact on deliverability (**Blue).**

7.3.6 Socio-economic

Having considered the potential impacts of a 220 kV OHL it is concluded that this option will have moderate socio-economic impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400 kV or 220 kV OHL would be similar. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development. It performs better than the other OHL option to Belcamp as it only travels to the substations on the western fringes of Dublin City and avoids more constrained areas.

7.3.7 Summary of option

Overall performance Corduff – Woodland 220 kV OHL	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Overall Performance

Table 7 *Summary of performance of all criteria for the Corduff – Woodland 220 kV OHL option*

7.4 New Finglas - Woodland 220 kV OHL circuit

7.4.1 Description of option

This option involves a transmission network reinforcement to strengthen the network between the existing Woodland 400 kV substation in County Meath and the Finglas 220 kV substation in North County Dublin. The reinforcement consists of a new 220 kV overhead line linking the Woodland 400 kV substation to the Finglas 220 kV substation.

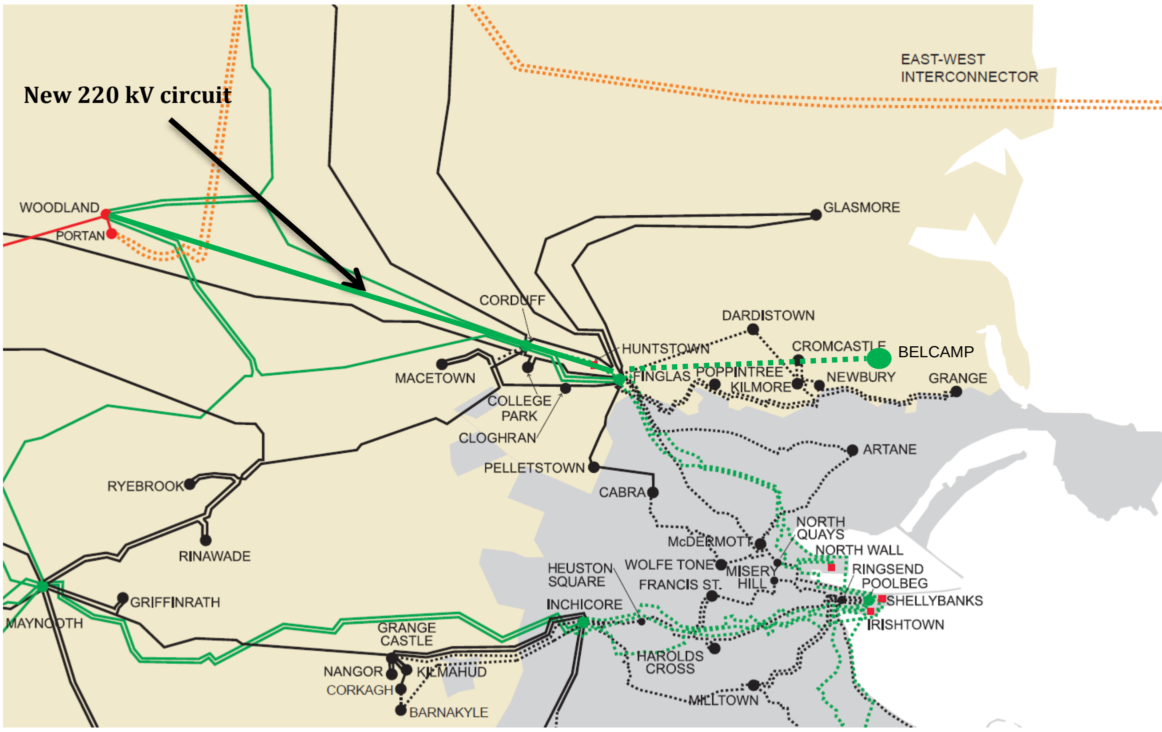


Figure 6: *New 220 kV overhead line circuit connecting the Woodland and Finglas substations.*

7.4.2 Technical Performance

7.4.2.1 Thermal overloads

In comparison to the alternative options, the New Finglas - Woodland 220 kV OHL option performs poorly in terms of remaining thermal overloads that are required to be resolved to fulfil a fully compliant solution with the Transmission System Security and Planning Standards (TSSPS) (**Dark Blue**).

This option removes the overload of Clonee – Woodland 220 kV circuit seen when the system is intact. It is reduced to a post contingent overload of 114% following the unplanned loss of the Corduff – Woodland 220 kV circuit. The post contingent overload on the existing Corduff – Woodland 220 kV circuit following the unplanned loss of the Clonee – Woodland 220 kV circuit identified in Step 1, is reduced from 172% to 109%. The unplanned loss of the new Finglas – Woodland 220 kV circuit has a similar result.

Dependence on generation in the North Dublin area is reduced by this option as the option will better manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations. In particularly the dependence on the generators at Huntstown generation station is reduced. Generation at Poolbeg generation station can be used to alleviate thermal problems, but its effect is limited by the capacity of the circuits between Poolbeg, North Wall, and Shellybanks and Finglas substations.

This option increases the flows on the 400/220 kV transformers at Woodland. The thermal ratings of the transformers are not breached, however remaining capacity headroom is eroded.

To further reduce dependence on generation in North Dublin additional reinforcement will be required. For example, the existing Corduff – Finglas 1 & 2, Corduff – Woodland, Clonee – Woodland and Clonee – Corduff 220 kV circuits may need thermal uprating in the future, depending on the rate of demand increases and generation portfolio changes. Other potential solutions include new additional circuits in the area to add further network capacity, for example a new circuit between Corduff, Finglas or Belcamp substations in North Dublin and Poolbeg or Irishtown substations in the city centre.

7.4.2.2 Voltage

The management of voltage in the Dublin and Mid East area is a known operational challenge.

This option is an overhead line option and so will not be expected to have a significant influence on increasing the voltage in the area. The analysis carried out has confirmed this. This option performs well in terms of voltage and has a low influence on the need for additional reactive power controlling equipment (**Cream**)

7.4.2.3 Short Circuit Analysis

The transmission network in North Dublin has relatively high short circuit current levels, but still with standards and Grid code levels. This option contributes to a moderate to low increase of short circuit current levels in the North Dublin area. All increases in short circuit level remain within Grid Code levels, but represent a reduction in available headroom. The results of the short circuit analysis can be found in Appendix 4. This option is considered to have a moderate to low impact in terms short circuit current levels (**Green**).

7.4.2.4 Reinforcements to cater for maintenance conditions

This option will require additional reinforcements to keep the network within standards following a subsequent loss of plant and equipment whilst another is out for planned maintenance. In particular, a maintenance and trip combination that includes the new Finglas - Woodland 220 kV OHL and one of the existing 220 kV circuits between Corduff, Clonee, Finglas, and Woodland, result in overloads on remaining circuits in that corridor which are the same as the unplanned loss of a single piece of transmission equipment before the new circuit is added. This issue is common to all the options evaluated. These overloads can be managed using dispatch of existing thermal generation in North Dublin. To reduce dependence on these generators additional reinforcements will be required. The additional reinforcements range from thermal uprates of the existing 220 kV circuits, or new circuits to add further capacity to the network in the area.

This option is considered to have a high to moderate performance in terms possible future reinforcements. (**Blue**).

7.4.2.5 Conclusion of technical performance

The ability of each option to reduce thermal overloads in the network corridor is a key consideration for technical performance, and when combined with the other technical aspects this option is considered to have moderate to poor performance (**Blue)**.

Technical performance Finglas – Woodland 220 kV OHL	Thermal overloads	Voltage	Short circuit	Maintenance conditions	Combined Technical Performance

Table 8 *Summary of technical performance for the Finglas – Woodland 220 kV OHL option*

7.4.3 Economic Performance

The estimated capital costs for the full solution for the Finglas – Woodland 220 kV OHL option is approximately €20.3m. This includes new circuit bays required. The estimated cost for the transmission system operator to develop the Finglas – Woodland 220 kV OHL option is approximately €23.3m. This option is considered to have low impact in terms of the cost (**Cream**).

7.4.4 Environmental

Having considered the potential environmental impacts of a 220 kV OHL it is concluded that this option will have moderate environmental impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400kV or 220kV OHL would be similar. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts, they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.4.5 Deliverability

Having assessed high level deliverability aspects for a new 220 kV overhead line circuit it is concluded that this option could be associated with high planning risks.

A new OHL circuit will require permits and wayleaves – this elevates the deliverability risks. There is a public participation facet requiring extensive relationship building with individual landowners, the risk to the option is often in the time required to achieve wayleaving.

It is considered that this option will have a low to moderate impact in terms of potential outages required as it is mostly a new build with only outages required for energisation.

Given the nature of the project the planning risks are considered to more difficult to mitigate and more dominant in delivering the project. Combining the planning risks with the risks around permits and wayleaving, this option is considered to have an overall high to moderate impact on deliverability (**Blue**)

7.4.6 Socio-economic

Having considered the potential impacts of a 220 kV OHL it is concluded that this option will have moderate socio-economic impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400 kV or 220 kV OHL would be similar. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development. It performs better than the other OHL option to Belcamp as it only travels to the substations on the western fringes of Dublin City and avoids more constrained areas.

7.4.7 Summary of option

Overall performance Finglas – Woodland 220 kV OHL	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Overall Performance

Table 9 *Summary of performance of all criteria for the Finglas - Woodland 220 kV OHL option*

7.5 New Finglas – Woodland 400 kV UGC circuit

This option involves a transmission network reinforcement to strengthen the network between the existing Woodland 400 kV substation in County Meath and the Finglas 220 kV substation in North County Dublin. The reinforcement consists of a new 400 kV underground cable linking the Woodland 400 kV substation to the Finglas 220 kV substation, and a new 400 kV busbar and 400/220 kV transformer at Finglas.

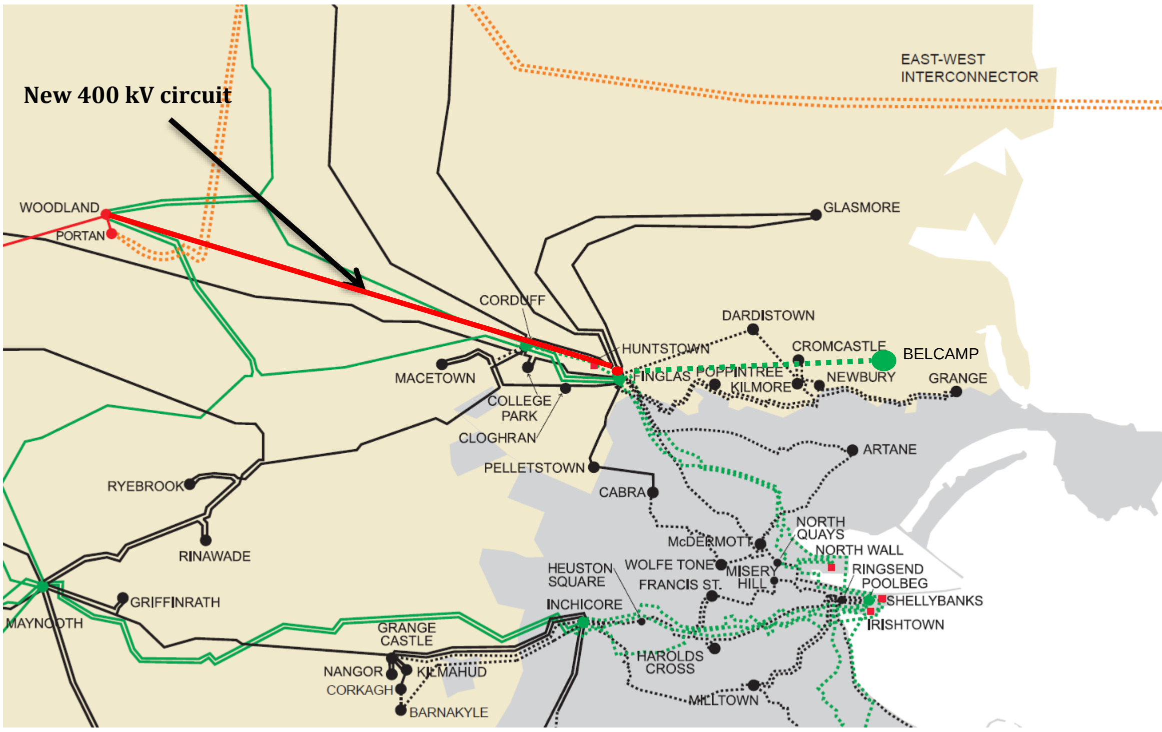


Figure 7: *New 400 kV underground cable circuit connecting the Woodland and Finglas substations.*

7.5.1 Technical Performance

7.5.1.1 Thermal overloads

In comparison to the alternative options, the New Finglas - Woodland 400 kV UGC option performs well in terms of remaining thermal overloads that are required to be resolved to fulfil a fully compliant solution with the Transmission System Security and Planning Standards (TSSPS). (**Green**).

This option removes the overload of Clonee – Woodland 220 kV circuit seen when the system is intact. It is reduced to a post contingent overload of 105% following the unplanned loss of the new circuit. The post contingent overload on the existing Corduff – Woodland 220 kV circuit following the unplanned loss of the Clonee – Woodland 220 kV circuit identified in Step 1, is reduced from 172% to 100%.

Dependence on generation in the North Dublin area, particularly the generators at Huntstown, to manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations is reduced by this option, but some dependence remains.

The new 400/220 kV transformer at Finglas can be seen to be loaded above its continuous rating, but within its emergency rating, when one Huntstown generator trips while the other is unavailable. Additional 400/220 kV transformer capacity may be required at Finglas to accommodate these power flows. These power flows are higher than those shown for the 400 kV OHL options due to the lower impedance of the cable circuit between Woodland and Finglas.

Dependence on generation in the North Dublin area is reduced by this option as the option will better manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations. In particularly the dependence on the generators at Huntstown generation station is reduced. Generation at Poolbeg generation station can be used to alleviate thermal problems, but its effect is limited by the capacity of the circuits between Poolbeg, North Wall, and Shellybanks and Finglas substations.

To further reduce dependence on generation in North Dublin additional reinforcement will be required. For example, the existing Corduff – Finglas 1 & 2, Corduff – Woodland, Clonee – Woodland and Clonee – Corduff 220 kV circuits may need thermal uprating in the future, depending on the rate of demand increases and generation portfolio changes. Other potential solutions include new additional circuits in the area to add further network capacity, for example a new circuit between Corduff, Finglas or Belcamp substations in North Dublin and Poolbeg or Irishtown substations in the city centre.

7.5.1.2 Voltage

The management of voltage in the Dublin and Mid East area is a known operational challenge.

This option is an underground cable option and so will be expected to have a significant influence on increasing the voltage in the area. The analysis carried out has confirmed this identifying night time voltages above allowable limits that will require mitigation. If this option progresses to Step 3, further analysis will be undertaken to determine the mitigation required. This option has a moderate influence on the need for additional reactive power controlling equipment (**Green**)

7.5.1.3 Short Circuit Analysis

The transmission network in North Dublin has relatively high short circuit current levels, but still with standards and Grid code levels. This option contributes to a moderate to high increase of short circuit current levels in the North Dublin area. All increases in short circuit level remain within Grid Code levels, but represent a reduction in available headroom. The results of the short circuit analysis can be found in Appendix 4. This option is considered to have a moderate to high impact in terms short circuit current levels (**Blue**).

7.5.1.4 Reinforcements to cater for maintenance conditions

This option will require additional reinforcements to keep the network within standards following a subsequent loss of plant and equipment whilst another is out for planned maintenance. In particular, a maintenance and trip combination that includes the new Finglas - Woodland 400 kV UGC and one of the existing 220 kV circuits between Corduff, Clonee, Finglas, and Woodland, result in overloads on remaining circuits in that corridor which are the same as the unplanned loss of a single piece of transmission equipment before the new circuit is added. This issue is common to all the options evaluated. These overloads can be managed using dispatch of existing thermal generation in North Dublin. To reduce dependence on these generators additional reinforcements will be required. The additional reinforcements range from thermal uprates of the existing 220 kV circuits, or new circuits to add further capacity to the network in the area. Details of the criteria are found in section 3.2

This option is considered to have a moderate performance in terms possible future reinforcements (**Dark Green**).

7.5.1.5 Conclusion of technical performance

This option is considered to have good performance from a technical point of view (**Green**) when all technical aspects were considered.

Technical performance Finglas – Woodland 400 kV UGC	Thermal overloads	Voltage	Short circuit	Maintenance conditions	Combined Technical Performance

Table 10 *Summary of technical performance for the Finglas – Woodland 400 kV UGC option*

7.5.2 Economic Performance

The estimated capital costs for the full solution for the Finglas – Woodland 400 kV UGC option is approximately €154.6m. This includes new circuit bays, new 400 kV equipment at the existing substation, and new 400/220 kV transformer required. The estimated cost for the transmission system operator to develop the Finglas – Woodland 400 kV UGC option is approximately €17.0m. This option is considered to have high impact in terms of the cost (**Dark Blue**).

7.5.3 Environmental

Having considered the potential environmental impacts of a 400kkV UGC it is concluded that this option will have low-moderate environmental impact (**Green**) – this is relative to the other options being considered and in particular the OHL. The construction of UGC however is not without its impacts and requires careful consideration of impacts on sensitive receptors. It should be possible to mitigate significant impacts. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.5.4 Deliverability

An UGC option may reduce the risk in attaining permits. This is largely due to the elimination of visual impacts and preference from the public for EirGrid to pursue UGC options generally. It is currently considered that the UGC options in this project, due to their size, scale and likely impact, are likely to require planning permission. While there is precedent for 220 kV UGC within the public road to comprise exempted development, it is considered that the scale of the overall UGC development, combined with the new associated infrastructure likely to be required as outlined above, will result in the overall development not comprising exempted development.

Additionally, some other elements of the option may require planning, such as reactive support requirements if required, so the option will still have moderate planning risks associated.

An UGC option would preferably be accommodated in the public road network. However with regards to permits and wayleaving, it should be recognised that it may not be possible to lay a 400 kV underground cable along existing roads due to the cable trench width required. If this is the case, a 400 kV underground cable option may have to be laid across open fields.

This brings its own significant challenges in terms of landowner engagement and concerns, environmental and land use impacts – in particular the inability to undertake certain types of agricultural activity thereon. It is assumed that significant engagement with landowners with properties along public roads would be required in the delivery of a new 400 kV UGC, for such purposes as surveying, siting and construction.

A high level assessment showed limited options for the development of a new 400 kV busbar adjacent to the existing Finglas 220 kV substation. An appropriate site may be located in the vicinity, however this would introduce additional project complexity and risk associated with new circuits required to connect the new 400 kV busbar to the existing 220 kV busbar.

It is considered that this option will have a low to moderate impact in terms of potential outages required as it is mostly a new build with only outages required for energisation.

Overall, this option is considered to have an overall mid-level/moderate impact on deliverability (**Dark Green**).

7.5.5 Socio-economic

Having considered the potential impacts of a UGC it is concluded that this option will have low-moderate socio-economic impact (**Green**) – this is relative to the other options being considered and in particular the OHL. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.5.6 Summary of option

Overall performance Finglas – Woodland 400 kV UGC	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Overall Performance

Table 11 *Summary of performance of all criteria for the Finglas – Woodland 400 kV UGC option*

7.6 New Finglas - Woodland 400 kV OHL circuit

7.6.1 Description of option

This option involves a transmission network reinforcement to strengthen the network between the existing Woodland 400 kV substation in County Meath and the Finglas 220 kV substation in North County Dublin. The reinforcement consists of a new 400 kV overhead line linking the Woodland 400 kV substation to the Finglas 220 kV substation, and a new 400 kV busbar and 400/220 kV transformer at Finglas.

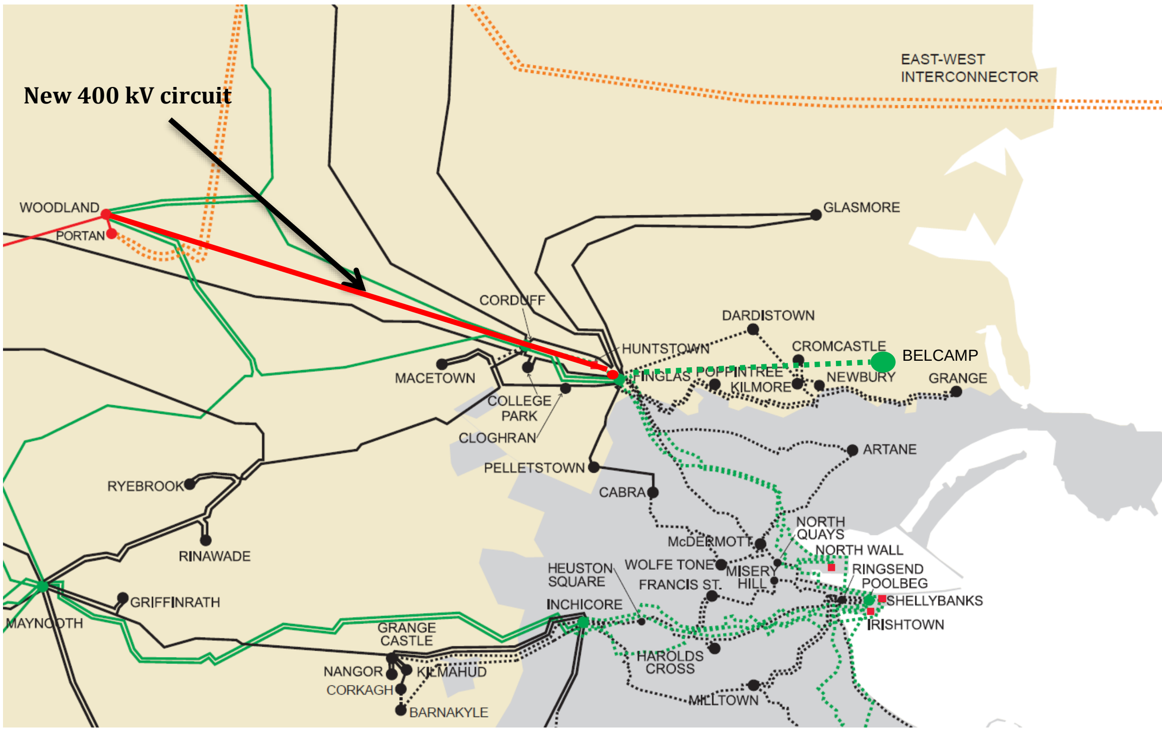


Figure 8: *New 400 kV overhead line circuit connecting the Woodland and Finglas substations.*

7.6.2 Technical Performance

7.6.2.1 Thermal overloads

In comparison to the alternative options, the New Finglas - Woodland 400 kV OHL option performs well in terms of remaining thermal overloads that are required to be resolved to fulfil a fully compliant solution with the Transmission System Security and Planning Standards (TSSPS).

This option removes the overload of Clonee – Woodland 220 kV circuit seen when the system is intact. It is reduced to a post contingent overload of 109% following the unplanned loss of the Corduff – Woodland 220 kV circuit. The post contingent overload on the existing Corduff – Woodland 220 kV circuit following the unplanned loss of the Clonee – Woodland 220 kV circuit identified in Step 1, is reduced from 172% to 105%.

Dependence on generation in the North Dublin area is reduced by this option as the option will better manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations. In particularly the dependence on the generators at Huntstown generation station is reduced. Generation at Poolbeg generation station can be used to alleviate thermal problems, but its effect is limited by the capacity of the circuits between Poolbeg, North Wall, and Shellybanks and Finglas substations.

To further reduce dependence on generation in North Dublin additional reinforcement will be required. For example, the existing Corduff – Finglas 1 & 2, Corduff – Woodland, Clonee – Woodland and Clonee – Corduff 220 kV circuits may need thermal uprating in the future, depending on the rate of demand increases and generation portfolio changes. Other potential solutions include new additional circuits in the area to add further network capacity, for example a new circuit between Corduff, Finglas or Belcamp substations in North Dublin and Poolbeg or Irishtown substations in the city centre.(**Green**).

7.6.2.2 Voltage

The management of voltage in the Dublin and Mid East area is a known operational challenge.

This option is an overhead line option and so will not be expected to have a significant influence on increasing the voltage in the area. The analysis carried out has confirmed this. This option performs well in terms of voltage and has a low influence on the need for additional reactive power controlling equipment (**Cream**)

7.6.2.3 Short Circuit Analysis

The transmission network in North Dublin has relatively high short circuit current levels, but still with standards and Grid code levels. This option contributes to a moderate to high increase of short circuit current levels in the North Dublin area. All increases in short circuit level remain within Grid Code levels, but represent a reduction in available headroom. The results of the short circuit analysis can be found in Appendix 4. This option is considered to have a moderate to high impact in terms short circuit current levels (**Blue**).

7.6.2.4 Reinforcements to cater for maintenance conditions

This option will require additional reinforcements to keep the network within standards following a subsequent loss of plant and equipment whilst another is out for planned maintenance. In particular, a maintenance and trip combination that includes the new Finglas - Woodland 400 kV OHL and one of the existing 220 kV circuits between Corduff, Clonee, Finglas, and Woodland, result in overloads on remaining circuits in that corridor which are the same as the unplanned loss of a single piece of transmission equipment before the new circuit is added. This issue is common to all the options evaluated. These overloads can be managed using dispatch of existing thermal generation in North Dublin. To reduce dependence on these generators additional reinforcements will be required. The additional reinforcements range from thermal uprates of the existing 220 kV circuits, or new circuits to add further capacity to the network in the area.

This option is considered to have a moderate performance in terms possible future reinforcements (**Dark Green**).

7.6.2.5 Conclusion of technical performance

This option is considered to have good performance from a technical point of view (**Green**) when all technical aspects were considered.

Technical performance Finglas – Woodland 400 kV OHL	**Thermal overloads**	**Voltage**	**Short circuit**	**Maintenance conditions**	**Combined Technical Performance**

Table 12 *Summary of technical performance for Finglas – Woodland 400 kV OHL option*

7.6.3 Economic Performance

The estimated capital costs for the full solution for the Finglas – Woodland 400 kV OHL option is approximately €44.7m. This includes new circuit bays, new 400 kV equipment at the existing substation, and new 400/220 kV transformer required. The estimated cost for the transmission system operator to develop the Finglas – Woodland 400 kV OHL option is approximately €23.8m. This option is considered to have low to moderate impact in terms of the cost (**Green**).

7.6.4 Environmental

Having considered the potential environmental impacts of a 400kV OHL it is concluded that this option will have moderate environmental impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400kV or 220kV OHL would be similar.The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.6.5 Deliverability

Having assessed high level deliverability aspects for a new 400 kV overhead line circuit it is concluded that this option could be associated with high planning risks.

Based on experience on other similar OHL projects, permitting would be expected to be very challenging due to societal acceptance of such a development. This means that overall, the option could very likely experience delays in its development compared to the other options.

Furthermore, a high level assessment showed limited options for the development of a new 400 kV busbar adjacent to the existing Finglas 220 kV substation. An appropriate site may be located in the vicinity, however this would introduce additional project complexity and risk associated with new circuits required to connect the new 400 kV busbar to the existing 220 kV busbar.

It is considered that this option will have a low to moderate impact in terms of potential outages required as it is mostly a new build with only outages required for energisation.

Significant engagement with landowners and communities would be required in the delivery of a new overhead circuit, for such purposes as surveying, siting and construction. These parties may be new to accommodating electricity infrastructure on their landholdings and within their communities. New wayleaves would be required to facilitate construction of the new circuit. Based on recent precedent in terms of the provision of new 400 kV transmission infrastructure, there is the potential for significant landowner, community and public concerns with this option, with the likely consequence of project delays or difficulties in gaining access to land.

Overall, given the nature of the project the planning risks are considered difficult to mitigate and more dominant in delivering the project. Combining the planning risks with the risks around permits and wayleaving, this option is considered to have an overall high to moderate impact on deliverability (**Blue).**

7.6.6 Socio-economic

Having considered the potential impacts of a 400 kV OHL it is concluded that this option will have moderate socio-economic impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400 kV or 220 kV OHL would be similar. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development. It performs better than the other OHL option to

Belcamp as it only travels to the substations on the western fringes of Dublin City and avoids more constrained areas.

7.6.7 Summary of option

Overall performance Finglas – Woodland 400 kV OHL	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Overall Performance

Table 13 *Summary of performance of all criteria for the Finglas – Woodland 400 kV OHL option*

7.7 New Belcamp – Woodland 400 kV OHL circuit

This option involves a transmission network reinforcement to strengthen the network between the existing Woodland 400 kV substation in County Meath and the Belcamp 220 kV substation in North County Dublin. The reinforcement consists of a new 400 kV overhead line linking the Woodland 400 kV substation to the Belcamp 220 kV substation, and a new 400 kV busbar and 400/220 kV transformer at Belcamp.

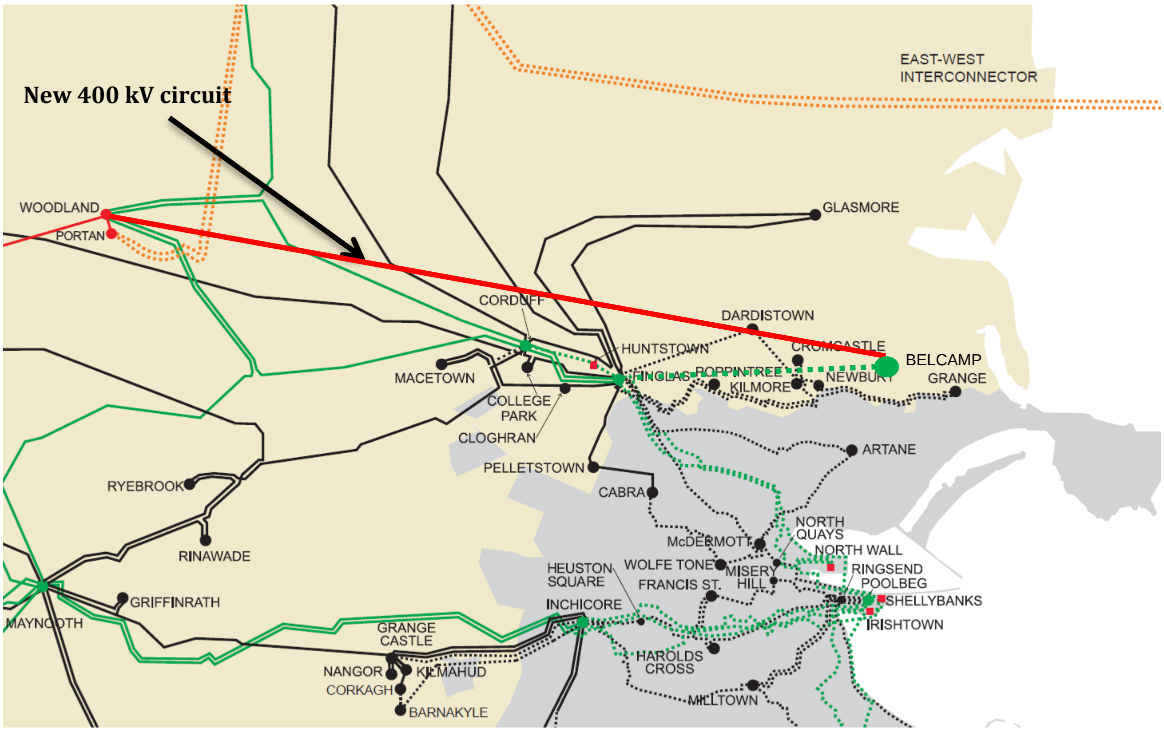


Figure 9: *New 400 kV overhead line circuit connecting the Woodland and Belcamp substations.*

7.7.1 Technical Performance

7.7.1.1 Thermal overloads

In comparison to the alternative options, the New Belcamp - Woodland 400 kV OHL option performs well in terms of remaining thermal overloads that are required to be resolved to fulfil a fully compliant solution with the Transmission System Security and Planning Standards (TSSPS). (**Green**).

This option removes the overload of Clonee – Woodland 220 kV circuit seen when the system is intact. It is reduced to a post contingent overload of 110% following the unplanned loss of the Corduff – Woodland 220 kV circuit. The post contingent overload on the existing Corduff – Woodland 220 kV circuit following the unplanned loss of the Clonee – Woodland 220 kV circuit identified in Step 1, is reduced from 172% to 107%.

Dependence on generation in the North Dublin area is reduced by this option as the option will better manage power flows on the existing 220 kV circuits between Woodland, Corduff, and Finglas 220 kV substations. In particularly the dependence on the generators at Huntstown generation station is reduced. Generation at Poolbeg generation station can be used to alleviate thermal problems, but its effect is limited by the capacity of the circuits between Poolbeg, North Wall, and Shellybanks and Finglas substations.

To further reduce dependence on generation in North Dublin additional reinforcement will be required. For example, the existing Corduff – Finglas 1 & 2, Corduff – Woodland, Clonee – Woodland and Clonee – Corduff 220 kV circuits may need thermal uprating in the future, depending on the rate of demand increases and generation portfolio changes. Other potential solutions include new additional circuits in the area to add further network capacity, for example a new circuit between Corduff, Finglas or Belcamp substations in North Dublin and Poolbeg or Irishtown substations in the city centre.

7.7.1.2 Voltage

The management of voltage in the Dublin and Mid East area is a known operational challenge.

This option is an overhead line option and so will not be expected to have a significant influence on increasing the voltage in the area. The analysis carried out has confirmed this. This option performs well in terms of voltage and has a low influence on the need for additional reactive power controlling equipment (**Cream**)

7.7.1.3 Short Circuit Analysis

The transmission network in North Dublin has relatively high short circuit current levels, but still with standards and Grid code levels. This option contributes to a moderate to high increase of short circuit current levels in the North Dublin area. All increases in short circuit level remain within Grid Code levels, but represent a reduction in available headroom. The results of the short circuit analysis can be found in Appendix 4. This option is considered to have a moderate to high impact in terms short circuit current levels (**Blue**).

7.7.1.4 Reinforcements to cater for maintenance conditions

This option will require additional reinforcements to keep the network within standards following a subsequent loss of plant and equipment whilst another is out for planned maintenance. In particular, a maintenance and trip combination that includes the new Belcamp - Woodland 400 kV OHL and one of the existing 220 kV circuits between Corduff, Clonee, Finglas, and Woodland, result in overloads on remaining circuits in that corridor which are the same as the unplanned loss of a single item of transmission equipment before the new circuit is added. This issue is common to all the options evaluated. These overloads can be managed using dispatch of existing thermal generation in North Dublin. To reduce dependence on these generators additional reinforcements will be required. The additional reinforcements range from thermal uprates of the existing 220 kV circuits, or new circuits to add further capacity to the network in the area. Details of the criteria are found in section 3.2

This option is considered to have a moderate performance in terms possible future reinforcements (**Dark Green**).

7.7.1.5 Conclusion of technical performance

This option is considered to have good performance from a technical point of view (**Green**) when all technical aspects were considered.

Technical performance Belcamp – Woodland 400 kV OHL	**Thermal overloads**	**Voltage**	**Short circuit**	**Maintenance conditions**	**Combined Technical Performance**

Table 14 *Summary of technical performance for the Belcamp – Woodland 400 kV OHL option*

7.7.2 Economic Performance

The estimated capital costs for the full solution for the Belcamp – Woodland 400 kV OHL option is approximately €58.2m. This includes new circuit bays, new 400 kV equipment at the existing substation, and new 400/220 kV transformer required. The estimated cost for the transmission system operator to develop the Belcamp – Woodland 400 kV OHL option is approximately €24.6m. This option is considered to have low to moderate impact in terms of the cost (**Green**).

7.7.3 Environmental

Having considered the potential environmental impacts of a 220kV OHL it is concluded that this option will have moderate environmental impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The construction and operation of a 400kV or 220kV OHL would be similar.The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

7.7.4 Deliverability

Having assessed high level deliverability aspects for a new 400 kV overhead line circuit it is concluded that this option could be associated with high planning risks.

Based on experience on other similar OHL projects, permitting would be expected to be very challenging due to societal acceptance of such a development. This means that overall, the option could very likely experience delays in its development compared to the other options.

On the other hand, a high level assessment showed suitable options for the development of a new 400 kV busbar adjacent to the existing Belcamp 220 kV substation. This would minimise project complexity and risk associated with connections between the new 400 kV busbar to the existing 220 kV busbar.

It is considered that this option will have a low to moderate impact in terms of potential outages required as it is mostly a new build with only outages required for energisation.

Significant engagement with landowners and communities would be required in the delivery of a new overhead circuit, for such purposes as surveying, siting and construction. These parties may be new to accommodating electricity infrastructure on their landholdings and within their communities. New wayleaves would be required to facilitate construction of the new circuit. Based on recent precedent in terms of the provision of new 400 kV transmission infrastructure, there is the potential for significant landowner, community and public concerns with this option, with the likely consequence of project delays or difficulties in gaining access to land.

Given the nature of the project the planning risks are considered difficult to mitigate and more dominant in delivering the project. Combining the planning risks with the risks around permits and wayleaving, this option is considered to have an overall moderate to high impact on deliverability (**Blue**)

7.7.5 *Socio-economic*

Having considered the potential impacts of a 400 kV OHL it is concluded that this option will have moderate-high socio-economic impact (**Dark Green**) – this is relative to the other options being considered and in particular the UGC. The introduction of new overhead infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development. It performs worse than the other OHL options as it travels to the substations with additional constrained areas like including north Dublin City, Dublin Airport Environs, Swords.

7.7.6 Summary of option

Overall performance Belcamp – Woodland 400 kV OHL	Technical Performance	Economic Performance	Environmental	Deliverability	Socio-economic	Overall Performance

Table 15 *Summary of performance of all criteria for the Belcamp – Woodland 400 kV OHL option.*

7.8 Summary of the performance of options

7.8.1 Technical Performance

The technical performance of each option was assessed to achieve Transmission System Security and Planning Standards (TSSPS) compliant solutions. In addition, certain aspects were looked at in detail to distinguish between the options such as the difference in thermal overloads, improvements in phase angles, difference in reactive support requirements, changes in short circuit levels and how the options performed under maintenance conditions. It should be noted that the relative performance between the options may change in Step 3 when further analysis is carried out.

Estimated Technical performance for options	Corduff - Woodland 400 kV OHL	Corduff – Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL

Table 16 *Summary of technical performance for all options*

7.8.2 Economic Performance

The economic performance of the options is based on capital costs for each option. Each option is fully assessed to achieve a Transmission System Security and Planning Standards (TSSPS) compliant solution. The capital costs for the five options range between €86m – €173m. Each option is also assessed on estimated cost for the transmission system operator to develop. These costs range between €13-20m for the five options.

Estimated economic performance for options	Corduff - Woodland 400 kV OHL	Corduff – Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL

Table 17 *Summary of economic performance for all options*

7.8.3 Environmental

The options were assessed, at a high level, for potential environmental impacts. The construction of any new transmission infrastructure will compare poorly against other options using existing infrastructure. It is also recognised that the installation of an underground option is not without environmental impacts. An underground option will have a slightly better environmental performance in comparison with an above ground solution on a high level general comparison.

Estimated environmental aspects	Corduff - Woodland 400 kV OHL	Corduff – Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL

Table 18 *Summary of environmental aspects for all options*

7.8.4 Deliverability

The deliverability aspects in regards to timelines, planning risks, permits and wayleaving and outages were assessed on a high level for the options. All the options involve new infrastructure and so were associated with low outages as is assumed that they will be constructed off-line with minimal outages required to connect to the transmission system. All options could have a range of different planning, permitting, wayleaving and construction risks and other aspects associated with their technology and this was reflected in the assessment at a high level. Further investigations and assessments will be undertaken in Step 3.

Estimated deliverability aspects	Corduff - Woodland 400 kV OHL	Corduff – Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL

Table 19 *Summary of deliverability aspects for all options*

7.8.5 Socio-economic

A new asset in a socio-economic environment will, in general, always perform poorly relative to other options which may use existing infrastructure. The introduction of new infrastructure into the study area will change the baseline environment and while it may be possible to mitigate impacts they may be significant. The determination of the significance of which would require more detailed assessment as the options move through the various steps in the Framework for Grid Development.

Estimated socio-economic aspects	Corduff - Woodland 400 kV OHL	Corduff – Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL

Table 20 *Summary of socio-economic performance for all options*

8 Conclusions

EirGrid follow a six step approach when we develop and implement the best performing solution option to any identified transmission network problem. The transmission network problem for Capital Project 1021 was identified and described in previous Step 1 and was documented in the Need Report.

The need, in this case, involves a transmission network problem relating to the transfer of power across the existing 220 kV transmission network from the Woodland 400 kV substation to the north Dublin area. The issues encountered involve the capacity of the transmission system in the area.

Capital Project 1021 has now gone through Step 2 of the framework for grid development. Step 2 was carried out in two parts. Part A covered the aspects that were considered when the long list of options was created and the first refinement of this list. This is documented in Options Report Part A. The outcome of the second part of refinement of the list has been presented in this report, Options Report Part B (this document).

The outcome from the Part B in Step 2 is that four solution options will be brought forward for further analysis in Step 3. The four options are:

1. New Finglas – Woodland 400 kV overhead line (OHL)
2. New Finglas – Woodland 400 kV underground cable (UGC)
3. New Belcamp – Woodland 400 kV overhead line (OHL)
4. New Belcamp – Woodland 400 kV underground cable (UGC)

Appendix 1 – Analysis Result

Appendix 1A – New Corduff – Woodland 400 kV OHL Circuit

Loss of single piece of transmission equipment Results

Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	291.5	569.5	434	131.2	Summer Peak
Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	291.5	569.5	434	131.2	Summer Peak

Loss of single piece of transmission equipment while generation is out of service Results

Generator Outage	Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	407	624.7	434	143.9	Summer Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	355.3	608.8	434	140.3	Summer Peak
Huntstown 2	New Corduff - Woodland 400 kV circuit	Clonee - Woodland 1 220 kV circuit	407	585.1	434	134.8	Summer Peak
Huntstown 2	New Corduff 400/220 kV transformer	Clonee - Woodland 1 220 kV circuit	407	585.2	434	134.8	Summer Peak
Huntstown 2	New Corduff - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	355.3	538.2	434	124	Summer Peak
Huntstown 2	New Corduff 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	355.3	538.3	434	124	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	355.3	528.8	434	121.8	Summer Peak
Huntstown 2	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	257.5	502.5	434	115.8	Summer Peak
Huntstown 2	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	257.5	502.5	434	115.8	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	279.4	491.1	434	113.2	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	392.7	600.6	534	112.5	Winter Peak

Maintenance and trip combination Results

Maintenance	Contingency	Monitored Bus	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Clonee - Woodland 1 220 kV circuit	New Corduff 400 / 220 kV transformer	Corduff - Woodland 2 220 kV circuit	430	748.4	434	172.5	Summer Peak
Clonee - Woodland 1 220 kV circuit	New Corduff - Woodland 400 kV circuit	Corduff - Woodland 2 220 kV circuit	430	746.8	434	172.1	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Corduff - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	373.8	653.6	434	150.6	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Corduff 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	373.8	653.8	434	150.6	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Corduff - Woodland 400 kV circuit	Clonee - Corduff 1 220 kV circuit	344.8	622.8	434	143.5	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Corduff 400/220 kV transformer	Clonee - Corduff 1 220 kV circuit	344.8	622.9	434	143.5	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	303.6	593.5	434	136.8	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	303.6	593.5	434	136.8	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Corduff 400/220 kV transformer	468.2	682.9	500	136.6	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	New Corduff 400/220 kV transformer	458.9	682.9	500	136.6	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	299	585	434	134.8	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	299	585	434	134.8	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	293.9	575.1	434	132.5	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	293.9	575.1	434	132.5	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	293	572.9	434	132	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	293	572.9	434	132	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	284.6	556.5	434	128.2	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	284.6	556.5	434	128.2	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	279.6	546.8	434	126	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	279.6	546.8	434	126	Summer Peak
Dunstown - Woodland 1 400 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	277.3	542.5	434	125	Summer Peak
Dunstown - Woodland 1 400 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	277.3	542.5	434	125	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Corduff 400/220 kV transformer	444.7	621.6	500	124.3	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	New Corduff 400/220 kV transformer	458.9	621.6	500	124.3	Summer Peak
Corduff - Woodland 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	275.1	538	434	124	Summer Peak
Corduff - Woodland 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	275.1	538	434	124	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	272.4	532.5	434	122.7	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	272.4	532.5	434	122.7	Summer Peak
Oldstreet - Woodland 1 400 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	268.5	524.4	434	120.8	Summer Peak
Oldstreet - Woodland 1 400 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	268.5	524.4	434	120.8	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	317.9	478.9	434	110.3	Summer Peak

Appendix 1B – New Corduff – Woodland 400 kV UGC Circuit,

N, intact system issues

Monitored Bus	kV	V (pu)	Voltage condition	Demand Level
Louth	110	1.0937	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Mullagharlin	110	1.0904	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley

Loss of single piece of transmission equipment Results

Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	293.8	574.1	434	132.3	Summer Peak
Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	293.8	574.1	434	132.3	Summer Peak

Loss of single piece of transmission equipment while generation is out of service Results

Generator Outage	Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Huntstown 2	none	New Corduff 400/220 kV transformer	550.1	550.1	500	110	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 220 kV circuit	394.8	601.8	434	138.7	Summer Peak
Huntstown 2	New Corduff 400 / 220 kV transformer	Clonee - Woodland 220 kV circuit	394.8	588.4	434	135.6	Summer Peak
Huntstown 2	Clonee - Woodland 220 kV circuit	Corduff - Woodland 1 220 kV circuit	343.1	585.5	434	134.9	Summer Peak
Huntstown 2	New Corduff - Woodland 400 kV circuit	Clonee - Woodland 220 kV circuit	394.8	584.7	434	134.7	Summer Peak
Huntstown 2	New Corduff 400 / 220 kV transformer	Corduff - Woodland 1 220 kV circuit	343.1	541.5	434	124.8	Summer Peak
Huntstown 2	New Corduff - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	343.1	537.7	434	123.9	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	343.1	507.2	434	116.9	Summer Peak
Huntstown 2	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	259.2	506.1	434	116.6	Summer Peak
Huntstown 2	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	259.2	506.1	434	116.6	Summer Peak

Maintenance and trip combination Results

Maintenance	Contingency	Monitored Bus	Pre-cnt MVA	Post-cnt MVA	Rating (MVA)	% Loading	Demand Level
Clonee - Woodland 1 220 kV circuit	New Corduff 400 / 220 kV transformer	Corduff - Woodland 1 220 kV circuit	430	748.4	434	172.5	Summer Peak
Clonee - Woodland 1 220 kV circuit	New Corduff - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	430	746.8	434	172.1	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Corduff 400 / 220 kV transformer	Corduff - Woodland 1 220 kV circuit	356.9	655.2	434	151	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Corduff - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	356.9	653.8	434	150.6	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 220 kV circuit	New Corduff 400 / 220 kV transformer	494.8	722.7	500	144.5	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Corduff 400 / 220 kV transformer	Clonee - Corduff 1 220 kV circuit	328.3	624.1	434	143.8	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Corduff - Woodland 400 kV circuit	Clonee - Corduff 1 220 kV circuit	328.3	623	434	143.5	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	305.8	598	434	137.8	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	305.8	598	434	137.8	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	302	591.1	434	136.2	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	302	591.1	434	136.2	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	296.9	580.9	434	133.9	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	296.9	580.9	434	133.9	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	295.2	577.4	434	133	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	295.2	577.4	434	133	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Corduff 400 / 220 kV transformer	479.6	656.5	500	131.3	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	New Corduff 400 / 220 kV transformer	494.8	656.5	500	131.3	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	287.1	561.4	434	129.4	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	287.1	561.4	434	129.4	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	282.8	553.1	434	127.4	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	282.8	553.1	434	127.4	Summer Peak
Dunstown - Woodland 1 400 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	279.4	546.8	434	126	Summer Peak
Dunstown - Woodland 1 400 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	279.4	546.8	434	126	Summer Peak
Corduff - Woodland 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	278.4	544.4	434	125.4	Summer Peak
Corduff - Woodland 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	278.4	544.4	434	125.4	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	275.6	538.8	434	124.2	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	275.6	538.8	434	124.2	Summer Peak
Woodland - Oldstreet 1 400 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Fingls 2 220 kV circuit	270.3	528.4	434	121.8	Summer Peak
Woodland - Oldstreet 1 400 kV circuit	Corduff - Fingls 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	270.3	528.4	434	121.8	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Corduff 400 / 220 kV transformer	Clonee - Woodland 220 kV circuit	329.7	491.5	434	113.2	Summer Night Valley

Appendix 1C – New Corduff – Woodland 220 kV OHL Circuit

Loss of single piece of transmission equipment Results

Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	273.1	533.5	434	122.9	Summer Peak
Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	273.1	533.5	434	122.9	Summer Peak

Loss of single piece of transmission equipment while generation is out of service Results

Generator Outage	Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Huntstown 2	New New Corduff - Woodland 2 220 kV circuit	Clonee - Woodland 2 220 kV circuit	430.2	593.9	434	136.8	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 2 220 kV circuit	430.2	580.8	434	133.8	Summer Peak
Huntstown 2	Clonee - Woodland 2 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	378.6	568.9	434	131.1	Summer Peak
Huntstown 2	Clonee - Woodland 2 220 kV circuit	Corduff - Woodland 1 220 kV circuit	356.7	536	434	123.5	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	378.6	533.7	434	123	Summer Peak
Huntstown 2	New Corduff - Woodland 2 220 kV circuit	Corduff - Woodland 1 220 kV circuit	356.7	515.5	434	118.8	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	378.6	511.6	434	117.9	Summer Peak
Huntstown 2	Poolbeg 220 kV Bus Tie Reactor	Clonee - Woodland 2 220 kV circuit	430.2	492.3	434	113.4	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	356.7	482	434	111.1	Summer Peak

Maintenance and trip combination Results

Maintenance	Contingency	Monitored Bus	Pre-cnt MVA	Post-cnt MVA	Rating (MVA)	% Loading	Demand Level
Clonee - Woodland 2 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	Corduff - Woodland 1 220 kV circuit	414.8	734.8	434	169.3	Summer Peak
New Corduff - Woodland 2 220 kV circuit	Clonee - Woodland 2 220 kV circuit	Corduff - Woodland 1 220 kV circuit	394.7	734.8	434	169.3	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	386.4	653.6	434	150.6	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	Corduff - Woodland 1 220 kV circuit	364.1	643.1	434	148.2	Summer Peak
New Corduff - Woodland 2 220 kV circuit	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	394.7	643.1	434	148.2	Summer Peak
New Corduff - Woodland 2 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	342.1	622.8	434	143.5	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	286.3	559.6	434	128.9	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	286.3	559.6	434	128.9	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	280.1	547.9	434	126.3	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	280.1	547.9	434	126.3	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	275.1	538.1	434	124	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	275.1	538.1	434	124	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	275.3	538.2	434	124	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	275.3	538.2	434	124	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	266.4	520.8	434	120	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	266.4	520.8	434	120	Summer Peak
Dunstown - Woodland 1 400 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	264.8	517.6	434	119.3	Summer Peak
Dunstown - Woodland 1 400 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	264.8	517.6	434	119.3	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	262.3	512.6	434	118.1	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	262.3	512.6	434	118.1	Summer Peak
New Corduff - Woodland 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	259	506	434	116.6	Summer Peak
New Corduff - Woodland 2 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	259	506	434	116.6	Summer Peak
Clonee - Woodland 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	256.9	501.9	434	115.7	Summer Peak
Clonee - Woodland 2 220 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	256.9	501.9	434	115.7	Summer Peak
Woodland - Oldstreet 1 400 kV circuit	Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	255.6	499.1	434	115	Summer Peak
Woodland - Oldstreet 1 400 kV circuit	Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	255.6	499.1	434	115	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	Clonee - Woodland 2 220 kV circuit	351.1	479.2	434	110.4	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	New Corduff - Woodland 2 220 kV circuit	Clonee - Woodland 2 220 kV circuit	350.4	478.2	434	110.2	Summer Peak

Appendix 1D – New Finglas – Woodland 220 kV OHL Circuit

Loss of single piece of transmission equipment Results

Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	352.8	497.8	434	114.7	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	300.8	474.1	434	109.2	Summer Peak

Loss of single piece of transmission equipment while generation is out of service Results

Generator Outage	Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Huntstown 2	none	Clonee - Woodland 1 220 kV circuit	452.9	452.9	434	104.4	Summer Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	401.9	628.4	434	144.8	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	401.9	562.6	434	129.6	Summer Peak
Huntstown 2	New Finglas - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	401.9	538.5	434	124.1	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	322.3	511.9	434	118	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	440.5	630.3	534	118	Winter Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	389.9	608.5	534	114	Winter Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	322.1	480.1	434	110.6	Summer Peak

Maintenance and trip combination Results

Maintenance	Contingency	Monitored Bus	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Clonee - Woodland 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	Corduff - Woodland 2 220 kV circuit	430	748.4	434	172.5	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	377.4	696.9	434	160.6	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	361	696.9	434	160.6	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	413.3	653.6	434	150.6	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	371.9	622.8	434	143.5	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	335	611.2	434	140.8	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	361	611.2	434	140.8	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	360.8	510.3	434	117.6	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	360.2	509.3	434	117.3	Summer Peak
Corduff - Finglas 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	279.2	508.2	434	117.1	Summer Peak
Corduff - Finglas 2 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	Corduff - Finglas 1 220 kV circuit	279.2	508.2	434	117.1	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	356.8	504.2	434	116.2	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	354	500.2	434	115.3	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	350.2	494.2	434	113.9	Summer Peak
Corduff - Finglas 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	344.4	490.9	434	113.1	Summer Peak
Corduff - Finglas 2 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	344.4	490.9	434	113.1	Summer Peak
Dunstown - Woodland 1 400 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	346.7	489.5	434	112.8	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	309.1	486.9	434	112.2	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	307	485.3	434	111.8	Summer Peak
Finglas - North Wall 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	303.8	480.2	434	110.6	Summer Peak
Corduff - Finglas 1 220 kV circuit	Corduff - Finglas 2 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	271	479.4	434	110.5	Summer Peak
Corduff - Finglas 2 220 kV circuit	Corduff - Finglas 1 220 kV circuit	New Finglas - Woodland 1 220 kV circuit	271	479.4	434	110.5	Summer Peak

Appendix 1E – New Finglas – Woodland 400 kV UGC Circuit

N, intact system issues

Monitored Bus	kV	V (pu)	Voltage condition	Demand Level
Artane	110	1.0904	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Cabra	110	1.0902	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Finglas	110	1.0901	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Gorman	110	1.0902	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Gorman	220	1.0929	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Louth A	110	1.111	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Louth	220	1.0944	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Lisdrum	110	1.0946	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
McDermott St	110	1.0903	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Meath Hill	110	1.0971	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Mullagharlin	110	1.1079	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Pelletstown	110	1.0901	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Ratrussan	110	1.0936	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Woodland	220	1.0924	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Wolfe Tone St	110	1.0903	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley
Louth B	110	1.1065	BUSES WITH VOLTAGE GREATER THAN 1.0900:	Summer Night Valley

Loss of single piece of transmission equipment Results

Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	301.9	452.8	434	104.3	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	250	435.6	434	100.4	Summer Peak

Loss of single piece of transmission equipment while generation is out of service Results

Generator Outage	Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Huntstown 2	none	New Finglas 400/220 kV transformer	551.2	551.2	500	110.2	Summer Peak
Huntstown 2	none	New Finglas 400/220 kV transformer	540.7	540.7	500	108.1	Winter Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	399.4	612.5	434	141.1	Summer Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	347.7	596.8	434	137.5	Summer Peak
Huntstown 2	New Finglas 400/220 kV transformer	Clonee - Woodland 1 220 kV circuit	399.4	588.8	434	135.7	Summer Peak
Huntstown 2	New Finglas - Woodland 400 kV circuit	Clonee - Woodland 1 220 kV circuit	399.4	585.1	434	134.8	Summer Peak
Huntstown 2	New Finglas 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	347.7	542	434	124.9	Summer Peak
Huntstown 2	New Finglas - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	347.7	538.2	434	124	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	347.7	516.9	434	119.1	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	272.4	480.2	434	110.6	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	385.6	589.6	534	110.4	Winter Peak

Maintenance and trip combination Results

Maintenance	Contingency	Monitored Bus	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Clonee - Woodland 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Woodland 2 220 kV circuit	430	748.4	434	172.5	Summer Peak
Clonee - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Woodland 2 220 kV circuit	430	746.8	434	172.1	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	361.3	656.9	434	151.4	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	361.3	653.9	434	150.7	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	Clonee - Corduff 1 220 kV circuit	333.1	625.5	434	144.1	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Clonee - Corduff 1 220 kV circuit	333.1	623	434	143.5	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	488.1	662.6	500	132.5	Summer Peak
Corduff - Finglas 1 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Finglas 2 220 kV circuit	186.8	508.8	434	117.2	Summer Peak
Corduff - Finglas 2 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Finglas 1 220 kV circuit	186.8	508.8	434	117.2	Summer Peak
Corduff - Finglas 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Finglas 2 220 kV circuit	186.8	508.3	434	117.1	Summer Peak
Corduff - Finglas 2 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Finglas 1 220 kV circuit	186.8	508.3	434	117.1	Summer Peak

Appendix 1F – New Finglas – Woodland 400 kV OHL Circuit

Loss of single piece of transmission equipment Results

Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	313.5	473.8	434	109.2	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	261.4	457	434	105.3	Summer Peak

Loss of single piece of transmission equipment while generation is out of service Results

Generator Outage	Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	413.4	638.5	434	147.1	Summer Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	361.7	623.2	434	143.6	Summer Peak
Huntstown 2	New Finglas - Woodland 400 kV circuit	Clonee - Woodland 1 220 kV circuit	413.4	585.1	434	134.8	Summer Peak
Huntstown 2	New Finglas 400/220 kV transformer	Clonee - Woodland 1 220 kV circuit	413.4	585.2	434	134.8	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	361.7	541.7	434	124.8	Summer Peak
Huntstown 2	New Finglas - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	361.7	538.1	434	124	Summer Peak
Huntstown 2	New Finglas 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	361.7	538.2	434	124	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	285.2	504	434	116.1	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	399.4	614	534	115	Winter Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	348.2	598.8	534	112.1	Winter Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	315.1	476.5	434	109.8	Summer Night Valley

Maintenance and trip combination Results

Maintenance	Contingency	Monitored Bus	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Clonee - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Woodland 2 220 kV circuit	430	748.4	434	172.5	Summer Peak
Clonee - Woodland 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Woodland 2 220 kV circuit	430	746.8	434	172.1	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	381	653.6	434	150.6	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	381	653.8	434	150.6	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Clonee - Corduff 1 220 kV circuit	352.2	622.8	434	143.5	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	Clonee - Corduff 1 220 kV circuit	352.2	622.9	434	143.5	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	465.3	676.5	500	135.3	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	456.6	676.5	500	135.3	Summer Peak
Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	New Finglas 400/220 kV transformer	443.2	617.3	500	123.5	Summer Peak
Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	New Finglas 400/220 kV transformer	456.6	617.3	500	123.5	Summer Peak
Corduff - Finglas 1 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Finglas 2 220 kV circuit	204.8	508.3	434	117.1	Summer Peak
Corduff - Finglas 1 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Finglas 2 220 kV circuit	204.8	508.3	434	117.1	Summer Peak
Corduff - Finglas 2 220 kV circuit	New Finglas - Woodland 400 kV circuit	Corduff - Finglas 1 220 kV circuit	204.8	508.3	434	117.1	Summer Peak
Corduff - Finglas 2 220 kV circuit	New Finglas 400/220 kV transformer	Corduff - Finglas 1 220 kV circuit	204.8	508.3	434	117.1	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	321.1	486.8	434	112.2	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	318.9	482.9	434	111.3	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	317.4	480.7	434	110.8	Summer Peak

Appendix 1G – New Belcamp – Woodland 400 kV OHL Circuit.

Loss of single piece of transmission equipment Results

Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	317	481	434	110.8	Summer Peak
Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	265	464.5	434	107	Summer Peak

Loss of single piece of transmission equipment while generation is out of service Results

Generator Outage	Contingency	Monitored line	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	418.2	648.9	434	149.5	Summer Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	366.6	633.9	434	146.1	Summer Peak
Huntstown 2	New Belcamp - Woodland 400 kV circuit	Clonee - Woodland 1 220 kV circuit	418.2	585.1	434	134.8	Summer Peak
Huntstown 2	New Belcamp 400/220 kV transformer	Clonee - Woodland 1 220 kV circuit	418.2	585.2	434	134.8	Summer Peak
Huntstown 2	Clonee - Corduff 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	366.6	551.6	434	127.1	Summer Peak
Huntstown 2	New Belcamp - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	366.6	538.2	434	124	Summer Peak
Huntstown 2	New Belcamp 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	366.6	538.3	434	124	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Corduff 1 220 kV circuit	289.8	513.7	434	118.4	Summer Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	403.9	624.5	534	116.9	Winter Peak
Huntstown 2	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	352.9	609.4	534	114.1	Winter Peak
Huntstown 2	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	317.8	482.4	434	111.2	Summer Night Valley

Maintenance and trip combination Results

Maintenance	Contingency	Monitored Bus	Pre-cnt MVA	Post-cnt MVA	Rating MVA	% Loading	Demand Level
Clonee - Woodland 1 220 kV circuit	New Belcamp 400 / 220 kV transformer	Corduff - Woodland 2 220 kV circuit	430	748.4	434	172.5	Summer Peak
Clonee - Woodland 1 220 kV circuit	New Belcamp - Woodland 400 kV circuit	Corduff - Woodland 2 220 kV circuit	430	746.8	434	172.1	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Belcamp - Woodland 400 kV circuit	Corduff - Woodland 1 220 kV circuit	387.8	653.6	434	150.6	Summer Peak
Clonee - Corduff 1 220 kV circuit	New Belcamp 400/220 kV transformer	Corduff - Woodland 1 220 kV circuit	387.8	653.8	434	150.6	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Belcamp - Woodland 400 kV circuit	Clonee - Corduff 1 220 kV circuit	359.1	622.8	434	143.5	Summer Peak
Corduff - Woodland 1 220 kV circuit	New Belcamp 400/220 kV transformer	Clonee - Corduff 1 220 kV circuit	359.1	623	434	143.5	Summer Peak
Corduff - Finglas 1 220 kV circuit	New Belcamp - Woodland 400 kV circuit	Corduff - Finglas 2 220 kV circuit	211.5	508.3	434	117.1	Summer Peak
Corduff - Finglas 1 220 kV circuit	New Belcamp 400/220 kV transformer	Corduff - Finglas 2 220 kV circuit	211.5	508.3	434	117.1	Summer Peak
Corduff - Finglas 2 220 kV circuit	New Belcamp - Woodland 400 kV circuit	Corduff - Finglas 1 220 kV circuit	211.5	508.3	434	117.1	Summer Peak
Corduff - Finglas 2 220 kV circuit	New Belcamp 400/220 kV transformer	Corduff - Finglas 1 220 kV circuit	211.5	508.3	434	117.1	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	323.2	496.9	434	114.5	Summer Peak
Finglas - North Wall 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	323.1	492	434	113.4	Summer Peak
Dunstown - Carrickmines 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	322.5	490.3	434	113	Summer Peak
Belcamp - Shellybanks 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	322.5	490	434	112.9	Summer Peak
Belcamp - Finglas 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	270.6	481.2	434	110.9	Summer Peak
Poolbeg - Shellybanks 1 220 kV circuit	Corduff - Woodland 1 220 kV circuit	Clonee - Woodland 1 220 kV circuit	316.8	480.9	434	110.8	Summer Peak

Appendix 2 – Short Circuit Results

The following tables give the short circuit results for the options in the refined long list.

3ph Peak Make		% of rating	Change in % of rating comapred to no reinforcement case						
Node	Rating (kA)	No Reinforcment	Corduff - Woodland 400 kV OHL	Corduff - Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL
BELCAMP 110 kV	62.5	57%	2%	2%	1%	1%	2%	2%	3%
BELCAMP 220 kV	100	59%	6%	6%	4%	5%	7%	7%	9%
CORDUFF 110 kV	78.75	73%	2%	2%	1%	1%	2%	2%	2%
CORDUFF 220 kV	100	64%	9%	9%	6%	3%	7%	6%	6%
FIN_URBAN 110 kV	78.75	50%	2%	2%	1%	1%	2%	2%	2%
FINGLAS 220 kV	100	64%	7%	7%	5%	6%	9%	9%	8%
FIN_RURAL 110 kV	78.75	50%	2%	2%	1%	1%	2%	2%	2%
POOLBEG NORTH	78.75	74%	6%	6%	4%	5%	8%	7%	8%
POOLBEG SOUTH	78.75	81%	1%	1%	0%	0%	1%	1%	1%
SHELLYBANKS	100	58%	5%	5%	3%	4%	6%	6%	7%
WOODLAND 220 kV	100	72%	0%	0%	4%	5%	0%	0%	0%
WOODLAND 400 kV	100	44%	4%	4%	1%	1%	4%	5%	4%

3ph RMS AC Break		% of rating	Change in % of rating comapred to no reinforcement case						
Node	Rating (kA)	No Reinforcment	Corduff - Woodland 400 kV OHL	Corduff - Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL
BELCAMP 110 kV	25	48%	2%	2%	1%	1%	2%	2%	2%
BELCAMP 220 kV	40	50%	5%	5%	4%	5%	7%	6%	8%
CORDUFF 110 kV	31.5	68%	2%	2%	1%	1%	2%	2%	2%
CORDUFF 220 kV	40	54%	7%	7%	5%	3%	6%	6%	5%
FIN_URBAN 110 kV	31.5	42%	2%	2%	1%	1%	2%	2%	2%
FINGLAS 220 kV	40	54%	6%	6%	5%	5%	8%	7%	7%
FIN_RURAL 110 kV	31.5	40%	2%	2%	1%	1%	2%	2%	2%
POOLBEG NORTH	31.5	63%	6%	6%	4%	5%	7%	7%	8%
POOLBEG SOUTH	31.5	70%	1%	1%	0%	0%	1%	1%	1%
SHELLYBANKS	40	50%	5%	5%	3%	4%	6%	5%	6%
WOODLAND 220 kV	40	65%	1%	0%	3%	3%	0%	0%	0%
WOODLAND 400 kV	40	41%	3%	3%	0%	0%	3%	3%	3%

3ph TOT RMS Break		% of rating	Change in % of rating comapred to no reinforcement case						
Node	Rating (kA)	No Reinforcment	Corduff - Woodland 400 kV OHL	Corduff - Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL
BELCAMP 110 kV	25	58%	3%	3%	1%	2%	3%	3%	5%
BELCAMP 220 kV	40	55%	6%	6%	4%	4%	7%	7%	10%
CORDUFF 110 kV	31.5	68%	2%	2%	1%	1%	2%	2%	2%
CORDUFF 220 kV	40	60%	9%	9%	6%	3%	7%	6%	6%
FIN_URBAN 110 kV	31.5	51%	3%	3%	1%	2%	3%	3%	3%
FINGLAS 220 kV	40	61%	7%	7%	5%	6%	9%	9%	8%
FIN_RURAL 110 kV	31.5	50%	2%	3%	1%	2%	3%	3%	3%
POOLBEG NORTH	31.5	70%	6%	6%	4%	5%	7%	7%	8%
POOLBEG SOUTH	31.5	76%	1%	1%	0%	0%	1%	1%	1%
SHELLYBANKS	40	55%	5%	5%	3%	4%	6%	6%	6%
WOODLAND 220 kV	40	70%	0%	0%	4%	4%	0%	0%	0%
WOODLAND 400 kV	40	44%	4%	4%	1%	1%	4%	4%	4%

1 ph Peak Make		% of rating	Change in % of rating comapred to no reinforcement case						
Node	Rating (kA)	No Reinforcment	Corduff - Woodland 400 kV OHL	Corduff - Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL
BELCAMP 110 kV	62.5	45%	1%	1%	1%	1%	1%	1%	1%
BELCAMP 220 kV	100	65%	5%	5%	4%	4%	6%	6%	8%
CORDUFF 110 kV	78.75	76%	2%	2%	1%	1%	2%	2%	2%
CORDUFF 220 kV	100	71%	7%	7%	6%	3%	6%	5%	5%
FIN_URBAN 110 kV	78.75	60%	2%	2%	1%	1%	2%	2%	2%
FINGLAS 220 kV	100	74%	7%	7%	5%	6%	8%	8%	7%
FIN_RURAL 110 kV	78.75	53%	2%	2%	1%	1%	2%	2%	2%
POOLBEG NORTH	78.75	66%	3%	4%	2%	3%	4%	4%	5%
POOLBEG SOUTH	78.75	82%	1%	1%	0%	0%	1%	1%	1%
SHELLYBANKS	100	57%	3%	3%	2%	3%	4%	4%	4%
WOODLAND 220 kV	100	72%	0%	0%	5%	5%	0%	0%	0%
WOODLAND 400 kV	100	44%	3%	3%	1%	1%	3%	3%	3%

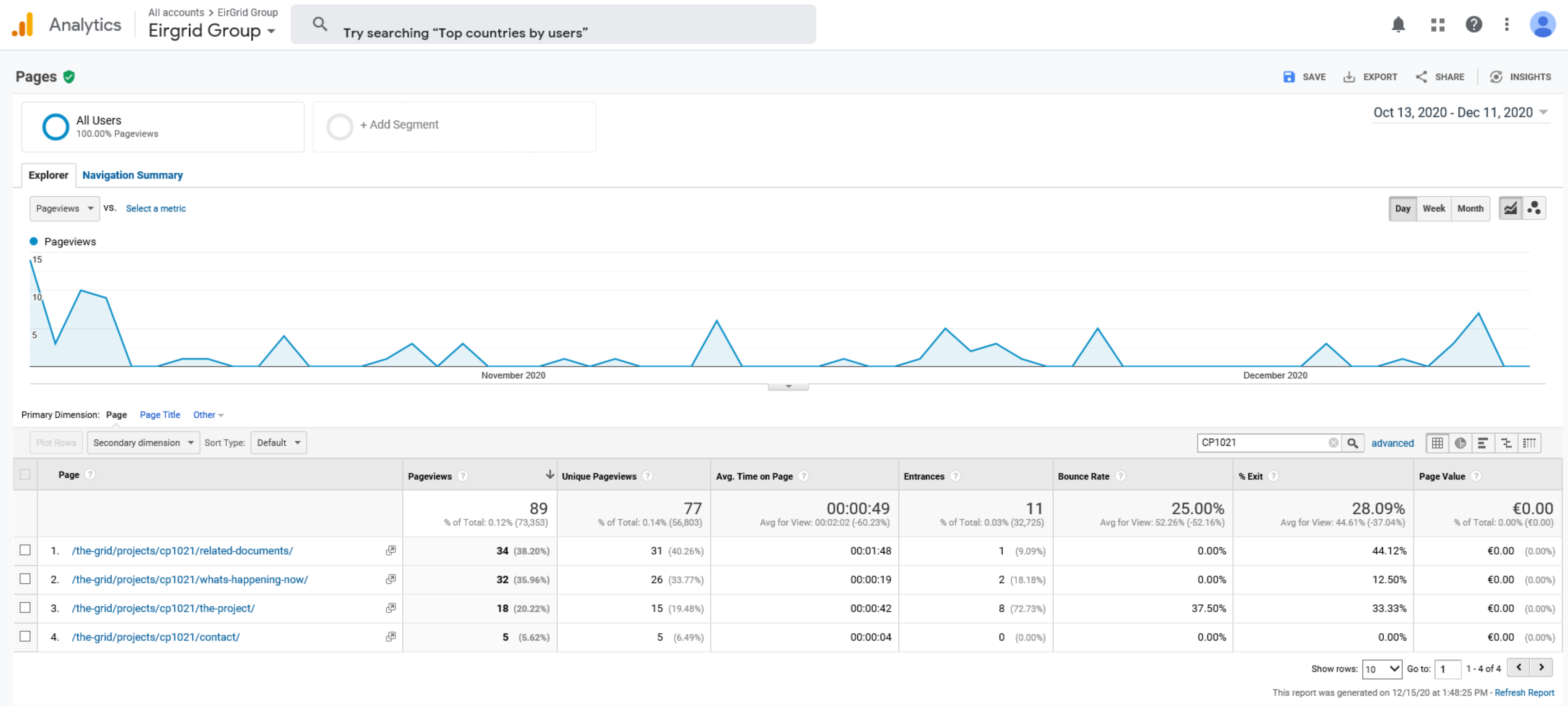
1ph RMS AC Break		% of rating	Change in % of rating comapred to no reinforcement case						
Node	Rating (kA)	No Reinforcment	Corduff - Woodland 400 kV OHL	Corduff - Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL
BELCAMP 110 kV	25	41%	1%	1%	1%	1%	1%	1%	1%
BELCAMP 220 kV	40	62%	5%	5%	4%	5%	6%	6%	7%
CORDUFF 110 kV	31.5	74%	2%	2%	1%	1%	2%	1%	1%
CORDUFF 220 kV	40	66%	7%	7%	6%	3%	6%	5%	5%
FIN_URBAN 110 kV	31.5	54%	2%	2%	1%	1%	2%	2%	2%
FINGLAS 220 kV	40	68%	6%	6%	5%	6%	8%	7%	7%
FIN_RURAL 110 kV	31.5	47%	1%	1%	1%	1%	2%	2%	1%
POOLBEG NORTH	31.5	67%	4%	4%	3%	4%	5%	5%	5%
POOLBEG SOUTH	31.5	81%	1%	1%	0%	0%	1%	1%	1%
SHELLYBANKS	40	56%	4%	4%	3%	3%	5%	4%	5%
WOODLAND 220 kV	40	69%	1%	0%	5%	5%	0%	0%	0%
WOODLAND 400 kV	40	43%	3%	3%	1%	1%	3%	3%	3%

1 ph TOT RMS Break		% of rating	Change in % of rating comapred to no reinforcement case						
Node	Rating (kA)	No Reinforcment	Corduff - Woodland 400 kV OHL	Corduff - Woodland 400 kV UGC	Corduff - Woodland 220 kV OHL	Finglas - Woodland 220 kV OHL	Finglas - Woodland 400 kV UGC	Finglas - Woodland 400 kV OHL	Belcamp - Woodland 400 kV OHL
BELCAMP 110 kV	25	47%	1%	1%	1%	1%	2%	2%	2%
BELCAMP 220 kV	40	65%	5%	5%	4%	5%	6%	6%	8%
CORDUFF 110 kV	31.5	74%	2%	2%	1%	1%	2%	2%	2%
CORDUFF 220 kV	40	71%	7%	8%	6%	3%	6%	6%	5%
FIN_URBAN 110 kV	31.5	63%	3%	3%	1%	2%	3%	3%	3%
FINGLAS 220 kV	40	75%	7%	7%	5%	6%	9%	9%	8%
FIN_RURAL 110 kV	31.5	54%	2%	2%	1%	1%	2%	2%	2%
POOLBEG NORTH	31.5	68%	4%	4%	3%	4%	5%	5%	5%
POOLBEG SOUTH	31.5	83%	1%	1%	0%	0%	1%	1%	1%
SHELLYBANKS	40	57%	4%	4%	3%	3%	4%	4%	5%
WOODLAND 220 kV	40	73%	0%	0%	5%	5%	0%	0%	0%
WOODLAND 400 kV	40	46%	3%	3%	1%	1%	3%	3%	3%

Appendix 3 Stakeholder Engagement

Project Website Visitor Statistics

The image below is taken from the analytics of the project website and the pages within the site. The chart shows the number of pageviews per day for the duration of the consultation period. The most visits recorded in one day was at the start of the consultation period, when 15 pageviews were recorded. This is not matched again for the duration of the period with a total of 89 views from 77 unique users.



	Page	Pageviews	Unique Pageviews	Avg. Time on Page	Entrances	Bounce Rate	% Exit	Page Value
		89 % of Total: 0.12% (73,353)	77 % of Total: 0.14% (56,803)	00:00:49 Avg for View: 00:02:02 (-60.23%)	11 % of Total: 0.03% (32,725)	25.00% Avg for View: 52.26% (-52.16%)	28.09% Avg for View: 44.61% (-37.04%)	€0.00 % of Total: 0.00% (€0.00)
1.	/the-grid/projects/cp1021/related-documents/	34 (38.20%)	31 (40.26%)	00:01:48	1 (9.09%)	0.00%	44.12%	€0.00 (0.00%)
2.	/the-grid/projects/cp1021/whats-happening-now/	32 (35.96%)	26 (33.77%)	00:00:19	2 (18.18%)	0.00%	12.50%	€0.00 (0.00%)
3.	/the-grid/projects/cp1021/the-project/	18 (20.22%)	15 (19.48%)	00:00:42	8 (72.73%)	37.50%	33.33%	€0.00 (0.00%)
4.	/the-grid/projects/cp1021/contact/	5 (5.62%)	5 (6.49%)	00:00:04	0 (0.00%)	0.00%	0.00%	€0.00 (0.00%)

Show rows: 10 Go to: 1 1 - 4 of 4

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Final Step 3 Report

The East Meath to North Dublin Network Reinforcement Project

Capital Project 1021

August 2022

EIRGRID

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Revision Table:

Revision	Issue Date	Description
01	17 June 2022	Draft
02	05 July 2022	Review and incorporation of comments provided to Rev 1 by the CFT
03	15 July 2022	Second review of comments incorporated
04	01 August	Remaining comments resolved

1 Table of Contents

2 Introduction

The East Meath to North Dublin Network Reinforcement Project (Capital Project 1021) is a reinforcement of the electricity network between Woodland 400 kV substation in County Meath and Belcamp 220 kV or Finglas 220 kV substation in County Dublin.

The need is based on two drivers - identified in the Tomorrow's Energy Scenarios (TES) 2019[1], in the Shaping Our Electricity Future Roadmap[2] published in 2021, and in subsequent studies carried out since to re-confirm the need - namely integration of generation and an increase in demand on Irish East Coast. A review of the needs in Step 3 has shown that the previously identified drivers still remain and have further increased the need to strengthen the transmission network between either Finglas or Belcamp and Woodland substations, and that the need for the reinforcement is still valid and robust.

This report describes the outcome of various assessments with regards to identified options for the project as well as presents the results that underpin the identified best performing option.

EirGrid follows a six-step approach when we develop and implement a solution to any identified transmission network problem. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[3]. The six steps are shown below. Each step has a distinct purpose with defined deliverables.

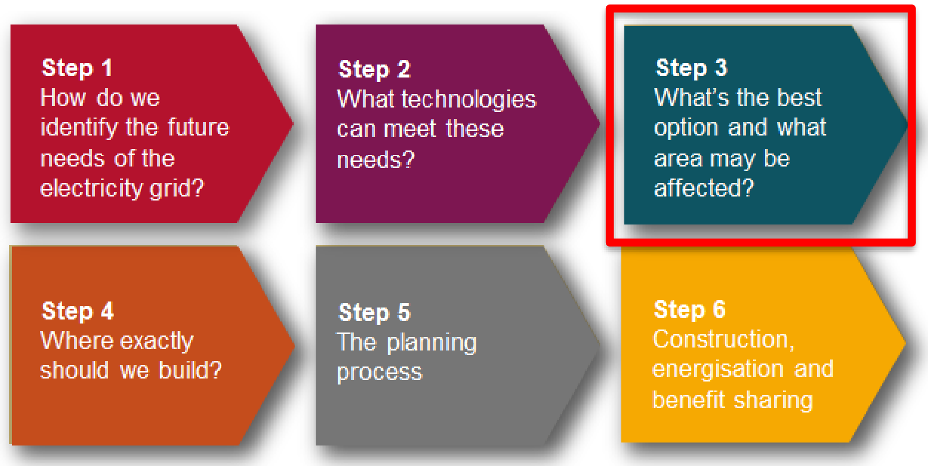

Figure 1 High level description of EirGrid's Project Development Process

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[1] Tomorrow's Energy Scenarios (TES, 2019) presents credible pathways for Ireland's clean energy transition with specific focus on what this means for the electricity transmission system over the next twenty years. The report is available on our website: https://www.eirgridgroup.com/customer-and-industry/energy-future/

[2] https://www.eirgridgroup.com/site-files/library/EirGrid/Shaping_Our_Electricity_Future_Roadmap.pdf

[3] https://www.eirgridgroup.com/__uuid/7d658280-91a2-4dbb-b438-ef005a857761/EirGrid-Have-Your-Say_May-2017.pdf

At the time of writing this report, this project is coming towards end of Step 3 of EirGrid's six step approach shown above. This report was initially written before the conclusion of Step 3 in June 2022.

The purpose of this report is to document the decision making and the analysis that was undertaken to date, which has informed decision making during the Step 3 process and which underpins the governance approval to proceed.

Following the successful conclusion of this Step 3, the project will enter Step 4, where further investigation, analysis, and assessment of the various underground cable route options, from Woodland 400 kV substation in County Meath and new 400 kV infrastructure at the existing Belcamp 220 kV substation in County Dublin, will be undertaken. As this report concludes, this is the Best Performing Option.

The process followed in Step 3 along with the activities undertaken to get us to here are described in Section 4.

A summary of the options review and the evaluation of the four options are outlined in Section 5.

The detailed assessment for each option can be read in Sections 6-9 followed by a conclusion in Section 10.

In Step 3, the process activities reference some terminology which will be used throughout this report. For clarity, these terminologies and expressions are introduced and listed below:

<u>Emerging Best Performing Option (EBPO)</u>
This is the option that emerged as the best performing option in Step 3 following the feasibility studies and which was taken forward for a period of public information campaign, in terms of the choice of technology and end node substations.

<u>Public Awareness Raising of the EBPO</u>
We held an awareness campaign on the EBPO for 8 weeks in May and June 2022. This period allowed for stakeholders and communities to be informed about the EBPO and any possible alternatives.

<u>Consideration of feedback</u>
Any feedback received throughout the awareness raising period will be carefully considered and will inform the activities to be carried out in Step 4 which will include a 12-week consultation period for local communities and other stakeholders on the route options, currently scheduled for the Autumn 2022.

Best Performing Option (BPO)

The Best Performing Option is identified at the end of Step 3 and documented in this report, Final Step 3 report. It is then approved for progression to the next step. In this case this is the underground cable route option, identified in this report, which will be taken forward for further investigation and development into a planning application for review and decision (in Step 5) by the relevant consenting authority and further on toward detailed design, construction, and energisation (in Step 6).

2.1 External professional assistance with the assessment

In Step 3 we assessed the various options against five criteria; these are described further in section 4. The assessments and investigations in relation to the environmental and socio-economic criteria as well as some technical feasibility studies have been carried out by external parties. Where relevant, this is highlighted in this report and the referenced reports are named and a summary of the findings is presented.

Jacobs[4] assessed the environmental and socio-economic criteria and conducted certain technical feasibility studies. PSC[5] carried out the technical cable integration study. The detailed assessment reports can be found on our website[6].

[4] Jacobs Ireland Ltd
[5] PSC Ireland
[6] https://www.eirgridgroup.com/the-grid/projects/cp1021/the-project/

3 The Project

3.1 Confirmation of the Need

CP1021 is a proposed electricity transmission development project that will help strengthen the grid to facilitate increased demand in East Meath and north Dublin and variability in generation output in Dublin. This section provides a summary of the need; the detailed report is available on our website[7] together with reports from previous steps.

The need is based on two drivers - identified in the Tomorrow's Energy Scenarios (TES) 2019[8], in the Shaping Our Electricity Future Roadmap[9] published in 2021, and in subsequent studies carried out since to re-confirm the need - namely integration of generation and an increase in demand on Irish East Coast. A review of the needs in Step 3 indicates that the previously identified drivers still remain and have further increased the need to strengthen the transmission network between either Finglas or Belcamp and Woodland substations, and that the need for the reinforcement is still valid and robust.

A significant number of Ireland's electricity generators are located in the South and South-West regions of the country. This is where many wind farms and some modern, conventional generators are located. This power needs to be transported to where it is used. The need is also present when planned offshore wind generation facilities connect on the East Coast. The project is essential to enable the further integration of renewable energy in line with government policy. The Government's Climate Action Plan sets a target to connect 3.5 GW of offshore wind by 2030. Once connected to the transmission system, this offshore power will have to be transported around the network to where it is required for use.

It will also be a key enabler in meeting the growing demand for electricity in the east region, by improving the capacity of the network in this region. The forecasted growth within the region is due to increased economic activity and the planned connection of new large-scale energy users.

[7] https://www.eirgridgroup.com/the-grid/projects/cp1021/related-documents/

[8] Tomorrow's Energy Scenarios (TES, 2019) presents credible pathways for Ireland's clean energy transition with specific focus on what this means for the electricity transmission system over the next twenty years. The report is available on our website: https://www.eirgridgroup.com/customer-and-industry/energy-future/

[9] https://www.eirgridgroup.com/site-files/library/EirGrid/Shaping_Our_Electricity_Future_Roadmap.pdf

When the transmission system is experiencing generation and demand patterns that lead to high volume power flows on the existing corridor of transmission circuits between the Woodland substation and the Corduff, Clonee, Finglas and Belcamp substations, the system analysis indicates that the network experiences significant violations of the Transmission System Security and Planning Standards (TSSPS)[10]. The TSSPS is the standard which the transmission network should adhere to so that a reliable and secure electricity system can be provided for all customers in Ireland.

3.2 Options considered

All options involve a transmission network reinforcement centred on strengthening the network between Woodland 400 kV substation in County Meath and the existing Finglas 220kV or Belcamp 220 kV substations in County Dublin.

Four solution options were brought forward from Step 2[11] (reduced from seven options in Step 2) for more detailed analysis in Step 3. They represent two different technologies to connect Woodland 400 kV substation and either Belcamp 220 kV substation, or Finglas 220 kV substation, namely:

- Overhead line (OHL); and
- Underground cable (UGC)

The four options that have been assessed in Stage 3 as part of the options review are:

1. New Finglas – Woodland 400kV overhead line (OHL)
2. New Finglas – Woodland 400kV underground cable (UGC)
3. New Belcamp - Woodland 400kV overhead line (OHL)
4. New Belcamp - Woodland 400kV underground cable (UGC)

3.3 Project Study Area

The original Project Study Area was defined in Step 2 as the area investigated for the possible installation of any of the four options in Step 3.

[10] https://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Transmission-System-Security-and-Planning-Standards-TSSPS-Final-May-2016-APPROVED.pdf
[11] For details of Step 2 outcome and documents please refer to our website. https://www.eirgridgroup.com/the-grid/projects/cp1021/related-documents/

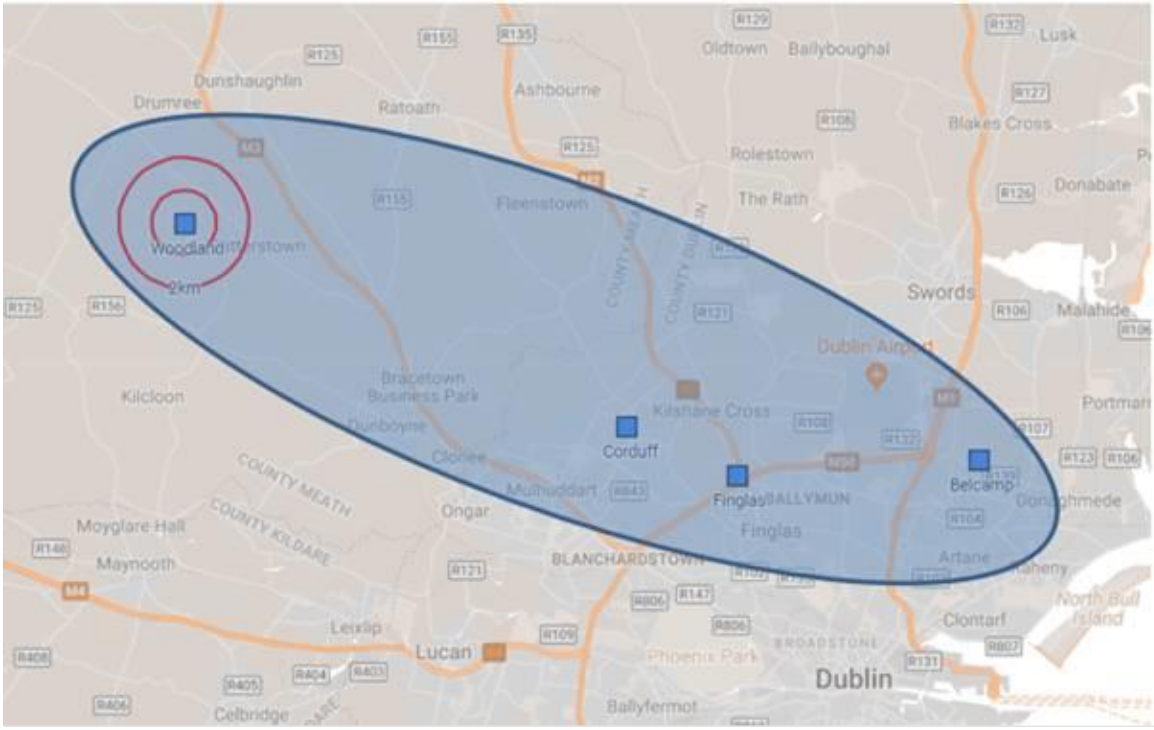

Figure 2 Step 2b Study Area

In defining the Study Area for this particular project, regard was paid to the M50 corridor and the highly urban and built-up area south of it; Dublin International Airport; significant towns and settlements such as Dunboyne, Blanchardstown, Swords and Malahide; environmental constraints such as Malahide Estuary; and the need to take the shortest and straightest route possible and to stay within the public road network wherever possible for the underground cable.

During Step 3, the area south of the M50 has been removed as this was not considered feasible for a variety of reasons including the proliferation and density of existing utilities residential and industrial buildings and the significant disruption of traffic flows and congestion that would likely occur during construction. Similarly, the area south of the N2 has been disregarded where it encroaches on the M50 for the same reasons. The M50 itself has been omitted, given that it is a protected road route[12] which would not be feasible for accommodating grid infrastructure. To the north, Dublin International Airport and its exclusion zone would impact an OHL route; for this reason, the towns of Swords and Malahide were included in the Step 3 Study Area so that the feasibility of bringing an OHL between Swords and Malahide could be investigated.

[12] Roads Act 1993 - https://www.irishstatutebook.ie/eli/1993/act/14/section/45/enacted/en/html

Figure 3 Step 3 Study Area

As part of Step 3, the Study Area has been further refined by considering a wide variety of factors. These included stakeholder and community feedback as well as technical requirements of the project, road network presence, settlements, presence of existing electrical utilities, physical constraints e.g., motorway, river or rail crossings and environmental constraints.

To ensure that a comprehensive and accurate environmental and social appraisal is carried out, a wider perspective is often needed for particular topics of relevancy (e.g., Natura 2000 Sites which may be located beyond the study area but are connected). The assessment of the project will cover all likely significant environmental impacts whether they occur inside the study areas or outside of it.

The study area for this project was further refined in March 2022 as a result of the feasibility studies and assessments. Option 4 – Woodland to Belcamp 400 kV UGC was identified as the Emerging Best Performing Option and study area refined as shown in below:

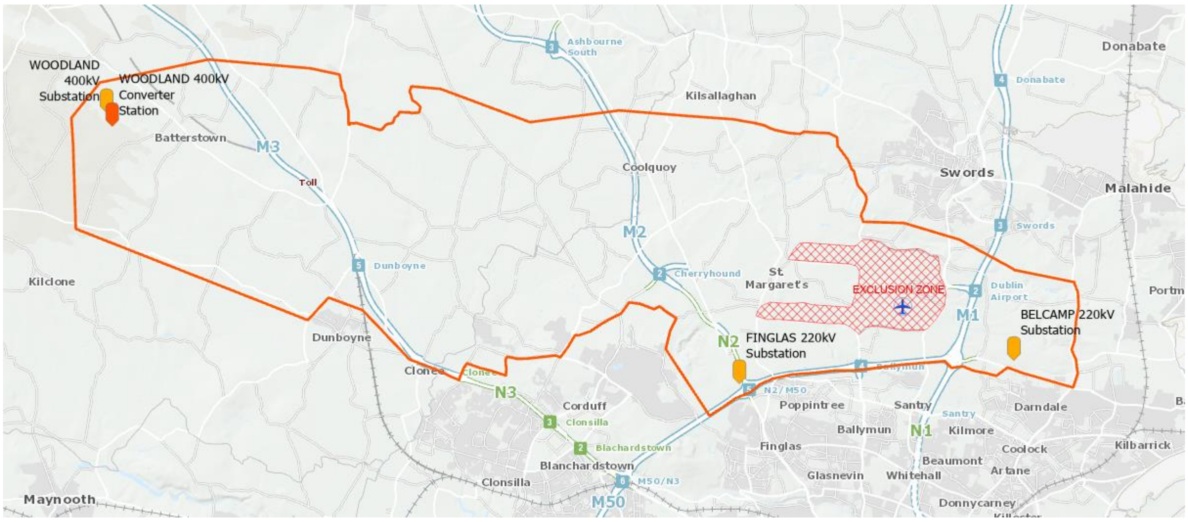

Figure 4 CP1021 refined study area after decision was made to progress with Option 4

3.4 Stakeholder Engagement

The aim of Step 3 Stakeholder Engagement was to present the Emerging Best Performing Option for this grid development project, namely a 400kV underground cable circuit from Woodland substation near Batterstown in County Meath to Belcamp substation near Clonshaugh in north Dublin to all stakeholders within the chosen study area and to outline the rationale that led to this decision. The purpose of this Step 3 engagement was to:

- Provide information about the project to date so stakeholders could provide informed feedback;
- Understand any issues of public concern around the project;
- Ensure local communities understood potential benefits of the project;
- Learn more about the local area;
- Identify potential issues that could restrict options in the study area;
- Set up engagement methods for future engagement, e.g. an East Meath-North Dublin Grid Upgrade Community Forum.
- Inform stakeholders of the 12-week consultation period that will occur in September - November 2022.

Step 3 Stakeholder Engagement was completed by way of an 8-week awareness and engagement campaign that took place from 4th May – 29th June 2022.

An array of activities were carried out in order to promote the engagement process and raise awareness of the project:

- Email correspondence to local authorities, councillors, TDs, public participation networks, chambers of commerce and local stakeholders;
- Bespoke letter drop to over 10,000 residents within the study area outlining information about the project and how stakeholders could find out more;
- Campaign advertising took place through print media, including Meath Chronicle, The Herald, Irish Daily Mirror, The Star, Dublin Gazette and the Dublin People;
- Radio advertising took place on LMFM, Radio Nova and Sunshine;
- Digital advertising took place on digital hubs in various locations including Applegreen and SuperValu's; and
- Online digital media advertising took place on platforms including Facebook, Instagram and twitter.

In-person engagement activities included:

- an open day at Swords County Hall where members of the public dropped in to learn more about the project;
- attendance at the Fingal Public Participation Network (PPN) Plenary meeting where over 80 community organisations were in attendance;
- a presentation to members of Fingal PPN linkage groups, these are thematic networks where local community organise advocacy around thematic issues important to them;
- door-to-door engagement in the vicinity of the two substations at Woodland and Belcamp; and
- several information days at locations within the project study area., namely Tyrrelstown, Kinsealy Garden Centre, St Margaret's GAA Club, Dunboyne, Kilbride, Airport Road in Fingal and Batterstown, Co Meath.

A webinar was held to provide a project update to attendees and offer the opportunity to engage in a Q&A session with the project managers on this grid development project.

In addition to raising awareness about the project development specifically, this campaign also raised awareness about the commencement of an East Meath-North Dublin Grid Upgrade Community Forum and the associated Community Benefit scheme that goes hand in hand with grid development projects at EirGrid. An information evening was held for the 14th of July, at which all stakeholders with an interest in joining the community forum were updated about the project and updated on the purpose, benefits and scope of the Community Forum. Expressions of interest for the community forum were invited during the period 4th July until 29th July.

Feedback received throughout the engagement period included;

- Concerns raised about potential disruption to lives and businesses.
- Road closures.
- Impacts on the environment, on Dublin Airport, and on other EirGrid projects in the area.
- Satisfaction regarding the early engagement with the public ahead of the Step 4 consultation and staff knowledge during in-person engagement.
- Support for the decision to route the cables underground and for the route to be road based.

The feedback from this awareness campaign has informed the overall direction of this grid development project and will be reflected in the route options that will be presented as part of the 12-week consultation period that commences in September 2022.

4 Process and multi-criteria applied

4.1 Description of process

As previously outlined, EirGrid assesses the performance of each of the options against five set criteria (Technical, Economic, , Deliverability, Environmental, Socio-Economic), and a multi-criteria performance matrix is used to compare the options against each other. Section 5 of this report details the outcome this assessment.

4.2 Criteria used for comparison of options

In line with EirGrid's roles and responsibilities, we have an obligation to develop a safe, secure, reliable, economical, and efficient electricity transmission system while having due regard for the environment of Ireland. In our decision making, these fundamentals are captured in the five criteria listed below. In addition, our decision-making process also provides for public participation and stakeholder engagement and deliverability aspects.

In Step 3, we considered a broad assessment of performance for each of the identified options. The broad assessment considered five different criteria that ensure that the full range of impacts and benefits of each option can be appropriately understood.

All of the five criteria are important when considering the options in the assessment and establishing the Best Performing Option. The options were assessed on an equal basis with no weighting applied for any of the criteria. We have also taken on board experience from other projects where applicable.

These five criteria are:

- Technical performance;
- Economic performance;
- Deliverability aspects;
- Environmental aspects; and
- Socio-economic aspects.

Descriptions of the five criteria are provided below. The assessments undertaken for each option in Step 3 were for comparative purposes between the options and are not absolute assessments of the individual options.

4.2.1 Technical performance criteria

The technical performance criterion includes seven sub-criteria. Descriptions of these are provided below.

- Compliance with health and safety standards

  Regardless of the technical option chosen, it will be designed, constructed, and maintained in accordance with applicable Irish and EU health and safety regulations and approved codes of practice. In undertaking a project, we are at all times aware of, and comply with, the applicable health and safety legislation, approved codes of practice and industry standards and all subsequent modifications or amendments in relation to same.

  The solution option should comply with relevant safety standards such as those from the European Committee for Electrotechnical Standardisation (CENELEC). Materials should comply with IEC or CENELEC standards.

- Compliance with EirGrid Security and Planning Standards

  The solution option should comply with the network reliability and security standards defined in the Transmission System Security and Planning Standards (TSSPS) and the Operation Security Standards (OSS)[13.] All options investigated will meet the minimum technical requirements set out in the above standards. Options which extend or enhance technical performance margins beyond minimum acceptable levels are favoured over others.

  To be able to distinguish between the individual technical performance of each solution option, the options are assessed against three main technical criteria. A short description of these is given below. The technical criteria are based on the previous technical criteria used in the Step 2B report[14] and relate to the need identified. The criteria are thermal overload and performance during maintenance conditions. It should be noted that in Step 2B, we also investigated short circuit performance.

  For the analysis in Step 3, we have not assessed the short circuit performance of the solution options as it was found in Step 2B that all of the options have very

[13] EirGrid, Operational Security Standards, 2021 (https://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid_Operating-Security-Standards_2021.pdf)

[14] https://www.eirgridgroup.com/site-files/library/EirGrid/CP1021-draft-Step-2-Part-B-Options-Report_Website_Version-Signing-page-removed.pdf

similar outcomes, and the short circuit performance will not be the deciding factor between the options.

The reactive support requirements have been assessed in cable integration studies that assess the specific impact that cables will have on the network and the mitigation required to remain within TSSPS limits.

Thermal overload criteria

The options are assessed for compliance with the TSSPS. For this technical criterion, we have assessed the options based on how they reduced or removed the forecasted thermal overloads on the network between East Meath and the North of Dublin. This will provide an indication of how the options are performing in terms of adding thermal capacity.

Performance during maintenance conditions

The options are assessed based on the remaining network congestion in the area of interest following a subsequent loss of plant and equipment whilst another is out for planned maintenance. This is used as an indicator of the benefit of an option in terms of minimising generator constraint during planned outages, or an indicator of future additional network reinforcement requirements.

For the purpose of this assessment in Step 3, we have only assessed the number of indicated violations of thermal capacity for each option and these possible additional reinforcements are not included in the full solution list of the options.

- Reliability performance

The technologies and equipment associated with the different options have different performance and reliability characteristics. The reliability of transmission infrastructure is associated with two categories or type of outages, namely unplanned outages and planned outages. Each technology or type of equipment is associated with faults (unplanned outages) that routinely occur. These can be represented as average failure rates usually expressed as unplanned outages/100km/year.

This criterion will also account for the mean time to repair. This is the time taken to return the equipment to service after a fault has occurred. The assessment has been based on transmission performance statistics[15] or industry standard reliability data.

This sub-criterion will also assess the typical time the options would be unavailable for during planned outages. Planned outages are normally associated with annual routine maintenance and will be based on typical outage durations taken from maintenance policies. The reliability for each option will be based on a combination of the above type of outages. The reliability of the station equipment associated with the options is assumed to be the same for all options and is therefore not included in this analysis.

- Headroom

  This criterion assesses the ability of each option to accommodate increases in large scale demand growth in the Dublin and mid-east region, and replacement of thermal generation located in Dublin with increased renewable generation in the west and south of the country.

  Each option is compared relative to the others to determine the increase in demand, or renewable generation outside Dublin, that can be accommodated without further network reinforcements being required. The limit for each option can be found by increasing large scale demand in Dublin and renewable generation in the south and west until a voltage stability limit is reached.

  The headroom for each option is the difference between the demand that can be accommodated by the network with that option included and the demand that can be accommodated by the network with no option included.

- Expansion or extendibility

  This considers the ease with which the option can be expanded, i.e., it may be possible to uprate an OHL to a higher capacity or a new voltage in the future. It will also consider the rating or capacity of the options.

- Repeatability

  This criterion examines whether this option can be readily repeated in the Irish network. One-off or bespoke solutions carry additional system integration, operational, and maintenance complexity. For example, an OHL option is very repeatable, but a fully or partially underground cable option is less repeatable as there may be harmonic filter and reactive compensation requirements that are

[15] Analysis of System Disturbances 2018, EirGrid, April 2019

bespoke for each option. The amount of cable that can be integrated in certain parts of the network may also be limited.

- Technical operational risk

  This criterion aims to capture the risk of operating different technologies on the network. It will consider if the option requires special procedures when energising or switching in the network. An example would be long cables which may require reactive compensation and special procedures when energised to prevent technical issues in the network.

4.2.2 Economic performance criteria

The economic appraisal we conduct as part of the Multi Criteria Assessment assesses the relative overall cost performance of the various options which meet the TSSPS and the impact on overall costs of production in meeting the demands on the system – it does not seek to replicate the economic trade-offs which have already been considered within the TSSPS itself.

The TSSPS, in driving new investment in transmission reinforcements, recognises that the economic cost to society of not preserving the security of supply standards defined by the TSSPS (N-1 etc.) is greater than the cost of maintaining such a standard. The TSSPS reflects the explicit and implicit economic trade-offs between enhanced security of supply and reduced risk of interruptions on the one hand and additional cost, including the full societal cost, of grid development on the other.

In this context then, the economic assessment described in Step 3 considers costs and benefits associated with each option.

A description of each of the cost criteria is given below.

- Pre-engineering cost

  The pre-engineering cost refers to the cost associated with the design and specification, route evaluation and management of the statutory planning application. The costs are capital in nature and are typically costs incurred by the Transmission System Operator (TSO) in the development of the reinforcement. The cost for the TSO to develop the option is based on experience of developing other current and previous projects.

- Implementation cost

  The project implementation costs are the costs associated with the procurement, installation, and commissioning of the option. The capital cost estimates have been developed with input from the Transmission Asset Owner (TAO) and are based on desktop designs and costings for similar works. The capital cost estimates include all items to achieve a fully compliant solution with Transmission System Security and Planning Standards (TSSPS) and other investment policies, but exclude reinforcements driven by maintenance conditions as discussed in Section 4.2.1.

Where capital costs were not available for a particular technology, the best, most recent estimates or quotes from manufacturers or assumed costs based on EirGrid or international experience have been used. The assumed cost for landowner payments, community fund and proximity payments are included under this cost category, as these costs are typically incurred during the implementation phase of the option.

- Life-cycle cost

  Life-cycle costs refer to the costs incurred over the useful life of the option and include the on-going cost of ensuring that it remains viable for the evaluation period. For the purposes of our assessments, decommissioning of assets is not considered. This criterion includes:

  – Operation and maintenance cost

    These costs are annualised and are based on estimated costs incurred to be able to maintain the option.

  – Electrical losses

    Losses are the electrical energy consumed by the transmission system as it transmits electricity. The more efficient a transmission reinforcement is, the lower the electrical losses it incurs.

    The quantity of electrical losses is calculated for a standard year with each option included in turn and compared with the reference situation without the reinforcement. The losses calculation for a standard year includes assumptions in regard to other plant and equipment being unavailable due to faults or planned routine maintenance.

    During the months between March and October, in any given year, the operation of the transmission system caters for approximately 20 circuits unavailable for various reasons per day. During the winter months, the transmission system has less than five circuits unavailable for various reasons per day.

The calculation has taken these aspects into account to a certain degree and assumed different 220 kV circuits, one at a time, unavailable for a week during the entire maintenance season simultaneously with different 110 kV circuits, one at a time, unavailable for a week during the entire year.

This assumption will provide a better understanding of the benefit in terms of losses that the proposed reinforcements will bring. A cost will be put against the losses incurred for each year during its lifetime following commissioning of the option. For this analysis, the average Day Ahead Market (DAM) price is used to represent the marginal cost of generation and is calculated to be €50.3 per MWh. The figure has been derived from the average Day Ahead Market (DAM) price for 2019, which was sourced from the Single Electricity Market Operator (SEMO) website[16].

– Replacement cost

The standard lifespan of a transmission asset is 50 years, and this is the also the evaluation period for the economic assessment. Assets that have a shorter useful life would have to include the cost of replacement at the end of its useful life and thereafter factor in a residual value equivalent to the depreciated asset value at the end of the evaluation period.
In the economic assessments, it has been assumed that underground cable (UGC) options will have a useful lifespan of 40 years. The assumption is based on research of other utilities internationally. This indicates that there is recognition by some reputable utilities that the useful lives of OHL and UGC may not be the same. There isn't consensus about what the useful lifespan of UGCs could be and it may be dependent on differences in environmental conditions, duty cycle and operational use, installation choices etc. The cost of replacement is taken to be precisely the same as the project pre- engineering cost and project implementation cost.

A description of the benefit criteria is provided below.

- Socio-economic welfare:

The benefits arising from transmission reinforcement project will usually be avoided costs. The value of some of these avoided costs is difficult to measure, especially in terms of beneficial contributions to society and the

[16] https://www.semopx.com/news/market-summary-2019-repor-1/

country’s welfare and economy. Benefits in relation to the transmission system and its operations only have been taken into account in this assessment. In this case, the benefits refer to the difference in production cost savings between the system with the reinforcement option and the system without the reinforcement.

The transmission system operational benefit can be measured by the amount of generation that is not constrained due the lack of transmission capability of the existing infrastructure. The benefit is therefore expressed as savings in generation costs due to the enhanced transmission capability. The constraints calculations are a result of annual market simulations. The simulations optimise the generation dispatch required to meet the electricity demand while taking into account the power carrying capability of the transmission system and contingencies.

The calculation of the production cost savings for each option is based on the assumption that each MW produced by a generation unit that can’t be exported due to a capacity constraint in the transmission network has to be procured elsewhere from another generation unit. The buying and selling of electricity is facilitated by the Single Electricity Market in order to meet the electricity demand in the All-Island electricity system.

On a very high level, the market is operated on the basis that the most efficient (cheapest) generation unit should be generating at any given time to reduce the electricity price. When the most efficient units are constrained due to a capacity constraint in the transmission network, a more expensive generation unit will be used to supply the electricity required. This will incur a higher cost in the operation of the system and market.

Transmission reinforcements will address network constraints and as such will help to reduce cost incurred. The project benefit can be expressed as expected annual savings of generation costs in the All-Island system depending on the respective option. For the estimate of annual savings in generation costs the hourly marginal generation costs are used from the simulations carried out.

- Cost to the Single Electricity Market

This criterion will take account of the impact of the cost to the electricity market for the periods where the reinforcement option is not available. The technologies and equipment associated with the different options have different performance and reliability characteristics. The reliability of transmission infrastructure is associated with two categories or type of outages, namely unplanned outages, and planned outages. The reliability performance criterion was described in Section 4.2.1 and will be used in combination with the calculated production cost benefits described in Section 4.2.2 to represent the cost to the Single Electricity Market for each option.

The robustness of each option's economic performance is also considered as part of the economic assessment. The robustness test considers two different aspects, namely:

- Least worst regrets

  To assess the robustness of each option's economic performance, 'Least Worst Regret' (LWR) analysis is carried out. This will indicate if some options perform better or worse under different future energy scenarios.

- Sensitivity analysis

  In addition, the options' sensitivity to changes in the reference parameters (implementation cost, WACC and Benefits) are assessed and taken into account.

4.2.3 Deliverability

In Step 3, the deliverability performance criterion includes a number of sub-criteria. A short description of these is provided below.

- Implementation timelines

  This criterion assesses the length of time required for each option to progress through each phase (including pre-consenting, consenting, pre-engineering (detailed design) and implementation (construction) up to project energisation). This will include timelines starting from Step 4, where the process will identify the exact location of the development. It assumes planning consent times or other permissions required, with the assumption of no unreasonable delays and/or potential judicial review.

- Project plan flexibility

  This criterion assesses the flexibility of the project plan to include for issues arising during pre-planning conceptual design, post-planning design, consenting and construction.

- Risk of untried technology

This criterion assesses any aspects (positive or negative) and risks each technology option may have including if the technology has been used in the past internationally or on the Irish transmission network.

- Dependence on other projects (outages)

  This criterion assesses dependence on completion of other projects and outage length required to implement the option. It also considers general inter-dependence with other projects, including in terms of multi-project programme sequencing.

- Supply chain constraints, permits, wayleaves

  This criterion assesses any constraints (e.g., small number of suppliers in Ireland or internationally) that would affect the procurement of materials or services (e.g. cable laying vessels waiting list lead time) to complete the project. This criterion also assesses the complexity and challenge in respect of various permissions and consents required, including the potential risk to achieving statutory consent(s) without reasonable delay (having regard to environmental and other impacts), the potential level of public interest, and the potential for Oral Hearings, considered potential for Judicial Review.

  This criterion also addresses the complexity and challenge of obtaining community and landowner "social licence" to construct an option, including securing access to land for pre-application survey, and obtaining post-consent wayleaves/easements.

4.2.4 Environmental

This criterion is assessed to identify and describe the types of environmental constraints that are most likely to be affected by the construction and operation of the identified solution options. It is based on a review of publicly available datasets, information gathered from County Development Plans (CDP) and Local Area Plans and mapping from state agencies such as the National Parks and Wildlife Service (NPWS) and the Environmental Protection Agency (EPA).

This assessment was carried out by Jacobs and a summary of its findings are presented in this report. Jacobs' detailed report (CP1021 Environmental Constraints Report)

The environmental constraints have been organised into the following topics to aid understanding and presentation of the assessment findings:

- **Biodiversity**: Assessment of the potential impacts on protected sites for nature conservation, habitats and protected species.
- **Soils and Water Impacts**: Potential impact on soils and geological features (geology, Irish geological heritage sites, etc.) and water (water quality of surface waters and groundwater);
- **Planning Policy and Land Use**: Impact on land use (forestry, farmland, bogs/peats, horticulture);
- **Landscape and Visual**: Assessment of landscape constraints and designations and the potential impact on visual amenity; and
- **Cultural Heritage** (Archaeological and Architectural Heritage): The potential for impacts on the cultural heritage resources.
- **Noise and Vibration**: Assessment of the potential impact of noise and vibration during construction and operation.
- **Climate Change**: Potential impact of climate change on the asset.

These topics have been selected as they are the most likely to represent the key considerations, constraints, risks, and opportunities for the project.

Only environmental constraints are described in this criterion; the socio-economic constraints are described under the socio-economic criterion. It is acknowledged that there is potential for environmental issues to result in socioeconomic effects; this is particularly the case for potential effects on amenities of local communities which could be adversely affected by noise, views and traffic. Notwithstanding this interrelationship, this criterion does not consider amenity effects; these are presented in the socio-economic criteria.

4.2.5 Socio-Economic

This criterion is assessed to identify and describe the social issues and their potential impacts within the study area(s) that are most likely to be affected by the construction and operation of the identified solution options. This assessment was carried out by Jacobs and a summary of its findings are presented in this report. Jacobs' detailed report (321084AE-REP-003 – CP 966 Strategic SIA Scoping Report) is available on our website – see Section 2.1 for the link.

The assessment is based on a number of data sources, such as County Development Plans, Census 2016 Data, Central Statistical Office (CSO.ie), National datasets from Prime 2 (Ordnance Survey Ireland's central database of spatial information) and some of the other findings from the investigation carried out by Jacobs as part of its assessment.

The social issues considered have been organised under particular topics to aid understanding and presentation of the assessment findings. These topics have been selected as they are the most likely to represent the key considerations, constraints, risks and opportunities for the project. Other criteria such as Land Use and Cultural Heritage are assessed under the environmental criterion.

- **Traffic & transport**: This considers potential effects on traffic and transport in the study area, during the construction phases of the different solutions. Of concern to communities is the potential for severance, isolation and significant delays during the construction phase. Also considered in this topic are potential effects on the crossings of major roads, railways and navigable waterways if relevant
- **Amenity**: Here 'amenity' is the term used to describe the overall pleasantness or attractiveness of surroundings. This includes effects on local communities, community facilities, local businesses and recreation and tourism assets. This builds on the work in the 321084AJ-REP-004Environmental Constraints report compiled by Jacobs.
- **Health**: To determine potential effects on humans, this considers amenity effects as well as considering WHO health thresholds; EMF is considered as set out in EirGrid's Guidelines[17];
- **Economy**: Effects on the regional and local economy;
- **Utilities**: Consideration of third-party assets, including telecommunications and aviation.

4.3 Scale used to assess each criterion

The colour-code scale below is used to illustrate the performance of each criterion. The assessment is carried out by specialist EirGrid personnel who considers evidence from a number of data sources in making the evaluation; in this case Jacobs have assisted by carrying out feasibility studies to assess and compare the various options against the multi-assessment criteria. The assessments undertaken for each option in Step 3 are for comparison against each other and are not absolute assessments of the individual options.

The effect on each criterion parameter is qualitatively determined using expert judgement and experience. This is presented by means of colour coding, along a range

[17] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-The-Electricity-Grid-and-Your-Health.pdf

from “more significant”/”more difficult”/“more risk” to “less significant”/”less difficult”/“less risk”.

The below illustration shows the colour coding applied to each option when assessing the five criteria:

More significant/difficult/risk Less significant/difficult/risk

In the text, this colour-coded scale is qualified by text comprising:

- Low (Cream);
- Low-Moderate (Green);
- Moderate (Mid-level) (Dark Green);
- Moderate-High (Blue);
- High (Dark Blue).

Figure 5 Colour coding applied to each option

5 Option Evaluation Summary

In Step 3, the short-listed options, described in Section 3.2, are further analysed and assessed. Each short-listed option has been assessed against the five criteria and sub-criteria, which are outlined in Section 4 of this report.

The summary of this multi-criteria assessment is presented in this section and outlines the rationale for the Best Performing Option (BPO). Further detail on each option is provided in Section 6.

5.1 Best Performing Option based on the multi-criteria assessment

Table 1 provides a summary of the performance of each option against the five evaluation criteria and the resulting overall combined performance. The detail of the performance of each option for each criterion is contained in sections 6 this report.

Based on the multi-criteria assessment, Option 4, New Belcamp – Woodland 400kV underground cable, is the Best Performing Option.

	Option 1 Woodland – Finglas OHL	Option 2 Woodland – Finglas UGC	Option 3 Woodland – Belcamp OHL	Option 4 Woodland – Belcamp UGC
Technical Performance				
Economic Performance				
Deliverability				
Environmental				
Socio-Economic				
Combined Performance				

Table 1 Overall comparison of options applying the multi-criteria assessment in Step 3

Options 1 and 3, representing the 400 kV OHL options from Woodland 400 kV substation to either Finglas 220 kV substation or Belcamp 220 kV substation respectively, perform well from a technical and economic performance perspective.

However, they are considered to have high risk or significant risk and difficulty from a deliverability perspective. This presents risks that would be difficult to mitigate and could have significant impacts on project progress. Therefore, it has been given an overall performance of high (**Dark Blue**) difficulties/risk.

Option 2, the new 400 kV UGC from Woodland 400 kV substation to Finglas 220 kV substation option, performs well from an environmental and socio-economic performance perspective. Option 2 may face considerable technical and deliverability risks which would be difficult to mitigate and could have significant impacts on project progress. Therefore, it has been given an overall performance of high (**Dark Blue**) difficulties/risk.

Option 4, the new 400 kV UGC from Woodland 400 kV substation to Belcamp 220 kV substation option, performs well from a technical, environmental, and socio-economic perspective and while some deliverability difficulties are foreseen. It is believed these can be effectively mitigated with appropriate design solutions. This option has therefore been given an overall performance of moderate (**Dark Green**) difficulties/risk and is the most preferable option.

5.2 Summary of technical performance of options

All options investigated will meet the minimum technical requirements. Options which extend or enhance technical performance margins beyond minimum acceptable levels are favoured over others. Table 2 shows the technical performance of the various options in relation to the different sub-criteria. This table is also displayed in Appendix 2.

Summary of technical performance all options				
	Option 1 **Finglas – Woodland 400 kV OHL**	**Option 2** **Finglas – Woodland 400 kV UGC**	**Option 3** **Belcamp – Woodland 400 kV OHL**	**Option 4** **Belcamp – Woodland 400 kV UGC**
Health and Safety Standard Compliance				
Security and Planning Standard Compliance				
Reliability Performance				
Headroom				
Expansion or Extendibility				
Repeatability				
Technical Operating Risk				
Combined Technical Performance				

Table 2 Summary of technical performance of all options

Option 1 and Option 3, the two OHL options, has similar technical performance across all of the sub-criteria, except the Expansion or Expandability sub-criteria. That difference result in a combined technical performance that distinguish the two options in their overall performance with Option 3 having a much better expandability opportunity terminating at the Belcamp 220 kV substation.

Option 2 and Option 4, the two UGC options, has similar technical performance across all of the sub-criteria, except the Headroom and Expansion or Expandability sub-criteria. That difference result in a combined technical performance that distinguish the two options in their overall performance with Option 4 having a much better expandability opportunity terminating at the Belcamp 220 kV substation.

The two UGC options, Option 2 and 4, have some challenges in relation to reliability, extendibility, repeatability and technical operational risk.

The options that terminate at Finglas, Options 1 and 2, each have performed poorly in relation to Expansion and Extendibility due to the limits to expansion of a new 400 kV substation at Finglas and that the existing 220 kV station has no remaining spare bays nor space to develop new 220 kV bays.

5.3 Summary of economic performance of options

The economic performance of each option is a combination of the economic result and a robustness test. All options have costs and savings which are considered in the economic result. A robustness test to check the options' performance for different credible future energy scenarios was also carried out including sensitivity to changes in some reference parameters. Table 3 shows a summary of the economic assessment inputs and resulting economic performance of the various options. This table is also displayed in Appendix 3.

Summary of economic performance all options 2022 values					
	units	**Option 1 FIN OHL**	**Option 2 FIN UGC**	**Option 3 BEL OHL**	**Option 4 BEL UGC**
Pre-Engineering Costs	[€M]	10	10	10	11
Project Implementation Costs	[€M]	114	300	130	396
Project Life-Cycle Costs (Losses)	[€M] pa	46	82	63	108
Project Life-Cycle Costs (O & M) Presented in period of years (1-20), (20-40), (40-50)	[€k] pa	230 337 2623	247 193 247	327 493 2452	286 206 286
Project Life-Cycle Costs (Decommissioning & Replacement)	[€M]	N/A	60	N/A	78
Cost to SEM based on unavailability of reinforcement (TES Scenario used)	[€M] pa	Range 62 to 321	Range 74 to 384	Range -17 to 251	Range -20 to 298
Combined Economic Performance					

Table 3 Summary of economic inputs and performance for all options

Options 1 and 3 have equal best economic performance, with options 2 and 4 having the worst economic performance.

5.4 Summary of deliverability aspects of the options

All options would be challenging to deliver, but for different reasons. Table 4 shows the deliverability performance of the various options in relation to the different sub-criteria. This table is also displayed in Appendix 4.

Option 4 performs the best under the overall deliverability criterion with options 1, 2 and 3 all performing similarly and very poorly.

Option 1 has the worst deliverability performance with this option facing major challenges regarding implementation timelines, project plan flexibility and high dependence on other projects given the highly constrained nature of Finglas substation. Option 2 faces similar constraints at the substation however the underground performs slightly better in regard to flexibility and timelines.

Option 3 faces significant deliverability constraints with timelines and project flexibility given the nature of the study area surrounding the Belcamp area with significant constraints such as the Dublin Airport and Malahide SAC areas.

Option 4 performs the best in the deliverability criterion; however, it still faces some deliverability constraints with the risk of untried technology and project plan flexibility given the proximity to the airport. This option does perform best on implementation timelines and Belcamp substation does not present as many deliverability challenges.

The dark blue rating for deliverability for Options 1-3 suggests significant risks to project delivery and as a result can deem the projects undeliverable. In contrast the potential deliverability challenges relating to Option 4 can be mitigated by appropriate design solutions. Option 4 can therefore be considered viable from a deliverability perspective.

Summary of Deliverability Performance of all Options				
	Option 1 Woodland – Finglas OHL	Option 2 Woodland – Finglas UGC	Option 3 Woodland – Belcamp OHL	Option 4 Woodland – Belcamp UGC
Implementation Timelines				
Project Plan Flexibility				
Risk of untried technology				
Dependence on other projects				
Supply chain constraints, permits wayleaves etc.				
Overall Summary				

Table 4 Summary of Deliverability Performance of all options

5.5 Summary of Environmental aspects of the options

Table 5 shows the environmental performance of the various options in relation to the different sub-criteria. This table is also displayed in Appendix 5.

Summary of Environmental Performance of all Options				
	Option 1 Woodland – Finglas OHL	**Option 2 Woodland – Finglas UGC**	**Option 3 Woodland – Belcamp OHL**	**Option 4 Woodland – Belcamp UGC**
Biodiversity				
Soil and Water				
Land Use (and Planning)				
Landscape and Visual				
Cultural Heritage				
Noise and Vibration				
Climate Change				
Overall Summary				

Table 5 Summary of Environmental Performance of all options

5.5.1 Option 1 Woodland to Finglas OHL

The greatest risks of significant impacts as a result of this option are associated with biodiversity and landscape and views, which have a moderate to high-risk rating. This is as a result of OHLs posing a collision risk to migratory birds, a loss of mature trees and significant impacts on views. This option also has the potential to conflict with local planning policies, impact on the setting of cultural assets and is less resilient to climate change than an underground option would be. As a result, this option has an overall moderate risk of significant impacts on the environment (**Dark Green**).

5.5.2 Option 2 Woodland to Finglas UGC

The greatest risks to the environment from this option are on soil and water, owing to the high number of water bodies in the study area, the likelihood of having to come off-road to cross them in the more rural areas and the number of roadside ditches present. For other environmental aspects, the risks are low to moderate that this option would cause significant impacts; for all topics any risk would be during construction and therefore of a temporary nature. UGC are in accordance with local planning policy ambitions and are more resilient to the impacts of climate change. As a result, this option has an overall low to moderate risk of significant impacts on the environment (**Green**).

5.5.3 Option 3 Woodland to Belcamp OHL

As with Option 1, the greatest risks of significant impacts as a result of this option are associated with biodiversity and landscape and views, which have a high-risk rating. Again, this is as a result of OHLs posing a collision risk to migratory birds, a loss of mature trees and significant impacts on views. However, this option is closer to European protected areas along the coast and migratory routes for birds and is longer so has the potential to impact on more views than Option 1. This option also has the potential to conflict with local planning policies, impact on the setting of cultural assets and is less resilient to climate change than an underground option would be. As a result, this option has a moderate to high risk of significant impacts to the environment overall (**Blue**).

5.5.4 Option 4 Woodland to Belcamp UGC

A number of environmental factors are at a moderate risk of significant impacts as a result of this option; this is because the impacts are similar to those for Option 2 where many of the factors were considered to be at low to moderate risk, however this option is longer and so this increases the risk of such impacts. For soil and water, the greatest risks are as a result of open cut crossing of water bodies and constructing trenches in roads with roadside ditches alongside. These are most likely to occur in the more rural western part of the study area and are of a similar magnitude to those identified for Option 2. The risk to soil and water remains moderate. For all topics any risk would be during construction and therefore of a temporary nature. UGC are in accordance with local planning policy ambitions and are more resilient to the impacts of climate change. As a result, this option has an overall moderate risk of significant impacts on the environment (**Dark Green**).

5.6 Summary of Socio-Economic aspects of the options

The assessment in this criterion has not considered the feedback from the consultation and stakeholder engagement, as this process has not yet been concluded. Table 6 shows the socio-economic performance of the various options in relation to the different sub-criteria. This table is also displayed in Appendix 6.

Summary of Socio-Economic Performance of all Options				
	Option 1 Woodland – Finglas OHL	Option 2 Woodland – Finglas UGC	Option 3 Woodland – Belcamp OHL	Option 4 Woodland – Belcamp UGC
Traffic & Transport				
Amenity				
Health				
Economy				
Utilities				
Overall Summary				

Table 6 Summary of the Socio-economic performance of all options

5.6.1 Option 1 Woodland to Finglas OHL

The greatest risks from a socio-economic perspective from this option are to amenity. Risks to the economy and utilities are low; Traffic and Transport and health risks are considered to be low to moderate. The risk to amenity is as a result of the significant impacts an OHL would have on landscape and views. As a result, this option as a moderate risk of significant impacts from a socio-economic perspective (**Dark Green**).

5.6.2 Option 2 Woodland to Finglas UGC

The greatest risk of this option, from a socio-economic perspective, is on Traffic and Transport. For other socio-economic topics the risk of significant impacts is considered to be low to moderate or low (economy). The impacts on traffic are not insubstantial, especially in the more urban areas of the study area; however, they are temporary in nature. As a result, this option has an overall low to moderate risk of significant impacts from a socio-economic perspective (**Green**).

5.6.3 Option 3 Woodland to Belcamp OHL

The greatest risks from a socio-economic perspective from this option are to amenity. Risks to the economy and utilities are low; Traffic and Transport and health risks are considered to be moderate and moderate to low respectively. The risk to amenity is as a result of the significant impacts an OHL would have on landscape and views. As a result, this option as a moderate to high risk of significant impacts from a socio-economic perspective (**Blue**).

5.6.4 Option 4 Woodland to Belcamp UGC

The greatest risk of this option, from a socio-economic perspective, is on Traffic and Transport. For other socio-economic topics the risk of significant impacts is considered to be moderate (utilities) low to moderate or low (economy). The impacts on traffic are not insubstantial, especially in the more urban areas of the study area; however, they are temporary in nature. As a result, this option has an overall moderate risk of significant impacts from a socio-economic perspective (**Dark Green**).

6 New Finglas to Woodland 400 kV Overhead Line (OHL)

This section describes the assessment of the new Finglas to Woodland 400 kV OHL option against the five criteria and their sub-criteria as described in Section 4.2. Each criterion is described in separate sections and a summary of the overall performance of the option is provided in Section 6.7.

The assessments for the environmental and socio-economic criteria have been carried out by Jacobs, and a summary of its findings are presented in this report. Jacobs' detailed reports of these assessments can be found on our website and the links can be found in Section 2.1.

6.1 Description of option

This option involves a transmission network reinforcement centred on strengthening the network between the existing Finglas 220 kV substation in County Dublin and Woodland 400 kV substation in County Meath. These consist of:

- Construction of a new 400 kV overhead line linking Finglas 220 kV station to Woodland 400 kV station. For the purpose of this investigation, we have assumed the length of the overhead line to be approximately 22 km;
- At the existing Finglas 220 kV station a new 400 kV C-Type busbar, and one 400/220 kV transformer. The new 400 kV station development must be capable of accommodating a future second 400/220 kV transformer and future additional 400 kV circuits, and expansion of the station to an enhanced ring busbar.
- At the existing Finglas 220 kV station new 220 kV transformer bay will be required to connect the new 400/220 kV transformer.
- At the existing Woodland 400 kV station a new line bay will be required to connect the new circuit.

Figure 6 Illustrative map showing the study area where the new Finglas - Woodland 400 kV OHL option could be located

6.2 Technical Performance

6.2.1 Compliance with health and safety standards

Please refer to Section 4.2.1 for a detailed description. The new Finglas – Woodland 400 kV OHL option will be compliant with the relevant safety standards and is considered to have a low (**Cream**) risk of not complying with health and safety standards.

6.2.2 Compliance with Security and Planning Standards

The security standards of the transmission network are defined in the following:

- The Transmission System Security and Planning Standards (TSSPS); and
- The Operational Security Standards (OSS).

These standards will ensure that the system is planned and operated in a manner which adheres to system security and integrity, and reliability of supply criteria.

The new Finglas – Woodland 400 kV OHL option proposed will comply with the relevant system reliability and security standards referenced above. Although the option will meet the minimum technical requirements, certain aspects may differentiate the option's technical performance compared to other options. A high-level summary of the technical aspects considered and investigated is presented below.

The need analysis indicated that, without mitigation, single contingencies (the unexpected loss of a circuit or piece of equipment), of either of the existing 220 kV circuits between Woodland and Corduff or Clonee, would lead to power flows in excess of the capacity of the remaining circuit. The analysis indicated that generation redispatch to increase conventional generation in North Dublin would be required to mitigate the overloads. This issue was shown to worsen as demand in Dublin increases.

When the new Finglas – Woodland 400 kV OHL option is added to the system model, the analysis indicates an improvement in these issues by removing the expected overloads between Woodland and Corduff or Clonee.

An assessment was undertaken into keeping the transmission network within standards following a loss of plant and equipment while another is out for planned maintenance. Maintenance is carried out annually during March to October. For planned outages, some re-dispatch of generation is allowed, but this should be kept to a minimum to ensure the most cost-effective generation is dispatched.

The assessment determined the worst case to manage was planned maintenance on the new Finglas – Woodland 400 kV OHL or the new 400/220 kV transformer at Finglas. This requires generation redispatch within allowed limits to manage a subsequent unplanned loss of transmission equipment. Without redispatch the issues identified in the need assessment would be experienced, with the unplanned loss of the Corduff – Woodland 220 kV circuit leading to a loading of 146% on Clonee - Woodland. This is an improvement on the issues indicated in the needs assessment, which showed that during a maintenance and trip combination the Clonee – Woodland circuit could expect an overload of 172% depending on dispatch conditions.

When all aspects are considered, the new Finglas – Woodland 400 kV OHL option is considered to have good compliance when assessed against the above standards and hence has been given a low impact (**Cream**) in the assessment.

6.2.3 Reliability performance

This criterion has been assessed using three inputs namely unplanned outages, planned outages and the time it takes to repair the circuit. The collective impact of these provides an indication of the annual availability of the asset. The reliability and outages of the station equipment associated with the circuit is assumed to be same for all options and is therefore not included in this analysis.

The statistics for reliability are based on EirGrid’s and international failure statistics, the mean time to repair and the availability in days per 100 km per year for OHL and UGC. It has been assumed that the new OHL circuit will be approximately 22 km in length for the purpose of this assessment.

There are 439 km of existing 400 kV OHLs in Ireland. This length of 400 kV OHL is too small a sample for determining meaningful performance statistics.

Meaningful statistics can, however, be obtained by considering the fault statistics of the combined quantity of 400 kV, 275 kV and 220 kV OHLs (approximately 2317 km) in the All-Island transmission system.

Unplanned Outages:

Almost all OHL faults are of short duration as a result of transient faults such as lightning strikes. If an auto-reclose function is provided for the protection of the line, it will restore the circuit shortly after the fault, generally in 0.5 – 3 seconds. Even if the line suffers physical damage, faults can be rapidly located and identified by visual inspection from the ground or air, and repairs effected in a matter of hours. Transmission system statistics indicate that 91.7 % of overhead line outages lasted less than one day[18].

Taking the fault statistics of the above combined network length of OHL for the period 2004 to 2020, gives a projected fault rate of 0.54 unplanned outages/100km/year.

Given typical repair times, this would equate to the circuit being out of service due to a permanent fault for 6 hours approx. per annum. The average failure rates during normal operation, average repair times and availabilities of the main elements of a typical 400kV OHL are set out in Table 7 and adjusted to reflect the length of the proposed option.

Transient faults are not considered, as any interruptions to supply that they may cause would be of such short duration that their effect is considered to be negligible, while acknowledged it may be an inconvenience for electricity users.

Planned outages:

Planned outages are normally associated with routine maintenance. For a 400 kV OHL, much of the required routine maintenance can be completed without an outage of the circuit. The planned outage rates and the typical outage durations taken from our maintenance policies[19] result in an annual planned outage rate of 0.65% for the 400 kV option, or circa 2.5 days per annum[20].

Combination of the planned and unplanned outages:

[18] EirGrid, Analysis of Disturbance and Faults 2020, System Performance, July 2021
[19] EirGrid, Routine Maintenance Activities Overhead Transmission Lines, April 2018
[20] EirGrid, Transmission Engineering Maintenance Statistics

Due to the length of the new OHL circuit (approximately 22km), the total unplanned outage time per year is circa 6 hours, which combined with the planned outage rate of 2.5 days sums to a total of 3 days per annum (rounded to nearest half day).

Parameter	Average statistics for 400 kV & 220 kV OHL combined
Reliability (Unplanned outages/22km/year)	0.12
Mean time to repair (days)	Circa 2 days
Unplanned Outages (combined) Unavailability due to disturbance (h/24km/year)	0.26 days (c.6 hours)
Planned Outages	2.5 days
Total Annual Unavailability (days/22km/year)	3 days

Table 7 Average failure statistics for a 22 km 400 kV OHL

The availability rate for the new Finglas – Woodland 400 kV OHL option is high at 99.2% over any given year and this OHL option is deemed to have a low risk of introducing additional reliability issues in the system (**Cream**).

6.2.4 Headroom

The new 400 kV OHL option accommodates a similar amount of large-scale demand in the Dublin and Mid-East region compared to the other options.

The assessment indicates that the new Finglas – Woodland 400 kV OHL option creates headroom (increases the amount of additional large-scale demand that could be accommodated) of approximately 275 - 325 MW compared to no reinforcement, depending on which scenario is analysed.

The new Finglas – Woodland 400 kV OHL option performs well in the headroom criterion compared to the other options and is deemed to have a moderate (**Dark Green**) performance in terms of headroom.

6.2.5 Expansion or extendibility

The new Finglas – Woodland 400 kV OHL option is based on Overhead Line (OHL) technology and has a thermal capacity[21] equivalent to the existing 400 kV circuits. The option provides a platform for future demand or generation development within the east of the country.

In the event that another connection along the circuit would be required, this could be achieved by constructing another substation which could be connected into this line. This is a very common way to expand the transmission network and is normally technically feasible and achievable, depending on the required connection size. As such, this option has the potential to provide a good base for any further expansion of the transmission network.

However, the substation feasibility analysis for the proposed new 400 kV substation at Finglas has shown that future expansion of the 400 kV busbar within the boundary of the existing substation is not possible. Further land would have to be acquired to allow expansion, and there is evidence that expansion into the land immediately surrounding the existing substation is not possible.

While the expandability and extendibility of the new circuit is good, it is countered by the distinct challenges to that of the required 400 kV substation. As such, this option has moderate to poor potential to provide a base for any further expansion of the transmission network (**Blue**).

6.2.6 Repeatability

Overhead Line (OHL) technology is already in use on the Irish transmission system with more than 4,500 km of circuit length. This criterion is assessed on a technical basis and there are few technical issues with OHL technology that would introduce additional system integration, operational, and maintenance complexity that would affect the repeatability of OHL circuits on the Irish transmission system. There may of course be other challenges with OHL technology, but they are assessed under other criteria.

Similarly, substations using both Air Insulated and Gas Insulated switchgear are already used extensively in the Irish transmission system and so will not introduce additional system integration, operational, and maintenance complexity that would affect the repeatability of the technology on the Irish transmission system.

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[21] Thermal capacity of existing 400 kV OHL is a winter rating of 2963 A and summer rating of 2506A based on conductor 2 x 600 mm2 ACSR CURLEW at 80°C,

This option is considered to have a low risk of not meeting the repeatability criteria (**Cream**).

6.2.7 Technical operational risk

The new Finglas – Woodland 400 kV OHL option is based on Overhead Line (OHL) technology and Air or Gas insulated substation switchgear. This technology is tried and tested internationally and in Ireland and it is considered to have a low operational risk. This option is therefore considered lowest on the difficult/ risk scale (**Cream**) in terms of operational risk.

6.2.8 Conclusion of technical performance

This option is considered to perform well when all of the technical sub-criteria are considered and hence has been given a moderate impact (**Dark Green**) in the assessment.

Summary of technical performance of Finglas – Woodland 400 kV OHL option	
Health and Safety Standard compliance	
Security & Planning Standard compliance	
Reliability performance	
Headroom	
Expansion or Extendibility	
Repeatability	
Technical Operational risk	
Combined Technical Performance	

Table 8 Summary of technical performance of the new Finglas - Woodland 400 kV OHL option

6.3 Economic Assessment

The economic performance of the options is represented using our colour scale with the individual performance of an option assessed relative to the performance of the other solution options.

6.3.1 Input cost to the economic appraisal

6.3.1.1 Pre-engineering cost

The pre-engineering costs are estimated to be €10 million. In the economic appraisal, a contingency provision of 5% has been applied to this amount.

The phasing of the pre-engineering costs is as follows:

Phasing of Pre-Engineering Spend – New Finglas – Woodland 400 kV OHL option					
2022	***2023***	***2024***	***2025***	***2026***	***2027***
17%	45%	15%	15%	8%	0%

Table 9 Phasing of pre-engineering spend for New Finglas - Woodland 400 kV OHL

6.3.1.2 Implementation cost

The capital investment required to deliver the new Finglas – Woodland 400 kV OHL option is estimated to be €147 million. A provision for Transmission System Operator (TSO) related implementation cost and landowner payments, proximity allowance and local community fund has been included in this cost. In the economic appraisal, a contingency provision of 10% has been applied to this amount. The estimated implementation cost is categorised into its general components and is summarised in Table 10.

Categorised implementation cost Option 1 – New Finglas – Woodland 400 kV OHL	
Cost category	**Implementation cost (€m)**
Overhead line	26.0
Underground cable	N/A
Stations	91.5
Other (flexibility & proximity payments and other allowances)	16.4
SUB-TOTAL	133.8
Contingency (10%)	13.4
TOTAL	147.8

Table 10 Categorised implementation cost for Finglas - Woodland 400 kV OHL option

The phasing of the implementation costs is as follows:

Phasing of implementation spend – New Finglas – Woodland 400 kV OHL option										
2026	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**
10%	25%	20%	10%	10%	10%	5%	5%	5%	0%	0%

Table 11 Phasing of implementation cost spend for New Finglas - Woodland 400 kV OHL

6.3.1.3 Life-cycle cost

This sub-criterion consists of three separate inputs incurred over the useful life of the option, namely operation and maintenance cost, electrical losses and replacement cost.

The equipment associated with the new Finglas – Woodland 400 kV OHL option is expected to be maintained in accordance with the well-established existing practices. The operation and maintenance cost varies over the assets' lifetime and as such three periods of approximate costs are assumed. Table 12 displays rounded figures to the nearest thousand. No replacement cost is assumed as the equipment has a life expectancy of 50 years which is line with the period for the economic assessment.

Life-cycle cost for New Finglas – Woodland 400 kV OHL		
Annual Operation and maintenance cost (€k)	0-20 year period	€230k
	21-40 year period	€337k
	41-50 year period	€161k
Annual Electrical losses cost (€M)	€2.8M	
Replacement cost	N/A	

Table 12 Life-cycle cost for the Finglas - Woodland 400 kV OHL option

6.3.1.4 Cost to Single Electricity Market

As described in Section 4.2.2, Economic performance criteria, the cost to the Single Electricity Market represents the cost for the periods when the reinforcement is unavailable. The unavailability is based on the reliability performance of the option. This is a cost to the single electricity market and is calculated as a combination of the benefit in production cost saving (project benefit) and reliability performance of the option.

The reliability performance of the option is taken from Section 4.2.1 Technical Performance Criteria. The production cost savings assessment used the TES 2019 scenarios and as such a range of annual production cost savings are used in the assessments as the different scenarios have different demand and generation patterns. Table 13 show the input for this criterion.

Cost to Single Electricity Market for Finglas – Woodland 400 kV OHL option	
Annual Production cost saving (Benefit) (€m/annum)	Range €4.4m to €22.8m
Annual unavailability of option during which benefits cannot be attributed	Unavailable for 3 days, available 99.18%
Annual Cost (saving) to SEM	Range €4.4m to €22.6m

Table 13 Cost to single electricity market of the new Finglas – Woodland 400 kV OHL option

6.3.2 Economic performance for the new Finglas – Woodland 400 kV OHL option.

When all of the above costs and savings are considered, the economic result of the new Finglas – Woodland 400 kV OHL option indicates a good result compared to the other options and hence is considered to have a moderate to low (**Green**) impact on the economic result. To be able to differentiate between competing options in a measured way and to check the options' performance in different credible future energy scenarios, a robustness and sensitivity test was carried out. The objective is to identify the option that is impacted the least in its economic result for a range of credible future energy scenarios. This robustness test indicates a stable performance compared to the other options independent from which future energy scenario is used in the assessment.

After considering both the economic result and the robustness test, the new Finglas - Woodland 400 kV OHL is considered to provide a good economic performance in comparison with the other options and hence has been given a moderate to low impact (**Green**) in the assessment.

Summary of economic performance of the new Finglas – Woodland 400 kV OHL option	
Economic result	Green
Robustness	Green
Combined Economic Performance	Green

Table 14 Summary of economic performance for new Finglas - Woodland 400 kV OHL option

6.4 Deliverability

6.4.1 Implementation timelines

The expected timeline for implementation of the 400 kV overhead line option from Woodland to Finglas is a period of 20 years in total. This time frame can be divided into two phases.

The first phase is based on 5.25 years for the outline design, environmental assessment and the planning process, and would be subject to the outcome of the consenting process.

The second phase is 14.75 years and includes detailed design, procurement of materials and construction works. This assumption includes time for the design to be confirmed, all landowner consents to be obtained by EirGrid including the use of compulsory acquisition powers if necessary, and materials procurement in the first 5.75 years of this period.

This includes a period of one (1) year to allow for a modification of the approved planning permission, which in EirGrid's experience of grid development is a normal process, as the permitted development is subject to detailed design and the accommodation where possible of landowner preferences for tower siting. The time to construct the OHL (five (5) years) includes construction access, foundation works, tower erection and stringing which would include sections that require transmission outages.

The design works, material procurement and construction period for the works required in the existing substations has been incorporated into the above timeline for the OHL works. The timeline for new 400 kV bay at Woodland 400 kV station is estimated at 1.5 years. At Finglas substation there are several impediments to the implementation timelines. A new 400 kV GIS substation is to be built on the already constrained site. The site for the 400 kV GIS is currently occupied by the old 110 kV AIS infrastructure. There are still transfer of existing circuits required before this older equipment can be decommissioned, and the site cleared.

In addition, the only remaining spare bay is a line bay which would need to be converted to a transformer bay and the outages to complete this are rarely granted. Timelines for the procurement of the required transformer is approximately 2 years.

There are yet unknown cable diversions at lower voltages which would have to be completed before the substation and circuit could be energised. Taking all of these impediments into consideration equates to approximately 1 year to design and 4 years to construction timeline.

The implementation timeline for the 400 kV OHL option is the longest compared to the other options. The impact of the implementation timelines is assessed to be high (**Dark Blue**) for the 400 kV OHL option.

6.4.2 Project plan flexibility

Route corridors for the OHL would be developed in Step 4 of our grid development process and would factor in constraints in the study area. Within the corridors, there would be a reasonable level of flexibility to identify the OHL routes. Once the route options have considered all the constraints, an emerging preferred OHL route would be the basis for the planning submission. The preferred route would be designed within the identified corridor and the design would consider the access routes for construction, stringing locations and tree cutting requirements. The design would be completed to a level that we would consider the foundation requirements and would identify all the requirements for the line construction. There would be very little flexibility on the route once the planning consent is in place. Some of the tower locations may have the potential for minor modifications, which could require a modification to the planning consent. Access routes to the tower locations would also form part of the planning consent and changes to these would also require modification to the planning consent. The 400 kV OHL option is assessed to have a moderate (**Dark Blue**) impact on the project plan flexibility compared to the other options.

6.4.3 Risk to untried technology

OHL technology is tried and tested in Ireland and internationally. This technology is considered international best practice and is a proven technical solution for transmission of high-voltage electricity. It is the technology around which the transmission network in Ireland has been developed to date. Nevertheless, it has been some time since new 400 kV infrastructure was built in Ireland in the 1980's and therefore it is not without some technological risk. Overall, this option is considered to have a moderate (**Dark Green**) risk in relation to this sub-criterion when compared to the other options.

6.4.4 Dependence on other projects (outages)

This option has a number of elements which would require planned outages.
The required work in both Woodland and Finglas substations would need proximity and commissioning outages. In Woodland, the work is in relation to the construction of the 400kV bay, which is included in CP1194 Woodland 400 kV redevelopment project.
In Finglas, the work involves the redevelopment of an existing 220kV bay as there is no room for extension to the busbar in Finglas substation. There would also be the construction of a new 400kV GIS substation which is dependent on CP0646 Finglas 110 kV decommissioning works of the old AIS switch gear. On-going projects in both these substations may cause conflicting outages depending on the projects' individual programmes. This would have to be taken into consideration and could have impacts on granting necessary outages. There are efforts ongoing to masterplan stations elements, but this has not been developed for Finglas. The impact on the dependence on other projects for the 400 kV overhead line option is considered to be at a high (**Dark Blue**) level.

6.4.5 Supply chain constraints, permits, wayleaves

For the purposes of this analysis, it is assumed that 400 kV structures, apparatus and equipment would be equivalent, if not similar in terms of nature and extent of materials, to that being planned and procured for the North South Interconnector (NSIC) development.

In terms of significant supply chain constraints envisaged, EirGrid is aware that there is a two-year lead time to procure a 400 kV/220kV transformer. Similarly, permitting is also likely to be very challenging, with the provision of new 400 kV OHL infrastructure in what can be described as a peri-urban commuter belt of the Greater Dublin Area, irrespective of final design and location. The Woodland substation is also the terminus of the existing Moneypoint – Woodland 400 kV OHL circuit, and the permitted North-South Interconnector (NSIC) 400 kV OHL. Based on established precedent, the infrastructure development comprising the provision of a new 400 kV OHL circuit is likely to be the subject of an application directly to An Bord Pleanála (ABP) as Strategic Infrastructure Development (SID). Given the nature of the proposed development as comprising a new 400 kV OHL circuit, the planning application would be subject to Environmental Impact Assessment (EIA). These factors make it almost inevitable that ABP would hold a full Oral Hearing in respect of a new 400 kV OHL development. A new 400 kV OHL circuit would need to be located on a new alignment. This would result in potentially significant environmental and social impacts on receiving environments and communities, including biodiversity, land use activities, and visual impacts. Social impacts may include community concerns regarding the provision of new large-scale OHL within an area. Significant engagement with landowners and communities would be required in the delivery of the new circuit, for such purposes as surveying, siting and construction. These parties may be new to accommodating electricity infrastructure on their landholdings and within their communities. New wayleaves would be required to facilitate construction of the new circuit. Based on recent precedent in terms of the provision of new 400 kV transmission infrastructure, there is the potential for significant landowner, community and public concerns with this option, with the likely consequence of project delays or difficulties in gaining access to land. Having regard to all the above aspects, the 400 kV OHL option is deemed to have a high (**Dark Blue**) impact and risk in terms of Supply Chain Constraints, Permits and Wayleaves.

6.4.6 Conclusion of deliverability performance

There are five sub criteria considered when the overall deliverability performance is assessed. For Option 1, an OHL to Finglas, most of these aspects indicate a high significance. This means that overall, this option is considered significantly challenging to deliver, with some risks and unknown technical issues that will have to be solved during the subsequent stages of project development.

The implementation timeline for any network reinforcement is important to be able to ensure that the transmission network will be in compliance with security standards and that all consumers have a secure electricity supply. The time it takes to develop, and construct reinforcements is also important in terms of accommodating new generation and demand that would like to connect to the system.

This option has the longest implementation timeline compared to the other options and this, in combination with the perceived risk of delays due to societal acceptance, means this option does not perform well from a deliverability point of view and this has been taken into account in the overall assessment of this option.

When all of these deliverability aspects are considered, this option is deemed to have high (**Dark Blue**) impact from a deliverability point of view.

Topic	Option 1 (New Finglas to Woodland OHL)
Implementation timelines	
Project plan flexibility	
Risk of untried technology	
Dependence on other projects	
Supply chain constraints, permits, wayleaves etc.	
Combined Deliverability Performance	

Table 15 Summary of deliverability performance for the new Finglas - Woodland 400 kV OHL option

6.5 Environmental Assessment

6.5.1 Biodiversity

There is a moderate to high risk of significant impacts on biodiversity as a result of this option. There is potential for impacts on protected sites as al of the water bodies in the study area are hydrologically connected to European designated sits on the coast; there will be a permanent loss of habitat within the footprint of the pylons and as a result of a loss of some mature trees and there is a collision risk to birds migrating across the study area. Although literature suggests that bird collisions with power lines are generally considered to be rare events, there is still potential for collision risk to bird species from the new OHL in addition to disturbance leading to displacement.

Having regard to all the above aspects, the 400 kV OHL option is deemed to have a moderate (**Blue**) impact and risk in terms of Biodiversity.

6.5.2 Soils and Water

There is a low risk of significant impacts on soils and water as a result of this option. The impacts would be only likely to occur during construction. These impacts would be fairly limited as Option 1 would aim to avoid designated water bodies and excavations would be limited to new pylon foundations. Short access tracks from local roads would be used, where possible, and would require minimal soil strip in site preparation.

Having regard to the above, the 400 kV OHL option is deemed to have a low (**Cream**) impact and risk in terms of Soils and Waters.

6.5.3 Material Assets - Planning Policy and Land Use

There is a moderate risk of conflict with planning policy and significant impacts on land use as a result of this option. There are some potential interactions with plan zonings within the Finglas Study Area; plan policies are broadly in support of electricity conveyance improvement and reinforcement development within the Finglas Study Area, however, it is possible that Option 1 would not fully accord with county planning policies, as new structures are proposed and there is a preference for new transmission connections to be underground. Perceived and actual impacts on land values may present significant constraints both in rural and urban areas. With careful routeing of OHL in consultation with communities and landowners, the risk of impacts would be reduced.

There is little scope for installing OHL in public roads however as there is for UGC so almost all of the land use would be 3rd party lands. New OHL corridors would require limited and temporary land take for construction, with short access tracks from local roads being used, wherever possible. Permanent land take would be limited to the footprint of the OHL pylons. There would however be a small number of significant impacts on particular parcels of land during the operational phase due to potential land use restrictions.

Having regard to all the above aspects, the 400 kV OHL option is deemed to have a moderate (**Dark Green**) impact and risk in terms of Planning Policy and Land Use.

6.5.4 Landscape and Visual

There is a Moderate to High risk of significant impacts on landscape and views as a result of this option. The potential for significant visual impacts in particular is identified and these would be permanent. However, with sensitive landscapes, viewpoints and main settlements largely avoided, this impact would be reduced somewhat to a moderate to high (**Blue**) risk.

6.5.5 Cultural Heritage

There is a Moderate risk of significant impacts on cultural heritage as a result of this option. There would be a combined impact of the potential to encounter unknown archaeological assets during construction and the potential to impact the setting of built heritage assets during operation. Of these two potential impacts, however, the more significant impacts would be likely to arise on the setting of heritage features during operation.

Having regard to all the above aspects, the 400 kV OHL option is deemed to have a moderate (**Dark Green**) impact and risk in terms of Cultural Heritage.

6.5.6 Noise and Vibration

There is a low to moderate risk of significant impacts from noise and vibration as a result of this option. The construction of a new OHL and associated pylons would be likely to generate noise and vibration, most notably from works for pylon foundations. This noise impact would be temporary. There may also be some low levels of noise associated with the OHLs during operation. There is likely to be a greater impact in the area of Woodland substation due to its rural nature.

Having regard to all the above aspects, the 400 kV OHL option is deemed to have a low to moderate (**Green**) impact and risk in terms of Noise and Vibration.

6.5.7 Climate Change

There is a Moderate risk of significant impacts to and from climate change as a result of this option. The OHL would be vulnerable to predicted future climate impacts associated with storms and winds and increased rainfall. Damage done could be difficult to repair as a result of increased flooding. This is a long-term risk and one that is predicted to increase over time. This would impact security of supply. The volume of material required to construct an OHL between Woodland and Finglas is significant and carries with it associated embodied energy.

Having regard to all the above aspects, the 400 kV OHL option is deemed to have a moderate (**Dark Green**) impact and risk in terms of the effect of climate change on the asset.

6.5.8 Summary of Environmental assessment of the Finglas – Woodland 400 kV OHL option

The greatest risks of significant impacts as a result of this option are associated with biodiversity and landscape and views, which have a moderate to high risk rating. This is as a result of OHLs posing a collision risk to migratory birds, a loss of mature trees and significant impacts on views. This option also has the potential to conflict with local planning policies, impact on the setting of cultural assets and is less resilient to climate change than an underground option would be. As a result, this option has a moderate risk of significant impacts to the environment overall (**Dark Green**).

Topic	Option 1 (New Finglas to Woodland 400 kV OHL)
Biodiversity	
Soil and Water	
Planning Policy and Land Use	
Landscape and Visual	
Cultural Heritage	
Noise and Vibration	
Climate Change	
Combined Environmental Performance	

Table 16 Summary of environmental performance for the new Finglas - Woodland 400 kV OHL option

6.6 Socio-economic Assessment

6.6.1 Traffic and Transport

There is a low to moderate risk of significant impacts on Traffic and Transport as a result of this option. The greatest impacts to Traffic and Transport would be during construction as a result of construction traffic using local and regional roads as haul routes and accessing points to construction compounds or other construction installations. Such an occurrence could lead to driver and pedestrian delay; increased fear and intimidation for pedestrians, especially where there are no footpaths along the roads being used; and potentially severance of communities, community facilities and businesses if any roads need to close. Whilst impacts are temporary and comprise of construction traffic only, with no lengthy road closures anticipated, construction over a period of two years in an area as densely populated and congested as the study area would have a potentially significant impact on local traffic.

Having regard to the above aspects, the 400 kV OHL option is deemed to have a low to moderate (**Green**) impact and risk in terms of the effect of Traffic and Transport.

6.6.2 Amenity

Amenity considers combined impacts: during construction, there is the potential for impacts on amenity as a result of a combination of impacts on Traffic and Transport, Views and from Noise and Vibration; during operation amenity impacts could occur as a result of combined impacts on views and from noise. There is a moderate to high risk of significant impacts on amenity as s a result of this option. When considering the relative impacts identified for each of these topics in the assessment and then combining them, consideration is also given to the temporary or permanent nature of the impacts: Landscape and views are at a moderate to high risk of significant impacts and this is a permanent impact; traffic impacts would be temporary only, albeit over a long period of time; noise impacts would occur in both construction and operation but are not considered to be significant. As a result, and taking a precautionary approach, the combined assessment considers that there is a moderate to high risk of impacts on amenity.

Having regard to all the above aspects, the 400 kV OHL option is deemed to have a moderate to high (**Blue**) impact and risk in terms of Amenity.

6.6.3 Health

There is a low to moderate risk of significant impacts on health as a result of this option. Potential impacts relate to stress and anxiety associated with Traffic impacts, amenity impacts and ‘nuisance’ emissions such as noise. No significant impacts are anticipated from noise there is a moderate to high risk of amenity impacts which could lead to stress and anxiety, Concerns relating to EMFs relating to electrical transmission lines can also lead to increased stress and health issues. EirGrid's design standards require all OHLs to operate to existing public exposure guidelines from ICNIRP and as such there should be no direct impact from EMFs; despite this EMFs are likely to remain a concern for local communities. This has been demonstrated in a number of public consultations. As a result, there remains a low to moderate (**Green**) risk to health as a result of this option.

6.6.4 Local Economy

There is a low risk of significant impacts on the economy as a result of this option. Impacts considered under this topic are confined to the direct impacts the option might have during construction or operation. The aims of the Proposed Project, to facilitate economic growth in Ireland are not considered in the options appraisal as these aims and the resultant security of supply are common to all of the options. In terms of employment, during construction the workforce would be relatively small in the context of the local and regional economy; it is likely to require specialist labour which may not be available locally. In operation there would be limited scope for employment opportunities. In terms of expenditure, there would be positive impacts on the local and regional economy, but this would be relatively low in magnitude. Again, specialist equipment is likely to be required from outside of the study area.

Having regard to above, the 400 kV OHL option is deemed to have a low (**Cream**) impact and risk in terms of the local economy.

6.6.5 Utilities

There is a low risk of significant impacts to third party utilities as a result of this option. Above ground utilities include telephone network cables and OHLs. Connected to Woodland 400kV substation, there is the existing Moneypoint to Woodland 400kV OHL travelling east to west; and two 220kV OHLs, one travelling south and connecting into the Clonee to Maynooth 220kV OHL and one travelling east and then south to Corduff. There is also a 100kV OHL crossing to the south of Woodland substation in a north west to south east direction. At Finglas 220kV substation, there are numerous 220kV and 100kV OHL and UGC connections, in particular connecting Finglas to Corduff and Poolbeg in Dublin. There are likely to be a number of underground utilities in the regional road network between Woodland and Finglas, including other electricity cables; telephone and broadband cables; sewers; and private water supplies. There are unlikely to be significant issues with any existing utilities in the construction or operation of Option 1, with the exception of other OHL, some of which may need to be over-sailed or undergrounded. Third party utility surveys will be undertaken prior to excavation for pylon foundations, thereby removing the risk of impacting underground cables, water supply pipes, private water sources or wastewater treatment systems.

Having regard to all the above aspects, the 400 kV OHL option is deemed to have a low (**Cream**) impact and risk in terms of Utilities.

6.6.6 Summary of Socio-economic assessment of the Finglas – Woodland 400 kV OHL option

The greatest risks from a socio-economic perspective from this option are to amenity. Risks to the economy and utilities are low; Traffic and Transport and health risks are considered to be low to moderate. The risk to amenity is as a result of the significant impacts an OHL would have on landscape and views. As a result, this option as a moderate risk of significant impacts from a socio-economic perspective (**Green**).

Topic	Option 1 (New Finglas to Woodland 400 kV OHL)
Traffic & Transport	
Amenity	
Health	
Economy	
Utilities	
Combined Socio-Economic Performance	

Table 17 Summary of Socio-Economic performance for the new Finglas - Woodland 400 kV OHL option

6.7 Summary of the assessment for the Finglas – Woodland 400 kV OHL option

This option would involve constructing a new 400 kV OHL between Woodland 400 kV and Finglas 220 kV substations. This option is the best performing option in the economic criteria compared to the other options. The environmental criterion is considered to be of moderate impact when compared to the other options.

Based on other projects of a similar nature, some aspects under the deliverability and the socio-economic criteria are anticipated to be very challenging and would bring high risks to the completion of the project.

Having considered all of the five criteria, the outcome of the multi-criteria assessment indicates that the new Woodland – Finglas 400 kV OHL option (Option 1) does not perform very well, and it has been given a high impact (**Dark Blue**) on its overall performance.

Topic	Option 1 (New Finglas to Woodland 400 kV OHL)
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Table 18 Overall assessment outcome for the new Finglas - Woodland 400 kV OHL option

7 New Finglas to Woodland 400 kV Underground Cable (UGC)

This section describes the assessment of the new Finglas – Woodland 400 kV UGC option against the five criteria, and their sub-criteria as described in Section 4.2. Each criterion is described in separate sections and a summary of the overall performance of the option is provided in Section 7.7.

The assessments for the environmental and socio-economic criteria have been carried out by Jacobs, and a summary of its findings are presented in this report. Jacobs' detailed reports of these assessments can be found on our website and the links can be found in Section 2.1.

Due to the nature of UGC, additional investigations were carried out to better inform the assessment from a feasibility and technical point of view. There are certain aspects that we need to understand before an UGC option can be deemed feasible. For instance, the power carrying capacity (rating) of the cable is dependent on how it is laid in the ground.

These investigations included a high-level feasibility study to determine if indicative feasible routes (which achieve adequate capacity ratings) can be found in the road network in the study area and what type of obstacles the cables may have to cross. Jacobs carried out this assessment and its detailed report (321084J-REP-002 Rev A03 – Cable Feasibility Report).

Also, other technical behaviours of UGCs had to be examined to avoid the cables causing damage to other electrical equipment once installed. These investigations included cable integration studies and indicative reactive compensation requirements, harmonic filter requirements, and temporary overvoltage assessments (TOV).

PSC carried out these assessments and its detailed report (Capital Project 1021 East Meath to North Dublin Grid Upgrade Cable Studies, EIR-014270, Rev 3, 7th June 2022) can be found on our website.

Further investigations will have to be carried out in relation to these issues if any of the underground cable options are brought forward to Step 4 to reflect the actual route and parameters of the cable option.

7.1 Description of option

This option involves a transmission network reinforcement centred on strengthening the network between the existing Finglas 220 kV substation in County Dublin and Woodland 400 kV substation in County Meath. This consists of:

- Construction of a new 400 kV underground cable linking a new 400 kV busbar at the existing Finglas 220 kV station to Woodland 400 kV station. For the purpose of this investigation, we have assumed the length of the cable to be approximately 30 km;
- At the existing Finglas 220 kV station a new 400 kV C-Type busbar, and one 400/220 kV transformer. The new 400 kV station development must be capable of accommodating a future second 400/220 kV transformer and future additional 400 kV circuits, and expansion of the station to an enhanced ring busbar.
- At the existing Finglas 220 kV station new 220 kV transformer bay will be required to connect the new 400/220 kV transformer.
- At the existing Woodland 400 kV station a new line bay will be required to connect the new circuit.
- Reactor of c.100 MVAr at each station end of the new cable circuit will be required. The size of the reactor compensation will be verified in further cable integration studies when circuit route and cable type are selected in later steps of the Six Step process.

7.2 Technical Performance

7.2.1 Compliance with health and safety standards

Please refer to Section 4.2.1 for a detailed description. The new Finglas – Woodland 400 kV UGC option will be compliant with the relevant safety standards and is considered to have a low (**Cream**) risk of not complying with health and safety standards.

7.2.2 Compliance with Security and Planning Standards

The security standards of the transmission network are defined in the following:

- The Transmission System Security and Planning Standards (TSSPS); and
- The Operational Security Standards (OSS).

These standards will ensure that the system is planned and operated in a manner which adheres to system security and integrity, and reliability of supply criteria.

The new Finglas – Woodland 400 kV UGC option proposed will comply with the relevant system reliability and security standards referenced above. Although the option will meet the minimum technical requirements, certain aspects may differentiate the option's technical performance compared to other options. A high-level summary of the technical aspects considered and investigated is presented below.

The need analysis indicated that, without mitigation, single contingencies (the unexpected loss of a circuit or piece of equipment), of either of the existing 220 kV circuits between Woodland and Corduff or Clonee , would lead to power flows in excess of the capacity of the remaining circuit. The analysis indicated that generation redispatch to increase conventional generation in North Dublin would be required to mitigate the overloads. This issue was shown to worsen as demand in Dublin increases.

When the new Finglas – Woodland 400 kV UGC option is added to the system model, the analysis indicates an improvement in these issues by removing the expected overloads between Woodland and Corduff or Clonee.

An assessment was undertaken into keeping the transmission network within standards following a loss of plant and equipment while another is out for planned maintenance. Maintenance is carried out annually during March to October. For planned outages, some re-dispatch of generation is allowed, but this should be kept to a minimum to ensure the most cost-effective generation is dispatched.

The assessment determined the worst case to manage was planned maintenance on the new Finglas – Woodland 400 kV UGC. This requires generation redispatch within allowed limits to manage a subsequent unplanned loss of transmission equipment. Without redispatch the issues identified in the need assessment would be experienced, with the unplanned loss of the Corduff – Woodland 220 kV circuit leading to a loading of 143% on Clonee - Woodland. This is an improvement on the issues indicated in the needs assessment, which showed that during a maintenance and trip combination the Clonee – Woodland circuit could expect an overload of 172% depending on dispatch conditions.

When all aspects are considered, the new Finglas – Woodland 400 kV UGC option is considered to have good compliance when assessed against the above standards and hence has been given a low impact (**Cream**) in the assessment.

7.2.3 Reliability performance

This criterion has been assessed using three inputs namely unplanned outages, planned outages and the time it takes to repair the circuit. The collective impact of these provides an indication of the annual availability of the asset. The reliability and outages of the station equipment associated with the circuit is assumed to be same for all options and is therefore not included in this analysis.

The statistics for reliability are based on EirGrid's and international failure statistics, the mean time to repair and the availability in days per 100 km per year for UGC. It has been assumed that the new Finglas – Woodland 400 kV UGC circuit will be approximately 30 km in length for the purpose of this assessment.

Unplanned Outages*:*

As mentioned in Section 6.2.3, almost all faults on OHLs are of short duration as a result of transient faults. If an auto-reclose function is provided for the protection of the OHL, it will restore the circuit shortly after the fault. Auto-reclose is not available for faults on UGC and as such faults are considered to be long-lasting and will not be re-energised until an investigation has been undertaken. Consequently, when a cable fault occurs, finding a fault location and resolving it can result in prolonged circuit outages. As such, cable circuits have a lower availability than OHLs because of the prolonged outage times in the event of a fault.

There is only 1 km of existing 400 kV UGC in Ireland. This length of 400 kV UGC is too small a sample for determining meaningful performance statistics.

Meaningful statistics can, however, be obtained by considering the fault statistics of the combined quantity (approximately 144 km) of 400 kV and 220 kV UGC under our control along with international failure statistics for cables[22]. Taking the fault statistics of this existing 144 km of UGC for the period 2004 to 2020, and the international failure for XLPE land cables from 220 kV to 400 kV, gives a projected fault rate of 0.27 Unplanned outages/100km/year.

Parameter	Average statistics for 400 kV & 220 kV UGC combined
Reliability (Unplanned outages/100km/year)	0.27
Mean time to repair (days)	25 – 45 Days[23]
Unavailability due to disturbance (days/100km/year)	7 – 12 days

Table 19 Average failure statistics for a 100km 400 kV UGC

[22] Cigre, TB379 Update of service experience of HV underground and submarine cable systems, 2020
[23] Dependant on installation method and number of joint bays

Table 20 shows the statistics for reliability, the mean time to repair faults, and the unavailability for 220 kV and 400kV cables (based on international failure statistics for cables[22]). These statistics, given that they apply to XLPE[24] cables, are taken to be applicable for this option.

Planned outages:

Planned outages are normally associated with routine maintenance. The typical routine maintenance outage duration for 400 kV cables taken from our maintenance policies is 2-3 days per annum (dependent on the number of joint bays and cable sections). Each year an operational test is performed, and periodically an ordinary service. These maintenance outages equate to a total unavailability of 0.84%, or c.2.5 days per annum.

Combination of the planned and unplanned outages:

The combination of the planned and unplanned outages the Finglas – Woodland 400 kV UGC option and the total annual unavailability are set out in the table below and adjusted to reflect the length of the proposed option (30 km).

Topic	Finglas – Woodland 400 kV UGC (30 km)
Reliability (Unplanned outages/circuit length(km)/year)	0.082
Mean time to repair (days)	25 – 45 days
Unplanned outages (Combined) Unavailability due to disturbances (days/circuit length(km)/year)	2– 3.7 days/annum
Planned Outages	2.5 days
Total Annual Unavailability	4.5 – 6.2 days/annum
Difficulty/risk scale	

Table 20 Average failure statistics for a 30 km 400 kV UGC

The average failure rate and time to repair for the new Finglas – Woodland 400 kV UGC option is deemed to be high when compared to the OHL alternative. The availability of this option as a result of outages is in the range of 98.3-98.8% at best and unavailability could potentially be greater than a month per annum. Based on this assessment, the

[24] XLPE cable means cross linked polyethylene

reliability criterion for the new Finglas – Woodland 400 kV UGC is considered to be at a moderate performance (**Dark Green)**.

7.2.4 Headroom

The new Finglas – Woodland 400 kV UGC option accommodates a similar amount of large-scale demand in the Dublin and Mid-East region compared to the other options. Underground cable options were noted to provide marginally better headroom due to their lower overall electrical impedance, and circuit options that terminate at Finglas were shown to perform marginally better than those terminating at Belcamp due to Finglas substation being connected to all the existing 220 kV circuit between Woodland and North Dublin.

The assessment indicates that the new Finglas – Woodland 400 kV UGC option creates headroom (increases the amount of additional large-scale demand that could be accommodated) of approximately 300 - 350 MW compared to no reinforcement, depending on which scenario is analysed.

The new Finglas – Woodland 400 kV UGC option performs well in the headroom criteria compared to the other options and is deemed to have a moderate to good (**Green**) performance in terms of headroom.

7.2.5 Expansion or extendibility

The new Finglas – Woodland 400 kV UGC will provide a future new circuit and as such there are opportunities for further expansion of the transmission network using this circuit as a platform in the future. In the event that another connection along the cable route is required, these cable options may make the opportunity for expansion and extendibility more challenging and difficult compared to if an OHL technology was used.

There are a number of aspects which make this more challenging. The cable circuit is relatively long and requires bespoke reactors at each end of the of the cable to limit the impact during energisation of the cables and also during normal operation as the reactors will make sure that the voltage does not deviate outside planning standards.

If the length of the cable is changed then these reactors would have to be resized and new reactors purchased. In the event that the cable is associated with harmonic filters, then additional studies would have to be undertaken to ensure that the filters are properly tuned for any new cable length and size. This could mean that some purchased equipment would become redundant in the future if the cable option chosen is altered. There may also be limitations on route options for diversions or connections to the new circuit in the road network (cables are preferably accommodated in roads to have easier access to the asset for maintenance and repair).

The new Finglas – Woodland 400 kV UGC option has a target thermal capacity[25] equivalent to the existing 400 kV circuits. Assessments of cable types available to maximise the capacity of the new circuit are under way at the time of this report. The result of these assessments will be an input to analysis in later steps of the Six Step process. The route selected will also be analysed for thermal pinch points, such as crossing roads or waterways or other cable circuits, that limit the capacity of the new circuit allowing mitigations to be developed where possible.

After considering all aspects in this criterion, all cable options provide a worse base for any further expansion of the transmission network compared to OHL technology.

In addition, the substation feasibility analysis for the proposed new 400 kV substation at Finglas has shown that future expansion of the 400 kV busbar within the boundary of the existing substation is not possible. Further land would have to be acquired to allow expansion, and there is evidence that expansion into the land immediately surrounding the existing substation is not possible.

The implications of the opportunity for expansion and extendibility is more challenging and difficult compared to OHL technology and new Finglas – Woodland 400 kV UGC option will have a high (**Dark Blue**) impact in terms of difficulty to accommodate potential for future expansion.

7.2.6 Repeatability

Underground Cable (UGC) technology for 220 kV and 400 kV voltages is already in use in the Irish transmission system, but on a smaller scale compared to OHL. Every time an UGC option is proposed as a solution, each cable option will have to be studied on its own merits. Bespoke network design would have to be considered for each option that would take account of necessary harmonic distortion introduced by any cable or if voltage limiting equipment is required to accommodate the cable options into the transmission network.

Substations using both Air Insulated and Gas Insulated switchgear are already used extensively in the Irish transmission system and so will not introduce additional system integration, operational, and maintenance complexity that would affect the repeatability of the technology on the Irish transmission system.

[25] Thermal capacity of existing 400 kV OHL is a winter rating of 2963 A and summer rating of 2506A based on conductor 2 x 600 mm2 ACSR CURLEW at 80°C,

In terms of repeatability, it is recognised that there may be limitations in the network in regards to accommodating cables. The impacts of the above points are usually greater the higher the operating voltage of the cable used. As such, it is considered that the new Finglas – Woodland 400 kV UGC option has high to moderate risk of not meeting the repeatability criteria (**Blue**).

7.2.7 Technical operational risk

Underground cable and Air or Gas insulated substation switchgear are technologies that are tried and tested internationally and in Ireland. However, the nature of cable technology means that when cables are used over long lengths, they require a bespoke design to be able to be accommodated into the network while remaining within the technical network design standards.

The voltage level and the considerable length will influence the technical operational risk in regards to cable options. Special energising and switching procedures will be required to manage any of the UGC options in an operational environment.

These aspects and additional equipment required to accommodate the underground cable will increase the technical operational risk. The new Finglas – Woodland 400 kV UGC option is considered to have a high to moderate (**Blue**) impact in relation to technical operational risk.

7.2.8 Conclusion of technical performance

This option is considered to perform poorly when all of the technical sub-criteria are considered and hence has been given a moderate to high (**Blue**) impact in the assessment.

Summary of technical performance of the Finglas – Woodland 400 kV UGC option	
Health and Safety Standard compliance	
Security & Planning Standard compliance	
Reliability performance	
Headroom	
Expansion or Extendibility	
Repeatability	
Technical Operational risk	
Combined Technical Performance	

Table 21 Summary of technical performance for Finglas - Woodland 400 kV UGC option

7.3 Economic Performance

The economic performance of the options is represented using our colour scale with the individual performance of an option assessed relative to the performance of the other solution options.

7.3.1 Input cost to the economic appraisal

7.3.1.1 Pre-engineering cost

The pre-engineering costs are estimated to be €10 million. In the economic appraisal, a contingency provision of 5% has been applied to this amount.

The phasing of the pre-engineering costs is as follows:

Phasing of Pre-Engineering Spend– New Finglas – Woodland 400 kV UGC					
2022	*2023*	*2024*	*2025*	*2026*	*2027*
20%	51%	15%	15%	0%	0%

Table 22 Phasing of pre-engineering spend for New Finglas - Woodland 400 kV UGC

7.3.1.2 Implementation cost

The capital investment required to deliver the new Finglas – Woodland 400 kV UGC option is estimated to be €367 million. A provision for Transmission System Operator (TSO) related implementation cost and landowner payments, proximity allowance and local community fund has been included in this cost. In the economic appraisal, a contingency provision of 10% has been applied to this amount. The estimated implementation cost is categorised into its general components and is summarised in Table 23.

Categorised implementation cost Option 2 – New Finglas – Woodland 400 kV UGC	
Cost category	**Implementation cost (€m)**
Underground cable	241.1
Stations	88.0
Other (flexibility & proximity payments and other allowances)	5.9
SUB-TOTAL	335.1
Contingency (10%)	33.5
TOTAL	368.6

Table 23 Categorised implementation cost for new Finglas - Woodland 400 kV UGC

The phasing of the implementation costs is as follows:

Phasing of implementation spend – New Finglas – Woodland 400 kV UGC option										
2026	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**
15%	30%	40%	15%	0%	0%	0%	0%	0%	0%	0%

Table 24 Phasing of implementation cost spend for New Finglas – Woodland 400 kV UGC option

7.3.1.3 Life-cycle cost

This sub-criterion consists of three separate inputs incurred over the useful life of the option, namely operation and maintenance cost, electrical losses and replacement cost.

The equipment associated with the new Finglas – Woodland 400 kV UGC option is expected to be maintained in accordance with the well-established existing practices. The operation and maintenance cost vary over the assets' life time and as such three periods of approximate costs are assumed. Table 25 displays rounded figures to the nearest thousand. No replacement cost is assumed as the equipment has a life expectancy of 50 years which is line with the period for the economic assessment.

Life-cycle cost for New Finglas – Woodland 400 kV UGC		
Annual Operation and maintenance cost (€k)	0-20 year period	€247k
	21-40 year period	€193k
	41-50 year period	€247k
Annual Electrical losses cost (€M)	€2.8M	
Replacement cost	€60M	

Table 25 Life-cycle cost for the Finglas - Woodland 400 kV UGC option

7.3.1.0 Cost to Single Electricity Market

As described in Section 4.2.2, Economic performance criteria, the cost to the Single Electricity Market represents the cost for the periods when the reinforcement is unavailable. The unavailability is based on the reliability performance of the option. This is a cost to the single electricity market and is calculated as a combination of the benefit in production cost saving (project benefit) and reliability performance of the option.

The reliability performance of the option is taken from Section 7.2.3 Reliability. The production cost savings assessment used the TES 2019 scenarios and as such a range of annual production cost savings are used in the assessments as the different scenarios have different demand and generation patterns. Table 26 show the input for this criterion.

Cost to Single Electricity Market for Finglas – Woodland 400 kV UGC option	
Annual Production cost saving (Benefit) (€m/annum)	Range €4.4m to €22.8m
Annual unavailability of option during which benefits cannot be attributed	Unavailable for 6 days, available 98.36%
Annual Cost (saving) to SEM	Range €4.3m to €22.4m

Table 26 Cost to single electricity market for the new Finglas - Woodland 400 kV UGC option

7.3.2 Economic performance for the new Finglas – Woodland 400 kV UGC option.

When all of the above costs and savings are considered, the economic result of the new Finglas – Woodland 400 kV UGC option indicates a poor result compared to the other options and hence is considered to have a moderate to high (**Blue**) impact on the economic result. To be able to differentiate between competing options in a measured way and to check the options' performance in different credible future energy scenarios, a robustness and sensitivity test was carried out. The objective is to identify the option that is impacted the least in its economic result for a range of credible future energy scenarios. This robustness test indicates a stable performance compared to the other options independent from which future energy scenario is used in the assessment.

After considering both the economic result and the robustness test, the new Finglas – Woodland 400 kV UGC is considered to provide a poor economic performance in comparison with the other options hence has been given a moderate to high impact (**Blue**) in the assessment.

Summary of economic performance of the new Finglas – Woodland 400 kV UGC option	
Economic result	
Robustness	
Combined Economic Performance	

Table 27 Summary of economic performance for Finglas - Woodland 400 kV UGC option

7.4 Deliverability

7.4.1 Implementation timelines

The expected timeline for the implementation of the 400 kV single circuit cable option is a period of 7.75 years in total. This is subject to and following statutory consenting for the structures and associated access routes. This time frame can be divided into two phases.

The first phase for all options is based on 4.5 years for the outline design, environmental assessment and the planning and permits process.

The second phase for the 400 kV single circuit cable option totals 3.25 years and includes detailed design, procurement of materials and construction works. This assumption includes time for the design to be confirmed, landowner consents being obtained by EirGrid and materials ordered in the first 1.5 years of this period. The design works, material procurement and construction period for the works required in the existing substations will be incorporated into the timeline.

The new 400 kV bays at Woodland 400 kV substation are estimated to take 1.5 years. At Finglas substation there are several impediments to the implementation timelines. A new 400 kV GIS substation is to be built on the already constrained site. The site for the 400 kV GIS is currently occupied by the old 110 kV AIS infrastructure. There are still transfer of existing circuits required before this older equipment can be decommissioned, and the site cleared.

In addition, the only remaining spare bay is a line bay which would need to be converted to a transformer bay and the outages to complete this are rarely granted. Timelines for the procurement of the required transformer is approximately 2 years.

There are yet unknown cable diversions at lower voltages which would have to be completed before the station and circuit could be energised. Taking all of these impediments into consideration equates to approximately 1 year to design and 4 years to construction timeline.

The UGC option has the shortest timeline of all of the options. The impact of the implementation timelines on the project is assessed to be moderate (**Blue**) for this option.

7.4.2 Project plan flexibility

Routes for the cable options will be developed in Step 4 of our grid development process should they be brought forward to that step. The cable route would be developed in line with EirGrid standard practices. It is established practice in grid development that transmission cables should be constructed in the existing public road network if possible. This is to make access and maintenance to the cable easier once the project is constructed.

One consideration in the selection of suitable roads to accommodate the cable options is the width of the required cable trench. All the cable options will require approx. 2.1 metre-wide trench and a working strip area wide enough to accommodate the required machinery. The road network in the study area will provide some flexibility in the identification of the best performing route. The use of Horizontal Directional Drill (HDD) technology to cross existing rivers, rail and roads will provide flexibility to avoid crossing point constraints.

Once the emerging preferred route has been submitted for planning consent, there is limited flexibility as we would need to work within the constraints of the site development boundary (otherwise known as the redline) of the route and the technical limitations of the cable route such as bending radius and fixed joint bay locations of the cable.

This option considered to have a moderate to high (**Blue**) impact on the project plan flexibility.

7.4.3 Risk to untried technology

In general, cables are increasingly used in transmission systems across the world and the mitigations to technical issues that arise with the technology are well known, and generally tried, and tested. In an Irish context, the first 220 kV XLPE cable was installed in 1984, and there are a number of recent projects on the Irish transmission system using this technology.

Another consideration in terms of untried technology is the use of long sections of UGC. This can lead to many technical issues which require specialised technical studies to determine if it is technically feasible to use a particular length of cable. Although, these studies have been carried out in Step 3 they may have to be repeated in Step 4 if any cable option is progressed to take account of the actual cable route determined. All cable options will require shunt reactors at either end of the cable to compensate the cable capacitance to keep the voltage within standards under normal operation.

Although shunt reactors are in place in the transmission system today, the size of the required shunt reactors for some of the UGC options is large and there is limited experience with these types of installations. The cable option may also require installation of filters in several substations in the network to mitigate any harmonic voltage distortions. The location of the filters cannot be determined until the design of the cable is known and this poses a risk for UGC options.

The installation of long lengths of 400 kV XLPE UGC became possible in the late 1990s with the development of a suitable cable joint for connecting lengths of such cable together. Nevertheless, EirGrid's experience with 400 kV cable is limited, with only a very small amount currently installed on the network.

Another aspect in relation to the UGC option is that Horizontal Directional Drilling (HDD) technology will very likely have to be used to cross specific obstacles within the study area, such as rivers and motorways, for short lengths of the cable route. This poses another risk to the UGC options as it is an expensive methodology, requiring the use of specialist equipment.

The risk to untried technology for the 400 kV single route cable option is considered to moderate to high (**Blue**).

7.4.4 Dependence on other projects (outages)

The UGC options would require a number of elements which would require planned outages.

The required work in both Woodland and Finglas substations would need proximity and commissioning outages. In Woodland, the work is in relation to the construction of the 400kV bay, which is included in CP1194 Woodland 400 kV redevelopment project.
In Finglas, the work involves the redevelopment of an existing 220kV bay as there is no room for extension to the busbar in Finglas substation. There would also be the construction of a new 400kV GIS substation which is dependent on CP0646 Finglas 110 kV decommissioning works of the old AIS switch gear. On-going projects in both these substations may cause conflicting outages depending on the projects' individual

programmes. This would have to be taken into consideration and could have impacts on granting necessary outages. There are efforts ongoing to masterplan stations elements, but this has not been developed for Finglas.

The dependence on other projects for Option 2 is considered to have a high (**Dark Blue**) level of impact.

7.4.5 Supply chain constraints, permits, wayleaves

For the new 400 kV UGC option, there may be significant supply chain constraints. This relates to the procurement and delivery of significant lengths (approx. 40km) of 400 kV UGC, the required filters and other associated large-scale equipment and testing apparatus. Cumulatively, this could result in significant supply chain constraints.

Permitting is likely to be challenging, with the provision of 400 kV UGC infrastructure in a suburban area of the Greater Dublin Area, irrespective of final design and location. It is confirmed, for the purpose of this analysis, that cable trenches will require to be 4m in width; in addition, it is envisaged that an 8m working width corridor will be required adjacent to the cable trench, thereby requiring an overall cable alignment width (permanent and temporary) of approx. 12m.

There are no roads within the receiving environment that could accommodate this width of construction corridor without significant temporary and/or permanent alteration, such as the removal of ditches, boundary vegetation, front gardens, walls and piers etc. Moreover, such roads would have to be closed for a considerable period of time, with potentially significant implications for traffic movements for both local access and commuter traffic. Overall, this would result in an impact of some significant scale and extent along the entire width of any UGC route.

It is currently considered that the UGC options, due to their size, scale and likely impact, are likely to require planning permission. If statutory consent is required, it is likely to be the subject of an application directly to An Bord Pleanála (ABP) as Strategic Infrastructure Development (SID). It is considered likely that, given the nature and extent of the development and its potential environmental and community impact, as well as the potential public interest in the proposed development, ABP would hold a full Oral Hearing in respect of a new 400 kV UGC development.

There is the potential for the UGC circuits to occur cross-country – i.e. away from public roads. This brings its own significant challenges in terms of landowner engagement and concerns, environmental and land use impacts – in particular the inability to undertake certain types of agricultural activity thereon.

It is assumed that significant engagement with landowners with properties along public roads would be required in the delivery of a new 400 kV circuit, for such purposes as surveying, siting and construction. These landowners may be new to accommodating electricity infrastructure on their landholdings. New temporary and permanent easements would be required to facilitate construction of the new circuit. Based on recent precedent in terms of the provision of new high-voltage UGC transmission infrastructure, there is the potential for significant landowner opposition to this option.

Having regard to all the above, this option is considered to have a moderate (**Dark Green**) impact in relation to the Supply Chain Constraints, Permits and Wayleaves criterion.

7.4.6 Conclusion of deliverability performance

There are five sub criteria considered when the overall deliverability performance is assessed. The UGC options have the best implementation timelines when compared to the other options under consideration. This is a benefit to these options as implementation timelines for any network reinforcement are important to be able to assure that the transmission network will be in compliance with security standards and that all consumers have a secure electricity supply.

It is likely that all of the UGC options would require planning permission or statutory consent, due to their size, scale and likely impact on the receiving environment. They would preferably be accommodated in the public road network and would require a 2.1 m cable trench and an additional working strip, thereby requiring an overall cable alignment width (permanent and temporary) of up to 12 metres in certain places. This could have significant impacts and may impact deliverability of these UGC options. Road closures and potentially significant implications for traffic movements for both local access and commuter traffic would be a factor for all the UGC options during construction

For a new 400 kV UGC from Woodland to Finglas, some of the aspects are considered to have high to moderate impact on the deliverability of the option. The aspects with the highest risks for these options are dependence on other projects and project plan flexibility. This option is deemed to have a high (**Dark Blue**) from a deliverability point of view.

Summary of deliverability performance of Option 2: Finglas - Woodland 400 kV UGC	
Implementation timelines	
Project plan flexibility	
Risk of untried technology	
Dependence on other projects	
Supply chain constraints, permits, wayleaves etc.	
Combined Deliverability Performance	

Table 28 Summary of deliverability performance for Finglas - Woodland 400 kV UGC option

7.5 Environmental Assessment

7.5.1 Biodiversity

There is a low to moderate (**Green**) risk of significant impacts on biodiversity as a result of this option. In the absence of mitigation, the greatest effects on biodiversity would be during construction, where despite cables primarily being laid in public roads, there is potential for impacts on hedgerows, tree lines and aquatic ecosystems; other habitats and species may also be disturbed or fragmented during the construction phase and effects could be permanent in some cases. There is also the potential for permanent loss of mature trees along the route, especially where roads are very narrow or where the UGC is required to cross fields and hedgerows off-road.

7.5.2 Soils and Water

There is a moderate (**Dark Green**) risk of significant impacts on soils and water as a result of this option. The greatest impacts would be during construction. The risk to water bodies from silt and spillages during the construction process would be Moderate as there are a number of waterbodies in the Finglas Study Area which would need to be crossed; it would not always be possible to use existing bridges for this purpose and in these cases, it would be necessary to go off-road and use other crossing techniques such as open cut trenches. There is also the potential for impacts on roadside ditches during construction.

7.5.3 Materials Assets - Planning Policy and Land Use

There is a low to moderate (**Green**) risk of significant impacts on planning policy and land use as a result of this option. This option supports the ambitions of local planning policy for new transmission infrastructure to be underground where possible. There is the potential for the sterilisation of land where a UGC crosses third party lands, however that would be limited as a result of the preference to use public roads. This preference also reduces the level of land take required, except at the connections into Woodland and Finglas: here there is the potential that the cable would have to be installed across third party land, requiring significant temporary land take during construction. This land take would be limited during operation, although a permanent wayleave and some restriction of agricultural practices above the UGC is likely.

7.5.4 Landscape and Visual

There is a low to moderate (**Green**) risk of significant impacts on landscape and views as a result of this option. The impacts would be greatest during construction, but this impact would be temporary in nature. During operation, the impacts would be limited. There would be visible joint boxes periodically along the UGC route, although these would be quite small. There may also be some requirement for third party land take and permanent loss of mature trees and hedgerows at points along the route and connections to the substations.

7.5.5 Cultural Heritage

There is a low to moderate (**Green**) risk of significant impacts on cultural heritage as a result of this option. The impacts on cultural heritage from the UGC would be greatest during construction, both in terms of ground disturbance and impacts on the settings of heritage assets. The crossing of third-party lands at the substations presents a greater risk to heritage assets, especially unknown archaeological assets, than installation in the regional road network.

7.5.6 Noise and Vibration

There is a low to moderate risk of significant impacts from noise and vibration as a result of this option. Potential noise and vibration impacts from the UGC would be during the construction phase and would result from the trench works, particularly in areas of hard-standing, such as along roads. However, the baseline noise environment along roads is higher than that of rural areas, and as such, the impact is not likely to be significant. There may be a slightly greater impact at Woodland substation due to the rural nature of the area, but appropriate noise screening will be provided to minimise any noise nuisance. No impacts are anticipated during the operational phase, as the cable will be buried.

7.5.7 Climate Change

There is a low to moderate (**Green**) risk of significant impacts on and from climate change as a result of this option. UGCs are reasonably resilient to the impacts of climate change, such as storms, wind, and rain, although changes in ground temperature and reduced moisture may have impacts on the efficiency of the cables. The volume of material required to construct an UGC between Woodland and Finglas is significant and carries with it associated embodied energy.

7.5.8 Summary of Environmental assessment of a new 400 kV UGC

The greatest risks to the environment from this option are on soil and water, owing to the high number of water bodies in the study area, the likelihood of having to come off-road to cross them in the more rural areas and the number of roadside ditches present. For other environmental aspects the risks are low to moderate that this option would cause significant impacts; for all topics any risk would be during construction and therefore of a temporary nature. UGC are in accordance with local planning policy ambitions and are more resilient to the impacts of climate change. As a result, this option has an overall low to moderate risk of significant impacts on the environment (**Green**).

Topic	Option 2 (New Finglas - Woodland 400 kV UGC)
Biodiversity	
Soil and Water	
Planning Policy and Land Use	
Landscape and Visual	
Cultural Heritage	
Noise and Vibration	
Climate Change	
Combined Environmental Performance	

Table 29 Summary of environmental assessment for Finglas - Woodland 400 kV UGC option

7.6 Socio-economic Assessment

7.6.1 Traffic and Transport

There is a moderate (**Dark Green**) risk of significant impacts on Traffic and Transport as a result of this option. It is EirGrid's preference to install UGC in the public road network. As a result, assuming an UGC rote would be largely in the public road, there are potentially very significant impacts on local and regional roads during its construction. Public roads in the Study Area vary in their widths, with some being only 4m wide, up to much wider regional roads of greater than 6m. Where routing is in more narrow roads, installation may necessitate whole road closures and diversions for short periods of time. In the wider roads, one carriageway may require to be closed, resulting in the need for traffic management measures. This would lead to driver and pedestrian delay; increased fear and intimidation for pedestrians, especially where there are no footpaths along the roads being used; and potentially severance of communities, community facilities and businesses if any roads need to close. There are also potential implications for businesses, with employees and goods experiencing delays.

7.6.2 Amenity

There is a low to moderate (**Green**) risk of significant impacts on amenity as a result of Option 2. As is set out in Section 6.6.2, amenity considers the combined impacts of traffic, views and noise during construction and views and noise during operation. There would be no impacts on noise and limited impacts on views in operation so only construction impacts are considered here. Noise impacts were considered to be low to moderate given the preference to use the public road network; whilst traffic impacts during construction may be significant, as described in Section 7.6.1, they are temporary in nature. In considering the combined amenity impact a greater weight is afforded to permanent. As a result, the risk would be low to moderate that significant impacts would occur.

7.6.3 Health

There is a low to moderate (**Green**) risk of significant impacts on health as a result of this option. Potential impacts relate to stress and anxiety associated with Traffic impacts, amenity impacts and 'nuisance' emissions such as noise. No significant impacts are anticipated from noise; there is a low to moderate risk of amenity impacts; and traffic impacts are moderate, Concerns relating to EMFs relating to electrical transmission lines can also lead to increased stress and health issues. There is no electric field above ground level of underground cables as the field is fully screened by the cable sheath. Magnetic fields from UGC drop rapidly with lateral distance. EirGrid's design standards require all OHLs to operate to existing public exposure guidelines from ICNIRP; recent studies (EirGrid 2014) show that surveyed existing underground cables are well below the ICNIRP reference level set to protect public health. Taking into account all of these factors, it is considered there would be a low to moderate risk of significant impacts to health as a result of this option.

7.6.4 Economy

Potential impacts on the economy from this option are considered to be positive but are of a low (**Cream**) risk, i.e., unlikely, to be significant for the local and regional economy. This is due to the likelihood that a small construction workforce is envisaged to be required to construct this option, and its atypical nature will also require construction workers to have particular skills and experience, making it harder for currently employed individuals to gain employment on the project. Similarly, supply-chain benefits are likely to positive but limited given the specialised nature of construction. During operation, potential impacts on the economy are anticipated to be positive (in the context of reinforcing the wider electricity network), albeit limited given the nature of the project.

7.6.5 Utilities

There is a low to moderate (**Green**) risk of significant impacts on utilities as a result of this option. It is EirGrid's preferred approach for UGC solutions, to use the existing road network (burying cables within the roads themselves) rather than within greenfield agricultural lands. As such, there is a greater potential to encounter pre-existing underground utilities than may otherwise be the case were an offline route to be taken or an OHL constructed. There are likely to be a number of underground utilities in the regional and local road network between Woodland and Finglas substations, including other electricity cables, telecommunication cables, sewers, and public and private water supplies. Whilst any utilities that are required to be altered or diverted would be done so at a time when disruption to the public would be reduced insofar as possible, and any disruption would be of a short duration, there is a reasonable likelihood of encountering other utilities during construction.

7.6.6 Summary of Socio-economic assessment

The greatest risk of this option, from a socio-economic perspective, is on Traffic and Transport. For other socio-economic topics the risk of significant impacts is considered to be low to moderate or low (economy). The impacts on traffic are not insubstantial, especially in the more urban areas of the study area; however, they are temporary in nature. As a result, this option has an overall low to moderate risk of significant impacts from a socio-economic perspective (**Green**).

Topic	Option 2 (New Finglas – Woodland 400 kV UGC)
Traffic & Transport	
Amenity	
Health	
Economy	
Utilities	
Combined Socio-Economic Performance	

Table 30 Summary of Socio-Economic performance for Finglas - Woodland 400 kV UGC option

7.7 Summary of the assessment for the Woodland to Finglas 400 kV UGC option

This option would involve constructing a new 400 kV UGC between Woodland 400 kV and Finglas 220 kV substations. This option is the best performing option in the environmental and socio-economic criteria compared to the other options. The technical criterion is the worst performing compared to other options, given the expansion or extendibility difficulties at Finglas 220 kV substation.

Having considered all of the five criteria, the outcome of the multi-criteria assessment indicates that the new Woodland to Finglas 400 kV UGC option (Option 2) does not perform very well, and it has been given a high impact (**Dark Blue**) on its overall performance.

Topic	Option 2: FIN - WOO 400 kV UGC
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Table 31 Overall Assessment outcome for the Finglas - Woodland 400 kV UGC option

8 New Belcamp to Woodland 400kV Overhead Line

This section describes the assessment of the new Belcamp to Woodland 400 kV OHL option against the five criteria, and their sub-criteria as described in Section 4.2. Each criterion is described in separate sections and a summary of the overall performance of the option is provided in Section 7.7.

The assessments for the environmental and socio-economic criteria have been carried out by Jacobs, and a summary of its findings are presented in this report. Jacobs' detailed reports of these assessments can be found on our website and the links can be found in Section 2.1.

8.1 Description of option

This option involves a transmission network reinforcement centred on strengthening the network between the existing Belcamp 220 kV substation in County Dublin and Woodland 400 kV substation in County Meath. These consist of:

- Construction of a new 400 kV overhead line linking Belcamp 220 kV station to Woodland 400 kV station. For the purpose of this investigation, we have assumed the length of the overhead line to be approximately 34 km;
- At the existing Belcamp 220 kV station a new 400 kV C-Type busbar, and one 400/220 kV transformer. The new 400 kV station development must be capable of accommodating a future second 400/220 kV transformer and future additional 400 kV circuits, and expansion of the station to an enhanced ring busbar.
- At the existing Belcamp 220 kV station new 220 kV transformer bay will be required to connect the new 400/220 kV transformer.
- At the existing Woodland 400 kV station a new line bay will be required to connect the new circuit.

8.2 Technical Performance

8.2.1 Compliance with health and safety standards

Please refer to Section 4.2.1 for a detailed description. The new Belcamp – Woodland 400 kV OHL option will be compliant with the relevant safety standards and is considered to have a low (**Cream**) risk of not complying with health and safety standards.

8.2.2 Compliance with Security and Planning Standards

The security standards of the transmission network are defined in the following:

- The Transmission System Security and Planning Standards (TSSPS); and
- The Operational Security Standards (OSS).

These standards will ensure that the system is planned and operated in a manner which adheres to system security and integrity, and reliability of supply criteria.

The new Belcamp – Woodland 400 kV OHL option proposed will comply with the relevant system reliability and security standards referenced above. Although the option will meet the minimum technical requirements, certain aspects may differentiate the option's technical performance compared to other options. A high-level summary of the technical aspects considered and investigated is presented below.

The need analysis indicated that, without mitigation, single contingencies (the unexpected loss of a circuit or piece of equipment), of either of the existing 220 kV circuits between Woodland and Corduff or Clonee, would lead to power flows in excess of the capacity of those circuits. The analysis indicated that generation redispatch to increase conventional generation in North Dublin would be required to mitigate the overloads. This issue was shown to worsen as demand in Dublin increases.

When the new Belcamp – Woodland 400 kV OHL option is added to the system model, the analysis indicates an improvement in these issues by removing the expected overloads between Woodland and Corduff or Clonee.

An assessment was undertaken into keeping the transmission network within standards following a loss of plant and equipment while another is out for planned maintenance. Maintenance is carried out annually during March to October. For planned outages, some re-dispatch of generation is allowed, but this should be kept to a minimum to ensure the most cost-effective generation is dispatched.

The assessment determined the worst case to manage was planned maintenance on the new Belcamp – Woodland 400 kV OHL. This requires generation redispatch within allowed limits to manage a subsequent unplanned loss of transmission equipment. Without redispatch the issues identified in the need assessment would be experienced, with the unplanned loss of the Corduff – Woodland 220 kV circuit leading to a loading of 146% on Clonee - Woodland. This is an improvement on the issues indicated in the needs assessment, which showed that during a maintenance and trip combination the Clonee – Woodland circuit could expect an overload of 172% depending on dispatch conditions.

When all aspects are considered, the new Belcamp – Woodland 400 kV OHL option is considered to have good compliance when assessed against the above standards and hence has been given a low impact (**Cream**) in the assessment.

8.2.3 Reliability performance

This criterion has been assessed using three inputs namely unplanned outages, planned outages and the time it takes to repair the circuit. The collective impact of these provides an indication of the annual availability of the asset. The reliability and outages of the station equipment associated with the circuit is assumed to be same for all options and is therefore not included in this analysis.

The statistics for reliability are based on EirGrid's and international failure statistics, the mean time to repair and the availability in days per 100 km per year for OHL and UGC. It has been assumed that the new OHL circuit will be approximately 34 km in length for the purpose of this assessment.

There are 439 km of existing 400 kV OHLs in Ireland. This length of 400 kV OHL is too small a sample for determining meaningful performance statistics.

Meaningful statistics can, however, be obtained by considering the fault statistics of the combined quantity of 400 kV, 275 kV and 220 kV OHLs (approximately 2317 km) in the All-Island transmission system.

Unplanned Outages:

Almost all OHL faults are of short duration as a result of transient faults such as lightning strikes. If an auto-reclose function is provided for the protection of the line, it will restore the circuit shortly after the fault, generally in 0.5 – 3 seconds. Even if the line suffers physical damage, faults can be rapidly located and identified by visual inspection from the ground or air, and repairs effected in a matter of hours. Transmission system statistics indicate that 91.7 % of overhead line outages lasted less than one day[27].

Taking the fault statistics of the above combined network length of OHL for the period 2004 to 2020, gives a projected fault rate of 0.54 unplanned outages/100km/year.

Given typical repair times, this would equate to the circuit being out of service due to a permanent fault for 8 approx. hours per annum. The average failure rates during normal operation, average repair times and availabilities of the main elements of a typical 400 kV OHL are set out in Table 32 and adjusted to reflect the length of the proposed option.

Transient faults are not considered, as any interruptions to supply that they may cause would be of such short duration that their effect is considered to be negligible, despite acknowledging this may be an inconvenience for electricity users.

Planned outages:

Planned outages are normally associated with routine maintenance. For a 400 kV OHL, much of the required routine maintenance can be completed without an outage of the circuit. The planned outage rates and the typical outage durations taken from our maintenance policies[26] result in an annual planned outage rate of 0.65% for the 400 kV option, or circa 2.5 days per annum[27].

Combination of the planned and unplanned outages:

Due to the length of the new OHL circuit (approximately 34km), the total unplanned outage time per year is circa 9 hours, which combined with the planned outage rate of 2.5 days sums to a total of 3 days per annum (rounded to nearest half day).

Parameter	Average statistics for 400 kV & 220 kV OHL combined
Reliability (Unplanned outages/34km/year)	0.18
Mean time to repair (days)	Circa 2 days
Unplanned Outages (combined) Unavailability due to disturbance (h/34km/year)	0.34 days (c.9 hours)
Planned Outages	2.5 days
Total Annual Unavailability (days/34km/year)	3 days

Table 32 Average failure statistics for a 34km 400kV or 220kV OHL

[26] EirGrid, Analysis of Disturbance and Faults 2018, System Performance, April 2019
[27] EirGrid, Transmission Engineering Maintenance Statistics

The availability rate for the new Belcamp – Woodland 400 kV OHL option is high at 99.2% over any given year and this OHL option is deemed to have a low risk of introducing additional reliability issues in the system (**Cream**).

8.2.4 Headroom

The new 400 kV OHL option accommodates a similar amount of large-scale demand in the Dublin and Mid-East region compared to the other options.

The assessment indicates that the new Belcamp – Woodland 400 kV OHL option creates headroom (increases the amount of additional large-scale demand that could be accommodated) of approximately 275 – 300 MW compared to no reinforcement, depending on which scenario is analysed.

The new Belcamp – Woodland 400 kV OHL option performs well in the headroom criteria compared to the other options and is deemed to have a moderate (**Dark Green**) performance in terms of headroom.

8.2.5 Expansion or extendibility

The new Belcamp – Woodland 400 kV OHL option is based on Overhead Line (OHL) technology and has a thermal capacity[28] equivalent to the existing 400 kV circuits. The option provides a platform for future demand or generation development within the east of the country.

In the event that another connection along the circuit would be required, this could be achieved by constructing another substation which could be connected into this line. This is a very common way to expand the transmission network and is normally technically feasible and achievable, depending on the required connection size.

The planned expanded Belcamp site will have sufficient space for the initial 400 kV busbar and transformer required, as well as any future needs for an expansion to the busbar and any additional 400/220 kV transformers or further 400 kV circuits.

As such, this option has the potential to provide a base for any further expansion of the transmission network and the option offers a low to moderate (**Green**) difficulty to accommodate potential future expansion.

[28] Thermal capacity of existing 400 kV OHL is a winter rating of 2963 A and summer rating of 2506A based on conductor 2 x 600 mm2 ACSR CURLEW at 80°C,

8.2.6 Repeatability

Overhead Line (OHL) technology is already in use on the Irish transmission system with more than 4,500 km of circuit length. This criterion is assessed on a technical basis and there are few technical issues with OHL technology that would introduce additional system integration, operational, and maintenance complexity that would affect the repeatability of OHL circuits on the Irish transmission system. There may of course be other challenges with OHL technology, but they are assessed under other criteria.

Similarly, substations using both Air Insulated and Gas Insulated switchgear are already used extensively in the Irish transmission system and so will not introduce additional system integration, operational, and maintenance complexity that would affect the repeatability of the technology on the Irish transmission system.

This option is considered to have a low risk of not meeting the repeatability criteria (**Cream**).

8.2.7 Technical operational risk

The new Belcamp – Woodland 400 kV OHL option is based on Overhead Line (OHL) and Air or Gas insulated substation switchgear technology. This technology is tried and tested internationally and in Ireland and it is considered to have a low operational risk. This option is therefore considered lowest on the difficult/ risk scale (**Cream**) in terms of operational risk.

8.2.8 Conclusion of technical performance

This option is considered to perform well when all of the technical sub-criteria are considered and hence has been given a low to moderate impact (**Green**) in the assessment.

Summary of technical performance of the Belcamp – Woodland 400 kV OHL option	
Health and Safety Standard compliance	
Security & Planning Standard compliance	
Reliability performance	
Headroom	
Expansion or Extendibility	
Repeatability	
Technical Operational risk	
Combined Technical Performance	

Table 33 Summary of technical performance for the new Belcamp - Woodland 400 kV OHL option

8.3 Economic Assessment

The economic performance of the options is represented using our colour scale with the individual performance of an option assessed relative to the performance of the other solution options.

8.3.1 Input cost to the economic appraisal

8.3.1.1 Pre-engineering cost

The pre-engineering costs are estimated to be €10 million. In the economic appraisal, a contingency provision of 5% has been applied to this amount.

The phasing of the pre-engineering costs is as follows:

Phasing of Pre-Engineering Spend– New Belcamp – Woodland 400 kV OHL					
2022	*2023*	*2024*	*2025*	*2026*	*2027*
16%	45%	15%	15%	8%	0%

Table 34 Phasing of pre-engineering spend for new Belcamp - Woodland 400 kV OHL

8.3.1.2 Implementation cost

The capital investment required to deliver the new Belcamp – Woodland 400 kV OHL option is estimated to be €131.8 million. A provision for Transmission System Operator (TSO) related implementation cost and landowner payments, proximity allowance and local community fund has been included in this cost. In the economic appraisal, a contingency provision of 10% has been applied to this amount. The estimated implementation cost is categorised into its general components and is summarised in Table 35.

Categorised implementation cost – New Belcamp – Woodland 400 kV OHL	
Cost category	**Implementation cost (€m)**
Overhead line	40.1
Underground cable	N/A
Stations	69.1
Other (flexibility & proximity payments and other allowances)	10.6
SUB-TOTAL	119.8
Contingency (10%)	12.0
TOTAL	131.8

Table 35 Categorised implementation cost for new Belcamp - Woodland 400 kV OHL

The phasing of the implementation costs is as follows:

Phasing of implementation spend – New Belcamp – Woodland 400 kV OHL										
2026	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**
10%	25%	20%	10%	10%	10%	5%	5%	5%	0%	0%

Table 36 Phasing of implementation cost spend for new Belcamp - Woodland 400 kV OHL

8.3.1.3 Life-cycle cost

This sub-criterion consists of three separate inputs incurred over the useful life of the option, namely operation and maintenance cost, electrical losses and replacement cost.

The equipment associated with the new Finglas – Woodland 400 kV OHL option is expected to be maintained in accordance with the well-established existing practices. The operation and maintenance cost varies over the assets' lifetime and as such three periods of approximate costs are assumed. Table 37 displays rounded figures to the nearest thousand. No replacement cost is assumed as the equipment has a life expectancy of 50 years which is line with the period for the economic assessment.

Life-cycle cost for New Belcamp – Woodland 400 kV OHL		
Annual Operation and maintenance cost (€k)	0-20 year period	€327k
	21-40 year period	€493k
	41-50 year period	€245k
Annual Electrical losses cost (€M)	€3.8M	
Replacement cost	N/A	

Table 37 Life-cycle cost for the new Belcamp - Woodland 400 kV OHL option

8.3.1.4 Cost to Single Electricity Market

As described in Section 4.2.2, Economic performance criteria, the cost to the Single Electricity Market represents the cost for the periods when the reinforcement is unavailable. The unavailability is based on the reliability performance of the option. This is a cost to the single electricity market and is calculated as a combination of the benefit in production cost saving (project benefit) and reliability performance of the option.

The reliability performance of the option is taken from Section 7.2.3 Reliability. The production cost savings assessment used the TES 2019 scenarios and as such a range of annual production cost savings are used in the assessments as the different scenarios have different demand and generation patterns. Table 38 show the input for this criterion.

Cost to Single Electricity Market for Belcamp – Woodland 400 kV OHL option	
Annual Production cost saving (Benefit) (€m/annum)	Range €-1.2m to €17.8m
Annual unavailability of option during which benefits cannot be attributed	Unavailable for 3 days, available 99.18%
Annual Cost (saving) to SEM	Range €-1.2m to €17.7m

Table 38 Cost to Single Electricity Market for the new Belcamp - Woodland 400 kV OHL option

8.3.2 Economic performance for the new Belcamp – Woodland 400 kV OHL option.

When all of the above costs and savings are considered, the economic result of the new Belcamp – Woodland 400 kV OHL option indicates a good result compared to the other options and hence is considered to have a low to moderate (**Green**) impact on the economic result. To be able to differentiate between competing options in a measured way and to check the options' performance in different credible future energy scenarios, a robustness and sensitivity test was carried out. The objective is to identify the option that is impacted the least in its economic result for a range of credible future energy scenarios. This robustness test indicates a stable performance compared to the other options independent from which future energy scenario is used in the assessment.

After considering both the economic result and the robustness test, the new Belcamp – Woodland 400 kV OHL is considered to provide a good economic performance in comparison with the other options hence has been given a low to moderate impact (**Green**) in the assessment.

Summary of economic performance of the new Belcamp – Woodland 400 kV OHL option	
Economic result	
Robustness	
Combined Economic Performance	

Table 39 Summary of economic performance for new Belcamp-Woodland 400kV OHL option

8.4 Deliverability

8.4.1 Implementation timelines

The expected timeline for implementation of the 400 kV overhead line option from Woodland to Belcamp is a period of 16 years in total. This time frame can be divided into two phases.

The first phase is based on 5.25 years for the outline design, environmental assessment and the planning process, and would be subject to the outcome of the consenting process.

The second phase is 10.75 years and includes detailed design, procurement of materials and construction works. This assumption includes time for the design to be confirmed, all landowner consents to be obtained by EirGrid including the use of compulsory acquisition powers if necessary, and materials procurement in the first 5.75 years of this period.

This includes a period of one (1) year to allow for a modification of the approved planning permission, which in EirGrid's experience of grid development is a normal process, as the permitted development is subject to detailed design and the accommodation where possible of landowner preferences for tower siting. The time to construct the OHL (five (5) years) includes construction access, foundation works, tower erection and stringing which would include sections that require transmission outages.

The design works, material procurement and construction period for the works required in the existing substations has been incorporated into the above timeline for the OHL works. The timeline for new 400 kV bay at Woodland 400 kV substation is estimated at

1.5 years. At Belcamp station a new 400 kV GIS substation is required, this is estimated to take 2.5 years.

The implementation timeline for the 400 kV OHL option is the second longest option. The impact of the implementation timelines is assessed to be high (**Dark Blue**) for the 400 kV OHL option.

8.4.2 Project plan flexibility

Route corridors for the OHL would be developed in Step 4 of our grid development process and would factor in constraints in the study area. Within the corridors, there would be a reasonable level of flexibility to identify the OHL routes. Once the route options have considered all the constraints, an emerging preferred OHL route would be the basis for the planning submission. The preferred route would be designed within the identified corridor and the design would consider the access routes for construction, stringing locations and tree cutting requirements. The design would be completed to a level that we would consider the foundation requirements and would identify all the requirements for the line construction. There would be very little flexibility on the route once the planning consent is in place. Some of the tower locations may have the potential for minor modifications, which could require a modification to the planning consent. Access routes to the tower locations would also form part of the planning consent and changes to these would also require modification to the planning consent. The 400 kV OHL option is assessed to have a high (**Dark Blue**) impact on the project plan flexibility compared to the other options.

8.4.3 Risk to untried technology

OHL technology is tried and tested in Ireland and internationally. This technology is considered international best practice and is a proven technical solution for transmission of high-voltage electricity. It is the technology around which the transmission network in Ireland has been developed to date. Nevertheless, it has been some time since new 400 kV infrastructure was built in Ireland in the 1980's and therefore it is not without some technological risk. Overall, this option is considered to have a moderate (**Dark Green**) risk in relation to this sub-criterion when compared to the other options.

8.4.4 Dependence on other projects (outages)

This option has a number of elements which would require planned outages.
The required work in both Woodland and Belcamp substations would need proximity and commissioning outages. In Woodland, the work is in relation to the construction of the 400kV bay, which is included in CP1194 Woodland 400 kV redevelopment project.

In Belcamp, the work involves the construction of a 400 kV GIS substation. Other on-going projects in both these substations may cause conflicting outages depending on the projects' individual programmes and this would have to be taken into consideration and could have impacts on granting necessary outages. There are efforts ongoing to masterplan substations elements, but this has not yet been developed for Belcamp.

The impact on the dependence on other projects for the 400 kV overhead line option is considered to be at a high to moderate (**Blue**) level.

8.4.5 Supply chain constraints, permits, wayleaves

For the purposes of this analysis, it is assumed that 400 kV structures, apparatus and equipment would be equivalent, if not similar in terms of nature and extent of materials, to that being planned and procured for the North South Interconnector (NSIC) development.

There are no significant supply chain constraints envisaged, with standard procurement and design timelines and scopes involved. Permitting is likely to be very challenging, with the provision of new 400 kV OHL infrastructure in what can be described as a peri-urban commuter belt of the Greater Dublin Area, irrespective of final design and location. The Woodland substation is also the terminus of the existing Moneypoint – Woodland 400 kV OHL circuit, and the permitted North-South Interconnector (NSIC) 400 kV OHL. Based on established precedent, the infrastructure development comprising the provision of a new 400 kV OHL circuit is likely to be the subject of an application directly to An Bord Pleanála (ABP) as Strategic Infrastructure Development (SID). Given the nature of the proposed development as comprising a new 400 kV OHL circuit, the planning application would be subject to Environmental Impact Assessment (EIA). These factors make it almost inevitable that ABP would hold a full Oral Hearing in respect of a new 400 kV OHL development. A new 400 kV OHL circuit would need to be located on a new alignment. This would result in potentially significant environmental and social impacts on receiving environments and communities, including biodiversity, land use activities, and visual impacts. Social impacts may include community concerns regarding the provision of new large-scale OHL within an area. Significant engagement with landowners and communities would be required in the delivery of the new circuit, for such purposes as surveying, siting and construction. These parties may be new to accommodating electricity infrastructure on their landholdings and within their communities. New wayleaves would be required to facilitate construction of the new circuit. Based on recent precedent in terms of the provision of new 400 kV transmission infrastructure, there is the potential for significant landowner, community and public concerns with this option, with the likely consequence of project delays or difficulties in gaining access to land. Having regard to all the above aspects, the 400 kV OHL option is deemed to have a significant (**Dark Blue**) impact and risk in terms of Supply Chain Constraints, Permits and Wayleaves.

8.4.6 Conclusion of deliverability performance

There are five aspects considered when the overall deliverability performance is assessed. For Option 1, an OHL to Finglas, most of these aspects indicate a high significance. This means that overall, this option is considered significantly challenging to deliver, with some risks and unknown technical issues that will have to be solved during the subsequent stages of project development.

The implementation timeline for any network reinforcement is important to be able to ensure that the transmission network will be in compliance with security standards and that all consumers have a secure electricity supply. The time it takes to develop, and construct reinforcements is also important in terms of accommodating new generation and demand that would like to connect to the system.

This option has a long implementation timeline compared to the UGC options and this, in combination with the perceived risk of delays due to societal acceptance, means this option does not perform well from a deliverability point of view and this has been taken into account in the overall assessment of this option.

When all of these deliverability aspects are considered, this option is deemed to have high impact (**Dark Blue)** from a deliverability point of view.

Topic	Option 3 (New Woodland to Belcamp 400 kV OHL)
Implementation timelines	
Project plan flexibility	
Risk of untried technology	
Dependence on other projects	
Supply chain constraints, permits, wayleaves etc.	
Combined Deliverability Performance	

Table 40 Summary of deliverability performance for the new Belcamp - Woodland 400 kV OHL option

8.5 Environmental

This assessment was carried out by Jacobs and a summary of its findings are presented in this report. The detailed Jacobs report (321084AJ-REP-004 – CP1021 Environmental Constraints report) is available on our website – see Section 2.1 for the link.

8.5.1 Biodiversity

There is a high (**Dark Blue**) risk of significant impacts on biodiversity as a result of this option. There is potential for impacts on protected sites as all of the water bodies in the study area are hydrologically connected to European designated sites on the coast at relatively close proximity as a connection approaches Belcamp substation, especially if it were to be routed from the north across the estuary at Malahide. There will be a permanent loss of habitat within the footprint of the pylons and as a result of a loss of some mature trees and there is a collision risk to birds migrating across the study area. These risks are greater than for Option 1 as the route is longer and is closer to designated sites and bird migratory routes. Although literature suggests that bird collisions with power lines are generally considered to be rare events, there is still potential for collision risk to bird species from the new OHL in addition to disturbance leading to displacement.

8.5.2 Soils and Water

There is a low to moderate (**Green**) risk of significant impacts on soils and water as a result of this option. The impacts would be only likely to occur during construction. These impacts would be fairly limited as Option 3 would aim to avoid designated water bodies and excavations would be limited to new pylon foundations. Short access tracks from local roads would be used, where possible, and would require minimal soil strip in site preparation. However, all water bodies in the study area are connected to designated sites on the coast and the potential for impacting these during construction increases as any OHL route approaches Belcamp. In addition, the increased size of the study area, length of the OHL and number of pylons required increases risks to water bodies for this option compared to Option 1.

8.5.3 Material Assets - Planning Policy and Land Use

There is a moderate (**Dark Green**) risk of conflict with planning policy and significant impacts on land use as a result of this option. There are some potential interactions with plan zonings within the Finglas Study Area; plan policies are broadly in support of electricity conveyance improvement and reinforcement development within the Finglas Study Area, however, it is possible that Option 3 would not fully accord with county planning policies, as new structures are proposed and there is a preference for new transmission connections to be underground. Perceived and actual impacts on land values may present significant constraints both in rural and urban areas. With careful routeing of OHL in consultation with communities and landowners, the risk of impacts would be reduced.

There is little scope for installing OHL in public roads however as there is for UGC so almost all of the land use would be 3rd party lands. New OHL corridors would require limited and temporary land take for construction, with short access tracks from local roads being used, wherever possible. Permanent land take would be limited to the footprint of the OHL pylons. There would however be a small number of significant impacts on particular parcels of land during the operational phase due to potential land use restrictions.

8.5.4 Landscape and Visual

There is a high (**Dark Blue**) risk of significant impacts on landscape and views as a result of this option. The potential for significant visual impacts in particular is identified and these would be permanent. Whilst sensitive landscapes, viewpoints and main settlements would be avoided where possible the length of this route and the high number of viewpoints which may be affected as a result means the risk of significant visual impacts remains high.

8.5.5 Cultural Heritage

There is a moderate to high (**Blue**) risk of significant impacts on cultural heritage as a result of this option. There would be a combined impact of the potential to encounter unknown archaeological assets during construction and the potential to impact the setting of built heritage assets during operation. Of these two potential impacts, however, the more significant impacts would be likely to arise on the setting of heritage features during operation. The increased length of this option and the subsequent requirement of a greater number of pylons and the potential for impacting the setting of more historic assets means there is a higher risk of significant impacts from this option than for Option 1.

8.5.6 Noise and Vibration

There is a low to moderate (**Green**) risk of significant impacts from noise and vibration as a result of this option. The construction of a new OHL and associated pylons would be likely to generate noise and vibration, most notably from works for pylon foundations. This noise impact would be temporary. There may also be some low levels of noise associated with the OHLs during operation. There is likely to be a greater impact in the area of Woodland substation due to its rural nature.

8.5.7 Climate Change

There is a moderate to high (**Blue**) risk of significant impacts to and from climate change as a result of this option. The OHL would be vulnerable to predicted future climate impacts associated with storms and winds and increased rainfall. Damage done could be difficult to repair as a result of increased flooding. This is a long-term risk and one that is predicted to increase over time. This would impact security of supply. This is an increased risk compared to option 1 because of the increased length of the route. The volume of material required to construct an OHL between Woodland and Finglas is significant and carries with it associated embodied energy. This would be greater than for Option 1.

8.5.8 Summary of Environmental assessment of the Woodland – Belcamp 400 kV OHL option

The greatest risks to the environment from this option are on Biodiversity and Landscape and Visual, owing to the high number of water bodies in the study area, the likelihood of having to come off-road to cross them in the more rural areas and the number of roadside ditches present. For other environmental aspects the risks are low to moderate that this option would cause significant impacts; for all topics any risk would be during construction and therefore of a temporary nature. UGC are in accordance with local planning policy ambitions and are more resilient to the impacts of climate change. As a result, this option has an overall low to moderate risk of significant impacts on the environment (**Green**).

Topic	Option 3 (New Belcamp to Woodland 400kV OHL)
Biodiversity	
Soil and Water	
Planning Policy and Land Use	
Landscape and Visual	
Cultural Heritage	
Noise and Vibration	
Climate Change	
Combined Environmental Performance	

Table 41 Summary of Environmental assessment of the new Belcamp - Woodland 400 kV OHL option

8.6 Socio-Economic

This assessment was carried out by Jacobs and a summary of their findings are presented in this report.

8.6.1 Traffic and Transport

There is a moderate to high (**Dark Green**) risk of significant impacts on Traffic and Transport as a result of this option. The greatest impacts to Traffic and Transport would be during construction as a result of construction traffic using local and regional roads as haul routes and accessing points to construction compounds or other construction installations. Such an occurrence could lead to driver and pedestrian delay; increased fear and intimidation for pedestrians, especially where there are no footpaths along the roads being used; and potentially severance of communities, community facilities and businesses if any roads need to close. Whilst impacts are temporary and comprise of construction traffic only, with no lengthy road closures anticipated, construction over a period of two years in an area as densely populated and congested as the study area would have a potentially significant impact on local traffic. In the wider study area to Belcamp there are four motorways and Dublin Airport. Construction traffic would be using these and regional roads. The longer route to Belcamp as compared to Option 1 to Finglas increases the risk of significant impacts.

8.6.2 Amenity

There is a high (**Dark Blue**) risk of significant impacts on amenity as s a result of this option. When considering the relative impacts identified for each of these topics in the assessment and then combining them, consideration is also given to the temporary or permanent nature of the impacts: Landscape and views are at a high risk of significant impacts and this is a permanent impact.; traffic impacts would be temporary only, albeit over a long period of time; noise impacts would occur in both construction and operation but are not considered to be significant. The longer route to Belcamp as compared to Option 1 to Finglas increases the risk of significant impacts compared to that option. As a result, and taking a precautionary approach, the combined assessment considers that there is a high risk of impacts on amenity.

8.6.3 Health

There is a low to moderate risk (**Green**) of significant impacts on health as a result of this option. Potential impacts relate to stress and anxiety associated with Traffic impacts, amenity impacts and 'nuisance' emissions such as noise. No significant impacts are anticipated from noise there is a moderate to high risk of amenity impacts which could lead to stress and anxiety, Concerns relating to EMFs relating to electrical transmission lines can also lead to increased stress and health issues. EirGrid's design standards require all OHLs to operate existing public exposure guidelines from ICNIRP and as such there should be no direct impact from EMFs; despite this EMFs are likely to remain a concern for local communities. This has been demonstrated in a number of public consultations. As a result, there remains a low to moderate risk to health as a result of this option.

8.6.4 Local Economy

There is a low (**Cream**) risk of significant impacts on the economy as a result of this option. In terms of employment, during construction the workforce would be relatively small in the context of the local and regional economy; it is likely to require specialist labour which may not be available locally. In operation there would be limited scope for employment opportunities. In terms of expenditure, there would be positive impacts on the local and regional economy, but this would be relatively low in magnitude. Specialist equipment is likely to be required from outside of the study area. In terms of potential impacts on the operation of Dublin Airport, beyond those related to road congestion, it is not considered there would be a significant impact. Development in the vicinity of airports is subject to a number of restrictions and an OHL would be subject to the same, to ensure the safe and continued operation of the airport.

8.6.5 Utilities

There is a low (**Cream**) risk of significant impacts to third party utilities as a result of this option. Above and below ground utilities are the same as those described for option 1, with the addition of more 110kV and 220kV connections. At Belcamp 220kV substation there is a 200kV UGC connection to Finglas and some local 110kV UGC connections. In addition to these, there are many 38kV and lower voltage OHLs criss-crossing the study area. Third party utility surveys will be undertaken prior to excavation for pylon foundations, thereby removing the risk of impacting underground cables, water supply pipes, private water sources or wastewater treatment systems.

8.6.6 Summary of Socio-economic assessment of the Finglas – Woodland 400 kV OHL option

The greatest risks from a socio-economic perspective from this option are to amenity. Risks to the economy and utilities are low; Traffic and Transport and health risks are considered to be moderate and moderate to low respectively. The risk to amenity is as a result of the significant.

Topic	Option 3 (New Belcamp to Woodland 400kV OHL)
Traffic & Transport	
Amenity	
Health	
Economy	
Utilities	
Combined Socio-Economic Performance	

Table 42 Summary of socio-economic performance for the new Belcamp - Woodland 400 kV OHL option

8.7 Summary of the assessment for the Woodland to Belcamp 400 kV OHL option

This option would involve constructing a new 400 kV OHL between Woodland 400 kV and Belcamp 220 kV substations. This option is the best performing option in none of the criteria compared to the other options. The environmental and socio-economic criteria are the worst performing compared to other options, given the specific environmental and visual sensitivities of the areas surrounding Belcamp 220 kV substation.

Having considered all of the five criteria, the outcome of the multi-criteria assessment indicates that the new Woodland to Belcamp 400 kV OHL option (Option 3) does not perform very well, and it has been given a high impact (**Dark Blue**) on its overall performance.

Topic	Option 3: BEL – WOO 400 kV OHL
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Table 43 Overall assessment outcome for the new Belcamp - Woodland 400kV OHL option

9 New Belcamp to Woodland 400kV Underground Cable

This section describes the assessment of the new Belcamp – Woodland 400 kV UGC option against the five criteria, and their sub-criteria as described in Section 4.2. Each criterion is described in separate sections and a summary of the overall performance of the option is provided in Section 7.7.

The assessments for the environmental and socio-economic criteria have been carried out by Jacobs, and a summary of its findings are presented in this report. Jacobs' detailed reports of these assessments can be found on our website and the links can be found in Section 2.1.

Due to the nature of UGC, additional investigations were carried out to better inform the assessment from a feasibility and technical point of view. There are certain aspects that we need to understand before an UGC option can be deemed feasible. For instance, the power carrying capacity (rating) of the cable is dependent on how it is laid in the ground.

These investigations included a high-level feasibility study to determine if indicative feasible routes (which achieve adequate capacity ratings) can be found in the road network in the study area and what type of obstacles the cables may have to cross. Jacobs carried out this assessment and its detailed report (321084AJ-REP-002 Rev A03 – Cable Feasibility Report) can be found on our website – see Section 2.1 for the link.

Also, other technical behaviours of UGCs had to be examined to avoid the cables causing damage to other electrical equipment once installed. These investigations included cable integration studies and indicative reactive compensation requirements, harmonic filter requirements, and temporary overvoltage assessments (TOV).

PSC carried out these assessments and its detailed report (Capital Project 1021 East Meath to North Dublin Grid Upgrade Cable Studies, EIR-014270, Rev 3, 7th June 2022) can be found on our website.

Further investigations will have to be carried out in relation to these issues if any of the underground cable options are brought forward to Step 4 to reflect the actual route and parameters of the cable option.

9.1 Description of option

This option involves a transmission network reinforcement centred on strengthening the network between the existing Belcamp 220 kV substation in County Dublin and Woodland 400 kV substation in County Meath. This consists of:

- Construction of a new 400 kV underground cable linking a new 400 kV busbar at the existing Belcamp 220 kV station to Woodland 400 kV station. For the purpose of this investigation, we have assumed the length of the cable to be approximately 45 km;
- At the existing Belcamp 220 kV station a new 400 kV C-Type busbar, and one 400/220 kV transformer will be built. The new 400 kV station development must be capable of accommodating a future second 400/220 kV transformer and future additional 400 kV circuits, and expansion of the substation to an enhanced ring busbar.
- At the existing Belcamp 220 kV station, a new 220 kV transformer bay will be required to connect the new 400/220 kV transformer.
- At the existing Woodland 400 kV station a new line bay will be required to connect the new circuit.
- Reactor compensation of c.100 MVAr at each station end of the new cable circuit will be required. The size of the reactor will be verified in further cable integration studies when circuit route and cable type are selected in later steps of the Six Step process.

9.2 Technical Performance

9.2.1 Compliance with health and safety standards

Please refer to Section 4.2.1 for a detailed description. The new Belcamp – Woodland 400 kV UGC option will be compliant with the relevant safety standards and is considered to have a low (**Cream**) risk of not complying with health and safety standards.

9.2.2 Compliance with Security and Planning Standards

The security standards of the transmission network are defined in the following:

- The Transmission System Security and Planning Standards (TSSPS); and
- The Operational Security Standards (OSS).

These standards will ensure that the system is planned and operated in a manner which adheres to system security and integrity, and reliability of supply criteria.

The new Belcamp– Woodland 400 kV UGC option proposed will comply with the relevant system reliability and security standards referenced above. Although the option will meet the minimum technical requirements, certain aspects may differentiate the option's technical performance compared to other options. A high-level summary of the technical aspects considered and investigated is presented below.

The need analysis indicated that, without mitigation, single contingencies (the unexpected loss of a circuit or piece of equipment), of either of the existing 220 kV circuits between Woodland and Corduff or Clonee, would lead to power flows in excess of the capacity of the remaining of the two circuits. The analysis indicated that generation redispatch to increase conventional generation in North Dublin would be required to mitigate the overloads. This issue was shown to worsen as demand in Dublin increases.

When the new Belcamp – Woodland 400 kV UGC option is added to the system model, the analysis indicates an improvement in these issues by removing the expected overloads between Woodland and Corduff or Clonee.

An assessment was undertaken into keeping the transmission network within standards following a loss of plant and equipment while another is out for planned maintenance. Maintenance is carried out annually during March to October. For planned outages, some re-dispatch of generation is allowed, but this should be kept to a minimum to ensure the most cost-effective generation is dispatched.

The assessment determined the worst case to manage was planned maintenance on the new Belcamp – Woodland 400 kV UGC. This requires generation redispatch within allowed limits to manage a subsequent unplanned loss of transmission equipment. Without redispatch the issues identified in the need assessment would be experienced, with the unplanned loss of the Corduff – Woodland 220 kV circuit leading to a loading of 146% on Clonee - Woodland. This is an improvement on the issues indicated in the needs assessment, which showed that during a maintenance and trip combination the Clonee – Woodland circuit could expect an overload of 172% depending on dispatch conditions.

When all aspects are considered, the new Belcamp – Woodland 400 kV UGC option is considered to have good compliance when assessed against the above standards and hence has been given a low impact (**Cream**) in the assessment.

9.2.3 Reliability performance

This criterion has been assessed using three inputs namely unplanned outages, planned outages and the time it takes to repair the circuit. The collective impact of these provides an indication of the annual availability of the asset. The reliability and outages of the station equipment associated with the circuit is assumed to be same for all options and is therefore not included in this analysis.

The statistics for reliability are based on EirGrid's and international failure statistics, the mean time to repair and the availability in days per 100 km per year for UGC. It has been assumed that the new Belcamp – Woodland 400 kV UGC circuit will be approximately 45 km in length for the purpose of this assessment.

Unplanned Outages*:*

As mentioned in Section 8.2.3, almost all faults on OHLs are of short duration as a result of transient faults. If an auto-reclose function is provided for the protection of the OHL, it will restore the circuit shortly after the fault. Auto-reclose is not available for faults on UGC and as such faults are considered to be long-lasting and will not be re-energised until an investigation has been undertaken. Consequently, when a cable fault occurs, finding a fault location and resolving it can result in prolonged circuit outages. As such, cable circuits have a lower availability than OHLs because of the prolonged outage times in the event of a fault.

There is only 1 km of existing 400 kV UGC in Ireland. This length of 400 kV UGC is too small a sample for determining meaningful performance statistics.

Meaningful statistics can, however, be obtained by considering the fault statistics of the combined quantity (approximately 144 km) of 400 kV and 220 kV UGC under our control along with international failure statistics for cables[29]. Taking the fault statistics of this existing 144 km of UGC for the period 2004 to 2020, and the international failure for XLPE land cables from 220 kV to 400 kV, gives a projected fault rate of 0.27 Unplanned outages/100km/year.

[29] Cigre, TB379 Update of service experience of HV underground and submarine cable systems, 2020

Parameter	Average statistics for 400 kV & 220 kV UGC combined
Reliability (Unplanned outages/100km/year)	0.27
Mean time to repair (days)	25 – 45 Days[30]
Unavailability due to disturbance (days/100km/year)	7 – 12 days

Table 44 Average failure statistics for a 100km 400kV or 220kV UGC

Table 45 shows the statistics for reliability, the mean time to repair faults, and the unavailability for 220 kV and 400kV cables (based on international failure statistics for cables[29]). These statistics, given that they apply to XLPE[31] cables, are taken to be applicable for this option.

Planned outages:

Planned outages are normally associated with routine maintenance. The typical routine maintenance outage duration for 400 kV cables taken from our maintenance policies is 2-3 days per annum (dependent on the number of joint bays and cable sections). Each year an operational test is performed, and periodically an ordinary service. These maintenance outages equate to a total unavailability of 0.84%, or c.2.5 days per annum.

Combination of the planned and unplanned outages:

The combination of the planned and unplanned outages the Belcamp – Woodland 400 kV UGC option and the total annual unavailability are set out in the table below and adjusted to reflect the length of the proposed option.

[30] Dependant on installation method and number of joint bays
[31] XLPE cable means cross linked polyethylene

	Belcamp – Woodland 400 kV UGC (45 km)
Reliability (Unplanned outages/circuit length(km)/year)	0.121
Mean time to repair (days)	25 – 45 days
Unplanned outages (Combined) Unavailability due to disturbances (days/circuit length(km)/year)	3.1 – 5.5 days/annum
Planned Outages	2.5 days
Total Annual Unavailability	5.6 – 8 days/annum
Difficulty/risk scale	

Table 45 Average failure statistics for a 45km 400kV UGC

The average failure rate and time to repair for the new Belcamp – Woodland 400 kV UGC option is deemed to be high when compared to the OHL alternative. The availability of this option as a result of outages is in the range of 97.8-98.5% at best and unavailability could potentially be greater than a month per annum. Based on this assessment, the reliability criterion for the new Belcamp – Woodland 400 kV UGC is considered to be at a moderate performance (**Dark Green)**.

9.2.4 Headroom

The new Belcamp – Woodland 400 kV UGC option accommodates a similar amount of large-scale demand in the Dublin and Mid-East region compared to the other options. Underground cable options were noted to provide marginally better headroom due to their lower overall electrical impedance, and circuit options that terminate at Finglas were shown to perform marginally better than those terminating at Belcamp due to Finglas substation being connected to all the existing 220 kV circuit between Woodland and North Dublin.

The assessment indicates that the new Belcamp – Woodland 400 kV UGC option creates headroom (increases the amount of additional large-scale demand that could be accommodated) of approximately 275 - 325 MW compared to no reinforcement, depending on which scenario is analysed.

The new Belcamp – Woodland 400 kV UGC option performs well in the headroom criteria compared to the other options and is deemed to have a moderate (**Dark Green**) performance in terms of headroom.

9.2.5 Expansion or extendibility

The new Belcamp – Woodland 400 kV UGC will provide a future new circuit and as such there are opportunities for further expansion of the transmission network using this circuit as a platform in the future. In the event that another connection along the cable route is required, these cable options may make the opportunity for expansion and extendibility more challenging and difficult compared to if an OHL technology was used.

There are a number of aspects which make this more challenging. The cable circuit is relatively long and requires bespoke reactors at each end of the of the cable to limit the impact during energisation of the cables and also during normal operation as the reactors will make sure that the voltage does not deviate outside planning standards.

If the length of the cable is changed then these reactors would have to be resized and new reactors purchased. In the event that the cable is associated with harmonic filters, then additional studies would have to be undertaken to ensure that the filters are properly tuned for any new cable length and size. This could mean that some purchased equipment would become redundant in the future, if the cable option chosen is altered. There may also be limitations on route options for diversions or connections to the new circuit in the road network (cables are preferably accommodated in roads to have easier access to the asset for maintenance and repair).

The new Belcamp – Woodland 400 kV UGC option has a target thermal capacity[32] equivalent to the existing 400 kV circuits. Assessments of cable types available to maximise the capacity of the new circuit are under way at the time of this report. The result of these assessments will be an input to analysis in later steps of the Six Step process. The route selected will also be analysed for thermal pinch points, such as crossing roads or waterways or other cable circuits, that limit the capacity of the new circuit allowing mitigations to be developed where possible.

The planned expanded Belcamp site will have sufficient space for the initial 400 kV busbar and transformer required, as well as any future needs for an expansion to the busbar and any additional 400/220 kV transformers or further 400 kV circuits.

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[32] Thermal capacity of existing 400 kV OHL is a winter rating of 2963 A and summer rating of 2506A based on conductor 2 x 600 mm2 ACSR CURLEW at 80°C,

After considering all aspects in this criterion, all cable options provide a worse base for any further expansion of the transmission network compared to OHL technology.

The implications of the opportunity for expansion and extendibility is more challenging and difficult compared to OHL technology and new Belcamp – Woodland 400 kV UGC option will have a high (**Dark Blue**) impact in terms of difficulty to accommodate potential for future expansion. expansion.

9.2.6 Repeatability

Underground Cable (UGC) technology for 220 kV and 400 kV voltages is already in use in the Irish transmission system, but on a smaller scale compared to OHL. Every time an UGC option is proposed as a solution, each cable option will have to be studied on its own merits. Bespoke network design would have to be considered for each option that would take account of necessary harmonic distortion introduced by any cable or if voltage limiting equipment is required to accommodate the cable options into the transmission network.

In terms of repeatability, it is recognised that there may be limitations in the network in regards to accommodating cables. The impacts of the above points are usually greater the higher the operating voltage of the cable used.

Similarly, substations using both Air Insulated and Gas Insulated switchgear are already used extensively in the Irish transmission system and so will not introduce additional system integration, operational, and maintenance complexity that would affect the repeatability of the technology on the Irish transmission system.

As such, it is considered that the new Belcamp – Woodland 400 kV UGC option has high to moderate risk of not meeting the repeatability criteria (**Blue**).

9.2.7 Technical operational risk

Underground cable and Air or Gas insulated substation switchgear are technologies that are tried and tested internationally and in Ireland. However, the nature of cable technology means that when cables are used over long lengths they require a bespoke design to be able to be accommodated into the network while remaining within the technical network design standards.

The voltage level and the considerable length will influence the technical operational risk in regards to cable options. Special energising and switching procedures will be required to manage any of the UGC options in an operational environment.

These aspects and additional equipment required to accommodate the underground cable will increase the technical operational risk. The new Belcamp – Woodland 400 kV UGC option is considered to have a high to moderate (**Blue**) impact in relation to technical operational risk.

9.2.8 Conclusion of technical performance

This option is considered to perform adequately when all of the technical sub-criteria are considered and hence has been given a moderate to high impact (**Dark Green**) in the assessment.

Summary of technical performance of the new Belcamp – Woodland 400 kV UGC option	
Health and Safety Standard compliance	
Security & Planning Standard compliance	
Reliability performance	
Headroom	
Expansion or Extendibility	
Repeatability	
Technical Operational risk	
Combined Technical Performance	

Table 46 Summary of technical performance of the new Belcamp - Woodland 400 kV UGC option

9.3 Economic Assessment

The economic performance of the options is represented using our colour scale with the individual performance of an option assessed relative to the performance of the other solution options.

9.3.1 *Input cost to the economic appraisal*

9.3.1.1 Pre-engineering cost

The pre-engineering costs are estimated to be €11 million. In the economic appraisal, a contingency provision of 5% has been applied to this amount.

The phasing of the pre-engineering costs is as follows:

Phasing of Pre-Engineering Spend – New Belcamp – Woodland 400 kV UGC					
2022	*2023*	*2024*	*2025*	*2026*	*2027*
21%	52%	14%	14%	8%	0%

Table 47 Phasing of pre-engineering spend for Belcamp - Woodland 400 kV UGC

9.3.1.2 Implementation cost

The capital investment required to deliver the new Belcamp – Woodland 400 kV UGC option is estimated to be €486 million. A provision for Transmission System Operator (TSO) related implementation cost and landowner payments, proximity allowance and local community fund has been included in this cost. In the economic appraisal, a contingency provision of 10% has been applied to this amount. The estimated implementation cost is categorised into its general components and is summarised in Table 48.

Categorised implementation cost – New Belcamp – Woodland 400 kV UGC	
Cost category	Implementation cost (€m)
Underground cable	357.8
Stations	76.7
Other (flexibility & proximity payments and other allowances)	7.5
SUB-TOTAL	442.0
Contingency (10%)	44.2
TOTAL	486.2

Table 48 Categorised implementation cost for Belcamp - Woodland 400 kV UGC

The phasing of the implementation costs is as follows:

Phasing of implementation spend – New Belcamp – Woodland 400 kV UGC										
2026	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**
15%	30%	40%	15%	0%	0%	0%	0%	0%	0%	0%

Table 49 Phasing of implementation cost spend for new Belcamp - Woodland 400 kV UGC

9.3.1.3 Life-cycle cost

This sub-criterion consists of three separate inputs incurred over the useful life of the option, namely operation and maintenance cost, electrical losses and replacement cost.

The equipment associated with the new Belcamp – Woodland 400 kV UGC option is expected to be maintained in accordance with the well-established existing practices. The operation and maintenance cost varies over the assets' life time and as such three periods of approximate costs are assumed. Table 50 displays rounded figures to the nearest thousand. No replacement cost is assumed as the equipment has a life expectancy of 50 years which is line with the period for the economic assessment.

Life-cycle cost for New Belcamp – Woodland 400 kV UGC		
Annual Operation and maintenance cost (€k)	0-20 year period	€286k
	21-40 year period	€206k
	41-50 year period	€286k
Annual Electrical losses cost (€M)	€3.8M	
Replacement cost	€78M	

Table 50 Life-cycle cost for the Belcamp - Woodland 400 kV UGC

9.3.1.4 Cost to Single Electricity Market

As described in Section 4.2.2, Economic performance criteria, the cost to the Single Electricity Market represents the cost for the periods when the reinforcement is unavailable. The unavailability is based on the reliability performance of the option. This is a cost to the single electricity market and is calculated as a combination of the benefit in production cost saving (project benefit) and reliability performance of the option.

The reliability performance of the option is taken from Section 7.2.3 Reliability. The production cost savings assessment used the TES 2019 scenarios and as such a range of annual production cost savings are used in the assessments as the different scenarios have different demand and generation patterns. Table 51 show the input for this criterion.

Cost to Single Electricity Market for Belcamp – Woodland 400 kV UGC option	
Annual Production cost saving (Benefit) (€m/annum)	Range €-1.2m to €17.8m
Annual unavailability of option during which benefits cannot be attributed	Unavailable for 8 days, available 97.81%
Annual Cost (saving) to SEM	Range €-1.2m to €17.4m

Table 51 Cost to single electricity market for the new Belcamp - Woodland 400 kV UGC

9.3.1.5 Economic performance for the new Belcamp – Woodland 400 kV UGC option. When all of the above costs and savings are considered, the economic result of the new Belcamp – Woodland 400 kV UGC option indicates a poor result compared to the other options and hence is considered to have a moderate to high (**Blue**) impact on the economic result. To be able to differentiate between competing options in a measured way and to check the options' performance in different credible future energy scenarios, a robustness and sensitivity test was carried out. The objective is to identify the option that is impacted the least in its economic result for a range of credible future energy scenarios. This robustness test indicates a stable performance compared to the other options independent from which future energy scenario is used in the assessment.

After considering both the economic result and the robustness test, the new Belcamp – Woodland 400 kV UGC is considered to provide a poor economic performance in comparison with the other options hence has been given a moderate to high impact (**Blue**) in the assessment.

Summary of economic performance of the new Belcamp – Woodland 400 kV UGC option	
Economic result	
Robustness	
Combined Economic Performance	

Table 52 Summary of economic performance of the new Belcamp - Woodland 400 kV UGC option

Deliverability

9.3.2 Implementation timelines

The expected timeline for the implementation of the 400 kV single circuit cable option is a period of 7.75 years in total. This is subject to and following statutory consenting for the structures and associated access routes. This time frame can be divided into two phases.

The first phase for all options is based on 4.5 years for the outline design, environmental assessment and the planning and permits process.

The second phase for the 400 kV single circuit cable option totals 3.25 years and includes detailed design, procurement of materials and construction works. This assumption includes time for the design to be confirmed, landowner consents being obtained by EirGrid and materials ordered in the first 1.5 years of this period. The design works, material procurement and construction period for the works required in the existing stations will be incorporated into the timeline.

The new 400 kV bays at Woodland 400 kV and Belcamp 220 kV substations are estimated to take 1.5 years.

The UGC option has the shortest timeline of all of the options. The impact of the implementation timelines on the project is assessed to be moderate (**Dark Green**) for this option.

9.3.3 Project plan flexibility

Routes for the cable options will be developed in Step 4 of our grid development process should they be brought forward to that step. The cable route would be developed in line with EirGrid standard practices. It is established practice in grid development that transmission cables should be constructed in the existing public road network if possible.

This is to make access and maintenance to the cable easier once the project is constructed.

One consideration in the selection of suitable roads to accommodate the cable options is the width of the required cable trench. All the cable options will require a 4-metre-wide trench and a working strip area wide enough to accommodate the required machinery. The road network in the study area will provide some flexibility in the identification of the best performing route. The use of Horizontal Directional Drill (HDD) technology to cross existing rivers, rail and roads will provide flexibility to avoid crossing point constraints.

Once the emerging preferred route has been submitted for planning consent, there is limited flexibility as we would need to work within the constraints of the site development boundary (otherwise known as the redline) of the route and the technical limitations of the cable route such as bending radius and fixed joint bay locations of the cable.

This option considered to have a moderate to high (**Blue**) impact on the project plan flexibility.

9.3.4 Risk to untried technology

In general, cables are increasingly used in transmission systems across the world and the mitigations to technical issues that arise with the technology are well known, and generally tried, and tested. In an Irish context, the first 220 kV XLPE cable was installed in 1984, and there are a number of recent projects on the Irish transmission system using this technology.

Another consideration in terms of untried technology is the use of long sections of UGC. This can lead to many technical issues which require specialised technical studies to determine if it is technically feasible to use a particular length of cable. Although, these studies have been carried out in Step 3 they will have to be repeated in Step 4 if any cable option is progressed to take account of the actual cable route determined. All cable options will require shunt reactors at either end of the cable to compensate the cable capacitance to keep the voltage within standards under normal operation.

Although shunt reactors are in place in the transmission system today, the size of the required shunt reactors for some of the UGC options is large and there is limited experience with these types of installations. The cable option may also require installation of filters in several substations in the network to mitigate any harmonic voltage distortions. The location of the filters cannot be determined until the design of the cable is known and this poses a risk for UGC options.

The installation of long lengths of 400 kV XLPE UGC became possible in the late 1990s with the development of a suitable cable joint for connecting lengths of such cable together. Nevertheless, EirGrid's experience with 400 kV cable is limited, with only a very small amount currently installed on the network.

Another aspect in relation to the UGC option is that Horizontal Directional Drilling (HDD) technology will very likely have to be used to cross specific obstacles within the study area, such as rivers and motorways, for short lengths of the cable route. This poses another risk to the UGC options as it is an expensive methodology, requiring the use of specialist equipment.

The risk to untried technology for the 400 kV single route cable option is considered to moderate to high (**Blue**).

9.3.5 Dependence on other projects (outages)

The UGC options involves a number of elements which would require planned outages.

The required work in both Woodland 400 kV and Belcamp 220 kV substations would need proximity and commissioning outages. In Woodland, the work is in relation to the construction of the 400kV bay, which is included in CP1194 Woodland 400 kV redevelopment project. In Belcamp, a new 400 kV GIS substation and associated station elements will be required in order to connect the new UGC.
The dependence on other projects for Option 4 is considered to have a moderate to high (**Blue**) level of impact.

9.3.6 Supply chain constraints, permits, wayleaves

For the new 400 kV UGC option, there may be significant supply chain constraints. This relates to the procurement and delivery of significant lengths (approx. 40km) of 400 kV UGC, the required filters and other associated large-scale equipment and testing apparatus. Cumulatively, this could result in significant supply chain constraints.

Permitting is likely to be challenging, with the provision of 400 kV UGC infrastructure in a suburban area of the Greater Dublin Area, irrespective of final design and location. It is confirmed, for the purpose of this analysis, that cable trenches will need to be approximately 4m in width; in addition, it is envisaged that an 8m working width corridor will be required adjacent to the cable trench, thereby requiring an overall cable alignment width (permanent and temporary) of approx. 12m.

There are no roads within the receiving environment that could accommodate this width of construction corridor without significant temporary and/or permanent alteration, such as the removal of ditches, boundary vegetation, front gardens, walls and piers etc.

Moreover, such roads would have to be closed for a considerable period of time, with potentially significant implications for traffic movements for both local access and commuter traffic. Overall, this would result in an impact of some significant scale and extent along the entire width of any UGC route.

It is currently considered that the UGC options, due to their size, scale and likely impact, are likely to require planning permission. If statutory consent is required, it is likely to be the subject of an application directly to An Bord Pleanála (ABP) as Strategic Infrastructure Development (SID). It is considered likely that, given the nature and extent of the development and its potential environmental and community impact, as well as the potential public interest in the proposed development, ABP would hold a full Oral Hearing in respect of a new 400 kV UGC development.

There is the potential for the UGC circuits to occur cross-country – i.e. away from public roads. This brings its own significant challenges in terms of landowner engagement and concerns, environmental and land use impacts – in particular the inability to undertake certain types of agricultural activity thereon.

It is assumed that significant engagement with landowners with properties along public roads would be required in the delivery of a new 400 kV circuit, for such purposes as surveying, siting and construction. These landowners may be new to accommodating electricity infrastructure on their landholdings. New temporary and permanent easements would be required to facilitate construction of the new circuit. Based on recent precedent in terms of the provision of new high-voltage UGC transmission infrastructure, there is the potential for significant landowner opposition to this option.

Having regard to all the above, this option is considered to have a moderate to high (**Blue**) impact in relation to the Supply Chain Constraints, Permits and Wayleaves criterion.

9.3.7 Conclusion of deliverability performance of Option 4

There are five sub criteria considered when the overall deliverability performance is assessed. The UGC options have the best implementation timelines when compared to the other options under consideration. This is a benefit to these options as implementation timelines for any network reinforcement are important to be able to assure that the transmission network will be in compliance with security standards and that all consumers have a secure electricity supply.

It is likely that all of the UGC options would require planning permission or statutory consent, due to their size, scale and likely impact on the receiving environment. They would preferably be accommodated in the public road network and would require a 2.1

m cable trench and an additional working strip, thereby requiring an overall cable alignment width (permanent and temporary) of up to 12 metres in certain places. This could have significant impacts and may impact deliverability of these UGC options. Road closures and potentially significant implications for traffic movements for both local access and commuter traffic would be a factor for all the UGC options during construction

For a new 400 kV UGC from Woodland to Belcamp, implementation timelines is the least impact with all other sub criteria performing similarly. When all of these deliverability aspects are considered, this option is deemed to have a moderate to high impact (**Blue)** from a deliverability point of view.

Topic	Option 4 (New Woodland to Belcamp 400kV UGC)
Implementation timelines	
Project plan flexibility	
Risk of untried technology	
Dependence on other projects	
Supply chain constraints, permits, wayleaves etc.	
Combined Deliverability Performance	

Table 53 Summary of deliverability performance of the new Belcamp - Woodland 400 kV UGC option

9.4 Environmental Assessment

9.4.1 Biodiversity

There is a moderate (**Dark Green**) risk of significant impacts on biodiversity as a result of this option. In the absence of mitigation, the greatest effects on biodiversity would be during construction, where despite cables primarily being laid in public roads, there is potential for impacts on hedgerows, tree lines and aquatic ecosystems; other habitats and species may also be disturbed or fragmented during the construction phase and effects could be permanent in some cases. There is also the potential for permanent loss of mature trees along the route, especially where roads are very narrow or where the UGC is required to cross fields and hedgerows off-road. The increased length of this route compared to Option 1 results in an increased risk of significant impacts to biodiversity.

9.4.2 Soils and Water

There is a moderate (**Dark Green**) risk of significant impacts on soils and water as a result of this option. The greatest impacts would be during construction. The risk to water bodies from silt and spillages during the construction process would be moderate as there are a number of waterbodies in the Study Area which would need to be crossed; it would not always be possible to use existing bridges for this purpose and in these cases, it would be necessary to go off-road and use other crossing techniques such as open cut trenches. There is also the potential for impacts on roadside ditches during construction. The risk is within the same category as for Option 2, despite being longer as the risks for Option 2 already take into account the potential for a large number of off-road crossing requirements which are more likely to be required along rural roads than in the urban areas close to Belcamp.

9.4.3 Materials Assets - Planning Policy and Land Use

There is a low to moderate (**Green**) risk of significant impacts on planning policy and land use as a result of this option. This option supports the ambitions of local planning policy for new transmission infrastructure to be underground where possible. There is the potential for the sterilisation of land where a UGC crosses third party lands, however that would be limited as a result of the preference to use public roads. This preference also reduces the level of land take required, except at the connections into Woodland and Belcamp: here there is the potential that the cable would have to be installed across third party land, requiring significant temporary land take during construction. This land take would be limited during operation, although a permanent wayleave and some restriction of agricultural practices above the UGC is likely.

9.4.4 Landscape and Visual

There is a moderate risk (**Dark Green**) of significant impacts on landscape and views as a result of this option. The impacts would be greatest during construction, but this impact would be temporary in nature. During operation, the impacts would be limited. There would be visible joint boxes periodically along the UGC route, although these would be quite small. There may also be some requirement for third party land take and permanent loss of mature trees and hedgerows at points along the route and connections to the substations. The increased length of this option compared to option 1 increases the number of joint boxes and the potential for losses of mature trees and hedgerows along the route

9.4.5 Cultural Heritage

There is a moderate (**Dark Green**) risk of significant impacts on cultural heritage as a result of this option. The impacts on cultural heritage from the UGC would be greatest during construction, both in terms of ground disturbance and impacts on the settings of heritage assets. The crossing of third-party lands at the substations presents a greater risk to heritage assets, especially unknown archaeological assets, than installation in the regional road network. During operation, there is also some potential for impacts on the setting of heritage assets from the joint boxes required along the UGC route. There are also a number of heritage features in very close proximity to the west of Belcamp substation that present constraints.

9.4.6 Noise and Vibration

There is a low to moderate (**Green**) risk of significant impacts from noise and vibration as a result of this option. Potential noise and vibration impacts from the UGC would be during the construction phase and would result from the trench works, particularly in areas of hard-standing, such as along roads. However, the baseline noise environment along roads is higher than that of rural areas, and as such, the impact is not likely to be significant. There may be a slightly greater impact at Woodland substation due to the rural nature of the area, but appropriate noise screening will be provided to minimise any noise nuisance. No impacts are anticipated during the operational phase, as the cable will be buried.

9.4.7 Climate Change

There is a moderate (**Dark Green**) risk of significant impacts on and from climate change as a result of this option. UGCs are reasonably resilient to the impacts of climate change, such as storms, wind and rain, although changes in ground temperature and reduced moisture may have impacts on the efficiency of the cables. The volume of material required to construct an UGC between Woodland and Belcamp is significant and carries with it associated embodied energy. This would be greater than for Option 2.

9.4.8 Summary of Environmental assessment of Option 4

A number of environmental factors are at a moderate risk of significant impacts as a result of this option; this is because the impacts are similar to those for Option 2 where many of the factors were considered to be at low to moderate risk, however this option is longer and so this increases the risk of such impacts. For soil and water, the greatest risks are as a result of open cut crossing of water bodies and constructing trenches in roads with roadside ditches alongside. These are most likely to occur in the more rural western part of the study area and are of a similar magnitude to those identified for Option 2. The risk to soil and water remains moderate. For all topics any risk would be during construction and therefore of a temporary nature. UGC are in accordance with local planning policy ambitions and are more resilient to the impacts of climate change. As a result, this option has an overall moderate risk of significant impacts on the environment (**Dark Green**).

Topic	Option 4 (New Belcamp to Woodland 400 kV UGC)
Biodiversity	
Soil and Water	
Planning Policy and Land Use	
Landscape and Visual	
Cultural Heritage	
Noise and Vibration	
Climate Change	
Combined Environmental Performance	

Table 54 Summary of environmental assessment of the new Belcamp - Woodland 400 kV UGC option

9.5 Socio-economic Assessment

9.5.1 Traffic and Transport

There is a moderate to high (**Dark Green**) risk of significant impacts on Traffic and Transport as a result of this option. There are similar impacts as those outlined in Option2, given that it is EirGrid's preference to install UGC in the public road network. As a result, assuming an UGC rote would be largely in the public road, there are potentially very significant impacts on local and regional roads during its construction. Public roads in the Study Area vary in their widths, with some being only 4m wide. Where routeing is in more narrow roads, installation may necessitate whole road closures and diversions for short periods of time. In the wider roads, one carriageway may require to be closed, resulting in the need for traffic management measures. This would lead to driver and pedestrian delay; increased fear and intimidation for pedestrians, especially where there are no footpaths along the roads being used; and potentially severance of communities, community facilities and businesses if any roads need to close. There are also potential implications for businesses, with employees and goods experiencing delays. A UGC route to Belcamp from Woodland will need to cross three motorways/national roads and navigate a route around Dublin Airport which is a substantial constraint. There would be careful consideration of the use of public roads in the vicinity of the airport and early discussions carried out with the airport operators to ensure there would be no significant impact on airport operations as a result of this option. Notwithstanding this, the increased length of this option compared to Option 2 increases the risks of significant impacts.

9.5.2 Amenity

There is a low to moderate (**Green**) risk of significant impacts on amenity as a result of Option 4. As is set out in Section 6.6.2, amenity considers the combined impacts of traffic, views and noise during construction and views and noise during operation. There would be no impacts on noise and limited impacts on views in operation so only construction impacts are considered here. Noise impacts were considered to be low to moderate given the preference to use the public road network; whilst traffic impacts during construction may be significant, as described in Section 9.6.1, they are temporary in nature. In considering the combined amenity impact a greater weight is afforded to permanent impacts. As a result, the risk would be low to moderate that significant impacts on amenity would occur

9.5.3 Health

There is a low to moderate (**Green**) risk of significant impacts on health as a result of this option. Potential impacts relate to stress and anxiety associated with Traffic impacts, amenity impacts and 'nuisance' emissions such as noise. No significant impacts are anticipated from noise; there is a low to moderate risk of amenity impacts; although traffic impacts are moderate to high these would be temporary, Concerns relating to EMFs relating to electrical transmission lines can also lead to increased stress and health issues. There is no electric field above ground level of underground cables as the field is fully screened by the cable sheath. Magnetic fields from UGC drop rapidly with lateral distance. EirGrid's design standards require all OHLs to operate to existing public exposure guidelines from ICNIRP; recent studies (EirGrid 2014) show that surveyed existing underground cables are well below the ICNIRP reference level set to protect public health. Taking into account all of these factors, it is considered there would be a low to moderate risk of significant impacts to health as a result of this option.

9.5.4 Economy

Potential impacts on the economy from this option are considered to be positive but are of a low (**Cream**) risk, i.e. unlikely, to be significant for the local and regional economy. This is due to the likelihood that a small construction workforce is envisaged to be required to construct this option, and its atypical nature will also require construction workers to have particular skills and experience, making it harder for currently employed individuals to gain employment on the project. Similarly, supply-chain benefits are likely to positive but limited given the specialised nature of construction. During operation, potential impacts on the economy are anticipated to be positive (in the context of reinforcing the wider electricity network), albeit limited given the nature of the project.

9.5.5 Utilities

There is a moderate (**Dark Green**) risk of significant impacts on utilities as a result of this option. It is EirGrid's preferred approach for UGC solutions, to use the existing road network (burying cables within the roads themselves) rather than within greenfield agricultural lands. As such, there is a greater potential to encounter pre-existing underground utilities than may otherwise be the case were an offline route to be taken or an OHL constructed. There are likely to be a number of underground utilities in the regional and local road network between Woodland and Finglas substations, including other electricity cables, telecommunication cables, sewers, and public and private water supplies. Whilst any utilities that are required to be altered or diverted would be done so at a time when disruption to the public would be reduced insofar as possible, and any disruption would be of a short duration, there is a reasonable likelihood of encountering other utilities during construction. There is an existing aviation fuel line in the road to the immediate south of Belcamp substation which poses a significant constraint on the use of that road. The increased length of this option compared to Option 2 increases the risks of significant impacts.

9.5.6 *Summary of Socio-economic assessment of Option 4*

The greatest risk of this option, from a socio-economic perspective, is on Traffic and Transport. For other socio-economic topics the risk of significant impacts is considered to be moderate (utilities) low to moderate or low (economy). The impacts on traffic are not insubstantial, especially in the more urban areas of the study area; however, they are temporary in nature. As a result, this option has an overall moderate risk of significant impacts from a socio-economic perspective (**Dark Green**).

Topic	Option 4 (New Belcamp to Woodland 400 kV UGC)
Traffic & Transport	
Amenity	
Health	
Economy	
Utilities	
Combined Socio-Economic Performance	

Table 55 Summary of Socio-economic performance for the new Belcamp to Woodland 400kV UGC options

9.5.7 *Summary of the assessment for the Woodland to Belcamp 400 kV UGC option*

This option would involve constructing a new 400 kV UGC between Woodland 400 kV and Belcamp 220 kV substations. This option is the best performing option in the deliverability criterion compared to the other options. The economic criterion is the worst performing compared to other options, as this option is the longest route and UGC being more expensive than OHL.

Having considered all of the five criteria, the outcome of the multi-criteria assessment indicates that the new Woodland to Belcamp 400 kV UGC option (Option 4) does perform well, and it has been given a moderate impact (**Dark Green**) on its overall performance.

Topic	Option 4: WOO-BEL 400 kV UGC
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Table 56 Overall assessment outcome for the new Belcamp - Woodland 400kV UGC option

10 Conclusions

The East Meath – North Dublin Grid Reinforcement (Capital Project 1021) is a planned reinforcement of the electricity network between Woodland 400 kV substation in County Meath and either Finglas or Belcamp 220 kV substations in County Dublin. The project is in Step 3 of the six-step approach that we use when we develop and implement a solution to any identified transmission network problem.

The project is essential to enable the further integration of renewable energy in line with Government policy ambitions. It will further be a key enabler in meeting the growing demand for electricity in the east region.

The purpose of Step 3 is to decide on the Best Performing Option. In Step 3, there were four options investigated.

- Option 1: New 400 kV OHL between Woodland 400 kV Station and Finglas 220 kV Station;
- Option 2: New 400 kV UGC between Woodland 400 kV Station and Finglas 220 kV Station;
- Option 3: New 400 kV OHL between Woodland 400 kV Station and Belcamp 220 kV Station;
- Option 4: New 400 kV UGC between Woodland 400 kV Station and Belcamp 220 kV Station;

Each of these options has been assessed against the five criteria covering technical performance, economic performance, deliverability performance, environmental impacts and socio-economic impacts.

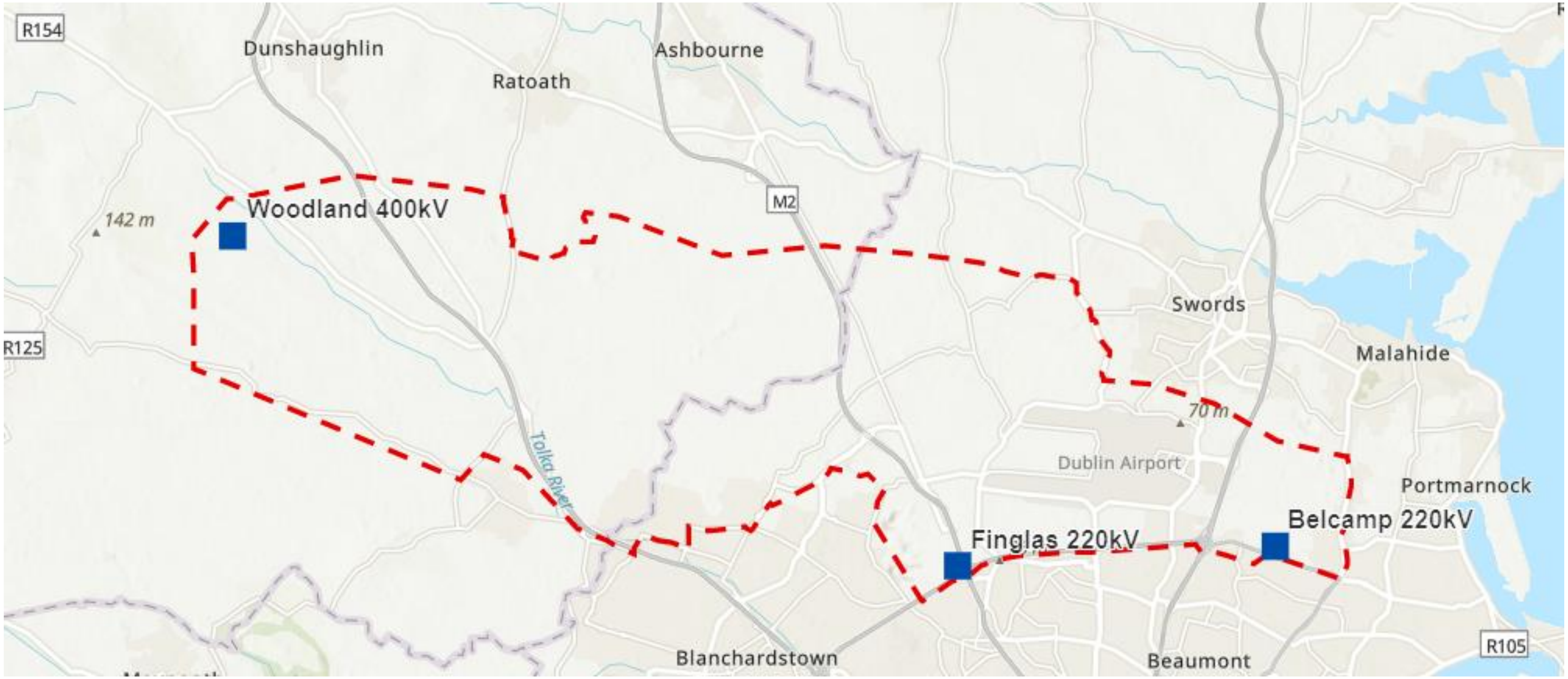
Based on the multi-criteria assessment, Option 4, the UGC to Belcamp, is the Best Performing Option (BPO).

This option will be brought forward to Step 4 of EirGrid's framework. A short-list of route options will be brough forward for public consultation later in 2022, all feedback will be considered before a cable route is confirmed.

Appendix 1 – Transmission map showing substation locations

An extract of the transmission map is presented below. The entire map can be found on our website in the following link
http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Group-Transmission-Map-January-2020.pdf

Belcamp 220 kV substation is located in north County Dublin along the R139. This substation is relatively new and is not shown in the transmission map yet. The substation's location is indicated for clarity.



Appendix 2 – Technical performance of options

Summary of Technical Performance of all options				
	Option 1 **FIN OHL**	**Option 2** **FIN UGC**	**Option 3** **BEL OHL**	**Option 4** **BEL UGC**
Health and Safety Standard compliance				
Security & Planning Standard compliance				
Reliability performance				
Headroom				
Expansion or Extendibility				
Repeatability				
Technical Operational risk				
Combined Technical Performance				

Appendix 3 – Economic performance of options

Summary of economic performance all options 2022 values					
	units	Option 1 FIN OHL	Option 2 FIN UGC	Option 3 BEL OHL	Option 4 BEL UGC
Pre-Engineering Costs	[€M]	10	10	10	11
Project Implementation Costs	[€M]	114	300	130	396
Project Life-Cycle Costs (Losses)	[€M] pa	46	82	63	108
Project Life-Cycle Costs (O & M) Presented in period of years (1-20), (20-40), (40-50)	[€k] pa	230 337 2623	247 193 247	327 493 2452	286 206 286
Project Life-Cycle Costs (Decommissioning & Replacement)	[€M]	N/A	60	N/A	78
Cost to SEM based on unavailability of reinforcement (TES Scenario used)	[€M] pa	Range 62 to 321	Range 74 to 384	Range -17 to 251	Range -20 to 298
Combined Economic Performance					

Summary of economic performance of all options				
	Option 1 FIN OHL	Option 2 FIN UGC	Option 3 BEL OHL	Option 4 BEL UGC
Economic Result				
Robustness				
Combined Economic Performance				

Appendix 4 – Deliverability performance of options

Summary of deliverability performance of all options				
	Option 1 FIN OHL	Option 2 FIN UGC	Option 3 BEL OHL	Option 4 BEL UGC
Implementation timelines				
Project plan flexibility				
Risk of untried technology				
Dependence on other projects				
Supply chain constraints, permits, wayleaves etc.				
Combined Deliverability Technical Performance				

Appendix 5 – Environmental performance of options

Summary of environmental performance of all options				
	Option 1 FIN OHL	Option 2 FIN UGC	Option 3 BEL OHL	Option 4 BEL UGC
Biodiversity				
Soils and water				
Planning policy and land use				
Landscape and views				
Cultural heritage				
Noise and Vibration				
Climate Change				
Combined Environmental Performance				

Appendix 6 – Socio-economic performance of options

Summary of socio-economic performance of all options				
	Option 1 FIN OHL	Option 2 FIN UGC	Option 3 BEL OHL	Option 4 BEL UGC
Traffic and Transport				
Amenity				
Health				
Economy				
Utilities				
Combined Socio-Economic Performance				

CP1021 East Meath - North Dublin Grid Upgrade

Step 4A Report - Analysis of Route Options

321084AJ-REP-010

March 2023

EirGrid

CP1021 East Meath - North Dublin Grid Upgrade

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02	August 2022	Second draft for client review	Various	KRS	KRS/HS	HS
03	February 2023	Final draft	Various	GS	AS	GS
04	March 2023	Final	Various	GS	AS	GS

Contents

Glossary and Abbreviations

Abbreviations	
ACA	Architectural Conservation Areas
AAP	Areas of Archaeological Potential
AEOS	Agri Environmental Options Scheme
AIS	Air insulated
ASI	Archaeological Survey of Ireland
CAFE	Cleaner Air for Europe
CFRAM	Catchment Flood Risk Assessment and Management
CPD	County Development Plan
CSO	Central Statistics Office
EHV	Extra High Voltage
End-to-End Option	A cable route option that runs from Woodland substation to Belcamp substation comprised of several shorter route sections.
EPA	Environmental Protection Agency
GIS	Geographic Information System
GSI	Geological Survey Ireland
HDD	Horizontal Directional Drilling
IGHS	Irish Geological Heritage Sites
i-WeBS	Irish Wetland Bird Survey
LCA	Landscape Character Area
MVAr	Mega Volt Amps (reactive)
MCA	Multi-Criteria Analysis
Node	A point where two or more route sections meet – labelled alphabetically.
NIAH	National Inventory of Architectural Heritage
NHA/ pNHA	Natural Heritage Area/ Proposed Natural Heritage Area
NPWS	National Parks and Wildlife Services
OHL	Overhead Line
OPW	Office of Public Works
PWS	Public Water Supply
Route section	A short section of a particular cable route option. Several added together form an End-to-End option.
RHM	Register of Historic Monuments
RMP	Record of Monuments and Places
RPS	Records of Protected Structures
RBMP	River Basin Management Plan
SAC	Special Area of Conservation, designated under the EU Habitats Directive
SI	Statutory Instrument
SMR	Sites and Monuments Record
SPA	Special Protection Area, designated under the EU Birds Directive
TPC	Total Project Cost
TSO	Transmission System Operator
TSSPS	Transmission System Security and Planning Standards

Abbreviations	
UGC	Underground cable
WFD	Water Framework Directive
XLPE	Cross-linked polyethylene

1. Introduction

1.1 Project Need

The East Meath – North Dublin Grid Upgrade (referred to as the 'Proposed Development' in this report) will strengthen the electricity network in the east of Meath and the north of Dublin to improve the transfer of power across the existing transmission network. We need to upgrade and strengthen the network to:

- address the increased electricity demand in east Meath and north Dublin due to economic development and population growth,
- reduce the use of and reliance on fossil fuels for electricity generation,
- facilitate further development of renewable energy generation, onshore and offshore, and;
- assist in achieving climate action targets of having up to 80% of electricity coming from renewable sources by 2030.

This project was identified as one of the candidate solutions in the Shaping Our Electricity Future Roadmap[1] which was published in November 2021.

The need for the Proposed Development has been established through a series of studies completed at Steps 1 to 3 (see Figure 1-2 below for reference). These reports are available on the project website[2]. This series of studies identified the need for a new connection between Woodland and Belcamp substations and that an underground cable would be the best technology for this connection. The Proposed Development is a high voltage (400 kV) underground cable between Woodland and Belcamp substations and the need for the project remains robust.

1.2 Project Benefits

The project is essential to meet the Government of Ireland's Climate Action Plan 2023[3] target to increase the proportion of renewable electricity to 80% by 2030, which includes transporting electricity from offshore wind energy. In addition to supporting future renewable generation, the project will improve power quality and support growing electricity demand in the north Dublin area.

The Proposed Development will strengthen the transmission network between Woodland and Belcamp substations to continue to ensure the security of the network feeding the east of Meath and the north of Dublin, between Woodland, Clonee, Corduff, Finglas and Belcamp substations. EirGrid has identified that the Proposed Development will have the following benefits:

- Security of Supply – Improve electricity supply for Ireland's electricity consumers. The network can be more readily rearranged in response to an unplanned tripping or during planned outages to manage power flow;
- Sustainability – Help facilitate Ireland's transition to a low carbon energy future by connecting renewable energy sources (onshore and offshore) to the network and reducing use of fossil fuels for electricity generation;
- Community – Deliver community benefits in the areas that facilitate the project infrastructure including savings in electricity costs and addressing increased electricity demand in the area;
- Competition – Apply downward pressure on the cost of electricity; and
- Economic – Contribute to the regional economy particularly during the construction stage and support foreign direct investment.

[1] https://www.eirgridgroup.com/site-files/library/EirGrid/Shaping_Our_Electricity_Future_Roadmap.pdf
[2] https://www.eirgridgroup.com/the-grid/projects/cp1021/related-documents/
[3] https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

1.3 Project Description

CP1021 is a proposed development to reinforce the network between East Meath and North Dublin. As noted above, reinforcement of this part of the network is needed to continue to ensure the security of the network feeding the east of Meath and the north of Dublin, between Woodland, Clonee, Corduff, Finglas and Belcamp substations.

The Proposed Development will add a high-capacity 400 kV underground cable electricity connection from Woodland substation near Batterstown in County Meath to Belcamp substation near Clonshaugh in north Dublin (see Figure 1-1).

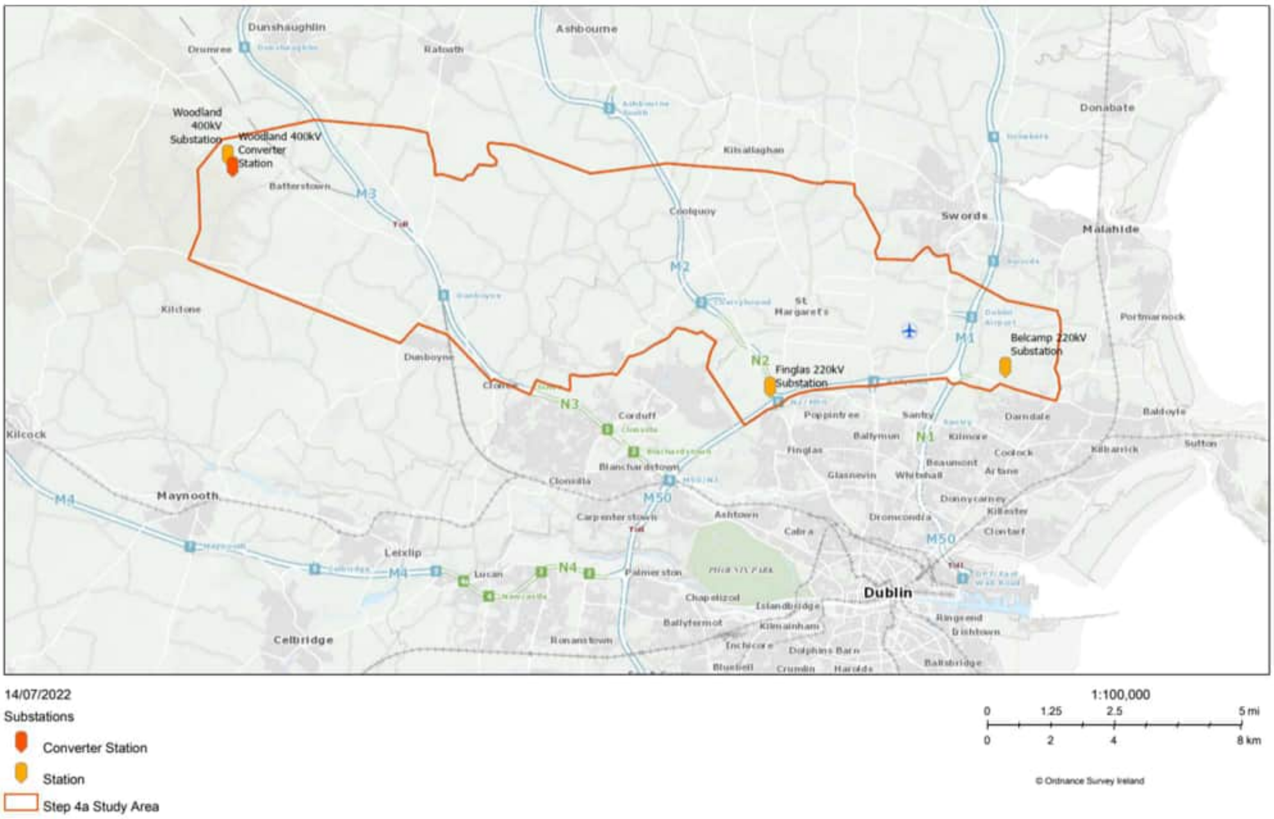


Figure 1-1: East Meath – North Dublin Grid Upgrade Step 4 Study Area

1.4 Assessment Process

For any identified transmission network problem, EirGrid follows a six-step approach when they develop and implement the best performing solution option. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[4]. The six steps are shown at a high-level in Figure 1-2. Each step has a distinct purpose with defined deliverables and collectively they represent the lifecycle of a development from conception through to implementation and energisation.

[4] http://www.eirgridgroup.com/the-grid/have-your-say/

Figure 1-2: EirGrid's six-step approach to developing the electricity grid

The Proposed Development is currently in Step 4, where the project team in consultation with stakeholders and the community identifies exactly where the underground electricity circuit will be built. The timeline for Step 4 can be seen in Figure 1-3.

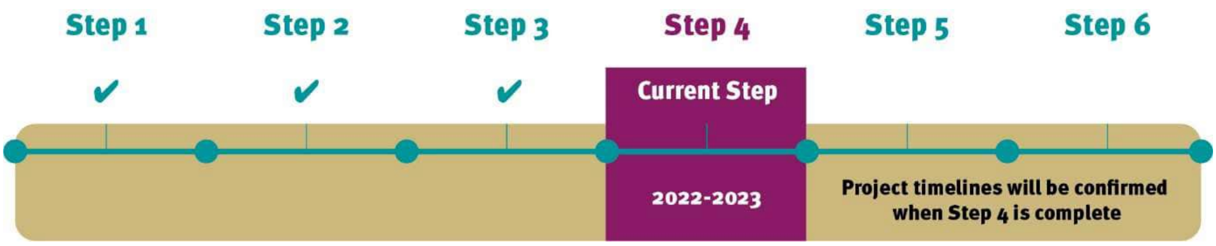


Figure 1-3: EirGrid's six-step timeline for the Proposed Development

In Step 1, EirGrid identified the need for the Proposed Development.

In Step 2, EirGrid compiled a shortlist of best performing technical options, which went out for public consultation between October and December 2020. This included a mix of overhead line and underground cable technological solutions and the possibility of a new transmission route being between Woodland and either Corduff, Finglas or Belcamp substations. This identified a short list of four options: an underground cable or overhead line to either Finglas or Belcamp substations.

In Step 3, EirGrid re-confirmed the need for the Proposed Development and assessed the feasibility of, and constraints which may impact upon, the shortlisted technology options to strengthen the electricity network in East Meath and North Dublin. In April 2022, EirGrid identified the 400 kV underground cable option between Woodland and Belcamp substations as the best performing option to progress for this Proposed Development. This was communicated to stakeholders through a Public Engagement awareness campaign from May to June 2022, during which time feedback was encouraged through the project website, webinars and through mobile information units in the study area.

As part of Step 4, EirGrid has identified four potential underground cable route options and has consulted on these options during September to November 2022. The four proposed route options have been assessed against five key assessment criteria:

- **Environment**. This criterion assesses the potential environmental impact of an option on the following: biodiversity; geology and soils; surface water and flood risk; planning policy and land use; landscape and visual impact; cultural heritage; noise & vibration; and air quality.
- **Socio-economic**. This criterion assesses the potential social and economic impact and level of social acceptability of an option. Relevant considerations include traffic & transport; amenity; human health; employment and economy; agriculture (including equine); and utilities and critical infrastructure.
- **Technical**. This criterion assesses the technical performance of an option with reference to security of supply and efficiency standards including system reliability; headroom and ratings; maintainability; operational risk; and repeatability.
- **Deliverability**. This criterion assesses the ability to construct and deliver an option within an acceptable period of time. Relevant considerations include design complexity; traffic disturbance; dependence on other service providers; permits and wayleaves; and implementation timelines.
- **Economic**. This criterion assesses economic performance which considers investment costs and life-cycle costs.

Figure 1-4: EirGrid's Five Assessment Criteria for Projects

1.5 Purpose of Report

Step 4 has been divided into two sub-steps: Step 4A and Step 4B. This Step 4A Report presents a technical analysis of the proposed route options. It describes the process followed to identify the proposed route options and presents an evaluation of these options against a set of criteria while also considering feedback from stakeholders, local communities and the public. This report identifies what EirGrid, on the basis of information currently gathered, considers to be the Emerging Best Performing Option for the route of the underground cable.

This report will be published and EirGrid will consider all feedback arising and will use this, and further surveys and analysis, to confirm the Best Performing Option at Step 4B. The Best Performing Option will be the route option taken forward as part of the process to apply for planning permission (Step 5 of the six-step development process).

1.6 Structure of Report

This report is structured as outlined in Table 1.

Table 1.1: Report Structure

Section	Overview
Chapter 1 Introduction	An introduction to the development, setting out the project need, project benefits and project description as well as providing an outline of the assessment approach.
Chapter 2 Route Development Process	An explanation of the Step 4A route design and assessment approach, the assessment criteria and the methodology adopted.
Chapter 3 Description of Route Options	A description of the route options assessed and those not progressed.
Chapter 4 Environment Assessment	The assessment of route options against the environment assessment criteria.
Chapter 5 Socio-economic Assessment	The assessment of route options against the socio-economic assessment criteria.
Chapter 6 Technical Assessment	The assessment of route options against the technical assessment criteria.
Chapter 7 Deliverability Assessment	The assessment of route options against the deliverability assessment criteria.
Chapter 8 Economic Assessment	The assessment of route options against the economic assessment criteria.
Chapter 9 Emerging Best Performing Option and Conclusion	A comparison of the four route options (Option A – D) and selection of the Emerging Best Performing Option with an explanation of why it has been selected.
Appendices	Supporting information for the text of this report.

Section	Overview
Figures	Supporting maps and drawings. Some figures are inset within the text and some are stand-alone at the end of the report.

1.7 Accompanying Reports

The following reports accompany this Step 4A Report:

- Cable Feasibility Report[5], Jacobs, 2022 – this standalone report considers the technical feasibility of the underground cable solution and two connection options, Woodland substation to Finglas substation or Woodland substation to Belcamp substation.
- Step 4A Constraints Report[6], Jacobs, 2022 – this standalone report identifies the constraints (environmental and socio-economic) considered in the identification of route options.
- Consultation and Engagement Summary Report[7], Jacobs, 2023 – this standalone report provides a summary of engagement activities carried out in Step 4, including a public consultation, focus groups and other engagement activities such as stakeholder meetings, in person information days and webinars.
- Step 4A Social Impact Assessment[8], Jacobs, 2023 – this report provides a high-level assessment of socio-economic impacts resulting from the project in both the construction and operational (energisation) phases considering cultural identity, employment and educational opportunities, place and community attachment, health and overall sense of social cohesion.

[5] https://www.eirgridgroup.com/site-files/library/EirGrid/321084AJ-REP-002-Cable-Feasibility-Report-Final-April-2022.pdf
[6] https://www.eirgridgroup.com/site-files/library/EirGrid/321084AJ-REP-009_Constraints-Report-Final-August-2022-Clean.pdf
[7] https://www.eirgridgroup.com/the-grid/projects/cp1021/related-documents/
[8] https://www.eirgridgroup.com/the-grid/projects/cp1021/related-documents/

2. Route Development Process

2.1 Introduction

As detailed in Section 1.4, this Step 4A Report presents an analysis of the proposed route options that were identified following confirmation at the end of Step 3 that the Best Performing Technological Option was an underground cable (UGC) between Woodland and Belcamp substations. As noted in Section 1, the aim of the route development process is to identify the location of an Emerging Best Performing Route Corridor Option. The following sections outline how the proposed route options were designed and how they were assessed. The proposed route options are described in Chapter 3 and assessed in subsequent chapters.

2.2 Our Approach

This approach to route options identification and appraisal is a best practice approach to the Consideration of Alternatives for a linear infrastructure project and a key tenet of EirGrid's Framework for Grid Development.

The design of the proposed route options at Step 4 were based on the application, where reasonably practicable, of the following routing principles:

- Avoid motorways;
- Maximise the use of regional and local roads;
- Avoid town centres and industrial estates;
- Avoid going off-road, through private land and through agricultural land where possible;
- Avoid sensitive natural and built heritage locations;
- Minimise impact on communities where possible; and
- Minimise the overall length of the route.

These routing principles align with EirGrid's five key assessment criteria – Environment; Socio-Economic; Technical; Deliverability; and Economic, which are described in further detail in Section 2.4. By following the routing principles, improved route options were developed. **Error! Reference source not found.**Figure 2-2 outlines the process that was followed.

For the purposes of this route option assessment, a trench width of 1.5m to 2.1m was assumed. **Error! Reference source not found.** Figure 2-1 below shows an indicative arrangement of a High-Voltage Alternating Current (HVAC) cable (single conductor per phase solution).

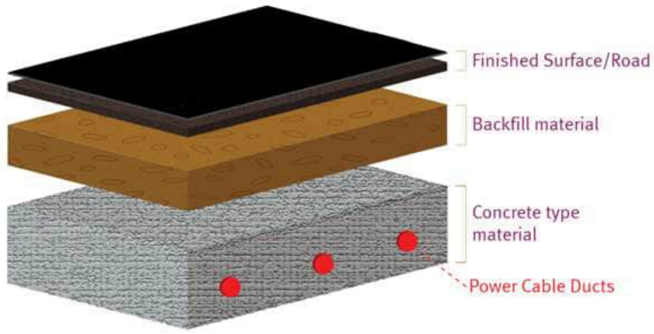


Figure 2-1: Indicative arrangement of a High-Voltage Alternating Current (HVAC) Cable

Study Area

- The Study Area from Step 3 was refined by considering a wide variety of factors including stakeholder and community feedback, technical requirements, road network presence, settlements, presence of existing utilities, physical constraints such as motorway, river or rail crossings and environmental constraints.

Constraints Identification

- A significant number of environmental and socio-economic constraints/receptors were identified and mapped.
- Constraints include houses, towns and villages, equine and agricultural land, motorways, designated sites, archaeological features, areas of peat, woodland, rivers and businesses.
- The constraints were used to inform a baseline assessment, identifying potential impacts for each environmental and socio-econmomic topic.

Possible route options

- Workshops were held with specialists from the project team to identify all reasonable options between Woodland and Belcamp substations, taking into account the mapped constraints and the routing principles.

Route Section Assessment

- A long list of options, comprising route sections, were identified. These individual sections were assessed against the routing principles.
- The individual sections that scored poorly or did not connect to well performing adjacent route sections were not progressed.

End-to-End Assessment

- The short listed individual sections were combined to create four end-to-end options.
- Feedback on these four end-to-end options was sought from the public and other stakeholders as part of the public consultation in 2022.
- The feedback from the public consultation was considered by the project team and the options were assessed against the five assessment criteria to provide a rating of potential impact.

Figure 2-2: Step 4A Route Design Process

2.2.1 Study Area

As part of Step 3, the Study Area was further refined by considering a wide variety of factors. These included stakeholder and community feedback as well as technical requirements of the project, road network presence, settlements, presence of existing electrical utilities, physical constraints such as motorway, river or rail crossings and environmental constraints. In particular, the conurbations of Swords and Blanchardstown have been excluded from the Study Area (see Figure 1-1); as has Malahide Estuary, which is a European designated Special Area of Conservation.

Following the identification of Option 4 – Woodland to Belcamp 400 kV UGC as the Emerging Best Performing Technical Option and as a result of the feasibility studies and assessments the study area was further refined in March 2022. The Study Area shown in Figure 1-1 was used as the basis for the Step 4A assessment and formed the boundary for the identification and mapping of constraints.

2.2.2 Constraints Identification

In advance of the Step 4A Public Consultation (September to November 2022) a Constraints Report[9] was published. The purpose of the Constraints Report was to review and update the constraints identified in Step 3, to ensure they may be considered appropriately as part of the assessment work to select the Emerging Best Performing Option. The objective of the Constraints Report was to identify the international, national, county, and local constraints that should be taken into account to better inform the design of the Proposed Development.

The project team used site visits, consultation, online mapping, and a project Geographical Information System (GIS) to ensure that details were not omitted and would be fully considered as part of the development of potential route options. This mapping is available for public viewing via the EirGrid website[10].

The study area was subdivided into sub-study areas to allow the identification of key constraints and to better understand the varying characteristics. The key constraints were used to inform a baseline assessment of the following socio-economic and environmental aspects:

- Socio-Economics Factors
  - Traffic and Transport
  - Amenity
  - Human Health
  - Economy
  - Utilities and Critical Infrastructure; and
  - Agronomy including Equine
- Environmental Factors
  - Biodiversity, Flora and Fauna
  - Soils and Water
  - Material Assets
  - Planning Policy and Land-Use
  - Landscape and Visual
  - Cultural Heritage (Archaeological and Architectural Heritage)
  - Noise and Vibration

[9] https://www.eirgridgroup.com/site-files/library/EirGrid/321084AJ-REP-009_Constraints-Report-Final-August-2022-Clean.pdf
[10] https://www.eirgridgroup.com/the-grid/projects/cp1021/related-documents/

- Air Quality; and
- Climate Change.

The potential impacts presented in the Constraints Report were used to guide the identification and assessment of possible route options as part of the subsequent Step 4A route design process.

2.2.3 Possible Route Options

Possible route options were developed using the project Geographical Information System (GIS). This allowed consideration of constraints and routing principles while identifying possible route options. Workshops were held with technical, environmental and socio-economic specialists from the project team to identify and develop initial designs for range of possible route options. As part of this stage of the process, the project team attempted to avoid, where possible, direct impacts on key socio-economic and environmental constraints, such as houses, towns and villages, businesses, equine and agricultural land, designated sites, archaeological features, area of peat and woodland.

Given the large number of potential route options, it was decided that the proposed route options would be broken down into shorter sections first, and then assessed. Eighty-eight individual route sections were designed and labelled for the nodes they connected (for example the section between Nodes A and B was labelled as Route Section AB). This is illustrated in Figure 2-3.

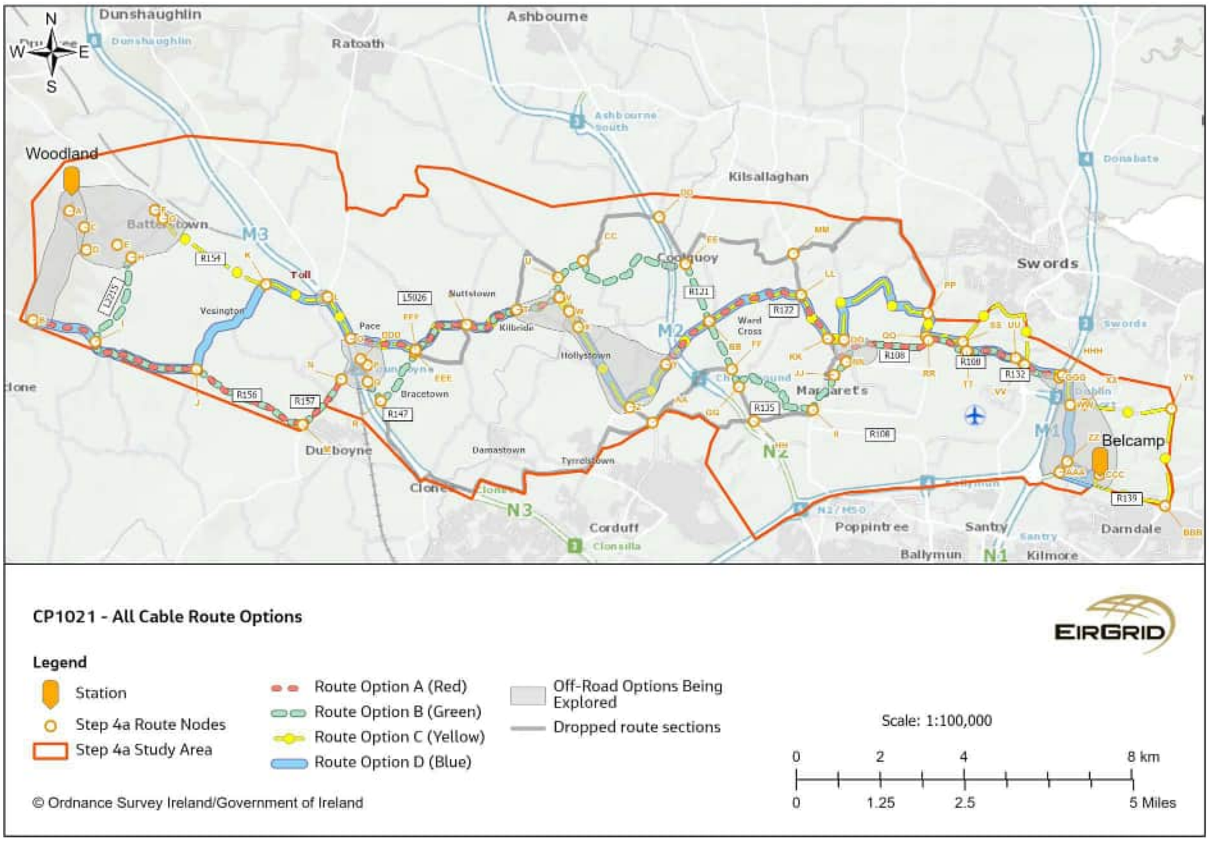


Figure 2-3: Route Sections and Nodes

This process has been described as being like building with bricks. The individual bricks can be swapped out or added together to make something larger. The shorter route sections could be added with other sections to create longer route sections. The route section approach allows greater flexibility in the design and subsequent assessment of route options. In addition, constraints can be more easily avoided by switching to a different route section, and the routing principles can be followed more closely.

This long list of possible route sections, defined by nodes, was taken forward to the next stage of the design process, route section assessment.

2.2.4 Route Section Assessment

The assessment of route sections was based on the five key assessment criteria (Environment; Socio-Economic; Technical; Deliverability; and Economic (see Section 2.4 for further details on the criteria)). These are the same criteria that are used for the assessment of route corridors (see Chapters 4 to 8 for the assessments). With the use of GIS, a large amount of environmental, social and technical data was collected for each route section. For example, this included the number of houses along each route section, how many watercourses in the route section, the geology of the route section, how many archaeological sites were within 25m, 50m, 200m, etc. The data collected is presented in Appendix F of this report.

This data was used as the basis for the assessment of the individual route sections. Environmental and socio-economic specialists used this data and professional judgment to identify the potential impacts, challenges and risks of each route section to assign a ranking based on the process outlined in Section 2.4 of this report. Route sections that had greater potential impact, greater challenges or higher risk relative to comparable sections were sifted out and not progressed. The outcome of this process is summarised in Section 3.1.2 of this report.

2.2.5 End-to-End Assessment

Following the Route Section assessment, the better performing route sections were added together to create end-to-end options between Woodland substation and Belcamp substation. The four (End-to-End) route options presented to the public and stakeholders during the Step 4A consultation are assessed in Chapters 4 to 8 of this report. The four options share some common sections in certain areas (e.g. between Bracetown and Kilbride). This is because the route sections at these locations were assessed to be the best performing. Other alternative route sections at these locations were explored in accordance with the process described above and were deemed not to perform as well as the identified options.

The four options presented at public consultation are presented in Chapter 3. Some larger areas are shown on the maps where a specific alignment has yet to be identified. These areas typically incorporate off road sections where engagement with landowners in these areas will continue, with the route design in these locations subject to further assessment and development.

The results of the end-to-end assessment are shown in Chapters 4 to 8 of this report. The proposed route options are subject to further design and changes as the project continues to the next steps. This will result from further surveys, through public consultation, or information from landowners and statutory bodies.

2.2.5.1 Assumptions and Limitations

For all route options, the following assumptions have been made:

- The UGC will be installed in sections equal to the length of cable on drum (approximately 700 m). Welfare facilities and storage area to be provided at the end of each section;
- Motorways, national roads, railways and major rivers and canals will be crossed using Horizontal Directional Drilling (HDD) reducing disruption and impacts to these elements of transport infrastructure and the environment;
- The cables will be laid primarily using the regional and local road network and will not cross third-party land, except where physical constraints dictate that approach (for example, there is insufficient space in the road network to accommodate the cables and joint boxes e.g. the local road to the Woodland substation from R154 already carries the East West Interconnector DC cable with insufficient space to accommodate the Proposed Development);
- Indicative routes were assumed in the off-road areas. Further surveys, design, engagement and assessment work are required to inform the refinement of the route design in these areas. The assumed off-road routes were necessary since assessing a much wider corridor would not have been practicable. The wider corridors are shown in the accompanying figures to reflect the further work required to optimise the route during Step 4B.

- The circuit will be connected into the substations as underground cables and there will be no requirement for overhead line (OHL) connections. In this regard, there will be requirement for associated additional apparatus and works within both Woodland and Belcamp substations; however, this is not considered further for the purposes of this Step 4A report, as this is a matter of technical detail relevant to Step 5 – it does not influence the cable routing process.

2.3 Public Consultation

EirGrid invited the public to give feedback on the four proposed route options during a public consultation from September to November 2022. A range of communication methods were adopted including in person meetings and online methods to reach as wide an audience as possible. Public Consultation was promoted through Community Forum meetings, onsite engagement in the project area, stakeholder engagement, public webinars, multi-channel advertisements, social media and a project website. The consultation opened on 7 September 2022 and remained open for twelve weeks, closing on 30 November 2022. EirGrid undertook engagement to promote the consultation among local stakeholders. This phase included:

- A Community Forum, with independent chair and members from local community groups, met a total of 4 times during the consultation period.
- Three focus groups convened in November 2022 across the study area to gain further insights from members of the local community.
- Five onsite engagements, with a Mobile Information Unit visiting towns and villages.
- Six in-person drop-in sessions held at various venues.
- Engagement (including meetings and/or written communications) with multiple stakeholders.
- Three public webinars.
- Attendance at the Meath Energy Expo.
- Door-to-Door Engagement carried out by Community Liaison Officers (CLOs).
- A media campaign in regional press and radio, social media, a project website, and online consultation portal.

The public consultation process allowed members of the public to view the four proposed route options (Figure 3-3 to Figure 3-6) in a consultation brochure[11] as well as other materials available via the project website, including interactive mapping, to view the route sections that were not progressed (see Figure 3.1.2). The public were invited to provide comments in relation to each route, about the approach taken on the project to date, and confirm if there were any events in the local area that should be considered during scheduling of the project.

Three channels were provided for submission of responses to the consultation:

- Online: by using the consultation portal at consult.eirgrid.ie, accessible via the EirGrid website;
- Email: by emailing the project's dedicated email address; EastMeathNorthDublin@eirgrid.com, administered by the project team at EirGrid;
- Post: by returning the freepost questionnaire delivered to all homes and businesses along the route, or by sending a letter to the address provided by EirGrid.

A total of 24 responses were received during the consultation period. Full details on the responses are provided in the Engagement and Consultation Summary Report[12] available on the EirGrid website.

Chapters 4 to 8 include a summary of the feedback received for various topics relating to each route option. A response from the project team is also included to demonstrate how the feedback has been considered as part of the Step 4A process, or will be considered during subsequent steps.

[11] https://www.eirgridgroup.com/site-files/library/EirGrid/210538-EirGrid-East-Meath-North-Dublin-Step-4-Consultation-v14.pdf
[12] Hyperlink to be added following publication

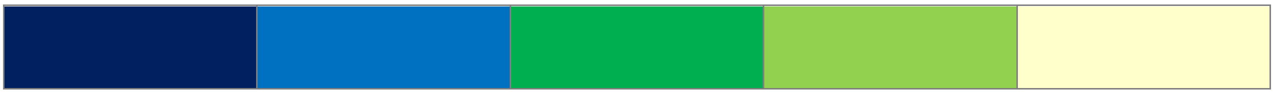
2.4 Route Option Assessment Criteria and Methodology

The design and assessment of the Proposed Development has followed EirGrid's six-step approach as outlined in Section 1.4. This approach facilitates engagement and consultation with stakeholders and the public which helps to explore route options fully and make more informed decisions. As part of the approach, a comprehensive and consistent multi criteria analysis is applied to decision making. The multi criteria analysis facilitates a balanced consideration of the following assessment criteria relating to the Proposed Development:

- Environment;
- Socio-Economic;
- Technical;
- Deliverability; and
- Economic.

Each of the proposed route options have been assessed across the constraints criteria detailed below based on the ranking approach presented below. Matters raised during public consultation. of relevance to the assessment criteria and methodology are highlighted.

More significant/difficult/risk Less Significant/difficult/risk



This risk scale is clarified by text, as follows:

- High: Dark Blue;
- Moderate-High: Blue;
- Moderate: Dark Green;
- Low-Moderate: Light Green; and
- Low: Cream.

2.4.1 Environment

Environmental matters were of key concern to several stakeholders during the consultation process; both generally and in respect of particular environmental topics, for example:

- Stakeholders praised the project for its role in enabling the green agenda.
- A number raised concerns about impacts of the project on cultural heritage sites.
- Stakeholders commented that they had experienced previous issues with flooding of the River Boyne and the tributaries of the River Tolka.
- Some focus group participants raised concerns about the loss of hedgerows and trees along the route and suggested that further information is provided about the effects of the project on the environment.

Inland Fisheries Ireland (IFI) provided feedback related to potential impacts on watercourses along the route and set out requirements for the design and assessment of watercourse crossings and drainage features.

Transport Infrastructure Ireland (TII) noted the consideration of an environmental impact statement, TII's Environmental Assessment and Construction Guidelines as well as other TII Publications, in addition to the Environmental Noise Regulations 2006.

Taking the above into account, the environmental risks and considerations associated with the proposed route options are presented under the following environmental assessment topics:

- Biodiversity (Flora and Fauna);
- Geology and Soils;
- Surface Water and Flood Risk;
- Planning Policy and Land-Use;
- Landscape and Visual;
- Archaeology, Architectural Heritage and Cultural Heritage;
- Noise and Vibration;
- Air Quality; and
- Climate Change

The assessment approach undertaken by each environmental assessment topic is outlined below with the detail on each individual option assessment presented within Chapter 4. The environmental assessment topics use a mixture of qualitative and quantitative assessment to assign the overall score (e.g. low, moderate, high, etc.) to the assessment topic under consideration.

2.4.1.1 Biodiversity, Flora and Fauna

The following aspects were considered in the assessment of the four route options in terms of biodiversity (flora and fauna):

- **Distance and connectivity to European and Ramsar sites –** the assessment looked at the proximity and hydrological connection of the proposed route options to both SACs and SPAs in addition to any Ramsar sites. This allowed an understanding of potential pollution pathways and /or impact to Qualifying Interest (QI) species including potential impacts to foraging bird species from each route option;
- **Distance and connectivity to nationally important sites -** as above in the context of national sites;
- **Watercourse crossings, aquatic species and Water Framework Directive (WFD) status -** The assessment looked at the number and location of potential watercourse crossings, proposed crossing technique, the aquatic species of interest and the current WFD waterbody status i.e., good, poor etc.; and
- **Known or presumed locations of species and/or habitats of conservation interest -** the assessment considered findings from desk-based review in addition to initial site visits to identify species/habitats of conservation interest potential impacted by each of the proposed route options.

Ecological constraints are shown in Appendix A.1.

2.4.1.2 Geology and Soils

The following aspects were considered in the assessment of the four route options in terms of geology and soils:

- **Geology -** a review of desk-based data to understand the geology and soils potentially impacted by the proposed route options. This aspect also considered potential for the proposed route options to encounter karst features and known mines;
- **Land Quality -** a review of desk-based data to understand potential impacts associated with licensed facilities, historic contaminated sites, and landfills;
- **Hydrogeology -** a review of desk-based data to understand aquifer importance, groundwater vulnerability, WFD status, public or private water supplies and any groundwater dependent water bodies potentially affected by each route option.

2.4.1.3 Surface Water and Flood Risk

The following aspects were considered in the assessment of the four route options in terms of surface water and flood risk:

- **Surface Water -** closely connected to the biodiversity criteria, this assessment looked at the number and location of potential watercourse crossings, proposed crossing technique, the current Water Framework Directive (WFD) water body status (i.e. good, moderate, poor etc.) and proximity to designated sites. Sensitivities are determined based upon their WFD status and proximity to internationally or nationally designated habitat.
    - Likely crossing techniques are determined as follows:
        - Open Cut (OC): shallow crossings (i.e. streams, very small/shallow canals, drainage channels) can be open cut using temporary over-pumping if required to maintain water flow during installations;
        - Cable bridges/micro-tunnels: for anything (approximately) wider than 4m and deeper than 1m where Horizontal Directional Drilling (HDD) not adopted, alternative solutions like cable bridges/culverts/micro-tunnels are also considered;
        - HDD: When the crossing would be significant (i.e. at large and/or sensitive watercourse);
        - Tunnelling: If the crossing is significant and HDD is not feasible from a cable ratings perspective (i.e. very deep or very poor ground), and creating compounds on both sides of the river to account for changes in the number/type of cables for HDD at the crossing is not an option, then tunnelling is also considered.
    - Potential impacts are identified by considering the sensitivity of the water body and the risk associated with the crossing technique employed.
- **Flood Risk –** National Indicative Flood Mapping[13] reviewed for each route option and the number of watercourse crossings also taken into account.

2.4.1.3.1 Methodology – Surface Water

Water bodies are given a score for sensitivity based upon their Water Framework Directive (WFD) status and proximity to designated sites, as follows:

- High or Good quality or within <2km hydrologically from an SAC – Score 5
- Moderate quality and 2-5km hydrologically from an SAC – Score 4
- Poor quality and 2-5km hydrologically from an SAC – Score 3
- Moderate quality and >5km hydrologically from an SAC – Score 3
- Poor quality and >5km hydrologically from an SAC – Score 1

The likely crossing techniques are also taken into consideration. Possible crossing techniques are as follows:

- Open cut
- HDD (trenchless)
- In-road

Whilst most of the route options are in-road, there are a number of crossings of water bodies which require the route to come off-road for a short stretch because existing road bridges are not deep enough to allow the trench to be installed within them. The likely occasions where this may happen have been identified for each of the crossings. A risk score is assigned to each of the crossing techniques as follows:

- Open cut – score 5;

[13] www.floodinfo.ie

- HDD – score 1;
- In-road – score 3.

Following identification of the number of crossings, the sensitivity and the potential impacts as a result of different crossing techniques, the route is assigned a risk score based upon the following method:

- The 'worst case' and best-case scenarios are established:
  - Worst case: all crossings are of high-quality water bodies; all crossings are via open cut. For example, 16 crossings of high sensitivity water bodies would score 80; 16 crossings using open cut techniques would also score 80
  - Best case: all crossings are of low quality, and all are HDD; these routes would score a maximum of 16 on sensitivity and technique.
- After establishing the highest possible (worst) and lowest possible (best) score, the mid-point can be determined and from this a risk ranking identified. The mid-point is moderate risk. Where there are varying likely crossing techniques proposed for a water body (which is crossed more than once), an average is taken.

2.4.1.3.2 Potential Impacts – Surface Water

- Potential impacts on water bodies include the following:
  - Increased sedimentation from silty water runoff and dewatering of trenches;
  - Hydromorphological impacts on banks as a result of open-cut crossings; and
  - Accidental releases of contaminants such as hydrocarbons or cement washings.

2.4.1.3.3 Methodology – Flood Risk

As far as possible all route options will avoid flood risk zones. Each route has been assessed based on the distance of each route located within a flood risk zone identified by the Preliminary Flood Risk Assessment. The routes have been assessed against the following sources of flooding:

- Pluvial (Surface Water) Flooding
- Fluvial (River) Flooding
- Coastal Flooding

A qualitative review of the route options using Jacobs Project Mapper does not identify any reasons why a particular route option is not feasible. Ranking of the routes by distance within a flood risk zone is therefore used to identify a route's impact.

To determine the level of risk from flooding to a given option, similar to surface water quality, a worst and best case scenario is identified; in this case, 100% of the route in flood zone would be the worst case scenario, 0% the best case scenario. Proportions in between are provided below to determine the risk:

- High –7.5-100 %
- Moderate to High – 5-7.5%
- Moderate – 2.5-5%
- Low to moderate – 1-2.5%
- Low – 0-1%

Additional weighting is given to fluvial flooding as this typically occurs for a longer duration and at greater depth than pluvial flooding. The total score for each was calculated as follows;

Total Score = (pluvial flooding rank x 1) + (fluvial flooding rank x 1.5) + (coastal flooding rank x 1)

2.4.1.4 Planning Policy and Land-Use

The following aspects were considered in the assessment of the four route options in terms of Planning Policy and Land Use:

- **Planning Policy** National, regional and local planning policy relevant to the Study Area has been reviewed. Development objectives and policies that have the potential to influence the siting of projects relating to land use zoning, biodiversity, flood risk, cultural heritage, landscape designations and characterisations, protection corridors, amenity, and existing and proposed residential land use have been considered.
- **Planning Applications (including other large infrastructure projects) -** A review of planning applications (both granted and currently in the system) over the last five years within a 50m buffer of each route option was conducted in order to gain insight into the future built environment and identify potential issues and impacts arising. Other strategic infrastructure developments with the potential to interact with the route options, including other planned electricity transmission projects as advised by EirGrid, have also been considered.

2.4.1.5 Landscape and Visual

The following aspects were considered in the assessment of the four route options in terms of Landscape:

- **Landscape Character -** this aspect of the landscape criteria assessment looked at the existing Landscape Character Areas (LCAs) and their sensitivity to the Proposed Development in order to identify the potential magnitude and significance of any impact to these LCAs. These significance ratings were used to feed into the overall score for each route option in terms of landscape impacts.
- **Landscape elements –** a review of designated and non-designated highly sensitive landscape elements was undertaken in the context of proximity to each route option. Again, the sensitivity, magnitude and potential significance to these Landscape elements is defined in order to develop the overall score in terms of landscape.

2.4.1.5.1 Methodology

All Route Options involve trenching works along the road network; thus, road users are also likely to notice some impacts during the construction phase, but these are not considered to be a differentiating factor between the Route Options. A review of the County Development Plans for Meath and Fingal identified and considered scenic designations, landscape character areas and other landscape-related elements. All of the Route Options were considered in relation to each the following landscape and visual designations. Meath County Council (https://www.meath.ie/): Landscape Character Area; and Views and Prospects. Fingal County Council (https://www.fingal.ie/): Landscape Character Types; Green Belt Zoning; Nature Development Areas; locations with Specific Objective to 'Protect & Preserve Trees, Woodlands and Hedgerows'; and Views and Prospects.

2.4.1.5.2 Sensitivity – landscape character

While influenced by the value and sensitivity judgements for particular Landscape Character Areas in the County Landscape Character Assessments for Meath and Dublin, independent landscape sensitivity judgements are provided for this assessment based on the more universal criteria, which are derived from the GLVIA-2013 Guidelines (Landscape Institute and Institute of Environmental Management & Assessment 2013) and accounts for the susceptibility of the landscape to the Proposed Development. This approach is consistent with best practice and also accounts for the inconsistency that commonly occurs in assigning landscape sensitivity to similar or adjoining landscape units between Counties. Furthermore, the receiving landscape is considered at a finer grain than that of a County-wide Landscape Character Assessment.

2.4.1.6 Archaeology, Architectural Heritage and Cultural Heritage

The potential to impact on archaeology, architectural heritage and cultural heritage assets was raised during public consultation and a thorough assessment was undertaken of the four route options in terms of the following :

- Designated Archaeology:
  - National Monuments and Preservation Orders
  - Register of Historic Monuments (RHM)
  - Recorded Monuments
  - Entries to the Sites and Monuments Record (SMR)
- Designated Architectural Heritage
  - Record of Protected Structures
  - Architectural Conservation Areas (ACA)
  - National Inventory of Architectural Heritage (NIAH)
  - Historic Gardens and Designed Landscapes (GDL)
- Non-designated Cultural Heritage Assets, typically post-medieval built heritage including stone road bridges, houses and farm buildings.

To identify and quantify the constraints above that may be impacted by the proposed route options, including indirect impacts, a Study Area of 100m was established around each route option under consideration. A 100m Study Area is considered sufficient to capture impacts given any direct impacts would largely result from the excavation for the cable trench, joint boxes, and temporary launch and reception pits for directional drilling, and be focused on the alignment of the route option. Any indirect impacts are anticipated to be temporary (lasting the duration of construction in each location), localised along the wayleave corridor and are not anticipated beyond 100m.

Baseline conditions were established through desk-based research, including a review of the following sources:

- The archaeological and architectural features identified as part of the Environmental Constraints Report;
- Aerial imagery, including Google, OSi Digital Globe, and EirGrid aerial photography;
- Historic mapping available online, comprising:
  - The Down Survey of Ireland[14];
  - Larkin's map of Meath (1812)[15]; and
  - Historic Ordnance Survey mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913);
- Placename information available online[16];
- The National Folklore Collection via the UCD digital library available online[17]; and
- Topographical files of the National Museum of Ireland through the online National Museum of Ireland: Finds Database (up to 2010) available online[18].

A unique reference number was assigned to each constraint. Archaeological constraints are prefixed with 'AY' and architectural heritage constraints are prefixed with 'AH'. Demesne lands are prefixed with 'DL' and undesignated cultural heritage sites are prefixed with 'CH'. Archaeological, architectural heritage and cultural heritage constraints are identified in the sections below and are also shown in Appendix B.1. Supporting

[14] http://downsurvey.tcd.ie/index.html [Accessed 05.11.21].
[15] https://www.logainm.ie/Eolas/Data/Brainse/logainm.ie-map-william-larkin-1812-grand-jury-meath-sheet-06.jpg [Accessed 09.11.21].
[16] www.loganim.ie
[17] https://digital.ucd.ie/
[18] http://heritagemaps.ie/

baseline information for the archaeological, architectural heritage and cultural heritage constraints identified is provided in Appendix B.1.

The assessment was undertaken based on the guidance provided in EirGrid's '*Cultural Heritage Guidelines for Electricity Transmission Projects*'[19]. The assessment looked at the potential for direct and indirect impacts on the identified feature within the 100m Study Area in order to ascertain the overall score for the archaeology, architectural heritage, and cultural heritage criteria. Full details for the archaeology, architectural heritage and cultural heritage constraints identified are provided in Appendix B.1.

2.4.1.7 Noise and Vibration and Air Quality

The assessment of potential impacts of noise and vibration and air quality is based on the quantification of sensitive receptors close to the proposed route options within a number of distance bands from each of the proposed route options. These distance bands are up to 300m for noise and 350m for air quality. The noise assessment focused on potential impact as a result of "noisy" elements during construction and the air quality assessment focused on potential impacts as a result of dust during construction.

2.4.1.7.1 Methodology – noise and vibration

The noise and vibration assessment at this stage of the Proposed Development involves gaining an appreciation of the baseline noise environment close to each of the proposed route options and identifying noise and vibration sensitive receptors within distance bands up to 300m from each of the proposed routes. Noise impacts from construction activities do not normally occur beyond 300m and vibration impacts do not normally occur beyond 100m. The locations of major crossings where HDD is likely to be required and off-road sections where noise impacts are likely to be greater compared to on-road sections is also used to assess each route in terms of the noise risk according to the multi criteria analysis at Step 4A.

A semi quantitative assessment was carried out using GIS to count the number of noise and vibration sensitive receptors within 100m and 300m of this option. Noise and vibration sensitive receptors include dwellings, schools, hospitals, nursing homes, places of worship, equestrian centres and heritage buildings. Noise and vibration impacts have the potential to be greater at sensitive receptors close to off-road sections and motorway crossings compared to standard on-road construction.

A count of the number of receptors within 100m and 300m of the off-road sections was undertaken and a count of the number of receptors within 100m and 300m of the motorway crossings was undertaken. See Table 4.9.

No baseline noise surveys were undertaken, and no noise modelling was undertaken at this stage of the Proposed Development. However, these will be completed during Step 5 of the Proposed Development.

2.4.1.7.2 Methodology – air quality

For human exposure to air pollutants, sensitive receptors (termed 'human receptors') include, for example, residential properties, schools and care homes. Air pollutants can also impact on sensitive vegetation and habitats (termed 'ecological receptors'). These include the following ecological receptor designations:

- Special Area of Conservation (SAC);
- Special Protection Area (SPA);
- Ramsar site;
- Natural Heritage Area (NHA) and proposed NHA (pNHA); and
- Ancient Woodland.

[19] EirGrid, 2015, Cultural Heritage Guidelines for Electricity Transmission Projects. https://www.eirgridgroup.com/site-files/library/EirGrid/Cultural-Heritage-Guidance-for-Electricity-Transmission-Projects.pdf

The Institute of Air Quality Management (IAQM) dust guidance[20] has been adapted for the purposes of this assessment.

A semi quantitative assessment was carried out using GIS to count the number of (human) air quality receptors within set distance bands of the design option centreline. For ecological receptors, distance bands of 20m and 50m were assessed, whereas human receptors used 20m, 50m, 100m and 350m.

2.4.1.7.3 Assessment criteria – air quality

The main criteria used for the assessment of each route option was adapted from Table 2 of the Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction (June 2016) (see Table 2.1).

Table 2.1: Sensitivity of the area to dust soiling impacts on people and property

Number of receptors	Distance from the source (m)		
	<50	<100	<350
>100	High	Medium	Low
10-100	Medium	Low	Low
1-10	Low	Low	Low

The following scoring was applied:

- Route options with a high sensitivity to dust soiling - Risk Score 3 (moderate risk);
- Route options with a medium sensitivity to dust soiling - Risk Score 2 (low to moderate risk); and
- Route options with a low sensitivity to dust soiling - Risk Score 1 (low risk).

2.4.1.8 Climate Change

All of the options will deliver the reinforcement of the Grid to facilitate the connection of new renewable sources of energy in line with the targets in the Climate Action Plan 2020. This is not a differentiator between the routes. The options assessment focuses on the resilience of each option to climate change impacts and the contribution each option may make to greenhouse gas emissions as a result of the materials used in its construction.

2.4.2 Socio-Economic

Socio-economic matters were raised by several stakeholders during the consultation process; both generally and in respect of particular socio-economic topics, for example:

- Stakeholders raised concerns about disruption to the road network during construction, particularly impact on narrow local roads and the potential need for road closures and diversions.
- Some expressed concerns about how delays on the road network during construction would affect local businesses and farming operations.
- Some respondents expressed concerns regarding the potential health impacts of electromagnetic fields.
- Stakeholders asked whether there had been consideration of joined up thinking around the presence of other ongoing local utilities and renewables construction projects.
- Some stakeholders expressed concerns that particular routes would be disruptive to agriculture.

[20] Institute of Air Quality Management. 2016. Guidance on the assessment of dust from demolition and construction. Version 1.1. http://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

TII raised concerns about the principle of the route options maximising use of national, regional and local roads. They express concerns about the impact of the route options on their management and maintenance of the national road network. They also commented on the following potential impacts:

- Impacts on embankments, bridges, drainage and road furniture infrastructure which could lead to maintenance liabilities in the future;
- Difficulties with future maintenance and operations activities;
- Challenges with future routine network improvements such as pavement overlay and strengthening and installation of new verge-side signs and other road infrastructure;
- Impacts on traffic flow during construction; and
- Difficulties with future on-line upgrades of national roads due to technical challenges and the additional cost of re-routing underground cables to accommodate road improvements.

Taking the above into account, the socio-economic risks and considerations associated with the four route options are presented under the following assessment topics:

- Traffic and Transport;
- Amenity;
- Human Health;
- Employment and Economy (and Tourism);
- Land Use (and Land-take)
- Utilities; and
- Agriculture (including Equine).

These assessment topics are consistent with the assessment topics considered within the Step 3 Strategic Social Impact Assessment Scoping Report (EirGrid 2022[21]) and the Step 3 Environmental Constraints Report (EirGrid 2022[22]).

The approach undertaken by each assessment topic is outlined below with the detail of the assessment of each individual route option outlined within Chapter 5 of this report. These assessment topics use a mixture of qualitative and quantitative assessment to assign the overall score (e.g. low, moderate, high, etc.) to the assessment topic under consideration.

Electromagnetic Fields (EMF) are an important consideration in any electrical transmission project. EirGrid's design standards require all underground cables to operate within existing public exposure guidelines from the International Commission on Non-Ionising Radiation Protection (ICNIRP)[23] and as such there will be no effect from EMFs in terms of human health or interference to other electrical devices and systems. In this way, EMFs are not a differentiator between the cable options and are not assessed at this stage in the Proposed Development.

2.4.2.1 Traffic and Transport

The following aspects were considered in the assessment of the four route options in terms of traffic and transport:

- Road Network – the road type, its length per type (km) and consideration of the available width along stretches of the corridor (e.g. hard shoulder, and/or cycleway, footway provision along the route).
- Junction – the number of key junctions potentially affected by the route option; and

[21] EirGrid. 2022. Step 3 Strategic Social Impact Assessment Scoping Report.
[22] EirGrid. 2022. Environmental Constraints Report. http://www.eirgridgroup.com/site-files/library/EirGrid/321084AJ-REP-004-Environmental-Constraints-Report-Final-May-2022.pdf
[23] ICNIRP GUIDELINES FOR LIMITING EXPOSURE TO ELECTROMAGNETIC FIELDS (100 KHZ TO 300 GHZ) https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf

- Access – the number of properties and community facilities located along the route option that could be potentially affected in terms of access as a result of the route option.

Consideration of these aspects of construction works were undertaken along the route and the likely traffic management measures required to accommodate current traffic movements along the routes. The likely impact of these measures on traffic progression and journey time reliability has been used to inform the ranking scoring applied.

2.4.2.2 Amenity

'Amenity' is the term used to describe the overall pleasantness and the 'feel' of a community and the ability for people to enjoy the general character or quality of their surroundings.

The impact on amenity of the four route options is determined by considering the indirect (in-combination) impact of the following environmental effects:

- Air quality;
- Noise (and vibration);
- Visual; and
- Traffic and transport.

Where there is a combination of at least two direct environmental effects on a receptor or group of receptors, this is classified as an indirect (in-combination) impact on amenity. For example, where there are both visual and air quality impacts on a receptor or group of receptors, it would be concluded that these receptors(s) would be indirectly impacted by an in-combination amenity effect.

2.4.2.3 Human Health

Impacts on human health relate to the likely impacts stemming from the direct 'nuisance effects' of noise (and vibration), air quality, visual, traffic. These environmental effects could impact individuals as well as groups of individuals directly, or indirectly by way of inducing stress or fear. Examples of how such environmental effects can impact human health during construction are outlined below. As noted in Section 2.4.2, EMF is not a differentiator between the cable options and is not assessed at this stage in the Proposed Development.

Dust and pollutant emissions from plant machinery or construction-related traffic, in the absence of mitigation measures, could lead to general annoyance as well as being detrimental to the respiratory health of individuals and communities in close proximity to construction activities.

Noise (and vibration) impacts that are considered to be excessively noisy and brought on by construction or operational activities can lead to impaired hearing, sleep disturbance, and general annoyance. There is also increasing evidence of a link to heart disease and hypertension (WHO, 2018)[24].

Changes in the long-standing visual environment can also lead to distress and annoyance for people and communities. This distress and annoyance would not just be in respect to changes in visual amenity but also due to changes in the landscape itself and its use by people and communities as a recreational amenity / asset.

2.4.2.4 Employment and Economy (and Tourism)

The potential impacts on employment and the economy as a result of the four route options are determined by professional judgement, informed by currently known project information (particularly in respect to likely workforce composition, the duration of construction, and the construction methodology more generally), statistical data and evidence of the current economic climate in Ireland from the Central Statistics Office (CSO) as well as past professional experience on infrastructure projects of a similar scale and nature.

[24] https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

2.4.2.5 Utilities

Utilities provide many different services that people, and communities rely upon. There are many different types of utility infrastructure, which may be situated overhead (such as other electricity or telephone lines) or underground (such as electricity cables, water services, sewers, gas, fibre optic cables).

The assessment of potential impacts on utilities is informed by desk-based research on the extent and nature of utilities likely present in the Study Area, currently known project information relative to likely construction methodology and best practice measures in respect to treatment of utility infrastructure during construction (and operation, as applicable).

2.4.2.6 Agriculture (including Equine)

The following aspects were considered in the assessment of the four route options in terms of agricultural (and equine):

- Agricultural Land – the amount of agricultural land crossed by the option.
- High sensitivity agricultural enterprises – the number of enterprises such as equine, dairy and horticultural potentially affected by the option. Sensitivity of enterprises is determined mainly from the type of farm enterprise, as set out in Table 2.2. The appraisal of sensitivity is subject to professional judgement and evaluation of other site-specific factors such as the land quality and importance of the enterprise.

Table 2.2: Sensitivity of Agricultural Lands

Farm Enterprise Type	Sensitivity
Stud farm, Equestrian centre, horticultural enterprise, intensive agriculture (poultry & pigs)	High - Very High
Dairy farm, intensive equine enterprises	High
Non-dairy grazing livestock enterprises (including beef, sheep and non-intensive equine) and grass cropping enterprise	Medium
Tillage	Medium
Rough Grazing, Bog, Forestry, Woodland (where poor land quality restricts farming practices)	Low - Very low

2.4.3 Technical

Feedback from TII set out a number of technical requirements regarding horizontal directional drilling (HDD) crossings of motorways:

- Launch and reception pits for the pipeline are located outside the motorway boundary;
- Installation of the pipeline at a depth that does not impact drainage for the motorway;
- Neither the works nor the pipeline will damage or impact the motorway;
- Any maintenance or planned upgrades of the pipeline at the crossing location can take place without access to the motorway boundary;
- There are no bolted joints in the section of pipeline within the motorway fence-line; and
- A pre and post-construction survey is necessary along the length of the pipeline over the extents of the motorway boundary.

IFI also provided a series of technical requirements regarding temporary watercourse crossings:

- Preferred option is clear span ‘bridge type’ structures on fisheries water;

- If clear span structures cannot be used, structures should:
  - use one or more metal or concrete pipes or prefabricated culverts;
  - maintain the existing stream profile;
  - avoid significant alternation of speed or hydraulic characteristics;
  - have capacity to accommodate the full range of flows including flood flows; and
  - be covered with a clean, inert material to enable safe crossing of all items of construction equipment without the cover material being dislodged.
- Design and install the approach and departure routes for drainage to fall away from the watercourse being crossed;
- Provide additional earthwork settlement areas where the fall of ground does not allow sufficient control on drainage;
- Fence with geotextile to prevent the wind carrying dust to waters;
- Use side armour to make sure machinery cannot drive over the edge of crossings;
- Ensure crossings can accommodate all construction machinery.

All four route options require HDD crossings under the M3, M2 and M1 motorways and the assessment in the respect of motorway crossings is similar in this respect. Similarly, all four route options are required to cross numerous watercourses where, depending on the nature of the watercourse, either HDD or a trenching approach may be appropriate. This feedback will therefore be further considered as the route design is developed and refined as part of Step 4B.

The technical assessment included review of the proposed route options against the criteria laid out in EirGrid's Framework for Grid Development:

- **General Compliance with System Reliability, Security Standards –** EirGrid's reliability and security standards are defined in the Transmission System Security and Planning Standards and their Operation Security Standards;
- **Headroom and Ratings Impact –** This is the amount of additional capacity each route option offers that would be available for the future without requiring further upgrade;
- **Maintainability –** This considers the ease with which the route option can be serviced and maintained, for example how easy it is to access joint bays and link boxes;
- **Technology Operational Risk –** This criterion aims to capture the risk of operating different technologies on the network;
- **Average Reliability Rates –** This is the likelihood of the chosen cable technologies such as cables, joint bays, and bonding failing during operation; and
- **Repeatability –** Repeatability means whether the proposed technical solution can be readily repeated in the transmission network.

It is proposed to use the same cable solution (same conductor cross-section) and cable system design for all options (cross bonded solution). As a result, all of the route options will receive the same scoring from a technical perspective.

2.4.3.1 Technical Delivery Solution

It should be noted that independent cable integration studies indicate there will be a need for reactive compensation at both Woodland and Belcamp substations, dependent on the cable size chosen. These shunt reactors work to maintain voltages within acceptable limits during operation of the cable. The reactors are similar to transformers and are installed on concrete plinths adjacent to the cable connections to the substation within the substation compound. Additional harmonic filtering on the network for all the proposed route options may also be required. At this stage, given the available information, the small percentage difference in the lengths of each route option does not trigger any substantial change for any of the required auxiliary equipment noted above.

The technical delivery solution presented below follows on from the Step 3 report, as well as technical discussions and meetings with EirGrid. Initially at Step 3, three variations of size of conductor and trench size were assessed. These options were:

- 400 kV 2500mm^2 Cu conductor, single conductor per phase, cable solution in a 1.7m trench
- 400 kV 3000mm^2 Cu conductor, single conductor per phase, cable solution in a 2.1m trench
- 400 kV 2500mm^2 Cu conductor, two conductors per phase, cable solution in a 1.7m trench

However, to understand the potential impact of the Proposed Development on the physical environment, Jacobs prepared a typical trench cross-section for reference (see Figure 2-4). This cross section is in line with the initial assumptions for the Kildare - Meath Grid Upgrade project.

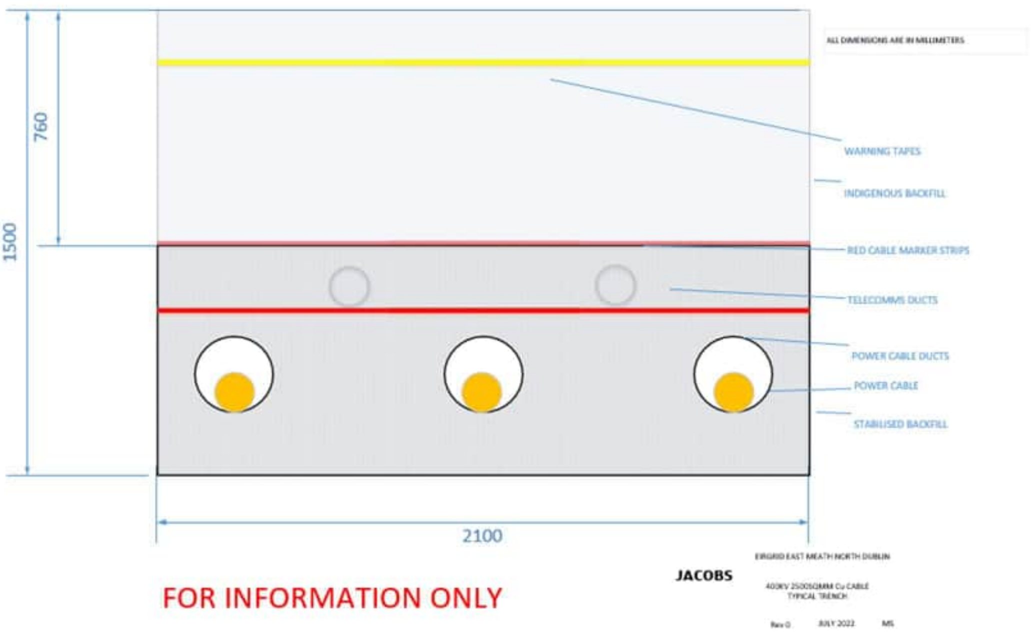


Figure 2-4: Preliminary typical trench cross-section for 400 kV 3000sqmm Cu solution (trench width 2100mm)

Recent developments and advancements in the Kildare - Meath Grid Upgrade project have now moved the focus to the following solution, illustrated in Figure 2-5:

- Cable: 400kV, 3200sqmm Cu conductor
- Trench cross-section: Width of 1.5m

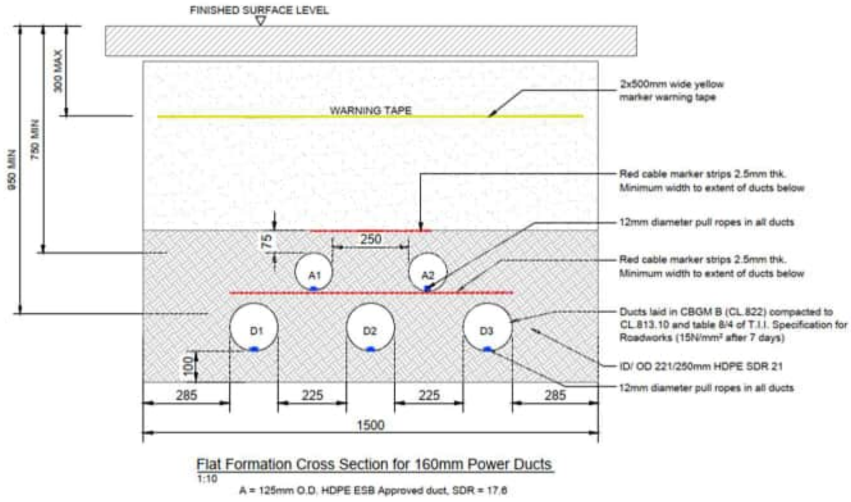


Figure 2-5: 1.5m, Wide Trench

This construction solution is expected to be utilised for the majority of the length of the Proposed Development, where the circuit is installed in roads.

This solution carries the following advantages:

- Fully ducted route solution allows for decoupling of civil works from cable installation and testing works;
- Will minimise duration of any required road closure along the route sections;
- Will facilitate future maintenance and repair works;
- Is compliant with EirGrid standards and best practices; and
- Allows for the delivery of transmission power as outlined in Table 2.3 (these revised target ratings are an increase on the initial values identified at Step 3).

Table 2.3: Target Transmissible Power (continuous ratings)[25]

	Winter	Summer
Transmissible Power/ Current*	1866MVA /2693A	1577MVA/2276A

**Correct at the time of writing – further changes in the cable rating may affect this*

2.4.3.2 Technical Delivery Solution at crossing points

The delivery option described in Section 2.4.3.1 will be adopted for all options (Option A: Red, Option B: Green, Option C: Yellow, and Option D: Blue) for cable installation in road like conditions.

Due to the presence of numerous and different obstacles along each of the proposed route options, a number of different crossing methodologies may be required. Possible solutions are outlined in Table 2.3.

Table 2.3: Potential Obstacle Crossings Solutions

Obstacle description	Potential Solution	Comment
Shallow crossings like Utilities, road drainage ducts, telecoms, medium pressure gas and other.	Typical trench as per Figure 2-5 with increased depth of ducts	Measures to improve rating, including special thermal backfill materials and bentonite filled ducts
Small streams/roadside water ditch/ shallow water crossings.	Typically open cut installation to avoid shallow obstacles with temporary water	N/A

[25] In August 2022, EirGrid issued a new cable policy (Ref. Pol_St_11_v1.0) indicating target ratings for underground cables operating at 400kV

Obstacle description	Potential Solution	Comment
	over-pumping to maintain flow during works (unless environmental risks drive HDD)	
Larger waterways.	Cable bridges or cable culverts or micro tunnels	Solution will depend on ground conditions and impact on surrounding environment.
Large rivers/ wide canals/ motorways/ railways	Horizontal Directional Drilling (HDD) or Auger Bores solutions	Solution will depend on ground conditions. Assume maximum depth of approximately 10m for these types of installation. Further lateral spacing of cables will be required to counteract the effects of depth on ratings.
Large rivers/canals/motorways/railways/extremely densely populated areas with very poor ground conditions.	Tunnel installation	Solution will depend on ground conditions

2.4.3.3 Impact on deliverable ratings caused by crossings

The crossings noted above that will necessitate deep HDD excavations, will have an impact on the overall circuit transmissible power. Along each of the proposed route options, the deepest crossing will act as a "ratings pinch point" for the route option and limit the overall transmissible power.

Preliminary calculations show the following:

- Solution A (refer **Error! Reference source not found.**): An HDD, 10m Deep, with phase separation of 12m, will deliver 90% of target winter ratings as described in Table 2.2
- Solution B (refer Figure 2-7): An HDD, 10m Deep, with phase separation of 10m, will deliver 88% of target winter ratings as described in Table 2.2

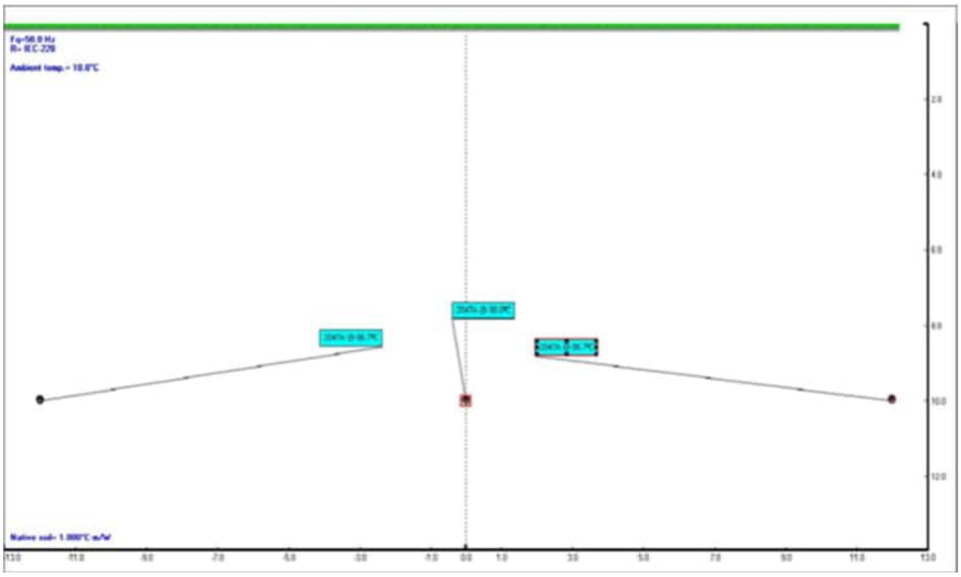


Figure 2-6: Calculation showing Solution A

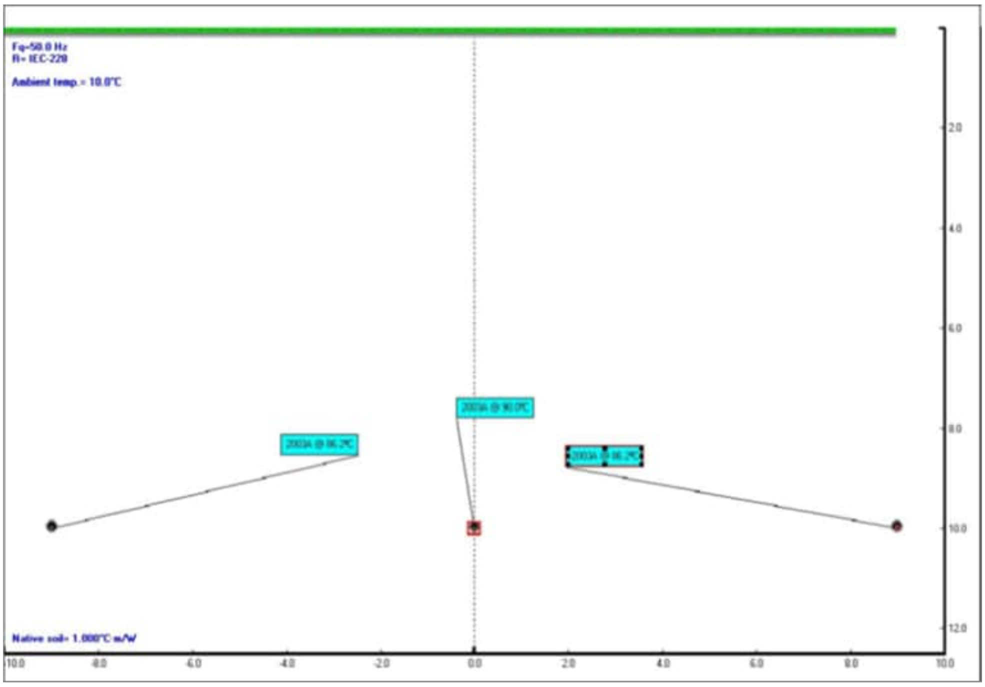


Figure 2-7: Calculation showing Solution B

There are a number of solutions to mitigate such effects:

- Using bentonite in HDD ducts;
- Increase conductor size at HDD crossing;
- Double number of phases at crossing; and
- Utilise a tunnel crossing solution.

2.4.4 Deliverability Criterion

Deliverability matters were raised by several stakeholders during the consultation process; both generally and in respect of particular deliverability topics, for example:

- Stakeholders raised concerns about disruption to the road network during construction, particularly impact on narrow local roads and the potential need for road closures and diversions.

TII raised concerns about the principle of the route options maximising use of national, regional and local roads. They express concerns about the impact of the route options on their management and maintenance of the national road network. They also commented on the following potential impacts:

- Impacts on embankments, bridges, drainage and road furniture infrastructure which could led to maintenance liabilities in the future;
- Difficulties with future maintenance and operations activities;
- Challenges with future routine network improvements such as pavement overlay and strengthening and installation of new verge-side signs and other road infrastructure;
- Impacts on traffic flow during construction; and
- Difficulties with future on-line upgrades of national roads due to technical challenges and the additional cost of re-routing underground cables to accommodate road improvements.

The deliverability risks and considerations associated with the four route options, which include consideration of the feedback summarised above, were considered under the following assessment criteria:

- **Design complexity**: Each route section will be assessed in terms of the length of the route, obstacles encountered along the route, the number of utility crossings that will need to be made, the need for Horizontal Directional Drilling (HDD), micro-routing requirements to ensure a minimum duct bending radius of 20m, and the extent to which services have already been installed within the road;
- **Traffic disturbance impact**: Each route section will be assessed in terms of level of disruption including: the need for traffic management; the availability of alternate routes for diversion during installation works; and anticipated length of time the diversion or traffic management shall be in place;
  - TII noted that a Traffic and Transport Assessment should, where appropriate, be carried out according to relevant guidelines. This will be further considered during Step 4B.
- **Dependence on other infrastructure projects**: This will assess the extent to which the route may be impacted/may impact other infrastructure projects in the area;
- **Permits and wayleaves**: This will include consideration of the number of permits required for crossing other utilities, licenses, and easements/wayleaves;
- **Implementation Timelines**: The installation timelines will be directly impacted by the deliverability criteria outlined above. Consideration will be given to the length of ducting that can be installed per day, as well as any seasonal and local constraints that may impact the implementation. Installation of the cable route will assume a standard 5-day working week; and
- **Third party utilities**: from a deliverability perspective, existing underground electricity cables and third-party utilities were identified, in so far as possible from a desk-based study, to determine the potential for interactions and conflicts.

2.4.5 Economic

Each route option is evaluated on the following:

- Length of installed cable;
- Quantity of Minor and Major service crossings; and
- Number of Major Crossings (such as Horizontal Directional Drills).

The economic evaluation consisted of assessing the number of each crossing solution per section, for each of the four route options. The crossings were matched to the standard crossings highlighted in Table 2.3 above. Each of the crossing solutions above has an associated cost which is a multiplier of the standard trench cost.

When added together, an indication of the relative cost for the selected route option is provided. A relative weight was also assigned to each route option based on its relative length over the shortest route. When assessing service crossings, focus has been placed on the differences between the reference installation rate (typical trench) and that of the crossing. This results in the key differences being the:

- Depth of excavation;
- Additional trench support;
- Support for the service being crossed;
- Method of excavation;
- Special equipment used; and
- Additional material used.

The method of excavation changes where either an existing gas main or electrical cable is being crossed. In these circumstances, hand digging is required. For water service crossings mechanical excavation methods with suitable supervision and controls are assumed to be used. Traffic management costs are included in the reference rate and consequently incur no additional cost for a service crossing.

3. Route Options Assessed

3.1 Description of Route Options

The route options are presented in **Error! Reference source not found.** and an overview of key constraints is provided in Appendix F. The route options vary in length and location, which were determined taking into account the mapped constraints and the routing principles.

In line with the routing principles, route options have avoided going off-road, through private land and through agricultural land, where possible. The balancing with the other routing principles means that there are some route sections which do impact agricultural land. The impacts on agricultural land have been carefully considered and a balance has been sought between impacts to farming operations, the importance of field drains and hedgerows at the edges of field for their ecological value, and technical considerations. None of the route sections directly impact private dwellings and none would require demolition of dwellings or other buildings.

The off-road sections within the options are shown as refinement areas. As noted above this is because further engagement, surveys, design and assessment work is required to refine the route design in these areas. However, an indicative route within these corridors has been assumed in some cases to assist consultation and engagement. This is also to allow a comparative assessment to be undertaken at this Step of the Proposed Development. Following the identification of the Emerging Best Performing Option, further survey, design, consultation and assessment will be completed to refine the potential corridors into a specific route. This will be presented at Step 4B and further refined at Step 5.

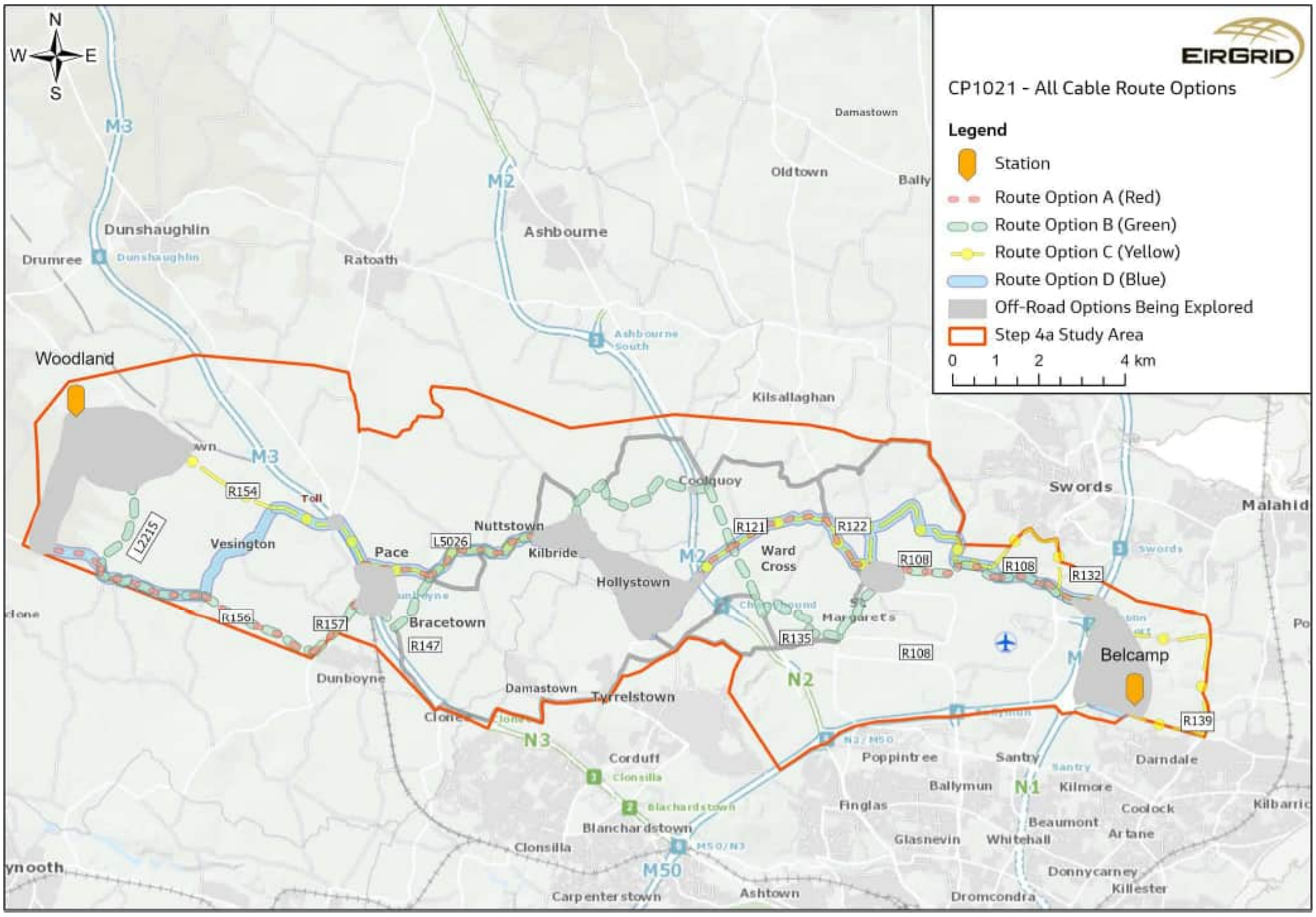


Figure 3-1: Route Options

3.1.1 Common to all four route options

3.1.1.1 Woodland Station – all routes start here

Woodland 400kV substation near Batterstown, Co Meath is of national strategic importance within the electricity transmission grid. It already has several major circuits connected with several grid infrastructure developments planned to be connected in the coming years. The planned underground cable will connect into the existing substation, which will require the associated provision of apparatus and site development works.

There are a number of high voltage infrastructure projects which are planned to connect to the existing Woodland station, such as:

- East Meath – North Dublin Grid Upgrade (the Proposed Development);
- Kildare – Meath Grid Upgrade;
- North South Interconnector; and
- Woodland substation improvement works.

For this grid development project, each of the four proposed route options has a common connection point at Woodland substation.

3.1.1.2 Belcamp Substation – all routes travel to here

Belcamp 220kV substation is an existing substation in the Clonshaugh area of County Dublin around 7km from Dublin city centre. This substation is also of strategic importance in the electricity transmission grid, as it will accommodate further grid development projects in the coming years.

This 220kV substation needs to be extended and a new 400kV infrastructure needs to be developed to accommodate the planned underground cable development. The works will improve power quality and support future renewable generation, including offshore renewables, and growing demand in the North Dublin area.

Projects currently in development at Belcamp substation include:

- East Meath – North Dublin Grid Upgrade (the Proposed Development);
- Kildare – Meath Grid Upgrade (Associated works);
- Shellybanks to Belcamp 220kV cable;
- Finglas to Belcamp 220kV cable;
- Belcamp 220kV substation extension; and
- Offshore windfarm connection.

As with Woodland, for this grid development project, there is a common connection point at Belcamp for each of the four proposed route options.

3.1.1.3 Motorway crossings

All routes will cross the M3, M2 and M1 between Woodland and Belcamp.

It is likely these will be crossed using Horizontal Directional Drilling (HDD) to minimise disruption and impacts on existing infrastructure.

Horizontal Directional Drilling (HDD) is a method of drilling that installs underground pipelines and cables without digging trenches. It involves using a directional drilling machine to drill along the chosen path underneath the infrastructure and then installing the required pipe and cable.

3.1.1.4 Off-road corridors

The lengths of the four options range from 36km to 43km. Most of the cable route in each option can be laid in the existing road network. However, each option will require some of the cable route to be off-road. These off-road corridors will range from c.3km to c.9km of the cable route and are in locations where off-road routing is unavoidable. More detailed environmental and technical surveys will inform further assessment work in these locations in addition to ongoing engagement with landowners to refine the route design.

For this reason, we have shown an indicative route in a highlighted refinement area on each of the route maps. The off-road section may pass through any part of this corridor. We will minimise impacts on agricultural operations as far as possible by carefully routing the cable.

3.1.1.5 Construction Principles and Assumptions for All Route Options

All four proposed route options have been assessed to be acceptable in terms of technical aspects in addition to economic, deliverability, socio-economic and environmental factors based on the information currently available. Further design will be undertaken during subsequent steps in the Proposed Development to refine the location and nature of the construction works and allow an assessment of the potential social and environmental impacts of the Proposed Development. The further design will include matters such as construction sequencing, traffic management, management of excavated material, construction compounds, and ensuring existing utilities and structures are not affected. Mitigation, control and management measures will also be identified to avoid or minimise social and environmental impacts.

Engagement with key stakeholders has been undertaken in advance and in parallel with the Public Consultation period in September to November 2022 and will continue throughout the remaining steps of project development. From a constructability perspective, this will necessarily include discussions with statutory bodies such as Iarnród Éireann (Irish Rail), Transport Infrastructure Ireland (TII), Fingal County Council and Meath County Council. Utility operators have also been contacted to understand the location of existing services and further consultations will be undertaken. Landowners will also be engaged with directly.

Each of the four proposed route options will have significant groundworks associated with them whether that is following carriageways or across agricultural land. Due to the nature of this type of construction works there will be a requirement to temporarily stockpile large amounts of the excavated material during the ongoing works and this will be factored into the site setups and planning boundaries.

Dependent on road conditions and highways specification, there could be opportunities to reuse the initially removed asphalt surface, treatment and conditioning and returning to be used as a temporary road surface before the final permanent surface is applied. This would require an agreed crushing and treatment suite suitable for the chosen route. Whilst vehicles being used for the transport of aggregate and fills will be used at peak optimum (i.e. always travelling with a load), reuse of excavated materials on site may reduce the overall carbon footprint of the scheme and disruption to local communities. This will be considered further following ground investigations of the best performing route corridor.

All four of the proposed route options require three crossings of motorways. These crossings are not key differentiators in the assessment between the proposed route options.

A proposed construction sequence and methodology for the Proposed Development is as follows:

- Setup traffic management (road closure / lane closure / diversions);
- Saw cut and remove road surface;
- Address any existing utilities (the details will be confirmed with utility owners);
- Excavate trench;
- Install concrete base;
- Install ducts for High Voltage cables and control / pilot cables;
- Install concrete surround to ducts;
- Installation of cable identification tape / tiles;

- Back filling and compacting;
- Resurfacing and lining of the road surface; and
- Removal of traffic management.

These activities would then be repeated until a cable jointing bay is needed to be installed. Cable jointing bays will be provided approximately every 600m to 800m and will allow sections of cable to be linked together as well as providing future access points for maintenance. The jointing bays are installed below ground at fixed intervals corresponding to the cable length. Joint bays are firstly installed and then later used for cable installation and jointing. The jointing bays can be constructed in a number of different ways – one method is to use prefabricated joint bays or precast bays which can be delivered to site and lifted into position. Traffic passing bays will be located and assessed at the next step of the project. These temporary passing bays will be located adjacent to jointing bays and will allow traffic to flow around the bay during its construction, reducing the need for diversions or road closures.

Subsequent to the installation of ducts and jointing bays, the following activities occur:

- Pulling the cables into the ducts;
- Jointing of the cables; and
- Testing and commissioning of the entire cable at the end of the construction phase but prior to the operational phase.

Overall, it is estimated that the construction of the Proposed Development will have a duration of three years assuming no unforeseen delays. The construction programme and estimated duration will be refined at the next step of the Proposed Development (Step 5) when further design and assessment will be carried out.

3.1.2 Route Options not progressed

The process of how the route sections were designed and assessed is presented in Chapter 2 of this report. This section and Appendix E present the route sections not progressed which reduces the long list of potential route options to four end-to-end options that were taken forward to public consultation (see Section 2.3) and further detailed assessment.

Following the approach and methodology described in Chapter 2, it was determined that a number of route sections would not be taken forward. These route sections are shown in Figure 3-2 and described in tables in Appendix E. These tables include some route sections that are directly connected to sections that featured significant constraints such that they were not progressed.

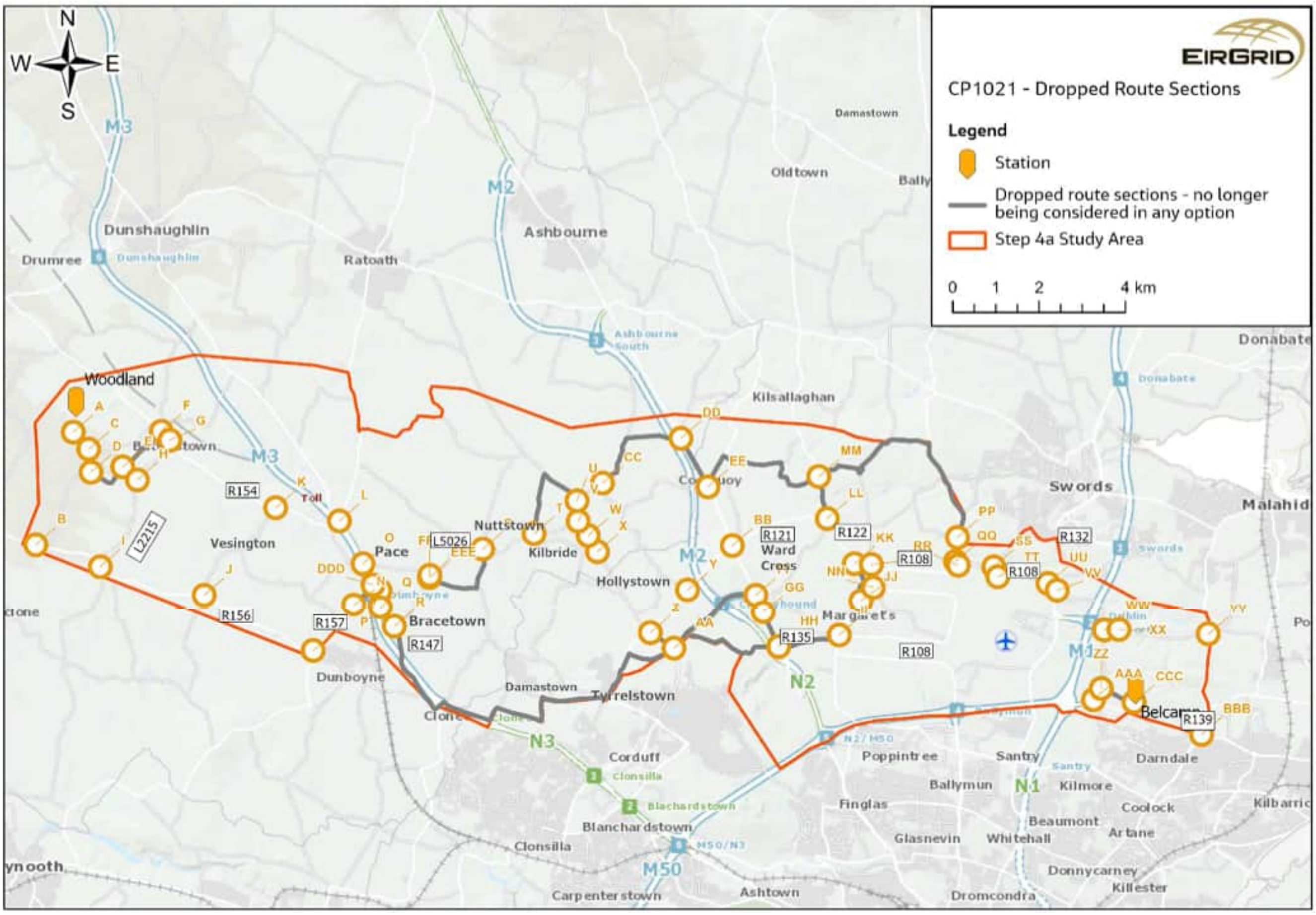


Figure 3-2: Route Sections Not Progressed

3.1.3 Overview of Proposed Route Options

Table 3.4 provides an overview of the four underground cable options considered for this project.

Table 3.4: Overview of Route Options

Option	Estimated overall length (km)	Estimated off-road sections (km)	Key aspects
Option A (Red)	37	9	Shortest route but affects largest amount of agricultural land.
Option B (Green)	38	7	Second shortest and avoids Hollystown.
Option C (Yellow)	43	2	Longest route. Goes through Batterstown village and southern suburbs of Swords. Least agricultural land.
Option D (Blue)	41	4	Second lowest agricultural land, second highest route length.

3.1.4 Route Option A (Red)

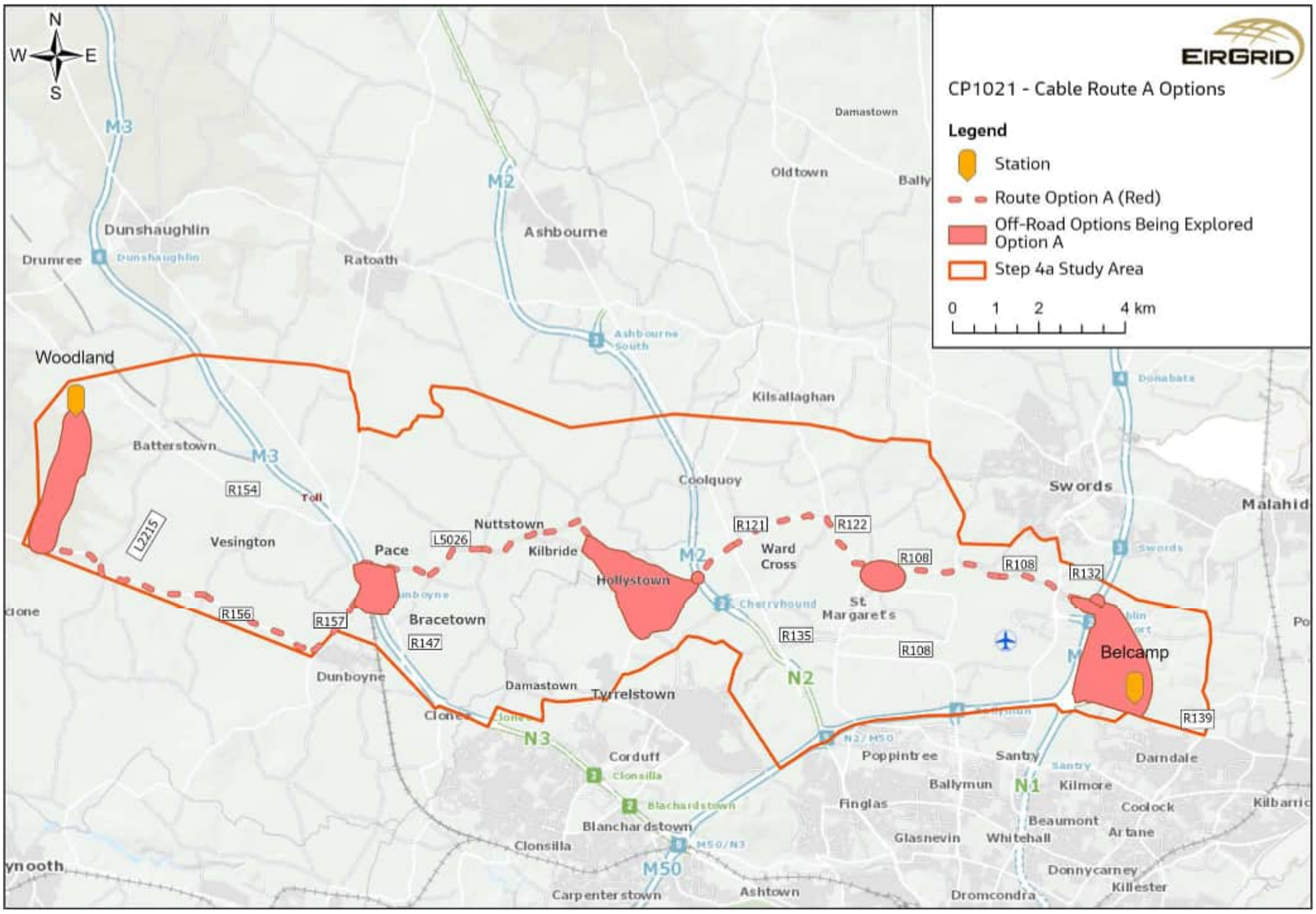


Figure 3-3: Route Option A (Red)

Route Option A (Red) is the shortest of the four cable route options at 37 km but has the longest off-road portion (9km). It potentially affects the largest amount of agricultural land of the four route options but has a relatively low impact on regional and local road networks.

From Woodland, Route Option A will travel south through fields for around 3 km until it joins the R156 at Barstown Industrial Estate. From there, the route will travel east as far as Dunboyne, turning north along the R157 once it reaches the north-western outskirts of the town.

It will cross the River Tolka, Railway at M3 Parkway and M3 Motorway at Junction 5.

The motorway itself is avoided as any crossing here will likely be via Horizontal Directional Drilling (HDD) or via a tunnel. A potential off-road corridor is shown for this crossing of the motorway. The route will then briefly progress north along the R147 before travelling east once more along the L5026 and local roads.

Route Option A advances east to Kilbride, with three crossings of the Ward River along the way. At Kilbride, the route turns south. A potential off-road corridor is shown for the route at, and to the south of, Kilbride. The route will pass through this corridor and join the R121 a short distance to the west of the M2. A further off-road corridor is shown for the crossing of the M2 motorway. Following the crossing, the route continues broadly east to the Ward Cross and stays east on the R121 until this road reaches the R122.

Route Option A will then progress south via Kilreesk Lane (also known as Tobermurr Link Road) and Kilreesk Road (also known as Tobermurr Road) to the R108 and Naul Road along the northern boundary of Dublin Airport as far as Cloghran Roundabout, northeast of Dublin Airport.

From there, Route Option A will briefly use Stockhole Lane travelling east to the M1 motorway. A potential off-road corridor is shown for this motorway crossing. Once across the motorway, Route Option A remains off-road; a potential off-road corridor is shown for the onward connection south to Belcamp substation.

3.1.5 Route Option B (Green)

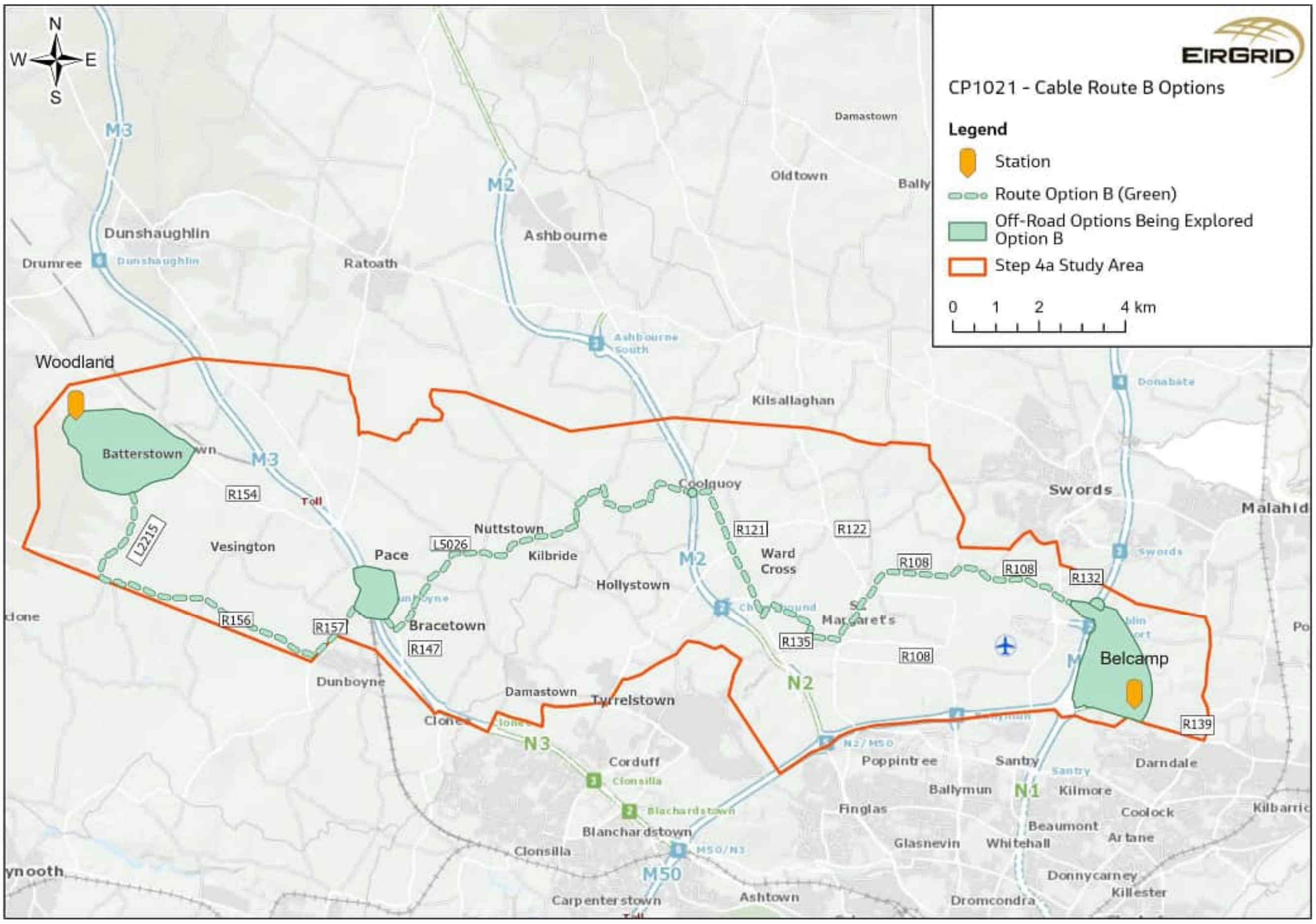


Figure 3-4: Route Option B (Green)

Route Option B (Green) is the second shortest of the proposed route options, with the second longest off-road portion. It shares a common route with Route Option A in multiple sections between Woodland and Belcamp but follows an alternative path for more than half of the course.

Route Option B will travel off-road in an east / southeast direction from Woodland until it reaches the L2215 in the townland of Lismahon. A potential off-road corridor is shown for this. At the L2215, the route travels south in the road to the R156. From there, the route option will advance east along the same route as Option A, avoiding Dunboyne.

It will cross the River Tolka, Railway at M3 Parkway and M3 Motorway at Junction 5.

Again, the motorway itself is avoided as any crossing here will most likely be via Horizontal Directional Drilling (HDD) or via a tunnel. A potential off-road corridor is shown for this motorway crossing.

The route will then re-join the R147 and progress south as far as Bracetown Business Park. It continues northeast along this road until it joins another shared section with Option A for the 4 km leading to Kilbride.

In Kilbride however, the proposed Route Option B travels north out of Kilbride and along a narrow road, through the townlands of Baytown, Mabestown and Irishtown.

Route Option B crosses the M2 Motorway at the flyover to the west of Coolquay, before joining the R135 in the village of Coolquay. A potential off-road corridor is shown for this motorway crossing. It travels south from there through the Ward Cross to Broughan. The route then travels east once more, joining the R122 via Broughan Lane and Newtown Cottages.

Route Option B runs close to St Margaret's and then joins the R108. Like Route Option A, the route will follow the northern boundary of Dublin Airport. From there, Route Option B will travel along Stockhole Lane before crossing the M1 motorway. A potential off-road corridor is shown for this motorway crossing. Route Option B will also remain off-road for its onward connection Belcamp. A potential off-road corridor is shown for this.

3.1.6 Route Option C (Yellow)

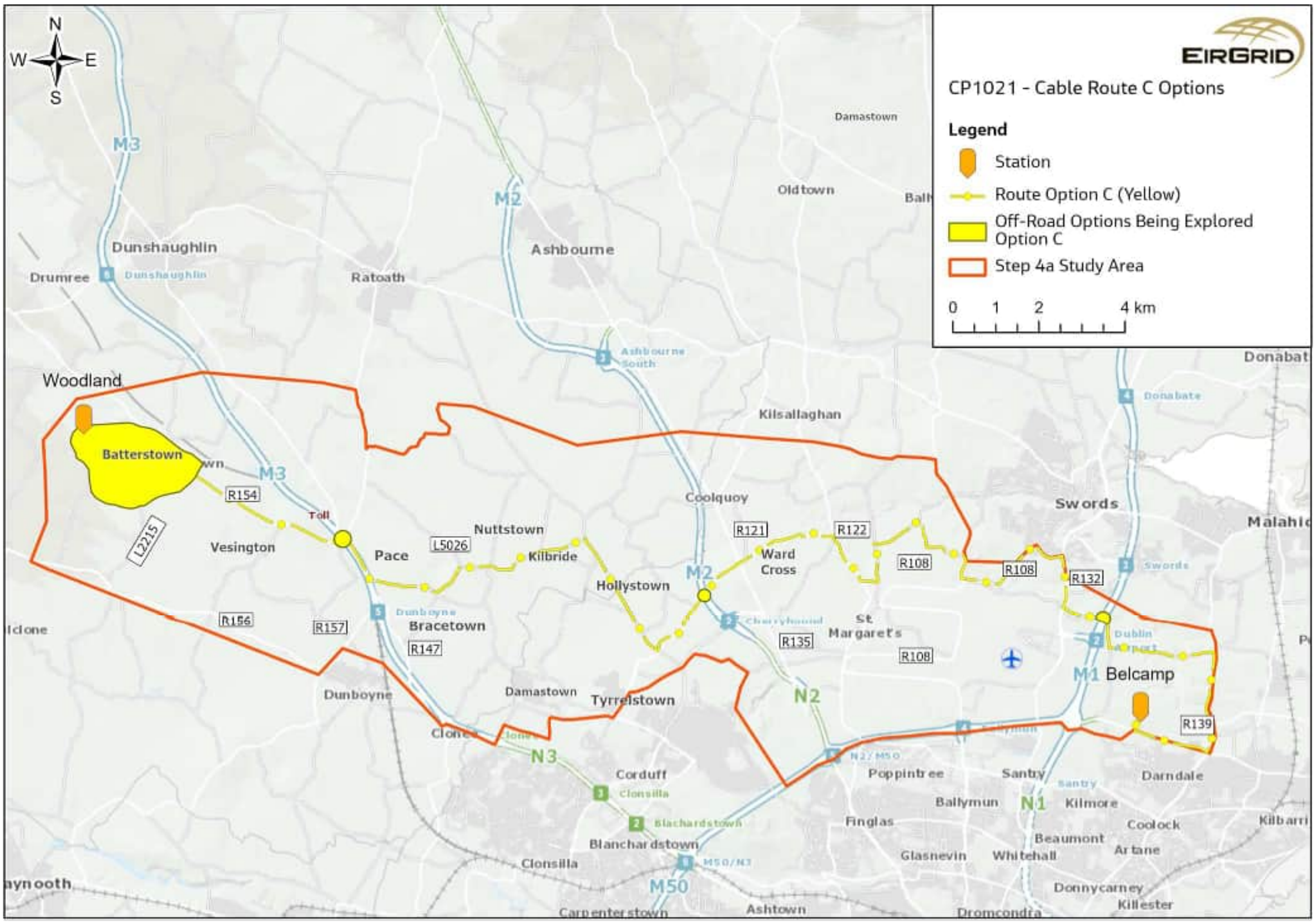


Figure 3-5: Route Option C (Yellow)

Route Option C is the longest of the cable route options but has the shortest off-road portion, with 2 km less off-road sections. Route Option C affects the least amount of agricultural land of the four shortlisted options.

Route Option C shares the initial 2 km route out of Woodland substation with Route Option B. A potential off-road corridor is shown for this. Upon joining the L2215, Route Option C will progress southeast to Batterstown. Here the route may pass off-road and so a potential off-road corridor is shown. Southeast of Batterstown it will travel along the R154 to the M3 motorway.

Route Option C will cross the River Tolka, then move off-road to cross the M3 Motorway to the south of the M3 Southern Toll Plaza, returning to the roadway at the roundabout to join the R147. A potential off-road corridor is shown for this motorway crossing

The route will then travel south along the R147 until the L5026 Pace, travelling east.

Route Option C will continue east through Nuttstown and into Kilbride. In Kilbride, it will pass Kilbride National School and progress south along the Kilbride Road. This route will enter Hollystown, turning northeast to join the R121 before reaching Hollywoodrath.

A potential off-road corridor is shown for the M2 motorway crossing. Following this, the route returns to the R121 and follows it through the Ward Cross until it finishes at the R122. Here, Route Option C will move east, using Kilreesk Lane (also known as Tobermurr Link Road) and then following Kilreesk Road north (also known as Tobermurr Road), then Killeek Lane eastwards, R108 southwards, Cooks Road eastwards and then northeast onto Forest Road. It will run along Forest Road next to Forrest Little Golf Club and into the southern suburbs of Swords, where the L2300 and R132 are used to return south to Cloghran Roundabout.

Route Option C will then follow Stockhole Lane, crossing the M1. A potential off-road corridor is shown for this motorway crossing. The proposed route option will then return to Stockhole Lane and turn east onto Baskin Lane which it will follow to the junction with the Malahide Road in Kinsealy. It will then move south, past Fingal Burial Ground, returning west along the R139 before turning north along the access road to reach Belcamp substation.

3.1.7 Route Option D (Blue)

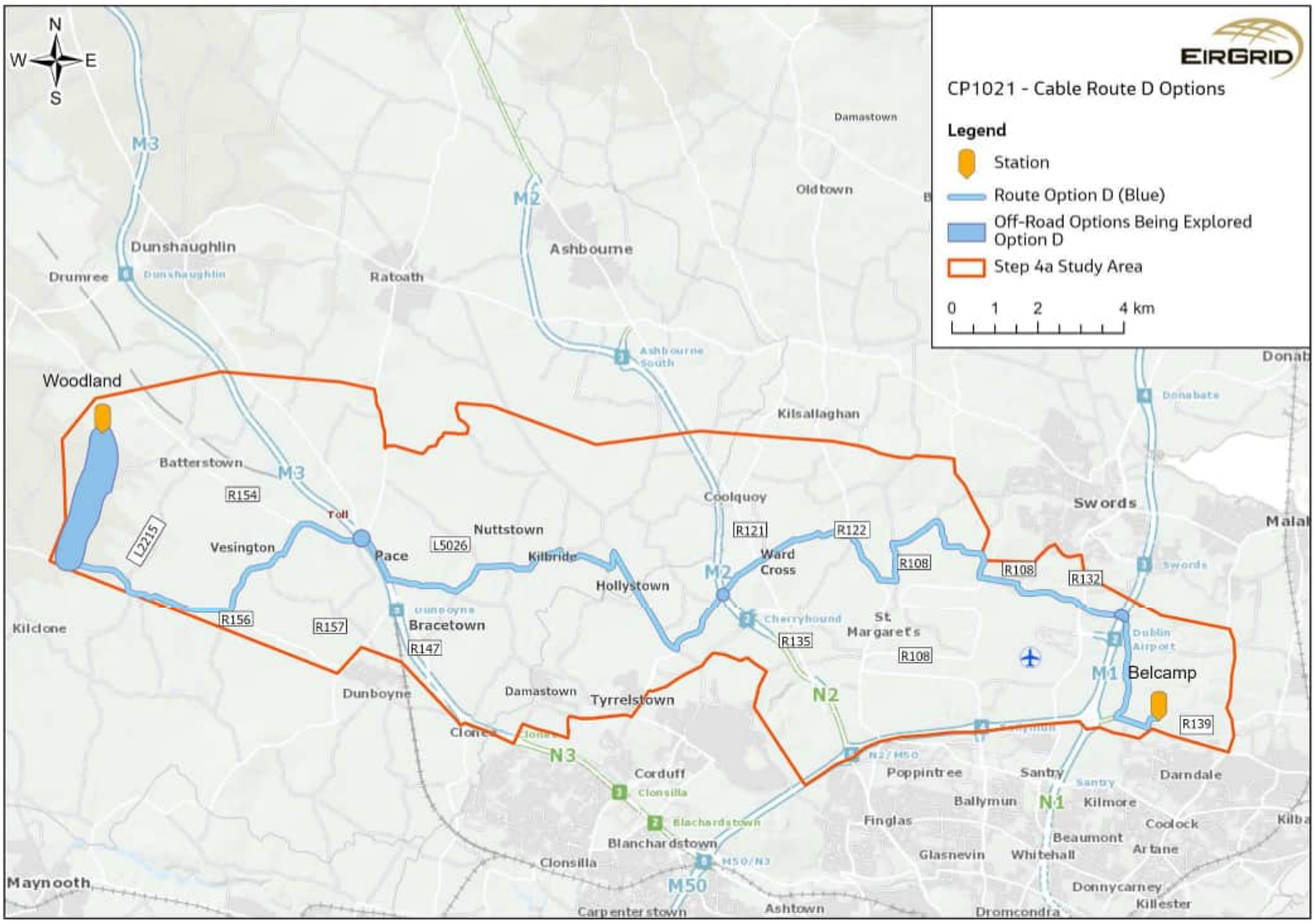


Figure 3-6: Route Option D (Blue)

Route Option D is the second longest proposed route but has the second shortest off-road portion of the four options.

Route Option D will exit Woodland substation by travelling south on an off-road route to join the R156. A potential off-road corridor is shown for this. It then turns east near Barstown Industrial Estate, sharing the same route as Option A for the first 7 km, before turning north at Baytowncross towards Vesington. The route travels along this local road to join the R154 in the townland of Quarryland.

From there, the route progresses southeast to the R147, crossing the M3 Motorway south of the flyover which is to the south of the M3 Southern Toll Plaza. A potential off-road corridor is shown for this motorway crossing.

Route Option D then follows the L5026 Pace eastwards, continuing along the minor road which passes through Kinoristown, which is then shared by all four route options. Near Kilbride, a potential off-road corridor is shown for this option.

The route travels south along Kilbride Road through Hollystown to join the R121 eastwards and will then cross the M2 Motorway. A potential off-road corridor is shown for this motorway crossing., From here, it travels east until it reaches the R122, passing the Ward Cross along the way.

Like Route Option C, Route Option D follows the R122 south, then uses Kilreesk Lane (also known as Tobermurr Link Road), then following Kilreesk Road north (also known as Tobermurr Road), Killeek Lane eastwards, R108 southwards and then Cooks Road eastwards. Like Route Options A and B, Route Option D then uses Naul Road on the northern border of Dublin airport.

From northeast of the airport, Route Option D would also briefly use Stockhole Lane before crossing the M1 motorway. A potential off-road corridor is shown for this motorway crossing., From the crossing of the motorway the route will return to Stockhole Lane travelling south before joining the R139. Here it will travel east and then north into Belcamp substation via the existing access road.

4. Environment

This chapter outlines the assessment of route options considering feedback received from the public consultation and the environment assessment criteria:

- Biodiversity (Flora and Fauna);
- Geology and Soils;
- Surface Water and Flood Risk;
- Planning Policy and Land Use;
- Landscape and Visual;
- Cultural Heritage (Archaeological and Architectural);
- Noise and Vibration; and
- Air Quality.

Chapter 2 provides further information regarding these subtopics, including the approach to the assessment and methodology.

4.1 Feedback

Feedback from the public consultation was received on several environment sub-topics comprising biodiversity, cultural heritage, surface water and flood risk, and planning policy and land use. This feedback, accompanied by a response from the project team for each comment, is summarised below.

Table 4.1: Biodiversity

Public Consultation Feedback	Project Team response
Concerns were raised about local effects on the environment (i.e., loss of trees and hedgerows). It was said that there was a lack of information about this, as well as restoration plans after the work is completed.	We have undertaken an initial assessment of potential impacts and further information is included in this chapter of the report. During the next stage (Step 4B) of the project development process, environmental surveys and further assessment work will be undertaken to understand the potential impacts including potential loss of habitat. Restoration and mitigation plans will similarly be developed during the next stage.

Table 4.2: Cultural Heritage

Public Consultation Feedback	Project Team response
Concerns were raised about impacts of the project on cultural and heritage sites.	We have undertaken an initial assessment of potential impacts and further information is provided in this chapter of the report. No direct impacts on known cultural heritage assets are anticipated and potential indirect impacts will be further assessed during the next stage of the project development process.

Table 4.3: Surface Water and Flood Risk

Feedback	Project Team response
Stakeholders commented that they had experienced previous issues with flooding of the River Boyne and the tributaries of the River Tolka.	We have undertaken a high-level review of flood risk and further information is provided in this chapter of the report. Flood risk will be further considered during the next stage of the project development process including preparation of a Flood Risk Assessment.

Table 4.4: Planning Policy and Land Use

Feedback	Project Team response
Stakeholders commented that Option B had the potential to impact on land intended for future development near St Margaret's and on their property.	Zoned areas and major planning applications have been reviewed as part of the initial assessment process and further information is provided in this chapter of the report.
It was noted that plans were already in place for the GAA (Gaelic Athletic Association) and County Board near Hollystown Golf club. Would this affect EirGrid's ability to execute Route Option A (Red).	Zoned areas and major planning applications have been reviewed as part of the initial assessment process and further information is provided in this chapter of the report. EirGrid will also continue to engage with the local community, including sport clubs, via our community forums.

4.2 Option A (Red)

4.2.1 Biodiversity (Flora and Fauna)

4.2.1.1 Internationally Designated Sites

Option A (Red) is not located within or directly adjoining any European site. The nearest European site is Baldoyle Bay SAC which is 4km to the east. Other European sites include North Dublin Bay SAC; Howth Head SAC; Baldoyle Bay SPA; North Bull Island SPA; South Dublin Bay, River Tolka Estuary SPA, Rockabill to Dalkey Island SAC; Ireland's Eye SAC; South Dublin Bay SAC; Rogerstown Estuary SAC; Lambay Island SAC; Ireland's Eye SPA; Howth Head Coast SPA; Rogerstown Estuary SPA; Lambay Island SPA and Dalkey Islands SPA.

Ramsar sites in the vicinity of the option include Baldoyle Bay Ramsar Site, Broadmeadow Estuary Ramsar Site, Rogerstown Estuary Ramsar Site, North Bull Island Ramsar Site, Sandymount Strand/Tolka Estuary Ramsar Site.

This route option is hydrologically linked to a number of these sites via watercourses which cross the route and ultimately discharge to coastal habitats.

4.2.1.2 National Sites

This option is not located within or directly adjoining any NHA's or pNHA's. The closest nationally important site is the Feltrim hill pNHA which is located 1.1km from this route option at its closest point.

4.2.1.3 Known or Presumed Locations of Species/Habitats of Conservation Interest

This route option runs alongside and through areas of supporting habitat for Light-bellied Brent Geese, particularly in the eastern extent of the study area close to Belcamp substation. This species will preferentially use foraging sites close to the SPA and there are records of Brent in habitats 9.8km from Malahide Estuary SPA. This supporting habitat is also suitable for other wintering bird species which are Species of Conservation Importance (SCI) species of the SPA.

There are numerous records for Annex 1 bird species in the vicinity of this route option.

There are numerous records of badger within close proximity of this route option, particularly in the western (Meath) section. There are also records of several other protected mammal species including otter, and bat species.

Invasive species, including giant rhubarb and winter heliotrope, have been observed along this route option. The NBDC search also returned records of giant rhubarb, Japanese knotweed, giant hogweed, and multiple other invasive plant species within the 10km grid square surrounding this option.

There are numerous lengths of treelines, hedgerows and wetland habitats which are important for biodiversity.

4.2.1.4 Potential Impacts

This option has 17 WFD Water Body crossings. There are eight water bodies crossed by the option, of these none are High or Good status, four are of Moderate and four are of Poor status[26]. These water bodies connect and flow into Baldoyle Estuary, Malahide Estuary, the Tolka Estuary, and are therefore connected to numerous European sites. There are no designated salmonid rivers within the entire study area for the Proposed Development although some of the water bodies have wildlife and fisheries value, for instance due to the presence of otter and brown trout.

4.2.1.5 Summary of Assessment

This option has a relatively low number of watercourse crossings but has a significant length of off-road sections (8.5km). However, the fact there are no international designated sites in close proximity to this route option means it is not high risk. Records of protected species along sections of off-road, especially close to Belcamp substation, do present a greater risk of impacts on both habitats and species. These factors introduce the potential for at least a moderate risk. The relatively low number of water course crossings combined with it being the shortest route reduces the magnitude of potential impacts from Moderate-High. Therefore, Option A has been assessed as Moderate Risk.

Moderate

4.2.2 Geology and Soils

4.2.2.1 Geology

The Route Corridor Option A: Red is underlain predominantly by Carboniferous limestone bedrock with associated calcareous shales and sandstones. There are no mapped geological heritage sites recorded in the vicinity of the route.

Superficial deposits underlying the Route Option A (Red) are predominantly limestone till (carboniferous). To the west of the Study Area the superficial deposits are mainly comprised of shale and sandstone till (Namurian) with an area of alluvium to the north of the substation. There are small pockets of limestone sands and gravels, alluvium and bedrock at the surface.

This option crosses areas of potential economic deposits (sand and gravel, granular aggregate and crushed rock). The greatest potential impacts on soils and geology relate to the potential loss of economic deposits (Crushed Rock and Sand and Gravel).

Quantitatively, 17% of the Route Corridor Option lies over Crushed Rock reserves with economic potential in the central portion of the Route Corridor Option. However overall, such reserves are present across large parts of the region and the availability of these resources will therefore not be significantly affected by the Route Corridor Option. In addition, 5% of Route Corridor Option A: Red lies over economic potential Sand and Gravel deposits. No areas of peatland were detected within the route corridor option.

[26] River Waterbody WFD Status 2016-2021: https://gis.epa.ie/EPAMaps/default

4.2.2.2 Land Quality

Two EPA licensed facilities (holding an Industrial Emissions (IE) License and Integrated Pollution Prevention Control (IPPC) license) are located along the route corridor option. MSD International is located north of Dunboyne on the M3, ABP Food Group is located north of Dublin City Airport. Historic contaminated land sites obtained from Ordnance Survey mapping include a Marl Pit located in Vesingstown, Dunboyne c. 250m from Route Option A, a gravel pit located in Nuttstown c.160m from the Route Corridor Option and a historic quarry located within Cloghran. No landfills were identified within the study area, however, a planning application for remediation of an unauthorised landfill of approximately 20,000m^3 of mixed commercial/industrial, municipal and construction and demolition waste was submitted for a 1.4 hectare site northeast of the N32/Clonshaugh Road Junction, located c.300m from the Route Corridor Option. The majority of Route Option A lies within the Dublin (poorly productive bedrock) WFD groundwater body.

4.2.2.3 Hydrogeology

The greatest potential impacts on hydrogeology relate to potential interaction with areas of vulnerable aquifer and associated risk of pollution and disruption of the groundwater resource. The majority of the route is underlain by bedrock classified as a Locally Important Aquifer (poorly productive bedrock). Quantitatively, 86% of the Route Corridor Option crosses an area of Locally Important Aquifer. 6% of the Route Corridor Option crosses an area of extreme groundwater vulnerability and 15% of the Route Corridor Option crosses an area of high groundwater vulnerability.

While no public water supplies are present in the study area, 3% of the Route Corridor Option crosses the inner aquifer protection zone of Dunboyne public water supply. Groundwater vulnerability is classified as high across the relevant study area of the proposed route option.

There are a large number of groundwater wells and springs mapped by the Geological Survey Ireland across the Study Area. However, consider of Transport Infrastructure Ireland (TII) guidance and the observation that low-yielding wells, which are used mainly for domestic and farm water supply are very common in Ireland, the assessment has focused on high yielding springs and wells used for public water supply and their surrounding protection zones and total number of wells and springs along each route corridor has not been used in assessing relative impacts between the route options at this stage.

At this stage of assessment, no groundwater dependent water bodies or groundwater dependent terrestrial ecosystems (GWDTEs) have been identified and so these features have not been used in assessing relative impacts between route options at this stage. However, the potential exists for such features to be present within the study area and it cannot be conclusively determined at this stage whether or not they may be a constraint for the proposed route.

4.2.2.3.1 Summary of Assessment

Potential impacts on mineral reserves are considered to be low risk. There are limited locations where there is potential for contaminated land to be encountered, however there are remediation works proposed at land to the west of Belcamp substation which this route option will pass through which presents some risk of impacts. There is a low risk of impacts to groundwater resources; only 6% of the route is within a zone of extreme vulnerability.

Taking together, in terms of soils, geology and groundwater the overall evaluation of potential risks for Option A is considered to be Low to Moderate.

Low to Moderate

4.2.3 Surface Water and Flood Risk

4.2.3.1 Surface Water

There are 17 crossings of water bodies by Route Option A (Red); eleven of Moderate status and six of Poor status[27]. There are eight water bodies crossed in total, a number are crossed twice; one, the Ward_030 is crossed seven times. This water body is made up of a number of segments which are not all hydrologically linked to each except after their confluence to form the Ward_040. Notwithstanding this, there is potential for cumulative impacts on this water body as a result the numerous crossings from this option.

All of the water bodies are ultimately connected to designated sites along the Irish coast north of Dublin, however none of the crossing points is hydrologically connected less than 5km from the designated sites and so this is not considered close enough to impact on the sensitivity of the water body. The rankings according to sensitivity and crossing technique are provided in Table 4.5:Wa and **Error! Reference source not found.**.

Table 4.5:Water Bodies Being Crossed

Waterbody	Status	Hydrological connection at closest crossing to SAC	Option A (Red) No. Crossings	Sensitivity	Impact Potential
Dunboyne Stream_010	Poor	>5km	2	1	2
Tolka_020	Moderate	>5km	2	3	6
Pinkeen_010	Moderate	>5km	1	3	3
Ward_010	Poor	>5km	2	1	2
Ward _020	Moderate	>5km	1	3	3
Ward_030	Moderate	>5km	7	3	21
Sluice_010	Poor	>5km	1	1	1
Mayne_010	Poor	>5km	1	1	1
Total	n/a	n/a	17	n/a	39
Ranking					**Low to Moderate**

Table 4.6: Crossing Techniques Ranking

Technique	Number of Crossings	Risk (crossings x risk score)
Open Cut likely	8	40
HDD	1	1
In-road	8	24
Total	17	65
Rank		**Moderate to High**

4.2.3.2 Flood Risk

4.2.3.2.1 Potential Impacts

The lengths and percentage of Option A (Red) located in flood zones are provided in Table 4.7Table 4.7: Lengths within PFRA Flood Zones. The overall length of Option A (Red) is 36.4km.

[27] River Waterbody WFD Status 2016-2021: https://gis.epa.ie/EPAMaps/default

Table 4.7: Lengths within PFRA Flood Zones

Flood Zone	Length (m)	%age of route	Ranking
Pluvial 10 year flood zone	73	0.2	Low
Fluvial 10 year flood zone	957	2.6	Moderate
Coastal 10 year flood zone	0	0	Low
Overall ranking			**Moderate**

4.2.3.2.2 Summary of Assessment

There are 17 crossings of eight different WFD water bodies, of relatively low sensitivity to change as a result of their existing conditions. Of these crossings it is likely that at least half will off-road via open cut crossing techniques. This presents a greater risk to water quality and hydromorphology than keeping the trench in the road or crossing via HDD.

The numerical scoring of the water courses and their crossing techniques allows benchmarking across all of the route options; the higher the score the greater the level of risk. Whilst the high number of off-road open cut crossings scores high and would suggest a moderate to high risk, the relatively low sensitivity of the water bodies being crossed reduces the overall significance of these impacts and the risk of such impacts occurring.

A very small proportion of the route is in any flood zone; notwithstanding, the potential for impact is of moderate risk, although these would be temporary during construction for the most part. There is a risk during operation, that there will be limited accessibility in flood zones and so these will be avoided wherever possible.

Combined score for surface water quality and flood risk:

Moderate

4.2.4 Planning Policy and Land Use

4.2.4.1 Planning Policy and Legislation

All of the route options traverse Meath and Fingal Administrative areas and the same policies will apply. Policy and legislation are therefore not a differentiator and so is not considered further in this assessment.

Within the Meath area of the Study Area, the only zoned area is Kilbride which is zoned for settlement and community infrastructure. All options pass through or in close proximity to Kilbride. Route Option A: Red is proposed to be in the road through the centre of Kilbride. There are no off-road sections proposed for Kilbride and therefore there is no sterilisation of land for future development.

Within Fingal administrative area, most of the land is zoned; route option A: red passes through land zoned for greenbelt. Whilst the majority of the route option will be installed within the public road network, the off-road sections proposed are in zoned greenbelt land. An UGC in greenbelt would not be inconstant with the objectives of this zoning.

This option does not go through any land zoned for future employment or industry apart from close to Belcamp substation; land to the east of the substation is zoned for High Technology business. The presence of a high voltage UGC in this area could present some sterilisation of land for development.

4.2.4.2 Planning Applications

Major planning applications at the time of writing, in proximity or potentially relevant to Route Option A, are listed below.

- Ballymacarney Solar Farm – this is under construction. Construction access is via the R121 to the south which is the road along which Options A (Red), C (Yellow) and D (Blue) would be routed to cross the M2 motorway. However, it is anticipated that construction will be completed ahead of any works beginning for the Proposed Development. There are no UGC connections in this road relating to the solar farm; it is connected via OHL to an existing 110kV OHL via a new 110kV ESB substation.
- Vesington Solar Farm – this is under construction and is accessed via the R156, which is proposed to be used for this route option. However it is anticipated that construction will be completed ahead of any works beginning for the Proposed Development. There are no UGC connections in local roads relating to the solar farm; it is connected via OHL to an existing 110kV OHL via a new 110kV ESB substation.
- Metrolink cable connections – this is currently in pre-planning stage. Metrolink has identified a preferred route for its connection to substations north and south of the airport and to Belcamp. The routes to the north of the airport would interface with this route option; and
- Greater Dublin Drainage project (Uisce Éireann) – this is paused awaiting a decision from ABP on how it might be progressed. This route option would cross the sewer connection to the major Wastewater Treatment plant proposed to be north of Belcamp substation. The routing has been chosen to minimise the interface with this project.

4.2.4.3 Summary of Assessment

This option is compliant with local planning policy and is only a risk to future development in the land to the west of Belcamp substation. Careful routing will minimise any impacts on this land, however, there remains a low to moderate risk. The major developments in proximity to this route option have been taken into account in the design of the option, however, there remains a low to moderate risk that it will impact those developments or be impacted upon by them. This is especially the case with GDD and Metrolink Connections which will have a direct interface with the Proposed Development.

Therefore, Option A has been assigned **Low to Moderate risk (Green)** in terms of the combined impacts to land use and planning policy.

Low to Moderate

4.2.5 Landscape and Visual Impact

4.2.5.1 Potential Impacts

Option A (Red), like the others, involves a piece of linear underground infrastructure which, similar to water and waste pipes, are, by their very nature, difficult to discern once operational. Construction activity will be localised, transitory and will largely occur along the road network. For these reasons, the sensitivity of the landscape character within the Study Area to a project of this nature is deemed to be low-negligible.

For all route options, the conductor will be installed below-ground in a 1.5m wide and 1.3m deep trench with joint bays (and associated temporary passing bays) positioned at intervals along the route; thus, the physical impact of the trench on the landscape is modest in scale, contained within already modified ground, temporary in duration, transient in location and reversible. Impacts on the land-cover will be limited to a 12m wide swathe within which some vegetation will need to be removed. During the construction phase, there may be a small degree of impact at certain locations within this swathe; however, it would not be at a scale that would have any material impact on the overall landscape fabric or on the landscape character along the route. Although construction activity may alter the landscape character in the immediate vicinity of where the cable is being laid, it will be transitory and temporary. Impacts will predominantly occur on the road network where vehicular movements are already part of the existing character.

The trenches will be backfilled, top soiled and vegetation will be reinstated having regard for agricultural land-use and/or biodiversity requirements. Any potentially noticeable permanent changes will be highly localised and will generally be limited to river crossings and where it was not possible to reinstate vegetation directly over the cable trench/within the permanent wayleave (noting that pre-existing hedged or wooded habitats cannot be re-instated over the cable duct). For these reasons, the magnitude of impact on the landscape character within the Study Area due to the Proposed Development will be low-negligible during the construction phase and negligible during the operational phase.

When the magnitude of impact on the landscape character is considered in conjunction with the low-negligible sensitivity of the landscape within the Study Area, it is anticipated that the significance of the impacts will be Imperceptible during the construction phase and Imperceptible during the operational phase.

Table 4.8: Summary of Impacts – Landscape Character

Landscape Character Area/Type	Summary of landscape character assessment in County Development Plan	Landscape sensitivity	Likely construction phase magnitude of impact	Likely operational significance of impact
Meath 10. The Ward Lowlands	• Landscape Character Type: Lowland Landscape • Value: Low • Importance: Regional • Sensitivity: High • Potential capacity to accommodate development - underground services: Low	Low-negligible	Negligible	Imperceptible
Meath: 11. South East Lowlands	• Landscape Character Type: Lowland Landscape • Value: Very High • Importance: Regional • Sensitivity: Medium • Potential capacity to accommodate development - underground services: Medium	Low-negligible	Negligible	Imperceptible
Meath: 12. Tara Skryne Hills	• Landscape Character Type: Hills and Upland Areas (southern portion of this area that does not encompass Hill of Tara or Skryne Hill) • Value: Exceptional • Importance: National/International • Sensitivity: High • Potential capacity to accommodate development - underground services: Low	Low-negligible	Negligible	Imperceptible
Fingal: Low Lying agriculture	• Low sensitivity • Can absorb a certain amount of development once the scale and forms are kept simple	Low-negligible	Negligible	Imperceptible

There is the potential for visual impacts at scenic designations, residential dwellings and along public roads, with scenic designations carrying a greater potential for risk. No scenic designations were identified within the portion of the Study Area that occurs within County Meath or County Fingal.

4.2.5.2 Summary of Assessment

This route Option involves hedgerow removal along an off-road section through an area zoned Green Belt near Belcamp. It also includes a 2.82 km off-road section through the High Sensitivity Tara Skryne Hills

Landscape Character Area near Woodland, involving hedgerow removal. However, potential for physical impacts will be limited in scale and localised. Significant impacts on landscape character or on visual receptors is unlikely; therefore, this Route Option is considered to be Low.

Low

4.2.6 Archaeology, Architectural Heritage, & Cultural Heritage

4.2.6.1 Archaeology

No National Monuments or sites with Preservation Orders, or sites on the RHM, were identified within the study area for Option A (Red).

A total of 15 Recorded Monuments are located within the study area for Option A (Red). These comprise early medieval ringforts and enclosures (AY_18, AY_29, AY_41, AY_43, and AY_61), medieval and post-medieval churches and their associated graveyards (AY_23, AY_24, AY_30, AY_44 and AY_45) and a holy well (AY_22), post-medieval houses (AY_27 and AY_42) and a mound and a castle, both of unknown date (AY_47 and AY_25 respectively).

A total of nine sites recorded on the SMR (AY_07, AY_19, AY_28, AY_31, AY_46, AY_48, AY_57, AY_58 and AY_59) were also identified within the study area for Option A (Red). These are characterised by cropmark enclosures and field systems identified from aerial imagery.

Further information of the archaeological constraints identified within the study area for Option A (Red) is included in Appendix B.

4.2.6.1.1 Archaeological Potential

Alluvium identified along the route has the potential to preserve previously unknown archaeological monuments and remains, including paleoenvironmental remains and preserved organic materials. There is also the potential for votive offerings, objects apparently deposited for religious reasons, in rivers such as the Pinkeen River and Ward River, as well as in minor watercourses.

Previous archaeological investigations within the study area for Option A (Red) have identified evidence of activity dating from the prehistoric period onwards (see Section 3.1.3 of Appendix B for information). The potential for the presence of previously unknown archaeological remains is higher in less developed areas, including within the Batterstown South off-road focus area, Dunboyne / Avoca / Bracetown off-road focus area, Belgree East off-road focus area and Belcamp off-road focus area. While the potential for the presence of previously unknown archaeological remains within the on-road sections for this route option is lower, given the construction of the road network may have removed or truncated any archaeological remains that have been present, there is also the potential for historic road surfaces to survive within pre-1840 roadways.

4.2.6.2 Architectural Heritage

Architectural heritage constraints within the study area for Option A (Red) comprise:

- Four Protected Structures, comprising two churches (AH_04 and AH_06), a stone well (AH_10), and a country house (AH_22).
- Three structures recorded on the NIAH (AH_05, AH_12 and AH_13), assessed by the NIAH to be of Regional importance.
- 16 GDLs comprising nine recorded by the Survey of Historic Gardens and Designed Landscapes and seven identified from historic mapping (Ordnance Survey 6", 1837 – 1842).

No Architectural Conservation Areas (ACAs) were identified within the study area for Option A (Red).

Further information of the architectural heritage constraints identified within the study area for Option A (Red) is included in Appendix B.

4.2.6.3 Cultural Heritage

A total of 26 cultural heritage sites have been identified within the study area for Option A (Red) from the sources identified in Section 2.3.2.5. These are largely characterised by post-medieval built heritage including stone road bridges, houses, and agricultural buildings. Further information on these sites is presented in Appendix B.

4.2.6.4 Potential Impacts on Archaeological, Architectural and Cultural Heritage

4.2.6.4.1 Construction - Direct Impacts

Archaeology

Where Option A (Red) is located within the Zone of Notification associated with a Recorded Monument, this has been assessed as a direct impact. While the option would not directly impact the Recorded Monument itself, excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive within this zone.

Option A (Red) is located within the Zones of Notification of eight Recorded Monuments (AY_23, AY_24, AY_25, AY_27, AY_29, AY_30, AY_41 and AY_43).[28] Within these zones the option is located in the carriageway of existing roads the construction of which is more than likely to have removed or truncated any archaeological remains associated with these monuments that may have been present. However, construction, including the excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive. Construction would also have a direct impact on any archaeological remains associated with these Recorded Monuments that may survive within any additional land take required for construction.

Two Recorded Monuments (AY_47 and AY_61) and 5 sites on the SMR (AY_46, AY_48, AY_57, AY_58 and AY_59) have been identified within the off-road focus areas for Option A (Red). While the route of the cable within the off-road focus areas for Option A (Red) is not yet known, there is the potential to directly impact these constraints during construction.

Excavation of the cable trench and joint bays, and the excavation of temporary launch and reception pits for directional drilling may also result in a direct impact any previously unknown archaeological remains that may be present within the land required for Option A (Red). The potential for this impact is considered to be higher in previously undeveloped areas than within the existing carriageways, the construction of which is likely to have likely to have removed or truncated any archaeological remains that may have been present.

Architectural Heritage

A stone well (AH_10), a Protected Structure, is located on the alignment of Option A (Red). Therefore construction of the option would require the removal of this structure.

Should Option A (Red) require additional land take for construction, the removal of boundary features would have a direct impact on two GDLs (DL_04 and DL_09). In addition, eight GDLs are also located within the offroad focus areas for Option A (Red) (DL_05, DL_14 – 18, DL_19, DL_26, and DL_27) and construction of Option A (Red) may remove features associated with these demesnes should the option pass through them.

Two Protected Structures (AH_04 and AH_22) and three structures assessed by the NIAH to be of Regional importance (AH_05, AH_12, and AH_13) are located within the offroad focus areas for Option A (Red). While the route of the cable within the off-road focus areas is not yet known, existing buildings within these areas will be avoided.

[28] While the locations of AY_29 and AY_43 have been developed, these sites are recorded on the RMP and therefore have been included as constraints.

Cultural Heritage

Two post-medieval road bridges (CH_14 and CH_15) are located on the existing road network and therefore there is the potential for accidental damage to these cultural heritage constraints and loss of historic fabric as a result of construction.

In addition, while the route of the cable within the off-road focus areas is not yet known the following cultural heritage constraints are located within these areas:

- Two cultural heritage constraints (CH_41 and CH_42) in the Batterstown off-road focus area;
- Four cultural heritage constraints (CH_19, and CH_51, CH_52, and CH_53) in the Belgree off-road focus area; and
- Ten cultural heritage constraints (CH_30 – CH_35 and CH_54 – CH_57) in the Belcamp off-road focus area.

While upstanding buildings and structures within these areas will be avoided, there is the potential to directly impact these constraints during construction.

4.2.6.4.2 Construction – Indirect Impacts

Archaeology

Two Recorded Monuments comprising a church (AY_23, also a Protected Structure; AH_06) and graveyard (AY_24) are located within 20m of Option A (Red). While construction activities may be visible in views south-east towards the R121, it is anticipated any intrusion would be temporary (lasting the duration of construction in this location).

While the route of the cable within the off-road focus areas for Option A (Red) is not yet known, construction activities within the cable corridor also have the potential to affect the setting of all the archaeological constraints within the off-road focus areas; however, these impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

Architectural Heritage

Option A (Red) is located approximately 20m to the south-east of a Protected Structure (AH_06) that is also a Recorded Monument (AY_23). To avoid double counting impacts, no impact has been assessed on AH_06 as an impact has already been assessed on AY_23 (see above).

Construction activities within the cable corridor also has the potential to affect the setting of all the architectural heritage constraints within the off-road focus areas. These impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

Cultural Heritage

Construction activities would have an indirect impact on the setting of seven cultural heritage sites (CH_01, CH_04, CH_12, CH_13, CH_24, CH_25 and CH_29). However, it is anticipated any intrusion would be temporary (lasting the duration of construction in each location).

Construction activities within the cable corridor also have the potential to affect the setting of twelve cultural heritage constraints within the off-road focus areas (CH_19, CH_30, CH_33, CH_34, CH_35,CH_42, .CH_51, CH_52, CH_54, CH_55, CH_56 and CH_57) These impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

4.2.6.4.3 Operational Impacts

Option A (Red) would be located beneath the road surface, and any off-road sections would be reinstated after construction no impacts on archaeological, architectural or cultural heritage constraints have been assessed as a result of the operation of Option A (Red).

4.2.6.5 Summary of Assessment

Considering the number of potential impacts on archaeology, architectural heritage and cultural heritage constraints overall and the length of off-road sections (c.8.5km), Option A (Red) has been assigned a risk of **'Moderate (Dark Green)'**.

A Route Corridor Summary Matrix for archaeology, architectural heritage and cultural heritage is provided in Appendix B.

Moderate

4.2.7 Noise and Vibration

4.2.7.1.1 Noise and Vibration Sensitive Receptors

As Table 4.9 shows there are 298 receptors within 100m and 606 receptors within 300m of this option. Most of the receptors are residential but there are other non-residential sensitive receptors within 300m of this option including:

- Dunboyne Nursing Home on R156 (Section I-J)
- Kilbride National School on Kilbride Road (Section V-W)
- New Park Care Centre Nursing Home (Section BB-LL)
- DIATA Aviation Training College (Section UU-VV)
- Trinity Care Nursing Home (Section VV-XX)

It also shows that there are 566 receptors within 100m of off-road sections and 901 receptors within 300m of off-road sections. Most of the receptors are residential properties with large numbers of dwellings located in Hollystown that could potentially be affected. Other sensitive receptors include Trinity Care Nursing Home which is located within the Belcamp off-road section.

Table 4.9: Residential Property Counts within 300m of Option A (Red)

Option	Number of receptors within 100m of route	Number of receptors within 300m of route	Number of receptors within 100m of off-road sections	Number of receptors within 300m of off-road sections	Number of receptors within 100m of motorway crossings	Number of receptors within 300m of motorway crossings
A	298	606	566	901	49	86

There are 49 receptors within 100m of motorway crossings and 86 receptors within 300m of motorway crossings. Most of the receptors potentially affected are residential though Trinity Care Nursing Home is within 300m of the M1 crossing and could potentially experience adverse noise and/or vibration impacts during construction.

4.2.7.1.2 Potential Noise and Vibration Impacts

This option has the potential to cause noise and vibration impacts during construction which will be temporary in nature. No permanent operational impacts are expected.

Areas of Potential Horizontal Directional Drilling (HDD)

There is greater potential for adverse noise and/or vibration impacts at sensitive receptors where construction activities would occur over a longer period (e.g. at trenchless crossings). It is recognised that certain construction activities at certain trenchless crossings could be required to take place outside of normal working hours, which would increase the likelihood of adverse noise effects occurring. In addition, certain potential trenchless crossing techniques that may be employed (e.g. HDD) also have the potential to cause adverse vibration impacts at nearby receptors.

Open Cut Trenches

For the majority of the proposed route option, the underground cables are expected to be installed using 'Open Cut' techniques. Where 'Open Cut' works are undertaken adjacent to the existing road network, there is a relatively low potential for temporary impacts due to construction noise. This is due to the relatively high levels of local environmental noise that are typically experienced adjacent to roads. Also, as the works are expected to progress in sections, noise levels at any receptor would only be elevated for a relatively short period of time. However, where 'Open cut' works are undertaken in relatively quiet areas (such as offline sections) close to sensitive receptors there is the potential for adverse temporary impacts due to construction noise.

4.2.7.2 Summary of Assessment

This option impacts a relatively small number of receptors, most of which are dwellings, but the option also passes within 100m of a school and two nursing homes. Therefore, an overall risk score of Low to Moderate (light green) has been applied.

Low to Moderate

4.2.8 Air Quality

4.2.8.1 Sensitive receptors

Table 4.10 shows the total receptor counts within each distance band for Option A (Red). These figures are, however, 'end to end' totals. Air quality has the greatest impact at a very localised level and so therefore the number of sensitivity receptors at these distances was also counted between route nodes.

No ecological designations were identified within 50m of the Option A: Red centreline and therefore have been excluded from further assessment. Human receptors, including residential properties and one school (Little Moo Playschool, an assumed 30-pupil pre-school, within 20m of the centreline), were identified and have been factored into the receptors counts below.

Table 4.10 Sensitive Receptors within 300m of Option A (Red)

Option	No. of sensitive receptors 0-20m	No. of sensitive receptors 0-50m	No. of sensitive receptors 0-100m	No. of sensitive receptors 0-350m
A	51	231	320	914

4.2.8.2 Assessment

The IAQM dust guidance states that "for almost all construction activity, the aim should be to prevent significant impacts on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual impact will normally be not significant." With the good practice mitigation that would be implemented, which would reduce the maximum risks, a risk score higher than moderate was not considered suitable so a maximum risk score of 3 was adopted.

If applied on the counts of sensitive receptors 'end to end', this route would have a moderate risk rating. However, at the local level, between nodes, only one section scored a moderate risk rating, and this was because of the presence of a local primary school. An average risk rating along the length of the route option was determined to be 1.4.

4.2.8.3 Potential Impacts

This option has the potential to cause air quality impacts during construction, which will be temporary in nature. No permanent operational impacts are expected.

Construction activities associated with the Proposed Development have the potential to generate fugitive dust emissions. These may give rise to annoyance due to the soiling of surfaces, risk of health effects due to the increase in exposure to fine particulates such as PM_{10} and $PM_{2.5}$ and damage to vegetation and ecosystems (where very high levels of dust soiling occur).

The main construction activities associated with the Proposed Development that could generate dust include earthworks, trench excavation and material storage. Dust may also be generated by vehicle movements through resuspending dust from haul roads and surfaces. The works associated with the construction of the Proposed Development would be split into several stages, which would involve different periods of earthworks, construction (including setting up compounds and pipeline installation) and trackout[29] and activity levels would not necessarily peak simultaneously. Also, as the works are expected to progress in sections, potential dust generation would only occur for a relatively short period of time at any one location.

4.2.8.4 Assessment Summary

Option A (red) has an average risk score of 1.4 along the length of the route option and has a relatively low number of sensitive receptors within all of the distance bands. Although there are no ecological designations within 200m of Option A (Red), there are several sensitive human receptors including dwellings and a school (Little Moo Moos Playschool) within 20m. Therefore, an overall risk score of '**Low-Moderate (Light Green)**' has been applied.

Low to Moderate

4.3 Option B (Green)

4.3.1 Biodiversity (Flora and Fauna)

4.3.1.1 Overview

The baseline for biodiversity for Option B (Green) is largely the same as for Option A and so the reader is referred to that text; it is not repeated here.

4.3.1.2 Potential Impacts

This option has 16 WFD Water body crossings. There are seven water bodies crossed by the options, of these none are High or Good status, four are of Moderate and three are of Poor status. There are also up to ten crossings of unnamed tributaries of these water bodies. These water bodies connect and flow into Baldoyle Estuary, Malahide estuary, the Tolka Estuary, and are therefore connected to numerous European sites. There are no designated salmonid rivers within the study area for the Proposed Development although some of the water bodies have wildlife and fisheries value due to the presence of otter and brown trout.

4.3.1.3 Summary of Assessment

This option has a relatively low number of watercourse crossings and a moderate distance of off-road sections (c. 6.3km). However, the fact there are no international designated sites in close proximity to this route option means it is not high risk. There are, however, records of protected species and the relatively long sections of off-road, especially close to Belcamp substation, do present some risk of impacts on both habitats and species. However, the relatively low number of water course crossings and considering the length of off-road sections, this option has been assessed as Low - Moderate.

Low to Moderate

29 The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.

4.3.2 Geology and Soils

4.3.2.1 Geology

The Route Corridor Option B (Green) is underlain predominantly by Carboniferous limestone bedrock with associated calcareous shales and sandstones. There are no mapped karst features or geological heritage sites recorded in the vicinity of the route.

Superficial deposits underlying the Route Option B (Green) are predominantly limestone till (carboniferous). To the west of the Study Area the superficial deposits are mainly comprised of shale and sandstone till (Namurian) with an area of alluvium to the north of the substation. There are small pockets of limestone sands and gravels, alluvium and bedrock at the surface.

Route Option B (Green) crosses areas of potential geological economic deposits (Crushed Rock and Sand and Gravel). Quantitatively 25% of the route option lies over economic deposits of crushed rock reserves in the central portion of the route corridor option. However, such reserves are more widespread elsewhere in the region and the availability of these resources will not be significantly affected. In addition, 6% of the Route Corridor Option lies over economic potential sand and gravel deposits.

4.3.2.2 Land Quality

Four limestone mines are crossed by Route Corridor Option B. No areas of peatland were detected along the route corridor option. Two EPA licensed facilities (holding an Industrial Emissions (IE) License and Integrated Pollution Prevention Control (IPPC) license) are located along the route corridor option. Historic contaminated land sites obtained from Ordnance Survey Mapping include a gravel pit c.180m from the Route Corridor Option located at Priest Town and a historic quarry at Cloghran. The majority of Route Option B lies within the Dublin (poorly productive bedrock) WFD groundwater body. Between the M1 and M2 Route Option B lies within Swords (poorly productive) WFD groundwater body.

4.3.2.3 Hydrogeology

The greatest potential impacts on hydrogeology relate to potential interaction with areas of vulnerable aquifer and associated risk of pollution and disruption of the groundwater resource. The majority of the route is underlain by bedrock classified as Locally Important Aquifer (poorly productive bedrock) quantitatively, 87% of the Route Corridor Option crosses an area of Locally Important Aquifer. 10% of the Route Corridor Option crosses an area of extreme vulnerability and 14.61% of the Route Corridor Option crosses an area of high groundwater vulnerability.

While no public water supplies are present in the study area, 3% of the Route Corridor Option crosses the inner aquifer protection zone of Dunboyne public water supply. Groundwater vulnerability is classified as high across the relevant study area of the proposed route option.

There are a large number of groundwater wells and springs mapped by the Geological Survey Ireland across the Study Area. However, considering Transport Infrastructure Ireland (TII) guidance and the observation that low-yielding wells, which are used mainly for domestic and farm water supply are very common in Ireland, the assessment has focused on high yielding springs and wells used for public water supply and their surrounding protection zones and total number of wells and springs along each route corridor has not been used in assessing relative impacts between the route options at this stage.

4.3.2.4 Summary of Assessment

Potential impacts on mineral reserves are considered to be low risk. There are limited locations where there is potential for contaminated land to be encountered, however there are remediation works proposed at land to the west of Belcamp substation which this route option will pass through which presents some risk of impacts. There is a low risk of impacts to groundwater resources; only 10% of the route is within a zone of extreme vulnerability.

In terms of soils, geology and groundwater the overall evaluation of potential risks for Option B are Low-moderate.

Low to Moderate

4.3.3 Surface Water and Flood Risk

4.3.3.1 Surface Water

4.3.3.1.1 Potential Impacts

For Route Option B (Green), there are 16 crossings of water bodies; seven of Moderate status and nine of Poor status. There are seven water bodies crossed in total, a number are crossed twice; the Tolka_020 is crossed five times and the Ward_030 is crossed four times. The Ward_030 is made up of a number of segments which are not all hydrologically linked to each except after their confluence to form the next water body. Notwithstanding this, there is potential for cumulative impacts as a result the numerous crossings from this option.

All of the water bodies are ultimately connected to designated sites along the north Dublin coastline, however none of the crossing points is hydrologically connected less than 5km from the designated sites and so this is not considered close enough to impact on the sensitivity of the water body. The rankings for sensitivity and crossing technique are provided in Table 4.11 and Table 4.12.

Table 4.11 Water Bodies Being Crossed

Waterbody	Status	Hydrological connection at closest crossing to SAC	Option B (Green) No. Crossings	Sensitivity	Impact Potential
Tolka_020	Moderate	>5km	5	3	15
Pinkeen_010	Moderate	>5km	2	3	6
Ward_010	Poor	>5km	1	1	1
Ward _020	Moderate	>5km	2	3	6
Ward_030	Moderate	>5km	4	3	12
Sluice_010	Poor	>5km	1	1	1
Mayne_010	Poor	>5km	1	1	1
Total	**n/a**	**n/a**	**16**	**n/a**	**42**
Ranking					**Low to Moderate**

Table 4.12 Crossing Techniques Ranking

Technique	Number of Crossings	Risk (crossings x risk score)
Open Cut likely	9	45
HDD	2	2
In-road	5	15
Total	**16**	**62**
Rank		**Moderate to High**

4.3.3.2 Flood Risk

4.3.3.2.1 Potential Impacts

The lengths and percentage of the Option B (Green) are provided in Table 4.13. The length of Option B (Green) is 37.9km.

Table 4.13 Lengths within PFRA Flood Zones

Flood Zone	Length (m)	%age of route	Ranking
Pluvial 10 year flood zone	115	0.3	Low
Fluvial 10 year flood zone	889	2.3	Low to moderate
Coastal 10 year flood zone	0	0	Low
Overall			**Low to Moderate**

4.3.3.2.2 Summary of Assessment

There are 16 crossings of seven different water bodies, which are relatively low sensitivity to change as a result of their existing conditions. Of these crossings it is likely that at least half will be off-road via open cut crossing techniques. This presents a greater risk to water quality and hydromorphology than keeping the trench in the road or crossing via HDD.

The numerical scoring of the water courses and their crossing techniques allows benchmarking across all of the route options; the higher the score the greater the level of risk. Whilst the high number of off-road open cut crossings score high and would suggest a moderate to high risk, the relatively low sensitivity of the water bodies being crossed reduces the overall significance of these impacts and the risk of such impacts occurring.

A very small proportion of the route is in any flood zone; notwithstanding, the potential for impacts is of moderate risk, although these would be temporary during construction for the most part. There is a risk during operation, that there will be limited accessibility in flood zones and so these will be avoided wherever possible.

Combined score for surface water quality and flood risk:

Moderate

4.3.4 Planning Policy and Land Use

4.3.4.1 Planning Policy and Legislation

All of the route options traverse Meath and Fingal Administrative areas and the same policies will apply. Policy and legislation are therefore not a differentiator and so is not considered further in this assessment.

The zoned areas of Meath and Fingal are the same for all of the options. Option B: green has the same potential for impacts on Kilbride and the land identified for industrial uses to the west of Belcamp as Option A.

4.3.4.2 Planning Applications

Major planning applications at the time of writing, in proximity or potentially relevant to Route Option B, are listed below.

- Ballymacarney Solar Farm – this is under construction. Construction access is via the R121 to the south. The road to the north, along which Option B (Green) is routed is likely to be the main access point during its operation. There are no UGC connections in this road relating to the solar farm; it is connected via OHL to an existing 110kV OHL via a new 110kV ESB substation.

- Vesington Solar Farm – this is under construction and is accessed via the R156, which is proposed to be used for this route option. There are no UGC connections in local roads relating to the solar farm; it is connected via OHL to an existing 110kV OHL via a new 110kV ESB substation.
- Metrolink cable connections – this is currently in pre-planning stage. Metrolink has identified a preferred route for its connection to substations north and south of the airport and to Belcamp. The routes to the north of the airport would interface with this route option; and
- Greater Dublin Drainhage project (Uisce Éireann) – this was consented and then the consent was held back following legal challenge. It is currently paused awaiting a decision from ABP on how it might be progressed. This route option would cross the sewer connection to the major Wastewater Treatment plant proposed to be north of Belcamp substation.

4.3.4.3 Summary of Assessment

Taking the above into account, Option B (Green) has the potential to interact with a few granted and live planning applications, Therefore, Option B (Green) has been assigned Low to **Moderate risk (Green)** in terms of the combined impacts to land use and planning policy.

Low to Moderate

4.3.5 Landscape and Visual Impacts

4.3.5.1 Potential Impacts

The nature of the potential impacts on the landscape and on visual receptors is as Is described in Section 4.2.5.1.

The same landscape character areas are crossed by this option as for Option A (Red) – see Table 4.8:.

4.3.5.2 Summary of Assessment

Route Option involves hedgerow removal along an off-road section through an area zoned Green Belt near Belcamp. However, potential for physical impacts will be limited in scale and localised. When the magnitude of impact on the landscape character is considered in conjunction with the low-negligible sensitivity of the landscape within the Study Area, it is anticipated that the significance of the impacts will be Imperceptible during the construction phase and Imperceptible during the operational phase.

Significant impacts on landscape character or on visual receptors is unlikely; therefore, this Route Option is considered to be Low.

Low

4.3.6 Archaeology, Architectural Heritage and Cultural Heritage

4.3.6.1 Archaeology

No National Monuments or sites with Preservation Orders, or sites on the RHM, were identified within the study area for Option B: Green and therefore no impacts have been identified on these types of constraint.

A total of 15 Recorded Monuments are located within the study area. These comprise ringforts and enclosures (AY_18, AY_41, AY_43 and AY_61), mounds (AY_03 and AY_47), a motte (AY_20) and moated site (AY_62), a field system of unknown date (AY_63), churches and graveyards (AY_02, AY_44, and AY_45), a holy well (AY_04), and a post-medieval house and roadside inn (AY_20 and AY_26).

A total of ten sites on the SMR (AY_01, AY_05, AY_07, AY_19, AY_32, AY_46, AY_48, AY_57, AY_58 and AY_59) have been identified within the study area for Option B (Green). These are largely characterised by cropmark enclosures.

Further information on the archaeological constraints identified within the study area for Option B: Green is included in Appendix B.

6.1.6.1.1 Archaeological Potential

Areas of alluvium within the study area for Option B: Green have the potential to preserve previously unknown archaeological monuments and remains, including paleoenvironmental remains and preserved organic materials. There is also the potential for votive offerings, objects apparently deposited for religious reasons, in rivers such as the Pinkeen River and Ward River, as well as in minor watercourses.

Similar to Option A (Red) evidence of activity dating to the prehistoric period onwards has been identified during archaeological excavations within the Study area for Option B (Green) (see Section 3.2.3 of Appendix B for information). Therefore, there is the potential for the presence of previously unknown archaeological remains, particularly in areas that are less developed including Batterstown North off-road focus area, Dunboyne / Avoca / Bracetown off-road focus area and Belcamp off-road focus area.

Given the construction of the road network is likely to have removed or truncated any archaeological remains that may have been present in on-road sections of Option B (Green), the potential for the presence of previously unknown archaeological remains is lower in the on-road sections. However, there is the potential for historic road surfaces to survive within pre-1840 roadways.

4.3.6.2 Architectural Heritage

Architectural heritage within the study area for Option B (Green) comprises:

- Five Protected Structures characterised by three churches (AH_02, AH_03 and AH_09), a stone well (AH_10), and an early 19th century house (AH_11).
- Three structures recorded on the NIAH (AH_01, AH_12 and AH_13), assessed by the NIAH to be of Regional importance.
- 15 GDLs comprising nine recorded by the Survey of Historic Gardens and Designed Landscapes and six identified from historic mapping (Ordnance Survey 6", 1837 – 1842).

No Architectural Conservation Areas (ACAs) were identified within the study area for Option B (Green).

Further information on the architectural constraints identified within the study area for Option B (Green) is included in Appendix B.

4.3.6.3 Cultural Heritage

A total of 34 cultural heritage sites have been identified within the study area for Option B (Green) from the sources identified in Section 2.3.2.5. These are largely characterised by post-medieval built heritage including stone road bridges, houses, and agricultural buildings. Further information on these sites is presented in Appendix B.

4.3.6.4 Potential Impacts on Archaeological, Architectural and Cultural Heritage

4.3.6.4.1 Construction - Direct Impacts

Archaeology

Where Option B (Green) is located within the Zone of Notification associated with a Recorded Monument, this has been assessed as a direct impact. While the option would not directly impact the Recorded Monument itself, excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive within this zone.

Option B (Green) is located within the Zones of Notification of six Recorded Monuments (AY_18, AY_26, AY_41, AY_43, AY_44, and AY_45)[30]. Within these zones the option is located in the carriageway of existing roads the construction of which is more than likely to have removed or truncated any archaeological remains

[30] While the location AY_43 has been developed, this site is recorded on the RMP and therefore has been included as a constraint.

associated with these monuments that may have been present. However, construction, including the excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive. Construction would also have a direct impact on any archaeological remains associated with these Recorded Monuments that may survive within any additional land take required for construction.

Six Recorded Monuments (AY_03, AY_04, AY_47, AY_61, AY_62, and AY_63) and five sites on the SMR (AY_46, AY_48, AY_57, AY_58 and AY_59) have been identified within the off-road focus areas for Option B (Green). While the route of the cable within the off-road focus areas for Option B (Green) is not yet known, there is the potential to directly impact these constraints during construction.

Excavation of the cable trench and joint bays, and the excavation of temporary launch and reception pits for directional drilling may also result in a direct impact any previously unknown archaeological remains that may be present within the land required for Option B (Green). The potential for this impact is considered to be higher in previously undeveloped areas than within the existing carriageways, the construction of which is likely to have likely to have removed or truncated any archaeological remains that may have been present.

Architectural Heritage

One Protected Structure (AH_02) and two structures assessed by the NIAH to be of Regional importance (AH_12, and AH_13) are located within the offroad focus areas for Option B (Green). While the route of the cable within the off-road focus areas is not yet known, existing buildings within these areas will be avoided.

Option B (Green) is located within Limepark (DL_13) and may remove features associated with this GDL. In addition, should Option B (Green) require additional land take for construction, the removal of boundary features would have a direct impact on five further GDLs (DL_01, DL_03, DL_04, DL_07 and DL_11). In addition, nine GDLs are also located within the off-road focus areas for Option B (Green) (DL_02, DL_14 – 18, DL_19, DL_26, and DL_27) and construction of Option B (Green) may remove features associated with these demesnes should the option pass through them.

Cultural Heritage

Five post-medieval road bridges (CH_03, CH_14, CH_15, CH_16, and CH_26) are located on the existing road network and therefore there is the potential for accidental damage and loss of historic fabric to these cultural heritage constraints as a result of construction.

In addition, while the route of the cable within the off-road focus areas is not yet known the following cultural heritage constraints are located within these areas:

- Eight cultural heritage constraints (CH_05 – CH_07, and CH_43 – CH_47) in the Batterstown off-road focus area; and
- Ten cultural heritage constraints (CH_30 – CH_35 and CH_54 – CH_57) in the Belcamp off-road focus area.

While upstanding buildings and structures within these areas will be avoided, there is the potential to directly impact these constraints during construction.

4.3.6.4.2 Construction - Indirect Impacts

Archaeology

Three Recorded Monuments comprising an inn (AY_26) on the R135, and a church (AY_44) within a walled graveyard (AY_45) are located within 30m of Option B (Green). While construction activities may add noise and visual intrusion in the setting of these constraints, it is anticipated any intrusion would be temporary (lasting the duration of construction in this location) and, for AY_44 and AY_45, filtered through established boundary vegetation.

While the route of the cable within the off-road focus areas for Option B (Green) is not yet known, construction activities within the cable corridor also have the potential to affect the setting of four Recorded Monuments (AY_03, AY_47, AY_61 and AY_62) and 4 sites on the SMR (AY_46, AY_48, AY_58 and AY_59) within the off-road focus areas; however, these impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

Architectural Heritage

Option B (Green) is located approximately 30m to the south of Kilbride Catholic Church (AH_03), a Protected Structure. Construction may add noise and visual intrusion into the setting of this constraint; however, it is anticipated any intrusion would be temporary (lasting the duration of construction in each location).

Construction activities within the cable corridor also has the potential to affect the setting of all the architectural heritage constraints within the off-road focus areas. However, these impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

Cultural Heritage

Construction activities would have an indirect impact on the setting of nine cultural heritage sites (CH_02, CH_04, CH_17, CH_18, CH_21, CH_22, CH_24, CH_27, and CH_28). However, it is anticipated any intrusion would be temporary (lasting the duration of construction in each location).

Construction activities within the cable corridor also have the potential to affect the setting of 14 cultural heritage constraints within the off-road focus areas (CH_05, CH_07, CH_30, CH_33, CH_34, CH_35, CH_43, CH_44, CH_45, CH_47, and CH_54 – CH_57). These impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

4.3.6.4.3 Operational Impacts

Option B (Green) would be located beneath the road surface, and any offline sections would be reinstated after construction no impacts on archaeological, architectural or cultural heritage constraints have been assessed as a result of the operation of Option B (Green).

4.3.6.5 Summary of Assessment

Considering the number of potential impacts on archaeology, architectural heritage and cultural heritage constraints and the length of off-road sections (c.6.3km), Option B (Green) has been assigned a risk of 'Moderate-High (Blue)'.

A Route Corridor Summary Matrix for archaeology, architectural heritage and cultural heritage is provided in Appendix B.

Moderate to High

4.3.7 Noise and Vibration

4.3.7.1 Noise and Vibration Sensitive receptors

As Table 4.14 shows there are 383 receptors within 100m and 776 receptors within 300m of this option. Most of the receptors are residential but there are other non-residential sensitive receptors within 300m of this option including:

- Ballymaglassan Stud Farm (Section H-I)
- Saint Keiran's Church (Section H-I)
- Dunboyne Nursing Home on R156 (Section I-J)
- Kilbride National School on Kilbride Road (Section T-V)
- Dunsogly Castle and St. Margaret's Well (Section GG-II)
- St. Margaret's National School (Section II-JJ)
- St. Margaret's Church (Section II-JJ)
- DIATA Aviation Training College (Section UU-VV)
- Trinity Care AnovoCare Nursing Home (Section VV-WW)

There are 216 receptors within 100m of off-road sections and 286 receptors within 300m of off-road sections. Most of the receptors are residential properties. Other sensitive receptors include Rathregan National School in the Batterstown off-road section and Trinity Care Nursing Home located in the Belcamp off-road section for this option.

Table 4.14: Residential Property Counts within 300m of Option B (Green)

Option	Number of receptors within 100m of route	Number of receptors within 300m of route	Number of receptors within 100m of off-road sections	Number of receptors within 300m of off-road sections	Number of receptors within 100m of motorway crossings	Number of receptors within 300m of motorway crossings
Option B	383	776	216	286	47	85

There are 47 receptors within 100m of motorway crossings and 85 receptors within 300m of motorway crossings. Most of the receptors potentially affected are residential though Trinity Care Nursing Home is within 300m of the M1 crossing and could potentially experience adverse noise and/or vibration impacts during construction.

4.3.7.2 Potential Noise and Vibration Impacts

This option has the potential to cause noise and vibration impacts during construction which will be temporary in nature. No permanent operational impacts are expected.

As was described for Option A, there is greater potential for noise impacts on sensitive receptors where HDD is used to cross major obstacles, such as motorways. The majority of this option will be installed using 'Open cut' techniques, which are less impactful on sensitive receptors. There will be three crossings of motorways; this option has 57 sensitive receptors within 100m of a motorway crossing.

4.3.7.3 Summary of Assessment

This option impacts a relatively small number of receptors, most of which are dwellings but the option also passes within 100m of a church, two nursing homes and a school. Therefore an overall risk score of Low to Moderate (light green) has been applied.

Low to Moderate

4.3.8 Air Quality

4.3.8.1 Sensitive receptors

The same approach as is set out in Section 4.2.8 was used to determine the potential impacts on sensitive receptors with respect to Air Quality. For human exposure to air pollutants, sensitive receptors (termed 'human receptors') include, for example, residential properties, schools and care homes. Air pollutants can also impact on sensitive vegetation and habitats (termed 'ecological receptors'). These include the following ecological receptor designations:

- Special Area of Conservation (SAC);
- Special Protection Area (SPA);
- Ramsar site;
- Natural Heritage Area (NHA) and proposed NHA (pNHA); and
- Ancient Woodland.

The Institute of Air Quality Management (IAQM) dust guidance[31]. has been adapted for the purposes of this assessment.

A semi quantitative assessment was carried out using GIS to count the number of (human) air quality receptors within set distance bands of the design option centreline. For ecological receptors, distance bands of 20m and 50m were assessed, whereas human receptors utilised 20m, 50m, 100m and 350m.

Table 4.15 shows the total receptor counts within each distance band for Option B (green). No ecological designations were identified within 50m of the Option B (Green) centreline and therefore have been excluded from further assessment. Human receptors, including residential properties and one school (St Margaret's National School, a 92-pupil primary school, within 50m of the centreline), were identified and have been factored into the receptors counts below.

Table 4.15 Sensitive Receptors within 300m of Option B (Green)

Option	No. of sensitive receptors 0-20m	No. of sensitive receptors 0-50m	No. of sensitive receptors 0-100m	No. of sensitive receptors 0-350m
B	40	341	466	1,212

4.3.8.2 Assessment Criteria

The same approach as is set out in Section 4.2.8 was used to determine the risk ratings for potential dust impacts.

If applied on the counts of sensitive receptors 'end to end', this route would have a moderate risk rating. However, at the local level, between nodes, no section scored a moderate risk rating. An average risk rating along the length of the route option was determined to be 1.6.

4.3.8.3 Potential Impacts

The potential impacts are the same as those described in Section 4.2.8.3.

4.3.8.4 Summary of Assessment

Option B (Green) has an average risk score of 1.6 along the length of the route option, is the second shortest route option (37.9km) and has the second fewest number of sensitive receptors within all of the distance bands. Although there are no ecological designations within 200m of Option B (Green), there are several sensitive human receptors including dwellings and a school (St Margaret's National School) within 50m. Therefore, an overall risk score of Low to Moderate (Light Green) has been applied.

Low to Moderate

4.4 Option C (Yellow)

4.4.1 Biodiversity (Flora and Fauna)

4.4.1.1 Overview

The baseline for biodiversity for Option C (Yellow) is largely the same as for Option A (Red) and so the reader is referred to that text; it is not repeated here.

[31] Institute of Air Quality Management. 2016. Guidance on the assessment of dust from demolition and construction. Version 1.1. http://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

4.4.1.2 Potential Impacts

This option is 42.9km and features numerous narrow roads creating greater potential for impacts on roadside hedgerows and ditches.

This option has 15 WFD water body crossings. There are eight water bodies crossed by the options, of these none are High or Good status, four are of Moderate and four are of Poor status. However, it also has up to 15 more crossings of unnamed tributaries of these water bodies. All of the water bodies connect and flow into Baldoyle Estuary, Malahide estuary, the Tolka Estuary, and are therefore connected to numerous European sites. There are no designated salmonid rivers within the study area for the Proposed Development although some of the water bodies have wildlife and fisheries value due to the presence of otter and brown trout.

1.7km of this route option is off-road which presents a relatively low potential impact by linear distance to habitats and species in terms of off-road sections. In particular, it remains on-road enroute to Belcamp and this presents a low risk of impacts to protected species.

4.4.1.3 Summary of Assessment

This option has a significant number of watercourse crossings (30) but also has the shortest length of off-road sections (c. 1.7km). The fact there are no internationally designated sites in close proximity to this route option means it is not high risk. It remains on-road enroute to Belcamp which reduces risk to protected species such as Brent Geese, however considering the significant number of watercourse crossings, this option has been assessed as Moderate risk.

Moderate

4.4.2 Geology and Soils

4.4.2.1 Geology

The Route Corridor Option C (Yellow) is underlain predominantly by Carboniferous limestone bedrock with associated calcareous shales and sandstones. There are no geological heritage sites recorded in the vicinity of the route.

Superficial deposits underlying Route Option C (Yellow) are predominantly limestone till (carboniferous). To the west of the Study Area the superficial deposits are mainly comprised of shale and sandstone till (Namurian) with an area of alluvium to the north of the substation. There are small pockets of limestone sands and gravels, alluvium and bedrock at the surface.

Route Option C (Yellow) crosses areas of potential geological economic deposits (Crushed Rock and Sand and Gravel). Quantitatively 15% of the route option lies over economic deposits of crushed rock reserves in the central portion of the route corridor option. However, such reserves are more widespread elsewhere in the region and the availability of these resources will not be significantly affected. In addition, 13% of the Route Corridor Option lies over economic potential sand and gravel deposits.

One karst feature is located within Option C (Yellow).

No areas of peatland are located along the route corridor option.

4.4.2.2 Land Quality

Two EPA licensed facilities are located along the Route Corridor Option. No historic landfills were located along the Route Corridor Option. Contaminated land sites identified from historic mapping include a brewery located at Ballymacartle and a quarry located at Cloghran. The majority of Option C (Yellow) lies within the Dublin (poorly productive bedrock) WFD groundwater body. Between the M1 and M2 it lies within Swords (poorly productive) WFD groundwater body.

4.4.2.3 Hydrogeology

The greatest potential impacts on hydrogeology relate to potential interaction with areas of vulnerable aquifer and associated risk of pollution and disruption of the groundwater resource. The majority of the route is underlain by bedrock classified as Locally Important Aquifer (poorly productive bedrock). Quantitatively, 76% of the Route Corridor Option crosses an area of Locally Important Aquifer. 5% of the Route Corridor Option crosses an area of extreme vulnerability and 14% of the Route Corridor Option crosses an area of high groundwater vulnerability.

There are a large number of groundwater wells and springs mapped by the Geological Survey Ireland across the Study Area. However, considering Transport Infrastructure Ireland (TII) guidance and the observation that low-yielding wells, which are used mainly for domestic and farm water supply are very common in Ireland, the assessment has focused on high yielding springs and wells used for public water supply and their surrounding protection zones and total number of wells and springs along each route corridor has not been used in assessing relative impacts between the route options at this stage.

At this stage of assessment, no groundwater dependent water bodies or groundwater dependent terrestrial ecosystems (GWDTEs) have been identified within the study area and so these features have not been used in assessing relative impacts between route options at this stage. The nearest known significant site is Malahide Estuary SPA, 3.9km from route Option C (Yellow) which is designated for petrifying springs with tufa formation. At this distance direct groundwater dewatering effects would not be expected based on current knowledge and any reduction in groundwater baseflow would be localised and not expected to be significant at this scale of this watercourse.

4.4.2.4 Summary of Assessment

Potential impacts on mineral reserves are considered to be low risk. There is one karst feature. There are limited locations where there is potential for contaminated land to be encountered, however there are remediation works proposed at land to the west of Belcamp substation, however this option will not pass through that land as it remains on-road enroute to Belcamp. There is a low risk of impacts to groundwater resources; only 5% of the route is within a zone of extreme vulnerability.

In terms of geology, soils and groundwater the overall evaluation of potential risks for Option C (Yellow) is considered to be low-moderate, based on currently available information.

Low to Moderate

4.4.3 Surface Water and Flood Risk

4.4.3.1 Surface Water

4.4.3.1.1 Potential Impacts

For Route Option C (Yellow), there are 16 crossings of WFD water bodies; nine of Moderate status and seven of Poor status. There are eight water bodies crossed in total, a number are crossed more than once; the Tolka_020 and Mayne_010 are crossed three times and the Ward_030 is crossed four times. The Ward_030 is made up of a number of segments which are not all hydrologically linked to each other except after their confluence to form the next water body. Notwithstanding this, there is potential for cumulative impacts as a result the numerous crossings from this option.

All of the water bodies are ultimately connected to designated sites along the north Dublin coastline, however only one of the crossing points is hydrologically connected less than 5km from the designated sites (Mayne_010 has a Poor WFD status and is hydrologically connected approximately 2.5km from Baldoyle SAC). The rankings for sensitivity and crossing technique are provided in Table 4.16 and Table 4.17.

Table 4.16 Water Bodies Being Crossed

Waterbody	Status	Hydrological connection at closest crossing to SAC	Option C (Yellow) No. Crossings	Sensitivity	Impact Potential
Tolka_010	Poor	>5km	1	1	1
Tolka_020	Moderate	>5km	3	3	9
Pinkeen_010	Moderate	>5km	1	3	3
Ward_010	Poor	>5km	2	1	3
Ward _020	Moderate	>5km	1	3	3
Ward_030	Moderate	>5km	4	3	12
Sluice_010	Poor	>5km	1	1	1
Mayne_010	Poor	2.5km (2-5km)	3	3	9
Total	**n/a**	**n/a**	**16**	**n/a**	**41**
Ranking					**Low to Moderate**

Table 4.17 Crossing Techniques Ranking

Technique	Number of Crossings	Risk (crossings x risk score)
Open Cut likely	11	55
HDD	1	1
In-road	5	15
Total	16	70
Rank		**Moderate to High**

4.4.3.2 Flood Risk

4.4.3.2.1 Potential Impacts

The lengths and percentages of the Option C (Yellow) are provided in Table 4.18. The length of Option C (Yellow) is 43km.

Table 4.18 Lengths within PFRA Flood Zones

Flood Zone	Length (m)	%age of route	Ranking
Pluvial 10 year flood zone	186	0.4	Low
Fluvial 10 year flood zone	820	1.9	Low to moderate
Coastal 10 year flood zone	0	0	Low
Overall			**Low to Moderate**

4.4.3.2.2 Summary of Assessment

There are 16 crossings of eight different water bodies of relatively low sensitivity to change as a result of their existing conditions. Of these crossings it is likely that most will be off-road via open cut crossing techniques. This presents a greater risk to water quality and hydromorphology than keeping the trench in the road or crossing via HDD.

The numerical scoring of the water courses and their crossing techniques allows benchmarking across all of the route options; the higher the score the greater the level of risk. Whilst the high number of off-road open cut crossings scores high and would suggest a moderate to high risk, the relatively low sensitivity of the water bodies being crossed reduces the overall significance of these impacts and the risk of such impacts occurring.

A very small proportion of the route is in any flood zone; notwithstanding, the potential for impacts is of moderate risk, although these would be temporary during construction for the most part. There is a risk during operation, that there will be limited accessibility in flood zones and so these will be avoided wherever possible.

Combined score for surface water quality and flood risk:

Moderate

4.4.4 Planning Policy and Land Use

4.4.4.1 Planning Policy

All of the route options traverse Meath and Fingal Administrative areas and the same policies will apply. Policy and legislation are therefore not a differentiator and so is not considered further in this assessment.

The zoned areas of Meath and Fingal are the same for all of the options. Option C (Yellow) has the same potential for impacts on Kilbride as Options A (Red) and B (Green), however it will not impact upon the zoned land to the west of Belcamp substation.

4.4.4.2 Planning Applications

Major planning applications at the time of writing, in proximity or potentially relevant to Route Option C, are listed below.

- Ballymacarney Solar Farm – this is under construction. Construction access is via the R121 to the south which is the road along which Options A (Red), C (Yellow) and D (Blue) would be routed to cross the M2 motorway. However it is anticipated that construction will be completed ahead of any works beginning for the Proposed Development. There are no UGC connections in this road relating to the solar farm; it is connected via OHL to an existing 110kV OHL via a new 110kV ESB substation.
- Metrolink cable connections – this is currently in pre-planning stage. Metrolink has identified a preferred route for its connection to substations north and south of the airport and to Belcamp. The routes to the substation along Baskin Lane and Malahide Road would interface with this route option; and
- NISA – a proposed off-shore wind farm which plans to connect into Belcamp substation via Malahide Road. This requires a high voltage (220kV) connection and it is proposed for this to be in-road.

The combination of the Metrolink and NISA connections, both proposed to be in Malahide Road and the R139 to connect to Belcamp substation would potentially make Option C (Yellow) unviable if they were to be granted consent and in place ahead of the Proposed Development. They are, however, both dependent upon the consenting of the applications for the schemes which require the connections and it is not guaranteed that both (or either) will be granted consent, or, if they are, whether that will be ahead of the Proposed Development. As such, Option C (Yellow) via Malahide Road remains a viable option.

4.4.4.3 Summary of Assessment

The avoidance of the zoned industrial land west of Belcamp somewhat reduces the risk to future development from Option C (Yellow) when compared to Options A (Red) and B (Green), however the potential for Malahide Road to become unviable as a route as a result of Metrolink and NISA connections increases the risk to the Proposed Development. Therefore, as an end to end option, Option C (Yellow) has been assigned **Moderate to High risk (Blue).**

Moderate to High

4.4.5 Landscape and Visual Impacts

4.4.5.1 Overview

The approach to identifying potential impacts on landscape and visual receptors is as described in Section 2.4.1.5.1.

4.4.5.2 Potential Impacts

The nature of the potential impacts on the landscape and on visual receptors is as Is described in Section 4.2.5.1. The same Landscape Character Areas have the potential to be impacted upon as set out in Table 4.8: and are not repeated here. A section of this Route Option adjoins an area designated as a Highly Sensitive Landscape (Kinsealy) and where there is the Specific Objective to Protect & Preserve Trees, Woodlands and Hedgerows within the St Doolaghs Church Nature Objective Area but the requirement for vegetation removal is unlikely as the trench will be within the road pavement, therefore, potential for physical impacts will be limited in scale and localised.

4.4.5.3 Summary Assessment

When the magnitude of impact on the landscape character is considered in conjunction with the low-negligible sensitivity of the landscape within the Study Area, it is anticipated that the significance of the impacts will be Imperceptible during the construction phase and Imperceptible during the operational phase. Significant impacts on landscape character or on visual receptors is unlikely; therefore, this Route Option is considered to be Low risk.

Low

4.4.6 Archaeology, Architectural Heritage, and Cultural Heritage

Baseline information on the archaeology, architectural heritage and cultural heritage constraints identified within the study area for Option C (Yellow) is provided in Appendix B.

Archaeological, architectural and cultural heritage constraints are shown in Appendix B.

4.4.6.1 Archaeology

No National Monuments or sites with Preservation Orders, or sites on the RHM, were identified within the study area for Option C (Yellow) and therefore no impacts have been identified on these types of constraint.

A total of 28 Recorded Monuments are located within the study area for Option C (Yellow). These comprise churches and chapels (AY_23, AY_37, AY_39, AY_44, AY_53), graveyards and burial grounds (AY_24, AY_30, AY_36, AY_40, AY_45 and AY_51), ecclesiastical enclosures (AY_35 and AY_50), a roadside cross (AY_56) and four ritual sites (AY_04, AY_22, AY_54 and AY_55), ringforts and enclosures (AY_18, AY_29, AY_34, and AY_38), a mound (AY_03), a moated site (AY_62), two post-medieval houses (AY_27 and AY_42), a field system (AY_63), and a castle of unknown date (AY_25).

Seven sites on the SMR (AY_05, AY_19, AY_28, AY_31, AY_33, AY_49 and AY_52) have been identified within the study area for Option C (Yellow). These comprise cropmark enclosures and a ring ditch, a field system, and the locations of a font and architectural fragments.

Further information on the archaeological constraints identified within the study area for Option C (Yellow) is included in Appendix B.

4.4.6.1.1 Archaeological Potential

Alluvium has the potential to preserve previously unknown archaeological monuments and remains, including organic and paleoenvironmental remains, and there is also the potential for votive offerings in rivers such as the Tolka River, Pinkeen River, Ward River and Mayne River and minor watercourses.

While previous archaeological excavations within the study area for Option C (Yellow) have identified evidence of prehistoric activity, Option C (Yellow) is largely within the existing road network, and the potential for previously unknown archaeological remains is lower given the construction of these roads may have removed or truncated any archaeological remains that may have been present. However, there is the potential for historic road surfaces to survive within pre-1840 roadways.

There is a higher potential for the presence of previously unknown archaeological remains in less developed areas, such as within the Batterstown North off-road focus area.

4.4.6.2 Architectural Heritage

Architectural heritage constraints within the study area for Option C (Yellow) comprise:

- Eleven Protected Structures characterised by six churches and graveyards (AH_02, AH_04, AH_06, AH_08, AH_09 and AH_14), a stone well (AH_10), a miles stone (AH_16), and houses and gate lodges (AH_07, AH_17 and AH_21)
- Seven structures recorded on the NIAH (AH_05, AH_12, AH_13, AH_15, AH_18, AH_19 and AH_20), assessed by the NIAH to be of Regional importance.
- 19 GDLs comprising nine recorded by the Survey of Historic Gardens and Designed Landscapes and ten identified from historic mapping (Ordnance Survey 6", 1837 – 1842).

No Architectural Conservation Areas (ACAs) were identified within the study area for Option C (Yellow).

Further information on the architectural constraints identified within the study area for Option C (Yellow) is included in in Appendix B.

4.4.6.3 Cultural Heritage

A total of 25 cultural heritage sites have been identified within the study area for Option C (Yellow). These are largely characterised by post-medieval built heritage including stone road bridges, houses, and agricultural buildings. Further information on these sites is presented in Appendix B.

4.4.6.4 Potential Impacts on Archaeological, Architectural and Cultural Heritage

4.4.6.4.1 Construction - Direct Impacts

Archaeology

Where Option C (Yellow) is located within the Zone of Notification associated with a Recorded Monument, this has been assessed as a direct impact. While the option would not directly impact the Recorded Monument itself, excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive within this zone.

Option C (Yellow) is located within the Zones of Notification of 17 Recorded Monuments (AY_18, AY_23, AY_24, AY_25, AY_27, AY_29, AY_30, AY_34, AY_39, AY_40, AY_42, AY_50, AY_51 and AY_53, AY_54, AY_55, AY_56)[32]. Within these zones the option is located in the carriageway of existing roads the construction of which is more than likely to have removed or truncated any archaeological remains associated with these monuments that may have been present. However, construction, including the excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive. Construction would also have a direct impact on any archaeological remains associated with these Recorded Monuments that may survive within any additional land take required for construction.

[32] While the location of AY_29 has been developed, this site is recorded on the RMP and therefore has been included as a constraint.

Four Recorded Monuments (AY_03, AY_04, AY_62 and AY_63) have been identified within the off-road focus areas for Option C (Yellow). While the route of the cable within the off-road focus areas for Option C (Yellow) is not yet known, there is the potential to directly impact these constraints during construction.

Excavation of the cable trench and joint bays, and the excavation of temporary launch and reception pits for directional drilling may also result in a direct impact any previously unknown archaeological remains that may be present within the land required for Option C (Yellow). The potential for this impact is considered to be higher in previously undeveloped areas than within the existing carriageways, the construction of which is likely to have likely to have removed or truncated any archaeological remains that may have been present.

Architectural Heritage

Belcamp House (AH_12 and AH_13), assessed by the NIAH to be of regional importance, is located on the alignment of Option C (Yellow). While the house has been demolished, construction of the option would remove any archaeological remains associated with this structure.

Should Option B (Green) require additional land take for construction, the removal of boundary features would have a direct impact on eleven GDLs (DL_04, DL_13, DL_16, DL_17, DL_18, DL_20, DL_21, DL_23, DL_22, DL_24, and DL_25).

One Protected Structure (AH_02) is located within the Batterstown offroad focus area for Option C (Yellow). While the route of the cable within the off-road focus areas is not yet known, existing buildings within these areas will be avoided. One GDL is also located within the Batterstown offroad focus area for Option C (Yellow) and construction may remove features associated with this demesne should the option pass through it.

Cultural Heritage

Four post-medieval road bridges (CH_14, CH_15, CH_37 and CH_40) are located on the existing road network and therefore there is the potential for accidental damage and loss of historic fabric to these cultural heritage constraints as a result of construction.

Option C (Yellow) crosses the alignment of the M.G.W.R (Dublin and Navan Branch) railway (CH_48) to the west of the M3 motorway. The excavation of temporary launch and reception pits for directional drilling in this location may remove of any surviving remains associated with this constraint.

In addition, while the route of the cable within the off-road focus areas is not yet known eight cultural heritage constraints (CH_05 – CH_07, and CH_43 – CH_47) are located in the Batterstown off-road focus area. While upstanding buildings and structures within this area will be avoided, there is the potential to directly impact these constraints during construction.

4.4.6.4.2 Construction - Indirect Impacts

Archaeology

Option C (Yellow) is located within 20m of a church (AY_23, also a Protected Structure; AH_06) and its associated graveyard (AY_24) in Ward Lower and within 60m of a graveyard (AY_36) and ruinous church (AY_37) in Killeek. While construction activities may add noise and visual intrusion in the setting of these constraints, it is anticipated any intrusion would be temporary (lasting the duration of construction in this location).

Option C (Yellow) is located within 5m of the Saint Doolagh's ecclesiastical complex (AY_50, AY_51 and AY_53 – AY_56, also a Protected Structure; AH_14). Noise and visual intrusion from construction plant may have an indirect impact on this complex. However, it is anticipated any intrusion would be temporary (lasting the duration of construction in this location).

While the route of the cable within the off-road focus areas for Option C (Yellow) is not yet known, construction activities within the cable corridor also have the potential to affect the setting of two Recorded Monuments (AY_02 and AY_62) however, these impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

Architectural Heritage

Construction activities may add noise and visual intrusion into the setting of the following five Protected Structures:

- a Church of Ireland Church and Graveyard in Hollystown (AH_04) is located approximately 15m to the north-east of Option C (Yellow);
- a thatched dwelling in Killeek (AH_07) is located approximately 5m to the east of Option C (Yellow);
- the site of 'Cloghran Church' and graveyard (AH_09) is located approximately 80m to the south of Option C (Yellow)
- Wellfield House (AH_17) is located approximately 30m to the east of Option C (Yellow); and
- the gate lodge to Saint Doolagh's Park (AH_21) is located approximately 5m to the east of Option C (Yellow).

However, it is anticipated any intrusion would be temporary (lasting the duration of construction in each location).

Option C (Yellow) is also located 20m of a church (AH_06), Killeek Church and graveyard (AH_08), and within 5m of the Saint Doolagh's complex (AH_14), all Protected Structures. These are also Recorded Monuments (AY_23, AY_36, AY_37, AY_50, AY_51 and AY_53 – AY_56) and to avoid double counting impacts, no impact has been assessed on AH_06, AH_08 and AH_14 as an impact has already been assessed on AY_23, AY_36, AY_37, AY_50, AY_51 and AY_53 – AY_56 (see above).

Option C (Yellow) is located within 20m of three gate lodges (AH_05, AH_15 and AH_18), assessed by the NIAH to be of Regional importance. Construction may add noise and visual intrusion into the setting of these constraints; however, it is anticipated any intrusion would be temporary (lasting the duration of construction in these locations) and limited by intervening boundary features.

Construction activities within the cable corridor also has the potential to affect the setting of all the architectural heritage constraints within the off-road focus areas. However, these impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

Cultural Heritage

Construction activities would have an indirect impact on the setting of ten cultural heritage sites (CH_12, CH_13, CH_19, CH_24, CH_25, CH_29, CH_35, CH_36, CH_38 and CH_39). However, it is anticipated any intrusion would be temporary (lasting the duration of construction in each location).

Construction activities within the cable corridor also have the potential to affect the setting of six cultural heritage constraints within the off-road focus areas (CH_05, CH_07, CH_43, CH_44, CH_45 and CH_47). These impacts are anticipated to be temporary (lasting the duration of construction in each location) and localised along the wayleave corridor.

4.4.6.4.3 Operational Impacts

Option C (Yellow) would be located beneath the road surface, and any off-road sections would be reinstated after construction no impacts on archaeological, architectural or cultural heritage constraints have been assessed as a result of the operation of Option C (Yellow).

4.4.6.5 Summary of Assessment

Considering the number of potential impacts on archaeology, architectural heritage and cultural heritage, Option C (Yellow) has been assigned a risk of 'Moderate-High (Blue)'.

A Route Corridor Summary Matrix for archaeology, architectural heritage and cultural heritage is provided in Appendix B.

Moderate to High

4.4.7 Noise and Vibration

4.4.7.1 Noise and Vibration Sensitive receptors

As Table 4.19 shows there are 1167 receptors within 100m and 3132 receptors within 300m of this option. Most of the receptors are residential but there are other non-residential sensitive receptors within 300m of this option including:

- Rathregan National School (Section G-K)
- Kilbride National School on Kilbride Road (Section V-W)
- New Park Care Centre Nursing Home (Section BB-LL)
- Oakwood Lodge Nursing Home (Section OO-PP)
- Tara Winthrop Private Clinic Care Home (Section SS-VV)
- Kilronan Equestrian Centre (Section SS-VV)
- DIATA Aviation Training College (Section UU-VV)
- Trinity Care AnovoCare Nursing Home (Section VV-WW)
- Kinsealy Riding Centre Dublin (Section XX-YY)
- Malahide/Portmarnock Educate Together National School (Section YY-BBB)
- St Doulagh's Church (Section YY-BBB)
- Care Choice Malahide Care Home (Section YY-BBB)

There are 103 receptors within 100m of off-road sections and 146 receptors within 300m of off-road sections. Most of the receptors are residential properties. Other sensitive receptors include Rathregan National School in the Batterstown off-road section and Trinity Care Nursing Home located in the Belcamp off-road section.

Table 4.19: Residential Property Counts within 300m of Option C (Yellow)

Option	Number of receptors within 100m of route	Number of receptors within 300m of route	Number of receptors within 100m of off-road sections	Number of receptors within 300m of off-road sections	Number of receptors within 100m of motorway crossings	Number of receptors within 300m of motorway crossings
Option C	1167	3122	130	146	2	18

There are two receptors within 100m of motorway crossings and 18 receptors within 300m of motorway crossings. Most of the receptors potentially affected are residential though Trinity Care Nursing Home is within 300m of the M1 crossing and could potentially experience adverse noise and/or vibration impacts during construction. This option (along with Option D (Blue)) crosses the M3 at a regional road therefore there is less potential for significant adverse noise effects compared to the other options which cross the M3 Motorway.

4.4.7.2 Potential Noise and Vibration Impacts

This option has the potential to cause noise and vibration impacts during construction which will be temporary in nature. No permanent operational impacts are expected.

As was described for Option A (Red), there is greater potential for noise impacts on sensitive receptors where HDD is used to cross major obstacles, such as motorways. The majority of this option will be installed using ‘Open cut’ techniques, which are less impactful on sensitive receptors. There will be three crossings of motorways; this option has 60 sensitive receptors within 100m of a motorway crossing.

4.4.7.2.1 Summary of Assessment

This option impacts a relatively large number of receptors as it passes close to the town of Swords. The majority of receptors are dwellings but the option also passes within 100m of three schools, three nursing homes, an equestrian centre and a church. Therefore an overall risk score of Moderate (dark green) has been applied.

Moderate

4.4.8 Air Quality

4.4.8.1 Sensitive receptors

The same approach as is set out in Section 4.2.8 was used to determine the potential impacts on sensitive receptors with respect to Air Quality.

Table 4.20 shows the total receptor counts within each distance band for Option C (yellow). No ecological designations were identified within 50m of the Option C centreline and therefore have been excluded from further assessment. Human receptors, including residential properties and two schools (Little Moo Moos Playschool, an assumed 30-pupil pre-school (within 20m), and Rathregan National School, a 94-pupil primary school (within 50m)), were identified and have been factored into the receptors counts below.

Table 4.20 Sensitive Receptors within 350m of Option C (Yellow)

Option	No. of sensitive receptors 0-20m	No. of sensitive receptors 0-50m	No. of sensitive receptors 0-100m	No. of sensitive receptors 0-350m
C	143	754	1,280	4,815

4.4.8.2 Assessment Criteria

The same approach as is set out in Section 4.2.8 was used to determine the risk ratings for potential dust impacts.

At the local level, between nodes, six sections scored a moderate risk rating. An average risk rating along the length of the route option was determined to be 1.9.

4.4.8.3 Potential Impacts

The potential impacts are the same as those described in Section 4.2.8.3.

4.4.8.4 Summary of Assessment

Option C (Yellow) has an average risk score of 1.9 along the length of the route option, and has the largest number of sensitive receptors within all of the distance bands. Although there are no ecological designations within 200m of Option C (Yellow), there are several sensitive human receptors including dwellings and two schools (Little Moo Playschool and Rathregan National School) within 20m and 50m. Therefore, an overall risk score of 'Moderate (Dark Green)' has been applied.

Moderate

4.5 Option D (Blue)

4.5.1 Biodiversity (Flora and Fauna)

4.5.1.1 Overview

The baseline for biodiversity for Option D (Blue) is largely the same as for Option A (Red) and so the reader is referred to that text; it is not repeated here.

4.5.1.2 Potential Impacts

This option is the second longest at 40.2km. With so many narrow roads, the longer the route the greater the potential for impacts on roadside hedgerows and ditches.

This option has 15 WFD water body crossings. There are eight water bodies crossed by the options, of these none are High or Good status, four are of Moderate and four are of Poor status. However, it also has up to 14 more crossings of unnamed tributaries of these water bodies. All of the water bodies connect and flow into Baldoyle Estuary, Malahide estuary, the Tolka Estuary, and are therefore connected to numerous European sites. There are no designated salmonid rivers within the study area for the Proposed Development although some of the water bodies have wildlife and fisheries value for instance due to the presence of otter and brown trout.

4.2km of this route option is offline which presents a higher impact by linear distance to habitats and species in terms of off-road sections. However it remains on-road enroute to Belcamp and this presents a lower risk of impacts to protected species than Options A (Red) and B (Green) in this location.

4.5.1.3 Summary of Assessment

This option is longer (40.2km) than Option A (Red) & B (Green) (36.3km and 37.8km respectively), but not the longest (Option C (Yellow), 42.9km), has more watercourse crossings (29) than Options A (Red) & B (Green) (26 each) but fewer than Option C (Yellow) (30). It also has a shorter off-road length (4.2km) than Option C (Yellow). On balance, therefore this option has been assessed as being of similar risk to Option B, Low - Moderate.

Low to Moderate

4.5.2 Geology and Soils

4.5.2.1 Geology

The Route Corridor Option D (Blue) is underlain predominantly by Carboniferous limestone bedrock with associated calcareous shales and sandstones. There are no geological heritage sites recorded in the vicinity of the route. Superficial deposits underlying the Route Option D (Blue) are predominantly limestone till (carboniferous). To the west of the Study Area the superficial deposits are mainly comprised of shale and sandstone till (Namurian) with an area of alluvium to the north of the substation. There are small pockets of limestone sands and gravels, alluvium and bedrock at the surface.

Route Option D (Blue) crosses areas of potential geological economic deposits (Crushed Rock and Sand and Gravel). Quantitatively, 15% of the route option lies over economic deposits of crushed rock reserves in the central portion of the route corridor option. However, such reserves are more widespread elsewhere in the region and the availability of these resources will not be significantly affected. In addition, 7% of the Route Corridor Option lies over economic potential sand and gravel deposits.

No areas of peatland have been identified along the Route Corridor Option.

4.5.2.2 Land Quality

Two EPA licensed facilities are located along the Route Corridor Option. Contaminated land sites identified from historical mapping included a graveyard at Vesingstown, Dunboyne c. 250m from the Route Corridor Option and a gravel pit located at Nuttstown c.50m from the Route Corridor Option. The Route Corridor will cross an area of unauthorised landfill northeast of the N32/Clonshaugh Road Junction. Previous ground investigations have shown that the unauthorised landfill contains up to 20,000m3 of mixed commercial/industrial, construction and demolition waste. The majority of Route Option D (Blue) lies within the Dublin (poorly productive bedrock) WFD groundwater body. Between the M1 and M2 Route Option D (Blue) lies within Swords (poorly productive) WFD groundwater body.

4.5.2.3 Hydrogeology

The greatest potential impacts on hydrogeology relate to potential interaction with areas of vulnerable aquifer and associated risk of pollution and disruption of the groundwater resource. The majority of the route is underlain by bedrock classified as Locally Important Aquifer (poorly productive bedrock). Quantitatively, 82% of the Route Corridor Option crosses an area of Locally Important Aquifer. 6% of the Route Corridor Option crosses an area of extreme vulnerability and 14% of the Route Corridor Option crosses an area of high groundwater vulnerability.

There are a large number of groundwater wells and springs mapped by the Geological Survey Ireland across the Study Area. However, considering Transport Infrastructure Ireland (TII) guidance and the observation that low-yielding wells, which are used mainly for domestic and farm water supply are very common in Ireland, the assessment has focused on high yielding springs and wells used for public water supply and their surrounding protection zones and total number of wells and springs along each route corridor has not been used in assessing relative impacts between the route options at this stage.

4.5.2.4 Summary of Assessment

Potential impacts on mineral reserves are considered to be low risk. There are limited locations where there is potential for contaminated land to be encountered. There are remediation works proposed at land to the west of Belcamp substation, however this option will not pass through that land as it remains on-road enroute to Belcamp. There is a low risk of impacts to groundwater resources; only 6% of the route is within a zone of extreme vulnerability.

In terms of geology and soils the overall evaluation of potential risks for Option D (Blue) is considered to be moderate based on currently available information.

Moderate

4.5.3 Surface Water and Flood Risk

4.5.3.1 Surface Water

4.5.3.1.1 Potential Impacts

For Route Option D (Blue), there are 15 crossings of water bodies; seven of Moderate status and eight of Poor status. There are seven water bodies crossed in total, a number are crossed twice; the Tolka_020 is crossed five times and the Ward_030 is crossed four times. The Ward_030 is made up of a number of segments which are not all hydrologically linked to each except after their confluence to form the next water body. Notwithstanding this, there is potential for cumulative impacts as a result the numerous crossings from this option.

All of the water bodies are ultimately connected to designated sites along the north Dublin coastline, however only one of the crossing points is hydrologically connected less than 5km from the designated sites (Mayne_010 has a Poor WFD status and is hydrologically connected approximately 4.5km from Baldoyle SAC). The rankings for sensitivity and crossing technique are provided in Table 4.21 and Table 4.22.

Table 4.21 Water Bodies Being Crossed

Waterbody	Status	Hydrological connection at closest crossing to SAC	Option D (Blue) No. Crossings	Sensitivity	Impact Potential
Dunboyne Stream_010	Poor	>5km	3	1	3
Tolka_010	Poor	>5km	1	1	1
Tolka_020	Moderate	>5km	2	3	6
Pinkeen_010	Moderate	>5km	1	3	3
Ward _020	Moderate	>5km	1	3	3
Ward_030	Moderate	>5km	3	3	9
Sluice_010	Poor	>5km	2	1	2
Mayne_010	Poor	4.5km (between 2-5km)	3	3	9
Totals	**n/a**	**n/a**	**15**	**n/a**	**36**
Ranking					**Low to Moderate**

Table 4.22 Crossing Techniques Ranking

Technique	Number of Crossings	Risk (crossings x risk score)
Open Cut likely	12	60
HDD	1	1
In-road	3	9
Total	15	70
Rank		**Moderate to High**

4.5.3.2 Flood Risk

4.5.3.2.1 Potential Impacts

The lengths and percentage of the Option D (Blue) are provided in Table 4.23. The overall length of Option D (Blue) is 40.2km.

Table 4.23 Lengths within PFRA Flood Zones

Flood Zone	Length (m)	%age of route	Ranking
Pluvial 10 year flood zone	130	0.3	Low
Fluvial 10 year flood zone	1152	2.9	Moderate
Coastal 10 year flood zone	0	0	Low
Overall			**Moderate**

4.5.3.2.2 Summary of Assessment

There are 15 crossings of eight different water bodies of relatively low sensitivity to change as a result of their existing conditions. Of these crossings it is likely that most will be off-road via open cut crossing techniques. This presents a greater risk to water quality and hydromorphology than keeping the trench in the road or crossing via HDD.

The numerical scoring of the watercourses and their crossing techniques allows benchmarking across all of the route options; the higher the score the greater the level of risk. Whilst the high number of off-road open cut crossings scores high and would suggest a moderate to high risk, the relatively low sensitivity of the water bodies being crossed reduces the overall significance of these impacts and the risk of such impacts occurring.

A very small proportion of the route is in any flood zone; notwithstanding, the potential for impacts is of moderate risk, although these would be temporary during construction for the most part. There is a risk during operation, that there will be limited accessibility in flood zones and so these will be avoided wherever possible.

Combined score: for surface water quality and flood risk:

Moderate

4.5.4 Planning Policy and Land Use

4.5.4.1 Planning Policy and Legislation

All of the route options traverse Meath and Fingal Administrative areas and the same policies will apply. Policy and legislation are therefore not a differentiator and so is not considered further in this assessment.

The zoned areas of Meath and Fingal are the same for all of the options. Option D (Blue) could impact upon land zoned for settlements in Kilbride and therefore impact the future development of this land. However it will not impact upon the zoned land to the west of Belcamp substation.

4.5.4.2 Planning Applications

Major planning applications at the time of writing, in proximity or potentially relevant to Route Option D, are listed below.

- Ballymacarney Solar Farm – this is under construction. Construction access is via the R121 to the south which is the road along which Options A (Red), C (Yellow) and D (Blue) would be routed to cross the M2 motorway. However it is anticipated that construction will be completed ahead of any works beginning for the Proposed Development. There are no UGC connections in this road relating to the solar farm; it is connected via OHL to an existing 110kV OHL via a new 110kV ESB substation.
- Vesington Solar Farm – this is under construction and is accessed via the R156, and an unnamed road between the R156 and R154, both of which are proposed to be used for this route option However it is anticipated that construction will be completed ahead of any works beginning for the Proposed Development. There are no UGC connections in this road relating to the solar farm; it is connected via OHL to an existing 110kV OHL via a new 110kV ESB substation;
- Metrolink cable connections – this is currently in pre-planning stage. Metrolink has identified a preferred route for its connection to substations north and south of the airport and to Belcamp. The routes to the north of the airport would interface with this route option; and
- Aviation Fuel Line: planning permission has been granted for the installation of an aviation fuel line which is proposed to be routed along the R139 and in Stockhole Lane for approximately half of its length east of Dublin Airport before turning west to the airport under the M1. Consent was granted in 2017 however construction has yet to commence. Increased demand for fuel and traffic congestion limiting deliveries of fuel to the airport via tanker mean there is likely to be a need for the fuel line in the coming years[33]. It is therefore likely that it will be constructed and commissioned within the next several years.

[33] Stakeholder Engagement Meeting with DAA Ltd – the fuel line was discussed and the likely requirement identified by DAA, although DAA will not own or operate it.

4.5.4.3 Summary of Assessment

There is some risk of impacts on the development of land earmarked for settlements in Kilbride and there is a risk associated with the potential presence of an aviation fuel line in Stockhole Lane. For the former, careful routing would minimise any sterilisation of land; for the latter, timing is critical to the potential risks from this development. If it is not installed ahead of the Proposed Development being constructed, it is unlikely to present a risk. The Proposed Development does not present any risk to the fuel line once it is installed; construction activities are the greatest risk to it.

This has been assigned **Moderate risk (Green)**.

Moderate

4.5.5 Landscape and Visual Impacts

4.5.5.1 Potential Impacts

The nature of the potential impacts on the landscape and on visual receptors is as Is described in Section 4.2.5.1

4.5.5.2 Summary Assessment

This route Option includes a 2.82 km off-road section through the High Sensitivity Tara Skryne Hills Landscape Character Area near Woodland, involving hedgerow removal. However, potential for physical impacts will be limited in scale and localised. Significant impacts on landscape character or on visual receptors is unlikely; therefore, this Route Option is considered to be at Low risk of resulting in significant impacts.

Low

4.5.6 Archaeology, Architectural Heritage and Cultural Heritage

Baseline information on the archaeology, architectural heritage and cultural heritage constraints identified within the study area for Option D (Blue) is provided in Appendix B.

Archaeological, architectural and cultural heritage constraints are illustrated in Appendix B.

4.5.6.1 Archaeology

No National Monuments or sites with Preservation Orders, or sites on the RHM, were identified within the study area for Option D (Blue) and therefore no impacts have been identified on these types of constraint.

A total of 20 Recorded Monuments are located within the study area for Option D (Blue). These comprise a barrow mound (AY_06), ringforts and enclosures (AY_18, AY_29, AY_34, AY_38 and AY_43), a castle of unknown date (AY_25), chapels and churches (AY_23, AY_37, AY_39 and AY_44), graveyards and a burial ground (AY_24, AY_30, AY_36, AY_40 and AY_45) and ecclesiastical enclosure (AY_35), a holy well (AY_22), and two post-medieval houses (AY_27 and AY_42).

Five sites on the SMR have been identified within the study area for Option D (Blue). These comprise cropmark enclosures and a ring ditch (AY_19, AY_28, AY_31, AY_33 and AY_46).

Further information on the archaeological constraints identified within the study area for Option D (Blue) is included in Appendix B.

4.5.6.1.1 Archaeological Potential

Alluvium and lacustrine sediments have the potential to preserve previously unknown archaeological monuments and remains, including organic and paleoenvironmental remains, and there is also the potential for votive offerings in rivers such as the Tolka River, Pinkeen River, and Mayne River and minor watercourses.

Similar to other options, evidence of dating from the prehistoric period onwards has been identified in the study area for Option D (Blue) from previous archaeological excavations undertaken in advance of development (see Section 3.4.3 of Appendix B for information). Therefore there is the potential for the presence of previously unknown archaeological remains particularly in less developed areas, including the Batterstown South off-road focus area and Belgree West off-road focus area. While sections of the option are located within the existing road network, and the potential for the presence of previously unknown archaeological remains is less in these locations given their construction may have removed or truncated any archaeological remains that may have been present, historic road surfaces may survive within pre-1840 roadways.

4.5.6.2 Architectural Heritage

Architectural heritage constraints within the study area for Option D (Blue) comprise:

- Six Protected Structures comprising four churches and graveyards (AH_04, AH_06, AH_08 and AH_09), a stone well (AH_10), and a thatched house (AH_07).
- Two structures recorded on the NIAH (AH_05 and AH_13), assessed to be of Regional importance.
- Twelve GDLs comprising five recorded by the Survey of Historic Gardens and Designed Landscapes and seven identified from historic mapping (Ordnance Survey 6", 1837 – 1842).

No Architectural Conservation Areas (ACAs) were identified within the study area for Option D (Blue).

Further information on the architectural constraints identified within the study area for Option D (Blue) is included in Appendix B.

4.5.6.3 Cultural Heritage

A total of 23 cultural heritage sites have been identified within the study area for Option D (Blue). These are largely characterised by post-medieval built heritage including stone road bridges, houses, and agricultural buildings. Further information on these sites is presented in Appendix B.

4.5.6.4 Potential Impacts on Archaeological, Architectural and Cultural Heritage

4.5.6.4.1 Construction - Direct Impacts

Archaeology

Where Option D (Blue) is located within the Zone of Notification associated with a Recorded Monument, this has been assessed as a direct impact. While the option would not directly impact the Recorded Monument itself, excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive within this zone.

Option D (Blue) is located within the Zones of Notification of 12 Recorded Monuments (AY_18, AY_23, AY_24, AY_25, AY_27, AY_29, AY_30, AY_34, AY_39, AY_40, AY_42 and AY_43). Within these zones the option is located in the carriageway of existing roads the construction of which is more than likely to have removed or truncated any archaeological remains associated with these monuments that may have been present. However, construction, including the excavation of the cable trench and joint bays would have a direct impact on any archaeological remains that may survive. Construction would also have a direct impact on any archaeological remains associated with these Recorded Monuments that may survive within any additional land take required for construction.

Excavation of the cable trench and joint bays, and the excavation of temporary launch and reception pits for directional drilling may also result in a direct impact any previously unknown archaeological remains that may be present within the land required for Option D (Blue). The potential for this impact is considered to be higher in previously undeveloped areas than within the existing carriageways, the construction of which is likely to have likely to have removed or truncated any archaeological remains that may have been present.

Architectural Heritage

No direct impacts have been identified on Protected Structures or structures on the NIAH.

Should Option D (Blue) require additional land take for construction, the removal of boundary features would have a direct impact on four GDLs (DL_07, DL_13, DL_16, and DL_17).

One GDL (DL_04) is also located within the Belgree offroad focus area for Option D (Blue) and construction may remove features associated with this demesne should the option pass through it.

Cultural Heritage

Five post-medieval road bridges (CH_08, CH_09, CH_10, CH_11, and CH_14) are located on the existing road network and therefore there is the potential for accidental damage and loss of historic fabric to these cultural heritage constraints as a result of construction.

Option D (Blue) crosses the location of 'Shane's Ford' (CH_31) in Stockhole and crosses the alignment of the M.G.W.R (Dublin and Navan Branch) railway (CH_48) to the west of the M3 motorway. Excavation of the cable trench and joint bays, and the excavation of temporary launch and reception pits for directional drilling in this location may remove of any surviving remains associated with these constraints.

In addition, while the route of the cable within the off-road focus areas is not yet known six cultural heritage constraints (CH_15, CH_16, CH_41, CH_42, CH_49 and CH_50) are located in the Batterstown and Belgree off-road focus areas for Option D (Blue). While upstanding buildings and structures within these areas will be avoided, there is the potential to directly impact these constraints during construction.

4.5.6.4.2 Construction - Indirect Impacts

Archaeology

Option D (Blue) is located within 20m of a church (AY_23, also a Protected Structure; AH_06) and its associated graveyard (AY_24) in Ward Lower and within 60m of a graveyard (AY_36) and ruinous church (AY_37) in Killeek. While construction activities may add noise and visual intrusion in the setting of these constraints, it is anticipated any intrusion would be temporary (lasting the duration of construction in this location).

No known archaeological constraints are located in the offroad focus areas for Option D (Blue); therefore, no additional indirect impacts are anticipated within these areas.

Architectural Heritage

Construction activities may add noise and visual intrusion into the setting of the following three Protected Structures:

- a Church of Ireland Church and Graveyard in Hollystown (AH_04) is located approximately 15m to the north-east of Option D (Blue);
- a thatched dwelling in Killeek (AH_07) is located approximately 5m to the east of Option D (Blue); and
- the site of 'Cloghran Church' and graveyard (AH_09) is located approximately 80m to the south of Option D (Blue).

However, it is anticipated any intrusion would be temporary (lasting the duration of construction in each location).

Option D (Blue) is also located 40m of a church (AH_06) and Killeek Church and graveyard (AH_08). These are also Recorded Monuments (AY_23, AY_36, and AY_37) and to avoid double counting impacts, no impact has been assessed on AH_06 and AH_08 as an impact has already been assessed on AY_23, AY_36, and AY_37 (see above).

Option D (Blue) is located within 12m of a gate lodge (AH_05), assessed by the NIAH to be of Regional importance. Construction may add noise and visual intrusion into the setting of this constraint; however, it is anticipated any intrusion would be temporary (lasting the duration of construction in these locations) and limited by intervening boundary features.

Cultural Heritage

Construction activities would have an indirect impact on the setting of nine cultural heritage sites (CH_01, CH_04, CH_12, CH_13, CH_19, CH_24, CH_25, CH_29, and CH_30). However, it is anticipated any intrusion would be temporary (lasting the duration of construction in each location).

Construction activities within the cable corridor also have the potential to affect the setting of one cultural heritage constraint within the off-road focus areas (CH_42). This impact is anticipated to be temporary (lasting the duration of construction in this location) and localised along the wayleave corridor.

4.5.6.4.3 Operational Impacts

Option D (Blue) would be located beneath the road surface, and any off-road sections would be reinstated after construction, therefore no impacts on archaeological, architectural or cultural heritage constraints have been assessed as a result of the operation of Option D (Blue).

4.5.6.5 Summary of Assessment

Considering the number of potential impacts for archaeology, architectural heritage and cultural heritage overall, and the length of off-road sections (c.4.2km), Option D (Blue) has been assigned a risk of 'Low-Moderate (Light Green)'.

Low to Moderate

4.5.7 Noise and Vibration

4.5.7.1 Noise and Vibration Sensitive receptors

Table 4.24 shows there are 561 receptors within 100m and 1336 receptors within 300m of this option. Most of the receptors are residential but there are other non-residential sensitive receptors within 300m of this option including:

- Dunboyne Nursing Home on R156 (Section I-J)
- New Park Care Centre Nursing Home (Section BB-LL)
- Oakwood Lodge Nursing Home (Section OO-PP)
- DIATA Aviation Training College (Section UU-VV)
- Trinity Care AnovoCare Nursing Home (Section VV-XX)

There are 70 receptors within 100m of off-road sections and 127 receptors within 300m of off-road sections. Most of the receptors are residential properties. Other sensitive receptors include Kilbride National School in the Belgree off-road section and Trinity Care Nursing Home located in the Belcamp off-road section for this option.

Table 4.24: Residential Property Counts within 300m of Option D (Blue)

Option	Number of receptors within 100m of route	Number of receptors within 300m of route	Number of receptors within 100m of off-road sections	Number of receptors within 300m of off-road sections	Number of receptors within 100m of motorway crossings	Number of receptors within 300m of motorway crossings
Option D (Blue)	561	1316	70	127	2	18

There are two receptors within 100m of motorway crossings and 18 receptors within 300m of motorway crossings. Most of the receptors potentially affected are residential though Trinity Care Nursing Home is within 300m of the M1 crossing and could potentially experience adverse noise and/or vibration impacts during construction. This option (along with Option C (Yellow)) crosses the M3 at a regional road therefore there is less potential for significant adverse noise effects compared to the options which cross the M3 Motorway.

4.5.7.2 Potential Noise and Vibration Impacts

This option has the potential to cause noise and vibration impacts during construction which will be temporary in nature. No permanent operational impacts are expected.

As was described for Option A (Red), there is greater potential for noise impacts on sensitive receptors where HDD is used to cross major obstacles, such as motorways. The majority of this option will be installed using 'Open cut' techniques, which are less impactful on sensitive receptors. There will be three crossings of motorways; this option has 60 sensitive receptors within 100m of a motorway crossing.

4.5.7.2.1 Summary of Assessment

This option impacts a relatively small number of receptors, most of which are dwellings but the option also passes within 100m of four nursing homes. Therefore, an overall risk score of Low to Moderate (light green) has been applied.

Low to Moderate

4.5.8 Air Quality

4.5.8.1 Sensitive receptors

The same approach as is set out in Section 4.2.8 was used to determine the potential impacts on sensitive receptors with respect to Air Quality.

Table 4.25 shows the total receptor counts within each distance band for Option D (Blue). No ecological designations were identified within 50m of the Option D (Blue)Option D centreline and therefore have been excluded from further assessment. Human receptors, including residential properties and one school (Little Moo Playschool, an assumed 30-pupil pre-school, within 20m of the centreline), were identified and have been factored into the receptors counts below.

Table 4.25 Sensitive Receptors within 300m of Option D (Blue)

Option	No. of sensitive receptors 0-20m	No. of sensitive receptors 0-50m	No. of sensitive receptors 0-100m	No. of sensitive receptors 0-350m
D	96	380	579	2101

4.5.8.2 Assessment Criteria

The same approach as is set out in Section 4.1.8 was used to determine the risk ratings for potential dust impacts. If applied on the counts of sensitive receptors 'end to end', this route would have a Moderate (Dark Green) moderate risk rating. However, at the local level, between nodes, six three sections scored a Moderate (Dark Green) moderate risk rating. An average risk rating along the length of the route option was determined to be 1.8.

4.5.8.3 Potential Impacts

The potential impacts are the same as those described in Section 4.2.8.3.

4.5.8.4 Summary of Assessment

Option D (Blue) has an average risk score of 1.8 along the length of the route option and has the second largest number of sensitive receptors within all of the distance bands. Although there are no ecological designations within 200m of Option D (Blue), there are several sensitive human receptors including dwellings and a school (Little Moo Playschool) within 20m. Therefore, an overall risk score of 'Low- to Moderate (Light Green)' has been applied.

Low to Moderate

This chapter outlines the assessment of route options considering feedback received from the public consultation and the deliverability assessment criteria and the following associated sub-topics:

- Traffic and Transport
- Amenity
- Health
- Employment and Economy (& Tourism)
- Land-use (and Land-take)
- Agriculture (including Equine)
- Utilities

Chapter 2 provides further information regarding these subtopics, including the approach to the assessment and methodology.

5. Socio-Economic

This chapter outlines the assessment of route options considering feedback received from the public consultation and the deliverability assessment criteria and the following associated sub-topics:

- Traffic and Transport
- Amenity
- Health
- Employment and Economy (& Tourism)
- Land-use (and Land-take)
- Agriculture (including Equine)
- Utilities

Chapter 2 provides further information regarding these subtopics, including the approach to the assessment and methodology.

5.1 Feedback

Feedback from the public consultation was received for the subtopics traffic and transport, amenity, health, agriculture (including equine), and utilities. This feedback, accompanied by a response from the project team, is summarised below.

Table 5.1: Traffic and Transport

Public Consultation Feedback	Project Team response
Stakeholders noted the presence of farm HGVs (Heavy Goods Vehicles) on the green (Option B) route.	During Step 4B of the project development process, traffic survey data will be acquired and a traffic study will assess delays and disruption due to traffic management during the construction phase.
Frustration was expressed at the amount of other infrastructure projects going on in the area. Traffic concerns were cited as well as safety concerns about dirt on roads associated with construction.	During Step 4B of the project development process, we will consider what measures may be necessary to be put in place by the contractor to control dust and debris. This may include the use of tarpaulins, wheel washing and cleaning of public roads. As noted, above traffic disruption will also be assessed further.
A particular area of focus regarding multiple projects and traffic disruption was Kilbride where all four-route options pass through. It was said that there has been a lot of construction in that area causing frustration for residents.	During Step 4B of the project development process, we will work with local communities and landowners to identify suitable site construction compounds and to identify appropriate haul routes. Where possible we will seek to avoid routes through towns, villages and other residential areas.
Stakeholders were keen to understand how the construction of the project might affect schools in the area. Concern was expressed about getting their children to and from school if there was road disruption. It was suggested that work causing disruption near schools would be best planned in the summer while schools are closed.	During Step 4B of the project development process, traffic survey data will be acquired and a traffic study will assess delays and disruption due to traffic management during the construction phase. As part of our ongoing socio-economic assessment work we will consider disruption to roads in the vicinity of sensitive receptors such as schools, nurseries and hospitals.

Table 5.2: Amenity

Public Consultation Feedback	Project Team response
Concerns were raised that the route is near GAA grounds and requests that EirGrid ensures 24/7 access to the grounds is maintained for both players and emergency services. Furthermore, it was requested that access to the walkway around the main pitch is maintained as it provides a site for community exercise.	The contractor will be required to maintain vehicular access to properties adjacent to the road, including St. Margarets GAA Club. It is also not envisaged that the walkway around the main pitch will be affected.
One respondent expresses concern about the potential impact of Option C on local communities.	Impacts on local communities was considered as part of the assessment of all route options. Regarding Option C (Yellow), potential impacts on local communities such as Batterstown, Hollystown, Swords and Kinsealy were considered.

Table 5.3: Health

Feedback	Project Team response
Stakeholders had queries about the impact of electric and magnetic fields (EMFs) and some commented that the open day events should have had information on EMFs and potential health impacts of the project.	The consensus from health and regulatory authorities is that extremely low frequency EMFs do not present a health risk. Further information is available on the EirGrid website: https://www.eirgridgroup.com/about/health-and-safety/ In addition, EirGrid's design standards require all underground cables to operate within existing public exposure guidelines from the International Commission on Non-Ionising Radiation Protection (ICNIRP) and as such there will be no effect from EMFs in terms of human health or interference to other electrical devices and systems.
Concern was expressed that Route Options C (Yellow) and D (Blue) could impact the health of a local resident with a condition that causes hypersensitivity to magnetic fields.	

Table 5.4: Agriculture

Feedback	Project Team response
Concerns raised that Route Option A (Red) would be the most disruptive to agriculture.	Route Option A (Red) may require off-road sections where in specific locations it is not technical feasible to follow an on-road route alignment. In these locations, EirGrid is working closely with directly affected landowners to develop an appropriate route design while seeking to minimise impacts to agriculture.
Concerns that Option C would impact their equine business due to road closures which could limit access to the business and the potential noise disruption which would adversely impact their livestock.	Farming (including equine) business surveys will be carried out by our specialists to understand farming operations including access from public roads and how the land is used. This information will be used to inform the development of the route design in off-road sections and to understand the potential impacts and mitigation that may be required during the construction phase.
Concerns that there may be a requirement for EirGrid to access their land during construction and that the noise of the project could represent a safety issue for their clients and their livestock.	

Table 5.5: Utilities

Feedback	Project Team response
Stakeholders expressed concerns about any potential impacts of the project on the overall price of electricity and whether it could lead to blackouts.	The project will help meet the growing demand for electricity in the east of the country due to the increased economic activity in recent years, reducing the likelihood of blackouts. It will also facilitate increasing amounts of renewable electricity that is generated by windfarms in the West and South and transported for use in the east of the country.
Stakeholders asked whether there had been consideration of joined up thinking around the presence of other ongoing local utilities and renewable construction projects.	EirGrid is engaging on a regular basis with ESB Networks and other developers to identify potential opportunities to work more closely together and reduce disruption to the public from construction activities.
Stakeholders commented that there were too many culverts. Some noted the presence of fibre broadband on the R122/R108 after Keelings.	The project team has acquired utility records from multiple sources including National Broadband Ireland and Uisce Éireann. This information has been considered and used to inform the development and assessment of route options.
Concerns that Route Options A (Red), C (Yellow) and D (Blue) uses Ward Road which has water pipes near the road. It was also commented that the presence of sewage pipes on the R135 between Coolquay and Finglas.	
Concerns about disruption to other utilities that might mean schools would have to close last minute.	Disruption to essential utilities such as power and water supply during the construction phase will be kept to a minimum however where necessary any outages will be communicated in advance. Any disruption to schools will be avoided wherever possible.

5.2 Option A (Red)

5.2.1 Traffic and Transport

5.2.1.1 Overview of the Route Option

From a traffic perspective all the potential route options identified for the Proposed Development aim to maximise the use of national, regional, and local roads by avoiding, where possible, the motorways, going off-road, through private land and through agricultural land and have been assessed based on number of themes as below.

Option A (Red) is the shortest of the route options at 36.4km. It also has the greatest proportion of off-road sections, and as such a lower percentage of the route option affects the regional and local road networks. This option leaves Woodland and heads directly south to the R156 and continues on this road towards Dunboyne, where it turns north to cross the M3 motorway. The motorway itself is avoided as any crossing here will most likely be via Horizontal Directional Drilling (HDD) or via a tunnel. This route is proposed to cross to the north of the motorway junction and join the R147 up to the MSD Pharmaceuticals/Avoca junction. From here it travels east on local roads to Kilbride village. Heading south for a period on Kilbride Road, this option goes off road to reach the R121, avoiding the residential areas further to the south and a busy roundabout on the R121. A short distance into the R121, the route crosses the M2. Again, this will be via HDD or tunnel, although it is not determined at this stage exactly where such a crossing would be, until discussions with landowners has progressed further. After the crossing, the route option stays largely on regional roads after this, following the R121, the R122 and on to the R108 to the northwest of Dublin Airport. Heading east on the R108, the route crosses the M1, via HDD or tunnel; the exact location of the crossing to be determined also. From here, however, this option remains off-road and heads directly south towards Belcamp substation. The exact route off-road has still to be determined.

Table 5.6: Option A (Red) Road Classification

Option	Total Length (km)	Road Length Percentage Distribution			Residential Properties 0-50m
		Regional	Local Roads and Smaller	Off-road and other Land Types	
Option A (Red)	36.4	46%	31%	23%	201

5.2.1.2 Potential Impacts

The high level of regional roads used, and off-road sections of this route minimises the potential for full road closures. However, it is anticipated that full or partial lane closures would be required on these roads. The local roads between Avoca and Kilbride are narrow and full road closures with diversions may be required. This would be the case for all options, given that alternatives to using these local roads have been discounted at earlier stages of the design process as a result of significant constraints, such as the presence of a significant numbers of services, or high levels of potential traffic congestion.

Some of these road closures have been identified and discussed in Section 7.2.2 under Deliverability. It is acknowledged that these closures and diversions will likely have an impact on vehicles in terms of additional delay and journey time reliability during periods of the day. However to minimise this impact, these temporary closures and diversions will be tested and assessed in robust traffic management plans prior to implementation. Where road closures are not required, some localised traffic management measures will also be introduced in a traffic management plan.

A review of the Option A (Red) also highlights that the construction works will likely impact a number of key junctions and roundabouts. These sections are also identified in Section 7.2.2. Similar to the route sections there might be a requirement to temporarily divert traffic or restrict certain vehicle movements at these locations. Traffic management measures would be assessed on a case-by-case basis for each signalised junction and standard roundabout.

Option A (Red) has a relatively low number of properties within 0 to 50 meters from the roadway centreline (201 properties), however it is anticipated that there will still be local traffic disruption to access during construction. It passes the access to Scoil Bhride Primary School in Priest Town, Kilbride and Dunboyn Nursing Home in Waynestown, Dunboyne.

5.2.1.3 Summary of Assessment

Option A (Red) is the shortest of the options although it does affect a significant amount of regional roads (46% of route). This option also has a significant proportion of the route off-road (23% of route) with greater impact on agricultural land and has relatively low number of residential properties within 0-50m (201). Despite the potential impact on regional roads, and therefore potentially more traffic, this route is likely to have the second least amount of road closures due to a greater number of wider roads with hard shoulders. Impacts to local roads will be comparatively easier to divert than regional roads with several options. This option also has a low number of key junctions along the route. It passes the access to Scoil Bhride Primary School in Priest Town, Kilbride and Dunboyn Nursing Home in Waynestown, Dunboyne.

This is considered to be a Moderate-High rating.

Moderate-High

5.2.2 Amenity

This section outlines the likely impact on the amenity of residential, commercial, and community (and recreational) receptors, collectively, by way of consideration of contributing environmental effects.

Table 5.7: Known Commercial and Community Receptors Adjacent to the Alignment of Option A (Red)

Commercial receptors:	Community receptors:
Barstown Commercial Park	Dunboyne Nursing Home
Karlswood High Performance Equestrian Centre	Dunboyne AFC
Thornton Recycling	M3 Parkway Train Station
Avoca Dunboyne	Scoil Bhride (Kilbride)
Kilsaran Head Office	The Ward Graveyard (R121)
Gordon Barron Crash Repairs	New Park Care Centre
Ballintry Stud Farm	Little Moo Moos Playschool (Creche)
Derryglen Stud Farm	St Margaret's GAA Club
Top Oil Kilbride Service Station	Cloghran Cemetery
Belgree Enterprise Park	Trinity Care AnovoCare Nursing Home
Pallas (Dublin Office)	Baskin Lane Playing Pitches
New Park Motor Services	Craobh Ciaran GAA Pitches
St Margaret's Golf and Country Club	
Dublin Airport	
Keelings Farm Shop	
Forrest Little Golf Club	
The Coachman's Inn	
National Show Centre	

Outlined above are details of potential impacts considered likely during the construction of Option A (Red) according to each environmental effect, with a concluding paragraph summing up the overall impact on amenity. Given that the Proposed Development would be underground, there are no operational impacts anticipated on amenity.

Table 5.8 outlines the assessment ratings and associated justifications for each of the contributing environmental effects that, when in-combination, may result in an impact on amenity.

Table 5.8: Ratings and Associated Justifications for Environmental Effects Contributing to Potential Impact on Amenity

Air Quality	Noise (and vibration)	Visual	Traffic and Transport
Low to moderate	Low to moderate	Low	Moderate to High

5.2.2.1 Summary of Assessment

The Amenity assessment combines the assessment findings of other topics as shown above. In relation to the assigned scoring for potential impacts relating to Air Quality, Noise (and vibration), Visual and Traffic and Transport, it is considered likely that, in a worse-case scenario, there is the potential for considerable but not significant impacts on amenity. Therefore, a rating of 'Moderate (Dark Green)' has been assigned.

Moderate

5.2.3 Health

5.2.3.1 Overview

The SAOI is largely considered to be 'marginally above average' in terms of the deprivation indices provided for 'my Pobal' (Pobal, 2016), although there are a number of Electoral Divisions (EDs) within the Study Area which are considered to be 'affluent', such as Airport and Balgriffin. It should also be noted that there are a number of EDs in the Study Area that are considered to be 'marginally below average', namely Kilsallaghan, and Priorswood A, while the EDs of Priorswood B and Priorswood C are considered to be ‘very disadvantaged’ and ‘disadvantaged’ respectively. According to the Institution of Public Health (in Ireland), people in higher socio-economic groups are a lower risk of chronic conditions and associated disability than those in lower socio-economic groups (Institute of Public Health, 2020).

5.2.3.2 Potential Impacts

5.2.3.2.1 Amenity

Using the outcomes of the amenity assessment, it is considered unlikely that the construction of Option A (red) would result in significant impacts on human health. This is primarily because processes and activities required during construction of the Proposed Development are temporary in nature, while the nature and scale of the Proposed Development means that construction activity would occur at any one location for a limited time; thereby not significantly impacting human health. The potential for stress caused by disruption to local roads is acknowledged however and so a low to moderate risk is identified for health.

5.2.3.2.2 Electromagnetic Fields (EMFs)

Electric and Magnetic Fields together with optical radiation, which includes infrared (IR), visible light (and laser), and ultraviolet radiation, collectively make up the non-ionising radiation (NIR) spectrum. This type of radiation does not have enough energy to break up (ionise) atoms or molecules. It is therefore different to ionising radiation such as X-rays or radioactive substances, that can break up molecules and is known to cause damage to human cells.

EMFs are generated when electricity is produced and distributed, by a number of man-made sources including everyday items such as mobile phones and electrical appliances. There are also natural sources of EMFs, such as the earth’s magnetic field and the sun.

EirGrid has published a series of evidence-based studies relating to the potential environmental effects of the transmission network; one of these is for EMF (EirGrid, 2014).

This study took the form of a literature review of the extremely low frequency (ELF) EMF health evidence base, and consideration of measurements taken of EMF from high-voltage electricity transmission infrastructure in Ireland during 2012-2013, with the combined objective of informing future grid infrastructure planning and more effectively addressing commonly raised community health concerns.

The review explored a range of possible health effects from ELF EMF on human health; core documents on the topic published by international organisations including the World Health Organisation (WHO) show that the evidence for an association between ELF EMF exposure and carcinogenic effects, particularly leukaemia, is limited; however, the research does not rule in or out the possibility of a causal link.

As a precautionary approach, public exposure guidelines have been set by an independent body, the International Commission on Non-Ionizing Radiation Protection (ICNIRP). It is considered appropriate by health protection bodies to remain within guidelines set to manage known health risks and where possible to further reduce unnecessary exposure.

For EirGrid’s study, measurements of EMF undertaken during 2012-13 were taken from single and double circuit OHLs at 110kV, 220kV and 400kV, transformer substations at these voltages, and UGCs at 110 kV and 220 kV. The measurement results were compared to the ICNIRP guidelines ‘reference levels’ of 5kV/m for electric fields and 200 microteslas (μT) for magnetic fields and discussed along with the underpinning health evidence base in the literature review section. The results of the study were as follows:

- UGCs produce no electric field above ground;
- The maximum electric field strength measured at all Overhead Lines (OHL) and substation perimeters surveyed was just below the ICNIRP reference level, however, points to note:
    - The ICNIRP reference level - this reference level is set on a highly conservative basis that ensures that the ICNIRP basic restriction for electric field exposure cannot be exceeded by external field strengths below the reference level; and

- For a 400kV single circuit OHL is close to the ICNRP's reference level directly under the OHL however there is a dramatically decreasing level of electric field with increasing distances from OHLs.
- The maximum magnetic field strength recorded among the overhead power lines was well below the 2010 ICNIRP guideline reference level for general public exposure; and
- As with electric fields, the magnetic field strength recorded for all types of overhead power lines and underground power cables under all load conditions falls rapidly with distance from their centrelines.

5.2.3.2.3 Summary of Assessment

Given the expected potential impacts a scoring of '**Low-Moderate (Light Green)**' has been assigned for the consideration of potential impacts on human health.

Low to moderate

5.2.4 Employment and Economy (and Tourism)

5.2.4.1 Employment

5.2.4.1.1 Overview

During construction and operation, impacts on employment as well as the national, regional, and local economy are anticipated to be similar among each of the proposed route options given that they are all similar in nature, extent and scale, and located in close proximity to one another within the same Study Area.

There is currently no information on the expected size or composition of the construction workforce required to construct any of the proposed route options, however given the similarities in extent and scale, it is considered that the size and composition of any construction workforce would be broadly the same to construct any of the proposed route options. Such a construction workforce is expected to be at relatively low numbers given the likely scale of works and envisaged construction methodology (i.e. a 'section-by-section' piecemeal construction method is expected to be employed). Furthermore, any employment opportunities are expected to be limited given there is considered to be low unemployment within the Study Area at present (the unemployment rate across all key settlement areas within the Study Area is estimated to be 4.5%) (CSO, 2021[34]). It is also likely that skilled workers with particular experience in laying underground cables will be required rather than currently unemployed, unskilled, workers, thereby further reducing the possibility for new employment.

Due to the above factors and assumptions, potential impacts on employment during the construction of any of the proposed route options are expected to be positive, albeit limited and not significant. There is expected to be no impact on the labour market during the operation of the Proposed Development given its nature (i.e. underground cables between two unmanned electricity sub-stations).

5.2.4.1.2 Potential Impacts

In respect to potential impacts on the national, regional, and local economy during the construction of any of the proposed route options, these are expected to be positive, limited and not significant. This is due to the expectation that there would be limited economic activity associated with the construction workforce given its small size but also the skilled nature of such employment which is likely to be sourced from outside of the Study Area. Furthermore, given the specialist nature of the equipment being installed, it is likely that most of the capital expenditure would be outside of the Study Area, thereby also limiting supply-chain opportunities.

The operation of the Proposed Development (by way of any of the proposed route options) is expected to have a positive, potentially significant impact on the local, regional and national economies, primarily given

[34] https://cso.maps.arcgis.com/apps/webappviewer/index.html?id=4d19cf7b1251408c99ccde18859ff739

its purpose to ensure the security of the electricity supply for consumers which will contribute to the regional economy and support foreign direct investment. The Proposed Development is also expected to provide benefits for local communities, promote sustainability, and stimulate competition in the electricity supply market, as outlined in Section **Error! Reference source not found.**. These benefits will be achieved regardless of which route option is selected and therefore there is no differentiation as a result.

No tourism receptors were encountered along the route of any of the proposed route options, therefore there is not expected to be any impact on tourism receptors or the tourism sector during the construction of any of the proposed route options.

5.2.4.2 Summary of Assessment:

Given the expected potential impacts, it is appropriate to assign a score of '**Low (Cream)**' for the consideration of potential impacts on 'Employment and Economy' (applicable to all route options as there is no differentiation).

Low

5.2.4.3 Land-use (and Land Take)

5.2.4.3.1 Overview

Option A (Red) is 36.4km in length, with the majority of the alignment routed along regional and local roads between Woodland substation and Belcamp substation. Some sections of the route alignment are not routed along roadways and are instead aligned across open agricultural land. Approximately 23% of Option A (Red) is routed through open greenfield land, largely classed as 'pastures or non-irrigated land' according to 2018 Corine Land Class data. The impacts on agricultural land (including land-take) are considered in Section 4.2.6.

5.2.4.3.2 Potential Impacts

It can be expected that there will be temporary land-take requirements to facilitate the construction of the Proposed Development along the route of Option A (Red). However, it is envisaged that construction activities would proceed on a section-by-section basis, thereby limiting the extent of such land-take requirements to a relatively small area at any one time. Furthermore, given the nature and scale of the Proposed Development, land-take requirements are expected to be minor and, as mentioned above, largely confined to regional and local roads. As such, there is anticipated to be no requirement for land-take from any residential, commercial or community receptors.

5.2.4.3.3 Summary of Assessment

Given the nature of the Proposed Development, there are no impacts on land-use and land take for residential, commercial or community receptors envisaged during the operational phase. Therefore, it is considered appropriate to assign a score of **'Low (Cream)'** for issues relating to land-use (and land-take), for non-agricultural land / receptors.

Low

5.2.5 Agriculture (including Equine)

This section addresses potential effects on agricultural land use. Where the construction of the Proposed Development crosses agricultural land there will be direct impacts on agricultural land-use and the operation of individual farms. The permanent land-take will be restricted to locations where inspection booths and other small structures associated with HVAC cable construction may be located. The use of temporary construction compounds located on agricultural land adjoining the works may be required. In general, the permanent land-take requirement will be very low and for the majority of the route crossing agricultural land the impacts will be restricted to soil disturbance and potential compaction due to excavation. This has the potential to affect the quality of the land along the working area and affect land drainage. For the majority of the route the land over the cable will be re-instated after construction is complete and returned to the farmer.

The potential effects of EMF are addressed in Section 2.4.2 of this report. The author refers to a large number of scientific references to back up the conclusion that effects on agriculture from EMF associated with the proposed HVAC cable are not significant. Disturbance caused by maintenance and inspection of the proposed HVAC cable is not significant.

During the construction period there will be temporary disturbances to the operation of farms. The works area will be temporarily fenced off and this could result in temporary severances of access to fields or farmyards and to water and power supplies (e.g. power supplies to electric fencing and water supplies to water troughs). The excavation works and construction traffic movements have the potential to create noises and movements which may disturb sensitive livestock such as thoroughbred horses. Other potential impacts include the introduction of invasive species and impacts on permanent low input pastures due to disturbance of topsoil. The construction duration will generally be for a period of a few weeks or a few months on most farms. There may be extended periods where alternative construction techniques are required (e.g. directional boring beneath rivers) or where project infrastructure is required. Construction of public utilities such as gas pipelines and water mains on agricultural land is commonplace in Ireland and with best practice (discussed below) the temporary construction impacts do not cause significant effects on agriculture. The risk of significant impacts rises with increasing farm enterprise sensitivity and therefore this assessment compares the numbers of high sensitivity enterprises, such as equine and dairy, along each option.

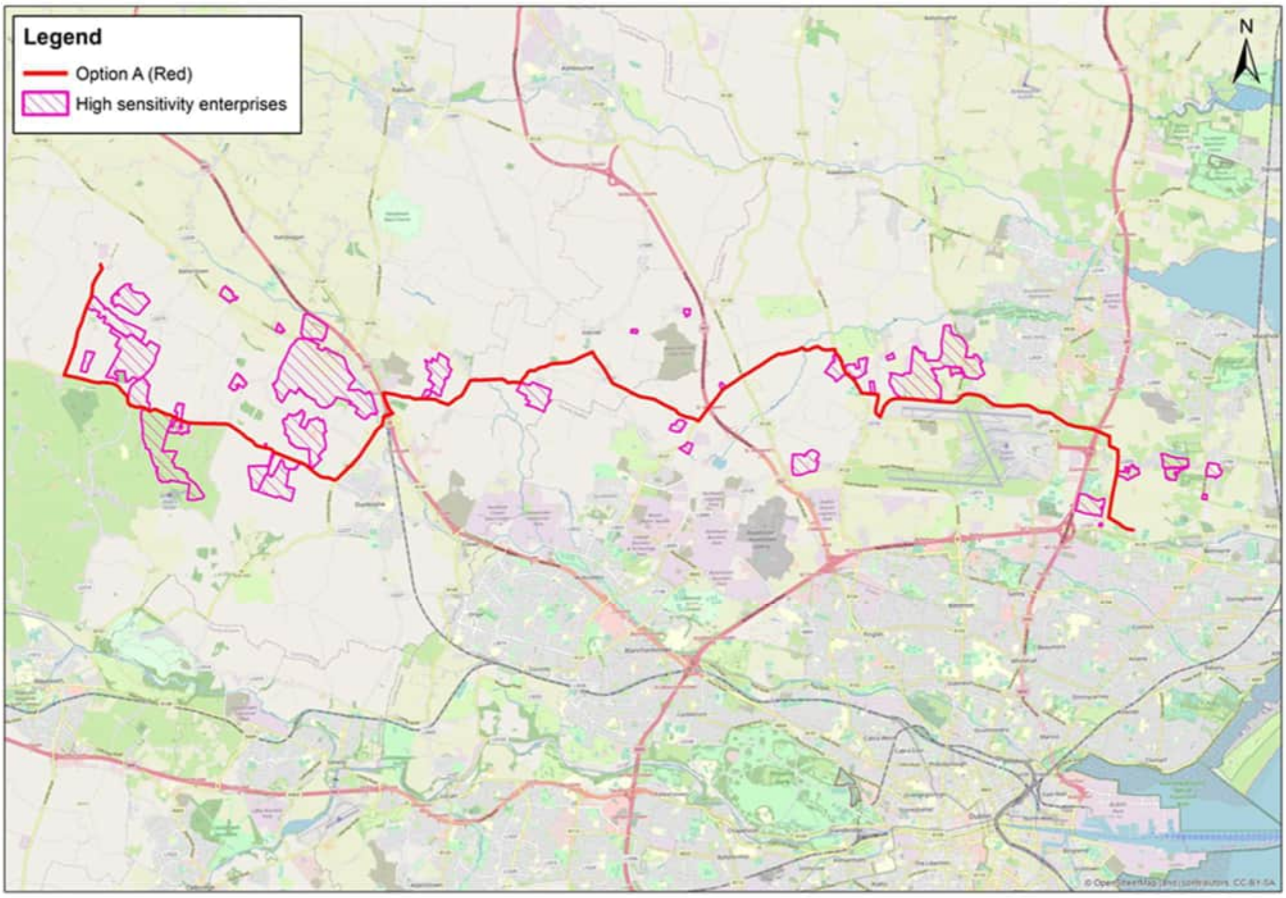


Figure 5-1 High Sensitivity Enterprises affected by Option A: Red

5.2.5.1 Potential Effects on Agriculture from Construction on Public Roads

Where the construction of the Proposed Development is confined to public roads the impacts on agricultural land-use and the operation of individual farms will be minimal. Farmers (and livestock) use the local road network to access fields and farmyards and for the transportation of livestock and goods. Therefore, there will be temporary disturbances to farms located along the route while construction is in progress. This period is likely to be a few weeks or months at any one location. The in-road construction will cross entrances to fields and farmyards, potentially causing temporary disturbance to access. Excavation works and construction traffic movements have the potential to create noises and movements which may disturb sensitive livestock (such as Thoroughbred horses) on lands adjoining the public road. Construction of public utilities in public roads is commonplace in Ireland and with best practice (discussed below) the temporary impacts do not cause significant effects on agriculture.

5.2.5.2 Best Practices Which Minimise Impacts on Agriculture

This assessment assumes the implementation of the principle of best practice during the construction and operation of the Proposed Development. Best practices in relation to safety and EMF involve laying the proposed HVAC cable in a concrete type of material beneath the field surface. Adherence to this methodology ensures safety of farm machinery operators and livestock. To ensure EMF levels from electricity cables remain within the safe limits for human health, EirGrid's design standards require all UGCs to operate within existing public exposure guidelines from the International Commission on Non-Ionising Radiation Protection (ICNIRP), therefore EMFs from UGCs are unlikely to be a cause of public concern for local communities. Such potential impacts are the same for all proposed route options.

The contractor will engage with all landowners along the route of construction and discuss their requirements for access. The contractor will maintain reasonable access at all times. Reasonable access will respond to the individual needs of farmers and stud farms on a case by case basis. For example it would be essential to allow access for milk lorries into dairy farms whereas, with agreement, it may not be necessary to maintain continuous access to some roadside field gates when alternative access is available through the farmer's land. It may also be reasonable to restrict access to land for a period of time which is agreed in advance with the farmer. The contractor will notify the adjoining landowners in advance when construction noises may occur so that landowners have time to manage sensitive livestock such as thoroughbred horses. The contractor will maintain services such as water and power to ensure livestock have continuous access to water or provide an alternative source where necessary. It is best practice that the contractor provides a key contact person whom landowners can contact on an on-going basis during construction. Agricultural land, land drainage, local roads and affected accesses will be re-instated to pre-works condition. Services will be diverted where necessary should they be impacted by the construction works and access to severed sections of land will arranged as necessary with landowners during the construction works.

5.2.5.3 Summary of Assessment

Option A (Red) is 36.4km in length and crosses through predominantly agricultural areas for approximately 95% of its entire length. There are good quality mineral soils along its entire length, Approximately 8.6km of the option will be offline through agricultural land. There are 13 high sensitivity enterprises along the length of the route corridor.

The ranking score for Option A (Red) is considered to be 'Low - Moderate' (Light Green) given the moderate length across agricultural land and absence of direct impacts on high sensitivity enterprises.

Low to Moderate

5.2.6 Utilities

5.2.6.1 Overview

There are numerous underground utilities in the regional road network between Woodland and Belcamp, including other electricity cables; telephone and broadband cables; sewers; and public and private water supplies. The public water supply is extensive in the area, with the network predominately using the road network for local residential supply while other larger mains being located off-road in agricultural land. There is no known group water supply with protected areas within the Study Area.

The assessment of Option A: Red, based on mapping provided by the utility owners, has found that it crosses existing high pressure gas pipeline (2 times), existing medium pressure gas pipelines (3 times), existing water supply network (48 times) and existing wastewater network (5 times). The count of crossing locations includes points within the same roads. For example, Option A (Red) meets the existing water supply network in multiple locations along its length, namely along the R108 / Naul Road on the northern boundary of Dublin Airport where the existing water supply network is crossed five times.

5.2.6.2 Potential Impacts

It is expected that all utilities encountered during construction will either remain in-situ or, where absolutely necessary, appropriate diversions or modifications carried out (with the permission of the respective provider) so as to ensure disruption to surrounding communities is kept to an absolute minimum and that any required service disruption will only be permitted for an agreed set period of time per day (generally a set number of hours) and will not be permitted to be continuous for full days at a time. Any required disruptions would be carefully planned so as to ensure that the duration of disruption is minimised in so far as is possible.

All route options predominantly run parallel to local, small diameter utilities and on occasion larger diameter utilities.

The primary differentiator is the crossings of large diameter and strategic infrastructure. In this regard, Option A is the least constrained.

Most notable constraints are the crossing of a 915mm water main, and running parallel to the proposed Ballystruan to Forest Little HV cable for lengths of the route for the entirety of the length in Naul Road/R122. The length is however shorter than for Option B (Green). Further consideration of utilities is given in the Deliverability section of this report.

5.2.6.3 Summary of Assessment

Given the number and type of utility interfaces along the length of Option A (Red), along with the potential for disruption to people and neighbouring communities, it is appropriate to assign a risk score of '**Low-Moderate (Light Green)**'.

Low-Moderate

5.3 Option B (Green)

5.3.1 Traffic and Transport

5.3.1.1 Overview of the Route Option

Option B (Green) takes a different route from Woodland substation; after leaving the substation to the southwest, it travels in south easterly direction, off-road. It crosses the Red Road to the south of the substation and heads across agricultural land to the L2215. Here it turns south to join the R156 and continues along the same route as Option A (Red) until the crossing of the M3. At the crossing of the M3, it is proposed that this route would take a southern approach via the Dunboyne Park and Ride car park to join the R147 south of the motorway junction. From here, the route would travel south for a short period before turning east at Bracetown Industrial Park. It would follow local roads and then join the same route as Option A (Red) towards Kilbride. At Kilbride Option B (Green) takes a different route to Option A (Red), travelling north towards Muckerstown for a short distance and then taking an unnamed local road travelling east towards Coolquoy. Immediately before Coolquoy, the route would cross the M2. Again it is not clear exactly where the crossing would be, however it is likely to be HDD or tunnelled. From Coolquoy, the route would head south on the R135, through the Ward Cross to Broughan. Here the route would travel east along Broughan Lane and past Newtown Cottages to join the R122, south of St Margaret's. From here the route would travel north along the R122 and joins the same route as Option A (Red) along the R108, Naul Road. This option would follow Naul Road up to the Stockhole Lane roundabout and then come off road, avoiding Stockhole Lane. Here it is proposed the route would travel off-road to the south of Stockhole Lane and then cross the M1. The exact location of the crossing to be confirmed. After crossing the M1, the route would remain off-road, close to the eastern edge of the motorway for a short stretch before heading east to join the route of Option A (Red) and travel south to Belcamp substation.

Table 5.9 presents the break-down of road classifications for Option B (Green).

Table 5.9: Option B (Green) Road Classification

Option	Total Length (km)	Road Length Percentage Distribution			Number of properties 0-50m
		Regional	Local Roads and Smaller	Off-road and other Land Types	
Option B	37.9	37%	46%	17%	249

5.3.1.2 Potential Impacts

Similar impacts on the road network as described for Option A (Red) can be expected. However, Option B (Green) has a significant proportion of narrow local roads that would require a greater number of full road closures. The unnamed road to Coolquoy, for example, would need to be closed in full in some sections, resulting in potentially lengthy diversions for those wishing to cross the M2 from the Kilbride area. Broughan Lane is also narrow, however it also has reasonably wide verges in places so a full road closure may be able to be avoided.

5.3.1.3 Summary of Assessment

Option B (Green) is within regional roads for approximately 37% of its length. It also has a significant length of the route following off-road sections (17%) and requires a moderate number of full closures with feasible local diversions. A relatively low number of key junctions would be impacted along the route. It also has a relatively low number of properties within 0-50m (249). This is considered to be a Moderate-High rating.

Moderate to High

5.3.2 Amenity

5.3.2.1 Overview

This section outlines the likely impact on amenity of residential, commercial, community (and recreational) and tourism receptors, collectively, by way of consideration of contributing environmental effects. Issues of access and severance are outlined in Section 5.3.1. All residential, commercial and community (and recreational) receptors are shown in Appendix C.

The alignment of Option B (Green) passes through both rural and urban areas along its length. **Error! Reference source not found.**Table 5.10 lists the known commercial and community receptors that are situated immediately adjacent to the route alignment (this list is not exhaustive but represents a high-level analysis for the purposes of informing the Step 4A selection process). No tourism receptors (i.e. receptors whose main function is aimed at visitors to its locality) were encountered along the alignment of Option B (Green), while one-off or ribboned residential receptors are located along all sections of the route (aside from off-line sections). Option B (Green) is also routed in close proximity or within a number of built-up areas, such as Kilbride, the western fringes of Dunboyne, southern edge of Swords, Collinstown (i.e. Dublin Airport), and the northern extent of Darndale.

Table 5.10: Known Commercial and Community Receptors Adjacent to the Alignment of Option B (Green)

Commercial receptors:	Community receptors:
Karlswood High Performance Equestrian Centre Thornton Recycling Tom Hand Cars / Circle K Bracetown Drummonds Farm Shop	Dunboyne Nursing Home Dunboyne AFC M3 Parkway Train Station Scoil Bhride (Kilbride)

Commercial receptors:	Community receptors:
Rennicks Signs Ireland	Kilbride GFC Meath
Bracetown Business Park	St Brigids Church, Kilbride
Doyle Truck & Trailer Components / Quinn Tanker Services	St Margaret's National School
Top Oil Kilbride Service Station	St Margaret's Church
Sweeneys of Kilbride	St Margaret's Graveyard
Rabbitte Catering Services Ltd.	Dublin Airport
Coolquoy Lodge	Cloghran Cemetery
Brady's Top Oil / Spar Coolquoy	Trinity Care AnovoCare Nursing Home
The White House Hotel / Footgolf Dublin	AUL Complex (Sports Facilities)
Ward Golf Centre	Craobh Ciaran GAA Pitches
Airport Driving School	
The Brock Inn Bar and Restaurant / Brock Inn Pitch and Putt	
Broughan Motors	
K&K Produce & Packs	
St. Margaret's Recycling	
Keelings Farm Shop	
Forrest Little Golf Club	
The Coachman's Inn	
National Show Centre	

5.3.2.2 Potential Impacts

Outlined below are details of potential impacts considered likely during the construction of Option B (Green) according to each environmental effect, with a concluding paragraph summing up the overall impact on amenity. Given that the Proposed Development would be underground, there ae no operational impacts anticipated on amenity.

Table 5.11 outlines the assessment ratings and associated justifications for each of the contributing environmental effects that, when in-combination, may result in an impact on amenity.

Table 5.11: Ratings and Associated Justifications for Environmental Effects Contributing to Potential Impact on Amenity

Air Quality	Noise (and vibration)	Visual	Traffic and Transport
Option B (Green) has an average risk score of 1.6 along the length of the route option, and has the second fewest number of sensitive receptors within all of the distance bands. Although there are no ecological designations within 200m of Option B (Green), there are several sensitive human receptors including dwellings and a school (St Margaret's National School) within 50m. Therefore, an overall risk score of Low to Moderate (light green) has been applied.	This option impacts a relatively small number of receptors, most of which are dwellings, but the option also passes within 100m of a church, two nursing homes and a school. Therefore, an overall risk score of Low to Moderate (light green) has been applied.	Route Option involves hedgerow removal along an off-road section through an area zoned Green Belt near Belcamp. However, potential for physical impacts will be limited in scale and localised. Significant impacts on landscape character or on visual receptors is unlikely; therefore, this Route Option is considered to be Low.	Option B (Green) is within regional roads for approximately 37% of its length, second least amount of all options. It also has the second most length of its route off-road (17%) and it requires slightly less full closures than Route A with a few options for traffic diversion. The same number of key junctions would be impacted along the route compared to Option A (Red), less than the other two. It has second least number of properties within 0-50m (249).

5.3.2.3 Summary of Assessment

In relation to the assigned scoring for potential effects relating to Air Quality, Noise (and vibration), Visual and Traffic and Transport, it is considered likely that, in a worse-case scenario, there is the potential for considerable but not significant impacts on amenity. Therefore, a risk scoring of 'Moderate (Dark Green)' has been assigned.

Moderate

5.3.3 Health

5.3.3.1 Overview

The same baseline conditions as described for Option A (Red) apply to this option and are not repeated.

5.3.3.2 Potential Impacts

5.3.3.2.1 Amenity

Option B (Green) passes through the same EDs within the Study Area as Option A (Red). Using the outcome of the amenity assessment, it is considered unlikely that the construction of Option B (Green) would result in significant impacts on human health. This is primarily because processes and activities required during the construction of the Proposed Development are temporary in nature, while the nature and scale of the Proposed Development means that construction activity would occur at any one location for a limited time; thereby not significantly impacting human health.

5.3.3.2.2 EMF

The same potential impacts in relation to EMFs as are described for Option A (Red) apply to this option and are not repeated here.

5.3.3.3 Summary of Assessment

Given the similarities in the nature and extent of potential impacts on human health between Option B (Green) and Option A (Red), Option B (Green) is also assigned a risk scoring of 'Low-Moderate (Light Green)'.

Low to Moderate

5.3.4 Employment and Economy (and Tourism)

5.3.4.1 Employment

5.3.4.2 Overview

The baseline conditions for employment are the same as those for Option A (Red) and are not repeated here.

5.3.4.3 Potential Impacts

There is currently no information on the expected size or composition of the construction workforce required to construct Option B (Green), however it is considered that the size and composition of any construction workforce would be relatively low numbers given the likely scale of works and envisaged construction methodology (i.e. a 'section-by-section' piecemeal construction method is expected to be employed). Furthermore, given the specialist nature of construction (to construct / lay underground electricity cables), skilled workers are likely to be required, further reducing general employment opportunities.

Given the nature of the project during its operation, there is expected to be no opportunity for gainful employment and as such no impacts are anticipated.

In regard to Economy, the construction of Option B (Green) is expected to be positive, albeit limited, and not significant given the scale of construction, while during the operational phase, positive, potentially significant impacts, are anticipated on the local, regional and national economies, primarily because of its purpose to ensure the security of the electricity supply for consumers which will contribute to the regional economy support foreign direct investment.

5.3.4.4 Summary of Assessment

The potential impacts on the employment and the national, regional and local economy are the same as that outlined in Section 7.5, and therefore a risk scoring of 'Low (Cream)' has been assigned to Option B (Green).

Low

5.3.4.5 Land-use (and Land Take)

5.3.4.6 Overview

Option B (Green) is 37.9m in length, with the majority of the alignment routed along regional and local roads between Woodland substation and Belcamp substation. Some sections of the route alignment are not routed along roadways and are instead aligned across open agricultural land. Approximately 17% of Option B (Green) is routed through open greenfield land, largely classed as 'pastures or non-irrigated land' according to 2018 Corine Land Class data. The impacts on agricultural land (including land-take) are considered in Section 5.2.6.

5.3.4.6.1 Potential Impacts

It can be expected that there will be temporary land-take requirements to facilitate the construction of the Proposed Development along the route of Option B (Green). However, it is envisaged that construction activities would proceed on a section-by-section basis, thereby limiting the extent of such land-take requirements to a relatively small area at any one time. Furthermore, given the nature and scale of the Proposed Development, land-take requirements are expected to be minor and, as mentioned above, largely confined to regional and local roads. As such, there is anticipated to be no requirement for land-take from any residential, commercial or community receptors.

5.3.4.7 Summary of Assessment

Given the nature of the Proposed Development, there are no impacts on land-use and land take for residential, commercial or community receptors envisaged during the operational phase. Therefore, it is considered appropriate to assign a score of **'Low to Moderate'** for issues relating to land-use (and land-take), for non-agricultural land / receptors.

Low to Moderate

5.3.5 Agriculture (including Equine)

5.3.5.1 Overview

The Option B (Green) is 37.9km in length. It adjoins agricultural land for approximately 37kms and it crosses agricultural land for approximately 6kms (17% of the entire length) – it crosses two dairy farms for approximately 1.3kms. There are good quality mineral soils along its entire length, approximately 64% is a Surface Water Gley, 31% is a Luvisol and 5% is a low lying wet alluvial soil. From Woodland Substation to Belcamp Substation there are twelve high sensitivity enterprises located along Option B (Green) – eight equine enterprises, two dairy enterprises and two horticultural enterprises.

5.3.5.2 Potential Impacts

The same type of impacts and management measures as have been described for Option A (Red) apply to this option and are not repeated here. There are different high sensitivity enterprises potentially affected by Option B (Green) (see Figure 5-2).

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Figure 5-2: High Sensitivity Enterprises affected by Option B (Green)

5.3.5.3 Summary of Assessment

The potential impacts on agriculture are addressed in general in Section 7. This Section addresses the impacts of Option B (Green). This option is 37.9km in length and crosses through predominantly agricultural areas for approximately 95% of its entire length. There are good quality mineral soils along its entire length. Approximately 6.3km of the option will be offline through agricultural land. As illustrated, there are 13 high sensitivity enterprises along the option. The ranking score for Option B (Green) is considered to be 'Low-Moderate' (Green) given the moderate length across agricultural land and the low number of direct impacts on high sensitivity enterprises.

Low to Moderate

5.3.6 Utilities

5.3.6.1 Overview

There are numerous underground utilities in the regional road network between Woodland and Belcamp substation, including other electricity cables; telephone and broadband cables; sewers; and public and private water supplies. The public water supply is extensive in the area, with the network predominately using the road network for local residential supply while other larger mains being located off-road in agricultural land. There is no known group water supply with protected areas within the Study Area.

The assessment of Option B (Green), based on mapping provided by utility owners, has found that it crosses existing an 220kV overhead line (once), existing 400kV underground cable (once) (East West Interconnector), existing high pressure gas pipeline (twice), existing medium gas pipeline (3 times), existing water supply network (55 times) and existing wastewater network (9 times). The count of crossing locations includes points within the same roads. For example, Option B (Green) meets the existing water supply network in multiple locations along its length, namely along the R108 / Naul Road on the northern boundary of Dublin Airport where the existing water supply network is crossed five times.

5.3.6.2 Potential Impacts

It is expected that all utilities encountered during construction will either remain in-situ or, where absolutely necessary, appropriate diversions or modifications carried out (with the permission of the respective provider) so as to ensure disruption to surrounding communities is kept to an absolute minimum and that any required service disruption will only be permitted for an agreed set period of time per day (generally a set number of hours) and will not be permitted to be continuous for full days at a time. Any required disruptions would be carefully planned so as to ensure that the duration of disruption is minimised in so far as is possible.

5.3.6.3 Summary of Assessment

Given the number and type of utility interfaces along the length of Option B (Green), along with the potential for disruption to people and neighbouring communities, it is appropriate to assign a risk score of 'Moderate (Dark Green)'.

Moderate

5.4 Option C (Yellow)

5.4.1 Traffic and Transport

5.4.1.1 Overview of the Route Option

Option C (Yellow) initially takes the same route from Woodland substation as Option B (Green); after leaving the substation to the southwest, it travels in south easterly direction, off-road. It crosses the Red Road to the south of the substation and heads across agricultural land to the L2215. However, here it turns north to Batterstown. At Batterstown, it joins the R154 and heads east towards the M3. Of note in this location is the presence of a toll booth a short distance to the north of the motorway bridge. The exact location of the crossing is yet to be determined, however it is likely to be via HDD or tunnel and no impacts on the motorway or slip roads are anticipated. Once the M3 is crossed, the route would follow the R147 to MSD Pharmaceuticals and follow the same route as Option A (Red) to Kilbride. At Kilbride, the route would travel south in Kilbride Road, but whilst Option A (Red) takes an off-road approach to the R121, Option C (Yellow) stays on Kilbride Road and travels south to the R122 roundabout before heading east to cross the M2. Here again, the exact crossing location is to be determined, however it is likely to be via HDD or tunnel and so no impacts on the motorway are anticipated. After crossing the M2, the route option follows the same route as Option A until Kilreesk Road. At this point, whereas Option A (Red) joins the R108 Naul Road, Option C (Yellow) heads north along Kilreesk Road to Killbrook. Here it travels east along Killeek Lane then joins the R108. It travels south to join Cooks Lane, and then travels east to join Forest Road. Travelling north towards Swords along Forest Road, the option turns east on the L2300, skirting the southern suburbs of Swords, to join the R132 heading south again towards the airport. The option then joins Stockhole Lane at the roundabout with the R108 and travels east along it. From Stockhole Lane, this option takes a long route round to Belcamp, travelling east along Baskin Lane, south along Malahide Road and then west along the R139 before entering the substation from the south.

Table 5.12 presents the break-down of road classifications for the Option C (Yellow) route:

Table 5.12: Option C (Yellow) Road Classification

Option	Total Length (km)	Road Length Percentage Distribution			Number of Properties 0-50m
		Regional	Local Roads and Smaller	Off-road and other Land Types	
Option C (Yellow)	43	47%	50%	3%	630

5.4.1.2 Potential Impacts

Similar impacts to those described for Option A (Red) would occur for Option C (Yellow), with some notable exceptions. The route would travel through Batterstown village and necessitate a lane closure and impact on local businesses and a school. After travelling through Kilbride, the route would also travel through Hollystown, an area of significant residential development, to the R122 roundabout, known to be a busy junction, a short distance north of access to the N2/M2. The alternative route, to using the R108 Naul Road, followed by this option requires the use of a very narrow local road, Killeek Lane. Works along this road would require a road closure. At the easternmost entrance to this lane, there is a haulage and distribution business; along its length are numerous greenhouses, part of the Keelings Foods holdings. It was observed during surveys that Keelings use large coaches to transport workers to and from the sites. A road closure on this route would have significant impacts on the ability of this business to continue to operate. This option also skirts the southern suburbs of Swords, a densely populated area. The roads here, whilst not all regional roads, are large, with wide pavements and cycle paths, however a very large number of people live in the vicinity that may be impacted by lane closures and traffic management requirements. The route to Belcamp has the potential to disrupt a number of road users, particularly along Malahide Road which is a busy route south into Dublin from Swords and Malahide. This area is also the focus for new strategic housing projects and so will become more densely populated over the coming years and there is potential for cumulative impacts during construction with these projects.

5.4.1.3 Summary of Assessment

Option C (Yellow) affects a significant number of regional roads (over 43% of total route length). This option also has a significant amount of its length on-road (97%), and impacts on a significant number of key junctions and has a large number of residential properties within 50m (630). In addition to this, this route impacts significant lengths of narrow roads without a hard shoulder and will require a significant number of full road closures. It passes the access to Scoil Bhride Primary School in Priest Town, Kilbride and Dunboyn Nursing Home in Waynestown, Dunboyne. Therefore an overall risk score of High is applied.

High

5.4.2 Amenity

5.4.2.1 Overview

This section outlines the likely impact on the amenity of residential, commercial, community (and recreational), and tourism receptors, collectively, by way of consideration of contributing environmental effects. Issues of access and severance are outlined in Section 6.2.1. All residential, commercial, community (and recreational) receptors are shown in Appendix C.

The alignment of Option C (Yellow) passes through both rural and urban areas along its length, as outlined in Section 3.2.3. Table 5.13 list the known commercial and community receptors that are situated immediately adjacent to the route alignment (this list is not exhaustive but represents a high-level analysis for the purposes of informing the Step 4A selection process). No tourism receptors (i.e. receptors whose main function is aimed at visitors to its locality) were encountered along the alignment of Option C (Yellow), while one-off or ribboned residential receptors are located along all sections of the route (aside from off-line sections). Option C (Yellow) is also routed in close proximity or within a number of built-up areas, such as through the centre of the villages of Batterstown, Kilbride, Hollystown / Hollywood, The Baskins, Kinsealy, the southern fringes of Swords, as well as the northern edge of Northern Cross (i.e. area between Clarehall and Darndale).

Table 5.13: Known Commercial and Community Receptors Adjacent to the Alignment of Option C (Yellow)

Commercial receptors:	Community receptors:
Caffery's Pub and Restaurant	Kilcloon & Batterstown Parish Church
Centra Texaco Batterstown	Rathregan National School
F. Doolan Family Butchers	Scoil Bhride (Kilbride)
MSD Dunboyne	St Thomas Church Hollywood, Dublin
Kilsarin Head Office	The Ward Graveyard (R121)
Avoca Dunboyne	St. Kevins Boys FC / Killegland Soccer Pitches
Gordon Barron Crash Repairs	New Park Care Centre
Derryglen Stud Farm	Little Moo Moos Playschool (Creche)
Ballintry Study Farm	St Margaret's GAA Club
Top Oil Kilbride Service Station	Oakwood Lodge Nursing Home
Belgree Enterprise Park	Killeek Graveyard
Hollystown Golf Club	Dublin Airport
Hollystown Service Station and Spar	Ridgewood Medical Centre
Ecomod Business Park	Tigers Childcare Ridgewood
Pallas Dublin	Cloghran Graveyard
New Park Motor Services	Trinity Care AnovoCare Nursing Home
St Margaret's Golf and Country Club	Baskin Lane Playing Pitches

Commercial receptors:	Community receptors:
Armagh Auctions Ireland	Malahide / Portmarnock Educate Together National School
Keelings Ireland	St Nicholas of Myra National School Kinsealy
Monks Field Equestrian	St Doulagh's Church
Forrest Equestrian Centre	Trinity Care St Doolagh's Park Care & Rehabilitation Centre
Forrest Little Golf Club	Balgriffin Cemetery
Tesco (Ridgewood)	Fingal Cemetery
Boroimhe Shopping Centre	Innisfails GAA Club
Airside Shopping Centre	Balgriffin Hall
Premier Inn Dublin Airport	Darnsdale Park
Airside Centre and Texaco	Craobh Chiarain GAA Club
N1 Business Park	St Michael's House Leisure Centre & Swimming Pool
Kilronan Equestrian Centre	Belcamp Park
Metropoint Business Park	
National Show Centre	
The Coachmans Inn	
Kinsealy Garden Centre	
Applegreen Service Station Malahide Road	
The Balgriffin Inn	
Hilton Dublin Airport (and associated / adjacent commercial / community receptors)	
Clarehall Shopping Centre	
Bewley's Tea and Coffee Head Office	

5.4.2.2 Potential Impacts

Outlined below are details of potential impacts considered likely during the construction of Option C (Yellow) according to each environmental effect. Given that the Proposed Development would be underground, there are no operational impacts anticipated on amenity.

The table below outlines the assessment ratings and associated justifications for each of the contributing environmental effects that, when in-combination, may result in an impact on amenity.

Table 5.14: Ratings and Associated Justifications for Environmental Effects Contributing to Potential Impact on Amenity

Air Quality	Noise (and vibration)	Visual	Traffic and Transport
Option C (Yellow) has an average risk score of 1.9 along the length of the route option, and has the largest number of sensitive receptors within all of the distance bands. Although there are no ecological designations within 200m of Option C (Yellow), there are several sensitive human receptors including dwellings and two schools (Little Moo Moos Playschool and Rathregan National School) within 20m and 50m. Therefore, an overall risk score of Moderate (Dark Green) has been applied.	This option impacts a relatively large number of receptors as it passes close to the town of Swords. The majority of receptors are dwellings, but the option also passes within 100m of three schools, three nursing homes, an equestrian centre and a church. Therefore, an overall risk score of Moderate (Dark Green) has been applied.	A section of this Route Option adjoins an area designated as a Highly Sensitive Landscape (Kinsealy) and where there is the Specific Objective to Protect & Preserve Trees, Woodlands and Hedgerows within the St Doolaghs Church Nature Objective Area but the requirement for vegetation removal is unlikely as trench will be within the road pavement. However, potential for physical impacts will be limited in scale and localised. Significant impacts on landscape character or on visual receptors is unlikely; therefore, this Route Option is considered to be Low (Cream).	Option C (Yellow) is the longest of the options and affects the second most percentage of regional roads of the four options (over 43%). This route also has a significant amount of its length on-road (97%), impacts on a great number of key junctions and has by far the most amount of residential properties within 50m (630). In addition to this, this route impacts the most amount of narrow road without a hard shoulder and will require greater amounts of full road closures will be required with this option. It passes the access to Scoil Bhride Primary School in Priest Town, Kilbride and Dunboyn Nursing Home in Waynestown, Dunboyne. Therefore an overall risk score of **High (Dark Blue)** is applied.

5.4.2.3 Summary of Assessment

In relation to the assigned scoring for potential effects relating to Air Quality, Noise (and vibration), Visual and Traffic and Transport, it is considered likely that, in a worse-case scenario, there is the potential for significant impacts on amenity as a result of the construction of Option C (Yellow). Therefore, a risk scoring of '**High (Dark Blue)**' has been assigned.

High

5.4.3 Health

5.4.3.1 Overview

The same baseline conditions as described for Option A (Red) apply to this option and are not repeated.

5.4.3.2 Potential Impacts

5.4.3.2.1 Amenity

Option C (Yellow) passes through the same EDs within the Study Area as Option A (Red). Using the outcome of the amenity assessment, it is considered unlikely that the construction of Option C (Yellow) would result in significant impacts on human health. This is primarily because processes and activities required during the construction of the Proposed Development are temporary in nature, while the nature and scale of the Proposed Development means that construction activity would occur at any one location for a limited time; thereby not significantly impacting human health.

5.4.3.2.2 EMF

The same potential impacts in relation to EMFs as are described for Option A (Red) apply to this option and are not repeated here.

5.4.3.3 Summary of Assessment

Construction and operation of Option C (Yellow) is unlikely to result in significant impacts on human health as, during construction, works are expected to be minor, temporary, and transient in nature, while in operation, the nature of the project and its location underground will limit any potential impacts, including any such potential impacts from electromagnetic fields. However, the potentially significant impacts on amenity may have indirect impacts on health and so this is ranked as being of moderate risk to health.

Moderate

5.4.4 Employment and Economy (and Tourism)

5.4.4.1 Employment

5.4.4.1.1 Overview

During construction and operation, potential impacts on employment and the national, regional and local economy are anticipated to be similar along each of the proposed route options given that they are all similar in nature, extent and scale, are located in close proximity to one another, and within the same Study Area.

5.4.4.1.2 Potential Impacts

There is currently no information on the expected size or composition of the construction workforce required to construct Option C (Yellow), however it is considered that the size and composition of any construction workforce would be relatively low numbers given the likely scale of works and envisaged construction methodology (i.e. a 'section-by-section' piecemeal construction method is expected to be employed). Furthermore, given the specialist nature of construction (to construct / lay underground electricity cables), skilled workers are likely to be required, further reducing general employment opportunities.

Given the nature of the project during its operation, there is expected to be no opportunity for gainful employment and as such no impacts are anticipated.

5.4.4.1.3 Summary of Assessment

In regard to Economy, the construction of Option C (Yellow) is expected to be positive, albeit limited, and not significant given the scale of construction, while during the operational phase, positive, potentially significant impacts, are anticipated on the local, regional and national economies, primarily because of its purpose to ensure the security of the electricity supply for consumers which will contribute to the regional economy support foreign direct investment.

Low

5.4.4.2 Land-use (and Land-take)

5.4.4.2.1 Overview

Option C is 43km in length, with the majority of the alignment routed along regional and local roads between Woodland substation and Belcamp substation. Some sections of the route alignment are not routed along roadways and are instead aligned across open agricultural land. Approximately 3% of Option C is routed through open greenfield land, largely classed as 'pastures or non-irrigated land' according to 2018 Corine Land Class data. The impacts on agricultural land (including land-take) are considered in Section 6.2.6.

5.4.4.2.2 Potential Impacts

It can be expected that there will be temporary land-take requirements to facilitate the construction of the Proposed Development along the route of Option C. However, it is envisaged that construction activities would proceed on a section-by-section basis, thereby limiting the extent of such land-take requirements to a relatively small area at any one time. Furthermore, given the nature and scale of the Proposed Development, land-take requirements are expected to be minor and, as mentioned above, largely confined to regional and local roads. As such, there is anticipated to be no requirement for land-take from any residential, commercial or community receptors.

5.4.4.2.3 Summary of Assessment

Given the nature of the Proposed Development, there are no impacts on land-use and land take for residential, commercial or community receptors envisaged during the operational phase. Therefore, it is considered appropriate to assign a score of **'Low (Cream)'** for issues relating to land-use (and land-take), for non-agricultural land / receptors.

Low

5.4.5 Agriculture (including Equine)

5.4.5.1 Overview

The Option C (Yellow) is 41.5km in length. It adjoins agricultural land for approximately 36.1kms and it crosses agricultural land for approximately 2kms (5% of the entire length) – it crosses one dairy farm for approximately 0.7kms. There are good quality mineral soils along its entire length, approximately 45% is a Surface Water Gley, 50% is a Luvisol and 4% is a low lying wet alluvial soil.

5.4.5.2 Potential Impacts

From Woodland Substation to Belcamp Substation there are thirteen high sensitivity enterprises located along Option C (Yellow) – ten equine enterprises, two dairy enterprises and one horticultural enterprise.

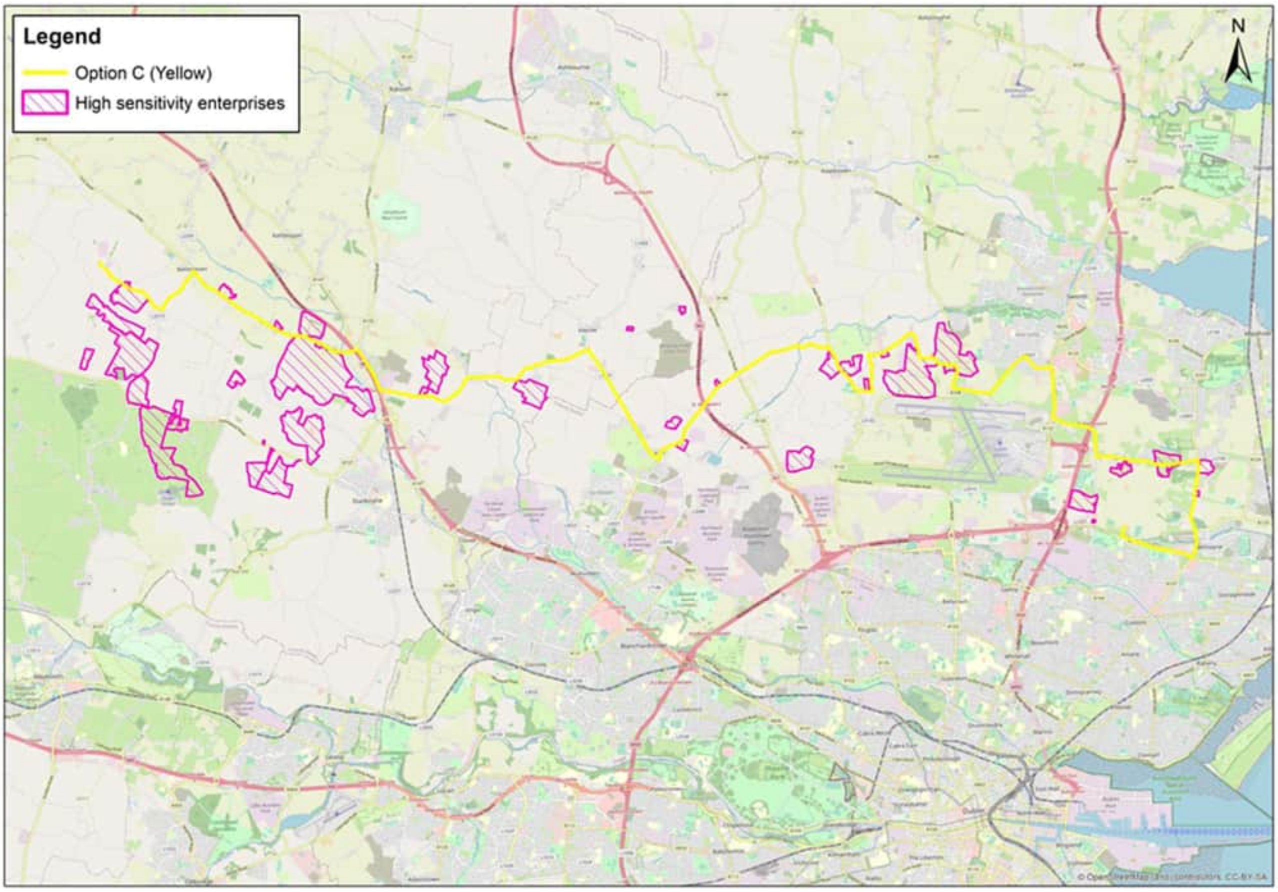


Figure 5-3 High Sensitivity Enterprises Option C (Yellow)

5.4.5.3 Summary of Assessment

The potential impacts on agriculture are addressed in general in Section 4.2.74.2.6. This Section addresses the impacts of Option C (Yellow). This option is 42.9km in length and crosses through predominantly agricultural areas for approximately 87% of its entire length. There are good quality mineral soils along its entire length. Approximately 1.8km of the option will be offline through agricultural land. As illustrated, there are 17 high sensitivity enterprises along the option. The ranking score for Option C (Yellow) is considered to be ‘Low’ (Cream)’ given the low length across agricultural land and the low number of direct impacts on high sensitivity enterprises.

Low

5.4.6 Utilities

5.4.6.1 Overview

There are numerous underground utilities in the regional road network between Woodland and Belcamp, including other electricity cables; telephone and broadband cables; sewers; and public and private water supplies. The public water supply is extensive in the area, with the network predominately using the road network for local residential supply while other larger mains being located off-road in agricultural land. There is no known group water supply with protected areas within the Study Area.

The assessment of Option C (Yellow), based on mapping provided by utility owners, has found that it crosses existing 200kV overhead lines (twice), existing 400kV underground cable (once), existing 110kV underground cable (twice), existing 38kV underground (once), existing high pressure gas pipeline (twice), existing medium pressure gas pipeline (30 times), existing water supply network (139 times), and existing wastewater network (26 times). The count of crossing locations includes points within the same roads. For example, Option C (Yellow) meets the existing water supply network in multiple locations along its length, namely in the village of Hollystown / Hollywood the existing water supply network criss-crosses the Kilbride Road multiple times and hence the number of crossings is higher.

5.4.6.2 Potential Impacts

It is expected that all utilities encountered during construction will either remain in-situ or, where absolutely necessary, appropriate diversions or modifications carried out (with the permission of the respective provided) so as to ensure disruption to surrounding communities is kept to an absolute minimum and that any required service disruption will only be permitted for an agreed period of time per day (generally a set number of hours) and will not be permitted to be continuous for full days at a time. Any required disruptions would be carefully planned so as to ensure that the duration of disruption is minimised in so far as is possible.

5.4.6.3 Summary of Assessment

Given the number and type of utility interfaces along the length of Option C (Yellow), along with the potential for disruption to people and neighbouring communities, it is appropriate to assign a risk score of ‘High (Dark Blue)’.

High

5.5 Option D (Blue)

5.5.1 Traffic and Transport

5.5.1.1 Overview of the Route Option

Option D (Blue) follows the same route out of Woodland substation as Option A (Red) does; crossing agricultural fields to reach the L2215. Here it travels south rather than via Batterstown and joins the R156. It continues along this regional road for a short distance before turning north onto the L6222 towards Vesington. It continues on this road until the junction with the R154 and then turns east onto that road. It follows the same route as Option C (Yellow) until it gets close to Kilbride. Here, it takes a small local road and avoids Kilbride village. From this point, it continues to follow the same route as Option C (Yellow) until it reaches Kilreesk Road, to the northwest of the airport. At this point it joins the same route as Options A and B and travels along the R108 and Naul Road. It remains on road for the rest of its length; whereas Options A and B go off-road after the crossing of the motorway, Option D (Blue) remains in the road. It crosses the M1, again the exact location of which is to be determined, and then follows Stockhole Lane to the R139 roundabout, where it turns east and then north into Belcamp substation.

Table 5.15 presents the break-down of road classifications for the Option D (Blue) route:

Table 5.15: Option D (blue) Road Classification

Option	Total Length (km)	Road Length Percentage Distribution			Number of Properties 0-50m
		Regional	Local Roads and Smaller	Off-road and other Land Types	
Option C	40.2	35%	57%	8%	350

5.5.1.2 Potential Impacts

This option has most of its length in common with one or more of the other options, particularly Option C (Yellow).

5.5.1.3 Summary of Assessment

Option D (Blue) has a relatively low percentage of the route on regional roads (35%). Additionally, this route has a high percentage of the route on-road (92%) and a significant number of residential properties within 50m (350). This route also impacts a significant number of junctions as well as a significant amount of narrow roads without hard shoulder, requiring a high number of full road closures. However, these roads have few residents and very few businesses that would be affected. Therefore, an overall risk score of Moderate to High is applied.

Moderate to High

5.5.2 Amenity

This section outlines the likely impact on the amenity of residential, commercial, community (and recreational), and tourism receptors, collectively, by way of consideration of contributing environmental effects. Issues of access and severance are outlined in Section 7.2.1. All residential, commercial, community (and recreational) receptors are shown in Appendix C.

The alignment of Option D (Blue) passes through both rural and urban along its length, as outlined in Section 3.2.4. Table 5.16 lists the known commercial and community receptors that are situated immediately adjacent to the route alignment (this is not exhaustive but represents a high-level analysis for the purposes of informing the Step 4A selection process). No tourism receptors (i.e. receptors whose main function is aimed at visitors to its locality) were encountered along the alignment of Option D (Blue), while one-off or ribboned residential receptors are located along all sections of the route (out with aside from off-line sections). Option D (Blue) is also routed in close proximity or within a number of built-up areas, such as through the centre of Hollystown / Hollywood, Kilbride, the northern fringe of Collinstown (i.e. Dublin Airport) and the northern extent of Darndale.

Table 5.16: Known Commercial and Community Receptors Adjacent to the Alignment of Option D (Blue)

Commercial receptors:	Community receptors:
Barstown Commercial Park	Dunboyne Nursing Home
Karleswood High Performance Equestrian Centre	St Thomas's Church
MSD Dunboyne	Hollystown Golf Club
Kilsaran Head Office	The Ward Graveyard
Avoca Dunboyne	New Park Care Centre
Gordon Barron Crash Repairs	St. Kevins Boys FC / Killegland Soccer Pitches
Derryglen Stud Farm	St Margaret's Golf and Country Club
Belgree Enterprise Park	Little Moo Moos Playschool (Creche)
Hollystown Service Station and Spar	St Margaret's GAA Club
Ecomod Business Park	Oakwood Lodge Nursing Home
Pallas Dublin	Killeek Graveyard
Armagh Auctions Ireland	Dublin Airport
Keelings Ireland	Forrest Little Golf Club
Monks Field Equestrian	Cloghran Graveyard
Forrest Equestrian Centre	Trinity Care AnovoCare Nursing Home
The Coachmans Inn	Craobh Ciaran GAA Pitches
National Show Centre	
AUL Complex (Sports Facilities)	
Clayton Hotel Dublin Airport (and associated / adjacent commercial receptors)	

Outlined below are details of potential impacts considered likely during the construction of Option D according to each environmental effect, with a concluding paragraph summing up the overall impact on amenity. Given that the Proposed Development would be underground, there are no operational impacts anticipated on amenity.

Table 5.17 outlines the assessment ratings and associated justifications for each of the contributing environmental effects that, when in-combination, may result in an impact on amenity.

Table 5.17: Ratings and Associated Justifications for Environmental Effects Contributing to Potential Impact on Amenity

Air Quality	Noise	Visual	Traffic and Transport
Option D (Blue) has an average risk score of 1.8 along the length of the route option, and has the second largest number of sensitive receptors within all of the distance bands. Although there are no ecological designations within 200m of Option D (Blue), there are several sensitive human receptors including dwellings and a school (Little Moo Playschool) within 20m. Therefore, an overall risk score of Low-Moderate (Light Green) has been applied.	This option impacts a relatively small number of receptors, most of which are dwellings, but the option also passes within 100m of four nursing homes. Therefore, an overall risk score of Low-Moderate (Light Green) has been applied.	This route Option includes a 2.82 km off-road section through the High Sensitivity Tara Skryne Hills Landscape Character Area near Woodland, involving hedgerow removal. However, potential for physical impacts will be limited in scale and localised. Significant impacts on landscape character or on visual receptors is unlikely; therefore, this Route Option is considered to be at Low (Cream) risk of resulting in significant impacts.	Option D (Blue) is the second longest of the route options although with the lowest percentage of the route on regional roads (35%). Additionally, this route does have one of the highest percentage of the route on-road (92%) and the second greatest number of residential properties within 50m (350). This route also impacts the second highest number of significant junctions as well as the second most amount of narrow roads without hard shoulder, requiring a high

Air Quality	Noise	Visual	Traffic and Transport
			amount of full road closures. However these roads have few residents and very few businesses that would be affected. Therefore, an overall risk score of **Moderate-High (Blue)** is applied.

5.5.2.1 Summary of Assessment

In relation to the assigned scoring for potential impacts relating to Air Quality, Noise (and vibration), Visual and Traffic and Transport, it is considered likely that, in a worse-case scenario, there is the potential for considerable but not significant impacts on amenity. Therefore, a risk scoring of '**Moderate (Dark Green)**' has been assigned.

Moderate

5.5.3 Health

5.5.3.1 Overview

The same baseline conditions as described for Option A (Red) apply to this option and are not repeated.

5.5.3.2 Potential Impacts

5.5.3.2.1 Amenity

Option D (Blue) passes through the same EDs within the Study Area as Option A (Red). Using the outcome of the amenity assessment, it is considered unlikely that the construction of Option C (Yellow) would result in significant impacts on human health. This is primarily because processes and activities required during the construction of the Proposed Development are temporary in nature, while the nature and scale of the Proposed Development means that construction activity would occur at any one location for a limited time; thereby not significantly impacting human health.

5.5.3.2.2 EMF

The same potential impacts in relation to EMFs as are described for Option A (Red) apply to this option and are not repeated here.

5.5.3.3 Summary of Assessment

Construction and operation of Option D (Blue) is unlikely to result in significant impacts on human health as, during construction, works are expected to be minor, temporary, and transient in nature, while in operation, the nature of the project and its location underground will limit any potential impacts, including any such potential impacts from electromagnetic fields. However the moderate impact on amenity may result in indirect effects on health and so a low to moderate risk is assigned.

Low to Moderate

5.5.4 Employment and Economy (and Tourism)

5.5.4.1 Employment

5.5.4.1.1 Overview

During construction and operation, potential impacts on employment and the national, regional and local economy are anticipated to be similar among each of the proposed route options given that they are all similar in nature, extent and scale, are located in close proximity to one another, and within the same Study Area.

5.5.4.1.2 Potential Impacts

There is currently no information on the expected size or composition of the construction workforce required to construct Option D (Blue), however it is considered that the size and composition of any construction workforce would be relatively low numbers given the likely scale of works and envisaged construction methodology (i.e. a 'section-by-section' piecemeal construction method is expected to be employed). Furthermore, given the specialist nature of construction (to construct / lay underground electricity cables), skilled workers are likely to be required, further reducing general employment opportunities.

Given the nature of the project during its operation, there is expected to be no opportunity for gainful employment and as such no impacts are anticipated.

5.5.4.1.3 Summary of Assessment

In regard to Economy, the construction of Option D is expected to be positive, albeit limited, and not significant given the scale of construction, while during the operational phase, positive, potentially significant impacts, are anticipated on the local, regional and national economies, primarily because of its purpose to ensure the security of the electricity supply for consumers which will contribute to the regional economy support foreign direct investment.

Low

5.5.4.2 Land-use (and Land-take)

5.5.4.2.1 Overview

Option D is 40.2km in length, with the majority of the alignment routed along regional and local roads between Woodland substation and Belcamp substation. Some sections of the route alignment are not routed along roadways and are instead aligned across open agricultural land. Approximately 8% of Option D is routed through open greenfield land, largely classed as ‘pastures or non-irrigated land’ according to 2018 Corine Land Class data. The impacts on agricultural land (including land-take) are considered in Section 6.2.6.

5.5.4.2.2 Potential Impacts

It can be expected that there will be temporary land-take requirements to facilitate the construction of the Proposed Development along the route of Option D. However, it is envisaged that construction activities would proceed on a section-by-section basis, thereby limiting the extent of such land-take requirements to a relatively small area at any one time. Furthermore, given the nature and scale of the Proposed Development, land-take requirements are expected to be minor and, as mentioned above, largely confined to regional and local roads. As such, there is anticipated to be no requirement for land-take from any residential, commercial or community receptors.

5.5.4.2.3 Summary of Assessment

Given the nature of the Proposed Development, there are no impacts on land-use and land take for residential, commercial or community receptors envisaged during the operational phase. Therefore, it is considered appropriate to assign a score of **'Low (Cream)'** for issues relating to land-use (and land-take), for non-agricultural land / receptors.

Low

5.5.5 Agriculture (including Equine)

5.5.5.1 Overview

The Option D (Blue) is 40.2km in length. It adjoins agricultural land for approximately 37kms and it crosses agricultural land for approximately 5.3kms (13% of the entire length) – it does not cross high sensitivity enterprises. There are good quality mineral soils along its entire length, approximately 65% is a Surface Water Gley, 33% is a Luvisol and 2% is a low lying wet alluvial soil.

5.5.5.2 Potential Impacts

The potential impacts on agriculture are addressed in general in Section 4.2.6. This Section addresses the impacts of Option D (Blue). From Woodland Substation to Belcamp Substation there are 17 high sensitivity enterprises located along Option C (Yellow) – nine equine enterprises, three dairy enterprises and three horticultural enterprise.

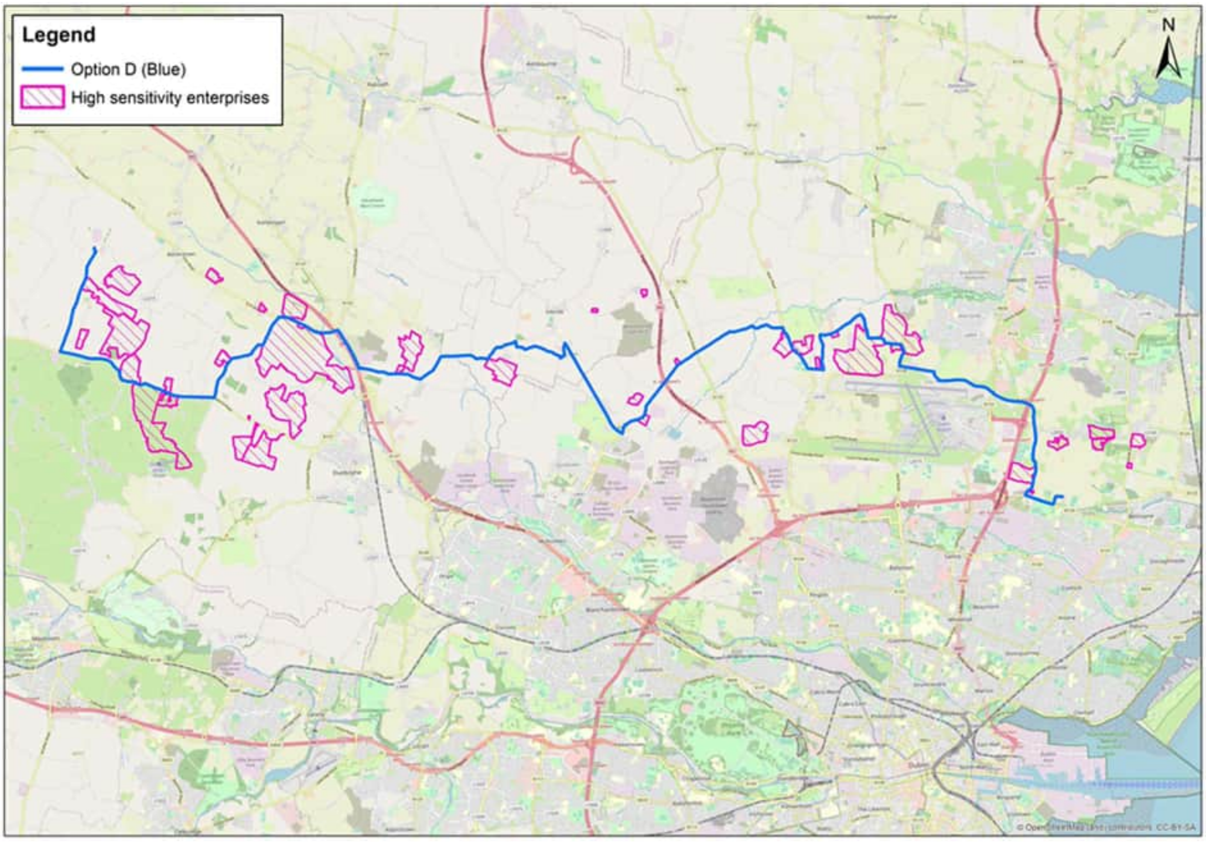


Figure 5-4: High Sensitivity Enterprises Option D (Blue)

5.5.5.3 Summary of Assessment

The ranking score for Option D (Blue) is considered to be 'Low - Moderate' (Green) given the low - moderate length across agricultural land and the absence of direct impacts on high sensitivity enterprises.

Low to Moderate

5.5.6 Utilities

There are numerous underground utilities in the regional road network between Woodland and Belcamp, including other electricity cables; telephone and broadband cables; sewers; and public and private water supplies. The public water supply is extensive in the area, with the network predominately using the road network for local residential supply while other larger mains being located off-road in agricultural land. There is no known group water supply with protected areas within the Study Area.

The assessment of Option D (Blue), based on mapping provided by utility owners, has found that is crosses existing 200kV overhead lines (once), existing 400kV underground cable (once), existing high pressure gas pipeline (twice), existing medium pressure gas pipeline (22 times), existing water supply network (99 times), and existing wastewater network (17 times). The count of crossing locations includes points within the same roads. For example, Option D (Blue) meets the existing water supply network in multiple locations along its length, namely in the village of Hollystown / Hollywood the existing water supply network criss-crosses the Kilbride Road multiple times and hence the number of crossings is higher.

It is expected that all utilities encountered during construction will either remain in-situ or, where absolutely necessary, appropriate diversions or modifications carried out (with the permission of the respective provided) so as to ensure disruption to surrounding communities is kept to an absolute minimum and that any required service disruption will only be permitted for an agreed period of time per day (generally a set number of hours) and will not be permitted to be continuous for full days at a time. Any required disruptions would be carefully planned so as to ensure that the duration of disruption is minimised in so far as is possible.

5.5.6.1.1 Summary of Assessment

Given the number and type of utility interfaces along the length of Option D (Blue), along with the potential for disruption to people and neighbouring communities, it is appropriate to assign a risk score of 'Moderate-High (Blue)'.

Moderate-High

6. Technical

This chapter outlines the assessment of route options considering feedback received from the public consultation and the technical assessment criteria and the following associated sub-topics:

- General Compliance with System Reliability, Security Standards;
- Headroom and Ratings Impact;
- Maintainability;
- Technology Operational Risk;
- Average Reliability Rates; and
- Repeatability.

Chapter 2 provides further information regarding these subtopics, including the approach to the assessment and methodology.

6.1 Feedback

No feedback was received from the public consultation regarding the technical assessment subtopics.

6.2 Option A (Red)

6.2.1 General Compliance with System Reliability, Security Standards

This is EirGrid's reliability and security standards are defined in the Transmission System Security and Planning Standards and their Operation Security Standards.

All technical input to the East Meath North Dublin project will comply to EirGrid's Standards for Security and Reliability. Therefore, there is no differentiation between the proposed route options and route Option A has been assigned a score of **Low (Cream)**.

Low

6.2.2 Headroom and Ratings Impact

Headroom is the amount of additional capacity each route option offers that would be available for the future without requiring further upgrade. All the proposed route options carry little additional headroom (spare current capacity) due to the nature of the corridor therefore giving no technical differentiation between the proposed routes in this aspect.

The current ratings bottleneck is the impact on the overall circuit ratings of the worst-case deepest obstacle crossing. As all the proposed route options will require some deep crossing solutions (below railways, motorways, rivers or a combination) of similar design, these will be the ratings bottleneck of that particular route. The connection spans west to east, whilst major natural and man-made obstacles are north south orientated, therefore all options cross the M3, M2 and M1.

On account for the potential total number of Horizontal Directional Drills, Option A (Red) has been assigned a score of **Low (Cream).**

Low

6.2.3 Maintainability

This considers the ease with which the route option can be serviced and maintained, for example how easy it is to access joint bays and link boxes.

All the proposed route options will be developed with the same design principles. For example, maximum standing sheath voltages, typical trench cross-section, separation between joint bays, location of link boxes (underground in chambers or pillar mounted), same substation entry locations. Whilst some route options come with a greater proportion of off-road build as opposed to road, with the level of design detail available at this stage, is not possible to substantially differentiate between the proposed route options.

As there is no differentiation between the proposed route options and route Option A has been assigned a score of **Low (Cream)**.

Low

6.2.4 Technology Operational Risk

This criterion aims to capture the risk of operating different technologies on the network.

The same technology is applied to all solutions including cables, joint bays, and bonding. All technology will be the standard technology in the industry and also the dominant technology on EirGrid's existing network (i.e. XLPE insulated underground cables). Therefore, there is no differentiation between the proposed route options and route Option A has been assigned a score of **Low (Cream)**.

Low

6.2.5 Average Reliability Rates

This is the likelihood of the chosen cable technologies such as cables, joint bays, and bonding failing during operation is low. This is a technical issue, which would not cause any safety issues. All cable technology listed above are common to all route options.

Industry data on Cross-Linked Polyethylene (XLPE) insulation technology indicates that cable failures on a statistical basis are related to cable length in km.

The proposed route options lengths are as per Table 6.1 (all values are based on desktop surveys).

Table 6.1: Option Length Comparison

Route Option	Length (km)	% increase over the shortest
Option A (Red)	36.4km	0
Option B (Green)	37.8km	3.8
Option C (Yellow)	42.9km	17.8
Option D (Blue)	40.2km	10.4

The small variation in length (km) between the proposed route options does not trigger any substantial increase in the risk of failure. Furthermore, there is not currently sufficient technical detail, at this point, to determine the number increase of joint bays of each route against the shortest (Option C).

Therefore, there is no discernible differentiation between the differentiation between the proposed route options and route Option A; red has been assigned a score of **Low (Cream)**.

Low

6.2.6 Repeatability

Repeatability is whether the proposed technical solution can be readily repeated in the transmission network.

All the proposed route options will be developed with the same design principles; therefore, all route options are easily repeatable across the transmission network. Therefore, there is no differentiation between the proposed route options and route Option A: red has been assigned a score of **Low (Cream)**.

Low

6.3 Option B (Green)

6.3.1 General Compliance with System Reliability, Security Standards

This is EirGrid's reliability and security standards are defined in the Transmission System Security and Planning Standards and their Operation Security Standards.

All technical input to the East Meath North Dublin project will comply to EirGrid's Standards for Security and Reliability. Therefore, there is no differentiation between the proposed route options and route Option B (Green) has been assigned a score of '**Low (Cream)**'.

Low

6.3.2 Headroom and Ratings Impact

Headroom is the amount of additional capacity each route option offers that would be available for the future without requiring further upgrade. All the proposed route options carry little additional headroom (spare current capacity) due to the nature of the corridor therefore giving no technical differentiation between the proposed routes in this aspect.

The current ratings bottleneck is the impact on the overall circuit ratings of the worst-case deepest obstacle crossing. As all the proposed route options will require some deep crossing solutions (below railways, motorways, rivers or a combination) of similar design, these will be the ratings bottleneck of that particular route. The connection spans west to east, whilst major natural and man-made obstacles are north south orientated, therefore all options cross the M3, M2 and M1.

On account for the potential total number of Horizontal Directional Drills, Option B (Green) has been assigned a score of **Low (Cream).**

Low

6.3.3 Maintainability

This considers the ease with which the route option can be serviced and maintained, for example how easy it is to access joint bays and link boxes.

All the proposed route options will be developed with the same design principles. For example, maximum standing sheath voltages, typical trench cross-section, separation between joint bays, location of link boxes (underground in chambers or pillar mounted), same substation entry locations. Whilst some route options come with a greater proportion of off-road build as opposed to road, with the level of design detail available at this stage, is not possible to substantially differentiate between the proposed route options.

As there is no differentiation between the proposed route options and route Option B (Green) has been assigned a score of '**Low (Cream)**'.

Low

6.3.4 Technology Operational Risk

This criterion aims to capture the risk of operating different technologies on the network.

The same technology is applied to all solutions including cables, joint bays, and bonding. All technology will be the standard technology in the industry and also the dominant technology on EirGrid's existing network (i.e. XLPE insulated underground cables). Therefore, there is no differentiation between the proposed route options and route Option B (Green) has been assigned a score of '**Low (Cream)**'.

Low

6.3.5 Average Reliability Rates

This is the likelihood of the chosen cable technologies such as cables, joint bays, and bonding failing during operation. All cable technology listed above are common to all route options.

Industry data on Cross-Linked Polyethylene (XLPE) insulation technology indicates that cable failures on a statistical basis are related to cable length.

The proposed route options lengths are as per Table 6.1 (all values are based on desktop surveys).

The small percentage difference between the lengths of the proposed route options does not trigger any substantial increase in the risk of failure. Furthermore, there is not currently sufficient technical detail, at this point, to determine the number increase of joint bays of each route against the shortest (Option C).

Therefore, there is no discernible differentiation between the solutions and route Option B (Green) has been assigned a score of '**Low (Cream)**'.

Low

6.3.6 Repeatability

Repeatability is whether the proposed technical solution can be readily repeated in the transmission network.

All the proposed route options will be developed with the same design principles; therefore, all route options are easily repeatable across the transmission network. Therefore, there is no differentiation between the proposed route options and route Option B has been assigned a score of '**Low (Cream)**'.

Low

6.4 Option C (Yellow)

6.4.1 General Compliance with System Reliability, Security Standards

This is EirGrid's reliability and security standards are defined in the Transmission System Security and Planning Standards and their Operation Security Standards.

All technical input to the East Meath North Dublin project will comply to EirGrid's Standards for Security and Reliability. Therefore, there is no differentiation between the proposed route options and route Option C (Yellow) has been assigned a score of '**Low (Cream)**'.

Low

6.4.2 Headroom and Ratings Impact

Headroom is the amount of additional capacity each route option offers that would be available for the future without requiring further upgrade. All the proposed route options carry little additional headroom (spare current capacity) due to the nature of the corridor therefore giving no technical differentiation between the proposed routes in this aspect.

The current ratings bottleneck is the impact on the overall circuit ratings of the worst-case deepest obstacle crossing. As all the proposed route options will require some deep crossing solutions (below railways, motorways, rivers or a combination) of similar design, these will be the ratings bottleneck of that particular route. The connection spans west to east, whilst major natural and man-made obstacles are north south orientated, therefore all options cross the M3, M2 and M1.

On account for the potential total number of Horizontal Directional Drills, Option C (Yellow) has been assigned a score of **Low (Cream).**

Low

6.4.3 Maintainability

This considers the ease with which the route option can be serviced and maintained, for example how easy it is to access joint bays and link boxes.

All the proposed route options will be developed with the same design principles. For example, maximum standing sheath voltages, typical trench cross-section, separation between joint bays, location of link boxes (underground in chambers or pillar mounted), same substation entry locations. Whilst some route options come with a greater proportion of off-road build as opposed to road, with the level of design detail available at this stage, is not possible to substantially differentiate between the proposed route options.

As there is no differentiation between the proposed route options and route Option C (Yellow) has been assigned a score of '**Low (Cream)**'.

Low

6.4.4 Technology Operational Risk

This criterion aims to capture the risk of operating different technologies on the network.

The same technology is applied to all solutions including cables, joint bays, and bonding. All technology will be the standard technology in the industry and also the dominant technology on EirGrid's existing network (i.e. XLPE insulated underground cables). Therefore, there is no differentiation between the proposed route options and route Option C (Yellow) has been assigned a score of '**Low (Cream)**'.

Low

6.4.5 Average Reliability Rates

This is the likelihood of the chosen cable technologies such as cables, joint bays, and bonding failing during operation. All cable technology listed above are common to all route options.

Industry data on Cross-Linked Polyethylene (XLPE) insulation technology indicates that cable failures on a statistical basis are related to cable length.

The proposed route options lengths are as per Table 6.1 (all values are based on desktop surveys).

The small percentage difference between the lengths of the route option does not trigger any substantial increase in the risk of failure. Furthermore, there is not currently sufficient technical detail, at this point, to determine the number increase of joint bays of each route against the shortest (Option C (Yellow)).

Therefore, there is no discernible differentiation between the solutions and route Option C (Yellow) has been assigned a score of '**Low (Cream)**'.

Low

6.4.6 Repeatability

Repeatability is whether the proposed technical solution can be readily repeated in the transmission network.

All the proposed route options will be developed with the same design principles; therefore, all route options are easily repeatable across the transmission network. Therefore, there is no differentiation between the proposed route options and route Option C (yellow) has been assigned a score of '**Low (Cream)**'.

Low

6.5 Option D (Blue)

6.5.1 General Compliance with System Reliability, Security Standards

This is EirGrid's reliability and security standards are defined in the Transmission System Security and Planning Standards and their Operation Security Standards.

All technical input to the East Meath North Dublin project will comply to EirGrid's Standards for Security and Reliability. Therefore, there is no differentiation between the proposed route options and route Option D (Blue) has been assigned a score of '**Low (Cream)**'.

Low

6.5.2 Headroom and Ratings Impact

Headroom is the amount of additional capacity each route option offers that would be available for the future without requiring further upgrade. All the proposed route options carry little additional headroom (spare current capacity) due to the nature of the corridor therefore giving no technical differentiation between the proposed routes in this aspect.

The current ratings bottleneck is the impact on the overall circuit ratings of the worst-case deepest obstacle crossing. As all the proposed route options will require some deep crossing solutions (below railways, motorways, rivers or a combination) of similar design, these will be the ratings bottleneck of that particular route. The connection spans west to east, whilst major natural and man-made obstacles are north south orientated, therefore all options cross the M3, M2 and M1.

On account for the potential total number of Horizontal Directional Drills, Option D (Blue) has been assigned a score of **Low (Cream).**

Low

6.5.3 Maintainability

This considers the ease with which the route option can be serviced and maintained, for example how easy it is to access joint bays and link boxes.

All the proposed route options will be developed with the same design principles. For example, maximum standing sheath voltages, typical trench cross-section, separation between joint bays, location of link boxes (underground in chambers or pillar mounted), same substation entry locations. Whilst some route options come with a greater proportion of off-road build as opposed to road, with the level of design detail available at this stage, is not possible to substantially differentiate between the proposed route options.

As there is no differentiation between the proposed route options and route Option D (Blue) has been assigned a score of '**Low (Cream)**'.

Low

6.5.4 Technology Operational Risk

This criterion aims to capture the risk of operating different technologies on the network.

The same technology is applied to all solutions including cables, joint bays, and bonding. All technology will be the standard technology in the industry and also the dominant technology on EirGrid's existing network (i.e. XLPE insulated underground cables). Therefore, there is no differentiation between the proposed route options and route Option D (Blue) has been assigned a score of '**Low (Cream)**'.

Low

6.5.5 Average Reliability Rates

This is the likelihood of the chosen cable technologies such as cables, joint bays, and bonding failing during operation. All cable technology listed above are common to all route options.

Industry data on Cross-Linked Polyethylene (XLPE) insulation technology indicates that cable failures on a statistical basis are related to cable length.

The proposed route options lengths are as per Table 6.1 (all values are based on desktop surveys).

The small percentage difference between the lengths of the proposed route options does not trigger any substantial increase in the risk of failure. Furthermore, there is not currently sufficient technical detail, at this point, to determine the number increase of joint bays of each route against the shortest (Option C).

Therefore, there is no discernible differentiation between the solutions and route Option D has been assigned a score of '**Low (Cream)**'.

Low

6.5.6 Repeatability

Repeatability is whether the proposed technical solution can be readily repeated in the transmission network.

All the proposed route options will be developed with the same design principles; therefore, all route options are easily repeatable across the transmission network. Therefore, there is no differentiation between the proposed route options and route Option D (Blue) has been assigned a score of '**Low (Cream)**'.

Low

7. Deliverability

This chapter outlines the assessment of route options considering feedback received from the public consultation and the deliverability assessment criteria and the following associated sub-topics:

- Design Complexity
- Traffic Disturbance
- Dependence on Infrastructure
- Permits & Wayleaves
- Timelines

Chapter 2 provides further information regarding these subtopics, including the approach to the assessment and methodology.

7.1 Feedback

Feedback from the public consultation was received for the subtopics 'traffic disturbance' and 'design complexity'. This feedback, accompanied by a response from the project team, is summarised below.

Table 7.1: Design Complexity

Feedback	Project Team response
It was suggested that the route chosen should use the old N3 near Pace.	EirGrid's routing principles have been closely followed in the development of the route options and the use of local and regional roads has been maximised where possible. Specifically, the old N3 route has not been used since the proposed route generally runs in an eastward direction from East Meath to North Dublin.

Table 7.2: Traffic Disturbance

<table>
<tr><th>Public Consultation Feedback</th><th>Project Team response</th></tr>
<tr><td>Stakeholders expressed concerns about disruption, particularly traffic disruption, with one stakeholder questioning whether the construction works would affect the road on which they live close to Kilbride Village. Furthermore, stakeholders expressed concerns about access to their dwellings/communities during construction.</td><td rowspan="3">During Step 4B of the project development process, traffic survey data will be acquired and a traffic study will assess delays and disruption due to traffic management during the construction phase.
We will also work with local communities and landowners to identify suitable site construction compounds and to identify appropriate haul routes and abnormal load routes.
Where possible we will seek to avoid routes through towns, villages and other residential areas while also seeking to minimise disruption to farms and other businesses in the area.
Where possible, we will seek to avoid road closures.</td></tr>
<tr><td>Concerns raised about the impact on traffic on narrow roads, including the L5026 and roads in Kilbride, and on roads described as 'rat runs'. Other stakeholders did not specify roads but also expressed concern that narrow roads might necessitate road closures as well as expressing concerns about general traffic management.</td></tr>
<tr><td>Feedback received about the impact of the project on harvest time which requires the use of trailers.
Concern that Option B is near many tillage fields and that farmers would therefore need access to the roads along this route during harvest time to transport their produce.</td></tr>
</table>

Concerns about potential impacts on traffic on roads on Route Options A (Red) and Route Option C (Yellow).	
Concerns over potential road closures at R153 and R121 which would directly affect the logistics of staff and deliveries of their business.	
Concerns that the narrower R156 used in Option A is less optimal for use than the wider R154.	Route Option A (Red) incorporates a section of the R156 and is identified as the Emerging Best Performing Option, partly due to the greater number of communities (including Batterstown) and residential properties located on the R154 between Woodland substation and Pace.
Support for Option C as it is the shortest route to Pace and maximises use of local roads including the recently widened and upgraded R154.	
Opposition to Option C on the grounds that Batterstown is regularly disrupted by work at Woodlands.	
Stakeholders requested details of road layouts and plans.	Plans showing the proposed route, layouts of traffic management and local diversion routes, if necessary, will be made available during subsequent stages of the project development process. The proposed routes can be viewed online via interactive mapping on the project website.
Stakeholders asked that EirGrid avoid using Malahide Road due to its existing congestion issues.	Route Option C (Yellow) is the only route using this road. The use of Malahide Road has been considered and discounted as part of the assessment as presented in this report.
Stakeholders requested that EirGrid avoid using any roads wherever possible.	EirGrid's routing principles seek to avoid motorways but maximise the use of national, regional and local roads.
Concerns about potential travel disruption, particularly with narrow roads. Added traffic associated with construction as well as the size of the construction vehicles could cause difficulties for the communities using these roads.	The extent of narrow roads has been considered as part of the assessment of traffic disturbance as presented in this chapter of the report.
It was suggested that the Option C from Woodland would maximise the use of local roads. It was also highlighted that the route is located near a busy agricultural businesses which has no alternative to but to travel on a narrow lanes.	
Concerns raised that Option C uses Killeek Lane which they comment is very narrow. They feel that closure of this road could impact residents living along this route.	
Concerns that Option B includes Broughan Lane which is very small and narrow lane as they believe closure of this road could impact residents along this route. Furthermore, it was commented that there is a large agricultural business on this lane which requires 24/7 access which may be limited if there is construction traffic or road closures.	
Participants felt clear and timely information about future disruption to their community would help to mitigate some of the inconvenience and frustration. Some said it would also help them plan their journeys in advance, avoiding stress.	EirGrid will work with ESB Networks to ensure that contractors prepare a stakeholder engagement and communications plan. This will include measures to engage with local communities and provide advance notifications via media channels of local road diversions and traffic management.

Respondents express support for Option A because they view it as the least disruptive and most direct route and because it avoids Hollystown which is regularly congested.	Option A (Red) is identified as the Emerging Best Performing Option and this feedback has been taken into account as part of the assessment process.

Table 7.3: Timelines

Feedback	Project Team response
An interest was expressed in finding out more information about the nature of the project, particularly the construction process and the timeline.	Project timelines, including Step 5 (apply for planning permission) and Step 6 (construction) will be confirmed following the completion of Step 4. Information will be available on the project website. Further information regarding the construction process, including the proposed construction sequence and methodology, is provided in Chapter 3 of this report.

Table 7.4: Dependence on Infrastructure

Feedback	Project Team response
Stakeholders requested information about the status of other EirGrid projects such as the North South Interconnector, including the Louth-Woodland 220 kV upgrade.	Information regarding the status of other EirGrid projects is available via the EirGrid website: https://www.eirgridgroup.com/the-grid/projects/
Stakeholders also commented on the presence of a sewage route from the prison to the M2 southwards.	We have engaged with utility providers, including Uisce Éireann, considering interfaces with other major projects and developments.
Concerns were raised that route options used the M2 motorway and that there is a proposed solar farm close to the M2 flyover.	All route options have been developed to avoid Motorways and any motorway crossings will be undertaken by non-disruptive techniques such as horizontal directional drilling.

Table 7.5: Permits and Wayleaves

Feedback	Project Team response
Stakeholders requested the choice of a route which does not impact their land and noted that Irish Water mains were being built on their land.	Engagement with local communities, including landowners, is ongoing as we develop the design of the proposed route.

7.2 Option A (Red)

7.2.1 Design Complexity

Option A is the shortest route which reduces cable length and the number of joint bays required. This option has the longest stretch of off-road sections which means the interface with private assets is increased. There are 16 crossings which will require open cut methodology which are mainly surface waterbodies. Option A (Red) will require nine major crossings (such as HDD) to cross M3, M2 and M1 motorways as well as M3 parkway railway, high pressure gas main, Greater Dublin Drainage project (sewer) and other high voltage underground cables

The M3 and M3 at the point of crossing are wide and very deep, potentially requiring more complex methods of tunnelling than would be standard.

Option A (Red) has been assigned a score of **Moderate to High**.

Moderate to High

7.2.2 Traffic Disturbance

7.2.2.1 Potential Impacts

As outlined in the Socio-Economic section, it is anticipated that the road closures will be required where the road does not have sufficient width to accommodate live traffic and the works associated with the construction. Any works along this route will be undertaken during normal daytime working hours with no night-time or weekend working, unless in the case of emergencies.

For Option A (Red), it is anticipated that full road closures may be required in parts of the following roads:

- R156
- L5026 Pace
- Unnamed Road (Kinoristown to Nuttstown)
- Kilbride Road
- R121
- R122
- Kilreesk Lane

In other areas of Option A (Red), the road width will be reduced to a minimum of 3.0 meters by the proposed construction works. In these areas it is anticipated that a lane closure may be required, with diversions for HGV vehicles:

- R157
- R147

For all the remaining road sections along Option A (Red), the roads may require lane closures with localized traffic management measures to allow the construction works to be carried out, specifically:

- R108
- Naul Road
- R157
- R147

Table 7.6 provides a high-level summary of the proposed traffic management measures during construction period for Option A (Red). The lengths shown are the lengths of road which will require traffic management including the entire length of any diversions that may be required. As such, the total length impacted is significantly higher than the length of the route option itself. It is recommended that, following selection of the proposed option, a detailed analysis be undertaken with regards to the phasing of road closures.

Table 7.6: Summary of Option A (Red) Traffic Management

Option A (Red)	Total Length (in km)	Lane Closures (in km)	HGV Diversions (in km)	Road Closures (in km)	Field Crossings (in km)
	104.5	7.3	68.1	20.5	8.5

As outlined in the Socio-Economic section, in terms of traffic disturbance, it has been acknowledged that the construction works will impact the private vehicle. A moderate to high-ranking score has been assigned to Option A (Red) based on the level of temporary Traffic Management which is anticipated to be required during the phased construction works. For Option A (Red), full lane or a road closure during the phased construction works 'with' or 'without' Heavy Goods Vehicles (HGVs), diversions are mostly available while at all times maintaining access for local residents. On this basis, the significance of the traffic disturbance impact is assessed to be low. Where suitable diversions for through traffic are available along the length of the route option, the average installation rate is anticipated to be 80 metres per day, resulting in a minimum timeline of approximately two years to install this option. The exact location of the cable trench will be defined later in the project and this will depend on further design, surveys, consultation, and assessment. Consultations with the local authorities will help to define where the cable trench will go in the road to minimise disruption. For example, if a safe alternative could be provided for access with significant disruption for pedestrians, a footpath could be used to minimise disruption to the road network.

7.2.2.2 Summary of Assessment

This route has the second least length of total road closures required (26.5km) and thus has the second least length of works and second lowest traffic disruption. This would likely also lead to the second lowest length of diversions at c. 68 km.

It will potentially involve three full closures of parts of regional roads, four of local roads.

Moderate-High

7.2.3 Dependence on Other Infrastructure Projects

All route options will have the same dependence on works required at the associated substations in terms of connections. Both Woodland and Belcamp substation are being developed to accommodate a number of connections proposed for several other projects.

In terms of other infrastructure projects in the area, similar crossings of existing motorways are required. All four of the proposed route options will cross the same infrastructure but, in some cases, in different locations. All four route options will cross or run parallel with utilities, including water mains and the low to high pressure gas network. All four routes will have to cross the East West Interconnector HV AC cable to exit Woodland substation. Option A (Red) will utilise the same corridor as the Kildare Meath project from Woodland but it is not envisaged that these cable will cross each other. All four of the proposed route options will cross the proposed Greater Dublin Project and therefore it is not considered a differentiator. Option A (red) runs parallel to the Ballystruan to Forrest Little Metrolink cable route and passes the proposed Forrest Little substation and the Metrolink station by the airport.

Moderate-High

7.2.4 Permits and Wayleaves

Option A includes four key locations where off-road sections may require easements and a wayleave to be agreed with private landowners:

- Approx. 2.7km offroad that could be co-located with Kildare-Meath project,
- Approx. 0.4km at the M3 Parkway Railway station which would require a license from Irish Rail,
- Approx. 2.2km around Hollystown, and;
- Approx. 3.2km east of Dublin Airport.

Whilst this total length of 8.5km is significant (including the potentially joint easement with Kildare-Meath, 5.8km without), recent engagement with landowners has helped to understand the risk of delivering these sections of the overall route.

A 'Road Opening License' is required before construction is allowed to take place in any public highway, footpath or grass verge. Applications must be made to the local authority Road Management Office up to 8 weeks ahead of works being carried out. Impacts related to this are directly correlated with the traffic disturbance impact assessment.

Considering recent engagement with landowners for the sections of the route described above and the requirement for Road Opening Licenses along the full length of the option means that this option is Low-Moderate risk in terms of deliverability of the necessary Permits and wayleaves required.

Low-Moderate

7.2.5 Implementation Timelines

Outside of the categories that have been discussed above, there's no significant difference in the implementation timelines at a high level when comparing all four route options. At a high level the various routes face the same general challenges.

Option A however is the shortest route overall, with the longest off-road sections. It is recognised that the off-road sections will achieve greater output per day in comparison to on-road construction. Accounting for a weighted average of output rates between the off-road and on-road sections shows that the Option A may have the shortest duration of implementation timeline.

It is noted that an increased number of watercourse crossings and increased lengths off road would bring in seasonal constraints with regards to field access, hedge trimmings, watercourse crossings etc., as well as environmental controls which would otherwise be avoided. As such, option A and B would have increased complexity for implementation but this would be balanced by the shorter overall route length and the higher production rate for section off-road.

Option A has therefore been assigned a score of **Moderate (Dark Green)** for this criterion.

Moderate

7.2.6 Combined Deliverability Performance

Considering the design complexity, traffic disturbance, dependence on infrastructure, permits and wayleaves and implementation timelines, a rating of Moderate has been assigned.

Design Complexity	Traffic Disturbance	Dependence on Infrastructure	Permits & Wayleaves	Timelines

The combined performance is Moderate.

Moderate

7.3 Option B (Green)

7.3.1 Design Complexity

Option B is one of the shorter route options, which reduces cable length and the number of joint bays required. There are 14 crossings which will require open cut methodology which are mainly surface waterbodies. Option B (Green) will require nine major crossings (such as HDD) to cross M3, M2 and M1 motorways as well as M3 parkway railway, high pressure gas main, Greater Drainage project and other high voltage underground cables.

Moderate to High

7.3.2 Traffic Disturbance

7.3.2.1 Potential Impacts

As outlined in the Socio-Economic section, it is anticipated that the road closures will be required where the road does not have sufficient width to accommodate live traffic and the works associated with the construction. Any works along this route will be undertaken during normal daytime working hours with no night-time or weekend working, unless in the case of emergencies. For Option B (Green), it is anticipated that the full road closures might be required at the following locations:

- R156
- Unnamed Road (Paddingstown to Kilbride)
- Kilbride Road
- Broughan Lane and Dunsoghly Lane
- R122
- L3132

In other areas of Option B (Green), the road width will be reduced to a minimum of 3.0 meters by the proposed construction works. In these areas it is anticipated that a lane closure may be required, with diversions for HGV vehicles:

- R135

For all the remaining road sections along Option B (Green), the roads may require lane closures with localized traffic management measures to allow the construction works to be carried out, specifically:

- R135
- Naul Road
- R108

Table 7.7 provides a high-level summary of the proposed traffic management measure during construction period for Option B (Green). The lengths shown are the lengths of road which will require traffic management including the entire length of any diversions that may be required. As such, the total length impacted is significantly higher than the length of the route option itself. It is recommended that, following selection of the proposed option, a detailed analysis be undertaken with regards to the phasing of road closures.

Table 7.7: Summary of Option B (Green) Traffic Management

Option B (Green)	Total Length (in km)	Lane Closures (in km)	HGV Diversions (in km)	Road Closures (in km)	Field Crossings (in km)
	102.7	10.4	64.9	21.1	6.3

7.3.2.2 Summary of Assessment

Option B (Green) will potentially involve two full closures of parts of regional roads, four of local roads.

This route has the least length of total road closures required (26 km) and thus has the lowest traffic disruption. This option is likely to have the shortest length of diversions at c. 65 km.

Moderate to High

7.3.3 Dependence on Other Infrastructure Projects

All route options will have the same dependence on works required at the associated substations in terms of connections. Both Woodland and Belcamp substation are being developed to accommodate a number of connections required for several other projects.

In terms of other infrastructure projects in the area, similar crossings of existing motorways are required. All four of the proposed route options will cross the same infrastructure but, in some cases, in different locations. All four route options will cross or run parallel with utilities, including water mains and the low to high pressure gas network. All four routes will have to cross the East West Interconnector HV AC cable to exit Woodland substation. All four of the proposed route options will cross the proposed Greater Dublin Project and therefore it is not considered a differentiator. It is proposed that Options B (Green) will cross the existing M3 parkway railway line with a major crossing (such as HDD). This will require a long crossing and additional studies and shielding to ensure that there are no electro-magnetic forces issues between the East Meath North Dublin project and the electrified railway line. There is a planned solar farm at Ballymacarney but it is assumed that Option B (green) will not cross any underground cable works for this project. Option B (green) runs parallel to the Ballystruan to Forrest Little Metrolink cable route, Forrest Little - Belcamp Metrolink cable and passes the proposed Forrest Little substation and the Metrolink station by the airport.

High

7.3.4 Permits and Wayleaves

Option B includes three key locations where off-road sections may require easements and a wayleave to be agreed with private landowners:

- Approx. 1.9km from Woodland substation,
- Approx. 0.65km around the M3 Parkway Railway Station which would require a license agreement with Irish rail, and;
- Approx. 4.4km east of Dublin Airport.

Whilst this total length of 6.95km is significant, recent engagement with landowners has helped to understand the risk of delivering these sections of the overall route.

A 'Road Opening License' is required before construction is allowed to take place in any public highway, footpath or grass verge. Applications must be made to the local authority Road Management Office up to 8 weeks ahead of works being carried out. Impacts related to this are directly correlated with the traffic disturbance impact assessment.

Considering recent engagement with landowners for the sections of the route described above and the requirement for Road Opening Licenses along the full length of the option means that this option is Moderate-High risk in terms of deliverability of the necessary Permits and wayleaves required.

Moderate-High

7.3.5 Implementation Timelines

Outside of the categories that have been discussed above, there's no significant difference in the implementation timelines at a high level when comparing all four route options. At a high level the various routes face the same general challenges.

Option B however has a shorter route length than Options C and D, albeit with longer off-road sections. It is recognised that the off-road sections will achieve greater output per day in comparison to on-road construction. Accounting for a weighted average of output rates between the off-road and on-road sections shows that the Option B may have a shorter duration of implementation timeline compared to Options C and D.

It is noted that an increased number of watercourse crossings and increased lengths off road would bring in seasonal constraints with regards to field access, hedge trimmings, watercourse crossings etc., as well as environmental controls which would otherwise be avoided. As such, option A and B would have increased complexity for implementation but this would be balanced by the shorter overall route length and the higher production rate for section off-road.

Option B has therefore been assigned a score of **Moderate (Dark Green)** for this criterion.

Moderate

7.3.6 Combined Deliverability Performance

Considering the design complexity, traffic disturbance, dependence on infrastructure, and permits and way leaves, a rating of Moderate to High has been assigned.

Design Complexity	Traffic Disturbance	Dependence on Other Infrastructure	Permits and Wayleaves	Implementation Timelines

The combined performance is Moderate to High.

Moderate to High

7.4 Option C (Yellow)

7.4.1 Design Complexity

Option C (Yellow) is the longest route, which is approximately 18% longer than the shortest route, this will add complexity since more equipment such as joint bays will be required. There are 19 crossings which will require open cut methodology which are mainly surface waterbodies. The crossings through the settlements of Batterstown, Hollystown and Swords will also increase the complexity due to the number of services, access, and dwellings. Option C (Yellow) will require 13 major crossings (such as HDD) to cross M3, M2 and M1 motorways and other high voltage underground cables. This option also crosses a high pressure gas main twice at R121 and R122.Option C (Yellow) also runs in parallel to the planned Forest Little-Belcamp Metrolink HV cable connection from Node VV to Node CCC (Belcamp substation) for 8.6km which will affect constructability and cable ratings.

High

7.4.2 Traffic Disturbance

7.4.2.1 Potential Impacts

As outlined in the Socio-Economic section, it is anticipated that the road closures will be required where the road does not have sufficient width to accommodate live traffic and the works associated with the construction. Any works along this route will be undertaken during normal daytime working hours with no night-time or weekend working, unless in the case of emergencies. For Option C (Yellow), it is anticipated that the full road closures might be required at the following locations:

- L2215
- R154

- L5026 Pace
- Unnamed Road (Kinoristown to Nuttstown)
- Kilbride Road
- R121
- R122
- Kilreesk Lane
- Kilreesk Road
- Killeek Lane
- Cook's Road
- Forest Road
- Stockhole Lane
- Baskin Lane

In other areas of Option C (Yellow), the road width will be reduced to a minimum of 3.0 meters by the proposed construction works. In these areas it is anticipated that a lane closure may be required, with diversions for HGV vehicles:

- Unnamed Road (Nuttstown to Kilbride)

For all the remaining road sections along Option C (Yellow), the roads may require lane closures with localized traffic management measures to allow the construction works to be carried out, specifically:

- R147
- Unnamed Road (Nuttstown to Kilbride)
- R139
- Naul Road
- L2300
- R132
- R107
- R139

Table 7.8 provides a high-level summary of the proposed traffic management measure during construction period for Option C (Yellow). The lengths shown are the lengths of road which will require traffic management including the entire length of any diversions that may be required. As such, the total length impacted is significantly higher than the length of the route option itself. It is recommended that, following selection of the proposed option, a detailed analysis be undertaken with regards to the phasing of road closures.

Table 7.8: Summary of Option C (Yellow) Traffic Management

Option C (Yellow)	Total Length (in km)	Lane Closures (in km)	HGV Diversions (in km)	Road Closures (in km)	Field Crossings (in km)
	144.3	3.8	101.1	37.6	1.8

7.4.2.2 Summary of Assessment

This route has the greatest length of total road closures required (approximately 38km) and thus has the greatest traffic disruption. This route is also likely to require the second longest length of diversions at c.100km. Road closures may include parts of three regional roads and eleven local roads.

High

7.4.3 Dependence on Other Infrastructure Projects

All route options will have the same dependence on works required at the associated substations in terms of connections. Both Woodland and Belcamp substation are being developed to accommodate a number of connections being proposed including for the Kildare Meath Grid Upgrade Project, the North South Interconnector (Woodland only) and new transmission connections into Belcamp from Finglas and Shellybank substations.

In terms of other infrastructure projects in the area, similar crossings of existing motorways are required. All four of the proposed route options will cross the same infrastructure but, in some cases, in different locations. All four route options will cross or run parallel with utilities, including water mains and the low to high pressure gas network. All four routes will have to cross the East West Interconnector HV AC cable to exit Woodland substation. All four of the proposed route options will cross the proposed Greater Dublin Project and therefore it is not considered a differentiator. Option C (Yellow) also runs in parallel to the planned Forest Little-Belcamp Metrolink HV cable connection from Node VV to Node CCC (Belcamp substation), and in parallel with the proposed NISA underground high voltage cable in R107/Malahide Road.

High

7.4.4 Permits and Wayleaves

Option C includes two key locations where off-road sections may require easements and a wayleave to be agreed with private landowners:

- Approx. 1.9km out of Woodlands, and;
- Approx. 0.2km around Belcamp.

Whilst this total length of 2.1km is not as significant as the other route options, recent engagement with landowners has helped to understand the risk of delivering these sections of the overall route.

A 'Road Opening License' is required before construction is allowed to take place in any public highway, footpath or grass verge. Applications must be made to the local authority Road Management Office up to 8 weeks ahead of works being carried out. Impacts related to this are directly correlated with the traffic disturbance impact assessment.

Considering recent engagement with landowners for the sections of the route described above and the requirement for Road Opening Licenses along the full length of the option means that this option is Moderate-High risk in terms of deliverability of the necessary Permits and wayleaves required.

Moderate to High

7.4.5 Implementation Timelines

Outside of the categories that have been discussed above, there's no significant difference in the implementation timelines at a high level when comparing all four route options. At a high level the various routes face the same general challenges.

Option C however has a longer route length than Options A and B but has the shortest overall length of off-road sections. It is recognised that the off-road sections will achieve greater output per day in comparison to on-road construction. Accounting for a weighted average of output rates between the off-road and on-road sections shows that the Option C may have a longer duration of implementation timeline compared to Options A and B.

It is noted that an increased number of watercourse crossings and increased lengths off road would bring in seasonal constraints with regards to field access, hedge trimmings, watercourse crossings etc., as well as environmental controls which would otherwise be avoided. As such, Option C would have reduced complexity for implementation but this would be balanced by the longer overall route length and the lower production rate for sections on-road.

Option C has therefore been assigned a score of **Moderate (Dark Green)** for this criterion.

Moderate

7.4.6 Combined Deliverability Performance

Considering the design complexity, traffic disturbance, dependence on infrastructure, and permits and wayleaves, a rating of Moderate to High has been assigned.

Design Complexity	Traffic Disturbance	Dependence on Infrastructure	Permits & Wayleaves	Implementation Timelines

The combined performance is Moderate to High.

Moderate to High

7.5 Option D (Blue)

7.5.1 Design Complexity

Option D (Blue) is the second longest route, which increases the cable lengths and amount of equipment required. There are 21 crossings which will require open cut methodology which are mainly surface water bodies. Option D (Blue) will require six major crossings (such as HDD) to cross M3, M2 and M1 motorways as well as the Greater Drainage project and other high voltage underground cables. This option also crosses a high pressure gas main twice at R121 and R122. The route through the settlement of Hollystown will also increase the complexity due to the number of services, access, and dwellings. Option D (Blue) has an off-road section round Kilbride which will reduce the number of watercourse and utility crossings required. The section near Roslin Food Park is a narrow road with multiple water mains crossings; this will require a road closure which increases complexity. Option D (Blue) runs in parallel to the planned Forest Little-Belcamp Metrolink HV cable connection from Node UU to Node WW for 2km which will affect constructability and cable ratings. There is also a planned aviation fuel pipe in Stockhole lane which may affect feasibility of going in the road in this section.

High

7.5.2 Traffic Disturbance

7.5.2.1 Potential Impacts

As outlined in the Socio-Economic section, it is anticipated that the road closures will be required where the road does not have sufficient width to accommodate live traffic and the works associated with the construction. Any works along this route will be undertaken during normal daytime working hours with no night-time or weekend working, unless in the case of emergencies. For Option D (Blue), it is anticipated that the full road closures might be required at the following locations:

- R156
- R154
- L5026 Pace

- Unnamed Road (Kinoristown to Nuttstown)
- Kilbride Road
- R121
- R122
- Kilreesk Lane
- Kilreesk Road
- Killeek Lane
- Cook's Road
- Stockhole Lane and Clonshaugh Road

In other areas of Option D (Blue), the road width will be reduced to a minimum of 3.0 meters by the proposed construction works. In these areas it is anticipated that a lane closure may be required, with diversions for HGV vehicles:

- Unnamed Road (Nuttstown to Kilbride)
- Kilreesk Lane

For all the remaining road sections along Option D (Blue), the roads may require lane closures with localized traffic management measures to allow the construction works to be carried out, specifically:

- R147
- Unnamed Road (Nuttstown to Kilbride)
- R139
- Naul Road

Table 7.9 provides a high-level summary of the proposed traffic management measure during construction period for Option D (Blue). It is recommended that, following selection of the proposed option, a detailed analysis be undertaken with regards to the phasing of road closures.

Table 7.9: Summary of Option D (Blue) Traffic Management

Option D (Blue)	Total Length (in km)	Lane Closures (in km)	HGV Diversions (in km)	Road Closures (in km)	Field Crossings (in km)
	146	4.3	105.8	31.6	4.2

7.5.2.2 Summary of Assessment

Option D (Blue) is the second longest of the route options although with the lowest percentage of the route on regional roads (35%). Additionally, this route does have the second highest percentage of the route on-road (89%) and the second greatest number of residential properties within 50m (350). This route also impacts the second most number of significant junctions as well as the second largest amount of narrow roads without hard shoulder, requiring a high amount of full road closures.

It will potentially involve the closure of parts of four regional roads and seven local roads. It is a Moderate to High risk of potential impacts.

High

7.5.3 Dependence on Other Infrastructure Projects

All route options will have the same dependence on works required at the associated substations in terms of connections. In terms of other infrastructure projects in the area, similar crossings of existing motorways are required. All four of the proposed route options will cross the same infrastructure but, in some cases, in different locations. All four route options will cross or run parallel with utilities, including water mains and the low to high pressure gas network. All four routes will have to cross the East West Interconnector HV AC cable to exit Woodland substation. Option D (Blue) will utilise the same corridor as the Kildare Meath project from Woodland but it is not envisaged that these cables will cross each other. All four of the proposed route options will cross the proposed Greater Dublin Project and therefore it is not considered a differentiator. Option D (Blue) runs in parallel to the planned Forest Little-Belcamp Metrolink HV cable connection from Node UU to Node WW for 2km and in parallel with a planned aviation fuel pipe in Stockhole Lane. There is a planned solar farm at Vesington but it is assumed that Option D (Blue) will not cross any underground cable works for this project.

Moderate to High

7.5.4 Permits and Wayleaves

Option D includes two key locations where off-road sections may require easements and a wayleave to be agreed with private landowners:

- Approx. 2.7km offroad that could be co-located with Kildare-Meath project, and;
- Approx. 0.2km at Belcamp substation.

Whilst this total length of 2.9km is significant (including the potentially joint easement with Kildare-Meath, 0.2km without), recent engagement with landowners has helped to understand the risk of delivering these sections of the overall route.

A 'Road Opening License' is required before construction is allowed to take place in any public highway, footpath or grass verge. Applications must be made to the local authority Road Management Office up to 8 weeks ahead of works being carried out. Impacts related to this are directly correlated with the traffic disturbance impact assessment.

Considering recent engagement with landowners for the sections of the route described above and the requirement for Road Opening Licenses along the full length of the option means that this option is Low-Moderate risk in terms of deliverability of the necessary Permits and wayleaves required.

Low-Moderate

7.5.5 Implementation Timelines

Outside of the categories that have been discussed above, there's no significant difference in the implementation timelines at a high level when comparing all four route options. At a high level the various routes face the same general challenges.

Option D however has a longer route length than Options A and B, but has a shorter length of off-road sections. It is recognised that the off-road sections will achieve greater output per day in comparison to on-road construction. Accounting for a weighted average of output rates between the off-road and on-road sections shows that the Option D may have a longer duration of implementation timeline compared to Options A and B.

It is noted that an increased number of watercourse crossings and increased lengths off road would bring in seasonal constraints with regards to field access, hedge trimmings, watercourse crossings etc., as well as environmental controls which would otherwise be avoided. As such, Option D would have reduced complexity for implementation but this would be balanced by the longer overall route length and the lower production rate for sections on-road.

Option D has therefore been assigned a score of **Moderate (Dark Green)** for this criterion.

Moderate

7.5.6 Combined Deliverability Performance

Considering the design complexity, traffic disturbance and dependence on infrastructure a rating of Moderate to High has been assigned.

Design Complexity	Traffic Disturbance	Dependence on Infrastructure	Permits & Wayleaves	Timelines

The combined performance is Moderate to High.

Moderate to High

8. Economic

For all route options, given the routes will be crossing developed areas, at this stage it is not possible to consider a number of factors influencing costs (i.e. complexity of the crossings, land purchase for the crossings). The assessment remains a high-level indication based on 2 parameters as there is insufficient information or developed work to make a more detailed assessment at this stage.

As set out in Section 2.4.5, the topic areas under consideration to assist with determining the best route option are as follows:

- Length of installed cable;
- Quantity of Minor and Major service crossings; and
- Number of Major Crossings (such as Horizontal Directional Drills).

8.1 Feedback

Feedback from the public consultation was received for the subtopic 'length of installed cable'. This feedback, accompanied by a response from the project team, is summarised below.

Table 8.1: Feedback regarding Length of installed cable

Public Consultation Feedback	Project Team response
Concerns expressed about the potential impact of Option C on local communities and the cost of Option C due to its length.	The length of installed cable has been considered as part of the evaluation of the economic impact of Route Options as presented in this chapter of the report.
Concern about the length of Option D compared to the other routes.	
Support for Option B because it is shorter than Options C and D and is near the airport. Praise for Option B as the second best option after Option A.	
Concern about the length of Option D compared to the other routes.	

8.2 Option A (Red)

For Option A (Red), which is the shortest route with amongst the lowest number of crossings, the economic assessment concludes that there is a low to moderate risk in relation to the quantity of cable required and a low risk in terms of number of nature of the crossings required. Overall this leads to a combined economic performance that is low risk.

Cable Quantity	Crossings Quantity	Combined Economic
Low-Moderate	Low	Low

8.3 Option B (Green)

For Option B (Green), which is one of the shortest routes with amongst the lowest number of crossings, the economic assessment concludes that there is a low to moderate risk in relation to the quantity of cable required and a low risk in terms of number of nature of the crossings required. Overall this leads to a combined economic performance that is Low risk.

Cable Quantity	Crossings Quantity	Combined Economic
Low-Moderate	Low	Low

8.4 Option C (Yellow)

For Option C (Yellow), which is the longest route with the greatest number of crossings, the economic assessment concludes that there is a moderate risk in relation to the quantity of cable required and a Moderate to High risk in terms of number of nature of the crossings required. Overall this leads to a combined economic performance that is Moderate-High risk.

Cable Quantity	Crossings Quantity	Combined Economic
Moderate	Moderate-High	Moderate-High

8.5 Option D (Blue)

For Option D (Blue), which is the second longest route with the second greatest number of crossings, the economic assessment concludes that there is a moderate risk in relation to the quantity of cable required and a Moderate risk in terms of number and nature of the crossings required. Overall this leads to a combined economic performance that is Moderate risk.

Cable Quantity	Crossings Quantity	Combined Economic
Moderate	Moderate	Moderate

9. Summary and Recommendation

9.1 Environment Assessment

Table 9.1 below summarises the findings of the environmental assessment for each of the options. For more detail on how each individual option was appraised, please see Sections 5.2 to 5.5 respectively.

The option with the highest potential environment impacts is Option C (Yellow) which has been scored as Moderate risk due to Land Use Planning and Cultural Heritage impacts. Between Options A (Red), B (Green) and D (Blue), Option A has three environmental topics with a score of Moderate, Option B has one Moderate and one Moderate-High score, and Option D (Blue) has only two Moderate scores due to its shorter lengths of off-road sections. Overall, Option D is the emerging best performing option from an environmental perspective.

Table 9.1: Summary of Environmental Assessment for Options

Option	Biodiversity	Soils & Geology	Surface Water & Flood Risk	Planning Policy and Land Use	Landscape	Archaeology, Architectural Heritage, & Cultural Heritage	Noise & Vibration	Air Quality	Combined Environment Score
A	Moderate	Low-Moderate	Moderate	Low-Moderate	Low	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
B	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low	Moderate-High	Low-Moderate	Low-Moderate	Low-Moderate
C	Moderate	Low-Moderate	Moderate	Moderate-High	Low	Moderate-High	Moderate	Moderate	Moderate
D	Low-Moderate	Low-Moderate	Moderate	Moderate	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate

9.2 Socio-economic Assessment

From a socio-economic perspective, Options C (Yellow) and D (Blue) have the highest level of potential social impacts as they are longer routes with the greatest proportion of on-road sections.

Option A (Red) and Option B (Green) have the same overall level of potential social impacts; however Option A (Red) has a lower potential impact on Utilities so has the lowest level of potential social impacts overall. Option A is the emerging best performing option considering socio-economic factors.

Table 9.2: Summary of Socio-economic Assessment of Options

Option	Traffic and Transport	Amenity	Health	Employment and Economy (and Tourism)	Land Use (and Land-take)	Agriculture (including Equine)	Utilities	Combined Socio-economic Score
A	Moderate-High	Moderate	Low-Moderate	Low	Low	Low-Moderate	Low-Moderate	Low-Moderate
B	Moderate-High	Moderate	Low-Moderate	Low	Low	Low-Moderate	Moderate	Low-Moderate
C	High	High	Moderate	Low	Low	Low	High	Moderate
D	Moderate-High	Moderate	Low-Moderate	Low	Low	Low-Moderate	Moderate-High	Moderate

9.3 Technical Assessment

At this stage in the Proposed Development there no technical differentiations. Other technical factors identified at later stages will have no impact on the selection of the Best Performing Option. Outlined below are the findings of the technical appraisal of each of the options.

Table 9.3: Summary of Technical Assessment of Options

Option	General Compliance	Headroom	Maintainability	Technology Operational Risk	Average Reliability Rates	Repeatability	Combined Technical Score
A	Low	Low	Low	Low	Low	Low	Low
B	Low	Low	Low	Low	Low	Low	Low
C	Low	Low	Low	Low	Low	Low	Low
D	Low	Low	Low	Low	Low	Low	Low

9.4 Deliverability Assessment

Options B (Green), C (Yellow) and D (Blue) all have an overall combined deliverability score of Moderate to High impact. However, Option C (Yellow) has three incidences of high risk, Option D (Blue) has two and Option B (Green) has one. Option C (Yellow) is the worst performing option.

Option A (Red) has no High impact criteria and a Moderate deliverability impact rating overall as compared to the Moderate to High overall rating assigned to the other route options. Option A (Red) has the largest amount of off-road sections which results in less traffic disturbance than some other options. In addition, while this also means that it will affect the largest number of landowners, landowner support is positive around the relevant sections.

Option A (Red) is therefore the emerging best performing option considering deliverability factors.

Table 9.4: Summary of Deliverability Assessment of Options

Option	Design complexity	Traffic disturbance	Dependence on other infrastructure projects	Permits and wayleaves	Implementation Timelines	Combined Deliverability Score
A	Moderate-High	Moderate-High	Moderate-High	Low-Moderate	Moderate	Moderate
B	Moderate-High	Moderate-High	High	Moderate-High	Moderate	Moderate-High
C	High	High	High	Moderate-High	Moderate	Moderate-High
D	High	High	Moderate-High	Low-Moderate	Moderate	Moderate-High

9.5 Economic Assessment

The economic assessment at this stage of the evolution of the Proposed Development is based only on the length of a route option and the number and complexity of any crossings. Option C (Yellow) is the longest route and has a larger number of crossings, and therefore has the highest potential impact. Options A (Red) and B (Green) have a relatively low number of crossings and both have a combined economic score of Low. Option A (Red) is also the shortest route and is therefore the emerging best performing option considering economic factors.

Table 9.5: Summary of Economic Assessment of Options

Option	Cable Quantity	Crossings Quantity	Combined Economic
A	Low-Moderate	Low	Low
B	Low-Moderate	Low	Low
C	Moderate	Moderate-High	Moderate-High
D	Moderate	Moderate	Moderate

9.6 Overall Summary of End-to-End Assessment

It is determined that Option A (Red) is selected as the Emerging Best Performing Option. This is due to several factors including its lowest combined impact across all topic areas compared to the other options (Table 9.6 below).

Option A has a lower environmental impact than Option C (Yellow), a lower socio-economic impact than Option C (Yellow) and Option D (Blue), a lower deliverability impact than all other options and a lower economic impact than Option C (Yellow) and Option D (Blue). This lower deliverability impact means that there will be less disruption to road users and local communities during the delivery phase compared to other options.

While Option A has the longest length of off-road sections compared to other options, there is a relatively high degree of confidence that the necessary permits and wayleaves can be arranged for these sections, and these off-road sections are primarily required for technical reasons such as avoiding impacts to existing utilities. While Option A (Red) has potentially moderate impacts on some environmental sub-criteria (biodiversity, surface water/flood risk and cultural heritage), further surveys, consultation, design, and assessment work will be undertaken to reduce or avoid these impacts.

Table 9.6: Summary of Options Assessment

Option	Environment Score	Socio-economic Score	Technical Score	Deliverability Score	Economic Score
Option A (Red)	Low-Moderate	Low-Moderate	Low	Moderate	Low
Option B (Green)	Low-Moderate	Low-Moderate	Low	Moderate-High	Low
Option C (Yellow)	Moderate	Moderate	Low	Moderate-High	Moderate-High
Option D (Blue)	Low-Moderate	Moderate	Low	Moderate-High	Moderate

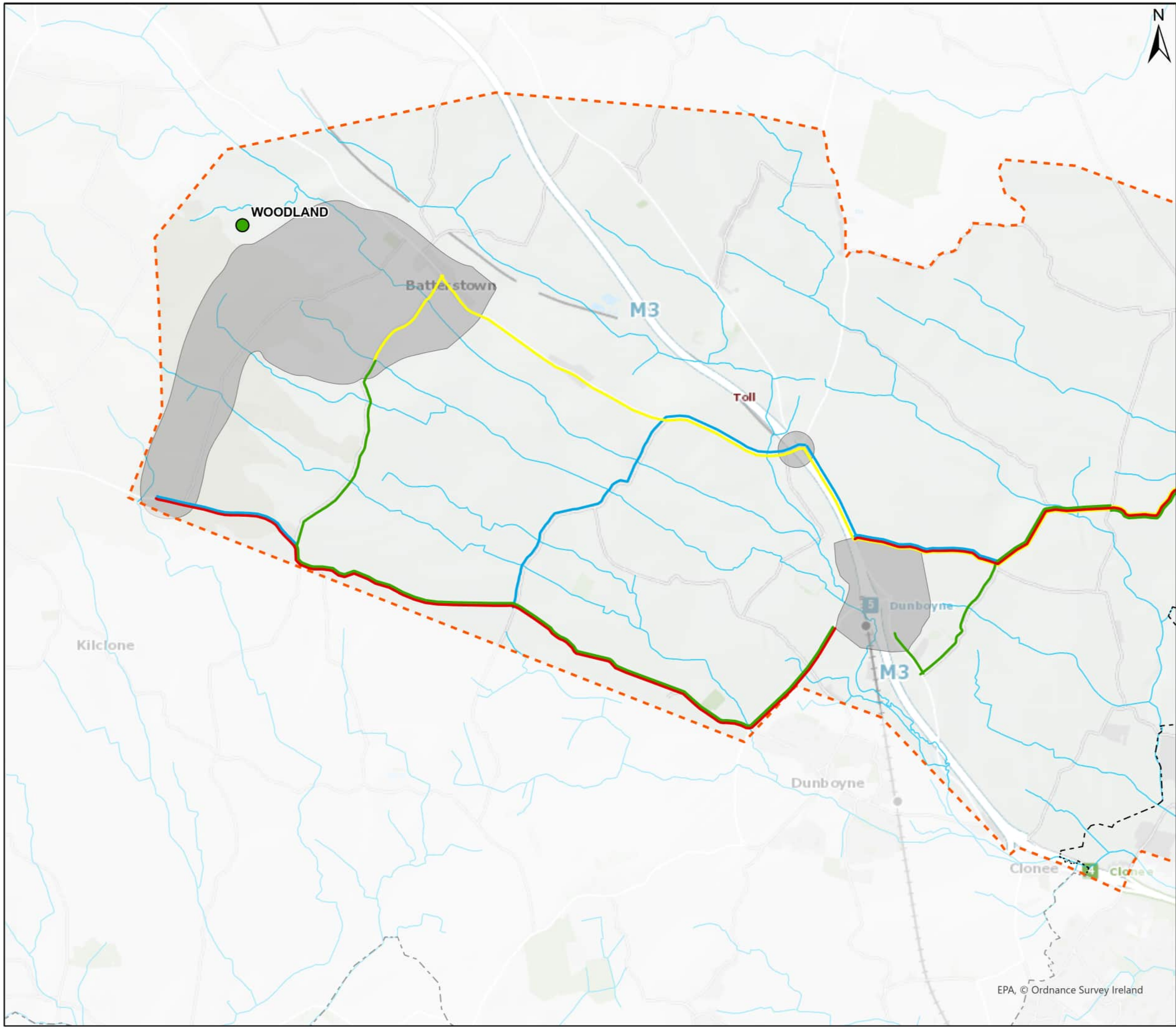
9.7 Next Steps

The following actions will be completed on the Proposed Development:

- This Step 4A report will be published and any further feedback on the Emerging Best Performing Option (Option A (Red)) will be considered by the project team and amendments will be made where it is considered appropriate (feeding into Step 4B report referenced below);
- EirGrid will continue to engage with key stakeholders to discuss the Proposed Development. Further meetings will be held with affected landowners in addition to bodies such as Meath and Fingal County Councils, TII, Irish Rail, Waterways Ireland, and the utility providers such as Uisce Éireann and Gas Networks Ireland;
- The project team will undertake a wide range of surveys for the Emerging Best Performing Option to help to refine the design and location of the proposed cable. This will also include designing how the cable will be constructed and how traffic disturbance will be minimised through traffic management. The surveys include archaeology, ecology, agriculture, ground investigations, utilities surveys, hydrology, technical assessments, etc.
- Development of the route design will be progressed at 'refinement areas' including the off-road sections, motorway crossings and the sections of the route on approach to the substations. The surveys will inform the process and may also result in other minor changes to the route shown in this report. This is a normal part of the design process – as further information is gathered, new issues can be identified resulting in changes to the route. If large scale changes are required, then the assessment will be remade, and further consultation will be undertaken;
- Further design work will be progressed at the substations to determine the works required to connect the proposed cable into the grid;
- When the proposed cable route and design have been progressed further, a subsequent report called the Step 4B report will be published on the project website. This is anticipated to be during Autumn 2023.
- Following that, the project team will prepare the planning submission for the Proposed Development. Further updates will be published by EirGrid on the project website: https://www.eirgridgroup.com/the-grid/projects/cp1021/the-project/

Appendix A – Biodiversity (Flora and Fauna) Figures

FIGURE A.1



Legend
- Step 4A Study Area
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Watercourse (EPA)

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

Jacobs

Client: EIRGRID

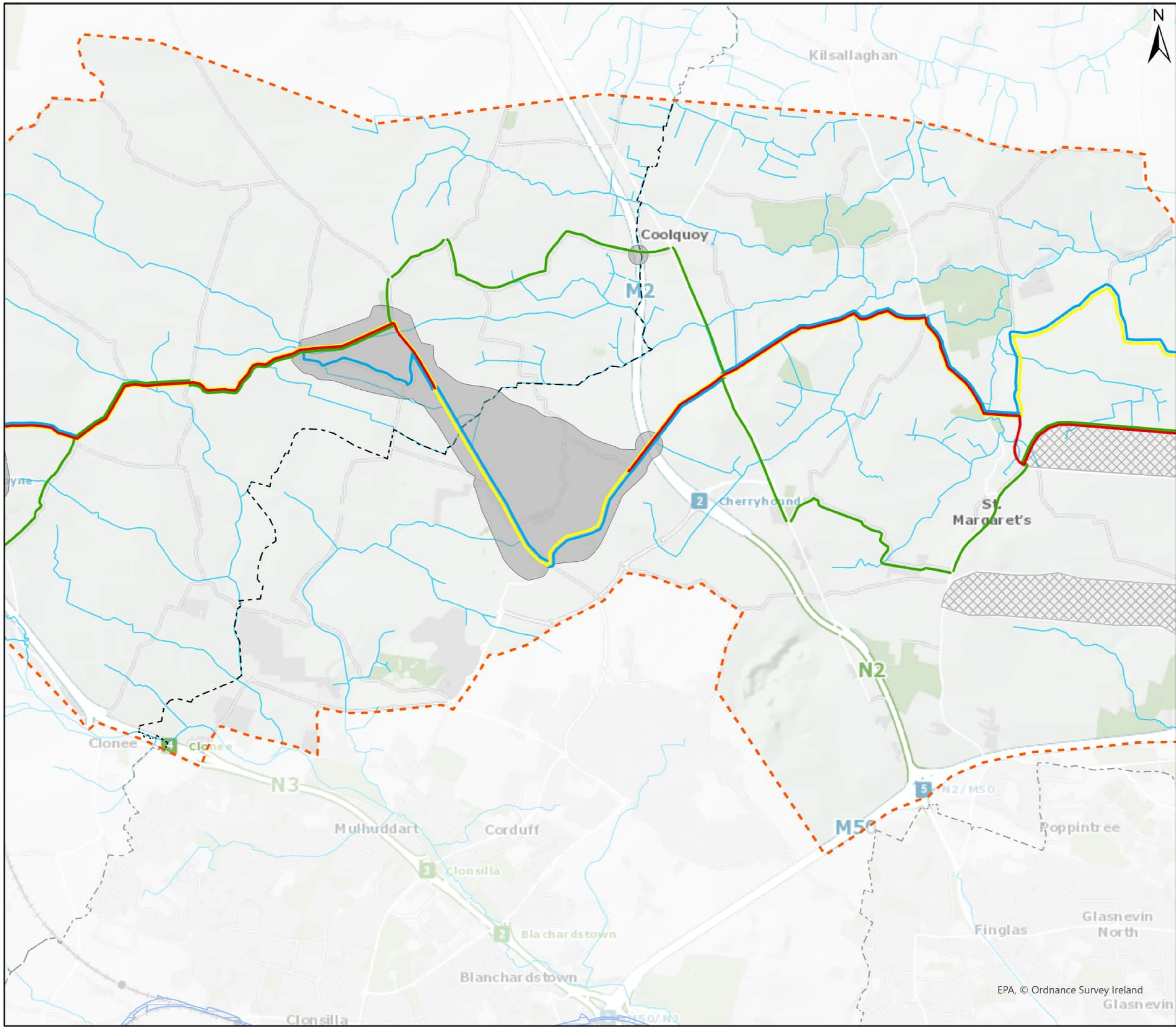
Project: CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title: Biodiversity Sheet 1 of 3

Drawing Status: FINAL

Scale @ A3	1:40,000	DO NOT SCALE
OSI Sheet No.		
Jacobs No.	B321084AJ	
Drawing No.	321084AJ-MAP-S4A-A.1	

FIGURE A.1



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Proposed Natural Heritage Areas
- Watercourse (EPA)

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

Jacobs

Client: EIRGRID

Project: CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title: Biodiversity Sheet 2 of 3

Drawing Status: FINAL

Scale @ A3	1:40,000	DO NOT SCALE
OSI Sheet No.		
Jacobs No.	B321084AJ	
Drawing No.	321084AJ-MAP-S4A-A.1	

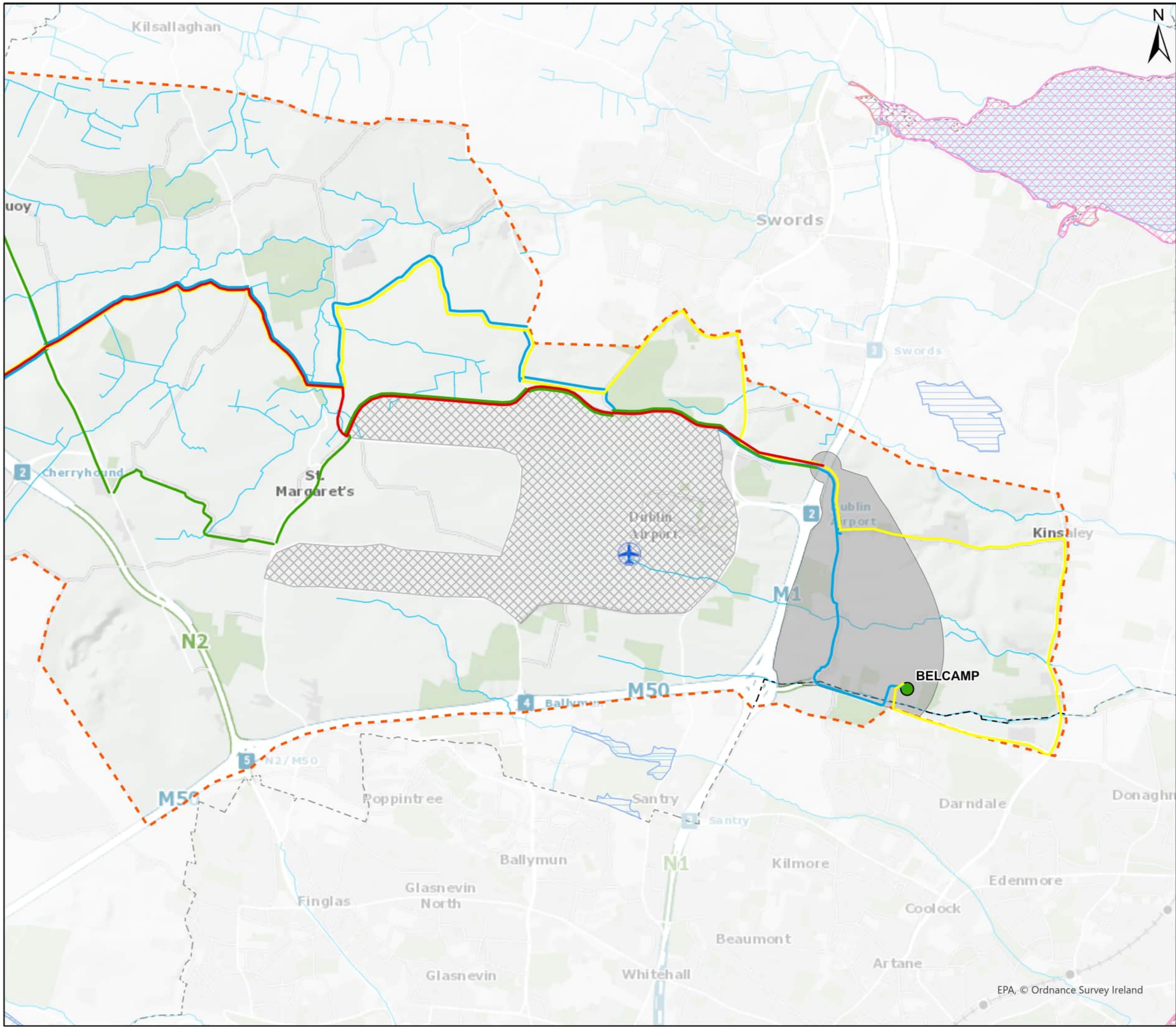


FIGURE A.1

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Special Protection Areas
- Special Area of Conservation
- Proposed Natural Heritage Areas
- Watercourse (EPA)

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

Jacobs

Client

EIRGRID

Project

CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Biodiversity
Sheet 3 of 3

Drawing Status: FINAL

Scale @ A3: 1:40,000 — DO NOT SCALE

OSI Sheet No.

Jacobs No.: 321084AJ

Drawing No.: 321084AJ-MAP-S4A-A.1

Appendix B – Archaeology, Architectural Heritage and Cultural Heritage

CP1021: East Meath to North Dublin Grid Upgrade

Step 4A Archaeology, Architectural Heritage, and Cultural Heritage Baseline Information

321084AJ-REP-017 | R01

February 2023

EirGrid

CP1021 East Meath - North Dublin Grid Upgrade

Project No:	321084AJ
Document Title:	Step 4A Archaeology, Architectural Heritage, and Cultural Heritage Baseline Information
Document No.:	321084AJ-REP-017
Revision:	R01
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Date:	February 2023
Client Name:	EirGrid
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Revision	Date	Description	Author	Checked	Reviewed	Approved
R00	August 2022	First Draft	AC	NF	JD and KRS	GS
R01	February 2023	First Issue	AC	KRS	KRS	GS

Contents

1. Introduction

This report presents the baseline information gathered for the archaeology, architectural heritage and cultural heritage constraints identified within the study areas for each of the four route options (Option A (Red), Option B (Green), Option C (Yellow), and Option D (Blue); see Section 2.2) identified for the CP1021: East Meath to North Dublin Grid Upgrade project (the 'Proposed Project'). The purpose of the report is to support the archaeology, architectural heritage and cultural heritage input into the Step 4A Report - Analysis of the Route Options for the Proposed Project (321084AJ-REP-017).

In line with the guidance provided by *Cultural Heritage Guidelines for Electricity Transmission Projects* (EirGrid, 2015), cultural heritage has been assessed under the following topics:

- Archaeology - defined as '*the study of past societies through the material remains left by those societies and the evidence of their environment. The 'archaeological heritage' consists of such material remains (whether in the form of sites and monuments or artefacts in the sense of moveable objects) and environmental evidence*' (EirGrid, 2015, page 5).
- Architectural Heritage - comprising '*all structures and buildings (together with their settings and attendant grounds, fixtures and fittings, groups of such structures and buildings and sites), which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. Architectural heritage is generally visible and has a presence in the landscape which requires assessment*' (EirGrid, 2015, page 6).
- Cultural Heritage - defined as '*a general term used to describe aspects of the environment and intangible heritage which are valued for their age, beauty, history or tradition. It encompasses aspects of archaeology, architecture, history, landscape and garden design, folklore and tradition and topography. Cultural heritage is expressed in the physical landscape in numerous often interrelated ways*' (EirGrid, 2015, page 6).

Section 2 of this report provides the methodology, including the legislative background and sources of information, used to identify archaeology, architectural heritage and cultural heritage constraints within the study areas for each of the four route options identified for the Proposed Project. Section 3 describes the archaeology, architectural heritage and cultural heritage within the study areas for the four route options. An Inventory of Archaeology, Architectural Heritage and Cultural Heritage Constraints is provided in Annex A. Figures showing the locations of the archaeology, architectural heritage and cultural heritage constraints are presented in Annex B.

2. Methodology

2.1 Legislation and Guidance

This report was informed by the following legislation and best practice guidance:

- National Monuments Act 1930 to 2014;
- European Cultural Convention 1954;
- International Council on Monuments and Sites (ICOMOS) International Charter for the Conservation and Restoration of Monuments and Sites 1964;
- United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention Concerning the Protection of the World Cultural and Natural Heritage 1972;
- Convention for the Protection of the Architectural Heritage of Europe (Granada, 1985);
- Convention for the Protection of the Archaeological Heritage of Europe (revised) (Valletta, 1992);
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999;
- Framework and Principles for the Protection of the Archaeological Heritage (Department of Arts, Heritage, Gaeltacht and Islands (now Department of Culture, Heritage and Gaeltacht), 1999);
- Planning and Development Act 2000 to 2020;
- Convention on the Value of Cultural Heritage for Society (Faro Convention, 2005);
- Code of Practice between the Department of the Environment, Heritage and Local Government and EirGrid (Department of the Environment, Heritage and Local Government and EirGrid, 2009);
- Architectural Heritage Protection Guidelines for Planning Authorities (Department of Arts Heritage and the Gaeltacht, 2011); and
- Cultural Heritage Guidelines for Electricity Transmission Projects (EirGrid, 2015).

Archaeological sites and monuments are protected under the National Monument Act 1930 – 2014 primarily through inclusion in the Record of Monument and Places (RMP), the Register of Historic Monuments (RHM) and/or by being declared a National Monument. Section 2 of the National Monument Act 1930 - 2014 defines a National Monument as '*a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic, or archaeological interest attaching thereto*'. In addition, Section 8 of the Act states that the Minister may also place a Preservation Order on a monument '*which in his [the minister's] opinion is a national monument is in danger of being or is actually being destroyed, injured, or removed, or is falling into decay through neglect*'. It is illegal to demolish, or remove wholly or in part, a National Monument or disturb the ground within, around or in proximity to a National Monument, without written consent from the Minister (and/or the local authority if they are the owners or guardians).

Under Section 5 of the National Monuments (Amendment) Act 1987, an RHM is required to be established and maintained. Monuments included on the RHM are afforded statutory protection under this Act, of a similar level to Recorded Monuments (see below).

Section 12 (1) of the National Monuments (Amendment) Act 1994 requires the establishment and maintenance of an RMP. Sites included in the RMP are legally protected and are referred to as Recorded Monuments. The RMP is maintained by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage who have defined Zones of Notification around each Recorded Monument. Zones of Notification do not define the extent of a site but are defined for the purposes of notification to the Minister under Section 12 of the National Monuments Act (1930-2004).

The Sites and Monuments Record (SMR) is the national database of the Archaeological Survey of Ireland (ASI) compiled and maintained by the NMS. The SMR details all sites where a monument is known to the ASI pre-dating AD 1700 and includes a selection of monuments from the post-AD 1700 period. The addition of a monument to the SMR does not, in itself, confer legal protection.

The Planning and Development Act 2000 sets out the conditions relating to the protection of architectural heritage. Structures of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest are protected under this Act, through their inclusion on the Record of Protected Structures (RPS) and are known as Protected Structures.

The Planning and Development Act 2000 as amended defines an Architectural Conservation Area (ACA) as '*a place, area, group of structures or townscape, taking account of building lines and heights, that:*

a) is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or value, or

b) *contributes to the appreciation of protected structures*' (Planning and Development Act, 2000, Part IV, Chapter II).

Development plans are required to include an objective to preserve the character of an ACA. In considering applications for permission for development within an ACA, the effect of a Proposed Project on the character of an ACA is a consideration for the planning authority. Both the Meath County Development Plan 2021 – 2027 (Meath County Council, 2021) and Fingal Development Plan 2017 – 2023 (Fingal County Council, 2017) include a list of ACAs protected under the Act.

Undertaken under the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999 the National Inventory of Architectural Heritage (NIAH) is a nationwide survey of architectural heritage including buildings, structures, and historic gardens and design landscapes. Inclusion on the NIAH alone does not in itself confer legal protection. The NIAH includes an assessment of the significance of structures based on an appraisal of their contribution to architectural heritage. Significance ratings are: International, National, Regional, Local and Record Only. Structures which are considered of International, National, and Regional significance are recommended by the Minister to the relevant Local Authority for inclusion in their RPS (Department of Culture, Heritage and the Gaeltacht, 2021).

The Survey of Historic Gardens and Designed Landscapes, undertaken by the NIAH, includes the sites of demesne lands from First Edition Ordnance Survey maps and assesses the level of survival and change. These gardens and designed landscapes (GDLs) largely date from the post-medieval period when the lands surrounding large houses assumed an increasingly ornamental role providing a landscape setting for the house.

2.2 Study Areas

A description of each of the route options is provided in Section 4.2 of the Step 4A Report.

In order to identify and quantify the archaeology, architectural heritage and cultural heritage constraints that may be impacted by the route options, including indirect impacts, individual study areas for each route option were used. The study area for each route option comprised the alignment of the online sections of each route option plus a 100m buffer and the off-road focus areas for consideration for that route (see Section 2.3.1.6 of the Step 4A Report and Figures in Annex B).

These study areas were considered sufficient to identify impacts on archaeology, architectural heritage and cultural heritage constraints given any direct impacts would largely result from the excavation for the cable trench and would be focussed on the alignment of the route option within the online sections and off-road focus areas. Any indirect impacts are anticipated to be temporary (lasting the duration of construction in each location) as the Proposed Project would be largely located beneath road surfaces and offline sections would be reinstated after construction, localised along the wayleave corridor, and are not anticipated beyond these study areas.

2.3 Sources of Information

Baseline conditions for archaeology, architectural heritage and cultural heritage were established through desk-based research using the following sources of information:

- The archaeological and architectural features reviewed as part of the CP1021 Environmental Constraints Report (Jacobs, 2022);
- The list of National Monuments in State Care Ownership and Guardianship for County Meath[1] and Dublin[2] published in 2009 for information on National Monuments;
- List of Preservation Orders held by the National Monuments Service[3], published in 2019 for information on monuments that have a Preservation Order placed on them;
- The RHM for County Meath[4];
- The maps and manuals of the RMP for County Meath (1996) and Dublin (1998) to identify Recorded Monuments[5];
- Data downloaded from the SMR [6] to identify sites and monuments, and zones, recorded by the Archaeological Survey of Ireland;
- Data from the Record of Protected Structures from Meath County Council and Fingal County Council[7],[8];
- Data downloaded from the NIAH survey[9];
- Meath County Council and Fingal County Council websites for information on ACAs[10],[11];
- Data from the Survey of Historic Gardens and Designed Landscapes on the NIAH website to identify gardens and designed landscapes recorded by the NIAH;
- Topographical files of the National Museum of Ireland through the online National Museum of Ireland: Finds Database (up to 2010) available online [12];
- The results of previous excavations recorded by the Database of Irish Excavations Reports[13] and TII's Digital Heritage Collection available online in the Digital Repository of Ireland[14];

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1 https://www.archaeology.ie/sites/default/files/media/pdf/monuments-in-state-care-meath.pdf.
2 https://www.archaeology.ie/sites/default/files/media/pdf/monuments-in-state-care-dublin.pdf.
3 https://www.archaeology.ie/sites/default/files/media/publications/po19v1-all-counties.pdf.
4 https://consult.meath.ie/en/consultation/meath-draft-county-development-plan/chapter/a09-national-monuments-state-care-register-historic-monuments.
5 https://www.archaeology.ie/publications-forms-legislation/record-of-monuments-and-places.
6 https://maps.archaeology.ie/HistoricEnvironment/.
7 https://consult.meath.ie/en/system/files/materials/7447/Appendix%206%20-%20Record%20of%20Protected%20Structures.pdf.
8 https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf.
9 https://www.buildingsofireland.ie/.
10 https://www.meath.ie/council/council-services/planning-and-building/architectural-conservation-and-heritage/architectural-conservation-areas.
11 https://www.fingal.ie/fingal-architectural-conservation-areas-aca.
12 http://heritagemaps.ie/.
13 https://excavations.ie/.
14 https://repository.dri.ie/catalog/v9807h80j.

- Placename information available online[15];
- The National Folklore Collection, including information from the Schools' Collection (1937–38), via the UCD digital library available online[16];
- Historic mapping available online, including Historic Ordnance Survey mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) to identify cultural heritage constraints within the study areas for each of the four route options; and
- Aerial imagery, including Google, and OSi Digital Globe.

Some archaeology, architectural heritage and cultural heritage constraints are entered separately on one or more datasets. Where constraints appear on more than one dataset these have been deconflicted to avoid double counting of constraints with its designation (or more significant designation) taking precedence as it affords the constraint legal protection. Where a constraint does appear on more than one dataset, this has been identified in Section 3 and Annex A (Inventory of Archaeology, Architectural Heritage and Cultural Heritage Constraints).

In addition to a review of sources of recorded archaeological and architectural features identified as part of the Environmental Constraints Report (321084AJ-REP-009), cultural heritage constraints within the study areas for each of the four route options were recorded, mapped and assessed through desk-based research using the sources identified above. Information from these sources has been incorporated into Section 3 and in the Inventory of Archaeology, Architectural Heritage and Cultural Heritage Constraints (Annex A). Additional cultural heritage sites identified from these sources are also described in Sections 3.1.3, 3.2.3, 3.3.3, and 3.4.3. Cultural heritage will be looked into in more detail, including verifying the results of the desk study through field survey, at a later stage of the Proposed Project.

A unique reference number was assigned to each constraint identified from the sources listed above. Archaeological constraints are prefixed with 'AY' and architectural heritage constraints are prefixed with 'AH'. Demesne lands are prefixed with 'DL' and undesignated cultural heritage sites are prefixed with 'CH'. Archaeological, architectural heritage and cultural heritage constraints are identified in the sections below and are also shown on the Figures in Annex B. Full details for the archaeology, architectural heritage and cultural heritage constraints identified are provided in Annex A (Inventory of Archaeology, Architectural Heritage and Cultural Heritage Constraints).

[15] https://www.logainm.ie/en/.
[16] https://digital.ucd.ie/.

3. Receiving Environment

This section presents baseline information for the archaeology, architectural heritage and cultural heritage constraints within the study areas for each of the four route options. Further details for the archaeology, architectural heritage and cultural heritage constraints identified within the study areas for each of the four route options are provided in Annex A (Inventory of Archaeology, Architectural Heritage and Cultural Heritage Constraints).

Evidence of prehistoric activity within the study areas for each of the four route options has been identified from the Neolithic period (c. 4000 – 2500 BC) onwards. A group of late Neolthic pits was excavated in Barberstown forming part of a multi-phase occupation site that also included a fulacht fiah (a horseshoe, or kidney, shaped mound of fire-cracked stone and charcoal-enriched soil around a sunken trough near a water supply, or in marshy areas) (Licence Number: 17E0282)[17]. Fulacht fiadh are amongst the most common site types in Ireland and primarily were used to heat water, likely for a variety of purposes including cooking, bathing, dyeing and metal working. While these typically date to the Bronze Age (c. 2500 – 600 BC) the example from Barberstown was dated to the Neolithic period of occupation of this site.[18] Further prehistoric activity includes sites in Dunboyne (AY_08), Pace (AY_13) and Bennetstown (AY_12) from which evidence for land reclamation, a possible seasonal dwelling and food storage structures, fulacht fiadh, and a rectangular house containing Late Bronze Age pottery was recovered[19][20]. A late Bronze Age habitation site, including a possible token cremation, was also identified in Ward Upper (AY_21). In addition, the Bronze Age is also evidenced by funerary monuments. While no dateable evidence was recovered, a mound barrow was excavated in Quarryland in proximity to the Tolka River (AY_06). Dating to the Bronze and Iron Ages (c. 2400 BC - AD 400), barrows comprise circular, or oval, earth mounds which may contain and/or cover burials. A ring ditch, the possible remains of a barrow, was also identified in Kingstown (AY_33) with a further example excavated off Malahide Road in Drinan (Licence Number: 04E1066).[21]

The early medieval period (AD 500 – 1169) is characterised by domestic and religious sites. Ringforts, circular enclosures defined by one or more ditches and banks, were a common feature of early medieval rural settlement and contained a farmstead of one or more houses located within the enclosure. Examples of ringforts have been identified in Common, Shanganhill, Forrest Great and Cloghan (AY_29; a Recorded Monument, AY_32, AY_41 and AY_43; both Recorded Monuments). Medieval field systems have also been identified including in Dunboyne (AY_07)[22]. The early medieval period also saw the introduction of Christianity in Ireland. Ecclesiastical enclosures have been identified in Killeek and Saint Doolaghs (AY_35 and AY_50; both Recorded Monuments) and comprise large oval or circular areas defined by a bank and external fosse, or drystone wall, enclosing an early medieval church, or monastery, and its associated areas of domestic and industrial activities. The earliest upstanding structures within the study areas for each of the four route options comprise the remains of medieval church buildings including in Ward Lower, Cloghran and Saint Doolaghs.

The land within the study areas for the four route options appears to have been largely agricultural into the post-medieval period (1550 – present). Historic mapping shows the hinterland north of Dublin as largely agrarian with dispersed settlements, scattered farms, and country houses (Down Survey of Ireland, 1656 – 1658; Rocque, 1760) and the barony of Coolock, covering the area to the north of Dublin, was described as having '*soyle of said Barony is Generall good either for Corne or Cattle*' in the Civil Survey of 1654 – 1656 (Simington, 1945, p.167). The current field pattern largely reflects that depicted on historic Ordnance Survey mapping (1837-1842), such as near Woodland and Batterstown. Where the amalgamation of fields has occurred, the historic field pattern remains perceptible as cropmarks in some areas.

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17 https://excavations.ie/report/2017/Dublin/0029454/.
18 https://excavations.ie/report/2017/Dublin/0029454/.
19 https://excavations.ie/report/2005/Meath/0014235/.
20 https://excavations.ie/report/2006/Meath/0016306/.
21 https://excavations.ie/report/2004/Dublin/0011630/.
22 https://excavations.ie/report/2005/Meath/0014279/.

The settlements within the study areas for the four route options are largely linear villages and towns originally established along roads, such as Batterstown, Baskin and Kinsaley. While these linear settlements have been subject to more recent development, some of the historic character of the streetscape is still perceptible through extant public and domestic buildings including public houses, churches, and houses. Large country houses, including the principal buildings, as well as their associated ancillary buildings, gardens and grounds, and decorative structures were established from the 17th to the 19th centuries. These 'big houses' and demesnes punctuated the landscape up until the 20th century and, while some such as Belcamp (AH_12 and AH_13; assessed by the NIAH to be of Regional importance) have been demolished, other examples within the study areas for the four route options, including the late 18th century Wellfield House (AH_17; a Protected Structure), remain extant.

Later development largely comprises linear communications and urban expansion. For example, a branch of the Dublin and Meath Railway (CH_48), extending from Dublin to Navan, was opened in 1862 by the Midland Great Western Railway company and remained operational until 1954[23]. With the increase in vehicular travel in the 20th century a network of motorways was developed across Ireland including most recently the M3 motorway north of Dublin (1992 – 2010). Dublin Airport was built in the 1930s to replace the former military aerodrome in Collinstown; however, it was not until the latter half of the century the airport was expanded to accommodate the growth in domestic air travel.

3.1 Option A (Red)

3.1.1 Archaeology

A total of 24 archaeological constraints were identified within the study area for Option A (Red) (see Annex A and Figure B.1.1 in Annex B). These comprise:

- 15 Recorded Monuments; and
- Nine sites recorded on the SMR.

No National Monuments, sites with Preservation Orders placed on them, or sites on the RHM were identified within the study area for Option A (Red).

Recorded Monuments

A total of 15 Recorded Monuments are located within the study area for Option A (Red) (see Figure B.1.1 in Annex B). These comprise:

- The site of a castle (AY_25) of unknown date located approximately 37m to the north of Option A (Red). Located within Ward House GDL (DL_07), this constraint is described as '*the walls of an olde castle*'[24], forming part of a holding with other buildings including the ruins of an old church (AY_23). A ruined church is noted on historic mapping dating to 1760 and 1853[25, 26]; however, no castle is depicted, and no remains are visible on aerial imagery. The church (AY_23, also a Protected Structure; AH_06) and associated graveyard (AY_24) are located adjacent to the road (R121) immediately to the north-west of Option A (Red) and comprise a raised, oval walled graveyard enclosing the footings of a rectangular medieval parish church dedicated to St Brigid. The church remains perceptible as a low stone wall. The form of the graveyard reflects the oval depicted on historic mapping dating to 1760 with memorials dating to the 19th and 20th centuries located within the graveyard. In addition, a holy well (AY_22) is located to

23 https://www.railscot.co.uk/companies/D/Dublin_and_Meath_Railway/
24 https://www.irishmanuscripts.ie/digital/The%20Civil%20Survey%20AD%201654-56%20Vol%20VII%20County%20of%20Dublin/The%20Civil%20Survey%20AD%201654-56%20Vol%20VII%20County%20of%20Dublin.pdf.
25 http://www.dublinhistoricmaps.ie/maps/1600-1799/index.html.
26 https://iiif.lib.harvard.edu/manifests/view/ids:10653105.

the south-west of the site of the church and comprises a formerly open water feature depicted on historic mapping as the '*Church Well*' in the center of a field with a track leading from the road (Ordnance Survey 25", 1888-1913). The well is not visible on aerial imagery.

- Another church (AY_44) and graveyard (AY_45), also Protected Structures (AH_09), located approximately 80m to the south of Option A (Red) and comprise a sub-rectangular walled graveyard built on an outcrop of rock enclosing the foundations of an early medieval building and the remains of a later (18th century) church. The graveyard contains 18th to 20th century memorials and vaults. 'Cloghran Church' is depicted in proximity to a quarry and lead mine on First Edition Ordnance Survey mapping (1837 – 1842) which formed the steep slopes on the eastern and northern boundaries. The graveyard and church are located on an elevated position, immediately to the north of Old Stockhole Lane and south-east of a commercial premises.
- A further graveyard (AY_30), located to the north of Option A (Red). This graveyard comprises '*Kits Green supposed site of old fort or Burying place*' depicted on First Edition Ordnance Survey mapping (1837 – 1842). Historic mapping dating to 1760 depicts this area as agricultural and the area currently comprises a large open pasture field. An enclosure (AY_29) shown as an oval enclosure adjacent to the R122 on historic mapping (First Edition Ordnance Survey mapping;1837 – 1842), is located nearby. The earthwork, interpreted as a ringfort, is not depicted on later mapping (Ordnance Survey 25", 1888-1913), and this location has subsequently been developed for a house. Archaeological testing in advance of the development did not identify any features of archaeological significance or relating to these constraints.[27] While the location of AY_29 has been developed, it is recorded on the RMP and has therefore been included as a constraint.
- Two additional ringforts were also identified within the study area for Option A (Red) (AY_41 and AY_43). The former comprises a large circular earthwork depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within an arable field to the north of the R108. The site has been interpreted as a platform-type ringfort with a waterlogged external fosse (ditch). The latter comprises a '*fort*' depicted on First Edition Ordnance Survey mapping (1837 – 1842) and has since been redeveloped as part of Dublin Airport. As with AY_29, while the location of AY_43 has been developed, it is recorded on the RMP and has therefore been included as a constraint.
- An ephemeral cropmark of a possible circular enclosure (AY_18) is located approximately 35m to the south of Option A (Red) in Ballintry. While not depicted on historic mapping, aerial imagery shows a faint circular feature in a field adjacent to the road[28]. A further enclosure (AY_61) depicted on First Edition Ordnance Survey mapping (1837 – 1842), measures approximately 35m in diameter. This constraint is located within the Belcamp off-road focus area in a relatively flat pasture field north of Middletown House; however, no features are visible on aerial imagery in this location.
- An earthen mound (AY_47) is located within the Belcamp off-road focus area. This constraint is not depicted on historic mapping or visible on aerial imagery.
- Two houses comprising:
    - a 16th/17th century dwelling (AY_42) owned by Lord Ranelagh and described as '*one faire stone house slated, with several offices houses, a stable, a Barne & Six tenants houses Thatcht wth a Pigeon house, slated… belonging to said house one orchanrd & garden plot; & a Grove of Ashtrees set for ornament*'. Historic mapping (1760) depicts a large house fronting the road, with ornamental grounds laid out to the north; however, later mapping (First Edition Ordnance Survey mapping; 1837 – 1842) shows this area to be agricultural fields with '*Forrest Ho. (in Ruins)*' noted near the road. The area has since been developed as a commercial premises; and
    - an 18th/19th century house (AY_27) included in the Down Survey (1655-6) as 'Fayre House' may correspond with Newpark House shown on historic mapping (1760) south of Newpark Road (R121) with associated grounds and ancillary buildings. 'Newpark House' is depicted on later

[27] https://excavations.ie/report/1999/Dublin/0004056/.
[28] https://www.cambridgeairphotos.com/location/bdk006/.

mapping (First Edition Ordnance Survey mapping; 1837 – 1842); however, the buildings appear in a different layout. This location has been redeveloped into a commercial premises.

Sites on the Sites and Monuments Record

A total of nine sites recorded on the SMR have been identified within the study area for Option A (Red). These are the locations of domestic and agricultural activity, including a medieval field system. The sites recorded on the SMR within the study area for Option A (Red) are included in Table 3.1 and are shown on Figure B.1.1 in Annex B.

Eleven further sites recorded on the SMR have not been included in Table 3.1. These comprise the sites excavations in advance of development including the Dunboyne Bypass (AY_08, AY_09, AY_11, AY_12 and AY_60), the M3 Motorway (AY_13, AY_14, AY_15, AY_16 and AY_17), and the N2 Motorway (AY_21). While these sites provide an indication of possible activity in these locations, given these sites have been removed and developed, they are no longer constraints.

Table 3.1: Sites recorded on the SMR within the study area for Option A (Red)

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
AY_07	ME050-030	A probable medieval field system, bisected by Option A (Red), identified from aerial imagery with a ditch that corresponds with a boundary on the Down Survey (1656-8). The fields comprise large regular parcels, with boundaries that run parallel to the current boundaries. This area was subject to geophysical survey which confirmed the presence of the ditches. Subsequent archaeological investigations in advance of the Dunoyne Bypass identified ditches, drainage containing post-medieval and modern ceramics, and a prehistoric structure (ME050-062001) with a possible associated kiln (ME050-062002). Linear cropmarks are visible in fields adjacent to the R157, including a possible trackway and field boundaries.	Dunboyne	700971 / 743204
AY_19	ME051-017	A circular cropmark, measuring approximately 30m in diameter in Nuttstown, approximately 75m to the north of Option A (Red), interpreted as an enclosure. The enclosure is located within an arable field to the north of Kilbride Road.	Nuttstown	705085 / 745365
AY_28	DU011-156	A circular cropmark, measuring approximately 30m in diameter in Common, approximately 45m to the north of Option A (Red), interpreted as an enclosure. While not depicted on historic mapping, this enclosure may correspond with the 'fort' identified on First Edition Ordnance Survey mapping (1837 – 1842). A circular feature is vaguely perceptible on aerial imagery in a pasture field to the north of the R121.	Common	712145 / 745847
AY_31	DU011-124	A large circular cropmark in Ballystrahan approximately 33m to the south-west of Option A (Red), interpreted as an enclosure, as well as a possible associated field system (DU011-125). The circular enclosure is visible on aerial imagery in an arable field, south-west of the R122, along with a number of linear features in the surrounding fields.	Ballystrahan	712641 / 745143

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
AY_46	DU014-111	An irregular shaped enclosure identified from aerial imagery with a possible associated field system. No corresponding features on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842 and Ordnance Survey 25", 1888-1913). Located in a relatively flat, arable field to the east of the M1 motorway within the Belcamp off-road focus area.	Stockhole	718714 / 743074
AY_48	DU015-120	A circular cropmark in Baskin in the Belcamp off-road focus area, interpreted as an enclosure. This site is located at the southern extent of a large gently sloping arable field, south of Baskin Lane. The enclosure is bisected by an extant field boundary (ditch).	Baskin	718994 / 742902
AY_57	DU014-112	A possible field system identified from aerial imagery within a relatively flat, arable field to the east of the M1 motorway within the Belcamp off-road focus area. One of the cropmarks may correspond with a field boundary depicted on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842). A possible associated enclosure (AY_46) is located in the same field.	Stockhole	718668 / 743064
AY_58	DU015-146	A sub-circular enclosure identified from aerial imagery within the Belcamp off-road focus area comprising a ditch, measuring approximately 27m – 35m across, with possible palisade trenches to the south. No evidence of an entrance was identified, and the enclosure is not depicted on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842 and Ordnance Survey 25", 1888-1913). A second enclosure is located in a field to the east (AY_59).	Middletown	719233 / 742338
AY_59	DU015-145	A circular enclosure located in a large arable field within the Belcamp off-road focus area, measuring approximately 42m in diameter. The enclosure is not depicted on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842 and Ordnance Survey 25", 1888-1913).	Middletown	719570 / 742282

Archaeological Potential

Previous archaeological excavations within the study area for Option A (Red) have identified evidence of human activity dating from the prehistoric period onward (see Section 3.1.3). While modern development, such as the M3 motorway, M3 Junction 5, and M3 Parkway Railway Station, may have removed or truncated any archaeological remains that may have been present in these areas, there is the potential for previously unknown archaeological remains to be present, particularly in greenfield areas, including within the Batterstown South off-road focus area, Dunboyne / Avoca / Bracetown off-road focus area, Belgree East off-road focus area and Belcamp off-road focus area. In addition, there is the potential for previously unknown archaeological remains associated with known archaeological constraints to be present, for example within the Zones of Notification of Recorded Monuments.

While the online sections of Option A (Red) follow the existing local and regional roads, the construction of which may have removed or truncated any previously unknown archaeological remains that may have been present, there is the potential for previously unknown archaeological remains to survive, albeit lower than in less developed areas. In addition, some sections of Option A (Red) are located within pre-1840 roadways, including the R156 and the road from the M3 to Kilbride, the R121, and the road from Common to Kingstown, and there is the potential for the presence of historic road surfaces in these locations.

Option A (Red) crosses the Pinkeen River and Ward River as well as a number of minor watercourses. There is the potential for votive offerings, objects apparently deposited for religious reasons, in rivers. The underlying geology is largely limestone with calcareous shale with superficial deposits of gravel, alluvium, till and pockets of outcropping bedrock[29]. In areas of alluvium there is the potential for previously unknown archaeological remains, including paleoenvironmental and organic materials, to be preserved.

3.1.2 Architectural Heritage

A total of 23 architectural heritage constraints were identified within the study area for Option A (Red). These comprise:

- Four Protected Structures (see Figure B.1.2 in Annex B);
- Three structure included on the NIAH (see Figure B.1.2 in Annex B), assessed by the NIAH to be of Regional importance; and
- 16 GDLs (see Figure B.1.3 in Annex B).

No ACAs have been identified within the study area for Option A (Red).

Record of Protected Structures

A total of four Protected Structures comprising churches and their associated graveyards (AH_06 and AH_09), a stone well (AH_10), and a county house (AH_22) have been identified within the study area for Option A (Red) (see Figure B.1.2 in Annex B).

The two churches comprising AH_06, the remains of a medieval parish church within a walled graveyard and AH_09, the site of 'Cloghran Church;' an early medieval church within enclosed graveyard are also Recorded Monuments (AY_22, AY_23, AY_44 and AY_45; see descriptions above) and have been described under Recorded Monuments (Section 3.1.1).

AH_10 is located on the alignment of Option A (Red), on the edge of Lime Park GDL (DL_13), and comprises an enclosed stone well, located north of Stockhole Lane. The well is described as being at the base of a set of steps beneath a tree[30] in Cloghran. The well is not depicted on First Edition Ordnance Survey mapping (1837 – 1842); however, is shown on later mapping (Ordnance Survey 25", 1888-1913) to the north-east of 'Lime Park' at the end of a trackway at the corner of a pair of field boundaries. The location of the well is obscured from the road by vegetation.

AH_22 is a late 18th or early 19th century house, with a 19th century gate lodge (AH_05) and other associated outbuildings within its demesne (DL_05). The house is depicted on First Edition Ordnance Survey mapping (1837 – 1842) as 'Hollywoodrath' and comprises a two-storey, L-shaped plan central block with single-storey portico, flanked by gabled projecting end bays. The house is located in the Belgree East off-road focus area within established grounds.

[29] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228.
[30] https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf.

National Inventory of Architectural Heritage

Located 40m to the south of Option A (Red), a 19th century house included on the NIAH is located within the Belcamp off-road focus area and comprises a country house (AH_12 and AH_13) assessed by the NIAH to be of Regional importance. Belcamp House was located within Belcamp GDL (DL_17) and comprised a detached three-bay, two-storey country house, built in c.1840; however, the house has been demolished. While the house is no longer extant, there is the potential for archaeological remains associated with the house, including the building's foundations and basements, to remain.

Hollywoodrath (AH_05) in Hollywood, is located within the Belgree East off-road focus area. This building comprises a single-storey, early 19th century gate lodge with a projecting central entrance porch and a 20th century extension to the east. The gate lodge is depicted on historic mapping (Ordnance Survey 25", 1888-1913) at the southern entrance to 'Hollywoodrath' (DL_05) on the tree-lined driveway leading to the main house (AH_22). The gate lodge is positioned within an established tree-lined plot, behind a low stone boundary wall with cast-iron railings with a pair of ashlar gate piers and iron gates to the west.

Gardens and Designed Landscapes

A total of 16 GDLs have been identified within the study area for Option A (Red). Of these nine were recorded by the Survey of Historic Gardens and Designed Landscapes and seven have been identified from historic mapping (Ordnance Survey 6", 1837 – 1842). Information on these GDLs is summarised in Table 3.2 and are shown on Figure B.1.3 in Annex B).

Table 3.2: GDLs identified within the study area for Option A (Red)

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_04	Priest Town House	The GDL to Priest Town House, including principal house and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Retains elements of parkland and woodland, as well as original driveways and entrances. Boundary along Belgree Lane formed of hedgerows and 'Crockanee' woodland.	Priest Town	NIAH 5156	Survey of Historic Gardens and Designed Landscapes
DL_05	Hollywoodrath	The GDL to Hollywoodrath, including principal building as well as garden and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842; Ordnance Survey 25", 1888-1913). While there has been development within the footprint of the site, including the golf course to the west, a section of roadside rubblestone boundary wall remains extant to the south of the site along the road that bisects the demesne.	Hollystown; Hollywood; Hollywoodrath; Spricklestown	NIAH 2267	Survey of Historic Gardens and Designed Landscapes
DL_06	Irishtown House	The GDL to Irishtown House. The principal building appears to have been demolished and the boundary and associated buildings and features depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) are no longer present. A plot of modern houses has been built at the southern extent.	Irishtown	NIAH 2270	Survey of Historic Gardens and Designed Landscapes
DL_07	Ward House	Demesne identified from historic mapping as 'Ward House' (Ordnance Survey 6", 1837 – 1842) located on the crossroads between the R135 and R121. The principal house appears to have been demolished and the area redeveloped, including a new high roadside boundary wall.	Ward Lower	N/A	Ordnance Survey 6", 1837 – 1842
DL_08	Newpark House	Demesne identified from historic mapping as 'Newpark House' (Ordnance Survey 6", 1837 – 1842) located to the south of the R121. The area appears to have been redeveloped as a commercial complex, including a concrete block boundary wall.	Newpark	N/A	Ordnance Survey 6", 1837 – 1842
DL_09	Kingstown House	Demesne identified from historic mapping as 'Kingstown House' (Ordnance Survey 6", 1837 – 1842). The boundaries of the demesne reflect those depicted on historic mapping (Ordnance Survey 6", 1837 – 1842); however, the buildings appear to have been removed and, while the driveway is still perceptible, the entrance has been replaced by a modern field gate. Boundary features along Kilreesk Road include a ditch and established boundary (trees and hedgerow), as well as a modern post and rail fence.	Kingstown	N/A	Ordnance Survey 6", 1837 – 1842
DL_11	Castle Mount	The GDL to Castle Mount. The principal building remains extant (RPS 611); however, the area has been developed. The boundary depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) is vaguely perceptible in places as hedgerows. The boundary on the R132 appears to have been replaced with a new wall.	Cloghran	NIAH 5726	Survey of Historic Gardens and Designed Landscapes

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_13	Limepark	Demesne identified from historic mapping as 'Limepark' (Ordnance Survey 6", 1837 – 1842). The principal building appears to have been demolished and the majority of the boundaries depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) are no longer present apart from sections of hedgerow. The demesne is bisected by Stockhole Lane.	Cloghran	N/A	Ordnance Survey 6", 1837 – 1842
DL_14	Woodlands	The GDL to Woodlands. While there has been some development to the north (R139 and roundabout), the footprint of this site and features within it, including the drive, trees and parkland remain perceptible. The principal building remains extant and appears to be on the site of an earlier dwelling. A belt of trees form the northern boundary along the R139.	Clonshagh	NIAH 2435	Survey of Historic Gardens and Designed Landscapes
DL_15	Upper Middletown	Demesne identified from historic mapping as 'Upper Middletown' (Ordnance Survey 6", 1837 – 1842). The principal building is no longer extant, along with the driveway and 'Turret' depicted on historic mapping, and the location of the gate lodge to the east of Stockhole Lane has been redeveloped as modern dwellings. The boundary of the demesne remains extant as established hedgerows with sub-divisions visible as cropmarks on aerial imagery and extant as a hedgerow / ditch.	Middletown	N/A	Ordnance Survey 6", 1837 – 1842
DL_16	Glebe House	Demesne identified from historic mapping as 'Glebe House' (Ordnance Survey 6", 1837 – 1842), located to the east of Stockhole Lane. While the principal building appears to have been replaced with modern dwellings, the boundary and sub-divisions of the demesne reflect those depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Boundaries comprise established hedgerows, including trees, some of which have modern fence running parallel.	Glebe	N/A	Ordnance Survey 6", 1837 – 1842
DL_17	Belcamp	The GDL to Belcamp. The principal building (NIAH 11349005) and ancillary buildings appears to have been demolished. The footprint is vaguely perceptible on aerial imagery and features depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), such as the bridge, weir and gardens are perceptible.	Belcamp	NIAH 2455	Survey of Historic Gardens and Designed Landscapes
DL_18	Baskin Hill	The GDL to Baskin Hill. The boundary along Baskin Lane appears to have been replaced with a modern post and rail fence. The entrance comprises a set of modern rubblestone and brick entrance walls with iron gates with a drive to Baskin Hall that corresponds with the drive on historic mapping (Ordnance Survey 6", 1837 – 1842).	Baskin	NIAH 2456	Survey of Historic Gardens and Designed Landscapes
DL_19	Woodpark	The GDL to Woodpark. While the Woodpark Stud Farm has been built on the site of the principal building, features including the boundary, entrances and drives remain perceptible. The eastern boundary of this GDL along Pace comprises a low rubble stone wall with irregular copes and a mature trees.	Woodpark	NIAH 5219	Survey of Historic Gardens and Designed Landscapes

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_26	Lower Middleton	Demesne identified from historic mapping as 'Lower Middletown' (Ordnance Survey 6", 1837 – 1842). The principal building along with associated agricultural ranges remain extant in the northern corner of the demesne. The access from the west remains the same. From aerial imagery the boundary of the demesne appears to have been removed.	Middletown	N/A	Ordnance Survey 6", 1837 – 1842
DL_27	Spring Hill	The GDL to Spring Hill. The footprint remains legible and the principal and associated buildings remain extant. Boundaries comprise established trees and hedgerows, surrounding parkland (now arable farmland).	Burgage	NIAH 2477	Survey of Historic Gardens and Designed Landscapes

3.1.3 Cultural Heritage

A total of 26 cultural heritage sites have been identified within the study area for Option A (Red) from the sources identified in Section 2. These comprise post-medieval built heritage including stone road bridges, houses and farm buildings. Summary information on these cultural heritage sites is presented in Table 3.3 and are shown on Figure B.1.4 in Annex B).

Table 3.3: Cultural heritage sites identified within the study area for Option A (Red)

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_01	694857 / 745004	Blackhall Big	Roadside house	An 'L'-shaped, single storey roadside cottage depicted on historic mapping (Ordnance Survey 25", 1888-1913). Located within a walled (low coursed, squared stone) plot, set at an angle with the road (R156). Views are over the R156 towards the fields to the north.
CH_04	696348 / 744292	Staffordstown Little	Roadside house	A single storey house depicted on historic mapping (Ordnance Survey 25", 1888-1913) positioned perpendicular to the road (R156), approximately 12m to the south of Option A (Red). Comprises a rendered structure with tile roof and central stack, with a high walled garden / yard to the south. Appears abandoned and plot is overgrown (Google StreetView, June 2021).
CH_12	702502 / 744660	Ballymagillin	Courtyard farm	Rendered stone farm buildings in courtyard plan depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913). Single and two-storey ranges with some modern additions. Views are internal across the farmyard with views out limited by a high stone wall. The farm is positioned immediately to the north of the L5026.
CH_13	702660 / 744657	Whitesland	House	A (much altered) roughly coursed rubble stone house depicted on historic mapping (Ordnance Survey 25", 1888-1913). Located within a low stone walled garden, perpendicular to the road (L5026) with views outward filtered by the surrounding grounds.
CH_14	703920 / 745061	Nuttstown	Road Bridge	A stone road bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), with low coursed rubblestone parapets and squared ends. The parapets appear to have been repaired / extended (Google StreetView, June 2021). Carries the road through Nuttstown across an unnamed watercourse.
CH_15	705608 / 745439	Belgree	Road Bridge	A refurbished stone road bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), with low coursed rubblestone parapets with squared ends and horizontal copes. Carries the road across the Ward River.
CH_16	706594 / 745764	Belgree	Road Bridge	A partially refurbished rubble stone bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) comprising parallel low coursed parapets with vertical copes. Carries the Kilbride Road over a minor watercourse.
CH_19	708295 / 743234	Hollywood	Police Barracks	A 'police barracks' depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Comprises a two-storey rectangular plan building, now ruinous (Google StreetView, July 2021) within a walled plot with an entrance to the north. Positioned immediately adjacent to the R121, within the Belgree East off-road focus area, views outwards are obscured by established vegetation.
CH_24	710160 / 745108	Ward Upper	House	'Six Mile House' depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), comprising a single storey, brick and rendered roadside house with slate roof and gable stack, located approximately 35m to the south of Option A (Red). The house is located on the junction between the R121 and the R135. Views out are limited by hedges, a wall, and outbuildings; however, to the north and east views are across the roundabout and roads.
CH_25	710338 / 745269	Newpark	Agricultural ranges	A group of one and two-storey stone and brick agricultural buildings, forming a courtyard, depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913). Positioned north of the R121, views are largely internal, across the farmyard, with views out limited by a wall.

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_29	712626 / 745191	Ballystrahan	House	A single storey house depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913). Farm buildings, some of which are depicted on later mapping (Ordnance Survey 25", 1888-1913) are located to the south and west. The house is located adjacent to R122 behind a low rendered boundary wall.
CH_30	718730 / 741985	Clonshaugh	Farm	A two-storey, roadside farmhouse with agricultural ranges depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Modern single-storey porch to east, and a single storey extension to the south (Google StreetView, January 2022). Located within the Belcamp off-road focus area the house is set back from Clonshaugh Road in a low walled garden, with views across the road, towards the fields beyond.
CH_31	718755 / 742792	Stockhole	Ford	The location of a ford depicted on First Edition Ordnance Survey mapping (1837 – 1842) on the road through Stockhole within the Belcamp off-road focus area. Later mapping (Ordnance Survey 25", 1888-1913) shows the location of the ford with the road also crossing an unnamed watercourse.
CH_32	718916 / 741898	Clonshaugh	Field system	Network of linear cropmarks visible on aerial imagery that correspond with field boundaries on historic mapping (Ordnance Survey 6", 1837 – 1842) within the Belcamp off-road focus area.
CH_33	718928 / 743480	Cloghran	Farm	A courtyard farm depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) comprising 'L'-shaped range and farmhouse, with modern agricultural buildings forming part of the complex. The farm is set back from Stockhole Lane, within the Belcamp off-road focus area, at the end of a drive within large rectangular fields, with views largely internal across the farmyard.
CH_34	718996 / 742340	Middletown	Farm (Site of)	The site of a farm depicted on historic mapping as 'Upper Middletown' (Ordnance Survey 6", 1837 – 1842) within the Belcamp off-road focus area. While the farm buildings have been demolished, earthwork remains are visible on aerial imagery.
CH_35	719145 / 743156	Baskin	Farm	A cluster of agricultural ranges depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) on Baskin Lane within the Belcamp off-road focus area. One rendered stone range with corrugated roof remains extant with a modern house and agricultural buildings nearby.
CH_41	694713 / 746280	Culcommon	Road Bridge	The western coursed, rubble stone parapet of a road bridge or culvert carrying a single lane carriageway over a small watercourse, within the Batterstown South off-road focus area, depicted on historic mapping (Ordnance Survey 6", 1837 – 1842).
CH_42	694977 / 746856	Ribstown	House	A single storey, brick and rendered roadside cottage depicted on historic mapping (Ordnance Survey 25", 1888-1913), located within the Batterstown South off-road focus area. Set within a rectangular plot bounded by established hedges. Views are south-east, across the road, towards modern properties.
CH_51	707212 / 744554	Court	Enclosure	A square enclosure with associated linear features identified from aerial imagery (GoogleEarth, Sept 2003), within the Belgree East off-road focus area. A field system recorded on the SMR (ME051-005) is located in this field.
CH_52	708438 / 744235	Irishtown	House	A rectangular roadside building depicted on First Edition Ordnance Survey mapping (1837 – 1842), later mapping shows the building an extension to the north and a projecting porch. Depicted as roofless on modern mapping, the building is adjacent to a local road in an overgrown area within the Belgree East off-road focus area.

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_53	708417 / 743907	Gallanstown	Quarry	A quarry depicted on First Edition Ordnance Survey mapping (1837 – 1842), also shown on later mapping (Ordnance Survey 25", 1888-1913). Located in an arable field to the west of a local road within the Belgree East off-road focus area.
CH_54	718534 / 742284	Stockhole	House	'Edendale' depicted on First Edition Ordnance Survey mapping (1837 – 1842) within its demesne (DL_15), comprising the principal building as well as a long range to the west and gate lodge to the east, adjacent to Stockhole Lane within the Belcamp off-road focus area. The house and lodge are no longer extant.
CH_55	719445 / 742897	Baskin	House	'Baskin Hall' depicted on First Edition Ordnance Survey mapping (1837 – 1842) with a farm to the south-west and gate lodge to the north at the junction between the drive and Baskin Lane within the Belcamp off-road focus area. Positioned within its demesne DL_18. Views from the house are limited to the north by an established boundary and to the west by modern agricultural buildings.
CH_56	719498 / 742412	Middleton	Farm	'Lower Middletown' depicted on First Edition Ordnance Survey mapping (1837 – 1842) as a cluster of buildings, later mapping (Ordnance Survey 25", 1888-1913) also identifies a lodge to the south of the group. Located within pasture fields, within the Belcamp off-road focus area, with views obscured by established hedgerows and buildings.
CH_57	719293 / 742270	Middleton	Enclosures	A series of cropmarks identified from aerial imagery (GoogleEarth, June 2018), located within the Belcamp off-road focus area, including two circular enclosures and a network of linear features interpreted as field boundaries (some of which correspond with field boundaries on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842), and Ordnance Survey 25", 1888-1913).

Previous Excavations

A review of Excavations Bulletin and TII's Archaeological Excavation Reports identified the following archaeological excavations in the Option A (Red) study area:

- Archaeological testing for the M3 Clonee to North of Kells motorway (Licence Numbers: A017/003, E3025, 04E0488, A017/004., E3026, A017/005, E3027, and A017/012) identified three sites in Bennetstown including a spread of heat-fractures stone and charcoal, another burnt spread, and a group of pits and postholes, some of which formed a possible semicircular structure. Further archaeological excavation for the M3 Clonee to North of Kells motorway in Dunboyne (Licence number: A017/009) identified evidence of late Bronze Age activity, including an oval enclosure, a possible kiln, and further pits, postholes and stakeholes. Archaeological excavation for the M3 Clonee to North of Kells motorway (Licence Numbers: E3027, E3024 and E3026) also identified postholes, some of which were interpreted as the remains of possible structures, a clay-lined, keyhole-shaped kiln and several pits, and burnt mound. Sherds of Middle or Late Bronze Age pottery were recovered from one of the postholes. Archaeological excavations also identified a prehistoric settlement comprising a circular structure, with associated pits and hearths, truncated by a medieval field system (Licence Number: A017/012).
- Archaeological excavation in Pace (Licence Number: A017/010) identified the remains of a group of early modern farm buildings including a cobbled courtyard and brick-lined hearth.
- Archaeological excavation in advance of the North Runway development at Dublin airport (Licence Number: 17E0090) in Barberstown identified the remains of an earth-cut early medieval kiln and a ditch which contained fragments of iron knives and sherds of 12th – 13th century pottery. In addition, and an oval bivallate enclosure previously identified through geophysical survey undertaken for the North Runway development at Dublin airport was confirmed through archaeological testing, along with a number of other features including pits and structural slot trenches (Licence Number: 19E0006). Archaeological testing (Licence Number: 17E0282) also identified multi-phase occupation evidence including fulacht fiah, late Neolithic pits, and a medieval field system.
- Monitoring for the Airport-Balbriggan Bypass (Licence Number: 00E0950) identified an isolated area of charcoal-rich soil, interpreted as a possible ploughed out pit of unknown date.
- Archaeological excavations in advance of the N2 Finglas- Ashbourne realignment (Licence Number: 03E1358) in Ward Upper identified a small pit or token cremation, as well as a pit containing a large amount of prehistoric pottery.
- Archaeological testing in advance of development in Clonshagh (Licence Number: 13E0355) identified a ditch associated with a potential enclosure and two oval features interpreted as a possible kiln.

A further 14 archaeological excavations were also identified (under Licence numbers: 02E1388, 08E0988, 99E0693, 15E0572, 18E0722, 98E0479, 00E0951, A017/011, 16E0335, 17E0091, 04E0381, 08E0333, 13E0464, and 04E0557); however, these did not identify any archaeological remains or deposits of archaeological significance.

A review of the National Museum Topographical Finds available online identified no casual finds within the study area for Option A (Red).

3.2 Option B (Green)

3.2.1 Archaeology

A total of 25 archaeological constraints were identified within the study area for Option B (Green) (see Annex A and see Figure B.1.1 in Annex B). These comprise:

- 15 Recorded Monuments; and
- Ten sites recorded on the SMR.

No National Monuments, sites with Preservation Orders placed on them, or sites on the RHM were identified within the study area for Option B (Green).

Recorded Monuments

A total of 15 Recorded Monuments are located within the study area for Option B (Green) (see Figure B.1.1 in Annex B) comprising:

- The site of a medieval church (AY_02) in Ballymaglassan, approximately 100m to the west of Option B (Green). The church is noted in early 14th century ecclesiastical documentation and is later described in the early 17th century as being in '*reasonable repair*'. Later 17th century mapping depicts the church in ruins (Down, 1656-1658), and First Edition Ordnance Survey mapping (1837 – 1842) identifies the '*Site of Old Church*' to the south of a new church - Saint Keiran's Church of Ireland Church (AH_01; see below). The site of the medieval church is within an enclosed graveyard (AY_01; see below); however, the contemporary graveyard may not have been enclosed. The site of the church is located within Ballymaglassan House GDL (DL_01) on a rise in the landscape; however, views beyond the immediate surroundings are limited by established belts of trees in all directions.
- A mound (AY_03), located within the Batterstown North off-road focus area, comprising a small circular grass-covered earthwork measuring approximately 16m by 9m in diameter at its base. The mound is depicted on First Edition Ordnance Survey mapping (1837 – 1842) as '*Lismahon Moat*'; however, is not visible from the L2215 to the west. A further earthwork (AY_20) is located approximately 74m to the north-west of Option B (Green) in Priest Town. Depicted as '*Kilbride Moat*' on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842 and Ordnance Survey 25", 1888-1913), no earthworks are visible on aerial imagery and the location appears to have been developed. The 'Moate field' in Priest Town is reportedly where Cromwell set up his guns to destroy the local church that was located in the current graveyard.[31]
- The site of a holy tree or bush (AY_04) located within the Batterstown North off-road focus area on the L2215 in Lismahon. A '*Monument Bush*' is depicted on First Edition Ordnance Survey mapping (1837 – 1842), with later mapping showing '*Monument Bush (Site of)*' (Ordnance Survey 25", 1888-1913). Tradition notes funerals were carried in procession around the big tree in Rathregan and the Monument Bush, and that mass was celebrated at the bush during Penal Times[32]. An account from the Schools' Collection (1937–38) records road workers recovering two human skulls from this location in the 1930s, these were believed to be the remains of Irish soldiers who were hanged in this location while retreating from the Battle of Tara (AD 980)[33]. No evidence remains of the holy bush; however, the road in this location appears slightly wider.
- An inn (AY_26), possibly dating to the 18th century, located within 20m of Option B (Green) fronting the R135. Depicted on First Edition Ordnance Survey mapping (1837 – 1842) as '*Carman's stage*', the

[31] https://www.duchas.ie/en/cbes/5008922/4966794/5107868?ChapterID=5008922.
[32] https://www.duchas.ie/en/cbes/5008916/4966444/5106937?ChapterID=5008916.
[33] https://www.duchas.ie/en/cbes/5008921/4966731/5107671.

roadside inn is also shown on later mapping (Ordnance Survey 25", 1888-1913) as the '*White House (P.H.)*'. The inn, a two-storey, white rendered structure, appears to have been extended a number of times, including a circular addition to the northern gable, and a number of modern ancillary buildings and a large carpark to the north-east have also been added. Views are across the R135 towards the agricultural fields to the west.

- A moated site (AY_62) is located within the Batterstown North off-road focus area in Portan. This site comprises a rectangular grass-covered area measuring approximately 24m by 19m and is defined by an earthen bank. An outer fosse or moat is noted on three sides. The moated site is depicted on historic Ordnance Survey mapping (Ordnance Survey 25", 1888-1913) as three sides of a rectangular earthwork and a square cropmark is visible in this location, in a pasture field, in this location.
- A field system (AY_63) of unknown date, comprising a small circular enclosure, platforms, drainage channels and two small ponds were identified, is located within the Batterstown North off-road focus area in Portan. Depicted on First Edition Ordnance Survey mapping (1837 – 1842) as a 'Fort', later mapping (Ordnance Survey 25", 1888-1913) shows a semi-circular earthwork. Archaeological testing in the area identified drainage features and the remains of lazy bed or cultivation furrow[34].
- A possible circular enclosure (AY_18) in Ballintry, is located approximately 35m to the south of Option B (Green), and a further enclosure (AY_61) is located within the Belcamp off-road focus area (see Section 3.1.1).
- Two ringforts (AY_41 and AY_43), approximately 40m to the north-west of Option B (Green) in Forrest Great and approximately 28m to the south of Option B (Green) in Cloghran respectively (see Section 3.1.1).
- The site of a 16th/17th century house (AY_42) approximately 65m to the north of Option B (Green) in Forrest Great (see Section 3.1.1).
- A church and its associated graveyard (AY_44 and AY_45) in Cloghran, approximately 14m to the south of Option B (Green) (see Section 3.1.1).
- A mound (AY_47) in Cloghran, is located within the Belcamp off-road focus area (see Section 3.1.1).

Sites on the Sites and Monuments Record

A total of ten sites recorded on the SMR have been identified within the study area for Option B (Green). These are the locations of domestic and religious activity. Information on these constraints is presented in Table 3.4 and they are shown on Figure B.1.1 in Annex B.

Ten further sites on the SMR have not been included in Table 3.4. These comprise the sites excavations in advance of development including the Dunboyne Bypass (AY_08, AY_09, AY_11, AY_12 and AY_60) and the M3 motorway (AY_13, AY_14, AY_15, AY_16 and AY_17). While these sites provide an indication of possible activity in these locations, given these sites have been removed and developed, they are no longer constraints.

Table 3.4: Sites recorded on the SMR within the study area for Option B (Green)

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
AY_01	ME050-002001	A 'D'-shaped graveyard defined by stone walls, approximately 67m to the west of Option B (Green). The graveyard encloses the site of a medieval church (AY_02; a Recorded Monument; see Section 3.2.1) and	Ballymaglassan	696087 / 745606

[34] https://excavations.ie/report/2021/Meath/0030717/.

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
		an 18th century church of Ireland church (AH_01). Memorials date from the late 18th to early 20th centuries. While located on a slight rise in the landscape, views are limited in all directions by established trees.		
AY_05	ME044-038	A medieval rectangular granite font, located in the grounds of the Roman Catholic church in Batterstown (AH_02) in the Batterstown North off-road focus area. The original location of the font is unknown.	Rathregan	697159 / 747637
AY_07	ME050-030	A probable medieval field system bisected by Option B (Green) (see Table 3.1 in Section 3.1.1).	Dunboyne	700971 / 743204
AY_19	ME051-017	A cropmark interpreted as a sub-circular enclosure, measuring approximately 30m in diameter, located approximately 75m to the north of Option B (Green). The enclosure comprises a single fosse (ditch) identified from aerial imagery. No corresponding features are depicted on historic mapping.	Nuttstown	705085 / 745365
AY_32	DU014-099	A cropmark comprising a single fosse (ditch) forming a curvilinear enclosure, located approximately 95m to the east of Option B (Green). Interpreted as a possible ploughed out ring fort. No corresponding features are depicted on historic mapping; however, cropmarks visible on aerial imagery correspond with the field pattern on First Edition Ordnance Survey mapping (1837 – 1842) mapping.	Shanganhill	712747 / 743085
AY_46	DU014-111	An enclosure identified from aerial imagery located in the Belcamp off-road focus area (see Table 3.1 in Section 3.1.1).	Stockhole	718714 / 743074
AY_48	DU015-120	An enclosure in the Belcamp off-road focus area (see Table 3.1 in Section 3.1.1).	Baskin	718994 / 742902
AY_57	DU014-112	A possible field system in the Belcamp off-road focus area (see Table 3.1 in Section 3.1.1).	Stockhole	718668 / 743064
AY_58	DU015-146	A sub-circular enclosure in the Belcamp off-road focus area (see Table 3.1 in Section 3.1.1).	Middletown	719233 / 742338
AY_59	DU015-145	A circular enclosure in the Belcamp off-road focus area (see Table 3.1 in Section 3.1.1).	Middletown	719570 / 742282

Archaeological Potential

Similar to Option A (Red), previous archaeological excavations in advance of development within the study area for Option B (Green) have identified evidence of human activity dating from the prehistoric period onward (see Section 3.2.3) and there is the potential for previously unknown archaeological remains to be present, particularly in greenfield areas, including within the Batterstown North off-road focus area, Dunboyne / Avoca / Bracetown off-road focus area and Belcamp off-road focus area. There is also the potential for previously unknown archaeological remains associated with known archaeological constraints to be present, for example within the Zones of Notification of Recorded Monuments.

Where Option B (Green) follows the existing local and regional roads, the potential for previously unknown archaeological remains is lower than in less developed areas. In addition, some sections of Option B (Green) are located within pre-1840 roadways, including the road from Lismahon to Blackhall Big, the road from the R147 to

Kilbride, the road through Kilbride to the M2 Motorway, the R135, and the road from the R135 to Dunsoghly and there is the potential for the presence of historic road surfaces in these locations.

Option B (Green) also crosses the Pinkeen River and Ward River as well as a number of minor watercourses. There is the potential for votive offerings, objects apparently deposited for religious reasons, in rivers. The underlying geology is largely limestone with conglomerate and calcareous shale with superficial deposits of tills and shales, limestone gravels, alluvium, and pockets of outcropping bedrock in Priest Town, Ward Lower, Coolatrath East, Broghan, Dunsoghly, Saint Margaret's, Barberstown, and Forrest Great[35]. In areas of alluvium there is the potential for previously unknown archaeological remains, including paleoenvironmental and organic materials, to be preserved.

3.2.2 Architectural Heritage

A total of 23 architectural heritage constraints were identified within the study area for Option B (Green). These comprise:

- Five Protected Structures (see Figure B.1.2 in Annex B);
- Three structures included on the NIAH (see Figure B.1.2 in Annex B), assessed by the NIAH to be of Regional importance; and
- 15 GDLs (see Figure B.1.3 in Annex B).

No ACAs have been identified within the study area for Option B (Green).

<u>Record of Protected Structures</u>

Five Protected Structures have been identified within the study area for Option B (Green). Protected Structures identified within the study area for Option B (Green) are shown on Figure B.1.2 in Annex B).

Batterstown Roman Catholic Church (AH_02), within the Batterstown North off-road focus area, comprises an early 19th century single cell church characteristic of its type in Ireland. While the church has been subject to later renovations, it retains original features including internal hood mouldings and rendered cherubs. The church is located within a walled graveyard adjacent to the R154, with established trees lining the northern and eastern boundaries.

Kilbride Catholic Church (AH_03), comprising a 20th century gabled granite hall with an octagonal bell turret and entrance gate and railings on the L1007. The church is located approximately 30m to the north of Option B (Green) within an enclosed churchyard. A 'R.C. Chapel' is depicted in this location just north of the 'Kilbride Cross Roads' on First Edition Ordnance Survey mapping (1837 – 1842) and 'St. Brigid's R.C. Church' is shown on later mapping (Ordnance Survey 25", 1888-1913); however, the present church replaced this building, opening in 1930. The church is situated in an elevated position within its surrounding grounds adjacent to the road through Priest Town, with a modern schoolhouse located to the north-east.

Located approximately 100m to the south of Option B (Green), the Former Cloghran Stud Farm (AH_11) comprises an early 19th century former Glebe House and entrance gates. The house is depicted on First Edition Ordnance Survey mapping (1837 – 1842) with associated buildings to the north-east; and later mapping (Ordnance Survey 25", 1888-1913), shows additional long stable ranges to the north-east. The house is enclosed by a rendered stone wall, with the entrance located to the south. Views out are limited by boundaries of established trees.

[35] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228.

The site of 'Cloghran Church' and graveyard (AH_09) and an enclosed stone well (AH_10) are also Protected Structures which are located within the study area for Option B (Green). AH_09 is also a Recorded Monument (see description above) and has been described under Recorded Monuments (see Section 3.2.1). AH_10 is described in Section 3.1.2.

National Inventory of Architectural Heritage

Three structures included on the NIAH have been identified within the study area for Option B (Green). These comprise a church (AH_01) and 19th century house (AH_12 and AH_13), assessed by the NIAH to be of Regional importance.

Saint Keiran's Church of Ireland Church (AH_01) in Ballymaglassan, assessed by the NIAH to be of Regional importance, is located approximately 100m to the west of Option B (Green). The church comprises an ashlar limestone structure with a three-stage castellated ad pinnacle tower set within a graveyard, bounded by a rendered stone wall, with grave markers and memorials.[36] Built in c.1800 with Board of First Fruits funds, the church is depicted on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842) near the '*Site of Old Church*' (AY_02; see above) and appears enclosed on later mapping (Ordnance Survey 25", 1888-1913). The church is located within Ballymaglassan House GDL (DL_01) within an area of well-established trees, with views in all directions limited.

In addition, Belcamp House (AH_12 and AH_13) in Belcamp, within the Belcamp off-road focus area, is also located within the study area for Option A (Red) (see Section 3.2.2).

Gardens and Designed Landscapes

A total of 15 GDLs have identified within the study area for Option B (Green). Of these nine were recorded by the Survey of Historic Gardens and Designed Landscapes and six have been identified from historic mapping (Ordnance Survey 6", 1837 – 1842). Information on these GDLs is summarised in Table 3.5 and are shown on Figure B.1.3 in Annex B).

[36] https://www.buildingsofireland.ie/buildings-search/building/14405002/saint-keirans-church-of-ireland-church-ballymaglassan-co-meath.

Table 3.5: GDLs identified within the study area for Option B (Green)

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_01	Ballymaglassan House	The GDL to Ballymaglassan House including the house and garden structures depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Some landscape elements have moved within the GDL, such as the driveway; however, areas of woodland and parkland remain extant. The stone entrance piers and gates are set back from the L2215. While the boundary, comprising a ditch and established line of trees and hedges remains, a modern post and rail fence and hedge runs along the road.	Ballymaglassan	NIAH 5699	Survey of Historic Gardens and Designed Landscapes
DL_02	Glebe	Demesne identified from historic mapping in Glebe (Ordnance Survey 6", 1837 – 1842) and on later mapping identified as 'Rathregan Rectory' (Ordnance Survey 25", 1888-1913). Located on the R154 in Batterstown. While the principal buildings remain extant, the driveway appears to have been realigned. Retains boundary features, including belts of woodland, as well as sections of the roughly coursed rubble stone boundary wall and a pair of squared gate piers on the R154.	Glebe	N/A	Ordnance Survey 6", 1837 – 1842
DL_03	Normans Grove House	The GDL to Normans Grove House. The principal building and associated buildings remain extant, and the layout of the grounds depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) remains perceptible. A belt of established woodland lines the road to the east of the house, and a low rubble stone boundary wall with vertical copes forms the boundary adjacent to the road.	Normansgrove	NIAH 5143	Survey of Historic Gardens and Designed Landscapes
DL_04	Priest Town House	The GDL to Priest Town House, including principal DL_05	Priest Town	NIAH 5156	Survey of Historic Gardens and Designed Landscapes
DL_07	Ward House	Demesne identified from historic mapping as 'Ward House' (Ordnance Survey 6", 1837 – 1842) located on the crossroads between the R135 and R121. The principal house appears to have been demolished and the area redeveloped, including a new high roadside boundary wall.	Ward Lower	N/A	Ordnance Survey 6", 1837 – 1842
DL_11	Castle Mount	The GDL to Castle Mount. The principal building remains extant (RPS 611); however, the area has been developed. The boundary depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) is vaguely perceptible in places as hedgerows. The boundary on the R132 appears to have been replaced with a new wall.	Cloghran	NIAH 5726	Survey of Historic Gardens and Designed Landscapes
DL_13	Limepark	Demesne identified from historic mapping as 'Limepark' (Ordnance Survey 6", 1837 – 1842). The principal building appears to have been demolished and the majority of the boundaries depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) are no longer present apart from sections of hedgerow. The demesne is bisected by Stockhole Lane.	Cloghran	N/A	Ordnance Survey 6", 1837 – 1842

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_14	Woodlands	The GDL to Woodlands. While there has been some development to the north (R139 and roundabout), the footprint of this site and features within it, including the drive, trees and parkland remain perceptible. The principal building remains extant and appears to be on the site of an earlier dwelling. A belt of trees form the northern boundary along the R139.	Clonshagh	NIAH 2435	Survey of Historic Gardens and Designed Landscapes
DL_15	Upper Middletown	Demesne identified from historic mapping as 'Upper Middletown' (Ordnance Survey 6", 1837 – 1842). The principal building is no longer extant, along with the driveway and 'Turret' depicted on historic mapping, and the location of the gate lodge to the east of Stockhole Lane has been redeveloped as modern dwellings. The boundary of the demesne remains extant as established hedgerows with sub-divisions visible as cropmarks on aerial imagery and extant as a hedgerow / ditch.	Middletown	N/A	Ordnance Survey 6", 1837 – 1842
DL_16	Glebe House	Demesne identified from historic mapping as 'Glebe House' (Ordnance Survey 6", 1837 – 1842), located to the east of Stockhole Lane. While the principal building appears to have been replaced with modern dwellings, the boundary and sub-divisions of the demesne reflect those depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Boundaries comprise established hedgerows, including trees, some of which have modern fence running parallel.	Glebe	N/A	Ordnance Survey 6", 1837 – 1842
DL_17	Belcamp	The GDL to Belcamp. The principal building (NIAH 11349005) and ancillary buildings appears to have been demolished. The footprint is vaguely perceptible on aerial imagery and features depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), such as the bridge, weir and gardens are perceptible.	Belcamp	NIAH 2455	Survey of Historic Gardens and Designed Landscapes
DL_18	Baskin Hill	The GDL to Baskin Hill. The boundary along Baskin Lane appears to have been replaced with a modern post and rail fence. The entrance comprises a set of modern rubblestone and brick entrance walls with iron gates with a drive to Baskin Hall that corresponds with the drive on historic mapping (Ordnance Survey 6", 1837 – 1842).	Baskin	NIAH 2456	Survey of Historic Gardens and Designed Landscapes
DL_19	Woodpark	The GDL to Woodpark. While the Woodpark Stud Farm has been built on the site of the principal building, features including the boundary, entrances and drives remain perceptible. The eastern boundary of this GDL along Pace comprises a low rubble stone wall with irregular copes and a mature trees.	Woodpark	NIAH 5219	Survey of Historic Gardens and Designed Landscapes
DL_26	Lower Middleton	Demesne identified from historic mapping as 'Lower Middletown' (Ordnance Survey 6", 1837 – 1842). The principal building along with associated agricultural ranges remain extant in the northern corner of the demesne. The access from the west remains the same. From aerial imagery the boundary of the demesne appears to have been removed.	Middletown	N/A	Ordnance Survey 6", 1837 – 1842

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_27	Spring Hill	The GDL to Spring Hill. The footprint remains legible and the principal and associated buildings remain extant. Boundaries comprise established trees and hedgerows, surrounding parkland (now arable farmland).	Burgage	NIAH 2477	Survey of Historic Gardens and Designed Landscapes

3.2.3 Cultural Heritage

A total of 34 cultural heritage sites have been identified within the study area for Option B (Green) from the sources identified in Section 2. These largely comprise post-medieval built heritage including houses, farm buildings and road bridges. Summary information on these cultural heritage sites is presented in Table 3.6 and are shown on Figure B.1.4 in Annex B).

Table 3.6: Cultural heritage sites identified within the study area for Option B (Green)

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_02	696285 / 746457	Lismahon	Farm	A 'U'-shaped layout farm depicted on First Edition Ordnance Survey mapping (1837 – 1842) with later mapping (Ordnance Survey 25", 1888-1913) showing a slightly different layout. One single storey range remains extant with more recent buildings largely forming the complex. The farm is located immediately to the east of the L2215.
CH_03	696319 / 746263	Lismahon	Road Bridge	A stone road bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) as 'Ballymaglassan Bridge' comprising a low pair of parapets. Carries the L2215 across an unnamed watercourse.
CH_04	696348 / 744292	Staffordstown Little	Roadside house	A single storey house depicted on historic mapping (Ordnance Survey 25", 1888-1913) approximately 12m to the south of Option B (Green) (see Table 3.3 in Section 3.1.3).
CH_05	696892 / 747290	Portan	Farmhouse	A single storey rubblestone farmhouse with slate roof and two rendered stacks depicted on historic mapping (Ordnance Survey 25", 1888-1913). Set back from road (L2215) in an established garden bounded by a hedge within the Batterstown North off-road focus area. Views east are across the road to the fields beyond.
CH_06	696967 / 747353	Lismahon	Road Bridge	A road bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). One rubblestone parapet with irregular vertical copes remains on a wide grass verge to the west of the road. Carries the L2215 across the Tolka River within the Batterstown North off-road focus area.
CH_07	697221 / 747488	Glebe	Buildings	Extant buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) along the road through Batterstown (R154), within the Batterstown North off-road focus area, including post office, houses, a public house and former smithy. While modern development has taken place in Batterstown, these buildings form a group with historic character along the main thoroughfare.
CH_14	703920 / 745061	Nuttstown	Road Bridge	A stone road bridge that carries the road through Nuttstown across an unnamed watercourse depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) (see Table 3.3 in Section 3.1.3).
CH_15	705608 / 745439	Belgree	Road Bridge	A stone road bridge that carries the road across the Ward River in Belgree depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) (see Table 3.3 in Section 3.1.3).

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_16	706594 / 745764	Belgree	Road Bridge	A rubble stone bridge that carries the Kilbride Road over a minor watercourse depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) (see Table 3.3 in Section 3.1.3).
CH_17	707201 / 746366	Baytown	Farm	An L'-shaped farm and orchard depicted on First Edition Ordnance Survey mapping (1837 – 1842) and with later additions shown on later mapping (Ordnance Survey 25", 1888-1913). Two-storey farmhouse with slate roof appears to have been modernised and the agricultural ranges have been replaced. Views are west across the private drive / garden towards the road and fields beyond. The building is located approximately 40m to the west of Option B (Green).
CH_18	708016 / 746178	Baytown	House	Located approximately 10m to the south of Option B (Green), a single storey rendered house depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) perpendicular to the road through Baytown. Appears to be in poor condition (Google StreetView, April 2019) with mounds of waste material immediately adjacent to the building, modern agricultural buildings to the east and a high concrete roadside boundary wall to the north.
CH_20	709100 / 746479	Irishtown	Field boundary	A sinuous linear feature visible on aerial imagery that corresponds with a field boundary depicted on First Edition Ordnance Survey mapping (1837 – 1842) located in an arable field to the south of the road through Irishtown.
CH_21	709721 / 746401	Coolquoy	Farm	A group of rendered stone farm buildings in a courtyard plan depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913). The buildings are set back from the road (R135), approximately 3om to the east of Option B (Green). The group includes modern agricultural buildings and is bounded by a modern metal railing fence. Views are predominantly across the yard with views out across the surrounding fields.
CH_22	709787 / 746077	Coolatrath East	Agricultural range	A rendered single-storey roadside agricultural range with corrugated roof depicted on historic mapping (Ordnance Survey 25", 1888-1913). Formed part of a courtyard farm; however, the other buildings in the group appear more recent constructions. This building is located approximately 5m to the west of Option B (Green), adjacent to the R135.
CH_23	709833 / 746182	Coolatrath East	Field system	A network of linear cropmarks visible on aerial imagery that correspond with a field system depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913). Located in an arable field to the east of the R135.

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_24	710160 / 745108	Ward Upper	House	'Six Mile House' depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) approximately 20m to the west of Option B (Green) (see Table 3.3 in Section 3.1.3).
CH_26	710606 / 744247	Broghan	Road Bridge	A stone road bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) as 'Broghan New Bridge', comprising a pair of parallel squared stone parapets with possibly later copes. Carries the R135 over a minor watercourse.
CH_27	710681 / 744121	Broghan	Farm	An 'L'-shaped layout roadside farm depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) with later mapping showing additional buildings (Ordnance Survey 25", 1888-1913). Single and two-storey ranges, as well as more recent additions. The group is enclosed by a rubblestone boundary wall adjacent to the R135, approximately 7m to the east of Option B (Green).
CH_28	711958 / 743365	Dunsoghly	Farm	A rendered single-storey roadside range depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913). Located approximately 4m to the north of Option B (Green), this building forms part of an operational farmyard.
CH_30	718730 / 741985	Clonshaugh	House	A roadside farmhouse with agricultural ranges depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).
CH_31	718755 / 742792	Stockhole	Ford	'Shane's Ford' depicted on First Edition Ordnance Survey mapping (1837 – 1842) on the road through Stockhole within the Belcamp off-road focus area. Later mapping (Ordnance Survey 25", 1888-1913) shows the location of the ford with the road crossing an unnamed watercourse. The road in this location still crosses the watercourse as depicted.
CH_32	718916 / 741898	Clonshaugh	Field system	A field system visible as cropmarks on aerial imagery located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).
CH_33	718928 / 743480	Cloghran	Farm	A courtyard farm depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).
CH_34	718996 / 742340	Middletown	Farm	The site of 'Upper Middletown' farm depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_35	719145 / 743156	Baskin	Farm	A cluster of agricultural ranges depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).
CH_43	695461 / 747780	Woodland	Agricultural Buildings	Group of three agricultural buildings depicted on First Edition Ordnance Survey mapping (1837 – 1842) and later editions (Ordnance Survey 25", 1888-1913), forming part of a larger group (other buildings no longer extant) within the Batterstown North off-road focus area. Views in all direction limited by established hedgerows.
CH_44	695803 / 748317	Portan	Thatched Building	A thatched building depicted as 'Portan' on First Edition Ordnance Survey mapping (1837 – 1842). Located in a private plot, within the Batterstown North off-road focus area, with views largely across open fields, with a belt of trees obscuring views westward.
CH_45	695477 / 747147	Ribstown	Agricultural Buildings	Two buildings depicted as 'Ribstown' on First Edition Ordnance Survey mapping (1837 – 1842) and later editions (Ordnance Survey 25", 1888-1913) forming part of a larger operational farmyard within the Batterstown North off-road focus area. Views are limited by modern buildings and established hedgerows.
CH_46	696925 / 747831	Rathregan	Tree	'The Big Tree' depicted on First Edition Ordnance Survey mapping (1837 – 1842), and later editions (Ordnance Survey 25", 1888-1913), at the junction between the R154 and Rathregan Court within the Batterstown North off-road focus area. The tree is thought to be where people were hanged.[37] No longer extant.
CH_47	697158 / 747323	Glebe	House	A house depicted on First Edition Ordnance Survey mapping (1837 – 1842) and identified as 'Rathregan Rectory' on later mapping (Ordnance Survey 25", 1888-1913). Set back from the R154 within its demesne (DL_02), within the Batterstown North off-road focus area, with views in all directions limited by established gardens and grounds.
CH_54	718534 / 742284	Stockhole	House	A house depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).
CH_55	719445 / 742897	Baskin	House	'Baskin Hall' depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).

[37] https://www.duchas.ie/en/cbes/5008916/4966446/5106944?ChapterID=5008916.

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_56	719498 / 742412	Middleton	Farm	A farm depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).
CH_57	719293 / 742270	Middleton	Enclosures	Enclosures and a field system identified from aerial imagery located within the Belcamp off-road focus area (see Table 3.3 in Section 3.1.3).

Previous Excavations

A review of Excavations Bulletin and TII's Archaeological Excavation Reports identified the following archaeological excavations in the Option B (Green) study area:

- Excavation in advance of the M3 Clonee to North of Kells motorway (Licence Number: A017/003, E3025, A017/005, E3027, A017/004., E3026, and A017/012) identified multiple phases of activity in Bennetstown comprising a fulacht fiadh and related activity, two large industrial pits (possibly a forge and slaking pit), and post-medieval and later activity, including drainage features combined with episodes of inundation of the site from the nearby River Tolka. Further archaeological excavation for the M3 Clonee to North of Kells motorway in Dunboyne (Licence number: A017/009) identified evidence of late Bronze Age activity, including an oval enclosure, a possible kiln, and further pits, postholes and stakeholes. Archaeological excavation for the M3 Clonee to North of Kells motorway (Licence Numbers: E3027, E3024 and E3026) also identified postholes, some of which were interpreted as the remains of possible structures, a clay-lined, keyhole-shaped kiln and several pits, and burnt mound. Sherds of Middle or Late Bronze Age pottery were recovered from one of the postholes.
- Archaeological excavation in Pace (Licence Number: A017/010) identified the remains of a group of early modern farm buildings including a cobbled courtyard and brick-lined hearth.
- Archaeological excavations in advance of the N2 Finglas- Ashbourne realignment (Licence Number: 03E1358) in Ward Upper identified a small pit or token cremation, as well as a pit containing a large amount of prehistoric pottery.
- Monitoring for the Airport-Balbriggan Bypass (Licence Number: 00E0950) identified an isolated area of charcoal-rich soil, interpreted as a possible ploughed out pit of unknown date.
- Archaeological excavation in advance of the North Runway development at Dublin airport (Licence Number: 17E0090) in Barberstown identified the remains of an earth-cut early medieval kiln and a ditch which contained fragments of iron knives and sherds of 12th – 13th century pottery. In addition, and an oval bivallate enclosure previously identified through geophysical survey undertaken for the North Runway development at Dublin airport was confirmed through archaeological testing, along with a number of other features including pits and structural slot trenches (Licence Number: 19E0006). Archaeological testing (Licence Number: 17E0282) also identified multi-phase occupation evidence including fulacht fiah, late Neolithic pits, and a medieval field system.
- Archaeological testing in advance of development in Clonshagh (Licence Number: 13E0355) identified a ditch associated with a potential enclosure and two oval features interpreted as a possible kiln.

A further nine archaeological excavations were also identified (under Licence numbers: 08E0988, A017/011, 17E0091, 16E0335, 00E0951, 08E0333, 13E0464, 04E0557, and 04E0381); however, these did not identify any archaeological remains or deposits of archaeological significance.

A review of the National Museum Topographical Finds available online identified a casual find of a bronze axehead (1962:259) within the study area for Option B (Green) in Saint Margaret's.

3.3 Option C (Yellow)

3.3.1 Archaeology

A total of 35 archaeological constraints were identified within the study area for Option C (Yellow) (see Annex A and Figure B.1.1 in Annex B). These comprise:

- 28 Recorded Monuments; and
- Seven sites recorded on the SMR.

There are no National Monuments, sites with Preservation Orders placed on them, or sites on the RHM located within the study area for Option C (Yellow).

Recorded Monuments

A total of 28 Recorded Monuments are located within the study area for Option C (Yellow) (see Figure B.1.1 in Annex B). The comprise:

- The site of an enclosure (AY_34), located by the RMP approximately 55m to the north of Option C (Yellow); however, an ephemeral circular cropmark is visible on aerial imagery (Google Earth, May 2017), behind a cottage to the north of Killeek Lane. While the enclosure is marked on Duncan's map (1821), First Edition Ordnance Survey mapping (1837 – 1842) does not depict an enclosure in this field and later mapping (Ordnance Survey 25", 1888-1913) shows a gravel pit in this location. A second enclosure (AY_38) is located within Killeek in disturbed fields, previously used for polytunnels, to the south of Option C (Yellow). While there is a tradition of a '*fort*' at this site, no feature is depicted at this location on historic mapping dating to 1760[38], or First Edition Ordnance Survey mapping (1837 – 1842). Aerial imagery shows this location to be disturbed and archaeological testing in advance of development (Licence Number 00E0688) did not identify any remains of archaeological significance[39].
- An ecclesiastical enclosure (AY_35) in Killeek comprising a broad earthen bank with an entrance to the south, approximately 38m to the north of Option C (Yellow). Ecclesiastical enclosures are commonly circular or oval in plan, with a church, burial ground and often dwellings contained within an enclosing bank, ditch or wall, dating to the early medieval period (Department of the Environment, Heritage and Local Government, 2004). The site of the enclosure is demarcated partially by the coursed, rubblestone wall of an oval graveyard (AY_36) to the east adjacent to a local road. The graveyard (AY_36) is elevated and contains monuments dating to the 18th century as well as a ruinous church (AY_37). A small rectangular building identified as a 'church' within '*Killeek Grave Yd*' is depicted in this location on First Edition Ordnance Survey mapping (1837 – 1842) as a roofless structure, and later mapping identified the church '*in ruins*' (Ordnance Survey 25", 1888-1913). The roofless building comprises a plain, roughly coursed, limestone structure situated in a prominent position, north of a crossroads with Killeek Lane. Views across the road and junction are filtered by mature trees along the boundaries of the site.
- Another ecclesiastical enclosure (AY_50) is in Saint Doolaghs, approximately 100m to the west of Option C (Yellow) set back from the R107. Identified by geophysical survey undertaken as part of a community project (Licence Number 09R165) the sub-circular enclosure is located to the west of a sub-rectangular walled graveyard (AY_51) and may pre-date the current complex[40]. Possibly pre-dating the Anglo-Norman colonisation of Dublin, the graveyard encloses a 12th to 15th century dressed limestone stone church (St. Doulagh's Church; AY_53) comprising a coursed stone building with a central tower and a vaulted stone roof, as well as a later 19th century entrance[41]. Archaeological excavations in the 1980s and 1990s identified 13th and 14th century pottery sherds, post-medieval coins, burials, and evidence of an inner and outer enclosing ditch. Two holy wells, St Doolaghs well (AY_54) and St. Catherine's Well (AY _55), are located to the north of the church. The former comprises a circular stone-lined well below ground level within an octagonal building with a cone-shaped roof and sunken entrance and the latter comprises an underground bath enclosed by a rectangular vaulted building. A stone roadside cross (AY_56) also forms part of the complex in Saint Doolaghs comprising a low granite cross with short arms and a triangular shaped head of early medieval date (Fingal Historic Graveyards Project, 2008). The

[38] http://www.dublinhistoricmaps.ie/maps/1600-1799/index.html.
[39] https://excavations.ie/report/2000/Dublin/0005128/.
[40] https://excavations.ie/report/2015/Dublin/0024753/.
[41] https://heritagemaps.ie/documents/Therefore_ArchaeologyReports/E000508.pdf.

complex is depicted on First Edition Ordnance Survey mapping (1837 – 1842) with a 'U'-shaped '*school house*' immediately to the east, which was later removed (Ordnance Survey 25", 1888-1913). Views are limited to the north and west by an established belt of trees; however, are open to the east down the drive towards the road.

- The site of a chapel and burial ground (AY_39 and AY_40), located in Forrest Great approximately 85m to the south of Option C (Yellow), comprises a complex of features identified during geophysical survey in advance of construction of a proposed equestrian centre on Killeek Lane (Licence Number 12R0059). Features included a circular ditch measuring 55m in diameter, internal pits and rectilinear responses extending from the enclosure. While a chapel is not depicted on historic mapping (First Edition Ordnance Survey mapping, 1837 – 1842 and Ordnance Survey 25", 1888-1913), human bone has reportedly been recovered from the site previously and there is a tradition of a chapel in this location.
- A mound (AY_03) and the site of a holy tree or bush (AY_04) are located within the Batterstown North off-road focus area in Limahon (see Section 3.2.1).
- A possible circular enclosure (AY_18) in Ballintry, located approximately 35m to the south of Option C (Yellow) (see Section 3.1.1).
- The site of a castle (AY_25), approximately 37m to the north of Option C (Yellow), a church and graveyard (AY_23 and AY_24), located adjacent to the R121 immediately to the north-west of Option C (Yellow), and holy well (AY_22) in Ward Upper and Ward Lower (see Section 3.1.1).
- The site of an 18th/19th century house (AY_27) in Newpark, approximately 60m to the south of Option C (Yellow) (see Section 3.1.1).
- An enclosure (AY_29) in Common, approximately 54m to the north of Option C (Yellow) (see Section 3.1.1).
- A graveyard (AY_30) located to the north of Option C (Yellow) in Common (see Section 3.1.1).
- The site of a 16th/17th century house (AY_42) approximately 30m to the north of Option C (Yellow) in Forrest Great (see Section 3.1.1).
- A church and its associated graveyard (AY_44 and AY_45) in Cloghran, approximately 65m to the south of Option C (Yellow) (see Section 3.1.1).
- A moated site (AY_62) and a field system (AY_63) located within the Batterstown North off-road focus area in Portan (see Section 3.2.1).

<u>Sites on the Sites and Monuments Record</u>

A total of seven sites recorded on the SMR have been identified within the study area for Option C (Yellow). These comprise the locations of cropmarks and evidence of medieval and post-medieval religious activity. These are included in Table 3.7 and are shown on Figure B.1.1 in Annex B.

Two further sites recorded on the SMR have not been included in Table 3.7. These comprise the sites excavated in advance of development including the M3 Motorway (AY_10) and the N2 Motorway (AY_21). While these sites provide an indication of possible activity in these locations, given these sites have been removed and developed, they are no longer constraints.

Table 3.7: Sites recorded on the SMR within the study area for Option C (Yellow)

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
AY_05	ME044-038	A medieval rectangular granite font, located in the grounds of the Roman Catholic church in Batterstown (AH_02) within the Batterstown North off-road focus area. The original location of the font is unknown.	Rathregan	697159 / 747637
AY_19	ME051-017	A circular cropmark, measuring approximately 30m in diameter in Nuttstown, approximately 75m to the north of Option C (Yellow), interpreted as an enclosure. The enclosure is located within an arable field to the north of Kilbride Road.	Nuttstown	705085 / 745365
AY_28	DU011-156	A circular cropmark, measuring approximately 30m in diameter in Common, approximately 45m to the north of Option C (Yellow), interpreted as an enclosure. While not depicted on historic mapping, this enclosure may correspond with the 'fort' identified on First Edition Ordnance Survey mapping (1837 – 1842). A circular feature is vaguely perceptible on aerial imagery in a pasture field to the north of the R121.	Common	712145 / 745847
AY_31	DU011-124	A large circular cropmark in Ballystrahan approximately 33m to the south-west of Option C (Yellow), interpreted as an enclosure, as well as a possible associated field system (DU011-125). The circular enclosure is visible on aerial imagery in an arable field, south-west of the R122, along with a number of linear features in the surrounding fields.	Ballystrahan	712641 / 745143
AY_33	DU011-126	A circular cropmark in Kingstown approximately 64m to the west of Option C (Yellow), interpreted as a ring ditch. In addition, other linear features were also identified from aerial imagery and interpreted as a possible field system in the same arable field (DU011-127).	Kingstown	713322 / 745300
AY_49	DU015-009008	A network of linear features identified during geophysical survey (Licence Number: 09R0165) to the south of St. Doulagh's Church (AY_53) interpreted as the remains of an early settlement associated with the ecclesiastical enclosure (AY_50)[42].	Saint Doolaghs	721026 / 742043
AY_52	DU015-009007	Late medieval mouldings used as cope stones of the wall south of St. Doulagh's Church (AY_53).	Saint Doolaghs	721048 / 742098

Archaeological Potential

While previous archaeological excavations within the study area for Option C (Yellow) have identified evidence of human activity dating from the prehistoric period onward (see Section 3.3.3), Option C (Yellow) largely follows the existing local and regional roads, and the potential for previously unknown archaeological remains is lower than in less developed areas given the construction of these roads may have removed or truncated any archaeological remains that may have been present. However, Option C (Yellow) is also located within pre-1840 roadways, including the R156, R154, the road from the M3 to Kilbride, the R121, Killeek Lane, Forest Road, and the road from the M1 to Woodlands and there is the potential for the presence of historic road surfaces in these locations. There is a higher potential for previously unknown archaeological remains to be present within the Batterstown North off-road focus area. There is also the potential for previously unknown archaeological remains associated with

[42] https://heritagemaps.ie/documents/Therefore_ArchaeologyReports/GeophysicalReports/09R0165.pdf.

known archaeological constraints to be present, for example within the Zones of Notification of Recorded Monuments.

Option C (Yellow) crosses the Tolka River, Pinkeen River, Ward River and Mayne River. This route option also crosses a number of minor watercourses. There is the potential for votive offerings, objects apparently deposited for religious reasons, in rivers. The underlying geology is largely limestone with conglomerate, calcareous shale and unbedded lime-mudstone. Superficial deposits comprise tills and shales, limestone gravels, alluvium, and pockets of outcropping bedrock in Killamonan, Newpark, Ballystrahan and Forrest Great[43]. In areas of alluvium there is the potential for previously unknown archaeological remains, including paleoenvironmental and organic materials, to be preserved.

3.3.2 Architectural Heritage

A total of 37 architectural heritage constraints were identified within the study area for Option C (Yellow). These comprise:

- Eleven Protected Structures (see Figure B.1.2 in Annex B);
- Seven structures included on the NIAH (see Figure B.1.2 in Annex B), assessed by the NIAH to be of Regional importance; and
- 19 GDLs (see Figure B.1.3 in Annex B).

No ACAs have been identified within the study area for Option C (Yellow).

Record of Protected Structures

Saint Thomas's Church (AH_04), is located approximately 15m to the north-east of Option C (Yellow) , comprises a 19th century rectangular plan Church of Ireland church to designs by William John Welland (c.1832-95) and William Gillespie (1818-99). The granite church includes an octagonal turret, rose window, and pitched slate roof. The church is positioned in the centre of Hollystown, set back from the main road, within landscaped grounds bounded by established trees.

In addition the remains of medieval church within oval shaped enclosed graveyard (AH_08) and the medieval church, graveyard, stone cross and two holy wells at Saint Doolaghs (AH_14) are also Recorded Monuments AY_37, AY_51, AY_53, AY_54—6; see above). These constraints have been described above under Recorded Monuments (Section 3.3.1).

A late 18th or early 19th century single-storey thatched cottage (AH_07) with stone outbuildings is located approximately 5m to the east of Option C (Yellow). The dwelling comprises a rendered stone structure, with a later projecting entrance porch, and a double pitched thatched roof; while the two outbuildings have later slate and corrugated roofs. Depicted on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842) the group of three buildings form a courtyard plan farm bounded by a whitewashed coursed rubble stone wall with vertical copes. The cottage is positioned perpendicular to Kilreesk Road with the outbuildings located to the south, parallel to the road, including one forming the roadside boundary to the farm.

A cast-iron milestone (AH_16), located at the entrance to Lime Hill House (DL_22) approximately 8m to the west of Option C (Yellow) adjacent to the R107. Set within a harled and painted entrance wall at ground level, the milestone reads 'GPO / Dublin / 6 / Malahide / 3'. A milestone is depicted in this location on historic mapping (Ordnance Survey 25", 1888-1913) annotated with '*M.S Malahide 3 Dublin 6*'.

[43] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228.

Wellfield House (AH_17) is located approximately 30m to the east of Option C (Yellow) and comprises a late 18th century house within its surrounding demesne (DL_24). Depicted on First Edition Ordnance Survey mapping (1837 – 1842) as '*St. Doolagh's Lodge*', the two-storey house is 'T'-shaped in plan, with a portico entrance on the western facing elevation and belvedere (a structure built in an elevated position to provide lighting and ventilation and to take in views) to the east. Associated buildings are located to the north; however, these appear to have been demolished. The house is set within a high rendered stone walled plot, with established trees and hedges obscuring views to the road (R107).

The gate lodge to Saint Doolagh's Park (AH_21) comprises a19th century single storey rendered former gate lodge. The building, depicted on historic mapping (Ordnance Survey 25", 1888-1913), is positioned behind a high rubblestone wall at the entrance to Saint Doolagh's Park – a set of rendered stone gate piers with iron railings atop low rendered walls.

In addition the remains of a medieval parish church within a walled graveyard (AH_06), the site of 'Cloghran Church' and graveyard (AH_09), and an enclosed stone well (AH_10) are also located within the study area for Option A (Red) (see Section 3.1.2). Batterstown Roman Catholic Church (AH_02), is also located within the Batterstown North off-road focus area (see Section 3.2.2).

National Inventory of Architectural Heritage

Seven structures included on the NIAH have been identified within the study area for Option C (Yellow). These comprise gate lodges (AH_05, AH_15 and AH_18), houses (AH_12, AH_13 and AH_19) and a post box (AH_20), assessed by the NIAH to be of Regional importance.

A gate lodge (AH_05) in Hollywood, located approximately 18m to the north-east of Option C (Yellow), also lies within the study area for Option A (Red) (see Section 3.1.2). Two further gate lodges (AH_15 and AH_18) are located 8m and 19m to the west of Option C (Yellow) respectively. AH_15 comprises the late 19th century single-storey gate lodge to Lime Hill House (NIAH 11350015). AH_18 comprises a mid-19th century single-storey gable-fronted gate lodge to Bohomer (NIAH 11350011); however, on First Edition Ordnance Survey mapping (1837 – 1842) the house the gate lodge is associated with identified as 'St. Doolagh's'. Both gate lodges are located adjacent to the driveways to their respective houses at entrances on the R107, behind low rubble stone boundary walls.

Wellfield House (AH_19) comprises a two-storey rubble stone house with brick dressings. Located 25m to the east of Option C (Yellow), the house is set within its associated demesne (DL_24). The house is depicted on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842) as 'St. Doolagh's Lodge' with associated buildings to the north, and on later mapping (Ordnance Survey 25", 1888-1913) associated with 'St. Doolagh's Park', a large house, to the north. The house is reportedly derelict[44]. Positioned behind high rendered stone boundary walls, within established grounds, outward views are limited towards the R107. In addition, Belcamp House (AH_12 and AH_13) in Belcamp, located within the Belcamp off-road focus area, is also located within the study area for Option A (Red) (see Section 3.2.2).

A post box (AH_20) located on Malahide Road comprises an early 20th century wall-mounted cast-iron post box, with 'ER VII' monogram. This area has been redeveloped and the wall within which the post box was located appears to have been removed (Google StreetView, June 2022).

Eight additional structures included on the NIAH have been identified within the study area for Option C (Yellow). These are also Protected Structures and, to avoid double counting of constraints, have been included above under Protected Structures.

[44] https://www.buildingsofireland.ie/buildings-search/building/11350020/wellfield-malahide-road-saintdoolaghs.

Gardens and Designed Landscapes

A total of 19 GDLs have been identified within the study area for Option C (Yellow). Of these nine have been identified from the Survey of Historic Gardens and Designed Landscapes and ten have been identified from historic mapping (Ordnance Survey 6", 1837 – 1842). Information on these 29 GDLs is presented in Table 3.8 and are shown on Figure B.1.3 in Annex B.

Table 3.8: GDLs identified within the study area for Option C (Yellow)

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_02	Glebe	Demesne identified from historic mapping in Glebe (Ordnance Survey 6", 1837 – 1842) and on later mapping identified as 'Rathregan Rectory' (Ordnance Survey 25", 1888-1913). Located on the R154 in Batterstown. While the principal buildings remain extant, the driveway appears to have been realigned. Retains boundary features, including belts of woodland, as well as sections of the roughly coursed rubble stone boundary wall and a pair of squared gate piers on the R154.	Glebe	N/A	Ordnance Survey 6", 1837 – 1842
DL_04	Priest Town House	The GDL to Priest Town House, including principal house and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Retains elements of parkland and woodland, as well as original driveways and entrances. Boundary along Belgree Lane formed of hedgerows and 'Crockanee' woodland.	Priest Town	NIAH 5156	Survey of Historic Gardens and Designed Landscapes
DL_05	Hollywoodrath	The GDL to Hollywoodrath, including principal building as well as garden and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842; Ordnance Survey 25", 1888-1913). While there has been development within the footprint of the site, including the golf course to the west, a section of roadside rubblestone boundary wall remains extant to the south of the site along the road that bisects the demesne.	Hollystown; Hollywood; Hollywoodrath; Spricklestown	NIAH 2267	Survey of Historic Gardens and Designed Landscapes
DL_07	Ward House	Demesne identified from historic mapping as 'Ward House' (Ordnance Survey 6", 1837 – 1842) located on the crossroads between the R135 and R121. The principal house appears to have been demolished and the area redeveloped, including a new high roadside boundary wall.	Ward Lower	N/A	Ordnance Survey 6", 1837 – 1842
DL_08	Newpark House	Demesne identified from historic mapping as 'Newpark House' (Ordnance Survey 6", 1837 – 1842) located to the south of the R121. The area appears to have been redeveloped as a commercial complex, including a concrete block boundary wall.	Newpark	N/A	Ordnance Survey 6", 1837 – 1842
DL_09	Kingstown House	Demesne identified from historic mapping as 'Kingstown House' (Ordnance Survey 6", 1837 – 1842). The boundaries of the demesne reflect those depicted on historic mapping (Ordnance Survey 6", 1837 – 1842); however, the buildings appear to have been removed and, while the driveway is still perceptible, the entrance has been replaced by a modern field gate. Boundary features along Kilreesk Road include a ditch and established boundary (trees and hedgerow), as well as a modern post and rail fence.	Kingstown	N/A	Ordnance Survey 6", 1837 – 1842
DL_10	Little Forest House	Demesne identified from historic mapping as 'Little Forrest House' (Ordnance Survey 6", 1837 – 1842). This area has been redeveloped into Forrest Little Golf Club. While a short section of rubblestone boundary wall appears to remain extant	Forrest Little	N/A	Ordnance Survey 6",

Reference Number	Name	Description	Townland	NIAH Reference	Source
		alongside Forest Road, at the junction with Cooks Road, the boundary appears to have largely been replaced by the modern entrance to the golf club.			1837 – 1842
DL_11	Castle Mount	The GDL to Castle Mount. The principal building remains extant (RPS 611); however, the area has been developed. The boundary depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) is vaguely perceptible in places as hedgerows. The boundary on the R132 appears to have been replaced with a new wall.	Cloghran	NIAH 5726	Survey of Historic Gardens and Designed Landscapes
DL_12	Kitronan House	Demesne identified from historic mapping as 'Kitronan House' (Ordnance Survey 6", 1837 – 1842). While development has been undertaken within this demesne, the footprint remains perceptible. Boundary features appear to have been replaced along the R132.	Cloghran	N/A	Ordnance Survey 6", 1837 – 1842
DL_13	Limepark	Demesne identified from historic mapping as 'Limepark' (Ordnance Survey 6", 1837 – 1842). The principal building appears to have been demolished and the majority of the boundaries depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) are no longer present apart from sections of hedgerow. The demesne is bisected by Stockhole Lane.	Cloghran	N/A	Ordnance Survey 6", 1837 – 1842
DL_16	Glebe House	Demesne identified from historic mapping as 'Glebe House' (Ordnance Survey 6", 1837 – 1842), located to the east of Stockhole Lane. While the principal building appears to have been replaced with modern dwellings, the boundary and sub-divisions of the demesne reflect those depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Boundaries comprise established hedgerows, including trees, some of which have modern fence running parallel.	Glebe	N/A	Ordnance Survey 6", 1837 – 1842
DL_17	Belcamp	The GDL to Belcamp. The principal building (NIAH 11349005) and ancillary buildings appears to have been demolished. The footprint is vaguely perceptible on aerial imagery and features depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), such as the bridge, weir and gardens are perceptible.	Belcamp	NIAH 2455	Survey of Historic Gardens and Designed Landscapes
DL_18	Baskin Hill	The GDL to Baskin Hill. The boundary along Baskin Lane appears to have been replaced with a modern post and rail fence. The entrance comprises a set of modern rubblestone and brick entrance walls with iron gates with a drive to Baskin Hall that corresponds with the drive on historic mapping (Ordnance Survey 6", 1837 – 1842).	Baskin	NIAH 2456	Survey of Historic Gardens and Designed Landscapes
DL_20	Abbeyville House	The GDL to Abbeyville House. Footprint remains perceptible along with the principal building (NIAH 11350002, RPS 452), ancillary buildings and designed landscape features, such as the remains of a boating lake and areas of woodland and	Abbeyville	NIAH 2486	Survey of Historic

Reference Number	Name	Description	Townland	NIAH Reference	Source
		parkland. While houses have been built to the south of this demesne on the site of the old brewery (Ordnance Survey 6", 1837 – 1842), the boundary along Baskin Lane comprises an established hedgerow / tree line.			Gardens and Designed Landscapes
DL_21	Belcamp Hutchinson	The GDL to Belcamp Hutchinson. While some development has taken place within the footprint, features of the demesne remain extant including the 18th century three-storey house (RPS 789) and walled garden. A section of rubblestone boundary wall remains extant along the R107 to the north of the demesne along with a terrace of buildings depicted on the edge of the demesne on historic mapping (CH_38; Ordnance Survey 6", 1837 – 1842).	Belcamp	NIAH 5682	Survey of Historic Gardens and Designed Landscapes
DL_22	Lime Hill House	The GDL to Lime Hill House. The principal building remains extant (NIAH 11350015) along with other features of the demesne including the alignment of the driveway, areas of parkland and gate lodge (AH_15). A rubblestone boundary wall bounds the R107; however, appears to have been rendered or replaced north of the entrance.	Saint Doolaghs	NIAH 2488	Survey of Historic Gardens and Designed Landscapes
DL_23	Emsworth	The GDL to Emsworth. The house (RPS 458) remains extant at the centre of the demesne with the footprint of the site still perceptible. While some development has encroached on the site, the gate lodge (AH_18), coach house and stable yard also remain. A rubblestone boundary wall, harled in places, with triangular vertical copes, remains extant along the R107, along with established trees lining the boundary.	Bohammer	NIAH 2490	Survey of Historic Gardens and Designed Landscapes
DL_24	St Doolagh's Lodge	Demesne identified from historic mapping as 'St. Doolagh's Lodge' (Ordnance Survey 6", 1837 – 1842), located to the east of Malahide Road. The principal building remains extant (AH_17), as well as the southern boundary and area of parkland to the east. The boundary adjacent to the R107 comprises a high rendered stone wall.	Saint Doolaghs	N/A	Ordnance Survey 6", 1837 – 1842
DL_25	Balgriffin	Demesne identified from historic mapping 'Balgriffin' (Ordnance Survey 6", 1837 – 1842), located south of an unnamed watercourse and east of Malahide Road. Now Fingal Burial Ground. Boundary wall, comprising a coursed rubblestone construction, remains extant along with a section of rendered wall to the northern extent.	Balgriffin	N/A	Ordnance Survey 6", 1837 – 1842

3.3.3 Cultural Heritage

A total of 25 cultural heritage sites identified within the study area for Option C (Yellow) from the sources identified in Section 2. These largely comprise extant post-medieval buildings and structures, including road bridges, houses and farm buildings. Summary information on these cultural heritage sites is presented in Table 3.9 and are shown on Figure B.1.4 in Annex B.

Table 3.9: Cultural heritage sites identified within the study area for Option C (Yellow)

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_05	696892 / 747290	Portan	Farmhouse	A single storey rubblestone farmhouse depicted on historic Ordnance Survey mapping (1888-1913) located within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_06	696967 / 747353	Lismahon	Road Bridge	A stone road bridge depicted on historic Ordnance Survey mapping (1888-1913) located within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_07	697221 / 747488	Glebe	Buildings	Extant buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) along the road through Batterstown within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_12	702502 / 744660	Ballymagillin	Courtyard farm	A group of rendered stone farm buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_13	702660 / 744657	Whitesland	House	A house depicted on historic mapping (Ordnance Survey 25", 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_14	703920 / 745061	Nuttstown	Road Bridge	A stone road bridge that carries the road through Nuttstown across an unnamed watercourse depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) (see Table 3.3 in Section 3.1.3).
CH_15	705608 / 745439	Belgree	Road Bridge	A stone road bridge that carries the road across the Ward River in Belgree depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) (see Table 3.3 in Section 3.1.3).
CH_16	706594 / 745764	Belgree	Road Bridge	A rubble stone bridge that carries the Kilbride Road over a minor watercourse depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) (see Table 3.3 in Section 3.1.3).
CH_19	708295 / 743234	Hollywood	Police Barracks	A 'police barracks' depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Comprises a two-storey rectangular plan building, now ruinous (Google StreetView, July 2021) within a walled plot with an entrance to the north. Positioned immediately adjacent to the R121 views outwards are obscured by established vegetation.

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_24	710160 / 745108	Ward Upper	House	'Six Mile House' depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) (see Table 3.3 in Section 3.1.3).
CH_25	710338 / 745269	Newpark	Agricultural ranges	A group of agricultural buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_29	712626 / 745191	Ballystrahan	House	A house depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_35	719145 / 743156	Baskin	Farm	A cluster of agricultural ranges depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_36	720576 / 742969	Bohammer	Farm	A group of agricultural buildings forming a courtyard depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) to the south of Baskin Lane, including a two-storey rendered farmhouse, perpendicular to the road, and rendered rubblestone stables, positioned immediately adjacent to the road enclosed by a rubblestone wall. Views are across the yard, and beyond the boundary to the north, across Baskin Lane towards the fields beyond.
CH_37	721014 / 741741	Saint Doolaghs	Road Bridge	A road bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), identified as 'St Doolagh's Bridge', comprising a single arch with a low stone parapet to the west of Malahide Road. Carries the Malahide Road across an unnamed watercourse.
CH_38	721109 / 741427	Belcamp	Buildings	Extant buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) in Balgriffin fronting the R107, including rendered commercial units with residential floors, and harled houses on the R123.
CH_39	721123 / 742238	Kinsaley	Memorial	A modern roadside memorial comprising a granite carved stone, with cross, adjacent to the R107, positioned in front of the remains of a rubblestone boundary wall.
CH_40	721156 / 741198	Belcamp	Road Bridge	A road bridge and weir depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). The bridge comprises a pair of low stone parapets, the western parapet appears to have been rendered and extends along Malahide Road. Carries the Malahide Road across the Mayne River.

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_43	695461 / 747780	Woodland	Agricultural Buildings	A group of agricultural buildings depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_44	695803 / 748317	Portan	Thatched Building	A thatched building depicted as 'Portan' on First Edition Ordnance Survey mapping (1837 – 1842) located within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_45	695477 / 747147	Ribstown	Agricultural Buildings	Two buildings depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_46	696925 / 747831	Rathregan	Tree	The site of 'The Big Tree' depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_47	697158 / 747323	Glebe	House	A house depicted on First Edition Ordnance Survey mapping (1837 – 1842) located within the Batterstown North off-road focus area (see Table 3.6 in Section 3.2.3).
CH_48	700948 / 745680	Piercetown	Railway (Site of)	Alignment of the M.G.W.R (Dublin and Navan Branch) railway, depicted on Ordnance Survey 25" mapping (1888-1913), perceptible as an earthwork, located within the M3 off-road focus area.
CH_51	707212 / 744554	Court	Enclosure	A square enclosure with associated linear features identified from aerial imagery (GoogleEarth, Sept 2003) (see Table 3.3 in Section 3.1.3).

Previous Excavations

A review of Excavations Bulletin and TII's Archaeological Excavation Reports identified the following archaeological excavations in the Option C (Yellow) study area:

- Archaeological monitoring for the High Voltage Cable—East–West Interconnector Project (Licence Number: 10E155) identified two areas of charcoal rich soil and deposits of medieval and post-medieval pottery, 19th century clay pipe and possible flint fragments.
- Archaeological excavation in advance of the M3 Clonee to north of Kells motorway (Licence Numbers: A017/014, E3036) identified a drainage system comprising a series of 19th century French drains and ditches and an isolated pit.
- Monitoring for the Airport-Balbriggan Bypass (Licence Number: 00E0950) identified an isolated area of charcoal-rich soil, interpreted as a possible ploughed out pit of unknown date.
- Archaeological testing for the Clonee-North of Kells PPP scheme (Licence Number: 04E0468) identified an isolated pit of unknown date.
- Archaeological testing of the outer enclosing ditch of the ecclesiastical enclosure as part of a community project (Licence Number: 15E0329) identified by geophysical survey to the south of St. Doolagh's.
- Archaeological excavations in advance of the N2 Finglas- Ashbourne realignment (Licecnce Number: 03E1358) in Ward Upper identified a small pit or token cremation, as well as a pit containing a large amount of prehistoric pottery.
- Archaeological monitoring (Licence Number: 04E1066) on Malahide Road identified a ring ditch with an entrance in the south-east of the ditch and a central pit. Fragments of Bronze Age pottery were recovered from the ditch fill and the central pit as well as burnt and unburnt bone.
- Archaeological excavations at St Doolaghs (Licence Number: E000508) did not identify any early activity or burials near the baptistry; however, did identify occupation and burial evidence within a circular enclosure, as well as iron working, from the late medieval period onwards.
- Archaeological monitoring for a proposed water main (Licence Number: 12E0185) identified possible structural remains east of St Doolagh's Church, as well as a post-medieval field boundary at the entrance to Bohomer estate, and two linear features between the entrance to Abbeville and the Malahide Road junction with Feltrim Road interpreted as possible robbed out walls.

A further 15 archaeological excavations were also identified (under Licence numbers: 15E0572, 18E0722, 06E0563, 06E0563 ext., 09E0467, 08E0333, 00E0951, 06E1029, 99E0470, 03E0104, 00E0688, 13E0361, 98E0479, 06E0343 99E0693); however, these did not identify any archaeological remains or deposits of archaeological significance.

A review of the National Museum Topographical Finds available online identified a casual find of a belt mount (IA/241/1988 (6)) within the study area for Option C (Yellow) in Saint Doolaghs.

3.4 Option D (Blue)

3.4.1 Archaeology

A total of 25 archaeological constraints were identified within the study area for Option D (Blue) (see Annex A and Figure B.1.1 in Annex B). These comprise:

- 20 Recorded Monuments; and

- Five sites recorded on the SMR.

No National Monuments, sites with Preservation Orders placed on them, or sites on the RHM were identified within the study area for Option D (Blue).

Recorded Monuments

A total of 20 Recorded Monuments are located within the study area for Option D (Blue) (see Figure B.1.1 in Annex B). These comprise:

- A mound (AY_06), approximately 70m to the west of Option D (Blue), comprising a sub-circular grass-covered mound, with a slight outer bank, measuring approximately 24m in diameter. The mound is depicted on First Edition Ordnance Survey mapping (1837 – 1842) and later mapping (Ordnance Survey 25", 1888-1913) as a 'Moat'. Archaeological testing to the south of the mound (Licence Number: 20E0014) did not identify any associated remains. The mound is visible on aerial imagery as a sub-circular area of rough ground to the south-west of a modern garden and as a low-profile mound from the road to the east. The mound is positioned to the north of the Tolka River in an area of pasture fields.
- A possible circular enclosure (AY_18) in Ballintry, located approximately 35m to the south of Option d (Blue) (see Section 3.1.1).
- The site of a castle (AY_25), approximately 37m to the north of Option D (Blue), a church and graveyard (AY_23 and AY_24), located adjacent to the R121 immediately to the north-west of Option D (Blue), and holy well (AY_22) in Ward Upper and Ward Lower (see Section 3.1.1).
- The site of an 18th/19th century house (AY_27) in Newpark, approximately 60m to the south of Option D (Blue) (see Section 3.1.1).
- An enclosure (AY_29) in Common, approximately 54m to the north of Option D (Blue) (see Section 3.1.1).
- A graveyard (AY_30) located to the north of Option D (Blue) in Common (see Section 3.1.1).
- The site of an enclosure (AY_34), located by the RMP approximately 55m to the north of Option D (Blue) in Killeek (see Section 3.3.1).
- An ecclesiastical enclosure (AY_35), walled graveyard (AY_36) and a ruinous church (AY_37) in Killeek, approximately 38m to the north of Option D (Blue) (see Section 3.3.1).
- An enclosure (AY_38) in Killeek to the south of Option D (Blue) (see Section 3.3.1).
- The site of a chapel and burial ground (AY_39 and AY_40), located in Forrest Great approximately 85m to the south of Option D (Blue) (see Section 3.3.1).
- The site of a 16th/17th century house (AY_42) approximately 65m to the north of Option B (Green) in Forrest Great (see Section 3.1.1).
- A ringfort (AY_43), approximately 28m to the south of Option D (Blue) in Cloghran (see Section 3.1.1).
- A church and its associated graveyard (AY_44 and AY_45) in Cloghran, approximately 65m to the south of Option D (Blue) (see Section 3.1.1).

Sites on the Sites and Monuments Record

A total of five sites recorded on the SMR have been identified within the study area for Option D (Blue). These comprise the locations of cropmarks. These are included in Table 3.10 and are shown on Figure B.1.1 in Annex B.

A further two sites on the SMR have not been included in Table 3.10 as these comprise sites excavated in advance of development including the M3 Motorway (AY_10), and the N2 Motorway (AY_21). While these sites provide an indication of possible activity in these locations, given these sites have been removed and developed, they are no longer constraints.

Table 3.10: Sites recorded on the SMR within the study area for Option D (Blue)

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
AY_19	ME051-017	A cropmark interpreted as a sub-circular enclosure, measuring approximately 30m in diameter, located approximately 75m to the north of Option D (Blue). The enclosure comprises a single fosse (ditch) identified from aerial imagery. No corresponding features are depicted on historic mapping.	Nuttstown	705085 / 745365
AY_28	DU011-156	A circular cropmark, measuring approximately 30m in diameter in Common, approximately 45m to the north of Option D (Blue), interpreted as an enclosure. While not depicted on historic mapping, this enclosure may correspond with the 'fort' identified on First Edition Ordnance Survey mapping (1837 – 1842). A circular feature is vaguely perceptible on aerial imagery in a pasture field to the north of the R121.	Common	712145 / 745847
AY_31	DU011-124	A large circular cropmark in Ballystrahan approximately 33m to the south-west of Option D (Blue), interpreted as an enclosure, as well as a possible associated field system (DU011-125). The circular enclosure is visible on aerial imagery in an arable field, south-west of the R122, along with a number of linear features in the surrounding fields.	Ballystrahan	712641 / 745143
AY_33	DU011-126	A circular cropmark in Kingstown approximately 64m to the west of Option D (Blue), interpreted as a ring ditch. In addition, other linear features were also identified from aerial imagery and interpreted as a possible field system in the same arable field (DU011-127).	Kingstown	713322 / 745300
AY_46	DU014-111	An enclosure identified from aerial imagery located in the Belcamp off-road focus area (see Table 3.1 in Section 3.1.1).	Stockhole	718714 / 743074

<u>Archaeological Potential</u>

Similar to the other route options, previous archaeological excavations in advance of development within the study area for Option D (Blue) have identified evidence of human activity dating from the prehistoric period onward (see Section 3.4.3) and there is the potential for previously unknown archaeological remains to be present, particularly in greenfield areas, including within the Batterstown South off-road focus area and Belgree West off-road focus area. There is also the potential for previously unknown archaeological remains associated with known archaeological constraints to be present, for example within the Zones of Notification of Recorded Monuments.

Option D (Blue) follows the existing local and regional road network, and there is a lower potential for previously unknown archaeological remains in these areas given construction of these roads may have removed or truncated any archaeological remains that may have been present. However, some sections of Option D (Blue) are located within pre-1840 roadways, including the road from Lismahon to Batterstown, the R154, the road from the M3 to Kilbride, the R121, the road through Ballystrahan, Killeek Lane, the R108, Dublin Road, Baskin Lane, Malahide Road, and Belcampe Lane and there is the potential for the presence of historic road surfaces in these locations.

Option D (Blue) crosses the Tolka River, Pinkeen River, and Mayne River as well as a number of minor watercourses. There is the potential for votive offerings, objects apparently deposited for religious reasons, in rivers. The underlying geology is largely limestone with conglomerate, calcareous shale and unbedded lime-mudstone. Superficial deposits comprise till, gravel, alluvium and lacustrine sediments, as well as pockets of outcropping bedrock in Killamonan, Ward Upper, Newpark, Ballystrahan, and Forrest Great[45]. In areas of lacustrine sediments and alluvium there is the potential for previously unknown archaeological remains, including paleoenvironmental and organic materials, to be preserved.

3.4.2 Architectural Heritage

A total of 20 architectural heritage constraints were identified within the study area for Option D (Blue). These comprise:

- Six Protected Structures (see Figure B.1.2 in Annex B);
- Two structures included on the NIAH (see Figure B.1.2 in Annex B), assessed by the NIAH to be of Regional importance; and
- 12 GDLs (see Figure B.1.3 in Annex B).

No ACAs have been identified within the study area for Option D (Blue).

Record of Protected Structures

The six Protected Structures identified within the study area for Option D (Blue) are shown on Figure B.1.2 in Annex B and comprise:

- Saint Thomas's Church (AH_04) is located approximately 15m to the north-east of Option D (Blue) and is described in Section 3.3.2.
- The remains of a medieval parish church within a walled graveyard (AH_06), the site of 'Cloghran Church' and graveyard (AH_09), and an enclosed stone well (AH_10) are also located within the study area for Option A (Red) (see Section 3.1.2).
- The remains of a medieval church within and oval shaped enclosed graveyard (AH_08). This is also a Recorded Monument (AY_37) and has been described under Recorded Monuments (see Section 3.4.1).
- A late 18th or early 19th century single-storey thatched cottage (AH_07) with stone outbuildings is located approximately 5m to the east of Option D (Blue).

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A gate lodge (AH_05) in Hollywood, is located approximately 12m to the north-east of Option D (Blue), is also located within the study area for Option A (Red) and is described in Section 3.1.2. In addition, Belcamp House (AH_13) in Belcamp, located approximately 70m to the south of Option B (Green), is also located within the study area for Option A (Red) (see Section 3.2.2).

Three additional structures included on the NIAH are also Protected Structures (AH_04, AH_07, and AH_08) and, to avoid double counting constraints, has been included above under Protected Structures.

[45] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228.

Gardens and Designed Landscapes

A total of 12 GDLs have been identified within the study area for Option D (Blue). Of these five were recorded by the Survey of Historic Gardens and Designed Landscapes and seven have been identified from historic mapping (Ordnance Survey 6", 1837 – 1842). Information on these GDLs is presented in Table 3.11 and are shown on Figure B.1.3 in Annex B.

Table 3.11: GDLs identified within the study area for Option D (Blue)

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_04	Priest Town House	The GDL to Priest Town House, including principal house and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Retains elements of parkland and woodland, as well as original driveways and entrances. Boundary along Belgree Lane formed of hedgerows and 'Crockanee' woodland.	Priest Town	NIAH 5156	Survey of Historic Gardens and Designed Landscapes
DL_05	Hollywoodrath	The GDL to Hollywoodrath, including principal building as well as garden and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842; Ordnance Survey 25", 1888-1913). While there has been development within the footprint of the site, including the golf course to the west, a section of roadside rubblestone boundary wall remains extant to the south of the site along the road that bisects the demesne.	Hollystown; Hollywood; Hollywoodrath; Spricklestown	NIAH 2267	Survey of Historic Gardens and Designed Landscapes
DL_07	Ward House	Demesne identified from historic mapping as 'Ward House' (Ordnance Survey 6", 1837 – 1842) located on the crossroads between the R135 and R121. The principal house appears to have been demolished and the area redeveloped, including a new high roadside boundary wall.	Ward Lower	N/A	Ordnance Survey 6", 1837 – 1842
DL_08	Newpark House	Demesne identified from historic mapping as 'Newpark House' (Ordnance Survey 6", 1837 – 1842) located to the south of the R121. The area appears to have been redeveloped as a commercial complex, including a concrete block boundary wall.	Newpark	N/A	Ordnance Survey 6", 1837 – 1842
DL_09	Kingstown House	Demesne identified from historic mapping as 'Kingstown House' (Ordnance Survey 6", 1837 – 1842). The boundaries of the demesne reflect those depicted on historic mapping (Ordnance Survey 6", 1837 – 1842); however, the buildings appear to have been removed and, while the driveway is still perceptible, the entrance has been replaced by a modern field gate. Boundary features along Kilreesk Road include a ditch and established boundary (trees and hedgerow), as well as a modern post and rail fence.	Kingstown	N/A	Ordnance Survey 6", 1837 – 1842
DL_10	Little Forest House	Demesne identified from historic mapping as 'Little Forrest House' (Ordnance Survey 6", 1837 – 1842). This area has been redeveloped into Forrest Little Golf Club. While a short section of rubblestone boundary wall appears to remain extant alongside Forest Road, at the junction with Cooks Road, the boundary appears to have largely been replaced by the modern entrance to the golf club.	Forrest Little	N/A	Ordnance Survey 6", 1837 – 1842
DL_11	Castle Mount	The GDL to Castle Mount. The principal building remains extant (RPS 611); however, the area has been developed. The boundary depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) is vaguely perceptible in places as hedgerows. The boundary on the R132 appears to have been replaced with a new wall.	Cloghran	NIAH 5726	Survey of Historic Gardens and Designed Landscapes

Reference Number	Name	Description	Townland	NIAH Reference	Source
DL_13	Limepark	Demesne identified from historic mapping as 'Limepark' (Ordnance Survey 6", 1837 – 1842). The principal building appears to have been demolished and the majority of the boundaries depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) are no longer present apart from sections of hedgerow. The demesne is bisected by Stockhole Lane.	Cloghran	N/A	Ordnance Survey 6", 1837 – 1842
DL_14	Woodlands	The GDL to Woodlands. While there has been some development to the north (R139 and roundabout), the footprint of this site and features within it, including the drive, trees and parkland remain perceptible. The principal building remains extant and appears to be on the site of an earlier dwelling. A belt of trees forms the northern boundary along the R139.	Clonshagh	NIAH 2435	Survey of Historic Gardens and Designed Landscapes
DL_15	Upper Middletown	Demesne identified from historic mapping as 'Upper Middletown' (Ordnance Survey 6", 1837 – 1842). The principal building is no longer extant, along with the driveway and 'Turret' depicted on historic mapping, and the location of the gate lodge to the east of Stockhole Lane has been redeveloped as modern dwellings. The boundary of the demesne remains extant as established hedgerows with sub-divisions visible as cropmarks on aerial imagery and extant as a hedgerow / ditch.	Middletown	N/A	Ordnance Survey 6", 1837 – 1842
DL_16	Glebe House	Demesne identified from historic mapping as 'Glebe House' (Ordnance Survey 6", 1837 – 1842), located to the east of Stockhole Lane. While the principal building appears to have been replaced with modern dwellings, the boundary and sub-divisions of the demesne reflect those depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Boundaries comprise established hedgerows, including trees, some of which have modern fence running parallel.	Glebe	N/A	Ordnance Survey 6", 1837 – 1842
DL_17	Belcamp	The GDL to Belcamp House. The principal building (AH_12 and AH_13) and ancillary buildings appears to have been demolished. The footprint is vaguely perceptible on aerial imagery and features depicted on historic mapping (Ordnance Survey 6", 1837 – 1842), such as the bridge, weir and gardens are perceptible.	Belcamp	NIAH 2455	Survey of Historic Gardens and Designed Landscapes

3.4.3 Cultural Heritage

A total of 23 cultural heritage sites identified within the study area for Option D (Blue) from the sources identified in Section 2. These largely comprise extant post-medieval buildings and structures, including stone road bridges, vernacular housing and farm buildings. Summary information on these cultural heritage sites is presented in Table 3.12Table and are shown on Figure B.1.4 in Annex B.

Table 3.12: Cultural heritage sites identified within the study area for Option D (Blue)

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_01	694857 / 745004	Blackhall Big	Roadside house	A single storey roadside cottage depicted on historic mapping (Ordnance Survey 25”, 1888-1913) approximately 8m to the south of Option D (Blue) (see Table 3.3 in Section 3.1.3).
CH_04	696348 / 744292	Staffordstown Little	Roadside house	A single storey house depicted on historic mapping (Ordnance Survey 25”, 1888-1913) approximately 12m to the south of Option D (Blue) (see Table 3.3 in Section 3.1.3).
CH_08	698026 / 744453	Baytownpark	Road Bridge	A road bridge depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842), comprising a pair of unmatching parallel stone parapets. Carries the road across an unnamed watercourse.
CH_09	698208 / 744723	Vesingtown	Road Bridge	A road bridge depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842). Comprises a pair of parallel rubblestone stone parapets with semi-circular copes. Appears to have been subject to repair (Google StreetView, March 2019). Carries the road across an unnamed watercourse.
CH_10	698964 / 745271	Vesingtown	Road Bridge	A stone road bridge depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842). Harled parallel parapets, western parapet obscured by vegetation (Google StreetView, March 2019). Carries the road across an unnamed watercourse.
CH_11	699269 / 745582	Lustown	Road Bridge	A stone road bridge depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842) comprising parallel parapets, the eastern of which has splayed approaches. The bridge appears to have been repaired / restored (Google StreetView, March 2019). Carries the road over the Tolka River.
CH_12	702502 / 744660	Ballymagillin	Courtyard farm	A group of rendered stone farm buildings depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842 and Ordnance Survey 25”, 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_13	702660 / 744657	Whitesland	House	A house depicted on historic mapping (Ordnance Survey 25”, 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_14	703920 / 745061	Nuttstown	Road Bridge	A stone road bridge that carries the road through Nuttstown across an unnamed watercourse depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842) (see Table 3.3 in Section 3.1.3).
CH_15	705608 / 745439	Belgree	Road Bridge	A stone road bridge that carries the road across the Ward River in Belgree depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842) located within the Belgree West off-road focus area (see Table 3.3 in Section 3.1.3).
CH_16	706594 / 745764	Belgree	Road Bridge	A rubble stone bridge that carries the Kilbride Road over a minor watercourse depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842) located within the Belgree West off-road focus area (see Table 3.3 in Section 3.1.3).
CH_19	708295 / 743234	Hollywood	Police Barracks	A police barracks depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842) (see Table 3.9 in Section 3.3.3).
CH_24	710160 / 745108	Ward Upper	House	‘Six Mile House' depicted on historic mapping (Ordnance Survey 6”, 1837 – 1842) (see Table 3.3 in Section 3.1.3).

Reference Number	Location (Easting / Northing)	Townland	Site Type	Description
CH_25	710338 / 745269	Newpark	Agricultural ranges	A group of agricultural buildings depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_29	712626 / 745191	Ballystrahan	House	A house depicted on historic mapping (Ordnance Survey 6", 1837 – 1842 and Ordnance Survey 25", 1888-1913) (see Table 3.3 in Section 3.1.3).
CH_30	718730 / 741985	Clonshaugh	House	A two-storey, roadside farmhouse with agricultural ranges depicted on historic mapping (Ordnance Survey 6", 1837 – 1842). Modern single-storey porch to east, and a single storey extension to the south (Google StreetView, January 2022). The house is set back from Clonshaugh Road in a low walled garden, with views across the road, towards the fields beyond.
CH_31	718755 / 742792	Stockhole	Ford	'Shane's Ford' depicted on First Edition Ordnance Survey mapping (1837 – 1842) (see Table 3.6 in Section 3.2.3).
CH_41	694713 / 746280	Culcommon	Road Bridge	The western coursed, rubble stone parapet of a road bridge depicted on historic mapping (Ordnance Survey 6", 1837 – 1842) located within the Batterstown South off-road focus area (see Table 3.3 in Section 3.1.3).
CH_42	694977 / 746856	Ribstown	House	A roadside cottage depicted on historic mapping (Ordnance Survey 25", 1888-1913) located within the Batterstown South off-road focus area (see Table 3.3 in Section 3.1.3).
CH_48	700948 / 745680	Piercetown	Railway (Site of)	The alignment of the M.G.W.R (Dublin and Navan Branch) railway, depicted on Ordnance Survey 25" mapping (1888-1913) within the M3 off-road focus area (see Table 3.9 in Section 3.3.3).
CH_49	705928 / 745630	Priest Town	Gravel Pit	A 'Gravel Pit' depicted on First Edition Ordnance Survey mapping (1837 – 1842), within the Belgree West off-road focus area, in a small area of woodland east of Priest Town Demesne (DL_04).
CH_50	705636 / 745261	Belgree	Gravel Pit	A 'Gravel Pit' depicted on First Edition Ordnance Survey mapping (1837 – 1842). Not identified on later mapping. Located in an arable field to the south of Belgree Lane within the Belgree West off-road focus area.
CH_51	707212 / 744554	Court	Enclosure	A square enclosure with associated linear features identified from aerial imagery (GoogleEarth, Sept 2003) (see Table 3.3 in Section 3.1.3).

Previous Excavations

A review of Excavations Bulletin and TII's Archaeological Excavation Reports identified the following archaeological excavations in the Option D (Blue) study area:

- Archaeological testing for the Clonee-North of Kells PPP scheme (Licence Number: 04E0468) identified an isolated pit of unknown date.
- Archaeological excavation in advance of the North Runway development at Dublin airport (Licence Number: 17E0090) in Barberstown identified the remains of an earth-cut early medieval kiln and a ditch which contained fragments of iron knives and sherds of 12th – 13th century pottery. An oval bivallate enclosure previously identified through geophysical survey undertaken for the North Runway development at Dublin airport was confirmed through archaeological testing, along with a number of other features including pits and structural slot trenches (Licence Number: 19E0006). Archaeological testing (Licence Number: 17E0282) also identified multi-phase occupation evidence including fulacht fiah, late Neolithic pits, and a medieval field system.
- Monitoring for the Airport-Balbriggan Bypass (Licence Number: 00E0950) identified an isolated area of charcoal-rich soil, interpreted as a possible ploughed out pit of unknown date.
- Archaeological excavations in advance of the N2 Finglas- Ashbourne realignment (Licence Number: 03E1358) in Ward Upper identified a small pit or token cremation, as well as a pit containing a large amount of prehistoric pottery.

A further nine archaeological excavations were also identified (under Licence numbers: 02E1388, 18E0219, 99E0226, 99E0693, 18E0722, 17E0091, 04E0381, 98E0479, and 00E0951); however, these did not identify any archaeological remains or deposits of archaeological significance.

A review of the National Museum Topographical Finds available online identified no casual finds within the study area for Option D (Blue).

4. References

Aerial Photographs

Cambridge University Collection of Aerial Photography (CUCAP): https://www.cambridgeairphotos.com/

CUCAP Number	Date	Subject
BDK006	1970	Crop marks. Dunboyne, Meath, Ireland

Historic Maps

The Down Survey of Ireland, 1656-1658, http://downsurvey.tcd.ie/index.html

Rocque, 1760, Dublin County, http://www.dublinhistoricmaps.ie/maps/1600-1799/index.html

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Ordnance Survey, 25" to 1 mile, 1888-1913, https://geohive.maps.arcgis.com/apps/webappviewer/index.html?id=9def898f708b47f19a8d8b7088a100c4

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Annex A. Inventory of Archaeology, Architectural Heritage and Cultural Heritage Constraints

Table A1: Inventory of Archaeological Constraints

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Location / Coordinates	Description	Approx. Date	Sources
AY_01	ME050-002001	N/A	Ballymaglassan	Meath	Graveyard	696087 / 745606	Situated on a rise in a fairly level landscape. The site of the medieval parish church of Ballymaglassan (ME050-002----), of which there is no physical trace, is within a D-shaped graveyard (max. dims c. 50m NE-SW; c. 40m NW-SE) defined by masonry walls with the straight sides at NE and SE. The headstones date from c. 1780 to c. 1930.	Medieval	Archaeological Survey of Ireland SMR
AY_02	ME050-002	Recorded Monument	Ballymaglassan	Meath	Church	696095 / 745606	Situated on a rise in a fairly level landscape. A church at Balimacglassan is listed in the ecclesiastical taxation (1302-06) of Pope Nicholas IV (Cal. doc. Ire., 5, 254). Ussher (1622) describes the church as in reasonable repair but the chancel was ruined (Erlington 1847-64, 1, lxxi). A ruined church is marked on the Down Survey (1656-8) parish map at Ballymaglassan. According to Dopping (1682-5) the church and chancel of St Kenan's (Kieran ?) were ruined since 1641 but the walls were standing and the graveyard was not enclosed (Ellison 1971, 38). A new church, described as a 'neat little edifice' was built in 1800 (Lewis 1837, 1, 146), but this is now closed. The E window from this church, which had come from the Church of Ireland church at Ratoath is now in the E wall of St Seachnall's Church of Ireland Church at Dunshaughlin (Kenny 1994-5). The site of the medieval church, of which there is no physical trace, is within a D-shaped graveyard (max. dims c. 50m NE-SW; c. 40m NW-SE) defined by masonry walls with straight sides at NE and SE. The headstones date from c. 1780 to c. 1930 and have been published (ibid). Depicted on 17th century mapping as being in ruins (Down, 1656-1658). Depicted on First Edition Ordnance Survey mapping (1837 – 1842) as the 'Site of Old Church' south of a new church (AH_01). The site of the church is located within Ballymaglassan House GDL (DL_01). The site of the medieval church is within an enclosed graveyard (AY_01). The site of the church is located on a rise in the landscape. Views are of its immediate surroundings and distant views are limited by established belts of trees in all directions.	Medieval	NMS, 1996, Record of Monuments and Places (County Meath) The Down Survey of Ireland, 1656-1658 Ordnance Survey 6", 1837 – 1842
AY_03	ME044-027	Recorded Monument	Lismahon	Meath	Mound	696401 / 746575	Situated on a level landscape and just N of where three old field drains meet. A small circular feature described as 'Lismahon Moat' is depicted on the 1836 edition of the OS 6-inch map and it is described similarly on the 1908 edition. This is an oval, flat-topped and grass-covered mound (dims of base 16m E-W; 9m N-S; dims of top 6.5m E-W; 1.5m; H 1.6m at E to 2.2m at W) at the S corner of a field with large, silted drains just to the E and W.	Unknown	NMS, 1996, Record of Monuments and Places (County Meath) Ordnance Survey 6", 1837 – 1842 https://www.duchas.ie/en/cbes/5008916/4966

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Location / Coordinates	Description	Approx. Date	Sources
							The mound is depicted on First Edition Ordnance Survey mapping (1837 – 1842) as 'Lismahon Moat'. Possibly the mound within the field known locally as 'The House Division,' where a group of men digging for gold under the mound and were struck down as a result.		449/5106948 [Accessed August 2022]
AY_04	ME044-035	Recorded Monument	Lismahon	Meath	Ritual site - holy tree/bush	696416 / 746776	Situated on a level landscape and on a small NE-SW roadway c. 1km SW of Batterstown village. A bush, described as the 'Monument Bush' in italic script is depicted in the roadway on the 1835 edition of the OS 6-inch map, but it had been removed by the start of the next century as it is described as the site of the monument bush on the 1908 edition. According to the OS letters of the 1830s funerals were carried in procession around the Big Tree in Rathregan and the Monument Bush, but there was no explanation of the name (Herity 2001, 114). In the folk tradition it was regarded as a Mass bush where Mass was celebrated in Penal times (IFC Schools' Collection vol. 0687, P 316). The roadway with its banks and hedges is still slightly wider at this point. A 'Monument Bush' depicted on First Edition Ordnance Survey mapping (1837 – 1842), and later mapping shows 'Monument Bush (Site of)'. Tradition notes funerals were carried in procession around the big tree in Rathregan and the Monument Bush, and that mass was celebrated at the bush during Penal Times. Road workers also recovered two human skulls from this location in the 1930s, believed to be the remains of Irish soldiers who were hanged in this location while retreating from the Battle of Tara (AD 980).	Unknown	NMS, 1996, Record of Monuments and Places (County Meath) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 https://www.duchas.ie/en/cbes/5008916/4966444/5106937?ChapterID=5008916 [Accessed August 2022] https://www.duchas.ie/en/cbes/5008921/4966731/5107671 [Accessed August 2022]
AY_05	ME044-038	N/A	Rathregan	Meath	Font	697159 / 747637	Located in the grounds of the Roman Catholic church of the Assumption at Batterstown. This is a rectangular granite font (ext. dims 0.58m x 0.58m; H 0.34m) with a rectangular basin (int. dims 0.42m x 0.41m; D 0.16m). Externally, it has chamfered corners at the bottom (H 0.21m) and its drain-hole is obscured by soil. Two of the sides have two shallow depressions (diam. 4cm) on the rim for the attachment of a lid. It is not known from which medieval church site it came.	Unknown	Archaeological Survey of Ireland SMR
AY_06	ME050-003	Recorded Monument	Quarryland	Meath	Barrow - mound barrow	699247 / 745732	Situated on a gentle SW-facing slope, this feature is described as a 'Moat' on the 1836 and 1908 editions of the OS 6-inch map. This is a subcircular grass-covered mound (diam. of base 24m NE-SW; diam. of top 11.5m N-S; 11.3m E-W; ext. H 1.2m at NE to 1.8m at SW), with a slight outer bank (Wth c. 2m; H 0.2m) at NE. Archaeological testing (20E0014) by P. D. Sweetman (2020) in an area (dims c. 80m NW-SE; c. 80m NE-SW) immediately S of the monument failed to produce any related material.	Bronze Age	NMS, 1996, Record of Monuments and Places (County Meath) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Location / Coordinates	Description	Approx. Date	Sources
							Depicted on First Edition Ordnance Survey mapping (1837 – 1842) and later mapping as a 'Moat'. The mound is visible on aerial imagery as a sub-circular area of rough ground to the south-west of a modern garden and as a low-profile mound from the road to the east. The mound is positioned to the north of the Tolka River in an area of pasture fields.		
AY_07	ME050-030	N/A	Dunboyne	Meath	Field system	700971 / 743204	Situated on a fairly level landscape. Aerial photographs by L. Swan (LS_AS_67BWN_00132) from the early 1970s record elements of a rectangular field system covering an extensive area (dims c. 220m NW-SE; c. 220m NE-SW) between the large enclosure (ME050-027----) to the SE and the possible church site (ME050-029----) to the NW, but not connected directly with either and different in character to both. The fields are large and rectangular (dims c. 60-120m x c. 30-50m), and appear to be defined by single ditches that correspond closely to features represented on the Down Survey (1656-8) barony and parish maps. They also run generally parallel with the current boundaries but are probably medieval in date. The area was subject to a partial magnetic gradiometer and earth resistance survey (00R0014) by I. Elliot (2000) where the features recorded in the aerial photographs are confirmed. Elliott's results suggest that the enclosing elements consisted primarily of hedges. The NE-SW by-pass road (R157) for Dunboyne cut through the area, and centre-line testing (04E0487) by R. O'Hara (2004, 10-11) noted four of these ditches of uniform character (Wth c. 1.2m; D 0.5m) with homogenous fills from which nothing was recovered except some snail shells (excavations.ie 2004:1229). Further excavation (E003024) by R. Elliott (excavations.ie 2004:1554) of Dunboyne 4 recorded the drain features in detail and recovered post-medieval and modern ceramics from them. The long structure (ME050-062001-) and its associated possible kiln (ME050-062002-) were also identified and excavated but they are unrelated to the fields (Elliott 2008).	Post-medieval	Archaeological Survey of Ireland SMR
AY_08	ME050-062001	N/A	Dunboyne	Meath	Structure	701066 / 743342	Situated on a slight rise in a generally level landscape. Archaeological testing (04E0487) by R. O'Hara on the link-road (R157) for Dunboyne set aside this area for resolution as Dunboyne 4 (excavations. ie 2004:1229). Archaeological excavation (E003024) by R. Elliott (excavations.ie 2004:1554) recorded elements of the field system (ME050-030----) as well as this prehistoric structure and the possible kiln (ME050-062002-). Nineteenth century quarrying, the importation of soils and subsequent ploughing severely truncated most of the archaeological features.	Middle – Late Bronze Age	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012351/

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Location / Coordinates	Description	Approx. Date	Sources
							Thirty one stake and post-holes were recorded in one area, and twenty three of these create a long narrow structure (dims 13m plus ENE-WSW; 3.5m NNW-SSE) extending outside the road-take to the WSW. A strictly regular pattern is not discernible but two post-holes just outside the S line towards the E end have ramps from the S, and a C14 date of 2117-1779 cal. BC was returned from one of these. A large post-hole at the E edge also has a ramp at the E edge. This produced two sherds of Middle-Late Bronze Age pottery together with cremated bone, from which a C14 date of 971-804 cal. BC was returned. A sample of charcoal from another post-hole yielded a date of 1115-853 cal. BC. The nature of this structure is uncertain, but it has neither slot-trenches nor a hearth, and the fairly even distribution of the post-holes suggests that it could be a post-alignment, except that its scale is reduced.		
AY_09	ME050-062002	N/A	Dunboyne	Meath	Kiln	701098 / 743314	Situated on a slight rise in a generally level landscape. Archaeological testing (04E0487) by R. O'Hara on the link-road (R157) for Dunboyne set aside this area for resolution as Dunboyne 4 (excavations. ie 2004:1229). Archaeological excavation (E003024) by R. Elliott (excavations.ie 2004:1554) recorded elements of the field system (ME050-030----) as well as this structure that is interpreted as a kiln and the prehistoric structure (ME050-062001-). This consists of a large sub-oval pit (max. dims 3.35m N-S; 1.3m E-W; D 0.43m) with a clay lining. It has two bowls with a connecting flue but many of the fills contained burnt stone. Some uncharred grain was recovered, but a sample of hazel charcoal from a basal fill yielded a C14 determination of 2117-1779 cal. BC. This sample must have been contaminated somehow. A subrectangular cut (dims 1.9m x 1.35m; D 0.17m) for a bellows was connected to the S bowl by a narrow channel, but much of the bellows pit was damaged by a large modern quarry to its S. (Elliott 2008, 3-4)	Unknown	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012351/
AY_10	ME050-041	N/A	Piercetown (Dunboyne By.)	Meath	Kiln - corn-drying	701477 / 745137	Systematic archaeological testing (16E0451) by Deirdre Murphy of the development area within Piercetown explored the larger enclosures (excavations.ie 2016:463). This programme also identified a third enclosure and three other potential, but smaller, archaeological areas. Final archaeological monitoring (16E0451) by Deirdre Murphy of the removal of topsoil identified further features throughout the large development area, but most of these were either related to the identified monuments or to drainage and almost all were resolved under the original licence (excavations.ie 2016:463). A cereal-drying kiln was excavated in Area 2. It was an irregularly-shaped area (dims 8.6m NE-SW x 1m; max. D 0.68m) and consisted of a flue (Wth 0.6m) connecting the firing and drying chambers. The kiln had four fills of silty clays with charcoal or ash and there were	Medieval	Archaeological Survey of Ireland SMR

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Location / Coordinates	Description	Approx. Date	Sources
							two recuts of the bowl. Plentiful evidence of cereals was recovered, and a sample produced a C14 date of 1020-1160 cal. AD. (Murphy 2019a 11, 17-18)		
AY_11	ME050-057	N/A	Bennetstown	Meath	Excavation - miscellaneous	701490 / 743915	Situated on the E-facing slope of a rise in a fairly level landscape. Centre-line testing (04E0488) by R. O'Hara on the Dunboyne link road (R157) to the M3 (excavations.ie 2004:1183) identified archaeological features that were fully excavated (E003027) by R. Elliott in February and March 2006 as Bennetstown 3 (excavations.ie 2006:1509). A group of eight post-holes (diam. 0.2-0.6m; D 0.2-0.66m) from which most of the posts had been removed rather than being burnt or left to rot form a rough rectangular structure (max. int. dims 4.3m NE-SW; 2.6m NW-SE) that might have been open (Wth c. 1.1m) on the NW side. Two small pits (dims 0.67m x 0.32m; D 0.16m: diam. 0.37-0.39m; D 0.13m) were just to the W and two patches of burnt clay (dims 1.2m x 0.7m; T 0.1m: 0.63m x 0.24m; T 0.07m) 11m to the NW may be the remains of hearths. There were four other pits (dims 0.69m x 0.41m; D 0.3m to 1.15m x 1.04m; D 0.17m) c. 20m to the W, some with charcoal and burnt bone inclusions, and a curving trench (dims 2m x 0.5m; D 0.09m) could represent a slot-trench for a hut-site but there is no further evidence of it. A charcoal sample from its fill produced a C14 date of 1490-1310 cal. BC, which accords well with a sherd of coarse pottery from the same context. (Elliott and Ginn 2008)	Prehistoric	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012305/
AY_12	ME050-058	N/A	Bennetstown	Meath	Burnt mound	701594 / 743995	Situated in the valley of the N-S Tolka or Tullaghanoge River, with a canalised NW-SE section of the stream just to the NE, although the original meandering stream is c. 50m to the NE. Centre-line testing (04E0488) by R. O'Hara on the Dunboyne link road (R157) to the M3 (excavations.ie 2004:1183) identified a spread of dark soil that was partially excavated (E003026) by R. Elliott in January 2006 as Bennetstown 2 (excavations.ie 2006:1508). It consisted of a spread (dims 11.5m N-S; 4.5m E-W; T 0.2m plus) of black silty clay with burnt and broken stones that extended outside the excavated area to the NW. It was over a black/brown clay peat, into which a small pit (dims 0.4m x 0.34m; D 0.12m) had been cut, and it was covered by alluvial layers of silt. A rectangular pit (dims c. 1.7m x c. 0.5m plus; D 0.23) that cut into the top of the burnt mound was modern, and a sample of charcoal from the mound produced a C14 date of 2460-2200 cal. BC. No trough was recognised but much of the monument lies outside the excavated area to the NW. (Elliott and Ginn 2008)	Prehistoric	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012305/
AY_13	ME050-056	N/A	Pace	Meath	Excavation - miscellaneous	701771 / 744170	Situated within the valley of the Tolka River, with a meandering NNW-SSE section of the stream c. 150m to the SW, and a relict pond just to the W. Archaeological centre-line testing (04E0490)	Late Bronze Age	Archaeological Survey of Ireland SMR

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Location / Coordinates	Description	Approx. Date	Sources
							by R. O'Hara of Testing area 6 of Contract 1 of the M3 motorway identified a spread of deposits (excavations.ie: 2004:1232) that were fully excavated (E003031) by R. Elliott (excavations.ie 2005:1229) as Pace 1 in September to November 2005. What was thought to have been a spread of burnt mound material proved to be natural riverine gravels, but a total of 24 pits (dims 0.34m x 0.26m; D 0.24 to 2.05m x 2.03m; D 0.16m) were recorded as well as numerous stake and post-holes, and a cereal-drying kiln. The pits were filled with a grey/brown/orange clayey silt with inclusions of pebbles, but charcoal flecks, largely hazel, were present in only 11 pits. A sample of hazel from one pit produced a C14 date of 2461-2155 cal. BC. Water-logged remains of thistle and grass were recorded in two pits, and animal bones were recovered from six, a sample of which provided a radiocarbon date of 924-806 cal. BC. There were few artefacts recovered from the pits, but sherds of likely Late Bronze Age pottery and a fragment of a clay mould of a bladed weapon were recovered as well as flint debitage and a cockle shell. There were 15 post-holes and 175 stake-holes, but no pattern is discernible amongst the post-holes, and the stake-holes clustered, together with the pits, at the W end of a ditch (Wth 0.5-0-.55m; D 0.24m) that terminated at the edge of a pond. Post-medieval material was recovered from the upper fill of this drain. (Elliott et al. 2008)		https://excavations.ie/report/2004/Meath/0012354/
AY_14	ME050-056001	N/A	Pace	Meath	Kiln - corn-drying	701799 / 744162	Located on slightly higher ground than the pits (ME050-056----) just to the S was a figure-of-eight kiln consisting of an oval pit (dims 1.37m x 1-1.2m; D 0.36m) connected at S to a circular pit (diam. 0.82-0.94m; D 0.46m). It was filled with silty clay with inclusions of charcoal and burnt bone over a red-stained clay indicating in situ burning. The oval pit produced charred evidence of wheat and barley but a sample of hazel charcoal from it yielded a C14 date of 422-596 cal. AD. A sample of charred hazel from the circular pit produced a C14 date of 267-540 cal. AD. The subsoil was scarred with ard-marks running NW-SE and NE-SW. (Elliott et al. 2008, 2-3)	Prehistoric	Archaeological Survey of Ireland SMR
AY_15	ME050-060001	N/A	Dunboyne	Meath	Structure	701885 / 743642	Archaeological centre-line testing (04E0489) by R. O'Hara of Testing Area 5 of Contract 1 prior to the construction of the M3 motorway identified archaeological features (excavations.ie: 2004:1191) that were fully excavated (E003034) by the same archaeologist as Dunboyne 2 in August/September 2005. The features were deeply truncated by medieval quarrying, and tree-bowls, possibly from a prehistoric clearance, were also present. Two parallel NW-SE drains c. 1.5m apart run through the excavated area and contained both medieval and post-medieval artefacts. Numerous small finds, including flint and chert flakes, the base of a stone mortar, and an iron arrowhead	Prehistoric	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012313/

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Location / Coordinates	Description	Approx. Date	Sources
							were retrieved from the ploughsoil. A circular structure, two corn-drying kilns, and evidence of metal-working was recorded. An arc of seven pits enclosed more than half a circular area (int. diam. c. 6.1m) but its S edge had been destroyed by medieval quarrying. The pits are broad shallow ovals (dims 0.9m x 0.6m; D 0.07m to 1.9m x 0.5m; D 0.07m) filled with dark grey/brown silty clays with charcoal flecking. One pit (dims 1.65m x 0.67m; D 0.37m) was less truncated with a similar fill from which a C14 date of 729-262 cal. BC was derived from a piece of blackthorn charcoal. Two smaller pits and a post-hole were less than 1m inside the line of defining pits. The outer pits may have been a drip-gully from the eaves or the slot-trench for the wall of a small circular hut-site. An area of oxidised subsoil (dims 1.5m x 1m) c. 3m to the N was probably a hearth where a Group VI tuff stone axe was found. Two flint flakes were the only (residual) artefacts recovered. (O'Hara 2009, 2-4)		
AY_16	ME050-060002	N/A	Dunboyne	Meath	Kiln - corn-drying	701890 / 743637	Archaeological centre-line testing (04E0489) by R. O'Hara of Testing Area 5 of Contract 1 prior to the construction of the M3 motorway identified archaeological features (excavations.ie: 2004:1191) that were fully excavated (E003034) by the same archaeologist as Dunboyne 2 in August/September 2005. The features were deeply truncated by medieval quarrying, and tree-bowls, possibly from a prehistoric clearance, were also present. Two parallel NW-SE drains c. 1.5m apart run through the excavated area and contained both medieval and post-medieval artefacts. Numerous small finds, including flint and chert flakes, the base of a stone mortar, and an iron arrowhead were retrieved from the ploughsoil. A circular structure, two corn-drying kilns, and evidence of metal-working was recorded. The remains of two oval kilns (dims 1.39m x 0.68m; D 0.26m: 1.02m x 0.68m; D 0.26m) were located c. 5-6m NW and E of the structure (ME050-060----). They both had oxidized bases where charred wheat, hazel and cherry were present, although barley was dominant. A fragment of alder charcoal from the smaller of the kilns yielded a C14 date of 401-206 cal. BC. (O'Hara 2009, 5)	Prehistoric – post-medieval	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012313/
AY_17	ME050-060003	N/A	Dunboyne	Meath	Furnace	701915 / 743647	Archaeological centre-line testing (04E0489) by R. O'Hara of Testing Area 5 of Contract 1 prior to the construction of the M3 motorway identified archaeological features (excavations.ie: 2004:1191) that were fully excavated (E003034) by the same archaeologist as Dunboyne 2 in August/September 2005. The features were deeply truncated by medieval quarrying, and tree-bowls, possibly from a prehistoric clearance, were also present. Two parallel NW-SE drains c. 1.5m apart run through the excavated area and contained both medieval and post-medieval artefacts. Numerous small finds, including flint and chert flakes, the base of a stone mortar, and an iron arrowhead	Unknown	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012313/

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							were retrieved from the ploughsoil. A circular structure, two corn-drying kilns, and evidence of metal-working was recorded. Two Ironworking bowl-furnaces were c. 32 and c. 37m ENE of the structure. A small furnace bottom (diam. 0.25m; D 0.08m) was c. 5m E of a large furnace (diam. 1m; D 0.1m). Both had oxidised bases and were filled with loose black/grey clays with hazel charcoal and metal waste. A date cannot be ascribed to them. (O'Hara 2009, 5)		
AY_18	ME051-002	Recorded Monument	Ballintry	Meath	Enclosure	704748 / 744981	Located on a fairly level landscape with an E-W road just to the N. The faint cropmark of a circular enclosure (diam. c. 50m) defined by a single fosse is visible on oblique aerial photographs (CUCAP: BDK006-007) from 1970. A gradiometer survey (18R01789) by J. Leigh proved inconclusive, and archaeological testing (18E0445) by F. O'Carroll in a trench parallel with the road bank and probably just N of the enclosure produced no evidence of it, although an area of burning did come to light and is preserved in situ. (O'Carroll 2019). Not depicted on historic mapping. Visible on aerial imagery as a faint circular feature in a field adjacent to the road.		NMS, 1996, Record of Monuments and Places (County Meath) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 https://www.cambridgeairphotos.com/location/bdk006/ [Accessed August 2022]
AY_19	ME051-017	N/A	Nuttstown	Meath	Enclosure	705085 / 745365	Situated on a low WNW-ESE ridge. The cropmark of a subcircular enclosure (diam. c. 30m) defined by a single fosse feature is visible on Google Earth (24/06/2018). It was first reported to the National Monuments Service by Anthony Murphy.		Archaeological Survey of Ireland SMR
AY_20	ME051-001	Recorded Monument	Priest Town	Meath	Castle - motte	706639 / 746395	Located at the N end of a NE-SW ridge and c. 400m SW of the medieval parish church of Kilbride (ME045-025----). It is depicted as a circular feature (diam. c. 20m) and described in gothic lettering as 'Kilbride Moat' on the 1835 and 1908 editions of the OS 6-inch map. It was described in 1942 (SMR file) as a tumulus '20 feet (c. 6m) high by 50 feet (c. 15m) in diameter surrounded by a circular rath 50 yards (c. 45m) in diameter.' Its profile had been removed by 1969 as the result of a quarry encroaching from the SW and even the outer enclosure, which was probably on the outer edge of a fosse, was no longer evident. Archaeological testing (99E0580) by F. O'Carroll c. 200m to the W produced no related material (excavations 1999:691). Depicted as 'Kilbride Moat' on historic mapping. No earthworks are visible on aerial imagery and the location appears to have been developed. The 'Moate field' in Priest Town is reportedly where Cromwell set up his guns to destroy a church that had been built (located in the current graveyard).		NMS, 1996, Record of Monuments and Places (County Meath) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 https://www.duchas.ie/en/cbes/5008921/4966731/5107671 [Accessed August 2022]
AY_21	DU011-091	N/A	Ward Upper	Dublin	Habitation site	709410 / 744364	Excavations in advance of the N2 Finglas-Ashbourne Road Scheme in 2004 revealed a random grouping of features	Late Bronze Age	Archaeological Survey of Ireland SMR

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							including a small burnt pit, a linear feature and a small pit or cremation (03E1358). The pit (diam 1.65m, D 0.65m) produced 280 pieces of prehistoric pottery of Late date (NRA).		
AY_22	DU011-038	Recorded Monument	Ward Lower	Dublin	Ritual site - holy well	709519 / 744730	The site is located in a large level field under tillage S of a medieval church (DU011-039001-). Formerly an open pool, dedicated to St. Brigid. Now enclosed and used for domestic and farm purposes (Ó Danachair 1958, 76). Depicted on historic mapping as the 'Church Well.' The well is not visible on aerial imagery. Branigan records that "the site of Church Well is located under a field of tillage south-west of the graveyard ruined church of Ward Lower. The well was in use up until the 1970s for agricultural purposes, having formerly a pump and subsequently a manhole cover erected over it. There are not no surviving surface indications of the well, but it was located at the edge of the field to the rear of the third bungalow south of the graveyard" (Branigan 2012: 61).	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 https://ihwcbc.omeka.net/items/show/527 [Accessed August 2022]
AY_23	DU011-039001	Recorded Monument	Ward Lower	Dublin	Church	709652 / 744834	Dedicated to St Brigid the church fell into ruin between 1630 and 1650 (Fingal Historic Graves Project 2008). This site was described as the walls of an old church in the Civil survey (1654-6) (Simington 1945, 235). The foundations of the medieval parish church can be traced within a raised, walled graveyard. In the 1992 report they appeared as a low rectangular mound, aligned WNW-ESE (dims. L 14m, Wth 8-9m, H.1m). The church has since undergone 'improvement'. It is defined by a rectilinear stone wall with a grass ramp built into south wall and return in north wall with a stone built concrete roofed alcove in east wall. the alcove contains a statute of the Blessed Virgin Mary. Wall stands to 0.75m-1m in height and is extensively ribbon pointed. Presumed enclosure of original mound remains. A fragment of a limestone window jamb of late medieval date has been re-used as a headstone east of the church.	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal)
AY_24	DU011-039002	Recorded Monument	Ward Lower	Dublin	Graveyard	709652 / 744825	A raised, roughly oval, walled graveyard (L 70m, Wth 50m) which encloses the foundations of the medieval parish church (DU011-039001-). Fragment of a limestone window jamb of late medieval date is used as gravemarker in the graveyard E of church. The memorials are 19th/20th century in date. The site was formerly surveyed (Egan 1992). Still in use.	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal)
AY_25	DU011-068	Recorded Monument	Ward Upper	Dublin	Castle - unclassified	710002 / 745096	The Civil survey (1654-6) describes the walls of an old castle at the Ward, held by Sir James Ware (Simington 1945, 235). This may have been formerly located where Ward House is situated just NE of the medieval parish church (DU011-039----). Austin Cooper's in 1779 describes the remains of an 'old castle. It is nothing more than the lower storey....built of small flat stones and is in a ruinous condition. The door is at one end opposite a	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal) https://www.irishmanuscripts.ie/digital/The Civil Survey AD 1654-56 Vol VII County of

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							window and the left corner as you enter a Gothic door which leads to the Orchard where there are pieces of other stone walls'. There are remains of an orchard to the rear of the present Ward House but no visible remains of a castle. Described as 'the walls of an olde castle.' Part of a holding with other buildings including the ruins of an old church (AY_23). A ruined church is depicted on historic mapping, no castle is depicted. No remains are visible on aerial imagery.		Dublin/The Civil Survey AD 1654-56 Vol VII County of Dublin.pdf [Accessed August 2022] http://www.dublinhistoricmaps.ie/maps/1600-1799/index.html [Accessed August 2022] https://iiif.lib.harvard.edu/manifests/view/ids:10653105 [Accessed August 2022]
AY_26	DU011-077	Recorded Monument	Newpark (Castleknock By.)	Dublin	Inn	710430 / 744652	An article in the Fingal Independent dated 23 December 1994 reports on the discovery of a 16th century arch in the White House, a public house at the Ward, county Dublin. It is a bow-shaped arch which is unlikely to be pre-1700 in date. It has been extensively ribbon pointed. Depicted on First Edition Ordnance Survey mapping (as 'Carman's stage,' the roadside inn is also shown on later mapping as the 'White House (P.H.).'	Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AY_27	DU011-076	Recorded Monument	Newpark (Castleknock By.)	Dublin	House - 18th/19th century	711009 / 745599	The Down Survey (1655-6) map mentions a 'Fayre House'. It has been suggested that Newpark House could be the site of or incorporated this dwelling. A single wall with hearth visible, possible remains of Newpark House were demolished. Surviving stable building to north. Located within a yard used for machinery storage and plant hire. May correspond with Newpark House shown on historic mapping (1760) with associated grounds and ancillary buildings. 'Newpark House' is depicted on later mapping; however, the buildings appear in a different layout. No longer extant - This location has been redeveloped into a commercial premises	Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) https://source.southdublinlibraries.ie/bitstream/10599/8879/3/wm_Duncan02.jpg [Accessed August 2022] Ordnance Survey 6", 1837 – 1842
AY_28	DU011-156	N/A	Common	Dublin	Enclosure	712145 / 745847	Circular enclosure identified as a crop mark on Bing (viewed 03/01/2015). The enclosure (c.30m diam.) appears to predate a field boundary that formed the western limit of Kit's Green and the townland boundary between Common and Corrstown. The field boundary has since been removed. It is possible that this site is the 'supposed site of old Fort or Burying Ground' marked on the 1st edition OS map. May correspond with the 'fort' identified on First Edition Ordnance Survey mapping. A circular feature is vaguely perceptible on aerial imagery in a pasture field.	Unknown	Archaeological Survey of Ireland SMR Ordnance Survey 6", 1837 – 1842
AY_29	DU011-023001	Recorded Monument	Common	Dublin	Ringfort - unclassified	712321 / 745846	Located in a field of low-lying pasture. The 1837 OS 6-inch map shows an oval enclosure (50m N-S; 30m E-W). The depiction of the site on the current OS 6-inch map suggests that it was a	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal)

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							ringfort. An archaeological assessment of the site in the winter of 1999 revealed no archaeological evidence for the monument. A dwelling had been constructed on the site (Conway, 2000, 57-8). An oval enclosure is depicted nearby on historic mapping but is not depicted on later mapping This location has been developed. Archaeological testing in advance of proposed residential development in this location did not identify any features of archaeological significance or relating to these constraints.		Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 https://excavations.ie/report/1999/Dublin/0004056/ [Accessed August 2022]
AY_30	DU011-023002	Recorded Monument	Common	Dublin	Graveyard	712321 / 745859	This is a small field in the N end of the townland. There is a local tradition that it was 'an old fort or burying place' (Healy1975, 23). Not visible at ground level. Identified as 'Kits Green supposed site of old fort or Burying place' on First Edition Ordnance Survey mapping. Historic mapping dating to 1760 depicts this area as agricultural. The area currently comprises a large open pasture field.	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 https://source.southdublinlibraries.ie/bitstream/10599/8879/3/wm_Duncan02.jpg [Accessed August 2022]
AY_31	DU011-124	N/A	Ballystrahan	Dublin	Enclosure	712641 / 745143	A large circular enclosure visible as a crop mark on an aerial photograph together with other features that could indicate an associated field system (DU011-125----) (SMR file; pers. comm. T. Condit). Located in open field that rises slightly from the roadway. No visible remains at ground level. Visible on aerial imagery with a number of linear features in the surrounding fields.	Unknown	Archaeological Survey of Ireland SMR
AY_32	DU014-099	N/A	Shanganhill	Dublin	Ringfort - unclassified	712747 / 743085	Aerial photograph (GB89. AF.01) shows cropmark of a curvilinear enclosure defined by a fosse. This is probably a ploughed out ringfort. Within rough pasture. No visible remains. No corresponding features are depicted on historic mapping; however, cropmarks visible on aerial imagery correspond with the field pattern on First Edition Ordnance Survey mapping.	Unknown	Archaeological Survey of Ireland SMR Ordnance Survey 6", 1837 – 1842
AY_33	DU011-126	N/A	Kingstown (Coolock By.)	Dublin	Ring-ditch	713322 / 745300	A circular ring-ditch visible as a crop mark on an aerial photograph together with other features that could indicate a possible field system (DU011-127----) (SMR file; pers. comm. T. Condit). Slight rise to north-east quadrant of relatively flat field indicates where the site is located. Despite being recently ploughed there were no visible remains at ground level.	Unknown	Archaeological Survey of Ireland SMR
AY_34	DU011-025	Recorded Monument	Killeek	Dublin	Enclosure	713680 / 745730	The site of an enclosure is marked on Duncan's map (1821). This is occupied by a fenced paddock behind a house. Not visible at ground level.	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal)

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							Visible on aerial imagery as an ephemeral circular cropmark (Google Earth, May 2017) Not depicted on historic mapping, although a gravel pit is located nearby on later mapping.		Ordnance Survey 6”, 1837 – 1842 Ordnance Survey 25”, 1888-1913
AY_35	DU011-031001	Recorded Monument	Killeek	Dublin	Ecclesiastical enclosure	714326 / 746205	Located off crossroads in a raised, walled graveyard which is oval in plan. There was a broad earthen bank evident outside the graveyard (dims. L 50m, Wth 35m, bank Wth 5m, H 1.5m) with an entrance ramp in the S. This is probably an early ecclesiastical enclosure. Possible remnants of bank to north, faced with graveyard wall and planted. To west a new entrance and landscaping to private residence-bank appears to have disappeared.	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal)
AY_36	DU011-031003	Recorded Monument	Killeek	Dublin	Graveyard	714330 / 746202	Located off crossroads amidst rolling countryside. This is a walled graveyard which is oval in plan. The wall is planted with sycamores and elders. There is a broad earthen bank evident outside the graveyard (DU011-031001-). Within the graveyard are the ruins of a church (DU011-031002-). The interior is raised above external ground level (H1.50m). The graveyard contains grave markers dating from 18th century, the earliest of which appears to be 1701. The graveyard was previously surveyed (Egan 1992). Still in use. Depicted on historic Ordnance Survey mapping.	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6”, 1837 – 1842 Ordnance Survey 25”, 1888-1913
AY_37	DU011-031002	Recorded Monument	Killeek	Dublin	Church	714337 / 746189	Within the graveyard (DU011-031003-) is a plain church of nave and chancel type with a round chancel arch. It is built of roughly coursed limestone blocks. The nave is entered through opposing doorways at W end with slightly pointed segmental arches (Nave dims. L12m, Wth 6m, wall T 0.85m). The interior has been used for interments. There are plain windows with splayed embrasures in the W wall, N wall, and two in the S wall (Healy 1975, 23). Has been subjected to ribbon pointing. Northwall built up 4-6 courses to make wall height even. Vegetation re-establishing itself and there is wash out of mortar along base of church. A small roofless rectangular building identified as a ‘church’ within ‘Killeek Grave Yd’ is depicted on First Edition Ordnance Survey mapping. Later mapping identifies the church ‘in ruins.’	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6”, 1837 – 1842 Ordnance Survey 25”, 1888-1913
AY_38	DU011-041	Recorded Monument	Killeek	Dublin	Enclosure	714642 / 745449	Situated in an elevated position enjoying extensive views. There is a tradition of a 'fort' at this site (Healy 1975, 24). Had been in use for poly tunnels, now abandoned. Not visible at ground level. No enclosure is depicted on historic mapping dating to 1760, or later mapping. Aerial imagery shows this location to be subject to disturbance. Archaeological testing in advance of development (Licence Number 00E0688) did not identify any remains of archaeological significance.	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal) http://www.dublinhistoricmaps.ie/maps/1600-1799/index.html [Accessed August 2022] Ordnance Survey 6”, 1837 – 1842

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									https://excavations.ie/report/2000/Dublin/0005128/ [Accessed August 2022]
AY_39	DU011-042001	Recorded Monument	Forrest Great	Dublin	Chapel	714979 / 745315	There is a tradition of a chapel at this site which is in an elevated position under tillage. Human bones have been exposed (Healy 1975, 24). No visible surface remains. The area was subject to geophysical survey (Licence no. 12R0059) undertaken in advance of a proposed development. Anomalies suggestive of an archaeological complex measuring 100m north-south were identified. These are characterised by a circular enclosure (c.55m diam.) within which are numerous responses indicative of pit features. Associated rectilinear responses extend from the enclosure some of which may be contemporary (Leigh 2012, 8). No chapel is depicted on historic mapping in this location.	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AY_40	DU011-042002	Recorded Monument	Forrest Great	Dublin	Burial ground	714979 / 745315	An elevated position under tillage. Human bones have been exposed (Healy 1975, 24). There are no visible surface remains. There is a tradition of a chapel at this site (DU011-042001-). The area was subject to geophysical survey (Licence no. 12R0059) undertaken in advance of a proposed development. Anomalies suggestive of an archaeological complex measuring 100m north-south were identified. These are characterised by a circular enclosure (c.55m diam.)within which are numerous responses indicative of pit features. Associated rectilinear responses extend from the enclosure some of which may be contemporary (Leigh 2012, 8).	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal)
AY_41	DU011-043	Recorded Monument	Forrest Great	Dublin	Ringfort - unclassified	715314 / 744668	Situated on level grassland. This site was formerly a platform type ringfort (diam. c. 50m) with a waterlogged external fosse (Healy 1975, 23). Its southeastern quadrant has been truncated by works associated with Dublin airport but the majority of the ringfort is visible as a crop mark on the Bird'sEye viewer of Bing Depicted on First Edition Ordnance Survey mapping.	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842
AY_42	DU011-044	Recorded Monument	Forrest Great	Dublin	House - 16th/17th century	715745 / 744780	The Civil survey (1654-6) mentions a fair stone house at the Great Forrest held by Lord Ranelagh (Simington 1945, 113). This is probably the building shown on the 1840 OS 6-inch map. as 'Forrest House in ruins'. In the 1992 report there were foundations of this building present at the rear of a large farmhouse. Now a yard. No visible remains. Owned by Lord Ranelagh as 'one faire stone house slated, with several offices houses, a stable, a Barne & Six tenants houses Thatcht wth a Pigeon house, slated… belonging to said house one orchard & garden plot; & a Grove of Ashtrees set for ornament.'	Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) https://source.southdublinlibraries.ie/bitstream/10599/8879/3/wm_Duncan02.jpg [Accessed August 2022] Ordnance Survey 6", 1837 – 1842

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							Historic mapping depicts a large house with ornamental grounds. Later mapping shows this area to be agricultural fields with 'Forrest Ho. (in Ruins)' identified. The area has since been developed as a commercial premises		
AY_43	DU011-046	Recorded Monument	Cloghran (Coolock By.)	Dublin	Ringfort - unclassified	717244 / 744290	Named 'fort' on the 1837 OS 6-inch map. It was partly demolished in 1822 and cleared away in 1873 (Healy 1975, 24). The area has been incorporated into an extension to the recently constructed runway at Dublin Airport. Not visible at ground level.	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842
AY_44	DU014-009001	Recorded Monument	Cloghran (Coolock By.)	Dublin	Church	717763 / 744003	There foundation remains of the early medieval church survive to the north east of the graveyard (DU014-009002-). An early 18th parish church was located in the centre of the graveyard and survives as a low grassed over platform. The medieval church was said to have been erected by Ryryd son of Owain, Prince of Wales and was in reasonable condition in 1630 (Fingal Historic Graveyards project 2008). 'Cloghran Church' is depicted on First Edition Ordnance Survey mapping, with a quarry and lead mine nearby.	18th century	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842
AY_45	DU014-009002	Recorded Monument	Cloghran (Coolock By.)	Dublin	Graveyard	717763 / 744003	A roughly rectangular graveyard built on a rock outcrop. This rock has been quarried along the exterior of the graveyard wall to create a steep precipice around the north and east side of the site. It encloses the remains of an 18th century church on the site of the medieval parish church (DU014-009001-). The graveyard contains 18th-20th century gravestones, undecorated markers and two vaults. Previously surveyed (Egan 1991).	18th century	NMS, 1998, Record of Monuments and Places (County of Fingal)
AY_46	DU014-111	N/A	Stockhole	Dublin	Enclosure	718714 / 743074	An irregular shaped enclosure visible as a crop mark on an aerial photograph together with other features that could indicate a possible field system (DU014-112----) (SMR file; pers. comm. T. Condit). Located within flat open land. No visible remains. No corresponding features on historic mapping.	Unknown	Archaeological Survey of Ireland SMR Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AY_47	DU015-001	Recorded Monument	Cloghran (Coolock By.)	Dublin	Mound	718868 / 743533	In field of pasture N of farm house. An aerial photograph (FSI 453/2) taken in 1971 shows evidence for an earthen mound (diam. c. 15m). Not visible at ground level. Not depicted on historic mapping. Not visible on aerial imagery.	Unknown	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AY_48	DU015-120	N/A	Baskin	Dublin	Enclosure	718994 / 742902	A circular enclosure visible as a crop mark on an aerial photograph (SMR file; pers. comm. T. Condit).	Unknown	Archaeological Survey of Ireland SMR
AY_49	DU015-009008	N/A	Saintdoolaghs	Dublin	Field system	721026 / 742043	Geophysical survey (Licence 09R 165) undertaken at St Doulagh's demonstrated that the ecclesiastical enclosure (c. 162m diam.) (DU015:009005) extends into the fields to the N, S and W of the church and graveyard. A sub-rectangular network	Post-medieval	Archaeological Survey of Ireland SMR

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							of ditches was identified to the S of the church extending further to the S as far as the ecclesiastical enclosure. These are likely to represent a network of enclosure remains contemporary with early settlement at St. Doulagh's, which later evolved according to changing patterns of landuse at the site through to the 19th century as there is a partial correlation with former boundary alignments indicated on 1st edition Ordnance Survey 6-inch map. The results of the survey further suggest that interspersed with the ditches are pits and other features (1.5m-4m diam.) that could be interpreted as kiln remains or similar industrial deposits. (Nicholls 2009, 7).		
AY_50	DU015-009005	Recorded Monument	Saintdoolaghs	Dublin	Ecclesiastical enclosure	721043 / 742091	The enclosing graveyard wall around St. Doulaghs Church (DU015-009001-) has a distinct curve in the SE quadrant. In 1977 there were traces of bank visible to N of the graveyard (OPW Report). This may indicate a former ecclesiastical enclosure in the environs of St. Doulagh's Church. Excavation undertaken at this site during 1990 revealed a well-defined ditch which was interpreted as part of the ecclesiastical enclosure revealed to the south of the site (Swan 1991, 24). Geophysical survey (Licence 09R 165) has been undertaken for the Friends of St Doulaghs. The well-defined enclosure (c.162m diam.), extends into the fields about the northern, southern and western perimeter of St Doulagh's church and graveyard. The eastern limit has been truncated by expansion of the Malahide road. Within the enclosure is an array of archaeological activity, comprising a network of enclosure remains, a dense scatter of pits, gullies, and associated features. Evidence of industrial activity in the form of possible kiln locations and associated features has also been recorded, with annexes annexes to the north.	Medieval	NMS, 1998, Record of Monuments and Places (County of Fingal)
AY_51	DU015-009006	Recorded Monument	Saintdoolaghs	Dublin	Graveyard	721045 / 742117	A sub rectangular area defined by a masonry wall which encloses the remains of St. Doulagh's Church (DU015-009001-). It is raised on the N side. There are late medieval mouldings used as coping stones for the wall S of the church. There are also two more mouldings at the foot of the stone steps in the SW (DU015-009007-). Excavations in 1989 showed that the ground level around the church had been truncated and most of the burials removed. This activity was associated with extensive reconstruction works which took place during the 19th century (Swan, 1990, 18-19). The graveyard contains a mixture of 18th, 19th and 20th century headstones (Fingal Historic Graveyards Project, 2008). Depicted on historic Ordnance Survey mapping.	Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AY_52	DU015-009007	N/A	Saintdoolaghs	Dublin	Architectural fragment	721048 / 742098	There are late medieval mouldings used as coping stones for the wall S of the church(DU015-009001-). There are also two more mouldings at the foot of the stone steps in the SW.	Medieval	Archaeological Survey of Ireland SMR

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AY_53	DU015-009001	Recorded Monument	Saintdoolaghs	Dublin	Church	721054 / 742100	The earliest reference to St. Doulagh is found in the 9th century Martyrology of Oengus where he is referred to as 'Duilech of Clochar' (Stokes 1905, 235). The present building is multi-period. It is rectangular in plan with a central residential tower that projects above the roofline and has stepped battlements. The masonry is well coursed in the central section but the blocks are more irregular in the E end. It is entered through a later addition to the building, which dates from 1864. The E end of the building is the earliest portion, dating from the mid-twelfth century. It has a vaulted stone roof with a pitch of 68 degrees, apparently the steepest pitch in Ireland (Leask 1955, 40) and has a croft within. Chamber of entrance hall referred to as the 'hermits cell' reputed to be a burial place of founder. The central tower was added in the 15th century when the earlier W gable was demolished and the church extended (Harbison 1982, 34). The level of the stone roof is higher at the W end and there are two separate low vaulted rooms below the croft. The E ground floor window is a 13th century doublelight with tracery and sandstone jambs. The remainder of the church is of 15th century date. A mural chamber carried on a retaining arch and squinch projects above the ground floor entrance along the S wall. The E end of the S wall is lit by a sandstone tracery window with a pointed arch. The W chamber off the first floor is lit by a trilobe cusped window and another above this is made of tufa. Archaeological excavations were undertaken at St Doulagh's in 1989 and a number of coins and tokens were recovered, including some from the spring of the baptistry, of which the oldest was a posthumously minted silver penny of Henry VIII. Small quantities of pottery fragments of all dates from the l3th/l4th centuries onwards were recovered. There were archaeologically significant deposits in a number of areas, including stratified occupation debris, indications of both inner and outer enclosing ditches, and an area of burial. The latter contained at least six extended human burials in very shallow grave pits, directly beneath the plough-soil. These were adult burials (Swan, 1990, 18-19). Two further periods of excavation were undertaken at this site during 1990. In the chancel of the church two fragments of roof tiling were recovered, one deeply scored and both with traces of green glaze on their outer surfaces. Along the south wall, a foundation trench 0.55m deep had been cut into the boulder clay, at the base of which a mantling of pebbles was laid. Above this, a rough paving of large, flat stones had been laid, forming the base of the wall. On this paving, a foundation of rough, uncoursed masonry rose for 0.4m to 0.45m, above which was	Medieval – Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913

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							the finely coursed masonry of the wall proper. The remnants of an early burial were set into the boulder clay at the lowest level, predating the construction of this wall. The inner face of the north wall of the chancel had been partly dismantled to allow for a large recess with a pointed arch, which had been set into the thickness of the wall. Clearance here revealed a solid masonry plinth at a depth of 0.52m below the old flooring, upon which a complete skeleton was laid. The skull, however, had been set into a recess, consisting of a single stone with a rectangular section cut through its mass, placed in an upright position on the plinth, so that the head of the burial was completely protected, and only the face could have been viewed prior to burial. The section of the trench cut to the north of the vault revealed a well-defined ditch at a point 12.8m from the vault face. This ditch was interpreted as part of the enclosure revealed to the south of the site (DU015-009005-; Swan 1991, 24). Depicted on First Edition Ordnance Survey mapping (1837 – 1842) with a 'U'-shaped 'school house' immediately to the east. Later mapping does not show this building.		
AY_54	DU015-009004	Recorded Monument	Saintdoolaghs	Dublin	Ritual site - holy well	721072 / 742150	St Doolaghs well lies downslope and N of St. Doolagh's Church. It is a circular stone-lined well below ground level which is enclosed by an octagonal building with a cone-shaped roof similar to that at St. Sylvester's in Malahide Village (DU012-023001-). The entrance is in the south of a sunken court. Interior is lit by cross-shaped windows. Above a string course is the cone-shaped roof which is marked by projecting gables on the N, E, S, and W with narrow pointed windows. Built of coursed masonry with well-shaped blocks (Anon , 1914, 268). Frescoes in the interior painted in 1609 by a Mr. Fagan, of Feltrim were still visible in the last century (Walsh, 1888, 233). Depicted on historic Ordnance Survey mapping. The well and pond "are located adjacent to the stone church of Doughlagh, near Balgriffin. They are considered to be two wells, but it is likely that St Catherine's pond is only filled via an overflow from St Doulagh's Well. St Doulagh's Well is a cut-stone circular well, approximately three feet deep, located within a stone-built octagonal baptistery, the only free-standing baptistery remaining in Ireland. It was [built] for the baptism of boys" (Branigan 2012: 50). The girls were baptized in St Catherine's Pond. Additionally, Branigan states that the interior of the well house "once held plaster frescoes on each of the four walls, with images of St Patrick, St Brighid, St Colmcille, and St Doulagh, with a further fresco on the ceiling depicting the descending Holy Spirit. In addition, it held a marble plaque with an inscription in Latin" (Branigan 2012: 50).	Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 https://ihwcbc.omeka.net/items/show/409 [Accessed August 2022]

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AY_55	DU015-009003	Recorded Monument	Saintdoolaghs	Dublin	Ritual site - holy well	721074 / 742162	St. Catherine's Well borders the north wall of St. Doolaghs Well (DU015-009004-). Comprises an underground bath enclosed by a rectangular vaulted building. Entrance in the east through a pointed arched doorway. The interior is lit by a double-light window in the N. The roof is pitched as is the gable over the E door (Anon, 1914, 268). Depicted on historic Ordnance Survey mapping. The well and pond "are located adjacent to the stone church of Doughlagh, near Balgriffin. They are considered to be two wells, but it is likely that St Catherine's pond is only filled via an overflow from St Doulagh's Well. St Doulagh's Well is a cut-stone circular well, approximately three feet deep, located within a stone-built octagonal baptistery, the only free-standing baptistery remaining in Ireland. It was [built] for the baptism of boys" (Branigan 2012: 50). The girls were baptized in St Catherine's Pond. Additionally, Branigan states that the interior of the well house "once held plaster frescoes on each of the four walls, with images of St Patrick, St Brighid, St Colmcille, and St Doulagh, with a further fresco on the ceiling depicting the descending Holy Spirit. In addition, it held a marble plaque with an inscription in Latin" (Branigan 2012: 50).	Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 https://ihwcbc.omeka.net/items/show/409 [Accessed August 2022]
AY_56	DU015-009002	Recorded Monument	Saintdoolaghs	Dublin	Cross	721102 / 742082	A stone cross marks the entrance to St. Doolaghs church and graveyard (DU015-009002-). In the late 18th century, when Austin Cooper visited the site, it was located in the graveyard (Price 1942, 70). It has very short arms and a triangular-shaped head (H 1.6m). It is set on a double-stepped pedestal immediately next to the Malahide road. Depicted on historic Ordnance Survey mapping.	Post-medieval	NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AY_57	DU014-112	N/A	Stockhole	Dublin	Field system	718668 / 743064	A possible field system visible as a crop mark on an aerial photograph together with an irregular shaped enclosure in the same field (DU014-111----) (SMR file; pers. comm. T. Condit). Within flat land. One of the cropmarks may correspond with a field boundary depicted on First Edition Ordnance Survey mapping.	Unknown	Archaeological Survey of Ireland SMR Ordnance Survey 6", 1837 – 1842
AY_58	DU015-146	N/A	Middletown	Dublin	Enclosure	719233 / 742338	Located in a large arable field c. 1.1km WSW of the complex of monuments at Springhill townland centered on an enclosure (DU015-057----). An unnamed E-W running stream, a tributary of the Mayne River, is located c. 180m to S. The enclosure can be seen on Google Earth coverage (24 June 2018) and on Apple Maps imagery (June 2018) where it is visible as a positive cropmark. The site encloses a subcircular area (ext. diam. 27.4m N-S; c. 35m E-W) defined by a ditch (Wth c. 1.9m). The Apple Maps image appears to indicate the presence of two outer palisade trenches outside the S perimeter of the enclosure. There is no clear evidence for an entrance gap through the bank.	Unknown	Archaeological Survey of Ireland SMR Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913

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							Not depicted on historic Ordnance Survey mapping.		
AY_59	DU015-145	N/A	Middletown	Dublin	Enclosure	719570 / 742282	Located in a large arable field c. 725m WSW of the complex of monuments at Springhill townland centered on an enclosure (DU015-057----). An unnamed E-W running stream, a tributary of the Mayne River, is located c. 120m to S. The enclosure can be seen on Google Earth coverage (24 June 2018) where it is visible as a positive cropmark. The enclosure is circular in plan (ext. diam. c. 42.5m) defined by a ditch (Wth c. 2m). There is no clear evidence for an entrance gap through the ditch. Not depicted on historic Ordnance Survey mapping.	Unknown	Archaeological Survey of Ireland SMR Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AY_60	ME050-059	N/A	Bennetstown	Dublin	Burnt mound	701775 / 743772	Situated on a slightly undulating landscape on the lip of the W edge of the floodplain of the meandering N-S River Tolka, which is c. 40m to the E. Centre-line testing (04E0488) by R. O'Hara on the Dunboyne link road (R157) to the M3 (excavations.ie 2004:1183) identified a spread of broken and burnt stone that was fully excavated (E003025) by R. Elliott in February 2006 as Bennetstown 1 (excavations.ie 2006:1507). A crescent-shaped mound of broken and burnt stone with a charcoal enriched matrix in two large sections (dims 10m; 5m; T 0.2m: 2.8m x 1.3m; T 0.3m) was interwoven with silt layers and partly washed out. Charred grains and seeds, including nettle and fruitstones of alder were recovered from the mound, and a sample of alder produced a C14 date of 1620-1440 cal. BC. The mound was associated with features, some pre-dating and others post-dating its construction. At the centre of the area was a concentration of stake and post-holes, some of which had been removed before they filled up with burnt mound material. Beneath the mound there were some small pits (diam. c. 0.5-1m; D 0.2-0.4m), from which environmentally rich samples were recovered but none could be identified as a trough. However, a large N-S modern service trench (Wth c. 9m) immediately to the E may have destroyed any trough. The largest circular pit (diam. 2.8m; max. D 0.6m) post-dated an alluvial layer that covered the burnt mound. It had a step (D 0.25m) covered in a charcoal-rich layer with burnt bone and charred wheat but mostly charred hazel and alder, occupying its E half. A sample of alder returned a C 14 date of 1050-1270 cal. AD. The topmost layer included burnt clay, which might have derived from a superstructure. Another post-alluvium pit (diam. 1.48-1.6m; D 0.4m) had a clay lining with frequent charcoal and burnt clay inclusions. It would have been watertight and may have functioned as a plunging pool from metalworking, but absolutely no waste from metal was found. A sample from this produced a C14 date of 1030-1230 cal. AD, but the fill was a	Prehistoric / medieval	Archaeological Survey of Ireland SMR https://excavations.ie/report/2004/Meath/0012305/

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							grey silty clay with only occasional charcoal inclusions. Only a few flint artefacts were recovered. (Elliott and Ginn 2008)		
AY_61	DU015-008	Recorded Monument	Middletown	Dublin	Enclosure	719413 / 742629	The site is in a field of pasture north of Middletown House. Shown on the 1937 edition OS 6-inch map as circular in plan (diam. c. 35m). Not visible at ground level. Depicted on First Edition Ordnance Survey mapping.		NMS, 1998, Record of Monuments and Places (County of Fingal) Ordnance Survey 6”, 1837 – 1842
AY_62	ME044-018	Recorded Monument	Portan (Ratoath By.)	Dublin	Moated site	695987 / 747822	Situated on a fairly level landscape. This is a rectangular grass-covered area (dims 24m NNE-SSW; 19m NWW-SSE) defined by an earthen bank (Wth of base 5.5-7m; int. H 0.3-0.6m; ext. H 0.9-1.4m) at N and S but the bank is slighter (Wth of base 3.2m; H 0.3m) at W and absent at E. There is an outer fosse or moat (Wth of top 6m; ext. D 0.1-0.3m) at N and S which is absent at W and more substantial (Wth of top 4m) at E. Depicted on historic Ordnance Survey mapping. A square cropmark is visible on aerial imagery in this location.		Archaeological Survey of Ireland SMR Ordnance Survey 25”, 1888-1913
AY_63	ME044-019	Recorded Monument	Portan (Ratoath By.)	Dublin	Field system	696355 / 747538	Situated on a fairly level landscape. A small circular embanked enclosure described as a ‘Fort’ is depicted on the 1836 edition of the OS 6-inch map and a hachured feature is represented on the 1908 edition. An area of about 5 acres (c. 2 ha) has elements of a relict field system consisting of platforms (dims c. 27m x c. 14m to c. 50m x c. 25m) defined by scarps (max. H 1m) separated by wide channels or drains (Wth 2-5m; D 0.3-1m) with two small ponds amongst them. One possible house site is visible as a rectangular area (dims 8m NW-SE; 5m NE-SW) defined by low earthen banks (Wth 2m; H 0.3m) but it is open on the SE side. This feature is located at a corner of one of the platforms and close to a pond. Archaeological testing (21E0414) by L. Clarke against the road at the W corner of the archaeological area recorded four field drains and a wide ENE-WSW ditch (Wth 2-2.2m; D 0.51m) which is interpreted as a cultivation ridge, but which is more likely to be a drainage ditch (excavations.ie2021:123). Depicted on First Edition Ordnance Survey mapping (1837 – 1842) as a ‘Fort’ and on later mapping (Ordnance Survey 25”, 1888-1913) as a semi-circular earthwork.		Archaeological Survey of Ireland SMR Ordnance Survey 6”, 1837 – 1842 Ordnance Survey 25”, 1888-1913

Table A2: Inventory of Architectural Heritage Constraints

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
AH_01	NIAH 14405002	N/A	Ballymaglassan	Meath	Church/ chapel	696101 / 745637	Saint Keiran's Church of Ireland Church Board of First Fruits church, built c.1800, with two-bay side elevation to nave and three-stage castellated and pinnacled tower to west. Pitched slate roof with limestone copings and cast-iron rainwater goods. Roughcast rendered walls with ashlar limestone string courses and dressings to blocked pointed arched openings. Rock-faced limestone gate piers with cast-iron double gates set in rendered boundary walls. Graveyard to site. 1798 date plaque set in boundary wall c.1998. Saint Keiran's Church exhibits many features which are typical of Church of Ireland churches which were built at the turn of the eighteenth century in Ireland, with funds from the Board of First Fruits. The simple architectural form of the building is articulated with limestone dressings, such as the string courses, pinnacles and surrounds to the openings. The setting of the church is enhanced by many of the carved stone grave markers to the site. The church is depicted on historic Ordnance Survey mapping (First Edition Ordnance Survey mapping; 1837 – 1842) near the 'Site of Old Church' and appears enclosed on later mapping (Ordnance Survey 25", 1888-1913). The church is located within Ballymaglassan House GDL (DL_01) within an area of well-established trees, with views in all directions limited.	1790 - 1810	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=ME&regno=14405002 [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AH_02	RPS 91424	Protected Structure	Rathregan	Meath	Church/ chapel	697144 / 747666	Batterstown Roman Catholic Church Single-cell church, built c.1820, with three-bay side elevation to nave. Sacristy added to north gable and pair of porches additions flanking south gable. Bellcote to north gable. Re-roofed, pinnacles added and windows replaced c.1998. Ashlar limestone entrance piers. Some interior features remain. The modest exterior of this church is in many ways representative of early nineteenth-century Roman Catholic church building in Ireland. Though many of the original external features and materials have been replaced, and the interior re-ordered post Vatican II, some interesting internal features survive. Of particular interest are the hood mouldings which are terminated by render cherubs. The church is located within a walled graveyard adjacent to the R154, with established trees lining the northern and eastern boundaries.	1800 - 1840	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=ME&regno=14404401 [Accessed August 2022]
AH_03	RPS 91568	Protected Structure	Priest Town	Meath	Church (RC)	706607 / 746268	Kilbride Catholic Church Gabled hall of rockfaced granite with an octagonal bell turret flanking the		https://consult.meath.ie/en/system/files/materials/74

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
							entrance gable. Entrance gates and railings, Single storey schoolhouse (1929) to rear of site. A 'R.C. Chapel' is depicted in this location just north of the 'Kilbride Cross Roads' on First Edition Ordnance Survey mapping (1837 – 1842) and 'St. Brigid's R.C. Church' is shown on later mapping (Ordnance Survey 25", 1888-1913); however, the present church replaced this building, opening in 1930. The church is situated in an elevated position within an enclosed churchyard adjacent to the road through Priest Town, with a modern schoolhouse located to the north-east.		47/Appendix%206%20-%20Record%20of%20Protected%20Structures.pdf [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AH_04	RPS 664	Protected Structure	Hollystown	Fingal	Church/ chapel	707827 / 743780	Church of Ireland Church and Graveyard Detached four-bay double-height single-cell Church of Ireland church, built 1870-1, on a rectangular plan to designs by William John Welland (c.1832-95) and William Gillespie (1818-99); single-bay single-storey lean-to porch abutting single-bay three-stage turret on an octagonal plan (south-west). ROOF: Pitched slate roof extending into lean-to slate roof (south-west), clay ridge tiles, trefoil-topped cut-granite chamfered coping to gables on cut-granite kneelers, and cast-iron rainwater goods with cast-iron downpipes. WALLS: Snecked rock faced limestone battered walls with benchmark-inscribed cut- or hammered granite flush quoins to corners. OPENINGS: Lancet window openings with cut- or hammered granite block-and-start surrounds having chamfered reveals framing fixed-pane fittings having margins centred on lattice glazing bars. Pointed-arch window opening (east) with cut- or hammered granite block-and-start surround having chamfered reveals. "Rose Window" (west) with cut-granite surround having chamfered reveals. INTERIOR: Full-height interior open into roof with central aisle between timber pews, stepped dais to chancel (east) with timber altar table, and exposed timber roof construction with wind braced rafters on carved timber cornice. SITE: Set in landscaped grounds with cut-granite chamfered piers to perimeter having roll topped gabled capping supporting timber gate. The church is positioned in the centre of Hollystown, set back from the main road, within landscaped grounds bounded by established trees.	1865 - 1875	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11346001 [Accessed August 2022]

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
AH_05	NIAH 11347003	N/A	Hollywood	Fingal	Gate lodge	708204 / 743184	Hollywoodrath Detached three-bay single-storey gate lodge, c.1825, on an L-shaped plan. Projecting central entrance porch. Single-bay single-storey extension to east c.1940. Pair of granite ashlar piers with cast-iron gates and railings. Depicted on historic Ordnance Survey mapping (Ordnance Survey 25", 1888-1913) at the southern entrance to 'Hollywoodrath' (DL_05). Located within a tree-lined plot, behind a low stone boundary wall with cast-iron railings with a pair of ashlar gate piers and iron gates to the west.	1800 - 1850	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11347003 [Accessed August 2022] Ordnance Survey 25", 1888-1913
AH_06	RPS 660	Protected Structure	Ward Lower	Fingal	Church	709654 / 744837	St. Brigid's Church & Graveyard (in ruins) Remains of foundations of medieval parish church within raised, walled graveyard. A ruined church is depicted on Rocque's map (1760) and a map of the environs of Dublin (1853). A church and graveyard are depicted on historic Ordnance Survey mapping, with a 'Church Well' to the south, opposite an 'Old Quarry.' Later mapping depicts the church 'in ruins.' Located immediately adjacent to the R121. Views to the west are open over the surrounding fields; however, are limited to the east and north by buildings and to the south by established trees. Also AY_23 and AY_24 (Recorded Monuments).	Medieval	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.dublinhistoricmaps.ie/maps/1600-1799/index.html [Accessed August 2022] https://iiif.lib.harvard.edu/manifests/view/ids:10653105 [Accessed August 2022] Ordnance Survey 6", 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
									Ordnance Survey 25", 1888-1913
AH_07	RPS 636	Protected Structure	Killeek	Fingal	House	713371 / 745437	Six-bay single-storey thatched dwelling Late 18th or early 19th century single-storey thatched dwelling and stone outbuildings. Detached six-bay single-storey thatched house, c.1750, with projecting entrance porch, c.1960. Complex of farm buildings to south, c.1750 - 1850. ROOF: Double pitched thatched roof with a nap rendered chimney stack. Double pitched slate and corrugated-iron roof on farm buildings. WALLS: Nap rendered. OPENINGS: Square headed with nap rendered reveals, concrete cills, timber sash window and tongue and groove door; timber casements and panelled door, c.1980. Depicted on historic mapping (First Edition Ordnance Survey mapping; 1837 – 1842) forming a courtyard plan farm with two other buildings. Bounded by a whitewashed coursed rubble stone wall with vertical copes. The cottage is positioned perpendicular to Kilreesk Road with the outbuildings located to the south, parallel to the road, including one forming the roadside boundary to the farm.	1720 - 1780	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11342006 [Accessed August 2022] Ordnance Survey 6", 1837 – 1842
AH_08	RPS 633	Protected Structure	Killeek	Fingal	Church	714337 / 746190	Killeek church & graveyard - Ecclesiastical Remains, graveyard still in use Remains of medieval church within oval shaped enclosed graveyard that is still in use. Medieval graveyard, with pre-1700 cut stone grave markers. Rubble stone church, now in ruins. A church and 'Killeek Grave Yd' are depicted on historic Ordnance Survey mapping, with the church later shown 'in ruins.' The building is roofless and comprises a plain, roughly coursed, limestone church positioned in a prominent location, north of a crossroads between a local road and Killeek Lane. Views north and west are limited by established trees and across the local	1500 - 1700	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.buildingsofireland.ie/ni

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
							road to the east and junction to the south are filtered by mature trees along the boundary of the churchyard. Also AY_35, AY_36 and AY_37 (Recorded Monuments).		ah/search.jsp?type=record&county=FI&regno=11342010 [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AH_09	RPS 609	Protected Structure	Cloghran (Swords)	Fingal	Church	717757 / 743995	Cloghran Church (in ruins) & Graveyard Site of early 18th century parish church (now demolished) and foundation remains of early medieval church within enclosed graveyard. 'Cloghran Church' is depicted on historic Ordnance Survey mapping immediately to the south of a quarry and west of a lead mine. Later mapping shows the 'L'-shaped church, within a graveyard with steep slopes to the west and north, and a small roofless building to the north. The church and graveyard are located on an elevated position, immediately to the north of Old Stockhole Lane and south-east of a modern commercial complex. Also AY_44 and AY_45 (Recorded Monuments).	Early medieval / 18th century	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] Ordnance Survey 6", 1837 – 1842
AH_10	RPS 608	Protected Structure	Swords Glebe (part of)	Fingal	Well	718010 / 744000	Enclosed stone well at base of steps under tree in field. The well is not depicted on First Edition Ordnance Survey mapping (1837 – 1842); however, is shown on later mapping (Ordnance Survey 25", 1888-1913) at the end of a trackway at the corner of a pair of field boundaries. The well is located north of Stockhole Lane, within an area of established vegetation.	Post-medieval	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] Ordnance Survey 6", 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
									Ordnance Survey 25", 1888-1913
AH_11	RPS 606	Protected Structure	Swords Glebe (part of)	Fingal	House	718195 / 743799	Former Cloghran Stud Farm Early 19th century former Glebe House & entrance gates (excluding stable complex). Depicted on First Edition Ordnance Survey mapping (1837 – 1842) with associated buildings to the north-east; and later mapping (Ordnance Survey 25", 1888-1913), shows additional long stable ranges to the north-east. The house is enclosed by a rendered stone wall, with the entrance located to the south. Views out are limited by boundaries of established trees.	Early 19th century	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AH_12	NIAH 11349005	N/A	Belcamp	Fingal	House	719395 / 741396	Belcamp House Detached three-bay two-storey house, c.1840, with central portico. ROOF: M-profile double pitched slate roof; rendered chimney stacks; terracotta pots. WALLS: Pebble dashed; nap rendered plinth course. OPENINGS: Ionic columns to portico; square headed openings; stone cills; uPVC casements. The house has been demolished.	1820 - 1860	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11349005 [Accessed August 2022]
AH_13	11349005	N/A	Belcamp	Fingal	House	719398 / 741439	Belcamp House Detached three-bay two-storey house, c.1840, with central portico. ROOF: M-profile double pitched slate roof; rendered chimney stacks; terracotta pots. WALLS: Pebble dashed; nap rendered plinth course. OPENINGS: Ionic columns to portico; square headed openings; stone cills; uPVC casements. The house has been demolished.	1820 - 1860	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11349005 [Accessed August 2022]

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
AH_14	RPS 459	Protected Structure	Saint Doolaghs	Fingal	Church/ chapel	721044 / 742110	St. Doulaghs Church & Well & St. Catherine's Well Medieval stone church with tower church (with 19th century interventions). Set within graveyard with stone cross at entrance on road and two holy wells in adjoining lands (St. Doolagh's Well is enclosed in an octagonal building, St. Catherine's Well is within a rectangular vaulted building). Dressed limestone church, built 1864, with three bays to side elevation of nave and single-bay chancel attached to east. Incorporates earlier church and tower, built in twelfth and fifteenth centuries, attached to south-east. Set in graveyard. Church restored by Lord Talbot to design by architect W.H. Lynn. A church in a square church yard is depicted on Rocque's map (1760). The complex is depicted on historic Ordnance Survey mapping with a 'U'-shaped school building to the east, which is later removed. The wells are both recorded on the Ireland's holy wells project. Also AY_50, AY_51, AY_53 – AY_56 (Recorded Monuments).	Medieval	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350016 [Accessed August 2022] http://www.dublinhistoricmaps.ie/maps/1600-1799/index.html [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 https://ihwcbc.omeka.net/items/show/409 [Accessed August 2022]

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
AH_15	NIAH 11350027	N/A	Saintdoolaghs	Fingal	Gate lodge	721049 / 741939	Limehill Three-bay single-storey gate lodge, c.1895. ROOF: Hipped slate roof; single chimney stack with terracotta ridge tiles. WALLS: Pebble dash; rendered. OPENINGS: Square headed; rendered reveals; early 20th century timber casement windows; simple timber panelled door. Located adjacent to the driveway at entrance on the R107 to Lie Hill House (NIAH 11350015). A 'Lodge' is depicted on historic Ordnance Survey mapping at the entrance to 'Lime Hill,' to the south of the drive to the house. Positioned behind a low rubble stone boundary wall adjacent to Malahide Road.	1880 - 1900	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350027 [Accessed August 2022] Ordnance Survey 25", 1888-1913
AH_16	RPS 462	Protected Structure	Saintdoolaghs	Fingal	Milestone/milepost	721056 / 741951	19th century cast-iron milestone in entrance wall to Lime Hill House. Cast-iron milestone, c.1850, set within granite surround. Inscription reads 'GPO/Dublin/6/Malahide/3'. Depicted on historic Ordnance Survey mapping annotated with 'M.S Malahide 3 Dublin 6'. Set within a harled and painted entrance wall at ground level.	1825 - 1875	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350029 [Accessed August 2022] Ordnance Survey 25", 1888-1913
AH_17	RPS 468	Protected Structure	St. Doolaghs	Fingal	House	721074 / 741838	Wellfield House Late 18th or early 19th century five-bay two-storey house with belvedere. Detached five-bay two-storey house, c.1790, with portico entrance, bowed end bays. Return and belvedere to rear. ROOF:	1780 - 1800	https://www.fingal.ie/sites/default/files/2019-04/2017-

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
							Double-pitched slate roof to front with perpendicular M-profile hipped roof to rear; nap rendered chimney stacks with clay pots; T-shaped plan. WALLS: Pebbledash to front; nap rendered elsewhere. OPENINGS: Square-headed; rendered reveals; granite cills; replacement 6/6 timber sash windows; fluted doric granite portico; moulded door surround; timber panelled door; centrally opening doors to side. Depicted on First Edition Ordnance Survey mapping (1837 – 1842) as 'St. Doolagh's Lodge', Associated buildings to the north appear to have been demolished. The house is set within a high rendered stone walled plot, with established trees and hedges obscuring views to the road (R107).		2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350021 [Accessed August 2022] Ordnance Survey 6", 1837 – 1842
AH_18	NIAH 11350012	N/A	Bohammer	Fingal	Gate lodge	721099 / 742284	Bohammer Detached three-bay single-storey gable-fronted gate lodge, c.1830. Single-bay extension and single-bay recessed entrance porch to west, c.1970. ROOF: Double pitched slate roof with a nap rendered chimney stack. WALLS: Nap rendered with a moulded string course. OPENINGS: Segmental headed; recessed panels to openings. Square headed diamond timber casement windows and a timber door. First Edition Ordnance Survey mapping (1837 – 1842) identifies the associated house as 'St. Doolagh's'. Located at the entrance to the main house on the R107, behind low rubble stone boundary wall.	1810 - 1850	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350012 [Accessed August 2022] Ordnance Survey 6", 1837 – 1842
AH_19	NIAH 11350020	N/A	Saintdoolaghs	Fingal	House	721112 / 741864	Wellfield Detached three-bay two-storey rubble stone house, c.1800, with brick dressings. Now derelict. Depicted on historic Ordnance Survey mapping as 'St. Doolagh's Lodge' with associated buildings to the north, and on later mapping associated with 'St. Doolagh's Park.' Positioned behind high rendered stone boundary walls, within established grounds, outward views are limited.	1790 - 1810	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350020 [Accessed August 2022]

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
									Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
AH_20	NIA 11350026	N/A	Belcamp	Fingal	Post box	721118 / 741387	Post box Wall-mounted cast-iron post box, c.1905, with 'ER VII' monogram. The wall within which the post box was located appears to have been removed (Google StreetView, June 2022).	1900 - 1910	http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350026 [Accessed August 2022]
AH_21	RPS 461	Protected Structure	Saintdoolaghs	Fingal	Gate lodge	721124 / 742158	Gate lodge of St Doolaghs Park 19th century former Gate lodge to St Doolaghs Park (now in separate ownership). Detached three-bay single-storey gate lodge, c.1850. Extensions c.1980 to north and east. Set behind entrance gates, comprising cast-iron double entrance gates and single pedestrian gates set in ashlar piers. Flanked by curved ashlar plinth walls with cast-iron railings, terminated by ashlar piers. ROOF: Double-pitched and hipped; slate with terracotta ridge tiles; single rendered chimney stack. WALLS: Nap rendered. OPENINGS: Segmental headed windows; rendered reveals; granite cills; replacement uPVC windows; segmental headed door; recessed opening; timber and glazed door. Depicted on historic mapping (Ordnance Survey 25", 1888-1913). Located behind a high rubblestone wall at the entrance to Saint Doolagh's Park.	1840 - 1860	https://www.fingal.ie/sites/default/files/2019-04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11350018 [Accessed August 2022] Ordnance Survey 25", 1888-1913
AH_22	RPS 665	Protected Structure	Hollystown	Fingal	House	708322 / 743506	Hollywoodrath House Late 18th or early 19th century seven-bay two-storey house plus gate lodge, gates & gate piers & outbuildings.	1810 - 1850	https://www.fingal.ie/sites/default/files/2019-

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Approx. Date	Sources
							Detached seven-bay two-storey house, c.1830, on an L-shaped plan. Comprising five-bay two-storey central block with single-storey prostyle Ionic portico, flanked by gabled projecting end bays. Return to rear. Gate lodge and gateway c.1830 to site. ROOF: Double pitched slate with concrete ridge tiles; nap rendered chimney stacks; cast-iron rainwater goods. WALLS: Lined and ruled; nap rendered. OPENINGS: Timber sash windows with granite sills, with entablatures and pediments above. Timber panelled door surrounded by moulded granite ashlar architrave with fluted corbels supporting entablature. Depicted on First Edition Ordnance Survey mapping (1837 – 1842) as 'Hollywoodrath'. Located within established grounds.		04/2017-2023_dev_plan_record_of_protected_structures.pdf [Accessed August 2022] http://www.buildingsofireland.ie/niah/search.jsp?type=record&county=FI&regno=11347001 [Accessed August 2022] Ordnance Survey 6", 1837 – 1842

Table A3: Inventory of Gardens and Designed Landscapes

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
DL_01	NIAH 5699	N/A	Ballymaglassan	Meath	Garden and Designed Landscape	696071 / 745695	Ballymaglassan House Principal building and garden structures. Some movement of landscape elements within the site (i.e. driveway). Areas of woodland and parkland remain extant. Depicted on historic mapping (Ordnance Survey 6", 1837 – 1842).	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/5699/ballymaglassan-house-co-meath [Accessed August 2022] Ordnance Survey 6", 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The stone entrance piers and gates are set back from the L2215. While the boundary, comprising a ditch and established line of trees and hedges remains, a modern post and rail fence and hedge runs along the road.		Google StreetView
DL_02	N/A	N/A	Glebe	Meath	Garden and Designed Landscape	697170 / 747290	Glebe Identified on historic Ordnance Survey mapping in Glebe and shown as 'Rathregan Rectory' on later mapping. The principal buildings remain extant; however, driveway appears to have been realigned. Retains boundary features, including belts of woodland, as well as sections of the roughly coursed rubble stone boundary wall and a pair of squared gate piers on the R154.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
DL_03	NIAH 5143	N/A	Normansgrove	Meath	Garden and Designed Landscape	702654 / 743842	Normans Grove House Building indicated, area to north labelled Normansgrove. The layout of the grounds depicted on historic Ordnance Survey mapping remains perceptible. A belt of established woodland lines the road to the east of the house, and a low rubble stone boundary wall with vertical copes forms the boundary adjacent to the road.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/5143/normans-grove-house-dunboyne-co-meath [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_04	NIAH 5156	N/A	Priest Town	Meath	Garden and Designed Landscape	705834 / 745825	Priest Town House Building indicated, area labelled Priest Town.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/5156/pri

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							House and ancillary buildings depicted on historic Ordnance Survey mapping. Parkland woodland, and original driveways and entrances remain extant. Boundary along Belgree Lane formed of hedgerows and 'Crockanee' woodland.		est-town-house-kilbride-co-meath [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_05	NIAH 2267	N/A	Hollystown; Hollywood; Hollywoodrath; Spricklestown	Dublin	Garden and Designed Landscape	708289 / 743285	Hollywoodrath Buildings indicated, area labelled Hollywood. House, garden and ancillary buildings depicted on historic Ordnance Survey mapping. Some development within the footprint of the site, including the golf course to the west. A section of roadside rubblestone boundary wall remains extant to the south of the site along the road that bisects the demesne.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2267/hollywoodrath-mulhuddart-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
DL_06	NIAH 2270	N/A	Irishtown	Dublin	Garden and Designed Landscape	708572 / 744663	Irishtown House Building indicated, area labelled Irishtown. House appears to have been demolished and the boundary and associated buildings and features depicted on historic Ordnance Survey mapping are no longer present. A plot of modern houses has been built at the southern extent.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2270/irishtown-house-mulhuddart-co-dublin [Accessed August 2022]

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
									Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_07	N/A	N/A	Ward Lower	Dublin	Garden and Designed Landscape	710057 / 745171	Ward House Identified from historic Ordnance Survey mapping as 'Ward House'. Located on the crossroads between the R135 and R121. The main house appears to have been demolished. The area has been redeveloped, including a new high roadside boundary wall.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_08	N/A	N/A	Newpark	Dublin	Garden and Designed Landscape	711071 / 745492	Newpark House Identified from historic Ordnance Survey mapping as 'Newpark House'. Located to the south of the R121. Redeveloped as a commercial complex, including a concrete block boundary wall.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_09	N/A	N/A	Kingstown	Dublin	Garden and Designed Landscape	713279 / 744623	Kingstown House Identified from historic Ordnance Survey mapping as 'Kingstown House'. Roadside boundaries reflect those depicted. House and associated buildings have been removed the entrance replaced. Boundary features along Kilreesk Road include a ditch and established boundary (trees and hedgerow), as well as a modern post and rail fence.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
DL_10	N/A	N/A	Forrest Little	Dublin	Garden and Designed Landscape	716413 / 744728	Little Forest House Identified from historic Ordnance Survey mapping as 'Little Forrest House'. Area redeveloped into Forrest Little Golf Club. A short section of rubblestone boundary wall noted alongside Forest Road, at the junction with Cooks Road; however, the boundary has been largely replaced by the modern entrance to the golf club.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_11	NIAH 5726	N/A	Cloghran	Dublin	Garden and Designed Landscape	717559 / 743989	Castle Mount Principal building remains extant (RPS 611). The interior of the site has largely been developed. The boundary depicted on historic Ordnance Survey mapping is vaguely perceptible in places as hedgerows. The roadside boundary on the R132 has been replaced with a new wall.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/5726/castle-mount-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_12	N/A	N/A	Cloghran	Dublin	Garden and Designed Landscape	717813 / 744792	Kitronan House Identified from historic Ordnance Survey mapping as 'Kitronan House'. Development has taken place within the site boundary; however, the footprint remains perceptible. Boundary features appear to have been replaced along the R132.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
DL_13	N/A	N/A	Cloghran	Dublin	Garden and Designed Landscape	718057 / 743892	Limepark Identified from historic Ordnance Survey mapping as 'Limepark'. House appears to have been demolished and the majority of the boundaries are no longer present apart from some sections of hedgerow. Bisected by Stockhole Lane.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_14	NIAH 2435	N/A	Clonshagh	Dublin	Garden and Designed Landscape	718581 / 741376	Woodlands Building indicated, not named. Some development to the north, including R139 and a roundabout; however, the site boundary remains perceptible. The house remains extant (on the site of an earlier dwelling). Features also remain extant (drive, trees and parkland). A belt of trees forms the northern boundary along the R139.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2435/woodlands-santry-santry-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_15	N/A	N/A	Middletown	Dublin	Garden and Designed Landscape	718864 / 742282	Upper Middletown Identified from historic Ordnance Survey mapping as 'Upper Middletown'. The house, driveway and 'Turret' are no longer extant. The gate lodge to the east of Stockhole Lane has been redeveloped as modern dwellings. The site boundary remains extant as established hedgerows with former sub-divisions visible as cropmarks on aerial imagery.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
DL_16	N/A	N/A	Glebe	Dublin	Garden and Designed Landscape	718945 / 743380	Glebe House Identified from historic Ordnance Survey mapping as 'Glebe House'. House has been replaced with modern dwellings; however, the boundary and sub-divisions reflect those depicted on historic Ordnance Survey mapping. The site boundary comprises established hedgerows, including trees, some of which have modern fence running parallel.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_17	NIAH 2455	N/A	Belcamp	Dublin	Garden and Designed Landscape	719160 / 741169	Belcamp Buildings indicated, not named. The house (AH_12 and AH_13) and ancillary buildings appears to have been demolished. The site boundary is vaguely perceptible on aerial imagery. Features depicted on historic Ordnance Survey mapping, including the bridge, weir and gardens remain extant.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2455/belcamp-santry-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_18	NIAH 2456	N/A	Baskin	Dublin	Garden and Designed Landscape	719473 / 742915	Baskin Hill Building indicated, area labelled Baskin. The site boundary along Baskin Lane appears to have been replaced (modern post and rail fence). The current entrance comprises a set of modern rubblestone and brick entrance walls with iron gates.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2456/baskin-hill-cloghran-co-dublin [Accessed August 2022]

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The drive reflects the alignment depicted on historic Ordnance Survey mapping.		Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_19	NIAH 5219	N/A	Woodpark	Meath	Garden and Designed Landscape		Woodpark Nothing indicated, area labelled Woodpark. The site has been redeveloped as Woodpark Stud Farm. Extant features include the boundary, entrances and drives. The eastern roadside boundary comprises a low rubble stone wall with irregular copes as well as mature trees.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/5219/woodpark-dunboyne-co-meath# [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_20	NIAH 2486	N/A	Abbeyville	Dublin	Garden and Designed Landscape	720693 / 743344	Abbeyville House Buildings indicated, area labelled Abbeyville. Site boundary remains perceptible. House (NIAH 11350002, RPS 452), as well as ancillary buildings and designed landscape features (remains of a boating lake, areas of woodland and parkland) remain extant. Houses have been built to the southern boundary on the site of the old brewery (Ordnance Survey 6", 1837 – 1842). The boundary along Baskin Lane comprises an established hedgerow / tree line.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2486/abbeyville-house-kinsaley-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_21	NIAH 5682	N/A	Belcamp	Dublin	Garden and Designed Landscape	720755 / 741339	Belcamp Hutchinson	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/5682/be

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							Development has taken place within the site boundary. Extant features include the main house (RPS 789) and walled garden. A section of rubblestone roadside boundary wall remains along the R107.		lcamp-hutchinson-co-dublin# [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_22	NIAH 2488	N/A	Saint Doolaghs	Dublin	Garden and Designed Landscape	720841 / 742057	Lime Hill House Building indicated, not named. The house (NIAH 11350015), driveway, areas of parkland and gate lodge (AH_15) remain extant. A rubblestone roadside boundary wall is located on the R107. Appears to have been rendered later or replaced north of the entrance.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2488/lime-hill-house-balgriffin-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_23	NIAH 2490	N/A	Bohammer	Dublin	Garden and Designed Landscape	720896 / 742659	Emsworth Building indicated, area labelled Bohammer. House (RPS 458) remains extant. The site footprint is still perceptible. There has been some modern development; however, the gate lodge (AH_18), coach house and stable yard remain extant. A rubblestone roadside boundary wall is located along the R107. It comprises a harled wall with	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2490/emsworth-balgriffin-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							triangular vertical copes. There is also an established tree line.		
DL_24	N/A	N/A	Saint Doolaghs	Dublin	Garden and Designed Landscape	721178 / 741791	St Doolagh's Lodge Identified from historic Ordnance Survey mapping as 'St. Doolagh's Lodge'. The House remains extant (AH_17), as well as the site boundary to the south and an area of parkland to the east. The roadside boundary to the R107 comprises a high rendered stone wall.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_25	N/A	N/A	Balgriffin	Dublin	Garden and Designed Landscape	721187 / 741672	Balgriffin Identified from historic Ordnance Survey mapping as 'Balgriffin'. Now Fingal Burial Ground. The roadside boundary comprises a coursed rubblestone wall including a section of rendered wall to the northern extent of the demesne.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
DL_26	N/A	N/A	Middletown	Dublin	Garden and Designed Landscape		Lower Middleton Identified from historic Ordnance Survey mapping as 'Lower Middletown'. The house remains extant, with a number of associated agricultural ranges. The western drive remains.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The boundary of the demesne appears to have been removed.		
DL_27	NIAH 2477	N/A	Burgage	Dublin	Garden and Designed Landscape		Spring Hill Building indicated, area labelled Springhill. The site boundary remains legible. The house remains extant along with a number of associated buildings and areas of parkland (now in use as arable farmland). Roadside boundaries comprise established trees and hedgerows.	Post-medieval	https://www.buildingsofireland.ie/buildings-search/site/2477/spring-hill-cloghran-co-dublin [Accessed August 2022] Ordnance Survey 6", 1837 – 1842 Google StreetView

Table A4: Inventory of Cultural Heritage Sites

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
CH_01	N/A	N/A	Blackhall Big	Meath	Roadside house	694857 / 745004	An 'L'-shaped, single storey roadside cottage depicted on historic Ordnance Survey mapping. Rendered with central stack. Located within a walled (low coursed, squared stone) plot, set at an angle with the road (R156), with an unenclosed drive to the north. Views are over the R156 towards the fields to the north.	Post-medieval	Ordnance Survey 25", 1888-1913 Google StreetView
CH_02	N/A	N/A	Lismahon	Meath	Farm	696285 / 746457	'Lismahon Farmstead', a 'U'-shaped layout farm, depicted on historic Ordnance Survey mapping with later editions showing a slightly different layout.	Post-medieval	Ordnance Survey 6", 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							A number of the ranges appear to have been demolished with one single storey range remaining extant, and more recent buildings largely forming the complex. The farm is located immediately to the east of the L2215.		Ordnance Survey 25", 1888-1913 Google StreetView, May 2009 & June 2021
CH_03	N/A	N/A	Lismahon	Meath	Road bridge	696319 / 746263	'Ballymaglassan Bridge', a road bridge depicted on historic Ordnance Survey mapping. The bridge comprises a low harled pair of parallel parapets with semi-circular copes and a wing wall of similar construction on the north-east corner. The bridge carries the L2215 across an unnamed watercourse.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
CH_04	N/A	N/A	Staffordstown Little	Meath	Roadside house	696348 / 744292	A house depicted on historic Ordnance Survey mapping. The house is positioned perpendicular to the R156, and comprises a single storey rendered structure with tile roof and central stack, with a high walled garden / yard to the south. Appears abandoned and plot is overgrown.	Post-medieval	Ordnance Survey 25", 1888-1913 Google StreetView, June 2021
CH_05	N/A	N/A	Portan	Meath	Farmhouse	696892 / 747290	A farmhouse depicted on historic Ordnance Survey mapping. The building comprises a single storey rubblestone with slate roof and two rendered stacks. The farmhouse is back from the L2215 in an established garden with an established boundary hedge. Views east are across the road to the fields beyond.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
CH_06	N/A	N/A	Lismahon	Meath	Road bridge	696967 / 747353	A road bridge depicted on historic Ordnance Survey mapping.	Post-medieval	Ordnance Survey 6", 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The bridge comprises a single rubblestone parapet with irregular vertical copes remains on a wide grass verge to the west of the road. The bridge carries the L2215 across the Tolka River.		Ordnance Survey 25", 1888-1913 Google StreetView
CH_07	N/A	N/A	Glebe	Meath	Buildings	697221 / 747488	A group of buildings depicted on historic Ordnance Survey mapping along the R154 through Batterstown. The buildings include a post office on the junction with the L2215, houses, a public house and former smithy (now petrol station). Modern development has taken place in Batterstown along the R154; however, these buildings form a group with historic character along the main thoroughfare.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
CH_08	N/A	N/A	Baytownpark	Meath	Road bridge	698026 / 744453	A road bridge depicted on historic Ordnance Survey mapping. The bridge comprises a pair of unmatching parallel stone parapets. The western parapet is harled rubble stone with vertical copes whereas the eastern parapet is harled with semi-circular copes. Carries the R156 across an unnamed watercourse.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
CH_09	N/A	N/A	Vessingtown	Meath	Road bridge	698208 / 744723	A road bridge depicted on historic Ordnance Survey mapping. The bridge comprises a pair of parallel rubblestone stone parapets with semi-circular copes. The bridge appears to have been subject to repair. The bridge carries a local road across an unnamed watercourse.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, March 2019

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
CH_10	N/A	N/A	Vessingtown	Meath	Road bridge	698964 / 745271	A road bridge depicted on historic Ordnance Survey mapping. Harled stone parallel parapets, western parapet obscured by vegetation. Carries a local road across an unnamed watercourse.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, March 2019
CH_11	N/A	N/A	Lustown	Meath	Road bridge	699269 / 745582	A road bridge depicted on historic Ordnance Survey mapping. The bridge comprises a pair of parallel squared rubblestone parapets. The eastern parapet has splayed approaches. Both have alternate vertical and horizontal copes. There is a narrow walkway inside either parapet. The bridge appears to have been repaired / restored. The bridge carries a local road over the Tolka River.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, March 2019
CH_12	N/A	N/A	Ballymagillin	Meath	Farm	702502 / 744660	A group of farm buildings arranged in a courtyard plan depicted on historic Ordnance Survey mapping. Single and two-storey rendered stone ranges remain extant with some modern additions forming part of the farm complex. Views are internal across the farmyard with views out limited by a high stone wall. The farm is positioned immediately to the north of the L5026.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_13	N/A	N/A	Whitesland	Meath	House	702660 / 744657	A house depicted on historic Ordnance Survey mapping comprising a roughly coursed rubble stone construction.	Post-medieval	Ordnance Survey 25", 1888-1913 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							Appears to have been altered and includes modern extensions. The house is located within a low stone walled garden and is positioned perpendicular to the L5026. Views outward are filtered by the surrounding established grounds.		
CH_14	N/A	N/A	Nuttstwon	Meath	Road bridge	703920 / 745061	A road bridge depicted on historic Ordnance Survey mapping. The bridge comprises low coursed rubblestone parapets and squared ends (no copes are present). A narrow footway is present inside both parapets. The parapets appear to have been repaired / extended. The bridge carries the road through Nuttstown across an unnamed watercourse.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, June 2021
CH_15	N/A	N/A	Belgree	Meath	Road bridge	705608 / 745439	A stone road bridge depicted on historic Ordnance Survey mapping. The bridge includes a pair of low coursed rubblestone parapets with squared ends and horizontal copes. A footway is present inside both parapets. The bridge appears to have been refurbished. The bridge carries Belgree Lane across the Ward River.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, June 2021
CH_16	N/A	N/A	Belgree	Meath	Road bridge	706594 / 745764	A bridge depicted on historic Ordnance Survey mapping. The rubblestone bridge includes two parallel low coursed parapets with vertical copes. The western parapet appears to have been refurbished / replaced.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, June 2021

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The bridge carries the Kilbride Road over a minor watercourse.		
CH_17	N/A	N/A	Baytown	Meath	Farm	707201 / 746366	An L'-shaped farm and orchard depicted on historic Ordnance Survey mapping with additions shown on later editions. The farmhouse comprises a two-storey structure with a slate roof. The farmhouse appears to have been modernised and the agricultural ranges have been replaced. Views are west across the private drive / garden towards the road and fields beyond.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_18	N/A	N/A	Baytown	Meath	House	708016 / 746178	A roadside house depicted on historic Ordnance Survey mapping. The house comprises a single storey rendered structure positioned perpendicular to the road through Baytown. Appears to be in poor condition with mounds of waste material immediately adjacent to the building. Modern agricultural buildings have been constructed to the east and a high concrete roadside boundary wall is located to the north.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView, April 2019
CH_19	N/A	N/A	Hollywood	Dublin	Police barracks	708295 / 743234	A 'police barracks' depicted on historic Ordnance Survey mapping. The building comprises a two-storey structure, rectangular in plan. The building is now in ruins. The former barracks is located within a walled plot with an entrance to the north immediately adjacent to the R121. Views outwards are obscured by established vegetation.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, July 2021

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
CH_20	N/A	N/A	Irishtown	Dublin	Field boundary	709100 / 746479	A sinuous linear feature visible on aerial imagery. The cropmark corresponds with a field boundary depicted on historic Ordnance Survey mapping. The former field boundary is located in an arable field to the south of the road through Irishtown.	Post-medieval	Digital Globe Ordnance Survey 6", 1837 – 1842meath
CH_21	N/A	N/A	Coolquoy	Dublin	Farm	709721 / 746401	A farm depicted on historic Ordnance Survey mapping in a courtyard plan. The farm comprises a group of rendered stone set back from the R135. The complex includes modern agricultural buildings. The site is bounded by a modern metal railing fence. Views are largely across the yard with views out across the surrounding fields.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_22	N/A	N/A	Coolatrath East	Dublin	Agricultural range	709787 / 746077	A roadside agricultural range depicted on historic Ordnance Survey mapping as part of a courtyard farm. The building comprises a rendered single-storey structure with corrugated roof. The other buildings in the group appear more recent constructions.	Post-medieval	Ordnance Survey 25", 1888-1913 Google StreetView
CH_23	N/A	N/A	Coolatrath East	Dublin	Field system	709833 / 746182	A network of linear cropmarks visible on aerial imagery. These cropmarks correspond with former field boundaries depicted on historic Ordnance Survey mapping that have since been removed. Located in an arable field to the east of the R135.	Post-medieval	Digital Globe Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
CH_24	N/A	N/A	Ward Upper	Dublin	House	710160 / 745108	'Six Mile House' depicted on historic Ordnance Survey mapping. The house comprises a single storey, brick and rendered building with a slate roof and gable stack. Original house appears to have been extended.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, July 2021

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The house is located on the roadside on the junction between the R121 and the R135. Views out are limited by hedges, a wall, and outbuildings; however, to the north and east views are across the roundabout and roads.		
CH_25	N/A	N/A	Newpark	Dublin	Agricultural range	710338 / 745269	A group of roadside agricultural buildings, forming a courtyard, depicted on historic Ordnance Survey mapping. The buildings comprise one and two-storey structures, constructed with stone and brick. Views are across the farmyard with views out limited by a wall. The farm is positioned immediately to the north of the R121.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_26	N/A	N/A	Broghan	Dublin	Road bridge	710606 / 744247	A road bridge depicted on historic mapping as 'Broghan New Bridge'. The bridge includes a pair of parallel squared stone parapets with possibly later copes. Carries the R135 over a minor watercourse.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_27	N/A	N/A	Broghan	Dublin	Farm	710681 / 744121	An 'L'-shaped layout roadside farm depicted on historic Ordnance Survey mapping with later editions showing additional buildings. The farm comprises single and two-storey ranges, as well as a more recent barn and bungalow. A modern billboard has been attached to one of the buildings. The group is enclosed by a rubblestone boundary wall adjacent to the R135.v	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView, July 2021

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
CH_28	N/A	N/A	Dunsoghly	Dublin	Farm	711958 / 743365	A roadside agricultural range depicted on historic Ordnance Survey mapping. The building comprises a rendered single-storey structure that forms part of an operational farmyard.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_29	N/A	N/A	Ballystrahan	Dublin	House	712626 / 745191	A roadside house depicted on historic Ordnance Survey mapping. The house comprises a single storey rendered five-bay structure with an off-centre stack and tile roof. Farm buildings, some of which are depicted on later mapping are located to the south and west. The house is located adjacent to R122 within a plot enclosed by a low rendered boundary wall.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_30	N/A	N/A	Clonshaugh	Dublin	Farm	718730 / 741985	A roadside farmhouse and agricultural ranges depicted on historic Ordnance Survey mapping. The house comprises a two-storey building with a modern single-storey porch to east, and a single storey extension to the south. The house is set back from Clonshaugh Road in a low walled garden, with views across the road, towards the fields beyond.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView, January 2022
CH_31	N/A	N/A	Stockhole	Dublin	Ford	718755 / 742792	'Shane's Ford' depicted on historic Ordnance Survey mapping; later editions continue to show the location of the ford with the road also crossing an unnamed watercourse. The road in this location still crosses the watercourse as depicted.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
CH_32	N/A	N/A	Clonshaugh	Dublin	Field system	718916 / 741898	A network of linear cropmarks visible on aerial imagery. These cropmarks correspond with former field boundaries depicted on historic Ordnance Survey mapping that have since been removed.	Post-medieval	Digital Globe Ordnance Survey 6”, 1837 – 1842
CH_33	N/A	N/A	Cloghran	Dublin	Farm	718928 / 743480	A courtyard farm depicted on historic Ordnance Survey mapping. The farm comprises an 'L'-shaped range and farmhouse on Stockhole Lane. The farm is positioned at the end of a drive within large rectangular fields. Modern agricultural buildings form part of the yard. Views are internal across the farmyard with views out limited by buildings and established field boundaries.	Post-medieval	Ordnance Survey 6”, 1837 – 1842 Google StreetView
CH_34	N/A	N/A	Middletown	Dublin	Farm (Site of)	718996 / 742340	'Upper Middletown', a farm, depicted on historic Ordnance Survey mapping. The farm buildings have been demolished. However, earthworks are visible in this location on aerial imagery and may indicate the site of the footings of the buildings.	Post-medieval	Ordnance Survey 6”, 1837 – 1842 Google StreetView Digital Globe
CH_35	N/A	N/A	Baskin	Dublin	Farm	719145 / 743156	A cluster of agricultural ranges depicted on historic Ordnance Survey mapping on Baskin Lane. Only one of the buildings, a rendered stone range with corrugated roof, remains extant. A modern house and agricultural buildings form part of this complex.	Post-medieval	Ordnance Survey 6”, 1837 – 1842 Ordnance Survey 25”, 1888-1913 Google StreetView
CH_36	N/A	N/A	Bohammer	Dublin	Farm	720576 / 742969	A group of agricultural buildings forming a courtyard depicted on historic Ordnance Survey mapping to the south of Baskin Lane.	Post-medieval	Ordnance Survey 6”, 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The farm including a two-storey rendered farmhouse, perpendicular to the road, and rendered rubblestone stables, positioned immediately adjacent to the road. The group is enclosed by a roughly coursed rubblestone wall with semi-circular copes, and the stable buildings. Views are largely internal, across the yard, and beyond the boundary wall to the north, across Baskin Lane, towards the fields beyond.		Ordnance Survey 25", 1888-1913 Google StreetView
CH_37	N/A	N/A	Saint Doolaghs	Dublin	Road bridge	721014 / 741741	'St Doolagh's Bridge' depicted on historic Ordnance Survey mapping. The bridge comprises a single arch rubblestone bridge with one low stone parapet with semi-circular copes to the west of Malahide Road (immediately north of the junction with Limekiln Lane). Carries the Malahide Road across an unnamed watercourse.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_38	N/A	N/A	Belcamp	Dublin	Buildings	721109 / 741427	Roadside buildings depicted on historic Ordnance Survey mapping in Balgriffin fronting the R107, on the junction with the R123. The group includes rendered commercial units with residential floors, as well as a terrace of harled houses on the R123. These buildings form a group with some historic character along the main thoroughfare.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_39	N/A	N/A	Kinsaley	Dublin	Roadside memorial	721123 / 742238	A roadside memorial identified from Google StreetView. Not depicted on historic Ordnance Survey mapping. The memorial comprises an inscribed granite carved stone, topped with a decorative cross. The memorial is located immediately adjacent to the R107, in front of the remains of a rubblestone boundary wall.	Modern	Google StreetView Ordnance Survey 6", 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
									Ordnance Survey 25", 1888-1913
CH_40	N/A	N/A	Belcamp	Dublin	Road bridge	721156 / 741198	A road bridge and weir depicted on historic Ordnance Survey mapping. The bridge includes a pair of low stone parapets with semi-circular copes, the western parapet appears to have been rendered and extends along Malahide Road. The bridge carries the Malahide Road across the Mayne River.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
CH_41	N/A	N/A	Culcommon	Meath	Road bridge	694713 / 746280	The western coursed, squared, rubble stone parapet of a road bridge or culvert carrying a single lane carriageway over a small watercourse depicted on historic mapping. Half-round copes, rendered. Only one side (west) remains extant.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView
CH_42	N/A	N/A	Ribstown	Meath	House	694977 / 746856	A roadside cottage depicted on historic Ordnance Survey mapping. The dwelling comprises a single storey, brick and rendered building with a hipped slate roof and brick stack. The cottage is positioned within a rectangular plot, bounded by established hedges, with views to the south-east, across the road, towards modern properties.	Post-medieval	Ordnance Survey 25", 1888-1913
CH_43	N/A	N/A	Woodland	Meath	Agricultural ranges	695461 / 747780	A group of agricultural buildings depicted on historic Ordnance Survey mapping. Only three of the buildings remain extant. Roofs appear to be corrugated iron.	Post-medieval	Ordnance Survey 6", 1837 – 1842

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							The group is located within pasture fields, with views out in all direction limited by established hedgerows.		Ordnance Survey 25", 1888-1913
CH_44	N/A	N/A	Portan	Meath	Thatched building	695803 / 748317	A thatched building depicted as 'Portan' on historic Ordnance Survey mapping. The building appears to have been extended to the north-west, with a central perpendicular wing added. The building is located within a private plot, south of the Tolka River, set back from the R154, within the surrounding fields. Views are largely across open fields, with a belt of trees obscuring views westward.	Post-medieval	Ordnance Survey 6", 1837 – 1842
CH_45	N/A	N/A	Ribstown	Meath	Agricultural buildngs	695477 / 747147	Two buildings depicted as 'Ribstown' on historic Ordnance Survey mapping and later editions. The buildings form part of a larger operational farmyard. Views are limited by modern buildings and established hedgerows.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
CH_46	N/A	N/A	Rathregan	Meath	Tree	696925 / 747831	'The Big Tree' depicted on historic Ordnance Survey mapping and later editions (Ordnance Survey 25", 1888-1913), at the junction between the R154 and Rathregan Court. No longer extant. The big tree is thought to be where 'many Bishops and people were hanged'.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey Google StreetView https://www.duchas.ie/en/cbes/5008916/4966446/5106944?ChapterID=5008916 [Accessed August 2022]

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
CH_47	N/A	N/A	Glebe	Meath	House	697158 / 747323	A house depicted on historic Ordnance Survey mapping and identified as 'Rathregan Rectory' on later editions. The house is set back from the R154 within its demesne (DL_02), with views in all directions limited by established gardens and grounds.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
CH_48	N/A	N/A	Piercetown	Meath	Railway (Site of)	700948 / 745680	The alignment of the M.G.W.R (Dublin and Navan Branch) railway depicted on historic Ordnance Survey mapping. Located immediately adjacent to the M3 motorway. The alignment is still perceptible as an earthwork.	19th century	Ordnance Survey 25", 1888-1913
CH_49	N/A	N/A	Priest Town	Meath	Gravel pit	705928 / 745630	A 'Gravel Pit' depicted on historic Ordnance Survey mapping; however, not shown on later editions. Located in a small area of woodland east of Priest Town Demesne (DL_04).	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
CH_50	N/A	N/A	Belgree	Meath	Gravel pit	705636 / 745261	A 'Gravel Pit' depicted on historic Ordnance Survey mapping; however, not shown on later editions. Located in an arable field to the south of Belgree Lane.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
CH_51	N/A	N/A	Court	Meath	Enclosure	707212 / 744554	Cropmarks visible on aerial imagery and interpreted as a possible square enclosure. Possible associated linear features were also identified nearby and may comprise an associated field system (a field system is recorded on the SMR (ME051-005) in this field).	Unknown	GoogleEarth, Sept 2003 Ordnance Survey 6", 1837 – 1842

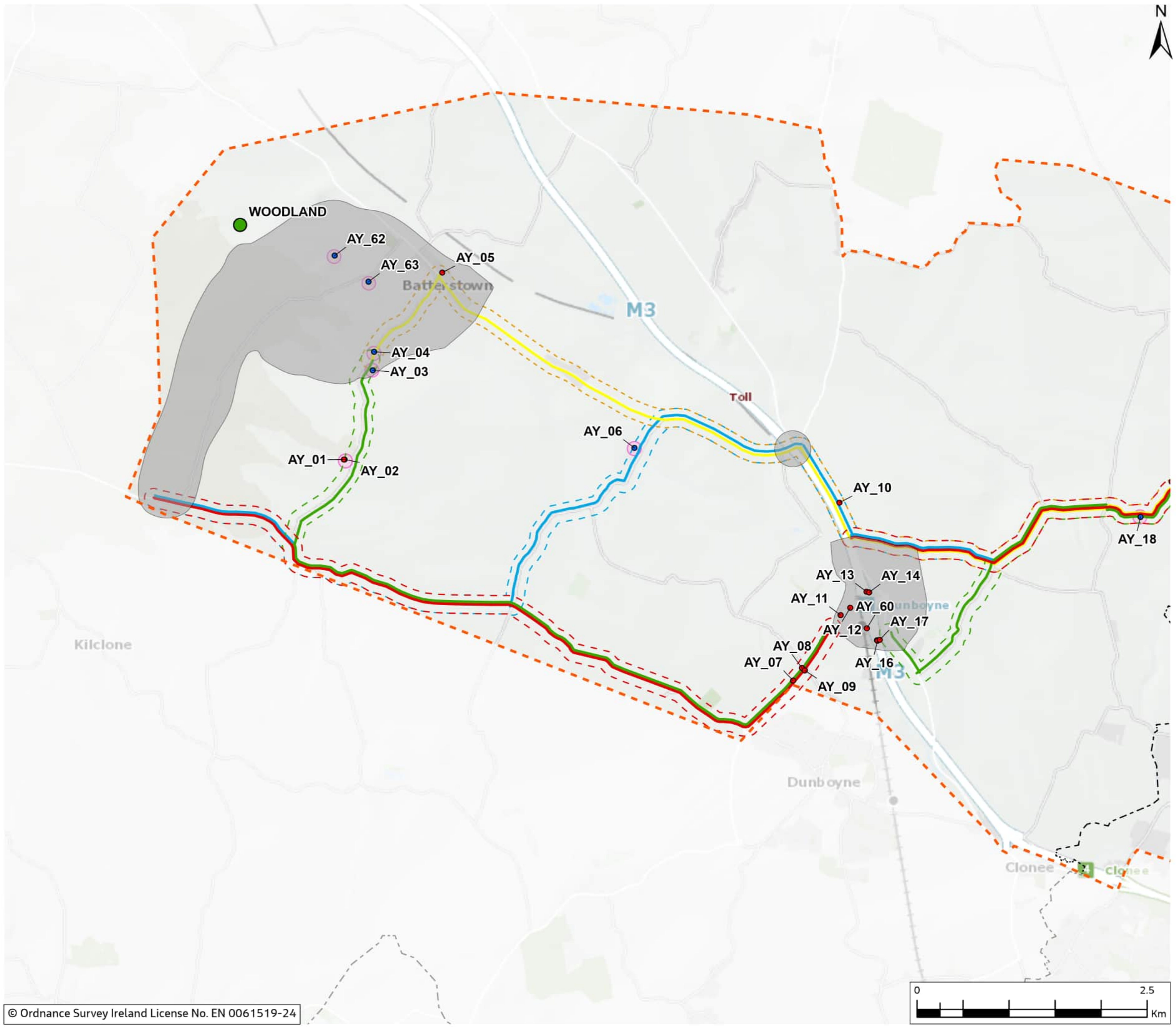
ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							No corresponding features are depicted on historic Ordnance Survey mapping at this location.		Ordnance Survey 25", 1888-1913
CH_52	N/A	N/A	Irishtown	Dublin	House	708438 / 744235	A rectangular roadside building depicted on historic Ordnance Survey mapping. Later editions show the building with an extension to the north as well as a projecting porch. The dwelling is depicted as roofless on modern mapping. The building is adjacent to a local road in an overgrown area.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913 Google StreetView
CH_53	N/A	N/A	Gallanstown	Dublin	Quarry	708417 / 743907	A 'Quarry' depicted on historic Ordnance Survey mapping. Located in an arable field to the west of a local road.	Post-medieval	Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913
CH_54	N/A	N/A	Stockhole	Dublin	House	718534 / 742284	'Edendale' depicted on historic Ordnance Survey mapping within its demesne (DL_15), including the house, a long agricultural range to the west, and gate lodge to the east. The agricultural range remains extant; however, the house and lodge have been demolished.	Post-medieval	Ordnance Survey 6", 1837 – 1842
CH_55	N/A	N/A	Baskin	Dublin	House	719445 / 742897	'Baskin Hall', depicted on historic Ordnance Survey mapping, with its associated farm to the south-west and gate lodge to the north. The house is positioned within its demesne DL_18. Now Newtown Stud, with a modern arena is located to the south, views from the house are largely limited to the	Post-medieval	Ordnance Survey 6", 1837 – 1842 Google StreetView

ID	Reference Number(s)	Legal Status	Townland	County	Site Type	Easting / Northing	Description	Date	Sources
							north by an established boundary and to the west by modern agricultural buildings.		
CH_56	N/A	N/A	Middleton	Dublin	Farm	719498 / 742412	'Lower Middletown' depicted on First Edition Ordnance Survey mapping (1837 – 1842) as a cluster of buildings, later mapping (Ordnance Survey 25", 1888-1913) also identifies a lodge to the south of the group. Located within pasture fields, with views obscured by established hedgerows and buildings.	Post-medieval	
CH_57	N/A	N/A	Middleton	Dublin	Enclosures	719293 / 742270	A series of cropmarks identified from aerial imagery. These comprise two circular features, interpreted as possible enclosures, and a network of linear features interpreted as former field boundaries. Some of these former field boundaries correspond with those depicted on historic Ordnance Survey mapping and may post-date the enclosures.	Unknown	GoogleEarth, June 2018 Ordnance Survey 6", 1837 – 1842 Ordnance Survey 25", 1888-1913

Annex B. Archaeology, Architectural Heritage and Cultural Heritage Figures

B.1.1: Archaeological Constraints

FIGURE B.1.1



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Recorded Monument
- Sites and Monuments Record (SMR)
- RMP Zone of Notification

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

Jacobs

Client: EIRGRID

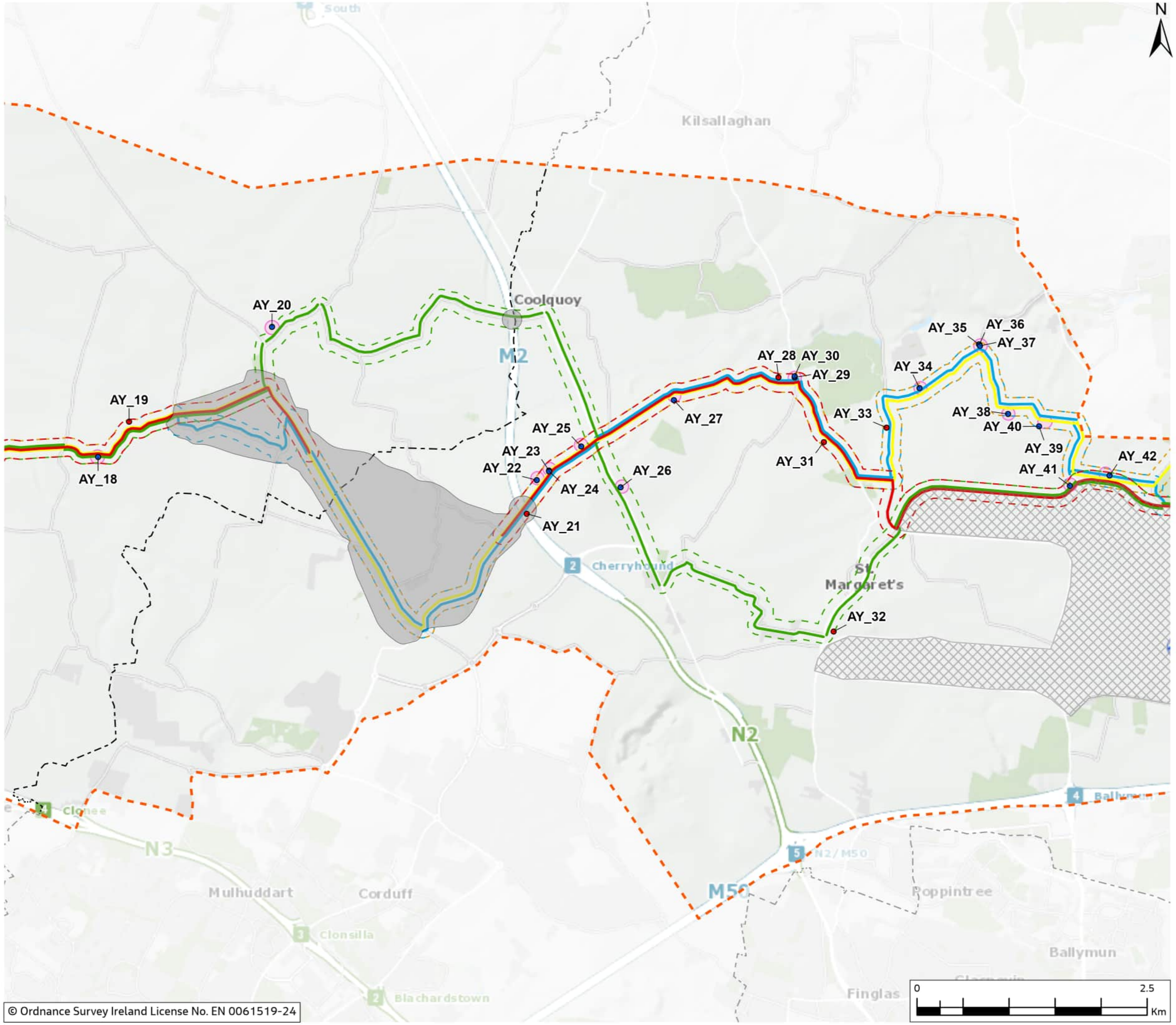
Project: CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title: Locations of Archaeological Constraints Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 1 of 3

Drawing Status: FINAL

Scale @ A3	1:40,000	DO NOT SCALE
OSI Sheet No.		
Jacobs No.	B321084AJ	
Drawing No.	321084AJ-MAP-S4A-B.1.1	

FIGURE B.1.1



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Recorded Monument
- Sites and Monuments Record (SMR)
- RMP Zone of Notification

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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Project

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Drawing Title

Locations of Archaeological Constraints Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 2 of 3

Drawing Status

FINAL

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Drawing No.	321084AJ-MAP-S4A-B.1.1	

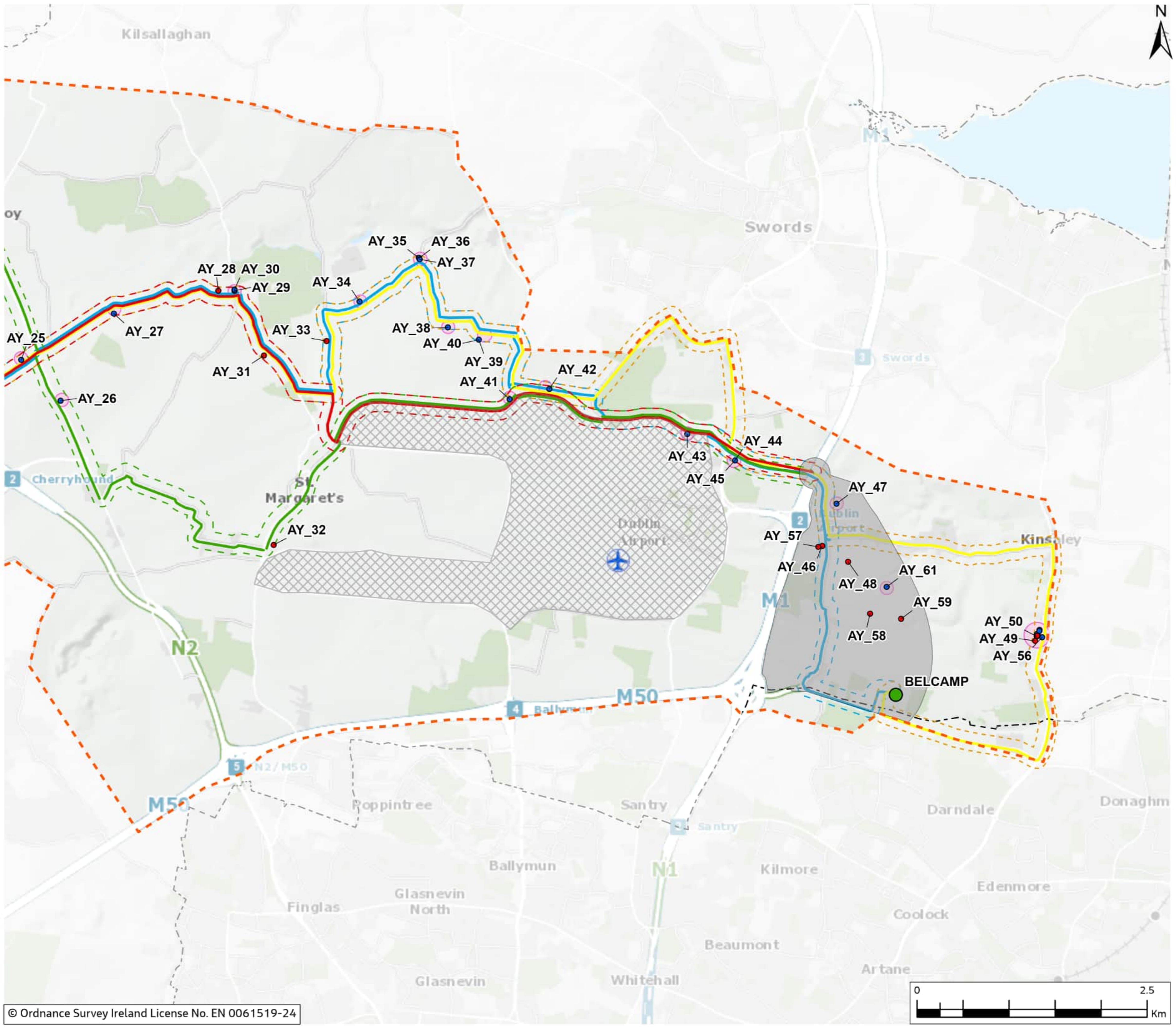

FIGURE B.1.1

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Recorded Monument
- Sites and Monuments Record (SMR)
- RMP Zone of Notification

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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Drawing Title

Locations of Archaeological Constraints Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 3 of 3

Drawing Status

FINAL

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Drawing No.	321084AJ-MAP-S4A-B.1.1	

B.1.2: Architectural Constraints

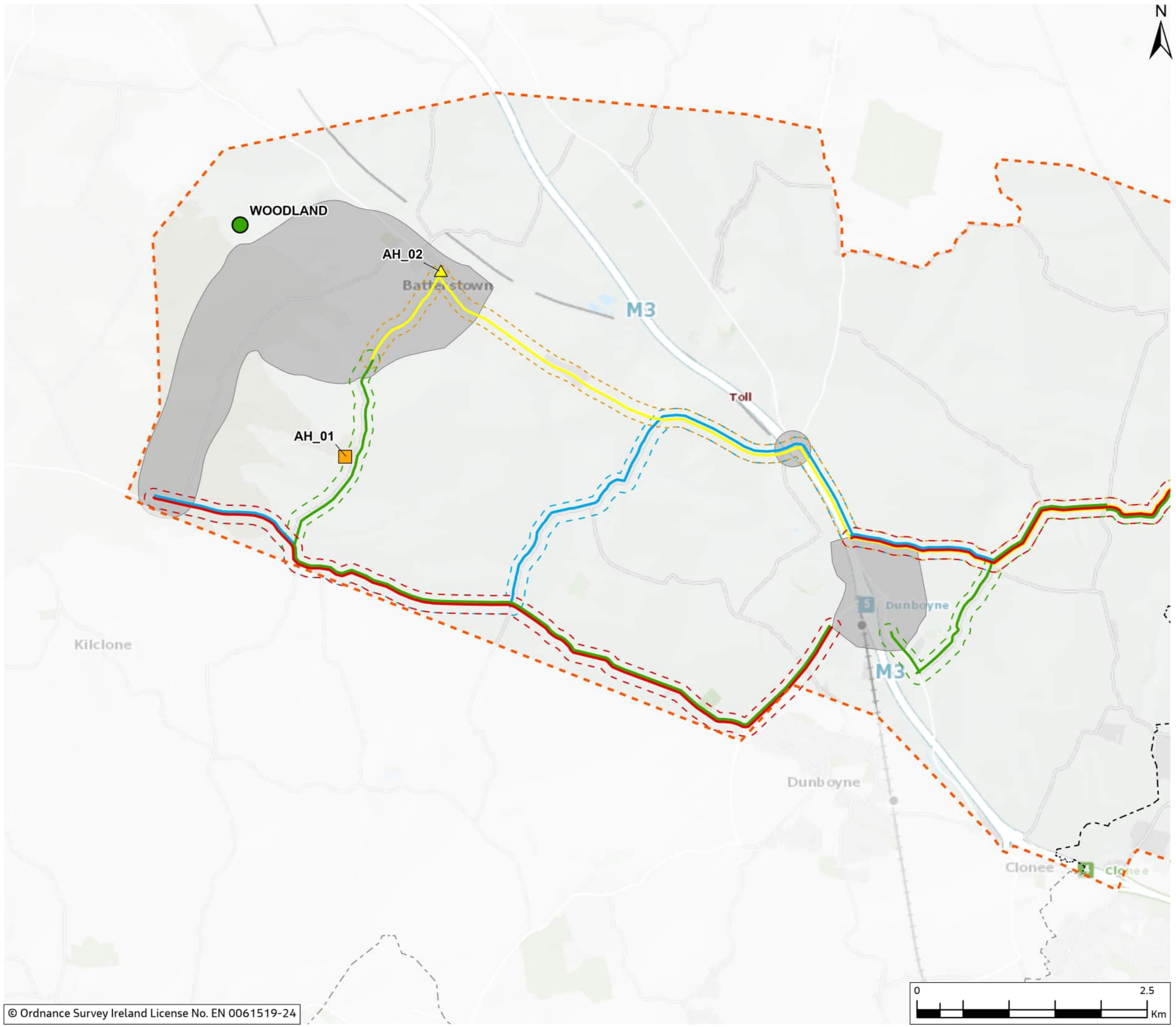

FIGURE B.1.2

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- National Inventory of Architectural Heritage (NIAH)
- Record of Protected Structures (RPS)

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Locations of Architectural Constraints Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 1 of 3

Drawing Status

FINAL

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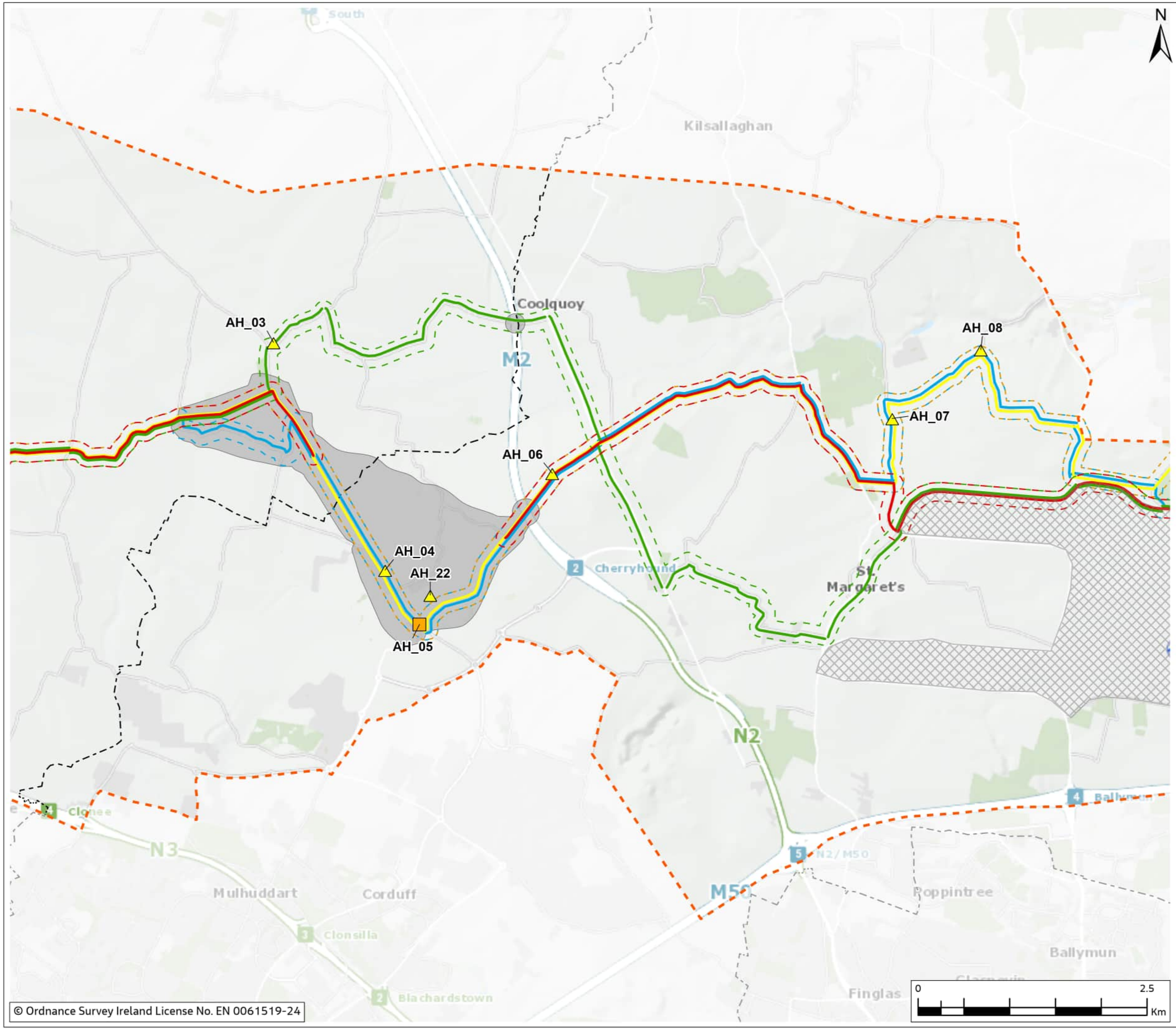

FIGURE B.1.2

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- National Inventory of Architectural Heritage (NIAH)
- Record of Protected Structures (RPS)

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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Drawing Title

Locations of Architectural Constraints
Within the Study Areas for Option A (Red),
Option B (Green), Option C (Yellow) and Option D (Blue)
Sheet 2 of 3

Drawing Status: FINAL

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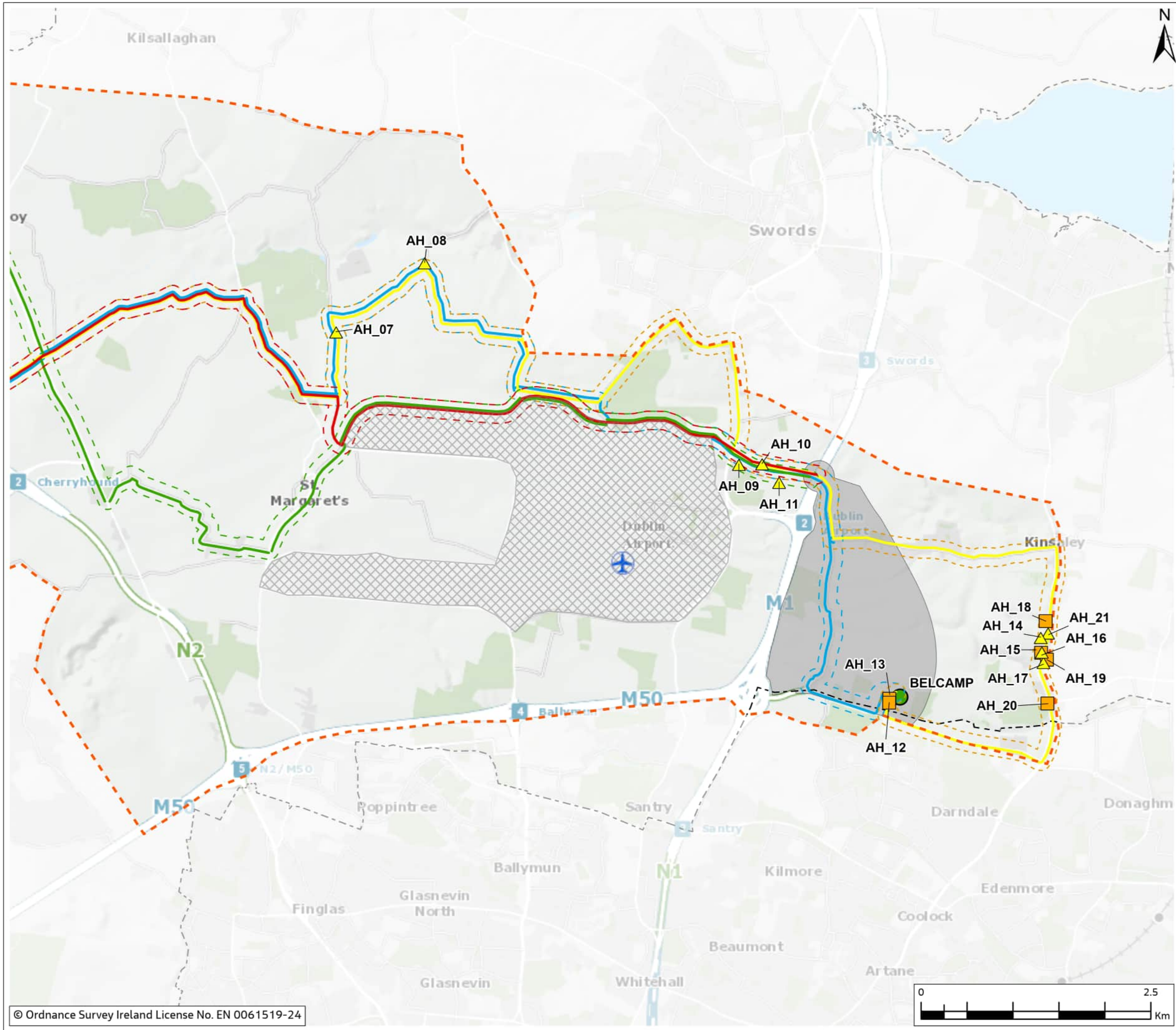

FIGURE B.1.2

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- National Inventory of Architectural Heritage (NIAH)
- Record of Protected Structures (RPS)

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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Drawing Title

Locations of Architectural Constraints Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 3 of 3

Drawing Status: FINAL

Scale @ A3: 1:40,000 — DO NOT SCALE

OSI Sheet No.

Jacobs No.: B321084AJ

Drawing No.: 321084AJ-MAP-S4A-B.1.2

B.1.3: Gardens and Designated Landscapes

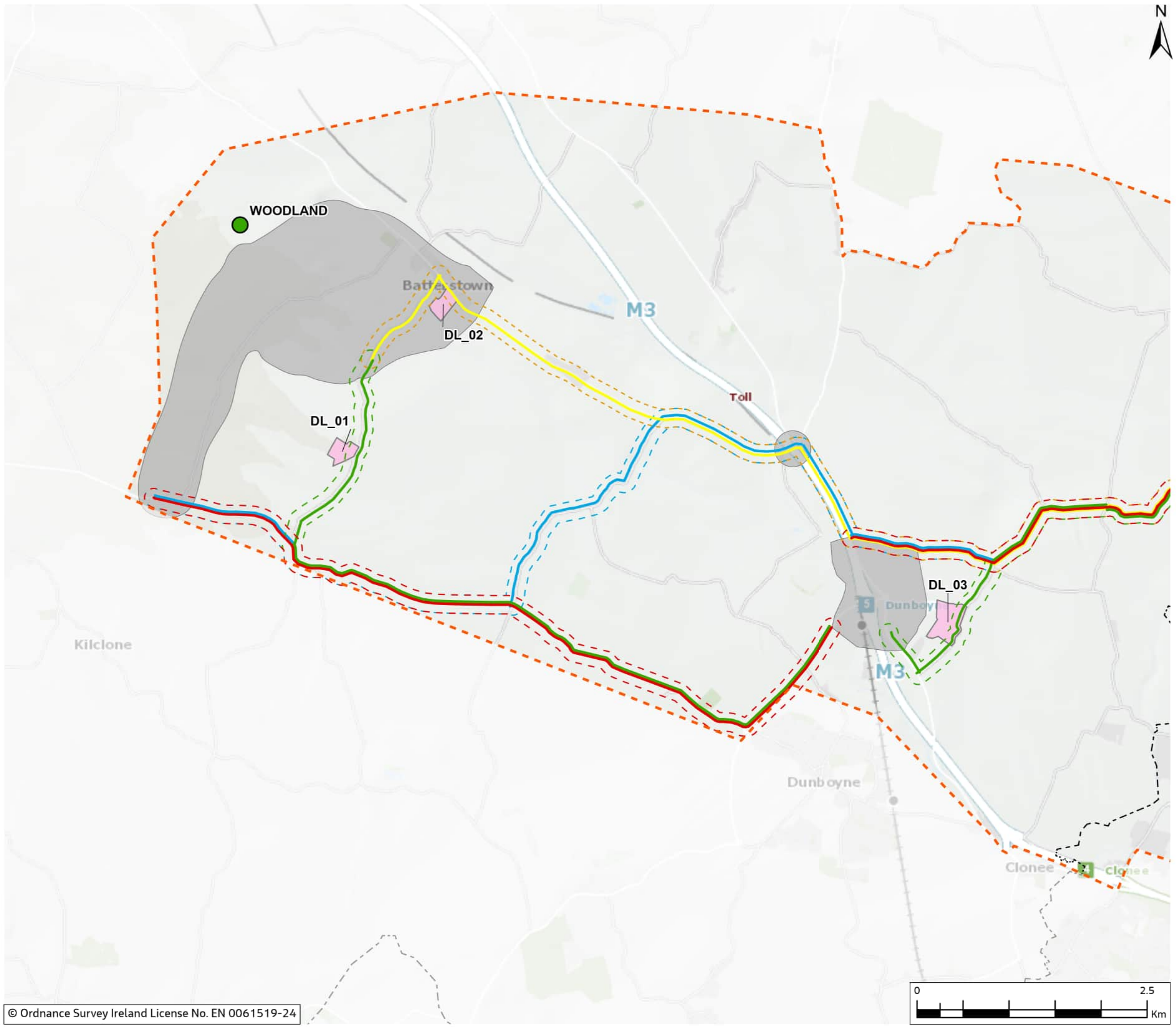

FIGURE B.1.3

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Gardens & Designed Landscape (GDL)

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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Client

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Project

CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Locations of Gardens & Designed Landscapes Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 1 of 3

Drawing Status: FINAL

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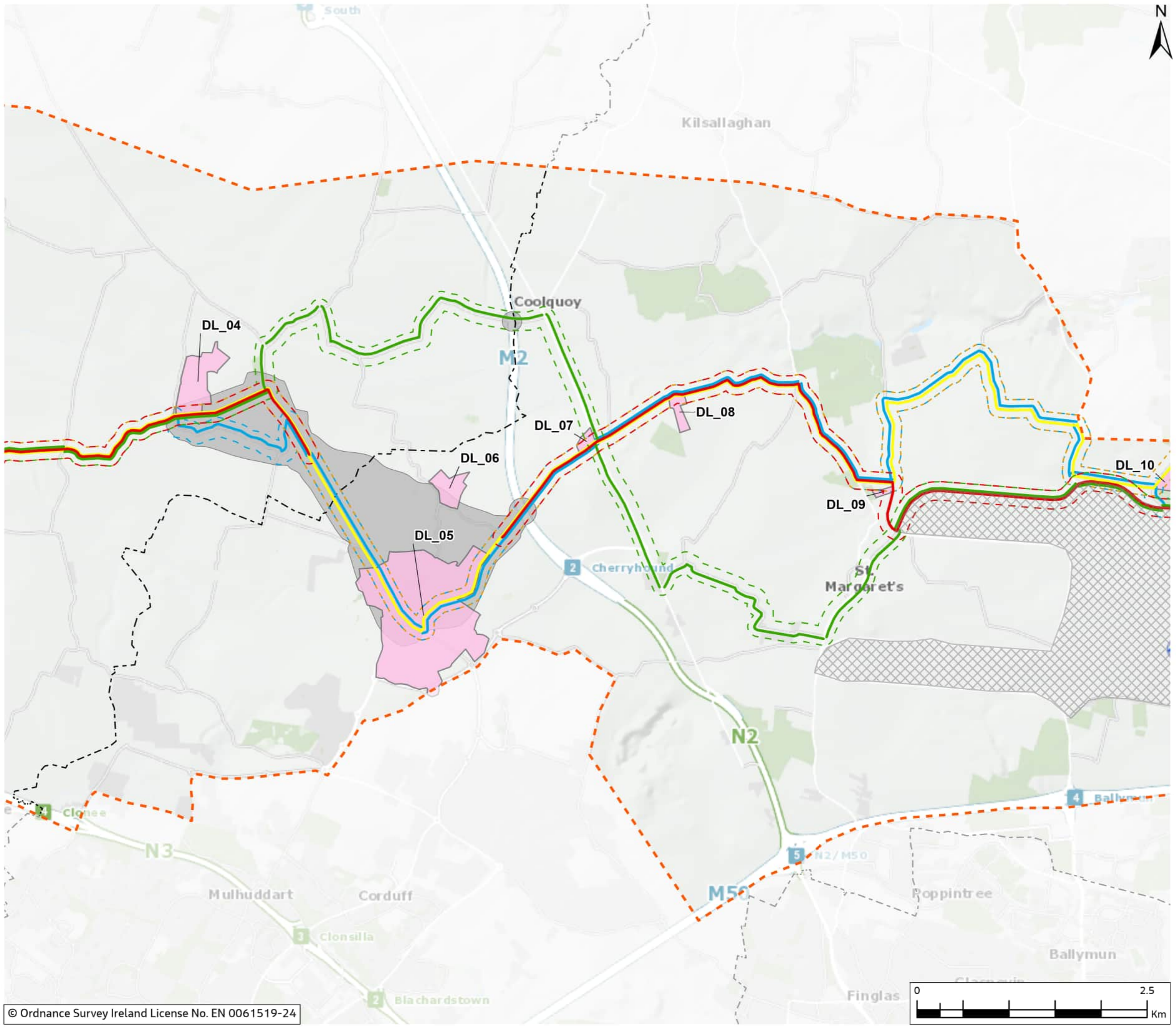

FIGURE B.1.3

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Gardens & Designed Landscape (GDL)

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Locations of Gardens & Designed Landscapes Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 2 of 3

Drawing Status: FINAL

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OSI Sheet No.

Jacobs No.: B321084AJ

Drawing No.: 321084AJ-MAP-S4A-B.1.3

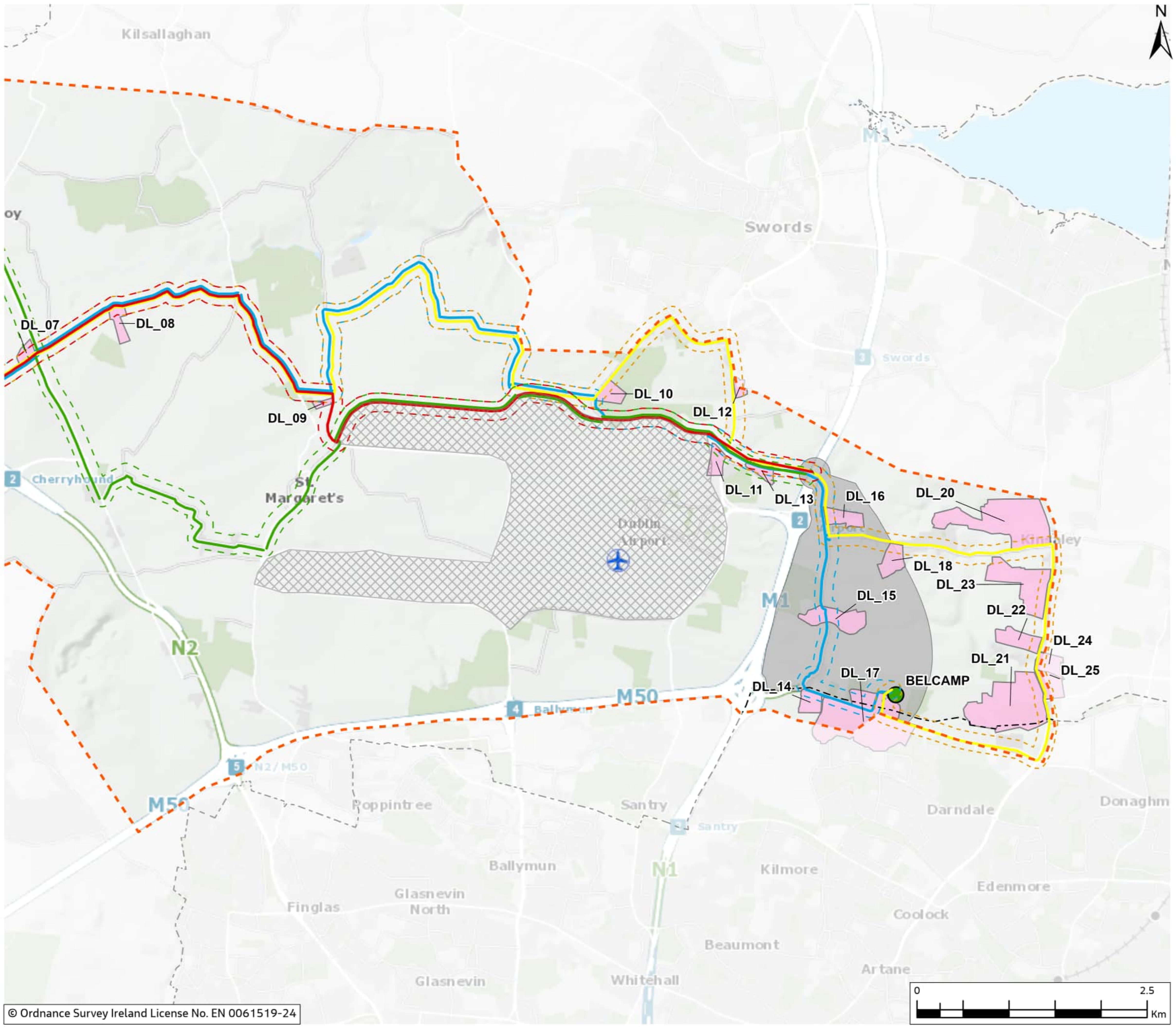

FIGURE B.1.3

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Gardens & Designed Landscape (GDL)

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Drawing Title

Locations of Gardens & Designed Landscapes Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 3 of 3

Drawing Status: FINAL

Scale @ A3	1:40,000	DO NOT SCALE
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Drawing No.	321084AJ-MAP-S4A-B.1.3	

B.1.4: Non-Designated Cultural Heritage Sites

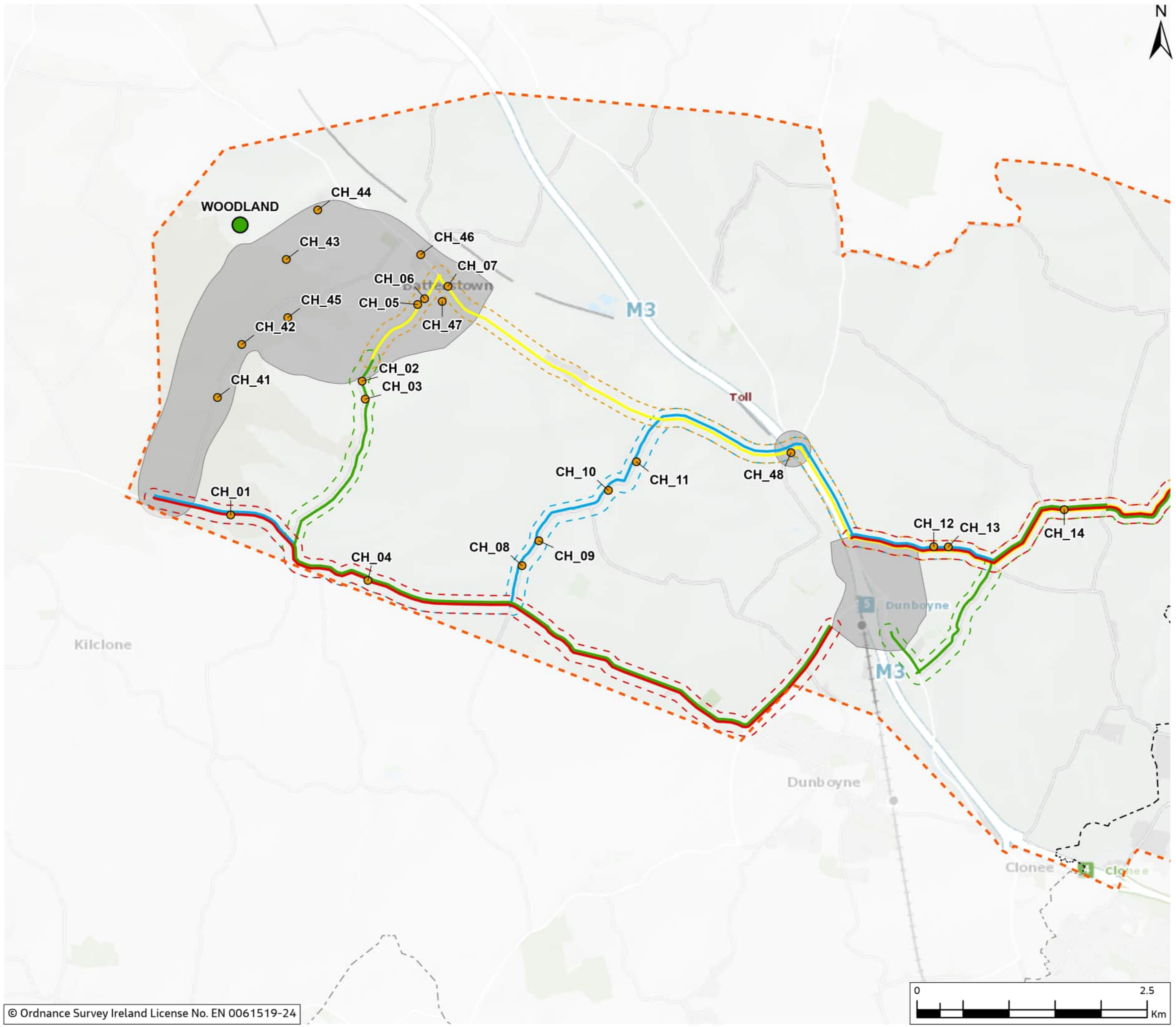

FIGURE B.1.4

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Locations of Non-Designated Cultural Heritage Sites Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 1 of 3

Drawing Status: FINAL

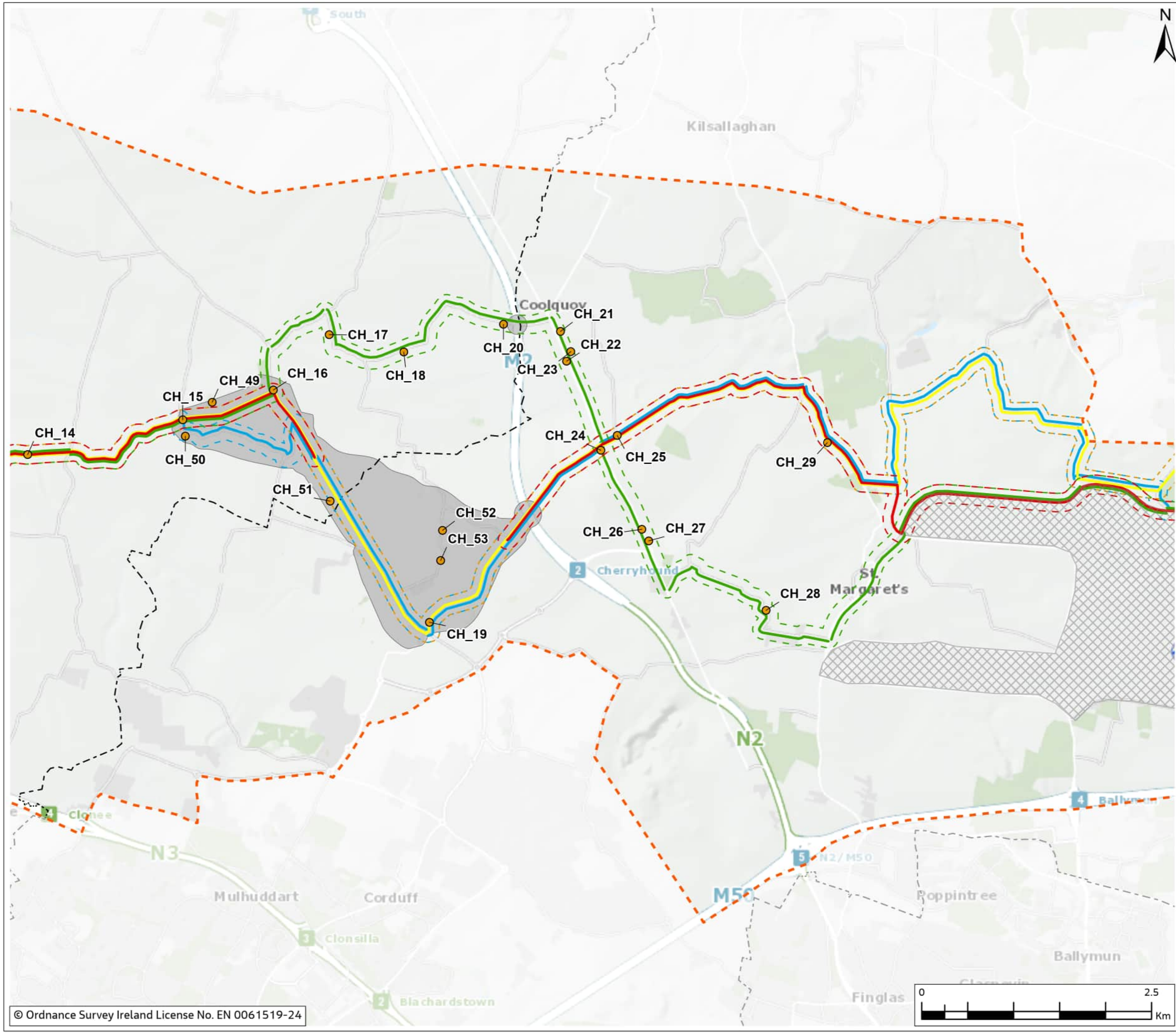
Scale @ A3: 1:40,000 DO NOT SCALE

OSI Sheet No.

Jacobs No.: B321084AJ

Drawing No.: 321084AJ-MAP-S4A-B.1.4

FIGURE B.1.4



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Cultural Heritage Point

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

Jacobs

Client

EIRGRID

Project

CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Locations of Non-Designated Cultural Heritage Sites Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 2 of 3

Drawing Status

FINAL

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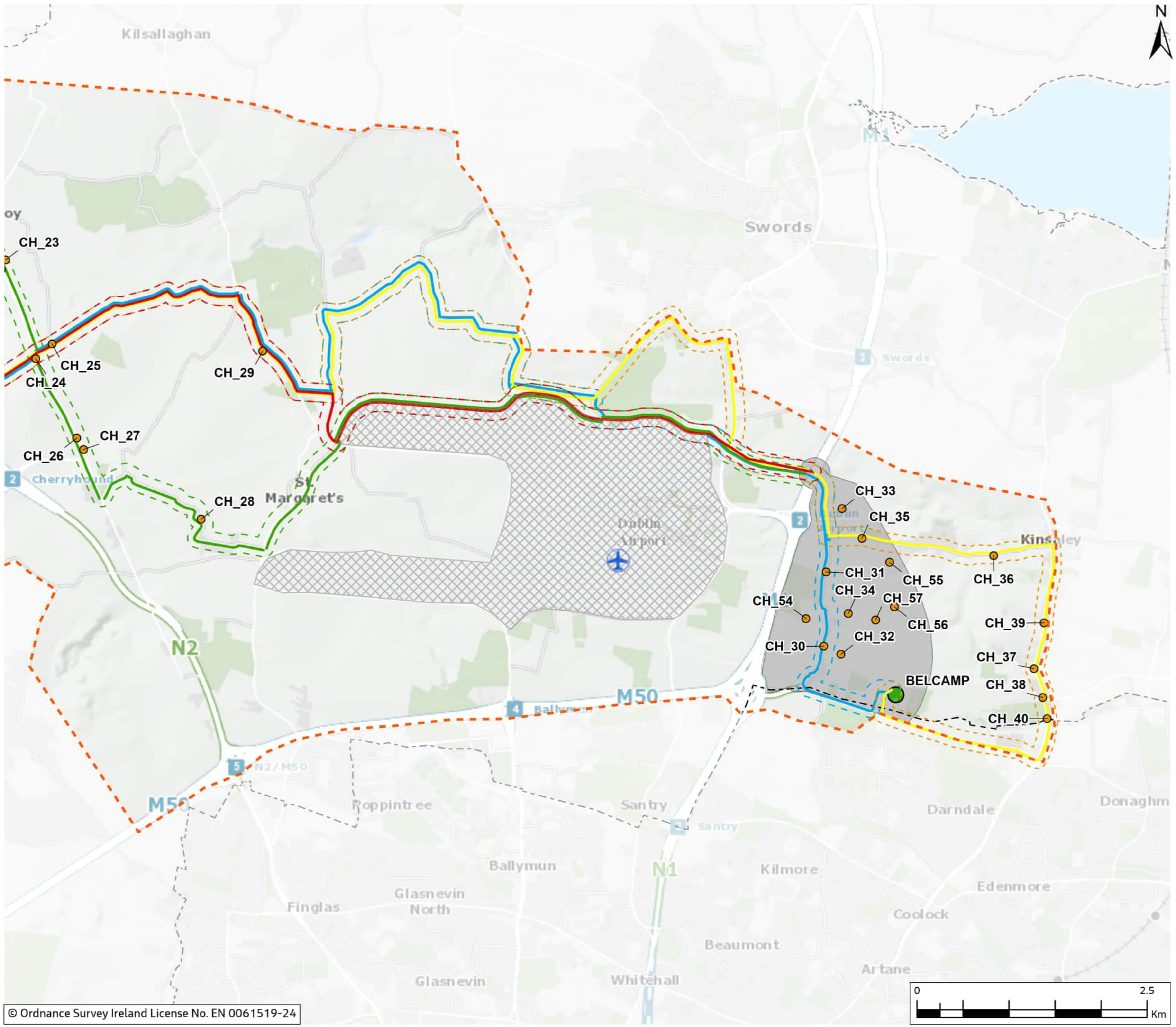

FIGURE B.1.4

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)*
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Cable Route Option A 100m Buffer*
- Cable Route Option B 100m Buffer*
- Cable Route Option C 100m Buffer*
- Cable Route Option D 100m Buffer*
- Cultural Heritage Point

*Indicative purposes only

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Drawing Title

Locations of Non-Designated Cultural Heritage Sites Within the Study Areas for Option A (Red), Option B (Green), Option C (Yellow) and Option D (Blue) Sheet 3 of 3

Drawing Status: FINAL

Scale @ A3: 1:40,000 — DO NOT SCALE

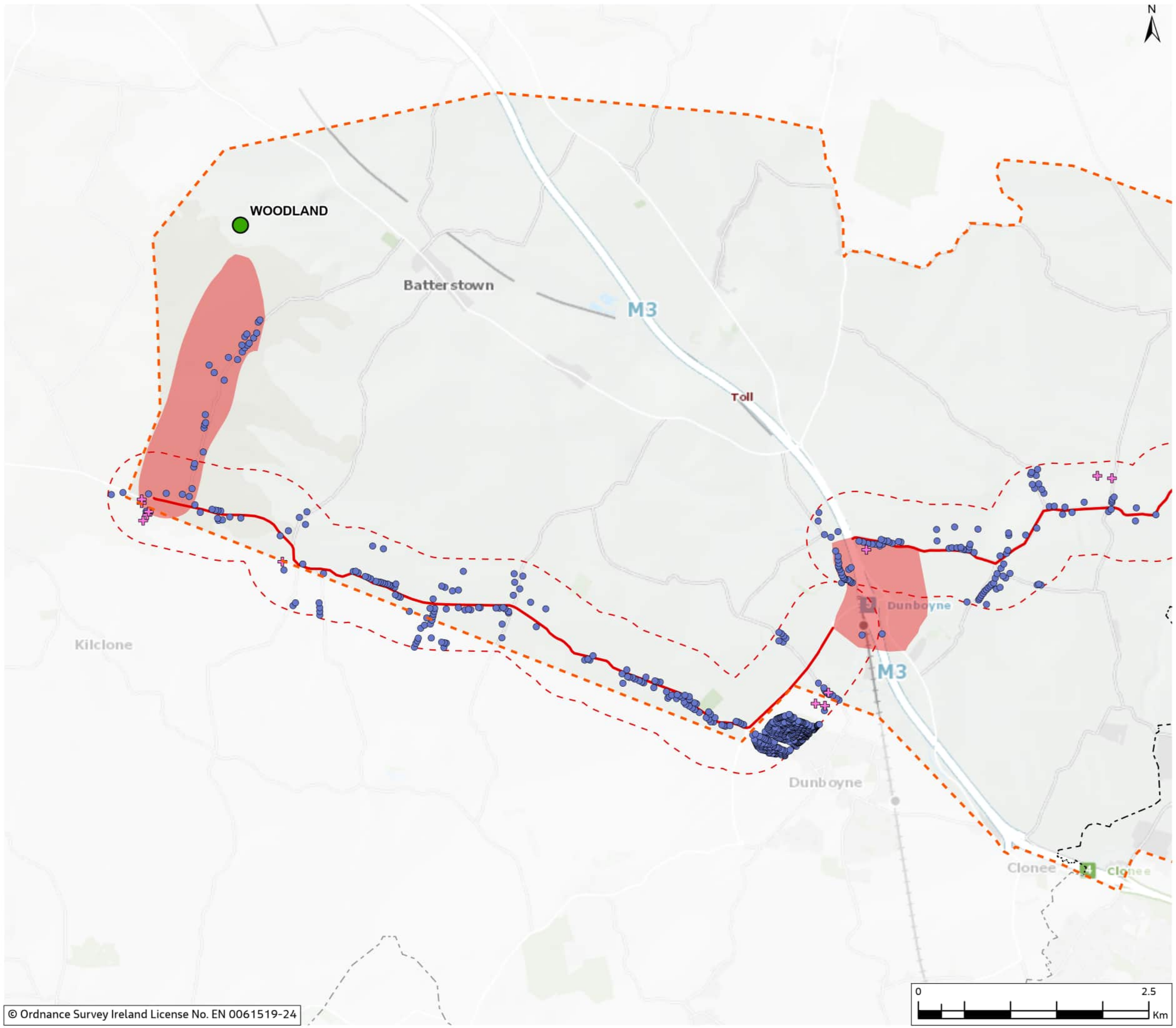
OSI Sheet No.

Jacobs No.: 321084AJ

Drawing No.: 321084AJ-MAP-S4A-B.1.4

Appendix C – Socio-Economic Figures

FIGURE C.1.1



0 2.5 Km

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option A (Red)*
- Off Road Options Being Explored - Option A*
- Cable Route Option A 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only

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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option A (Red)
Sheet 1 of 3

Drawing Status: FINAL

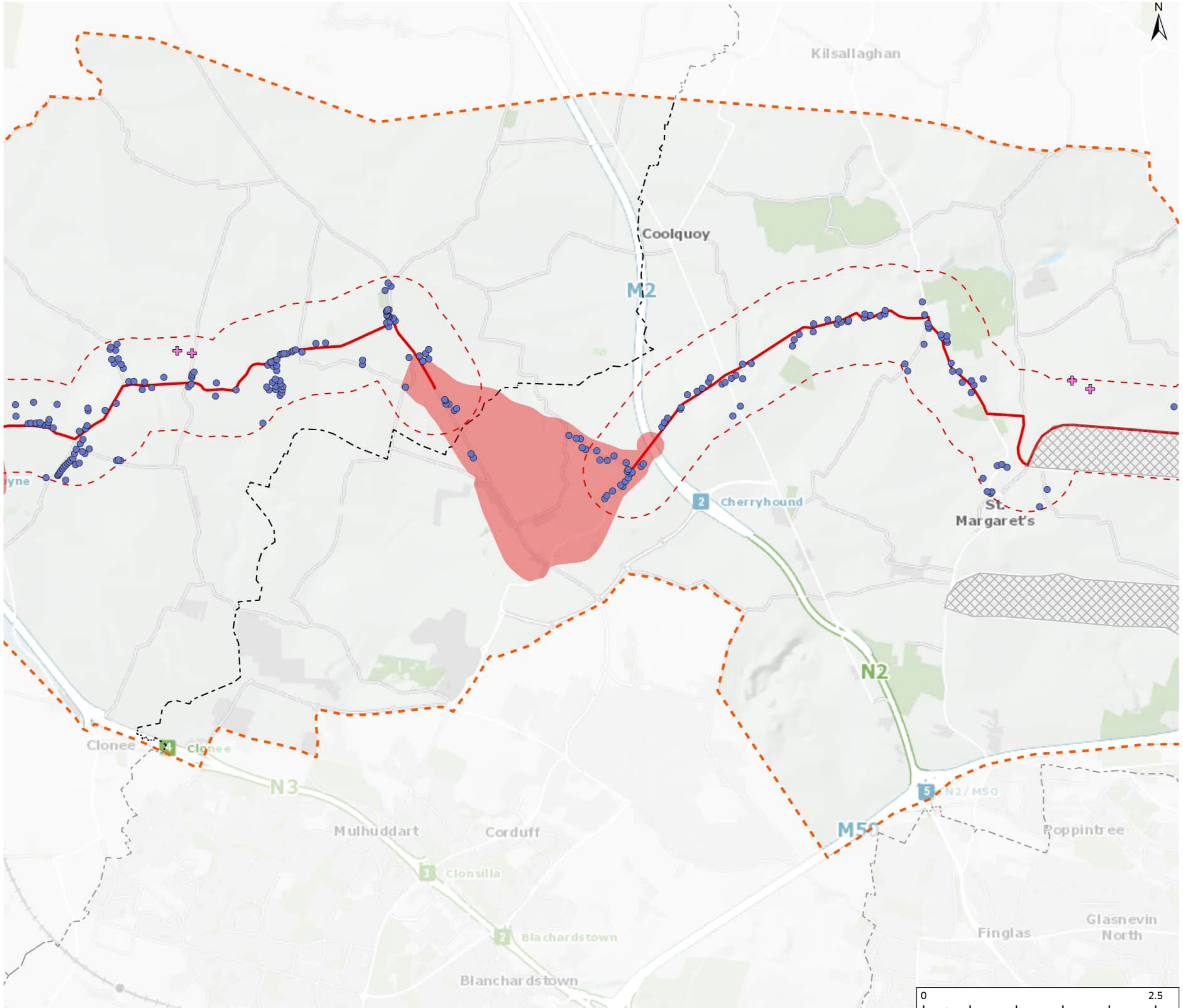
Scale @ A3: 1:40,000 DO NOT SCALE

OSI Sheet No.

Jacobs No.: 321084AJ

Drawing No.: 321084AJ-MAP-S4A-C.1.1

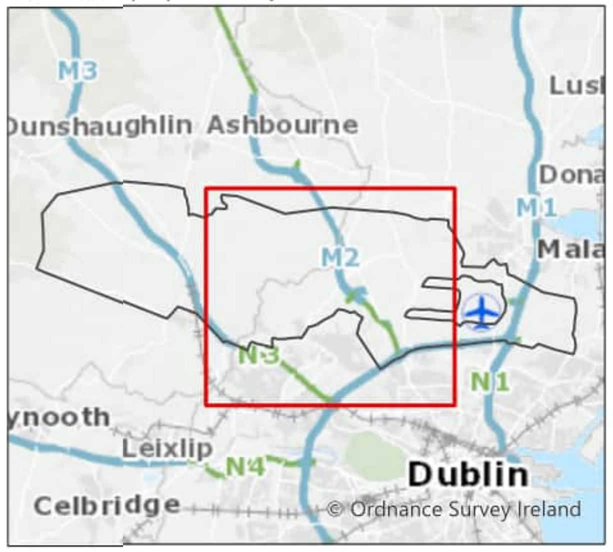
FIGURE C.1.1



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option A (Red)*
- Off Road Options Being Explored - Option A*
- Cable Route Option A 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only



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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option A (Red)
Sheet 2 of 3

Drawing Status	FINAL	
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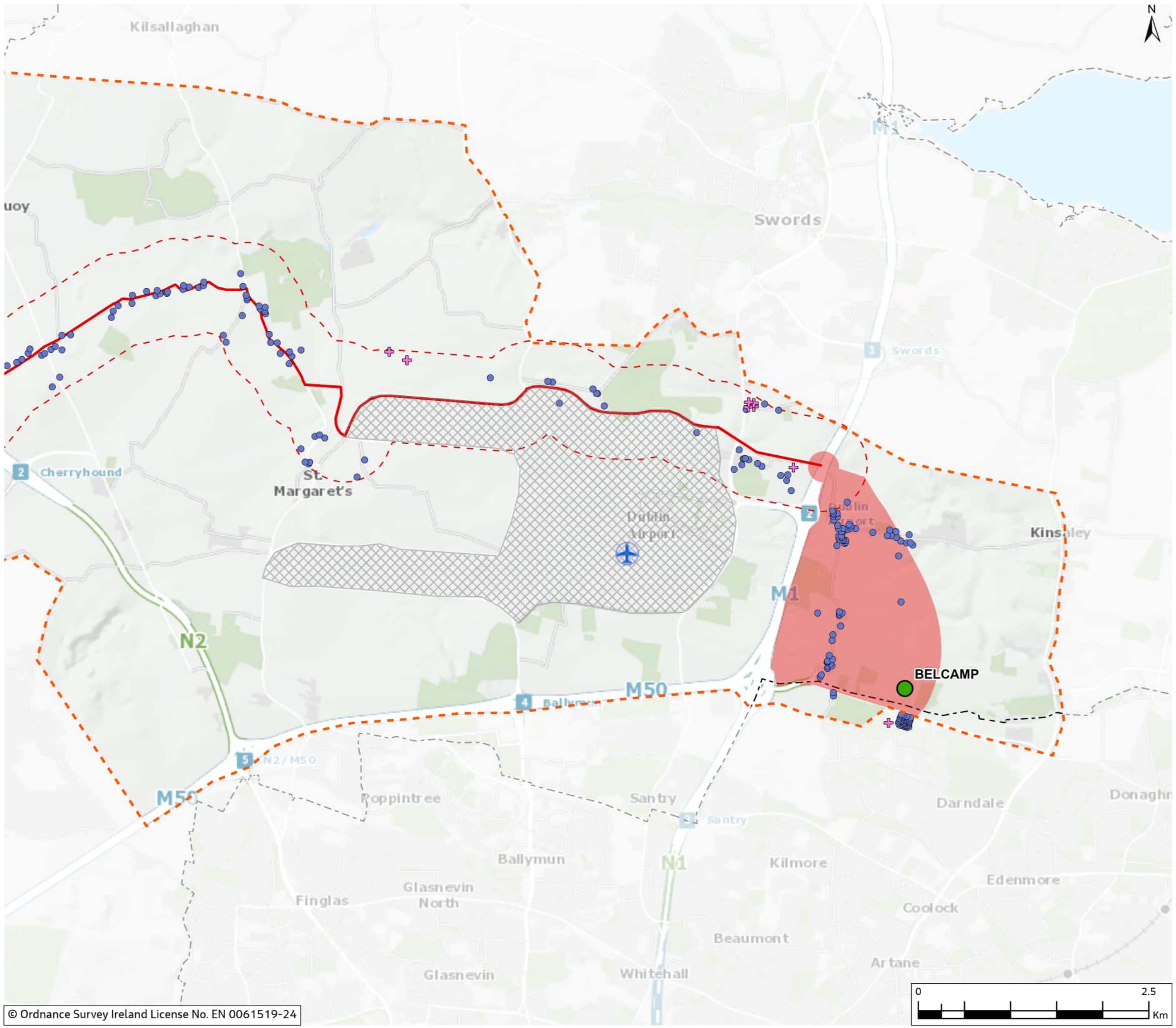

FIGURE C.1.1

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option A (Red)*
- Off Road Options Being Explored - Option A*
- Cable Route Option A 500m Buffer*
- Commercial/Retail property
- Residential property

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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option A (Red)
Sheet 3 of 3

Drawing Status

FINAL

Scale @ A3	1:40,000	DO NOT SCALE
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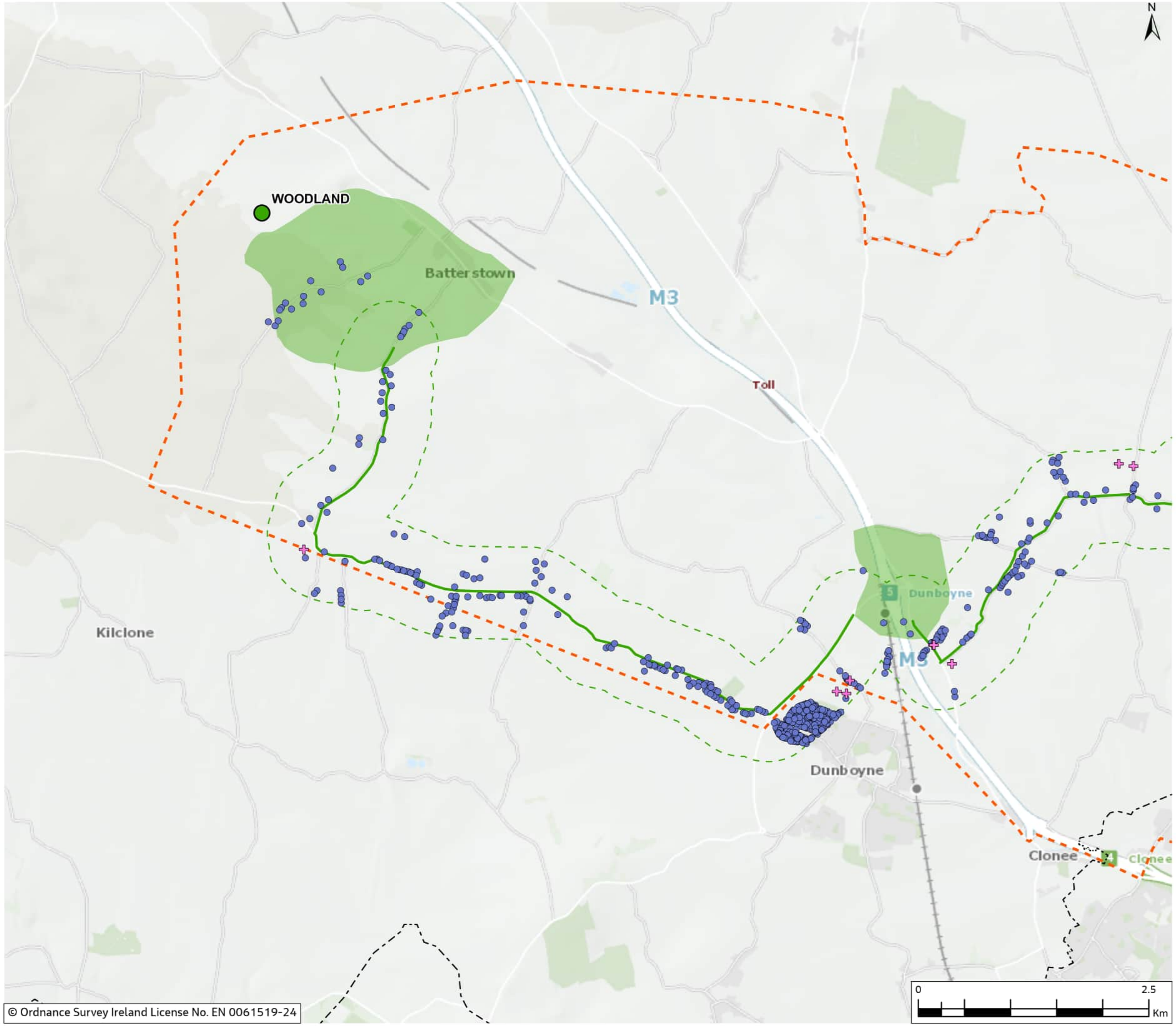
FIGURE C.1.2



Legend

- Step 4a Study Area
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option B (Green)*
- Off Road Options Being Explored - Option B*
- Cable Route Option B 500m Buffer*
- Commercial/Retail property
- Residential property

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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option B (Green)
Sheet 1 of 3

Drawing Status

FINAL

Scale @ A3	1:40,000	DO NOT SCALE
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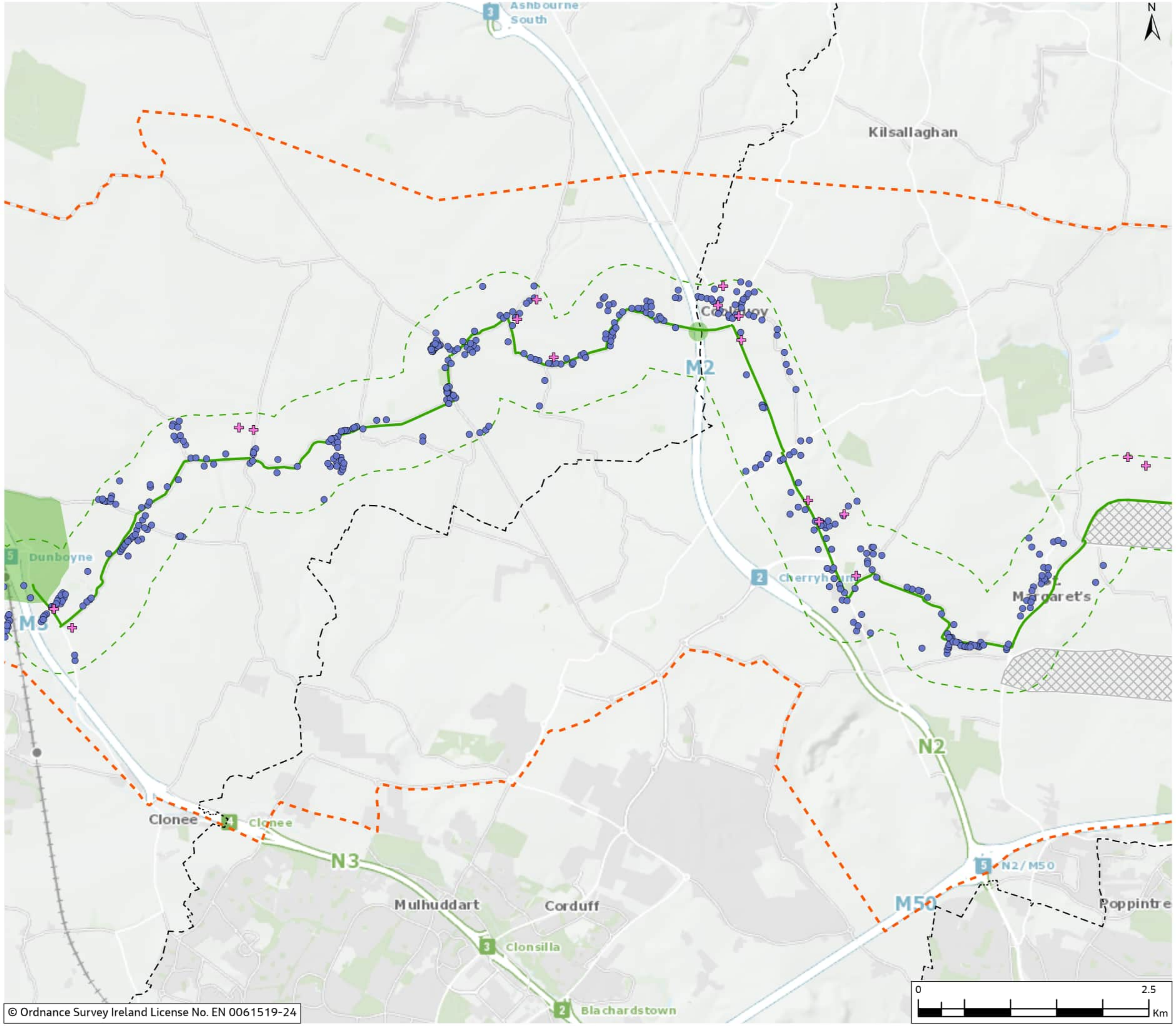
FIGURE C.1.2



Legend

- Step 4a Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option B (Green)*
- Off Road Options Being Explored - Option B*
- Cable Route Option B 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only

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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option B (Green)
Sheet 2 of 3

Drawing Status

FINAL

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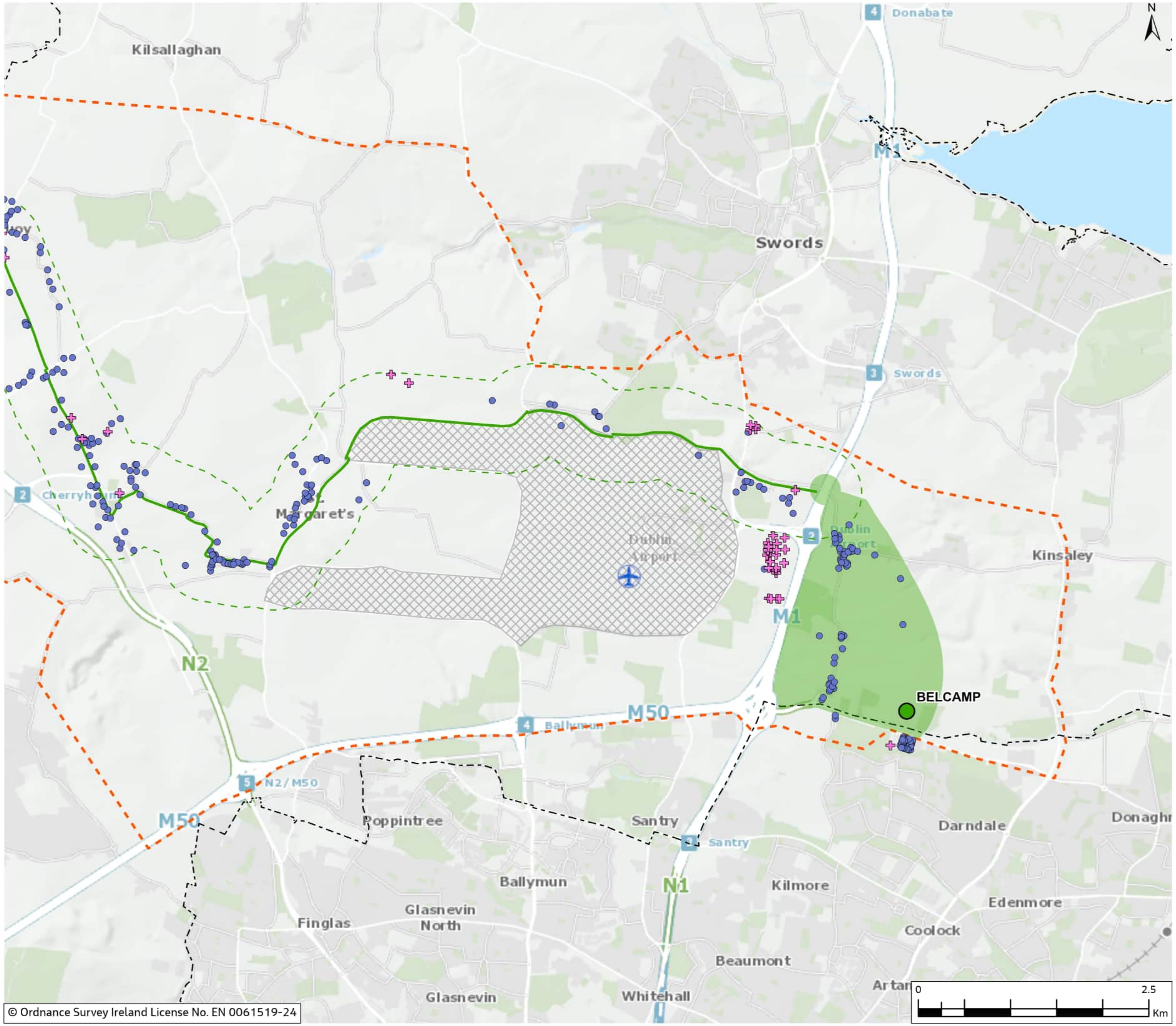

FIGURE C.1.2

Legend

- Step 4a Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option B (Green)*
- Off Road Options Being Explored - Option B*
- Cable Route Option B 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only

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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option B (Green)
Sheet 3 of 3

Drawing Status

FINAL

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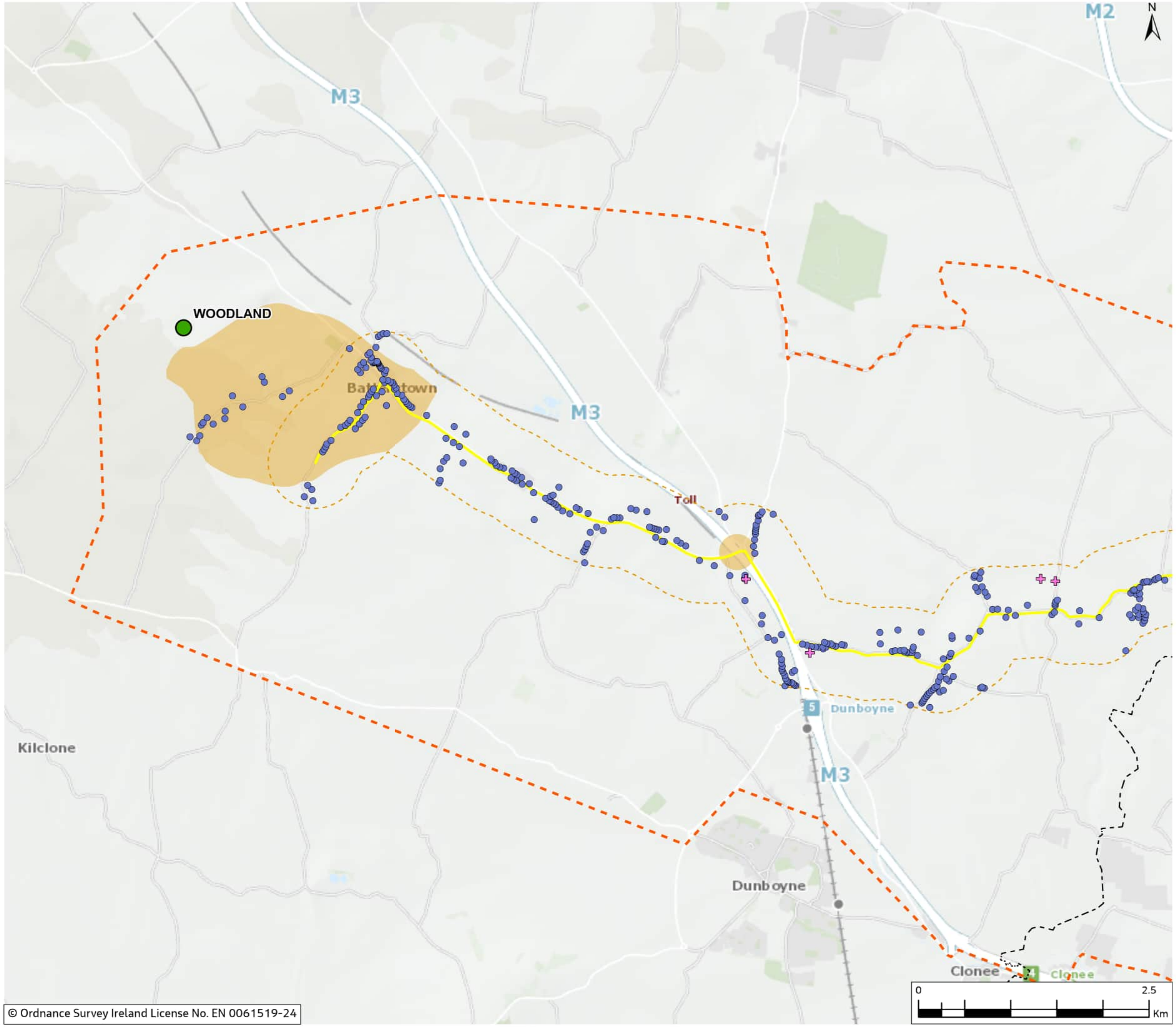
FIGURE C.1.3



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option C (Yellow)*
- Off Road Options Being Explored - Option C*
- Cable Route Option C 500m Buffer*
- Commercial/Retail property
- Residential property

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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option C (Yellow)
Sheet 1 of 3

Drawing Status

FINAL

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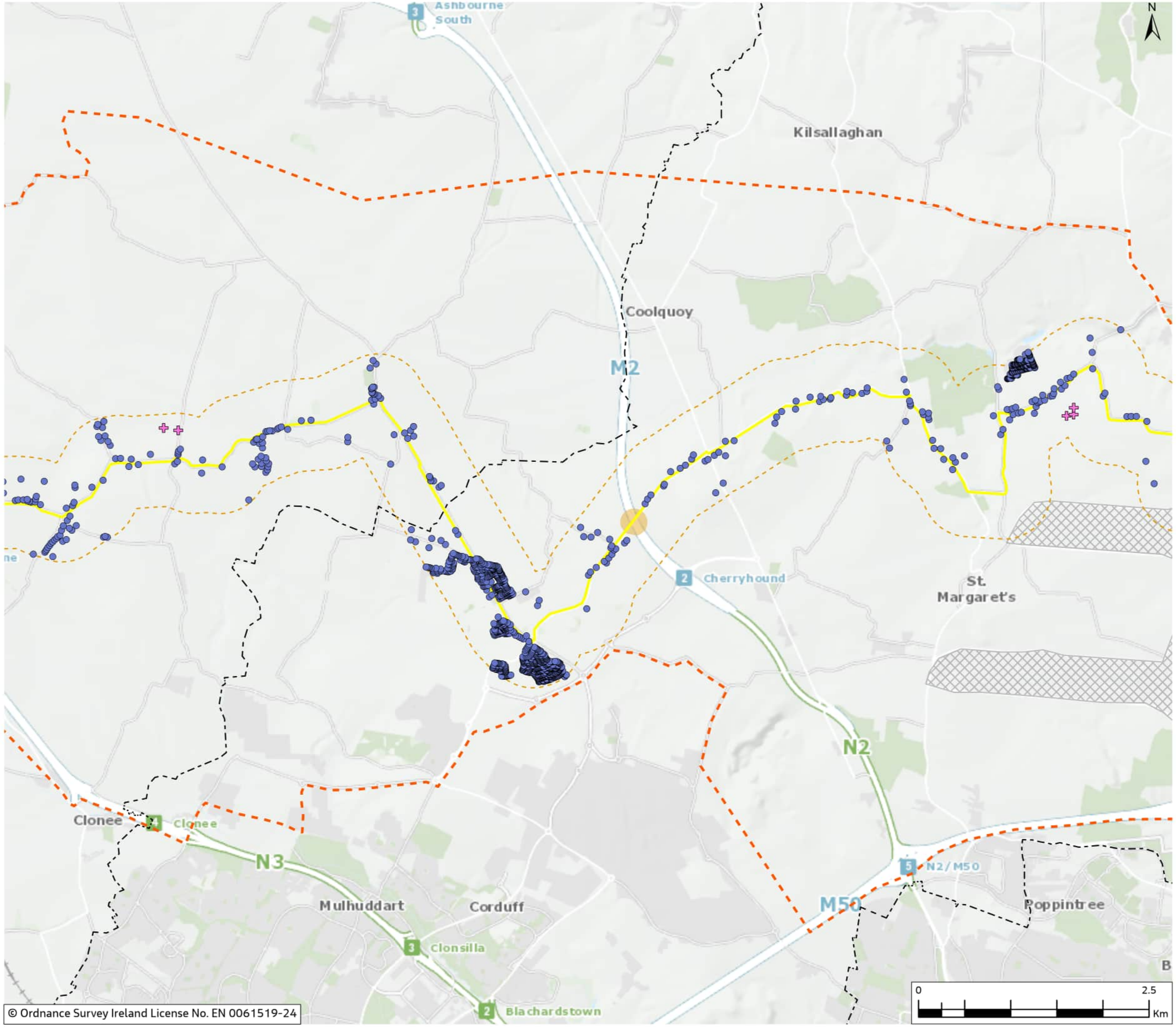
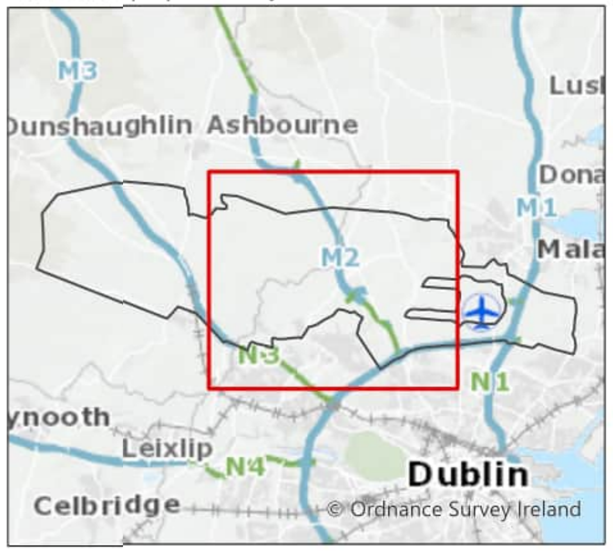


FIGURE C.1.3

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option C (Yellow)*
- Off Road Options Being Explored - Option C*
- Cable Route Option C 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only



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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option C (Yellow)
Sheet 2 of 3

Drawing Status

FINAL

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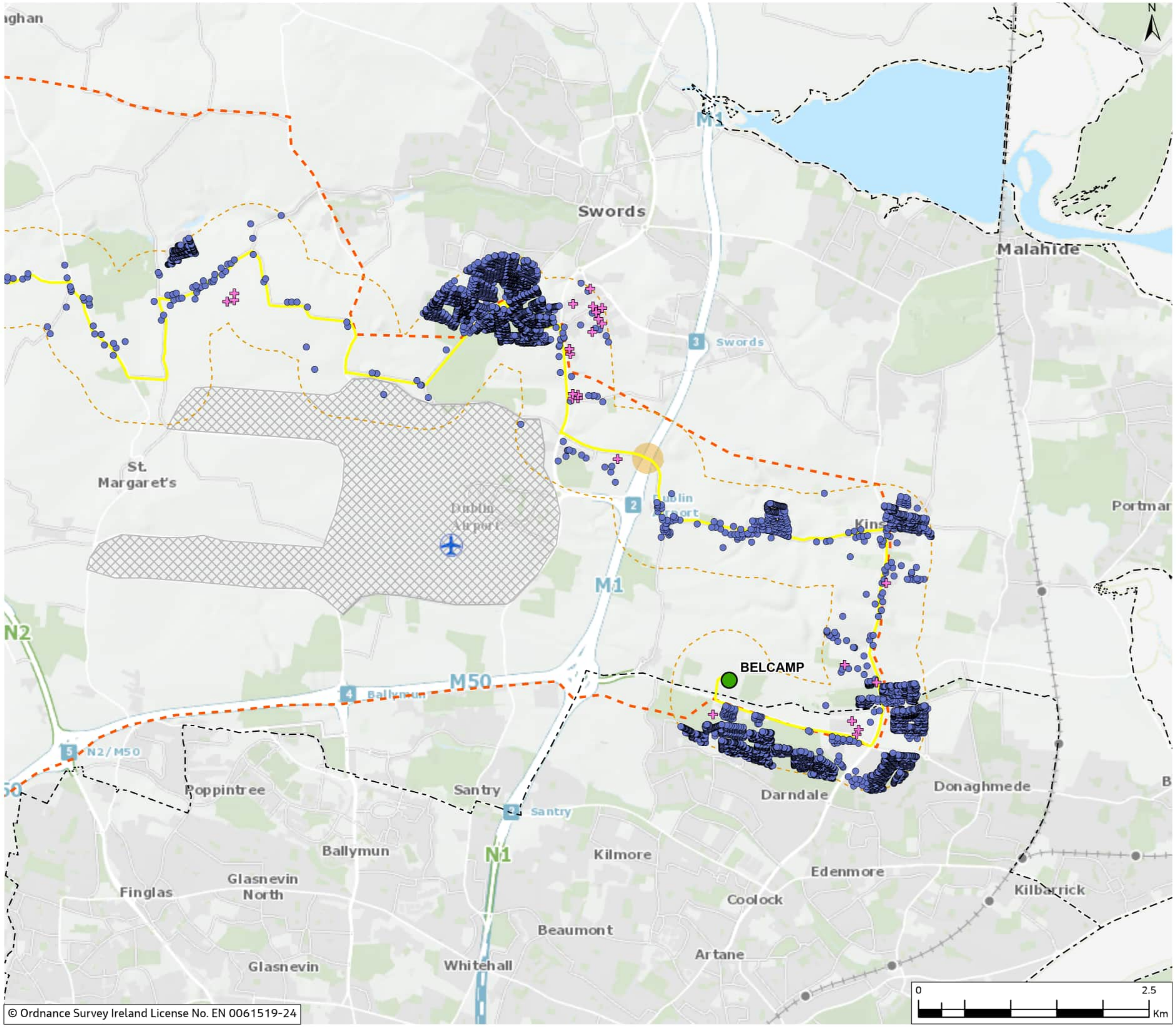
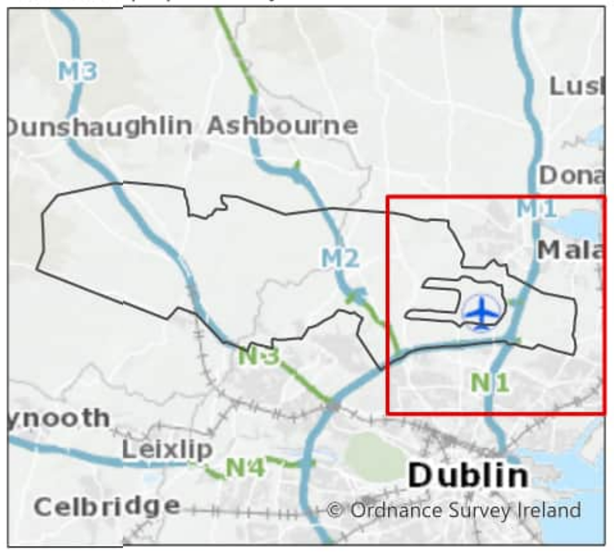


FIGURE C.1.3

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option C (Yellow)*
- Off Road Options Being Explored - Option C*
- Cable Route Option C 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only



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0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option C (Yellow)
Sheet 3 of 3

Drawing Status: FINAL

Scale @ A3: 1:40,000 DO NOT SCALE

OSI Sheet No.

Jacobs No.: 321084AJ

Drawing No.: 321084AJ-MAP-S4A-C.1.3

FIGURE C.1.4

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option D (Blue)*
- Off Road Options Being Explored - Option D*
- Cable Route Option D 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only

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Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option D (Blue)
Sheet 1 of 3

Drawing Status

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Scale @ A3	1:40,000	DO NOT SCALE
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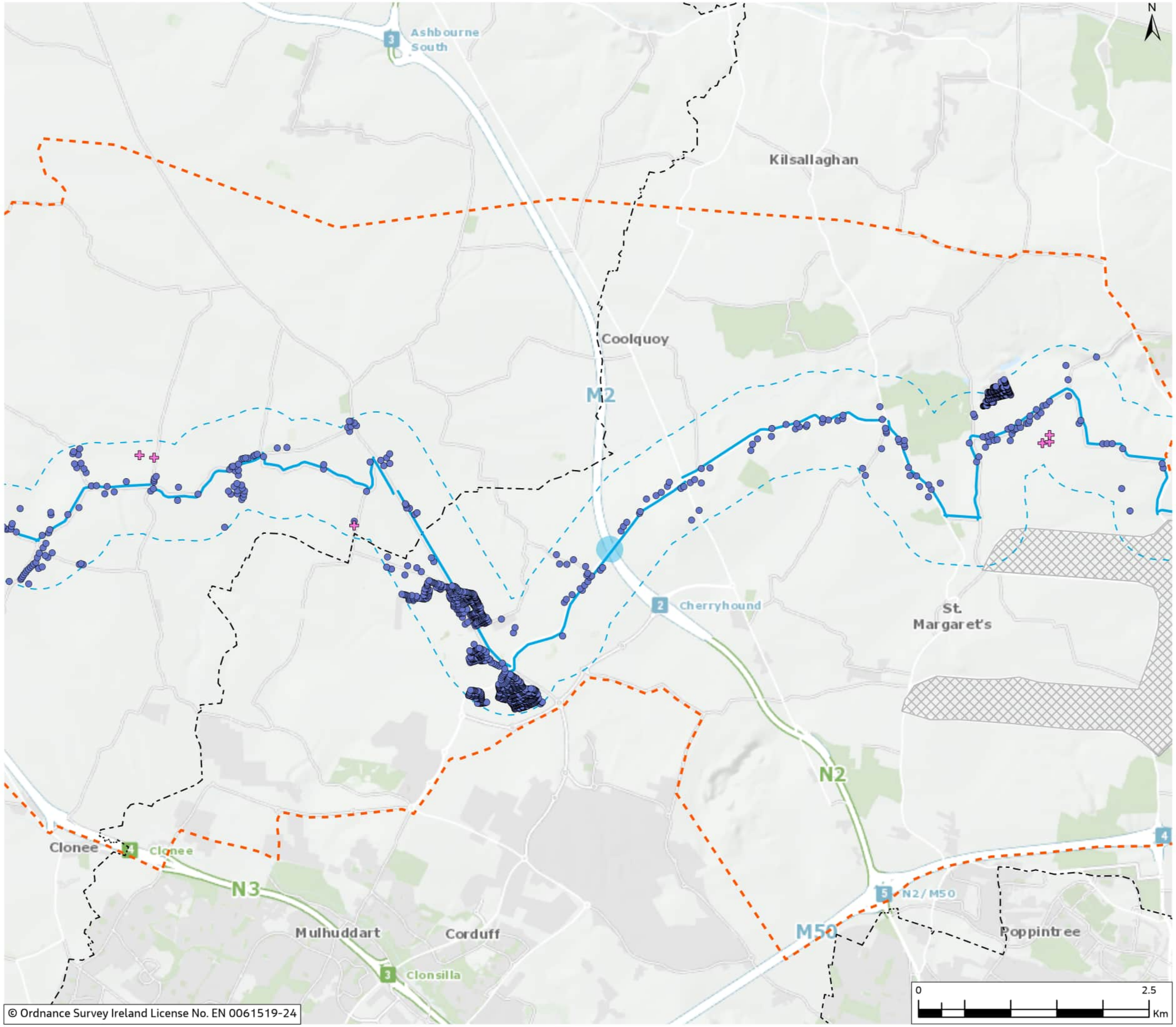
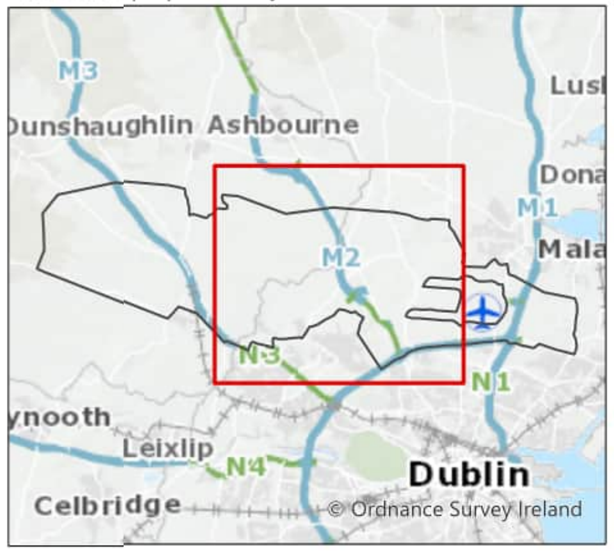


FIGURE C.1.4

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option D (Blue)*
- Off Road Options Being Explored - Option D*
- Cable Route Option D 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option D (Blue)
Sheet 2 of 3

Drawing Status	DRAFT	
Scale @ A3	1:40,000	DO NOT SCALE
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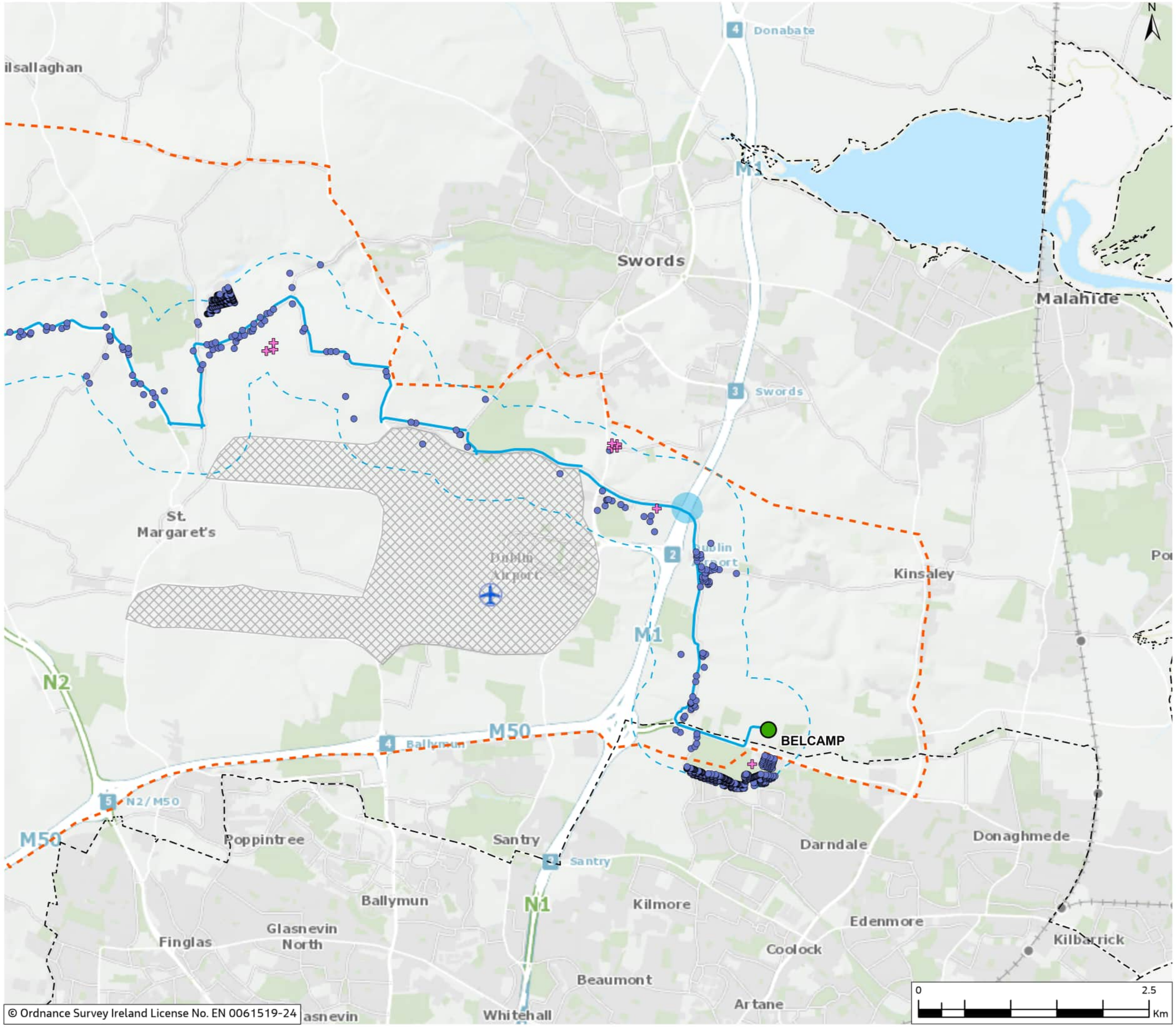
Jacobs No.	B321084AJ	
Drawing No.	321084AJ-MAP-S4A-C.1.4	

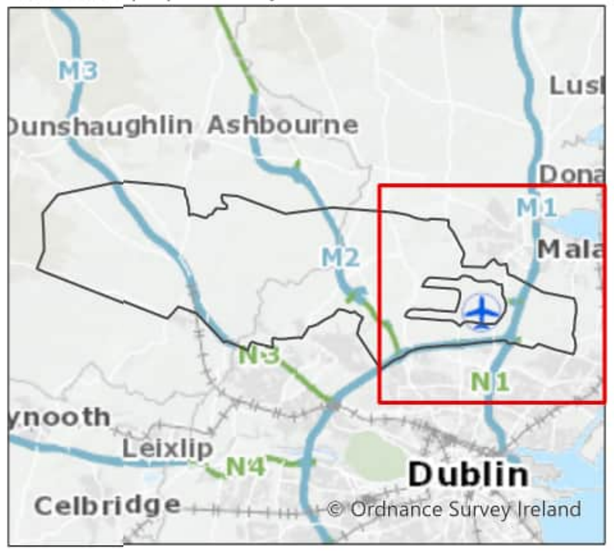
FIGURE C.1.4



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option D (Blue)*
- Off Road Options Being Explored - Option D*
- Cable Route Option D 500m Buffer*
- Commercial/Retail property
- Residential property

*Indicative purposes only



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Social Impact Assessment - Residential and Commercial Receptors
Proposed Cable Route Option D (Blue)
Sheet 3 of 3

Drawing Status: DRAFT

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OSI Sheet No.

Jacobs No.: 321084AJ

Drawing No.: 321084AJ-MAP-S4A-C.1.4

Appendix D – Key Infrastructure

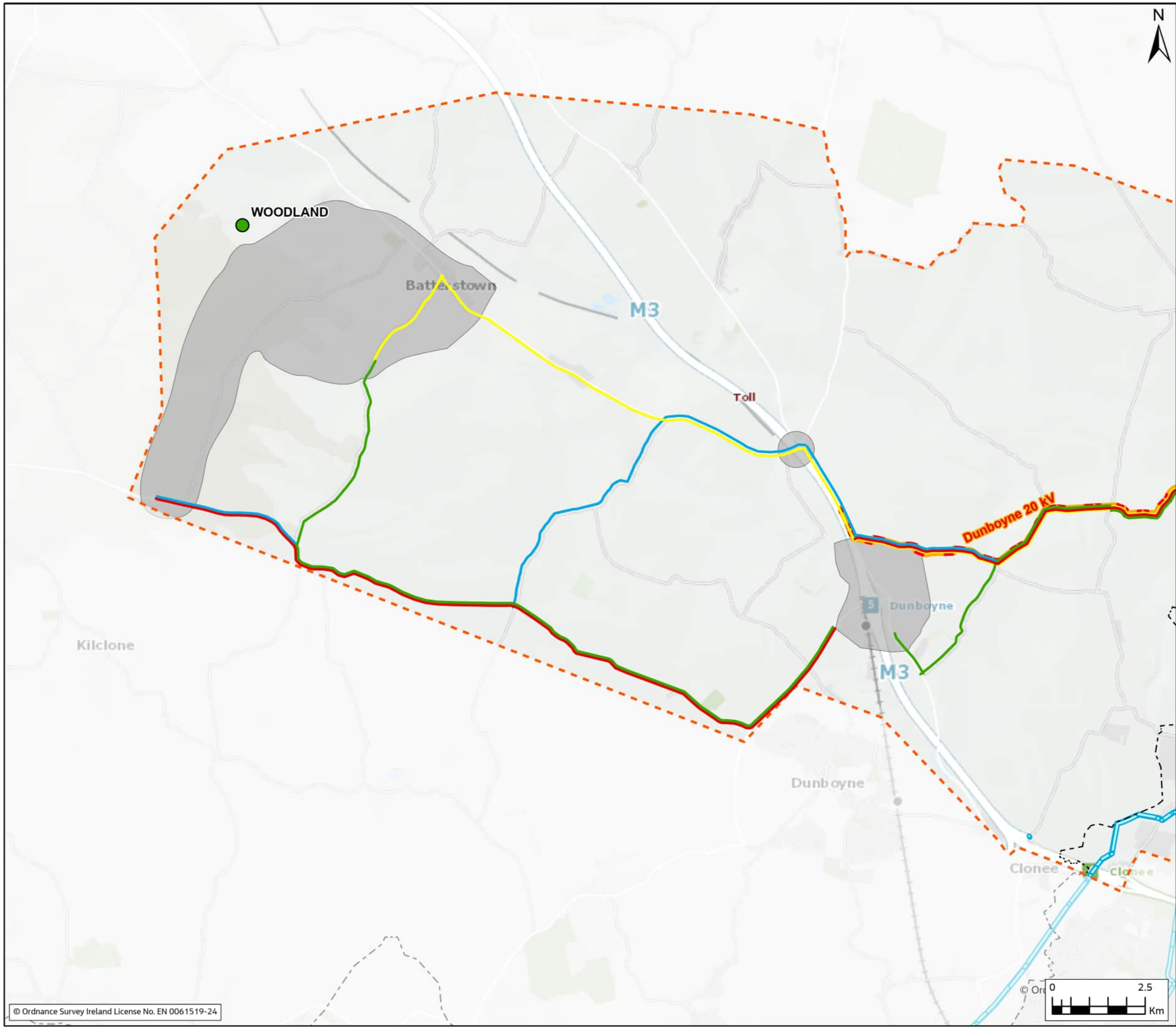

FIGURE D.1.1

Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 400kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Proposed MetroLink Cable Routes
- Dunboyne 20 kV UGC
- Water mains (>= 600 mm)

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Key Infrastructure Map
Sheet 1 of 3

Drawing Status

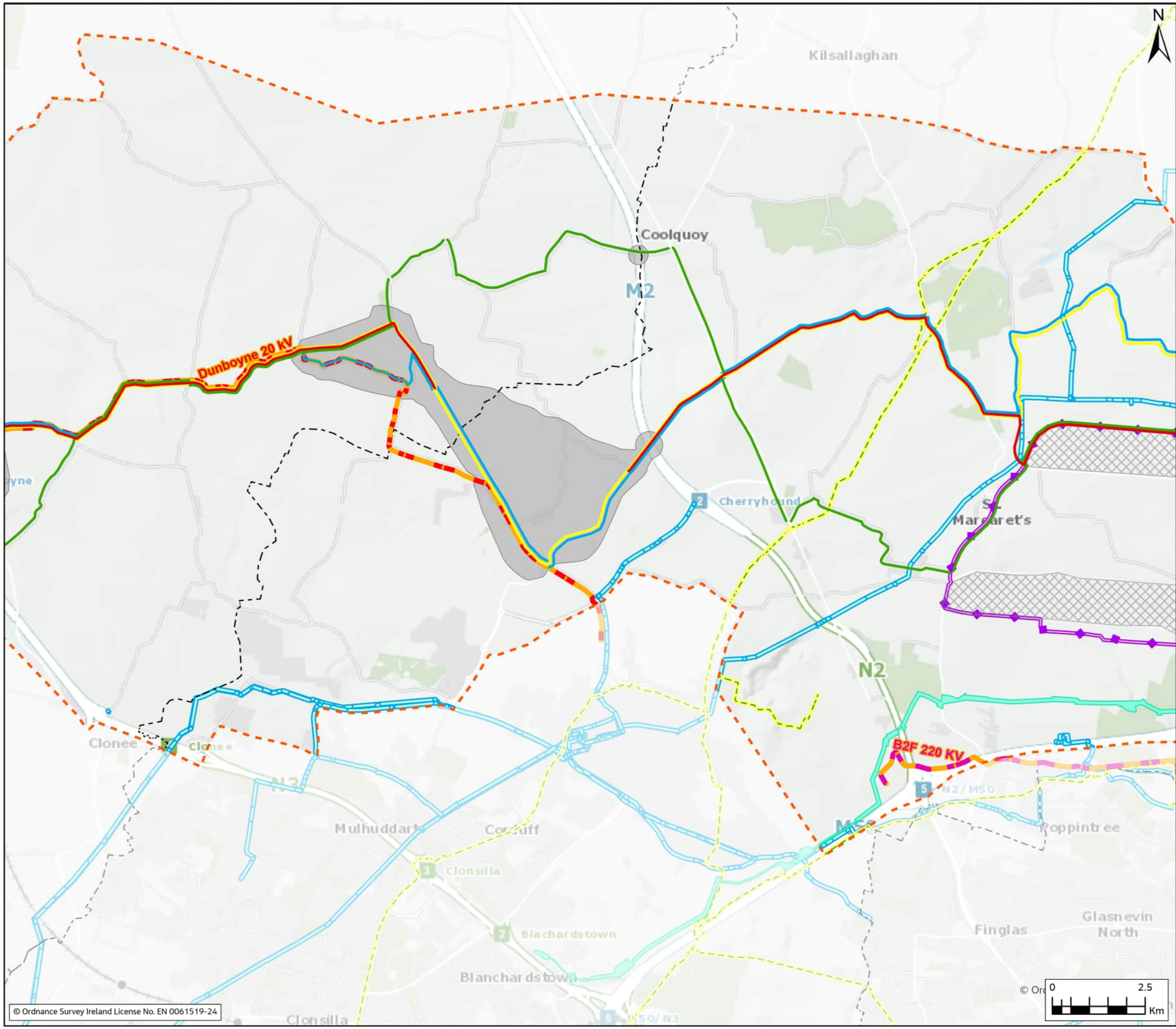
FINAL

Scale @ A3	1:40,000	DO NOT SCALE
OSI Sheet No.		
Jacobs No.	B321084AJ	

Drawing No.

321084AJ-MAP-S4A-D.1.1

FIGURE D.1.1



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Greater Dublin Drainage Proposed Project Area
- Proposed MetroLink Cable Routes
- Dunboyne 20 kV UGC
- Belcamp to Finglas (B2F) 220kV UGC
- High Pressure Gas Mains
- Water mains (>= 600 mm)

*Indicative purposes only

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Key Infrastructure Map
Sheet 2 of 3

Drawing Status

FINAL

Scale @ A3	1:40,000	DO NOT SCALE
OSI Sheet No.		
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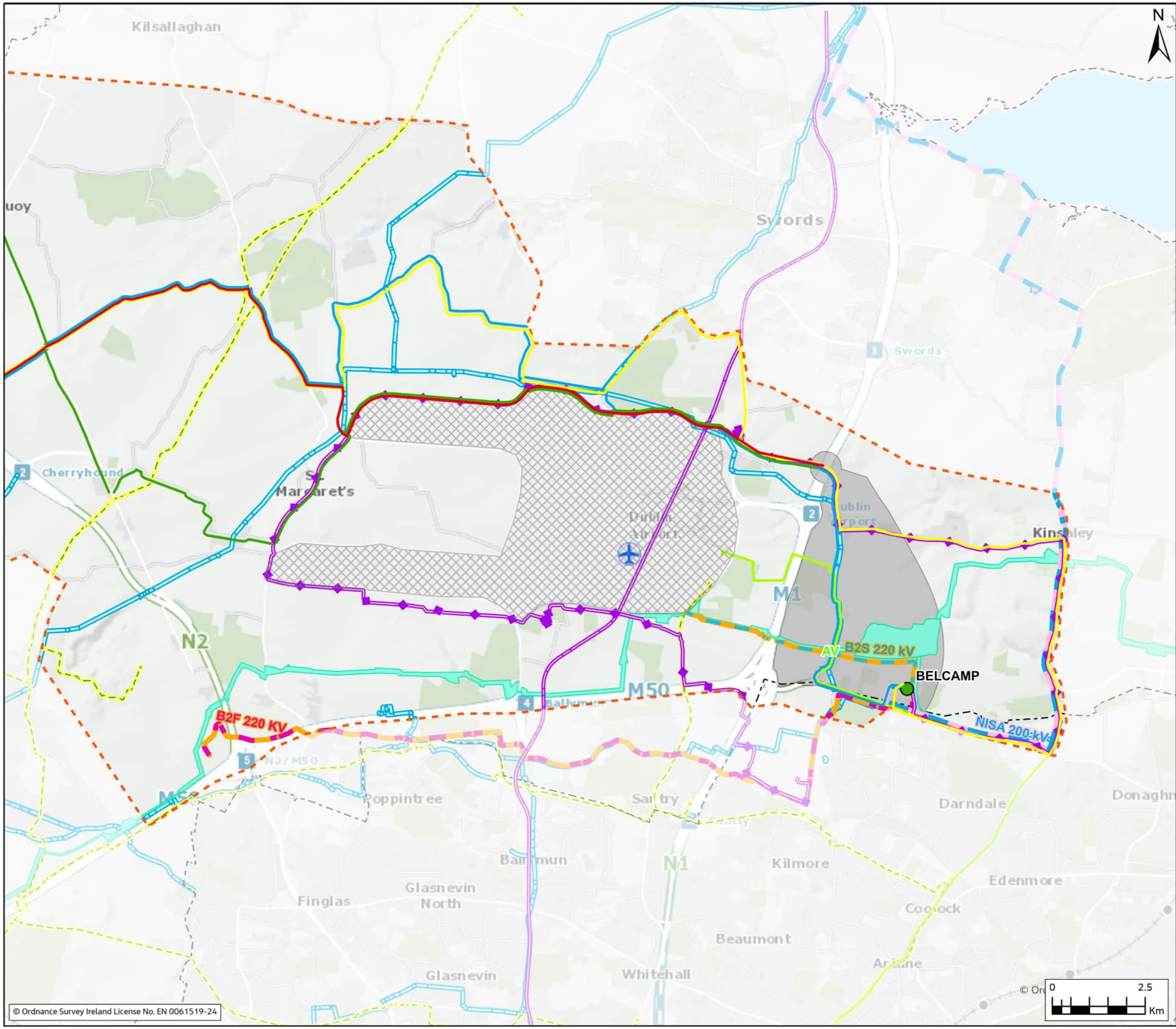
Drawing No.	321084AJ-MAP-S4A-D.1.1	

FIGURE D.1.1



Legend

- Step 4A Study Area
- Exclusion Zone
- County Boundary
- 220kV Substation
- Proposed Cable Route - Option A (Red)*
- Proposed Cable Route - Option B (Green)
- Proposed Cable Route - Option C (Yellow)*
- Proposed Cable Route - Option D (Blue)*
- Off-Road Options Being Explored*
- Greater Dublin Drainage Proposed Project Area
- Proposed MetroLink
- Proposed MetroLink Cable Routes
- Aviation Fuel Line (AV)
- Planned NISA 200kV Cable
- Belcamp to Finglas (B2F) 220kV UGC
- Belcamp to Shellybanks (B2S) 220kV UGC
- High Pressure Gas Mains
- Water mains (>= 600 mm)

*Indicative purposes only

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0	Feb 2023	Initial Issue	SMD	KRS	AS	GS

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CP1021 – East Meath-North Dublin Grid Upgrade

Drawing Title

Key Infrastructure Map
Sheet 3 of 3

Drawing Status: FINAL

Scale @ A3	1:40,000	DO NOT SCALE
OSI Sheet No.		
Jacobs No.	B321084AJ	
Drawing No.	321084AJ-MAP-S4A-D.1.1	

Appendix E – Route Sections not Progressed

Route Sections	Description	Reason for Not Progressing					
		Environment	Socio-economic	Technical	Deliverability	Economic	**Conclusion**
NPDDD and NPQ	Crossing of the M3 via the Motorway Junction via the R157	Avoids the Tolka River	Traffic disruption at a busy Motorway junction	Avoids potential lowering of ratings which come with HDD	Does not accord with principle of avoiding motorways Unlikely infrastructure provider and/or highways authority would give permission.	Traffic management costs high but no HDD cost	Traffic disruption and conflict with a key principle of avoiding motorways. Unlikely to be deliverable.
FFF to S	Route via Rowan	Deep ditch alongside the road	Narrow road requires full road closure	No significant risks	Very narrow road	Long section – more expensive than local alternative	No benefits to this link; significant constraints.
TU	Route via Priest Town	Three watercourse crossings – all would have to be off-road. Hedgerows on both sides with potential for impacts on at least one	Likely would require full road closure. Diversions would be lengthy.	No significant risks	Very narrow road. Off-road river crossings required.	Long section – more expensive than local alternative	No benefits to this link; significant constraints.

Route Sections	Description	Reason for Not Progressing					
		Environment	Socio-economic	Technical	Deliverability	Economic	**Conclusion**
RZ	Route via Corduff and Damastown along Damastown Road and R121.	No significant risks	Significant number of industrial parks and places of employment. Large scale traffic disruption and impacts on businesses.	No significant risks	Significant traffic management measures would be required. Both roads are serving local high tech industries and are already heavily congested with utilities.	Traffic management costs high.	There is the potential for numerous services and underground utilities in this area given the high number of ICT companies (IBM and Facebook for example) and large housing estates. This is also a very congested area for traffic, being a major employment and residential area and close to the motorways. This route does not accord with the routing principles and so will not proceed into the short-list.
ZZAAFF	Route through Hollywoodrath and then northeast across M2 at motorway junction.	No significant risks	Traffic disruption at a busy Motorway junction	Avoids potential lowering of ratings which come with HDD	Does not accord with principle of avoiding motorways Unlikely infrastructure provider and/or highways authority would give permission.	Traffic management costs high but no HDD cost	Traffic disruption and conflict with a key principle of avoiding motorways. Unlikely to be deliverable.
CCDDEE	Route across M2 via Coolquoy	Several watercourse crossings	Impacts the community of Coolquoy in conflict with one of the routing principles. Traffic disruption to communities along the route with lengthy diversions.	No significant risks – M2 still needs to be crossed via HDD	Limited suitable land at M2 crossing for the HDD and stringing of cables. Longer route than local alternatives. . Larger traffic disturbance.	Long section – more expensive than local alternative	No benefits to this link; significant constraints.

Route Sections	Description	Reason for Not Progressing					
		Environment	Socio-economic	Technical	Deliverability	Economic	**Conclusion**
EEMM	Route via Corrstown Golf Club	Several watercourse crossings	Local road passing through the golf course would need to be closed. Disruption to significant community facility.	No significant risks	Longer than local alternative. Requirement for road closures. Narrow road.	Traffic management costs and potential requirement to compensate golf club. Longer than local alternative.	No benefits to this link; significant constraints.
LLMM		Crosses the Ward_040 which in this location is within a very deep valley, with wide riparian zones on its banks. These are densely vegetated The road bridge may not be suitable for use in a crossing as it is an old stone bridge	public footpath along the river through the valley. Industrial horticulture site; to the south a large, new housing development		There are limited opportunities to HDD the river; the depth of the drilling would need to be substantial at >10m depth, the riparian zone is approximately 200m wide and there is little space either side of the river from which to launch and receive the drill and lay down cables.	Longer section than alternatives; HDD of substantial river cutting.	By removing the EEMM link, the route from LL to PP via MM becomes substantially longer than a route from LL to PP via other nodes. No benefits to this link; significant constraints.
HHII, AAHH and GGHH	Route across M2 via Bay and Kilshane to Kilshane Cross and then to St Margaret's; R135 from Broghan to Kilshane Cross	No significant risks	No significant risks	Existing 220kV in the road between HHII nodes.	Existing HV cables plus likelihood of other utilities makes section HHII unviable.	No significant risks	HHII is unviable, therefore the other links AAHH and GGHH become defunct and are removed.

Appendix F – Route Sections Description

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
AB	2.81	No interactions with roads or buildings. Off-road impacts to hedgerows and trees. Crosses 1 water body. Entirely through fields. Joins R156 at Node B.	Likely interference with cattle and sheep. Equine operation adjacent to the east. Nearby equine operation at road to the east of the route.	Risk of various shallow crossings which may involve both open cut installation and/or bentonite filled ducts to meet the required ratings. Will need to coordinate with Kildare Meath project. One of two potential starting routes. The cable will need to maintain clearance from the existing AC cables. Entirely through fields. Additional costs due to long sector.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
AC	0.54	Entirely through fields. Minimum of 3 hedgerow crossings with potential requirement for tree removal.	No settlements or buildings. No interaction with roads, water bodies or services. Close to Portan HVDC Station.	Will need to coordinate with Kildare Meath project. Off-road section costs. One of two potential starting routes. The cable will need to maintain clearance from the existing AC cables. Entirely through fields.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
BI	1.64	Entirely section runs along R156. Road approx. 5 m wide.	Sparse linear developments at both sides of the road (mostly residential).	Phone line along route. Traffic diversion requirement. 1 junction with a smaller road. No water body crossings. Joins L2215 at node I. Water mains line runs along route.
CD	0.73	Begins off-road, joins unnamed road (<5 m wide, insufficient width for two-way traffic), passes one residential property then goes off-road once more, through a field, then onto an internal farm path. Cattle and sheep nearby. 10% AEP flood risk along small, avoidable section of the route. Requires removal of hedgerow.	Passes adjacent to one house.	Road closure requirement. Off-road-related additional costs. No water mains, gas line or sewer.
CE	0.92	Off-road route. Follows Cookstown stream and field boundaries for most part. Off-road impacts to hedgerows and trees. Crosses small road (<5 m wide).	No interactions with buildings.	Off-road-related additional costs. No water mains, gas line or sewer interaction.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
DE	1.03	Entirely off-road route. Hedgerow/tree removal required in minimum of 4 locations. 10% AEP flood risk along small, avoidable section of the route. Meets Cookstown 09 water body at node E.	No nearby buildings.	Off-road-related additional costs. No water mains, gas line or sewer interaction.
EF	1.25	Cookstown 09 water body at node E; Moyleggan water body crossing. Off-road route joining the R154 in Batterstown. Requires removal of trees/hedging in minimum of 4 locations. Cattle and sheep in adjacent fields.	Route passes adjacent to three houses approaching node F. No other adjacent buildings.	Off-road-related additional costs. No water mains, gas line or sewer interaction. Water body crossing HDD costs.
EH	0.47	Off-road route which follows Cookstown small stream/hedgerow and tree line. Crosses hedge twice and tree line once.	No interaction with buildings.	OHL at node H. Off-road-related additional costs. No water mains, gas line or sewer interaction.
FG	0.30	Route follows R154 (~6 m wide, with footpaths and grass verges at both sides) from field exit point to L2215.	Graveyard including national monument adjacent to node G.	No mains water or gas line. Sewer crossing near node G.
GH	1.21	Follows L2215 (~5 m wide) south-west from Batterstown. Crosses Moyleggan River with low wall to one side and grass verge at both sides. Cookstown stream at node H. National monument near node H.	Residential properties along route. Sheep and cattle in adjacent field.	220 kV OHL crossing. Sewer pipe. No water mains or gas line. Traffic diversion likely.
GK	2.95	Route follows R154 (~5 m wide) south-east from Batterstown.	Linear properties, predominantly residential and dense in Batterstown and Moyleggan. Two equine operations adjacent to the north. Sheep and cattle adjacent. Primary school. Graveyard at node G.	No gas line. Water treatment plant indicated on Mapper. No sewer.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
HI	2.37	Route follows L2215 (~5 m wide) to R156. Crosses 2 water bodies. Dunboyne stream crosses under road with no apparent bridging structure. Lustown river bridged with low walls at either side of the road. National monument: church offset from road.	Karlswood Equine facility at node I. Large stud farm to the north of the road. Small equine operation to the south of the road. Sparse residential and non-residential properties along route.	OHL at node H. 10% AEP flood risk at water crossings. Water crossing HDD costs.
IJ	2.65	Entirely along R156 (~5 m wide). Starts at junction with L2215. Junctions with L2214, Harlockstown Road and small local/residential roads.	Staffordstown Stud. Karlswood Equine facility at node I. Frequent linear residential and non-residential properties along both sides of the road. Dog kennels adjacent to route.	110 kV line crosses overhead. 220 kV line crosses overhead at node J. Water mains along route.
JK	2.83	Entirely along unnamed road (<5 m wide) connecting R154 with R156. 4 water body crossings. Road bridges Mooyleggan stream with low walls at either side of the road. Lustown stream crosses under road. Road bridges Dunboyne Stream with walls at either side. Road crosses Vesingstown stream with low walls at either side.	Woodpark Stud farm adjacent at two locations. Sparse residential properties along route. Montessori school. Dog kennels adjacent to route.	220 kV line crosses overhead at node J. No mains water or gas line. HDD costs at water crossings.
JM	2.88	Follows the R156 (~5 m wide with a grass verge for a large portion of the route). Water body passes under road at node M.	Ballymacoll Stud. Interaction with major planned project. Frequent linear residential and non-residential properties along both sides of the road. Car park of sports ground adjacent to road. Junctions with smaller roads at both sides. Dog kennels adjacent to road.	220 kV line crosses overhead at node J; 3 other OHLs. Water mains along route. Roundabout at node M. Additional costs for HDD at water crossing.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
KL	1.59	Follows R154 (~7 m wide) with M3 motorway crossing at flyover to roundabout at R147. Tolka River crossing.	Godolphin Woodpark Stud and other equine operation to the south. Horses in field adjacent to road. Show-jumping course offset from road. Another equine operation on the north side of the road. Residential and non-residential properties along route.	Mains water. M3 crossing. Additional costs incurred due to M3 crossing and river crossing HDD requirement.
LO	1.09	Route follows R147 (>12 m wide).	Godolphin Woodpark Stud and other equine operation at opposite side of M3. Industrial facilities on the eastern side of the road, M3 on the western side.	No mains water. Medium pressure gas line at southern end of the route only. Flood risk at small area on road.
MN	1.44	Entirely along R157. 1 water body passes under road.	GDA Cycle Network Plan. Interaction with major planned project.	Water body passes under road at node M, causing cost increase. Roundabout at node M. 110 kV line crosses overhead. Lateral water line crosses road. R157 crosses over Kennedy Road. Roundabout at node N.
NP	0.69	Follows R157 (~10 m wide, with hard shoulders at both sides). Off-road section for M3 crossing. Tolka River crossing.	GDA Cycle Network Plan. Interaction with major planned project.	No mains water or sewer. Medium pressure gas line crossing near node P. Railway crossing. M3 motorway crossing at junction 5. Additional costs due to deviation from road, water body crossing, railway crossing and motorway crossing at a junction, requiring HDD.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
NQ	0.65	Route section deviates from R157 at node N at a roundabout, travelling along the M3 Parkway car park ring road (~5 m wide) for ~200 m. Next, it progresses off road though a field for ~140 m, breaks through a tree line and crosses a private laneway (<5 m wide). The route crosses a railway line, followed by an off-road section (~90 m) including a crossing of the Tolka River (>1 m wide). The route re-joins the road at a slip road (junction 5) of the M3 motorway, where it crosses. The route concludes at the R147, following a short off-road section and passage via a service station.	Interaction with major planned project.	Crosses Tolka River. Crosses residential cul-de-sac. Crosses train track. Crosses M3 motorway. Passes between two outbuildings. Joins R147 at node Q. Additional costs due to deviation from and return to roadways, river crossing, railway crossing and motorway crossing, requiring HDD.
NDDD	0.72	Sheep and equine activity in the field to the north-west of Junction 5. Route deviates from the R157, crossing the Tolka River at a culvert. The route then progresses through a field, crosses a railway line and crosses the M3 to the north of Junction 5, crossing slip roads at both sides, with short off-road sections between the M3 and slip roads. The route concludes at the R147 following an additional ~80 m crossing of a field.	GDA Cycle Network Plan. Interaction with major planned project. Mixed animals including horses.	Crosses the Tolka River. Goes off-road from R157 for approx. 200 m. Crosses railway line. Meets R147 at node DDD. No buildings. Medium pressure gas line crossing. No mains water or sewer. Railway crossing. M3 motorway crossing to the north of Junction 5 across slip roads. Additional costs due to river crossing, railway crossing, motorway crossing and mixed terrain.
ODDD	0.55	Entirely along R147. Roadway approx. 15 m wide.	GDA Cycle Network Plan. Interaction with major planned project. No adjacent buildings.	No additional costs. No water bodies. Gas line along route.
OFFF	1.60	Entirely along L5026 Pace (~5 m wide).	Scattered linear residential properties along the roadside.	Several minor roads to the north but no junctions at the southern side of the road. 220 kV line crosses overhead. Mains water along the road section. 2 hydrants along road section. Narrow road, no road markings. Trees along south side for the most part. Mostly hedgerow on north side. Traffic management costs, diversions.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
PQ	0.39	Entirely based along R147 (~6 m wide with hard shoulders at both sides), moving south from M3 Junction 5 roundabout. Stone building ruin adjacent to road.	Interaction with major planned project.	No mains water or sewer. Medium pressure gas line along route.
PDDD	0.21	Entirely based along R147 (~6 m wide with hard shoulders at both sides), moving north from M3 Junction 5 roundabout.	Interaction with major planned project. GDA Cycle Network Plan route.	Medium pressure gas line along route. No water mains or sewer.
QR	0.56	Entirely along R147. ~6 m wide with >1 m hard shoulder at both sides, footpath and grass verge.	Lies within major planned project area. Very little adjacent residential property impact. Junction to business park at node R.	Water mains for <200 m at node R. Medium pressure gas line. No additional costs.
RAA	9.30	Route follows R147, R156, Damastown Rd, Damastown Close, Damastown Ave and R121. 7 water body crossings, with 10% AEP flood risk at these points.	Interaction with major planned project. Route passes through built up areas of Clonee, Damastown, Macetown South and Tyrrelstown. Route borders dense industrial and residential properties.	Very long route. 2 motorway crossings. Many utility crossings. Many water body crossings. Significant disruption to traffic in urban areas. Crosses the M3 twice – at Junction 4 and at the R147 flyover. A 110 kV OHL crosses at 5 points; a 220 kV OHL crosses at 2 points. Aurora Telecoms line follows route for a long section with later crossing. Medium pressure gas line follows route in places, with multiple crossings along the route. Mains water in parallel and crossing at various stages. Multiple sewer crossings. Significant additional costs.
REEE	1.48	Follows unnamed road (~5 m wide) from Bracetown industrial park to the north.	Interaction with major planned project. GDA Cycle Network Plan route.	Frequent residential properties in the northern end, particularly on the eastern side. Industrial park at the southern end. Footpath for most of approx. 375 m at southern end of the section. 220 kV line crosses overhead. Mains water along road. 8 hydrants. Road crosses stream; wall at both sides at this point. Additional costs for stream crossing and traffic disruption.
ST	1.32	Entirely along local road (~5 m wide). Crossroads at nodes S and T. Some telephone poles listing.	Stud farm to the south. Sparse linear residential properties. Small roadside memorial adjacent to powerline crossing point.	110 kV line crosses overhead. Mains water along route section. Traffic management requirement.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
SEEE	2.11	Follows unnamed road (<5 m wide). Stream crossing with low walls at both sides of the road.	Sparse residential properties. National monuments adjacent to stream crossing. Stud farm nearby to the east.	Mains water for approx. half of route, no gas line or sewer. Additional costs due to stream crossing.
SFFF	1.49	Entirely along an unnamed local road (~5 m wide). Road crosses small streams in 2 places; low walls at both sides at one stream, open ditch at the other stream.	Sparse residential properties; no industrial properties. Cattle on adjacent land.	Water mains along route section. No sewer or gas line. 10% AEP flood risk close to node S. HDD costs for stream crossings.
TU	2.42	Based along unnamed road (<5 m wide, insufficient space for two-way traffic), which joins the L1007/Kilbride Rd (~5 m wide).	Sparse residential properties. Adjacent stud farm at northern part of the route.	Long route. Mains water and sewer for approx. half of route. No gas line. Traffic diversion required.
TV	1.09	Entirely along minor 5 m wide road. Ward River passes under road with low walls at both sides.	Sparse residential properties. Residential cluster at node V.	Mains water along route section. OHL crossing. HDD costs at river crossing.
TW	1.79	Entirely along narrow minor road (<5 m wide).	Road too narrow for two-way traffic. Very sparse residential properties. Factory at eastern end.	Power line passes overhead in two places.
UV	0.49	Route follows Kilbride Road (~6 m wide).	Adjacent sports ground. Residential clusters at both ends of the route section.	Mains water and sewer line along route. Adjacent pump house. No gas line.
UCC	0.75	Route follows Priestown Rd (~5 m wide).	Residential properties along route.	Mains water along half of the route and sewer line along the route. No gas line.
VW	0.42	Entirely along Kilbride Road (approx. 5 m wide). Ward River crosses under road with low walls at both sides of the road.	Primary school. Residential clusters at nodes V and W. No linear properties.	Water mains and sewer line along route section. No gas line. HDD costs for river crossing.
WX	0.41	Route follows Kilbride Road (~5 m wide).	Residential cluster at node W. No other residential or non-residential properties.	Water mains, sewer line and air control valve along route section. No gas line. No additional costs.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
XY	2.33	Off-road, avoiding Hollystown and avoiding longer route. Connects Kilbride Road and R121. Impacts internal and road-side hedgerows and trees.	Adjacent to possible equine operation.	Crosses 2 internal farm roads. Water mains and sewer at node X but no other utility interaction.
XZ	2.28	Entirely along Kilbride Rd (~5 m wide).	Sparse residential property until route passes through Hollystown (dense development through the village).	Mains water, gas line (medium pressure) and sewer line along route. Disruption through unban area.
YZ	1.48	Entirely along R121 (~5 m wide).	Sparse residential and non-residential properties. Possible equine facility to the north.	Water mains. No gas or sewer.
YBB	1.46	Linear residential and non-residential properties. Route follows R121, which flies over M2 motorway.	GDA Cycle Network Plan. Joins R121 at node Y, crosses M2, meets R135 at a roundabout (The Ward Cross) at node BB. Religious monument (protected structure) on roadside.	Multiple water mains connections and 7 hydrants along route section; water tower adjacent to road. No gas line or sewer. 110 kV line and 38 kV line cross overhead. Additional costs due to motorway crossing.
ZAA	0.66	Road-based route (~5 m wide) adjacent to a housing estate to the west and fields to the east, connection between two roundabouts.	GDA Cycle Network Plan route at node AA.	Water mains. No sewer or gas line. No additional costs.
AAFF	2.41	Follows dual carriageway (>15 m wide), with cycle lanes at both sides, east from a roundabout, through two roundabouts, then crosses the M2 motorway at Junction 2, continuing to the R135 at node FF. 2 water body crossings.	GDA Cycle Network Plan route.	Water mains, medium pressure gas line and sewer along route. 110 kV OHL crossing. M2 motorway crossing at Junction 2. HDD costs at M2 crossing.
AAHH	2.81	Follows dual carriageway with cycle lanes at both sides from node AA, then Bay Ln (<3 m wide) following a roundabout, then the L3120 Kilshane Rd (~5 m wide), crossing the M2 motorway, before finally reaching the R135. 10% AEP flood risk at a point.	GDA Cycle Network Plan. Adjacent quarry. Sparse residential properties.	Water mains, gas line and sewer for sections. 38 kV and 110 kV OHL crossings. Twin high pressure gas line crossing. Aurora Telecoms line follows route approaching node HH. M2 motorway crossing at flyover. HDD costs due to M2 crossing and utilities.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
BBEE	1.47	Entirely along R135 (~7 m wide with >1 m of hard shoulder at each side of the road). Ward River passes under road with low wall at one side.	Sparse residential and non-residential properties.	110 kV OHL crosses road. Water mains, sewer pipe. No gas connection. HDD costs at river crossing.
BBFF	1.29	Entirely along the R135 (~7 m wide with >1 m of hard shoulder at each side of the road) between two roundabouts. Small river (River Shallon) crosses under road with low wall at either side of road.	Sparse linear residential and non-residential properties.	Mains water (2 lines), sewer pipe, no gas line. Minor floor risk at node FF. Water body crossing requires additional HDD costs.
BBLL	2.43	Entirely along R121 (~5 m wide) connecting roundabout with R135 to R122. Stream (Shallon) crosses under road with low walls at both sides of the road.	Overlaps with GDA Cycle Network Plan. Sparse residential and non-residential properties along route. Nursing home adjacent to road.	110 kV OHL crosses over road. High pressure gas line 2021 Q2 crosses road at node LL. Mains water (2 lines), sewer pipe.
CCDD	2.57	Follows unnamed road (~5 m wide). Crosses M2 motorway at flyover. Crosses a stream with no apparent bridging infrastructure. 10% AEP flood risk at stream crossing.	Residential properties along route. Nearby equine operation to the north. Cattle in adjacent fields.	Indirect route. Motorway crossing. Mains water and sewer along approx. half of route. Lateral water line for a further section of the route. No gas line. 110 kV OHL crossing. HDD costs for crossings.
CCEE	3.14	Entirely along an unnamed residential road (<5 m wide). No road markings.	Linear residential properties along the route. Cattle on adjacent farm to the north.	110 kV OHL and 38 kV OHL cross road. Crosses over M2 motorway via flyover. Mains water, no gas, no sewer. HDD costs at motorway crossing.
DDEE	1.29	Entirely along the R135 (~6 m wide with hard shoulders at both sides). Enters Coolquay at node EE. Stream passes under road with no visible infrastructure. Road crosses a second stream with walls at both sides of the road and 10% AEP flood risk.	GDA Cycle Network Plan route. Other planned project adjacent to route. Residential properties along route.	Mains water. Sewer for approx. half of route. No gas line. 38 kV OHL crossing. Additional costs at stream crossings.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
EEMM	3.64	Follows R130, minor road (<5 m wide) and R122. Water body crossing with wall at one side of the road and 10% AEP flood risk. Water body crossing with no visible infrastructure. Water body crossing with fence at one side.	Corrstown Golf Club. Residential properties along eastern part of the route.	Mains water for less than half the route. 110 kV OHL crossing. Additional costs for water body crossings.
FFGG	0.44	Entirely along the R135 (~7 m wide with hard shoulders (>1 m) at both sides).	GDA Cycle Network Plan. Mixture of residential and industrial properties along roadside. Pitch & putt course on eastern side of the road.	Mains water, sewer pipe, no gas line. Minor flood risk around node FF.
GGHH	0.90	Follows R135 (~7 m wide with hard shoulders).	GDA Cycle Network Plan route. Residential and non-residential properties along route.	Mains water and sewer along route. Twin high pressure gas line crossing.
GGII	2.44	Entirely along Broughan Lane/Newtown Cottages (<5 m wide).	Cultural heritage site to the west of sharp bend in the road – equine operation on this farm. Sparse linear residential properties along most of the route, predominantly on northern side of the road. Dense residential development (Newtown Cottages) towards eastern end of route section, mostly on southern side of the road. Pitch and putt course at node GG.	Huntstown River (very small) crosses under the road – low walls at both sides of the road at this point. 110 kV OHL crosses. High pressure gas twin line crosses. No sewer. Water mains for small portion.
HHII	1.55	Follows unnamed road (~5 m wide) from R135 to R108/R122. Minor flood risk near node II. Water body crosses under road with steel fence at one side.	GDA Cycle Network Plan route. Borders Dublin Airport exclusion zone at node II.	Mains water crossing but not along route until final ~100 m. 110 kV OHL crossing. 110 kV UGC follows route. Aurora Telecoms line follows the route. Proposed 220 kV cable for Finglas Cable Route shares the route.
IIJJ	0.99	Entirely based along R122. Road approx. 7 m wide. Mature hedging and trees along most of the roadside.	GDA Cycle Network Plan. Avoids St. Margaret's (built up area) including national school and bus route. Passes a recycling centre. Only 1 residential property and 1 commercial property along route.	No mains water, except at node II. MetroLink cable route shares route. No other utilities. No additional costs.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
JJKK	1.14	Route follows R122 (~5 m wide). 2 water body crossings – no visible infrastructure at one, low walls at both sides of the road and 10% AEP flood risk at the other.	GDA Cycle Network Plan route at nodes JJ and KK. Adjacent sports ground. Nearby equine operation to the west. Sparse residential properties. Adjacent graveyard with national monuments.	Mains water shares route. No other utilities. Additional costs for HDD at water crossings.
JJNN	0.43	Entirely along L3132 until it meets R108 at node NN.	No residential or non-residential properties along route. GDA Cycle Network Plan route. Borders airport land at node NN.	Mains water does not run through road, it runs parallel. >1 m of grass along both sides of the road. Wide road, approx. 9 m wide. MetroLink cable route shares route. No additional costs.
KKLL	1.25	Follows the R122 (~5 m wide) from Kilreesk Ln to the R121.	Sparse residential properties. Playschool, sports grounds and golf course entrance on route. Cattle on farm on eastern side.	Mains water along route. High pressure gas line 2021 Q2 crosses the road. No sewer.
KKOO	0.39	Route follows Kilreesk Ln (~6 m wide). Stream crosses under road with no apparent infrastructure.	Overlaps with GDA Cycle Network Plan. No buildings along route.	No mains water, only a crossing at node KK. No other utilities. Additional costs for stream crossing.
LLMM	1.01	Route follows the R122 (~5 m wide). Water body crossing (Ward River) with low walls at both sides and 10% AEP flood risk.	GDA Cycle Network Plan route at node LL. Route passes from Corrstown Golf Course to St Margaret's Golf Course. Graveyard offset from road containing national monuments. Farm with national monuments at node LL. Sparse buildings.	Water mains shares the route. High pressure gas line shares route for almost half the section. 110 kV OHL crossing. No sewer.
MMPP	5.65	Route follows R108 (~5 m wide). Bridges the Ward River with low walls at both sides, 10% AEP flood risk and protected structures at both sides.	GDA Cycle Network Plan route overlap for a section. Overlap with other major planned project (polyline). Equestrian centre at node PP, two other adjacent and additional nearby equestrian centres. Residential and non-residential properties along route including Knocksedan Demesne (large housing estate).	Long, indirect route. Mains water shares route and has crossings. High pressure gas twin line crossing. Medium pressure gas line shares route for a section. Sewer shares route for a short section. 110 kV OHL crossing. HDD costs for river crossing.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
NNOO	0.57	Road is approx. 8 m wide with >1 m of grass space at either side and no roadside trees.	Entirely along Kilreesk Rd. No buildings at either side of the road. GDA Cycle Network Plan.	Water mains crosses road at 2 points but does not run along route section. Dunbro and Millhead streams pass under the road (3 points), incurring additional costs.
NNRR	2.28	Road is approx. 8 m wide with >1 m of grass space at either side and no roadside trees.	Runs along border with Dublin Airport. GDA Cycle Network Plan.	Crosses water mains in 2 places but no mains along road. 2 minor streams pass under road. 10% AEP flood risk at node RR. MetroLink cable route shares route. Costs relating to stream crossings.
OOPP	3.69	Route is entirely road-based, following the Kilreesk Rd (~6 m wide), Killeek Ln (~5 m wide) and a local road (~5 m wide), none of which have road markings. Small water body (Barberstown) crosses under road.	GDA Cycle Network Plan shares route along Kilreesk Rd and Killeek Ln. Equestrian centre at node PP and a second equestrian facility adjacent to the route. Route runs along Keelings fruit farm road. Sparse residential properties on the route.	Water mains along majority of route (no connection along Kilreesk Rd section). Gas line crosses route at one point. No sewer.
PPQQ	0.59	Entirely along R108 (~6 m wide).	Equestrian centre at node PP. 2 residential properties at node PP. Polytunnels adjacent to road. Helipad in field adjacent to road.	Mains water along route. No other utility interactions.
QQRR	0.11	No roadside trees. 10% AEP flood risk at node RR.	Runs along R108, approx. 9 m wide with space at roadside. No roadside buildings. Node RR is adjacent to Dublin Airport exclusion zone.	Very short section. 1 mains crossing and roadside mains at end of section near node QQ. 10% AEP flood risk at node RR. No additional costs.
QQSS	0.90	Entirely along Cooks Rd (approx. 5 m wide) with <1 m of grass space along roadsides.	Sparse residential and non-residential properties along route.	No water mains for most part, only for short distance at node SS. Golf club at node SS. Possible cultural heritage site at middle of route. Narrow road may add difficulty to delivery.
RRTT	0.99	No roadside buildings or trees. Road approx. 8 m wide with space at roadside.	Runs along border with Dublin Airport (Naul Rd). No roadside buildings.	No mains water through road. 10% AEP flood risk at node RR. MetroLink cable route shares route. No additional costs.
SSTT	0.27	Entirely along Forest Rd. Road approx. 6 m wide with trees on roadside. Small water body alongside/under road for part of the section.	Forrest Little Golf Club at node SS with course along the east of the route. Sparse residential and farm buildings along route.	No mains line in road. Possible additional costs due to traffic management and water body crossing.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
SSVV	3.21	Route follows Forest Road into Swords town, joins the L2300, then joins the R132, exiting the town.	Forrest Little Golf Club runs adjacent for first ~700 m from node SS. Interaction with major planned project. Route enters Swords town with dense residential and non-residential development for 1.4 km of the route. Cycle lane in the urban section. MetroLink train route crosses the road.	Mains water, gas line for more than half the route. Road approx. 6 m wide on approach to Swords, widening to >12 m in the town. Additional costs due to significant disruption in Swords town and length of cable.
TTUU	1.21	Follows Naul Rd (~6 m wide with >1 m grass verge adjacent to road).	Borders Forrest Little Golf Club and borders Dublin Airport land (Naul Rd). Crosses major planned project. Cultural Heritage zone of notification adjacent to road at non-residential site. No residential properties along route.	No water mains through road but mains crosses in 2 places. No residential properties, industrial property at 1 location. Road approx. 7 m wide with some adjacent grass space. MetroLink cable route shares route. No additional costs.
UUVV	0.28	No roadside trees for the most part; trees offset from road by >1 m for a section.	Borders Dublin Airport (Naul Rd).	No water mains or adjacent buildings. Short section. Road approx. 7 m wide with wide adjacent grass space. Connects Castlemoat Rd junction with Naul Rd at node UU and Cloghran Roundabout at node VV. No additional costs.
UUCCC	4.41	Long off-road section. Requires significant tree felling and hedgerow removal in places. Cuckoo Stream crossing.	Crosses major planned project. Some major interactions with residential and non-residential properties. Infrequent minor interactions with properties. Route runs adjacent to sports grounds. Route runs adjacent to a cemetery.	Cuts through a private garden, Parfit non-residential property, fields, M1 motorway (north of Junction 2 at the slip roads), thick hedgerow/woodland, across Clonshaugh Rd, across a private road, across Cuckoo Stream (in a field). Runs parallel to the M1 for a section. Passes under 38 kV OHL. Additional costs relating to crossing multiple roads, including the M1, clearance of large trees, thick hedges

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
UUXX	2.27	Mixed road and off-road route section. Requires removal of hedges and trees (crosses tree line in at least 3 places).	Adjacent to National Show Centre site but does not interfere with operations. Roadside section is along a wide road (approx. 7 m) with >1 m of grass area at roadsides. Moves off-road following the M1 flyover. Crosses a private property.	Must cross Cloghran Roundabout. Crosses M1 motorway via a flyover (which has a footpath at both sides and wide road). Crosses road (Baskin Lane, approx. 5 m wide) at node XX. HDD costs.
VVWW	1.72	Entirely along Stockhole Lane, from Cloghran Roundabout to junction with Baskin Lane.	MetroLink cable route along entire route section. Nursing home adjacent to road.	Crosses M1 motorway via flyover. Wide road (approx. 7 m) with >1 m path/grass area at both sides of the road. Mains water, gas line and residential properties only present for final 280 m approaching node WW. No sewer. Route follows MetroLink cable route. HDD costs at M1 crossing.
WWXX	0.34	Entirely road-based (along Baskin Lane). Trees along one side of the road.	Short route section with some residential properties. MetroLink Cable route along road.	Mains water, medium pressure gas pipeline and MetroLink cable route share route. No additional costs.
WWZZ	1.40	Entirely along Clonshaugh Road/Stockhole Lane. Cuckoo Stream passes under the road with low walls at both sides of the road.	Overlap with major planned project. Sports grounds adjacent to road. Sparse residential and non-residential properties scattered along route.	Mains water, sewer pipe, gas pipeline. 38 kV OHL crosses over. Road approx. 6 m wide and tree lined. HDD costs for stream crossing.
XXYY	2.12	Route is entirely along Baskin Lane.	Adjacent to sports ground (Baskin Lane). MetroLink cable route runs along route. Linear residential properties along route, sparse for the most part.	Medium pressure gas line along route, 2 lines in a section of the route. Mains water along route. Road is approx. 6 m wide with a footpath along one side.
XXCCC	2.05	Off-road route section. Multiple tree/hedge crossings. Crosses Cuckoo Stream between fields.	Crosses major planned project. Passes adjacent to a track. Crosses private laneway.	38 kV line crosses overhead. Requires tree and hedge removal in several locations. Stream crossing between fields, resulting in additional costs. Arrives at Belcamp substation at node CCC.
YYBBB	2.39	Entirely along R107 (Malahide Road). Cuckoo stream crosses under road.	Adjacent to cemetery. Crosses major planned project. Passes primary school. Linear residential and non-residential properties on both sides of the road. National monument at roadside (stone cross) outside St. Doulagh’s Church.	MetroLink cable route runs along the route. Road width varies significantly (approx. 6 m upwards). Mains water, sewer pipe. Additional costs for stream crossing.

Route Section	Approx. Length (km)	Environmental	Socio-Economic	Technical, Economic & Deliverability
ZZAAA	0.36	Route is entirely along Clonshaugh Road/Stockhole Lane.	Linear residential and non-residential properties along both sides of road for majority of the route section.	Encounters 2 roundabouts. Road width varies, with some usable space adjacent to the road for the majority of the route. Mains water, medium pressure gas line and sewer line along route.
ZZCCC	0.84	Off-road route connecting Clonshaugh Rd to Belcamp Substation. Entry point to field via gate. Hedging & tree removal may not be required.	Route crosses Major Planned Project at node ZZ.	Mains water, sewer and medium pressure gas line at node ZZ. No utilities for rest of route.
AAACCC	1.15	Off-road section, running adjacent to R139, moving off-road at node AAA. Requires some removal of trees and hedging.	Route concludes at Belcamp substation. Cable follows access road to substation for final section of route.	Mayne 09 stream passes (possibly underground). 10% AEP flood risk for prolonged section of route. Mains water, gas line and sewer pipe all present along part of the route.
BBBCCC	2.04	Predominantly road based (R139) section. Wide (6 lane) road at node BBB. >1 m grass strip/footpath for most of the route. Final section connecting R139 to substation follows off-road path with potential tree/wall crossings.	Route concludes at Belcamp substation. Residential and non-residential properties present.	38 kV UGC for a section of the route. 110 kV UGC for a section of the route, which crosses the road. Mains water.
EEEFFF	0.06	Trees on west side of road, hedgerow along east. Entirely along minor road.	Connects junction at west and junction at east. No roadside buildings.	Mains water along section. No other utilities.

Step 4B - Route Options and Evaluation Report

Document no: 321084AJ-REP-015
Version: 04

EirGrid
CP1021

East Meath - North Dublin Grid Upgrade

Step 4B - Route Options and Evaluation Report

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01	Dec 22	Initial draft	HS	KRS	AS	GS
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03	Aug 23	Third Issue	GS	AS	SMcG	AS
04	Sep 23	Fourth Issue	GS	AS	SMcG	AS

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Contents

Appendices

Executive Summary

What is this Report?

EirGrid follows a six-step approach when they develop and implement solutions to any identified transmission network problem. The process and timescale of the East Meath to North Dublin Grid Upgrade project (hereafter referred to as the Proposed Project) is shown in Figure A1-1 below. The Proposed Project is currently at Step 4 – Where exactly should we build? To help identify the best location for the project, Step 4 has been divided into two sub-steps: Step 4A and Step 4B. Step 4A was completed in March 2023 and further details are on the project website[1].

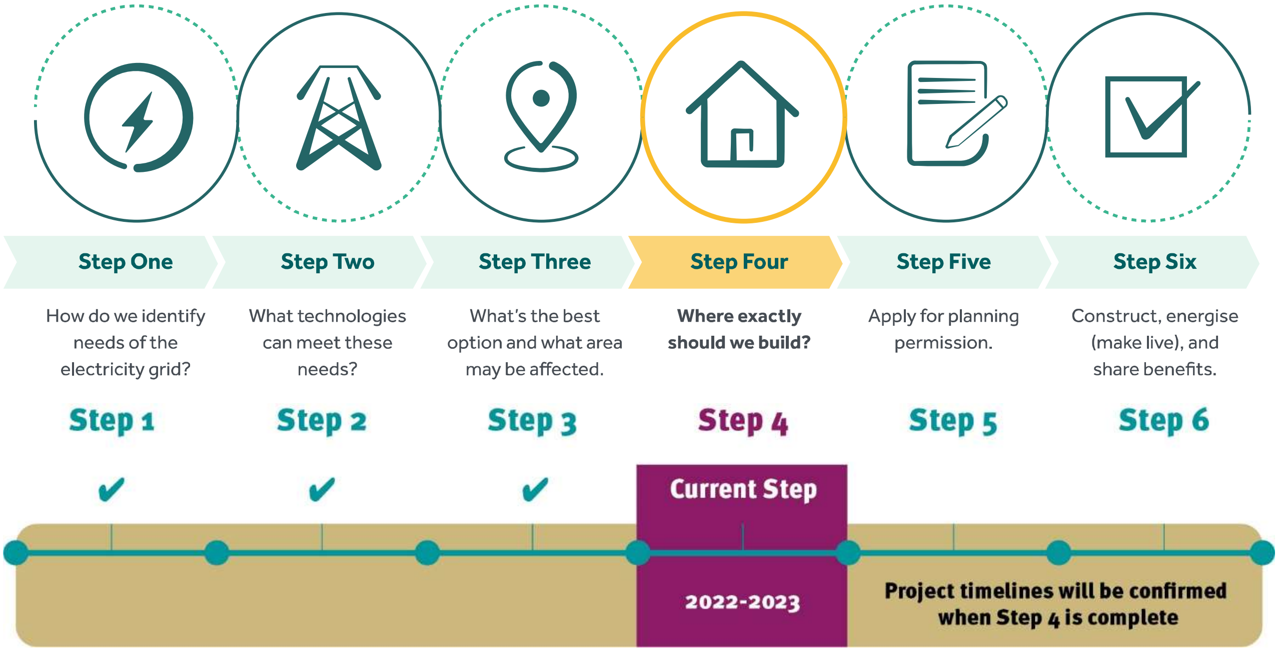


Figure A1-1: EirGrid's six-step approach and the timeline for the proposed development

This Step 4B Report identifies what EirGrid considers to be the Best Performing Option[2] for the route of the underground cable and presents a description of the proposed route. This report will be published on the project website and EirGrid will consider all feedback arising and will use this, and any further survey and analysis undertaken, to confirm the final route at Step 5.

What is the East Meath to North Dublin Grid Upgrade Project?

The East Meath to North Dublin Grid Upgrade is the Proposed Project to reinforce the grid network between east Meath and north Dublin. This Proposed Project will help to meet the growing demand for electricity in the east of the country due to the increased economic activity and population growth in recent years.

Meath and Dublin are ideally placed for optimal transport networks including air, road and rail routes which provide access to and from Dublin and the rest of Ireland. Over the past 25 years, the population in Meath has increased by 81.5%, and has doubled in north Dublin. Rapid population growth and proximity to Dublin City have led to thousands of businesses, including multi-national companies and Irish SMEs, being situated

[1] https://www.eirgridgroup.com/the-grid/projects/cp1021/the-project/

[2] The preferred route as shown in Step 4B. It is Option A (Red) from Step 4A with some minor changes.

within the region, including important sectors such as construction, pharmaceuticals, information technology, energy and more. The growth in the area is set to continue and with it the energy demand.

The East Meath to North Dublin Grid Upgrade will prepare the grid for the delivery of more renewable electricity from sources such as wind, solar and hydro. This is in line with Government policy. Renewable energy accounted for 36% of all electricity consumed in Ireland in 2019. Ireland's Climate Action Plan 2023 calls for 80% of the country's electricity to come from renewable energy sources by 2030.

Upgrading and strengthening Ireland's electricity grid allows the system to send more energy, both traditional and renewable sources, from where it is generated to where it is needed. The grid needs to deliver a constant supply of energy to users while simultaneously managing a variable supply of energy generated from wind, solar and hydro sources. Grid upgrades will help Ireland to meet growing and changing energy demands while also facilitating a transition to renewable, sustainable electricity generation.

What Happened at Step 4A (the previous step of the project)?

The design of the proposed route options at Step 4 were based on the application, where reasonably practicable, of the following routing principles:

- Avoid motorways;
- Maximise the use of regional and local roads;
- Avoid town centres and industrial estates;
- Avoid going off-road, through private land and through agricultural land where possible;
- Avoid sensitive natural and built heritage locations;
- Minimise impact on communities where possible; and
- Minimise the overall length of the route.

These routing principles align with EirGrid's five key assessment criteria (Environment; Socio-Economic; Technical; Deliverability; and Economic). By following the routing principles, improved route options were developed. The process outlined in Figure 2-1 (see p. 6) resulted in the identification of four route options.

EirGrid invited the public to give feedback on the four proposed route options during a public consultation from September to November 2022. A range of communication and engagement methods were adopted including in person meetings and online methods to reach as wide an audience as possible. Public Consultation was promoted through Community Forum meetings, engagement in the project area, stakeholder engagement, public webinars, multi-channel advertisements, social media and a project website.

During March 2023 it was announced that Route Option A (Red) was the Emerging Best Performing Option. The Step 4A Report was published at this time, describing the process followed to identify the proposed route options and presenting an evaluation of these options against a set of criteria while also considering feedback from stakeholders, local communities and the public.

Option A (Red) was selected as the Emerging Best Performing Option due to several factors including its lowest combined impact across all topic areas compared to the other options. Option A has a lower environmental impact than Option C (Yellow), a lower socio-economic impact than Option C (Yellow) and Option D (Blue), a lower deliverability impact than all other options and a lower economic impact than Option C (Yellow) and Option D (Blue). This lower deliverability impact means that there will be less disruption to road users and local communities during the delivery phase compared to other options.

While Option A (Red) has the longest length of off-road sections compared to other options, there is a relatively high degree of confidence that the necessary permits and wayleaves can be arranged for these sections, and these off-road sections are primarily required for technical reasons such as avoiding impacts to existing utilities and physical constraints in existing roads. While Option A (Red) has potentially moderate impacts on some environmental sub-criteria (biodiversity, surface water/flood risk and cultural heritage), further surveys, engagement, design, and assessment work will be undertaken to avoid or reduce these impacts.

Following the announcement of the Emerging Best Performing Option and the publication of the Step 4A Report, EirGrid held its seventh Community Forum on 19 April 2023. The Emerging Best Performing Option was promoted from 29 March 2023 to 14 May 2023, including via local and regional press titles and radio, out of home, digital and social media and a search campaign. During this time, EirGrid carried out open days, Mobile Information Unit days, and school presentations and project information was hosted in a number of local information points such as libraries, post offices and schools in the project area. EirGrid also corresponded with stakeholders throughout this period, including through emails, telephone calls, and information published on the EirGrid website to advise them of the Step 4A Report and the Emerging Best Performing Option.

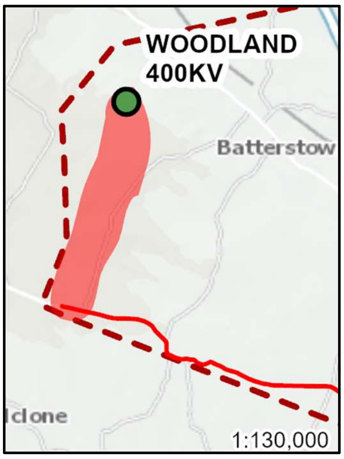
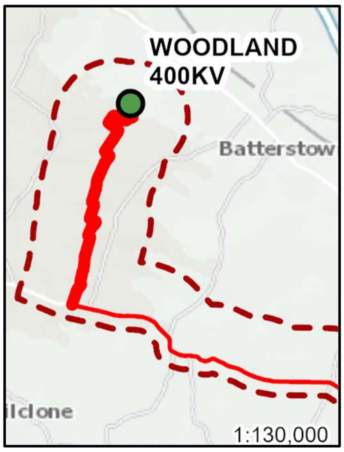
What Happened at Step 4B (the current step of the project)?

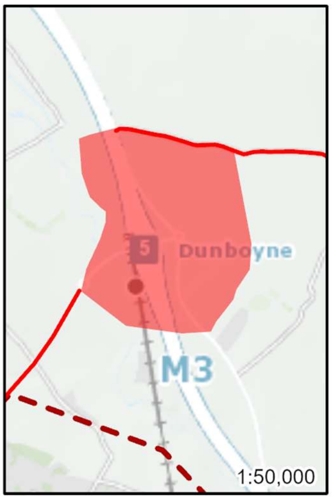
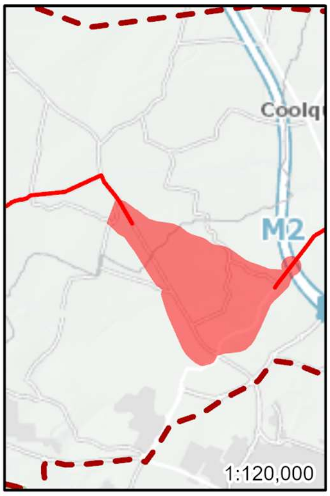
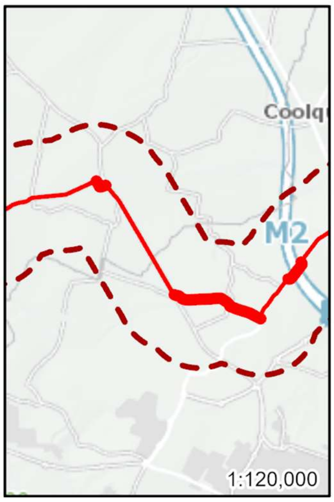
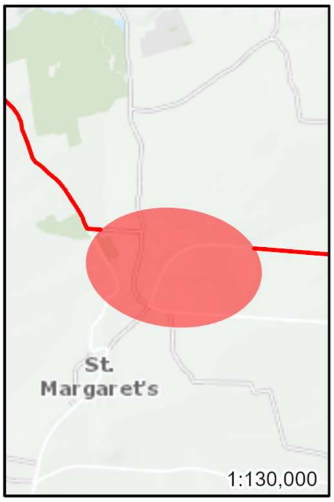
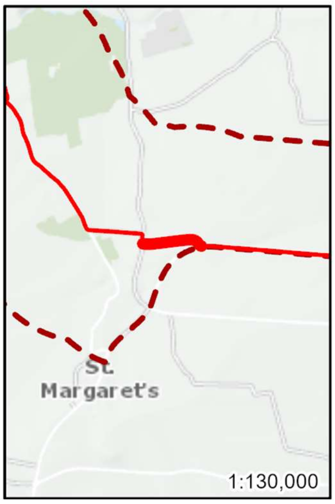
In Step 4B, Option A (Red) was re-examined to refine the route as far as possible to remove the need for any wider refinement areas and to provide more certainty on the specific location. The five wider areas at Step 4A were shown in this way, as these locations included off-road sections, and further discussions were required with relevant stakeholders and landowners. Further surveys and assessment work were also required to determine the best location for the cable route within these wider areas.

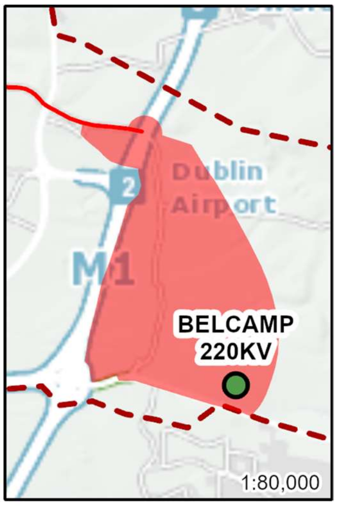
Option A (Red) from Step 4A provided a framework for the routing process at Step 4B. While it was explained in the Step 4A Report that route changes were a possibility because of further surveys and assessment, the project team sought to avoid significant changes.

The Step 4B process identified several areas where changes would result in an improved route. The vast majority of changes are in the off-road wider areas, as summarised in Table A.1 below. The changes were made for a number of reasons, such as reducing potential environmental impacts, or avoiding private lands. As a result, the route located within three of the five wider areas added during Step 4A, can now be determined. The route within the retained wider areas at the M3 motorway crossing and between M1 to Belcamp is subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5.

Table A.1: Changes to Step 4A Wider Areas

Emerging Best Performing Option	Reason for the Change	Best Performing Option
Woodland to R156 	This is now an off-road section approximately 3km in length through agricultural land. The use of the local road network in this area was technically challenging due to two existing masonry arch road bridges on the Red Road that were unsuitable. An off-road corridor would also minimise the risk of disrupting access to the Woodland substation and converter station. The BPO also optimises a corridor shared with another EirGrid project, CP0966.	

Emerging Best Performing Option	Reason for the Change	Best Performing Option
M3 Crossing  	Feasible route options have been developed at this location however the route remains subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5.	
Hollystown  	This is now an off-road section approximately 1.4km in length through agricultural land. The use of the local road through the village of Hollystown was considered challenging from a deliverability perspective due to potential disruption during construction and the presence of numerous existing utilities. An off-road corridor will minimise disruption to the local community, businesses and road users.	
St. Margaret's  	This is now an off-road section approximately 0.5km in length through agricultural land. The use of the local road network in this area was considered to be technically challenging due to potential risk of disruption to strategic infrastructure associated with the airport (i.e. runway landing lights). An off-road corridor will minimise risk.	

Emerging Best Performing Option	Reason for the Change	Best Performing Option
M1 to Belcamp 	This is now an off-road section approximately 3.5km in length through agricultural and industrial land. The use of the local road (Stockhole Lane) was identified to perform less successfully against the other options due to potential disruption during construction and the presence of numerous existing utilities. An off-road corridor will minimise disruption to the local community, businesses and road users. Feasible route options have been developed at this location however the route remains subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5. The potential for this off-road section to become a wider 'transmission cable corridor' has been discussed with affected landowners on the approach to Belcamp substation and continues to be investigated and assessed, for potential development under future EirGrid projects.	

Continued assessment, design and surveys, along with engagement with key stakeholders, including local communities and landowners, has enabled refinements of the Emerging Best Performing Option and identification of the Best Performing Option.

The route refinements described above have changed the length of the cable route from 36.5km to 37.7km, representing a difference of 1.2km. Within this 37.7km, there is also an increase to the off-road length, from 8.7km to 10.8km.

This increase in off-road length is largely due to the changes in the route design in the wider refinement areas, where the cable route is now predominantly crossing agricultural land. The increase in the overall length will slightly increase the overall cost and potentially, the ecological impact, of the Proposed Project. However, it was concluded that these route refinements were minor and do not materially alter the assessment of Option A (Red) as presented in the Step 4A Report. It has been concluded that Route Option A (Red) remains the Emerging Best Performing Option and that the route shown in this Step 4B Report is the Best Performing Option.

It is likely that further, minor route refinement work will be required at Step 5, following additional design, surveys, engagement, and assessment. As in previous steps, feedback from affected landowners, local communities and prescribed bodies will be considered and further project information will be provided to the public via EirGrid's website. Also, additional design features may be incorporated at Step 5, but these will generally be accommodated within the area of the route described. This will be determined at Step 5.

As noted in Table A.1, the M1 to Belcamp off-road section has the potential to become a wider 'transmission cable corridor' and this has been discussed with affected landowners on the approach to Belcamp substation and continues to be investigated and assessed, for potential development under future EirGrid projects.

Figures illustrating the Best Performing Option are presented in Appendix A of this report.

1. Introduction

1.1 Who is EirGrid?

EirGrid develops, manages, and operates Ireland's electricity grid. EirGrid is leading the secure transition of Ireland's electricity grid to a low carbon, renewable future. EirGrid is responsible for the safe, secure, and reliable supply of Ireland's electricity.

The grid brings power from where it is generated to where it is needed throughout Ireland. It supplies power directly to industry and businesses that use large amounts of electricity. The grid also brings power from generators to the domestic network that supplies the electricity you use every day in homes, businesses, schools and hospitals.

This critical infrastructure underpins our societal and economic development. Work carried out now will help to create a more sustainable future for the next generation.

1.2 What is the East Meath – North Dublin Grid Upgrade Project?

The Proposed Project is a high-capacity 400 kV underground electricity cable connection from Woodland substation, near Batterstown in County Meath, to Belcamp substation, near Clonshaugh, in north Dublin (see Figure 1-1).

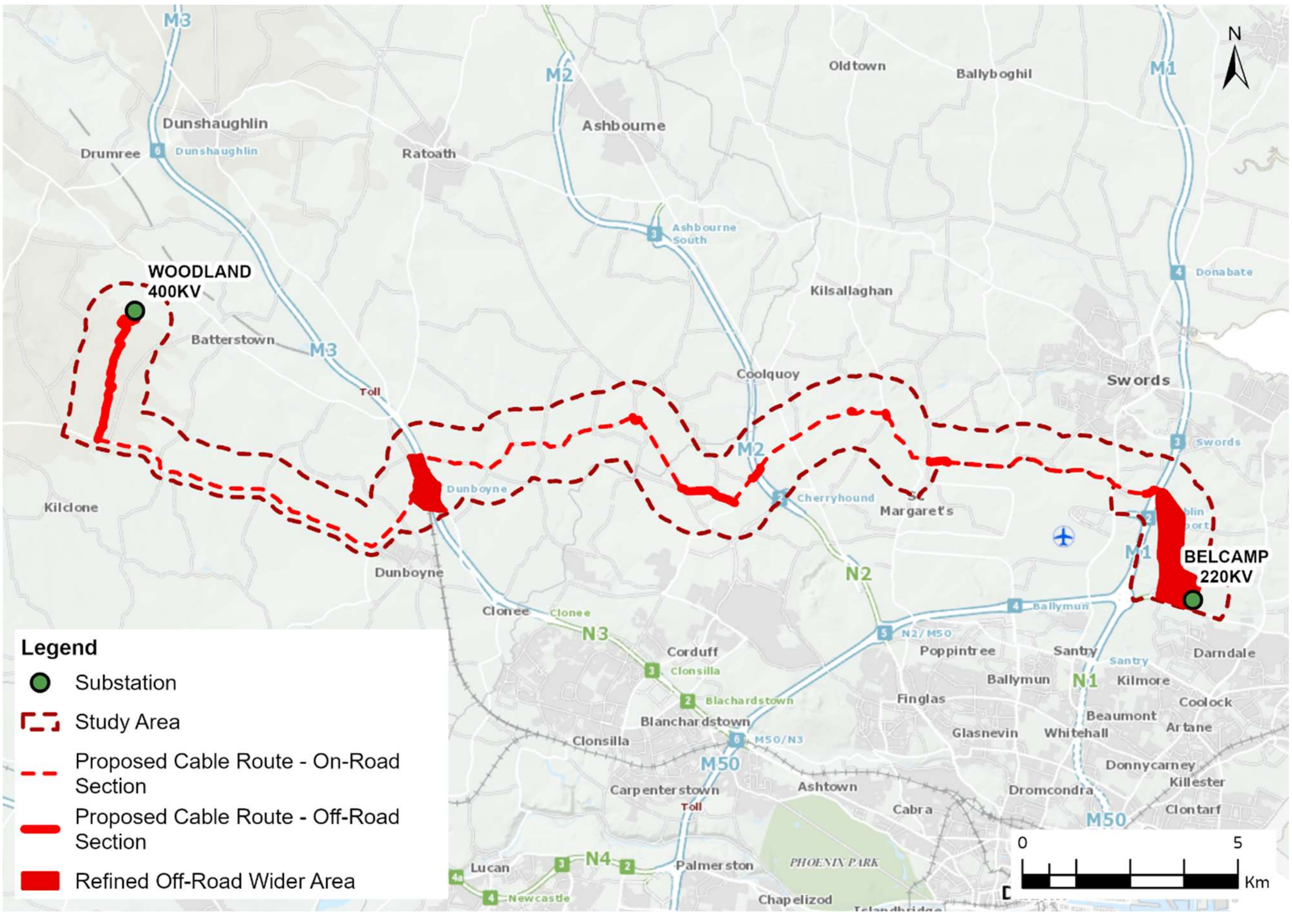


Figure 1-1: East Meath to North Dublin Grid Upgrade

The East Meath to North Dublin Grid Upgrade is the Proposed Project to reinforce the grid network between east Meath and north Dublin. This proposed upgrade will help to meet the growing demand for electricity in the east of the country due to the increased economic activity and population growth in recent years.

Meath and Dublin are ideally placed for optimal transport networks including air, road and rail routes, which provide access to and from Dublin and the rest of Ireland. Over the past 25 years, the population in Meath has increased by 81.5% and has doubled in north Dublin. Rapid population growth and proximity to Dublin City have led to thousands of businesses, including multi-national companies and Irish SMEs, being situated within the region, including important sectors such as construction, pharmaceuticals, information technology, energy and more. The growth in the area is set to continue and with it the energy demand.

The East Meath to North Dublin Grid Upgrade will prepare the grid for the delivery of more renewable electricity from sources such as wind, solar and hydro. This is in line with Government policy. Renewable energy accounted for 36% of all electricity consumed in Ireland in 2019. Ireland's Climate Action Plan 2023 calls for 80% of the country's electricity to come from renewable energy sources by 2030.

Upgrading and strengthening Ireland's electricity grid allows the system to send more energy, both traditional and renewable sources, from where it is generated to where it is needed. The grid needs to deliver a constant supply of energy to users while simultaneously managing a variable supply of energy generated from wind, solar and hydro sources. Grid upgrades will help Ireland to meet growing and changing energy demands while also facilitating a transition to renewable, sustainable electricity generation.

The need for the Proposed Project has been established through a series of studies completed at Steps 1 to 3 (see Figure 1-2). These reports are available on the project website[3]. This series of studies identified the need for a new connection between Woodland and Belcamp substations and that an underground cable is the best technology for this connection. The Proposed Project is a high voltage (400 kV) underground cable between Woodland and Belcamp substations and the need for the Proposed Project remains robust.

1.3 Purpose of this Report

For any identified transmission network problem, EirGrid follows a six-step approach when they develop and implement the best performing solution option. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[4]. The six steps are shown at a high-level in Figure 1-2. Each step has a distinct purpose with defined deliverables, and collectively, they represent the lifecycle of a project from conception through to implementation and energisation.

Figure 1-2: EirGrid's Six-Step Approach to Developing the Electricity Grid

[3] https://www.eirgridgroup.com/the-grid/projects/cp1021/related-documents/

[4] http://www.eirgridgroup.com/the-grid/have-your-say/

The Proposed Project is currently in Step 4, where the project team in consultation with stakeholders and the community identifies exactly where the underground electricity circuit will be built. The timeline for Step 4 can be seen in Figure 1-3.

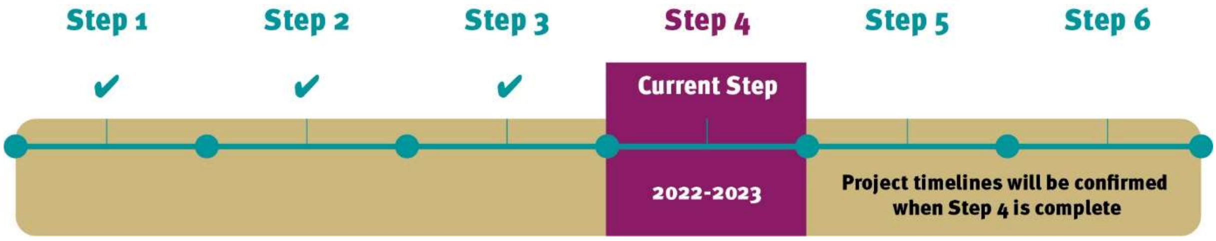


Figure 1-3: EirGrid's Six-Step Timeline for the Proposed Project

In Step 1, EirGrid identified the need for the Proposed Project.

In Step 2, EirGrid compiled a shortlist of best performing technical options, which went out for public consultation between October and December 2020. This included a mix of overhead line and underground cable technological solutions and the possibility of a new transmission route being between Woodland and either Corduff, Finglas or Belcamp substations. This identified a short list of four options: an underground cable or overhead line to either Finglas or Belcamp substations.

In Step 3, EirGrid re-confirmed the need for the Proposed Project and assessed the feasibility of, and constraints which may impact upon, the shortlisted technology options to strengthen the electricity network in East Meath and North Dublin. In April 2022, EirGrid identified the 400 kV underground cable option between Woodland and Belcamp substations as the best performing option to progress for this Proposed Project. This was communicated to stakeholders through a Public Engagement awareness campaign from May to June 2022, during which time feedback was encouraged through the project website, webinars and through mobile information units in the study area.

As part of Step 4, EirGrid has identified four potential underground cable route options and has consulted on these options during September to November 2022. The four proposed route options have been assessed against five key assessment criteria (see also Figure 1-4 below):

- Environmental factors;
- Socio-economic factors – such as the local economy and local amenities;
- Technical aspects;
- Deliverability factors – such as timeline and potential risks; and
- Economic factors.

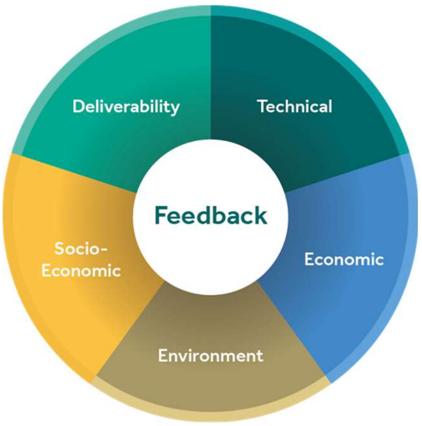


Figure 1-4: EirGrid's Five Assessment Criteria for Projects

Step 4 has been divided into two sub-steps: Step 4A and Step 4B. This Step 4B Report identifies what EirGrid, following technical assessments and substantive public and stakeholder engagement and consultation, considers to be the Best Performing Option for the route of the underground cable. This report will be published and EirGrid will consider all feedback arising. Comments on this report can be made to EirGrid (see Chapter 4 of this report for further details) for review and consideration by the project team. Should further changes to the design be required, this will be described in the Step 5 reports. The Best Performing Option will be the route option taken forward to the planning process and the design will be finalised at that time.

1.4 Structure of this Report

This report is structured, as outlined in Table 1.1.

Table 1.1: Report Structure

Chapter	Overview
Executive Summary	A summary of this report.
Chapter 1 Introduction	An outline of the report, a description of the Proposed Project; and information on the approach to the development of the project.
Chapter 2 Summary of Project to Date	An overview of the works that have been completed on the Proposed Project at Step 4A and Step 4B.
Chapter 3 Description of the Best Performing Option	A description of the current cable route highlighting any changes from Step 4A.
Chapter 4 Next Steps	Information on providing comments on this report to EirGrid, and an overview of what the project team will do next (Step 5).

1.5 Accompanying Reports

The following reports accompany this Step 4B report:

- Cable Feasibility Report[5] (Jacobs, 2022a) – this standalone report considered the technical feasibility of the underground cable solution and two connection options, Woodland substation to Finglas substation or Woodland substation to Belcamp substation;
- Step 4A Constraints Report[6] (Jacobs, 2022b) – this standalone report identified the constraints (environmental and socio-economic) considered in the identification of route options;
- Consultation and Engagement Summary Report[7] (Jacobs, 2023a) – this standalone report provided a summary of engagement activities carried out in Step 4, including a public consultation, focus groups and other engagement activities such as stakeholder meetings, in-person information days, and webinars; and
- Step 4A Report [8] (Jacobs, 2023b) – this standalone report presented a multi-criteria analysis of the proposed route options. It describes the process followed to identify the proposed route options and presents an evaluation of these options against a set of criteria while also considering feedback from stakeholders, local communities and the public. This report identifies what EirGrid considers to be the Emerging Best Performing Option for the route of the underground cable.

[5] https://www.eirgridgroup.com/site-files/library/EirGrid/321084AJ-REP-002-Cable-Feasibility-Report-Final-April-2022.pdf

[6] https://www.eirgridgroup.com/site-files/library/EirGrid/321084AJ-REP-009_Constraints-Report-Final-August-2022-Clean.pdf

[7] https://www.eirgridgroup.com/site-files/library/EirGrid/CP1021_EastMeath_NorthDublin_Grid-Upgrade_PublicConsultationAndEngagementReport_Final.pdf

[8] https://www.eirgridgroup.com/site-files/library/EirGrid/321048AJ-REP-010-Step-4a-Report-v4-Mar-23_Optimised.pdf

2. Summary of Project to Date

2.1 Introduction

This chapter provides an overview of the works that have been completed on the Proposed Project at Step 4A and includes a description of the work that has been undertaken at Step 4B. Further details are provided in the reports and mapping on the EirGrid website (see Chapter 1 of this report for details).

At Step 4A, Route Option A (Red) was presented as the Emerging Best Performing Option. This route option included several 'wider areas' to allow for further refinement of the route design at specific locations during Step 4B. This design process has been completed and the wider areas at three of five locations have been removed, providing confirmation of the current route design at these locations. The route within the retained wider areas at the M3 motorway crossing and between M1 to Belcamp is subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5.

This report presents the findings of the refinement of the Emerging Best Performing Option and identifies the Best Performing Option.

The Step 4 route design process is summarised in Figure 2-1.

Study Area

- The Study Area from Step 3 was refined by considering a wide variety of factors including stakeholder and community feedback, technical requirements, road network presence, settlements, presence of existing utilities, physical constraints such as motorway, river or rail crossings and environmental constraints.

Constraints Identification

- A significant number of environmental and socio-economic constraints/receptors were identified and mapped.
- Constraints include houses, towns and villages, equine and agricultural land, motorways, designated sites, archaeological features, areas of peat, woodland, rivers and businesses.
- The constraints were used to inform a baseline assessment, identifying potential impacts for each environmental and socio-econmomic topic.

Possible route options

- Workshops were held with specialists from the project team to identify all reasonable options between Woodland and Belcamp substations, taking into account the mapped constraints and the routing principles.

Route Section Assessment

- A long list of options, comprising route sections, were identified. These individual sections were assessed against the routing principles.
- The individual sections that scored poorly or did not connect to well performing adjacent route sections were not progressed.

End-to-End Assessment

- The short listed individual sections were combined to create four end-to-end options.
- Feedback on these four end-to-end options was sought from the public and other stakeholders as part of the public consultation in 2022.
- The feedback from the public consultation was considered by the project team and the options were assessed against the five assessment criteria to provide a rating of potential impact.

Selection of Route Option A (Red)

- Route Option A (Red) was selected as the Emerging Best Performing Option in the Step 4A Report.
- It was selected due to several factors including its lowest combined impact across all topic areas compared to the other options.
- From the public consultation, many respondents expressed their support for this option and the project team considered how the feedback could shape the development of the project.

Refinement of Route Option A (Red)

- At Step 4B, consultations with key stakeholders, including county councils and landowners, as well as further surveys, design and assessment work was undertaken.
- This enabled the refinement of the route design as the Best Performing Option.
- The Project Study Area was further refined to reflect the refined route design as the Best Performing Option.
- Best Performing Option identification allows progression to Step 5 and application for planning permission.

Figure 2-1: Step 4 Route Design Process

2.2 Overview of Step 4A

The design of the proposed route options at Step 4A were based on the application, where reasonably practicable, of the following routing principles:

- Avoid motorways;
- Maximise the use of regional and local roads;
- Avoid town centres and industrial estates;
- Avoid going off-road, through private land and through agricultural land where possible;
- Avoid sensitive natural and built heritage locations;
- Minimise impact on communities where possible; and
- Minimise the overall length of the route.

These routing principles align with EirGrid's five key assessment criteria (Environment; Socio-Economic; Technical; Deliverability; and Economic). By following the routing principles, improved route options were developed. The process outlined in Figure 2-1 resulted in the identification of four route options, illustrated in Figure 2-2.

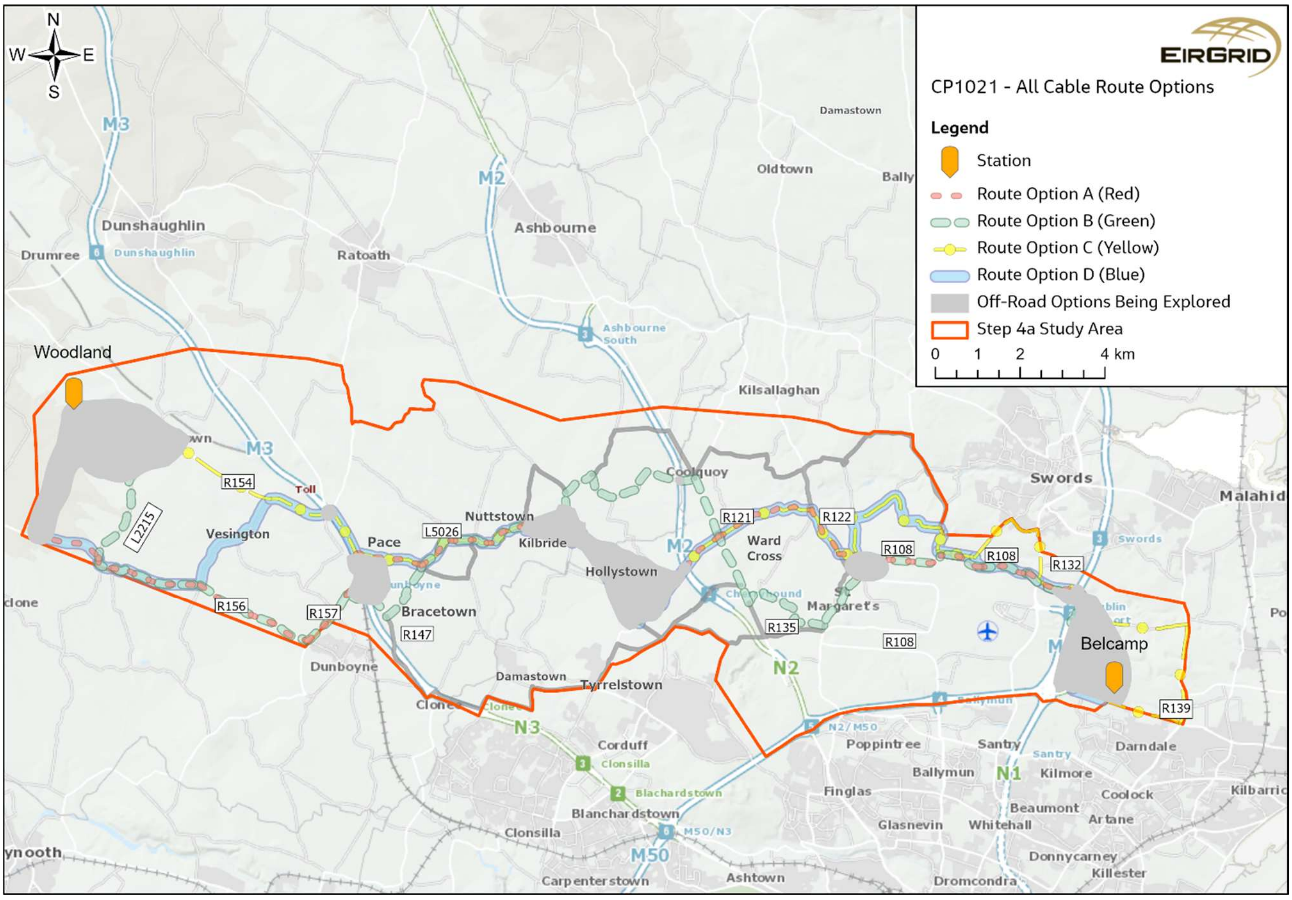


Figure 2-2: Route Options

EirGrid invited the public to give feedback on the four proposed route options during a public consultation from September to November 2022. A range of communication and engagement methods were adopted, including in person meetings and online methods to reach as wide an audience as possible. Public Consultation was promoted through Community Forum meetings, engagement in the project area, stakeholder engagement, public webinars, multi-channel advertisements, social media and a project website.

A total of 24 responses were received during the public consultation[9]. Consultation responses were received via an online portal (five), by email (eight) or by post (11). Public consultation has been an integral part of the Proposed Project, with each response being considered in the routing of the Proposed Project. Stakeholders expressed concerns about disruption, particularly traffic disruption, with one stakeholder questioning whether the construction works would affect the road on which they live close to Kilbride Village. Furthermore, stakeholders expressed concerns about access to their dwellings/ communities during construction. Stakeholders expressed broad support for the Proposed Project. Some commented that they understood the need for the development due to increasing national demand. Many praised the information provided at the Mobile Information Unit and the opportunity to have their questions answered. Stakeholders expressed support for the approach taken at the events and EirGrid's willingness to engage with the public.

During March 2023, it was announced that Route Option A (Red) was the Emerging Best Performing Option. The Step 4A Report was published at this time, describing the process followed to identify the proposed route options and presenting an evaluation of these options against a set of criteria while also considering feedback from stakeholders, local communities and the public.

Option A (Red) was selected as the Emerging Best Performing Option due to several factors, including its lowest combined impact across all topic areas compared to the other options. Option A has a lower environmental impact than Option C (Yellow), a lower socio-economic impact than Option C (Yellow) and Option D (Blue), a lower deliverability impact than all other options and a lower economic impact than Option C (Yellow) and Option D (Blue). This lower deliverability impact means that there will be less disruption to road users and local communities during the delivery phase compared to other options.

While Option A (Red) has the longest length of off-road sections compared to other options, there is a relatively high degree of confidence that the necessary permits and wayleaves can be arranged for these sections, and these off-road sections are primarily required for technical reasons such as avoiding impacts to existing utilities. While Option A (Red) has potentially moderate impacts on some environmental sub-criteria (biodiversity, surface water/flood risk and cultural heritage), further surveys, engagement, design and assessment work will be undertaken to reduce or avoid these impacts.

Following the announcement of the Emerging Best Performing Option and the publication of the Step 4A Report, EirGrid held its seventh Community Forum on 19 April 2023. The Emerging Best Performing Option was promoted from 29 March 2023 to 14 May 2023, including through local and regional press titles and radio, out of home, digital and social media and a search campaign. During this time EirGrid carried out open days, Mobile Information Unit days, school presentations and project information was hosted in a number of local information points such as libraries, post offices, schools in the project area. EirGrid also corresponded with stakeholders throughout this period, including through emails, telephone calls, and information published on the EirGrid website to advise them of the Step 4A Report and the Emerging Best Performing Option.

EirGrid also engaged with a number of stakeholders through in-person open days and door-to-door visits. Members of the EirGrid project team discussed the Step 4A Report and the Emerging Best Performing Option during these engagement days.

In total, four Open Day events were held following the announcement of the Emerging Best Performing Option. This included two in Dublin (in the Clayton Hotel Dublin Airport and in St. Margaret's GAA Club) and two in Meath (in Scoil Bhríde, Priest town and The Hatchet Inn, Dunboyne). For each of the Open Days, EirGrid's Community Liaison Officers (CLO), project managers and members of the EirGrid technical team were on site to answer questions and document feedback received. Approximately 50 people attended the Open Days during this phase in total.

[9] https://consult.eirgrid.ie/en/node/2569/submissions

In addition to Open Days, EirGrid organised four Mobile Information Unit events, in Dunboyne AFC, Caffrey's Batterstown, The Coachman's Inn (Dublin Airport) and Sweeneys of Kilbride. The EirGrid Mobile Information Unit events are staffed by EirGrid's CLOs and two members of the project team and provided additional opportunities for the public to get project information and provide feedback to the EirGrid team.

A Step 4 Emerging Best Performing Option Engagement Report has been prepared which outlines the engagement and communications that have taken place during the Emerging Best Performing Option period of engagement from 29 March 2023 to 14 May 2023. This report is available on the project website.

Table 2.1 below provides a summary of key issues raised and how the project team have considered the comments.

Table 2.1: Post Step 4A Engagement Summary

Feedback theme	Project Team response
What is the construction timeline?	The timelines for Step 5 and Step 6 will be confirmed following the completion of Step 4.
What measures will be taken to reduce disruption?	As part of Step 4B of the project development process, traffic survey data has been acquired and a traffic study will assess delays and disruption due to traffic management during the construction phase. We are also working with local communities and landowners to identify suitable site construction compounds and to identify appropriate haul routes and abnormal load routes. Where possible we are seeking to avoid routes through towns, villages and other residential areas while also seeking to minimise disruption to farms and other businesses in the area.
Will road closures be required ?	Wherever possible we seek to avoid road closures however we expect that some narrow roads may require temporary road closures.
What is the decision making process?	We will continue to engage with local communities and stakeholders during Step 4 and Step 5. Following the planning application in Step 5 a statutory public consultation process will also be undertaken as part of the statutory approval process.
How will this enable other energy projects?	This upgrade will strengthen the electricity grid in the east of Meath and the north of Dublin to improve the transfer of power across the existing transmission network. This will facilitate further development of renewable energy generation, onshore and offshore.
Will this work with other utilities?	We have undertaken surveys of existing utilities to assess the feasibility of the route. In some locations diversions of existing utilities may be required and in other locations off-road sections are required to avoid excessive disruption to local communities due to the utility diversions that would be required.
Could this impact health (i.e. due to EMF)?	The consensus from health and regulatory authorities is that extremely low frequency EMFs do not present a health risk. Further information is available on the EirGrid website: https://www.eirgridgroup.com/about/health-and-safety/ In addition, EirGrid's design standards require all underground cables to operate within existing public exposure guidelines from the International Commission on Non-Ionising Radiation Protection (ICNIRP) and as such there will be no effect from EMFs in terms of human health or interference to other electrical devices and systems.

2.3 Overview of Step 4B

In Step 4B, Option A (Red) was re-examined to refine the route as far as possible to remove the need for any wider areas and to provide more certainty on the specific location. The five wider areas presented at Step 4A were shown in this way, as these locations included off-road sections, and further discussions were required with relevant stakeholders and landowners. Further surveys and assessment work were also required to determine the best location for the cable route within these wider areas.

Option A (Red) from Step 4A provided a framework for the routing process at Step 4B. While it was explained in the Step 4A Report that route changes were a possibility because of further surveys and assessment, the project team sought to avoid significant changes.

The Step 4B process identified several areas where changes would result in an improved route. The vast majority of changes are in the off-road wider areas, as summarised in Table 3.1 below. Other, more localised changes to the route design are associated with watercourse crossings, as described in Sections 3.5.1 to 3.5.9.

The Step 4B process involved close cooperation between all members of the project team: agricultural liaison officers, and specialists in the fields of deliverability, technical, economic, environmental and socio-economic factors. This multidisciplinary team, along with input from stakeholders, landowners and the community, ensured that the Best Performing Option would be selected through consideration of all relevant issues.

Extensive engagement was carried out with a number of potentially affected landowners. This allowed landowner input into the potential routing and provided more information on ground conditions, environmental constraints, and farming practices that were considered in the routing process. At this time, further surveys and assessments were undertaken to determine how the route could be refined in order to avoid or reduce the potential environmental and social impacts, and to take account of technical issues. Issues such as the cable rating and the need to maintain the structural integrity of the cable (i.e. the cable must bend and not make 90º turns) have been factored into the routing. This process also included technical assessment of the roads affected by the cable, for example, masonry arch bridges on existing roads that may not be suitable to accommodate the proposed cable circuit. This is because the depth of the bridges below the roads are generally quite shallow. In these cases, off-road watercourse crossings adjacent to the bridges have been assessed to be the best solution, subject to the crossing methods, including site-specific environmental mitigation. These locations are identified in Chapter 3.

Environmental and social considerations were addressed via surveys, assessment, consultation with statutory bodies, input from landowners and the community, and discussions as a project team.

This process allowed for the consideration of relevant factors and for the project team to discuss potential routing options for the cable. The Step 4B Best Performing Option was chosen from this process and is detailed in Chapter 3 below.

The Project Study Area at Step 4A was roughly 340km^2, which represented a reduction of approximately 55% from the Step 3 Project Study Area, covering all four of the proposed route options. After the selection of Option A (Red) as the Emerging Best Performing Option, the Project Study Area was further refined to cover this area. The current Project Study Area is show in Figure 2.3. It covers an area of 51 km^2, which represents a reduction from the Step 4A area of approximately 85%. These refinements have allowed community engagement to be focused to the relevant area of the route.

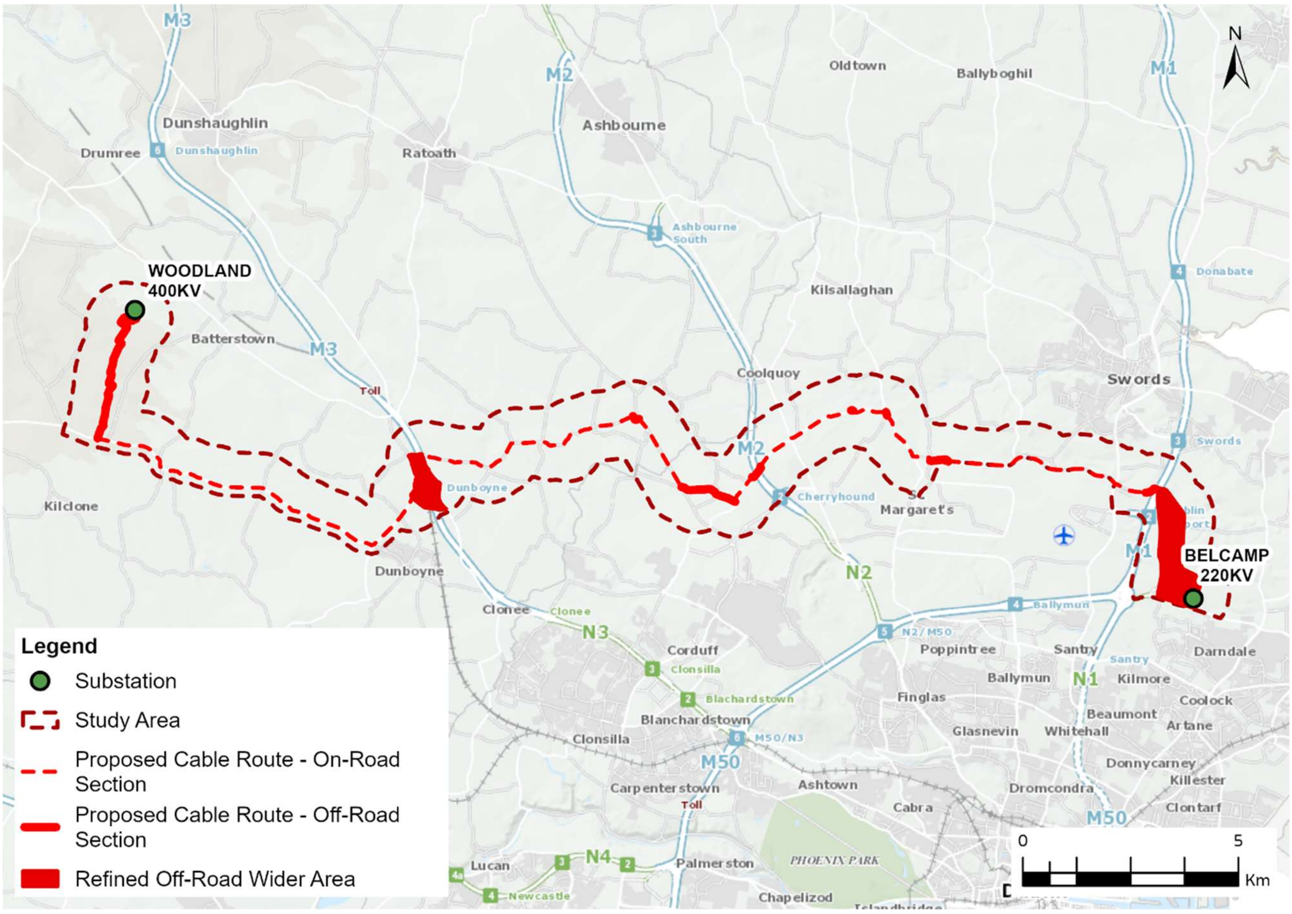


Figure 2-3: Step 4B Project Study Area

3. Description of Best Performing Route Option

3.1 Introduction

This chapter of the report provides a description of the Best Performing Option at Step 4B. The route described is based on the previous design, assessment work and surveys from Step 4A, with updates at this Step following the consideration of feedback from key stakeholders, including local communities and landowners. Further work will be undertaken as the project moves into Step 5 and this could result in further changes and refinement to the route design. This may be due to new information from ground investigations, new constraints identified from environmental surveys or new details provided by affected landowners. The changes will be made because of technical, deliverability or economic reasons, or to avoid or reduce potential impacts to the environment or local communities. Any changes will be fully described in the Step 5 reports.

3.2 Cable Details

3.2.1 Cable Trench

The route shown in this report is based on a 2.1m wide trench. It is possible that this width will be decreased when further technical assessments are completed at Step 5. However, 2.1m is the maximum width expected that could be used on this Proposed Project and is used here as a reasonable “worst case”. A narrower cable trench may result in reduced construction activity and fewer road closures. These issues will be addressed at Step 5. In some areas (e.g. at watercourse crossings), it may be necessary to widen the cable route to overcome physical constraints present.

The cable trench comprises several layers (see Figure 3-1 below) and is typically 1.5m in depth (that can change because of ground conditions or the presence of constraints, such as other utilities).

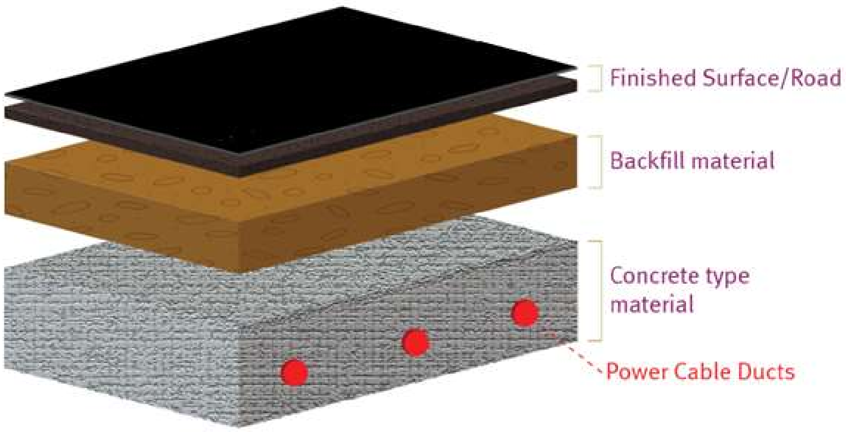


Figure 3-1: Indicative High-Voltage Alternating Current (HVAC) Cable Duct Arrangement (single conductor per phase solution)

3.2.2 Other Design Features

Further design features will be added to the Proposed Project at Step 5. These include jointing bays, passing bays, construction areas, access tracks, other associated works, and substation works. These works will be in the vicinity of the described route, however further surveys and assessment work are required before these elements can be designed. These elements will not affect the routing of the cable. However, they may result in additional requirements and further landowner engagement.

Jointing bays (underground chambers) will also be constructed along the cable route and are used to join together ('joint') consecutive lengths of cable and to facilitate the cable pulling. Typically, jointing bay spacing for this type of cable circuit is approximately 750m. To facilitate traffic management at locations where jointing bays are to be located within the carriageway, the use of temporary passing bays is proposed. These are strips of land at the edge of a public road on one side of a jointing bay (approximately 100m in length), that are temporarily cleared and laid with a temporary road surface in order to facilitate vehicle movements around the jointing bay, thereby avoiding or minimising the need for road closures. This will entail removing the top layer of ground to the side of the carriageway (including removal of hedges and other vegetation if present) and temporarily storing it locally to the site for reinstatement following the works. New hedges would be planted as part of reinstatement works.

Other traffic control measures will also be implemented as appropriate along the cable routes. These are likely to include road diversions, temporary closures and traffic management. All traffic management measures will be implemented in the context that the laying of cable is a linear construction process, which will be done in smaller sections along the cable route. This means that not all roads along the cable route will be disrupted at the same time during construction.

In addition to crossings of watercourses, crossings of utilities, motorways and a railway will also be required along the cable route. These crossings will be designed at Step 5 but typical crossing techniques include cable bridge, open-cut trenching or by use of Horizontal Directional Drilling (HDD). The specific detail of each crossing will be developed at Step 5 of the Proposed Project but an overview of the techniques is provided below:

- Cable bridge – a structure to pass cables over an area such as a watercourse. Measures are designed in to prevent unauthorised access to the structure;
- Open-cut trenching – an excavated area dug through fields where the cable is constructed. Where is it done through watercourses, the water flow is temporarily diverted with pipes around the area of work and the watercourse is then reinstated; and
- HDD – one of a number of trenchless techniques. A drilling rig launches a bore underground and it is guided in the desired direction. The cable is then laid in the drilled hole. There are no above ground works except for the start and end points of the hole.

3.3 Route Width

For the on-road sections, the route is shown as the width of the road. Further design and assessment will refine the location of the route within or adjacent to the road (e.g. in a footpath) at Step 5.

For the off-road sections, the route is generally shown as a 40m wide strip. The width of 40m is subject to ground conditions, severance issues, and other constraints. It may increase in size at watercourse crossings where additional land may be required for the Proposed Project works (e.g. HDD). This 40m width is mostly temporary construction areas within these sections and there will be a smaller permanent easement above the cable, which will be required for maintenance.

In some on-road sections, an off-road crossing of a watercourse will be required. These areas are described below and are needed at some existing bridge crossings of watercourses. At this time, it is considered that those bridges would not have sufficient depth to accommodate a cable and so an off-road crossing is required. Where it was determined that it would not be possible to utilise a watercourse crossing, an alternative route design has been considered.

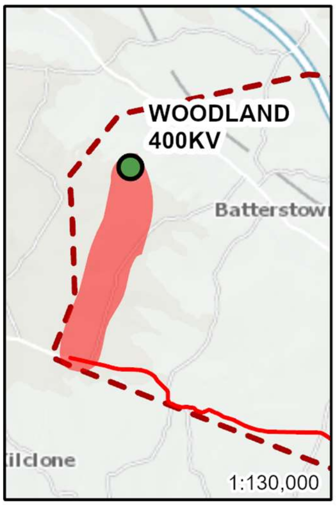
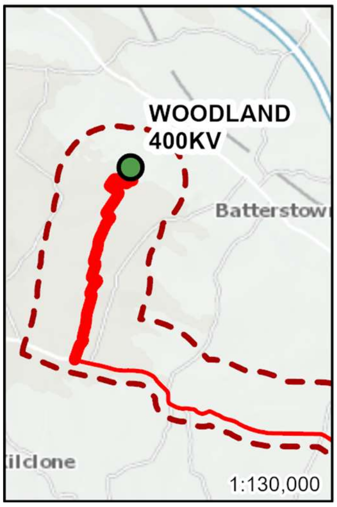
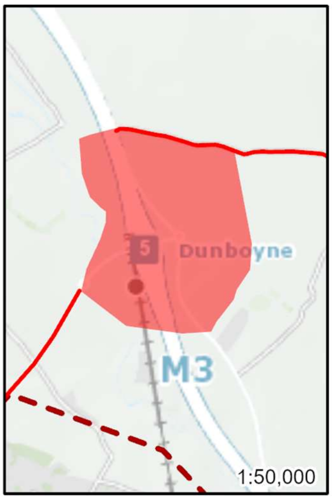
3.4 Route Changes from Step 4A

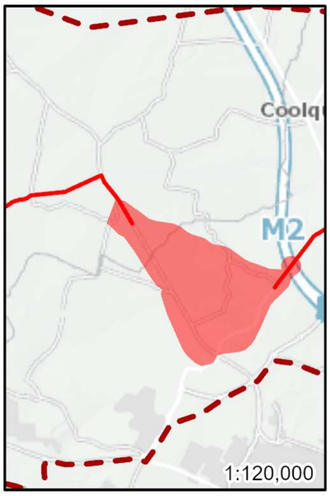
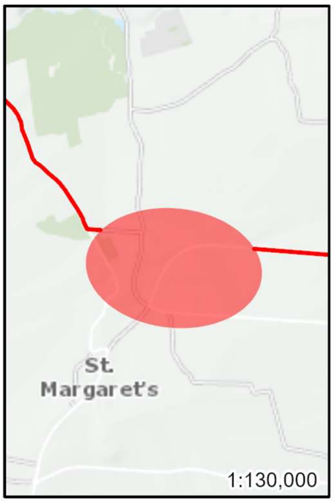
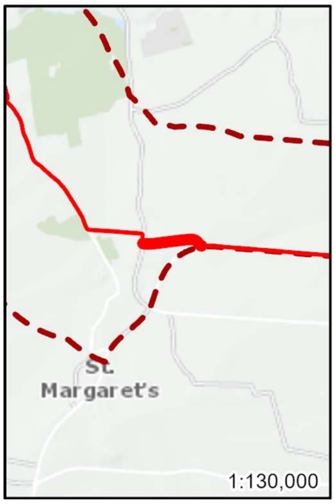
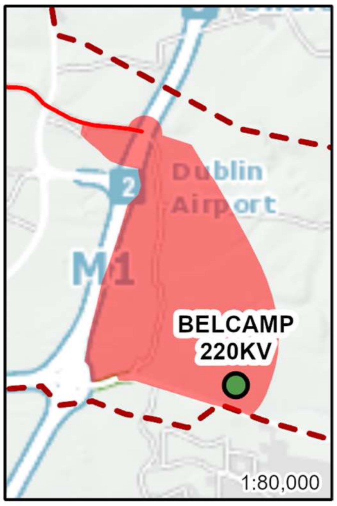
The work undertaken by the project team has allowed the refinement of the Emerging Best Performing Option that was shown at Step 4A. Route Option A (Red), as shown at Step 4A, had several wider areas and these are shown in Figure 2-2. It was necessary to show these wider areas because further design, assessment and consultation was required to refine the route at these locations.

In Step 4B, refinements to the route design have enabled the removal of four of these five 'wider areas', as the specific route at these locations has been identified.

Further details are provided in the text below with a summary of the key changes in Table 3.1.

Table 3.1: Changes to Step 4A Wider Areas

<table>
<tr><th>Emerging Best Performing Option</th><th>Reason for the Change</th><th>Best Performing Option</th></tr>
<tr><td>Woodland to R156

</td><td>This is now an off-road section approximately 3km in length through agricultural land. The use of the local road network in this area was technically challenging due to two existing masonry arch road bridges on the Red Road that were unsuitable. An off-road corridor would also minimise the risk of disrupting access to the Woodland substation and converter station. The BPO also optimises a corridor shared with another EirGrid project, CP0966.</td><td>
</td></tr>
<tr><td>M3 Crossing

</td><td>Feasible route options have been developed at this location however the route remains subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5.</td><td>
</td></tr>
</table>

<table>
<tr><th>Emerging Best Performing Option</th><th>Reason for the Change</th><th>Best Performing Option</th></tr>
<tr><td>Hollystown
</td><td>This is now an off-road section approximately 1.4km in length through agricultural land. The use of the local road through the village of Hollystown was considered challenging from a deliverability perspective due to potential disruption during construction and the presence of numerous existing utilities. An off-road corridor will minimise disruption to the local community, businesses and road users.</td><td></td></tr>
<tr><td>St. Margaret's
</td><td>This is now an off-road section approximately 0.5km in length through agricultural land. The use of the local road network in this area was considered to be technically challenging due to potential risk of disruption to strategic infrastructure associated with the airport (i.e. runway landing lights). An off-road corridor will minimise risk.</td><td></td></tr>
<tr><td>M1 to Belcamp
</td><td>This is now an off-road section approximately 3.5km in length through agricultural and industrial land. The use of the local road (Stockhole Lane) was identified to perform less successfully against the other options due to potential disruption during construction and the presence of numerous existing utilities. An off-road corridor will minimise disruption to the local community, businesses and road users.
Feasible route options have been developed at this location however the</td><td></td></tr>
</table>

Emerging Best Performing Option	Reason for the Change	Best Performing Option
	route remains subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5. The potential for this off-road section to become a wider 'transmission cable corridor' has been discussed with affected landowners on the approach to Belcamp substation and continues to be investigated and assessed, for potential development under future EirGrid projects.	

3.5 Summary of Route

The following sections of this chapter describe the Best Performing Option travelling from Woodland substation to Belcamp substation. For ease of reference, the route has been broken into sections in this report. It is noted that at the construction phase, the route may be progressed by multiple construction teams working at different locations (i.e., not necessarily working sequentially from Woodland to Belcamp). This will be addressed in the Step 5 reports.

See Appendix A for figures illustrating the Best Performing Option.

3.5.1 Woodland to R156

Figure 3-2: Woodland to R156

At Step 4A, a wider area as shown in Figure 3-2 was situated from Woodland substation to the R156. As part of Step 4B, several routing options were considered in accordance with the routing principles for the Proposed Project (see Chapter 2 of this report for further details). The option of an in-road section using the Red Bog Road and the Red Road to connect to the R156 was considered. However, this was not preferred due to the presence of two existing masonry arch road bridges, which were assessed to be unsuitable for the cable. Alternative design solutions (such as cable bridges) and off-road routes were considered in these areas. However, the area is constrained by residential properties and farm buildings adjacent to the bridges. Short off-road diversions at the bridges would have resulted in impacts to the properties and farm buildings and so this option was not preferred. Both the Red Road and Red Bog Road are also vital access routes to the substation itself and the East-West Interconnector station. As a result, any route along these roads, or immediately adjacent, could risk disruption to the operation of these stations particularly during the construction phase.

These issues required the project team to identify an alternative off road route. This is in-line with the routing principles for the Proposed Project, which aim to find the best overall option considering all issues. While there is a preference for on-road sections in the routing principles, that preference is to be considered on balance with all factors. In this case an off-road route was determined to be the Best Performing Option in this location. The route also shares a corridor with another EirGrid underground project, CP966 Kildare Meath UGC, ensuring efficiencies across the two projects and minimisation of potential impacts.

Consultation with landowners between Woodland substation and the R156 helped to identify a viable route for the cable. Potential impacts to the affected area have been discussed and the route has sought to minimise these effects.

The route will cross approximately 17 hedgerows and treelines and there will be a crossing of the Dunboyne Stream_010. There are field drains along hedgerows and treelines which will also require crossing. There are cultural heritage features (ring ditches) with the potential to be directly impacted. Construction may also impact any previously unknown archaeological remains that may be present (this applies to all off-road sections of the route). An assessment of the potential impacts of the proposed route was undertaken in the Step 4A Report for the Proposed Project; however further assessment will be undertaken at Step 5. Where it is required, mitigation will be proposed in the Step 5 reports to avoid or reduce the potential impacts.

Part of the cable route is shown outside of the north-west corner of the wider area. The route follows the field boundary at this location and a small additional area has been included to avoid potential severance of this portion of land.

3.5.2 R156 and R157

Figure 3-3: R156 and R157

This section of the route, illustrated in Figure 3-3, is in-road with no off-road sections. This section of the route joins the R156 close to Barstown Industrial Estate. The route travels east along the R156 towards Dunboyne.

There are two watercourse crossings where the cable circuit will remain in-road and cross above the bridge or culvert structures. The detail of the crossing will be confirmed at Step 5 following further technical surveys and assessment work, and consultations with Meath County Council. At the roundabout with the R157 and Summerhill Road (a local road), the route again crosses the Dunboyne Stream_010 watercourse on the circulatory carriageway of the roundabout. It is proposed to cross the watercourse on the road, above the watercourse structure. From this location, the route travels to the north along the R157 towards Junction 5 (Dunboyne) on the M3 Motorway. Along this section, the cable route crosses over the Tolka_020 watercourse within the road. It is proposed to cross the watercourse on the road, above the watercourse structure.

Continuing towards the junction with the M3 Motorway, the cable route will pass through the roundabout providing access to the M3 Parkway rail station and car park. It is understood that this roundabout may be upgraded to an alternative junction type as part of the development of adjacent land, however it is anticipated that the cable route will remain in-road at this location.

3.5.3 M3 Motorway

Figure 3-4: M3 Motorway

At Step 4A a wider area, as shown in Figure 3-4, was situated around the M3 Motorway crossing. The reason for the wider area was that the surrounding area is subject to planned development and engagement with local landowners and other interested parties was ongoing in order to determine the proposed route in this location. This wider area has been refined and reduced in size, as illustrated in Figure 3-4.

Several technically feasible options have been developed and assessed against environmental constraints These options have also been discussed with relevant landowners and stakeholders.

The route within the retained wider area is subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5.

3.5.4 L5026, L1010 and L1007

Figure 3-5: L5026, L1010 and L1007

This section of the route, illustrated in Figure 3-5, is largely in-road with the potential for several localised off-road sections at watercourse crossings. It joins the L5026 close to the junction with the R147 adjacent to the M3 Motorway. The route travels east along the L5026 passing through the townland of Whitesland. At the junction with the L1010, the route turns to the north-east, following the L1010, before turning east again through Nuttstown, currently following an on-road route to facilitate the crossing of two watercourses, both tributaries of the Pinkeen_010.

As the route continues eastward toward Kilbride, there is an on-road section to cross the Ward_010 watercourse. The route passes through Priest Town, and before reaching the junction with the L1007, follows a localised off-road section again crossing the Ward_010 watercourse. From this location, the route turns south-east following an on-road route along the L1007.

Approaching Hollystown, the route remains on-road using existing watercourse structures to cross over three tributaries of the Ward_020. Immediately north of Hollystown, opposite Kilmartin Lane, the route turns off-road to the south-east.

There is a recorded monument (AY_18) to the south of the route in Ballingtry townland. However, it is not anticipated to be directly impacted. Further assessment will be undertaken at Step 5, and where it is required, mitigation will be proposed in the Step 5 reports to avoid or reduce the potential impacts.

Off-road watercourse crossings may be required where there is an existing bridge in the road, which technical assessments have determined may not be suitable to accommodate the proposed cable circuit, due to the limited depth of the bridge structure. The crossing types at these watercourses could be trenched or trenchless crossings, such as cable bridges or HDD. The crossing type will be resolved at Step 5 following further surveys, assessment, and engagement with affected landowners, Meath and Fingal County Councils and other key stakeholders (such as Inland Fisheries Ireland).

Throughout a significant portion of this section of the route, from the junction with the R147 to the Priest Town Cross Roads, the route shares road space with an existing MV (medium voltage) cable. At certain pinch points, particularly on bends where the MV cable 'weaves' from one side of the road to the other, it may be necessary to consider local diversions of the MV cable and/or localised off-road sections of the proposed cable circuit. This will be resolved at Step 5 following further surveys, assessment, and engagement with affected landowners, Meath County Council and other key stakeholders.

3.5.5 Hollystown

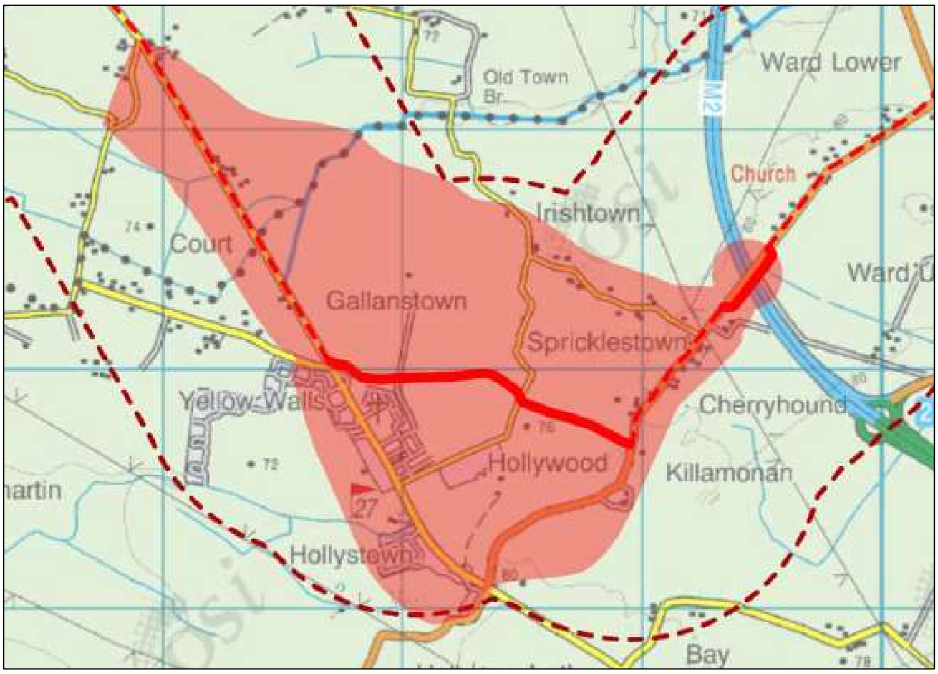


Figure 3-6: Hollystown

At Step 4A, a wider area as shown in Figure 3-6 was situated around the villages of Kilbride, Hollystown and the adjacent L1007 and R121. As described in Section 3.5.4, the route remains predominantly on-road along the L1010 and L1007 through the village of Kilbride, with only localised off-road sections to facilitate watercourse crossings.

As part of Step 4B, several routing options were considered in accordance with the routing principles for the Proposed Project (see Chapter 2 of this report for further details). The option of an in-road section using the L1007 through Hollystown to connect to the R121 at the roundabout with Hollywoodrath Road was considered. However, this was not preferred due to the presence of numerous utilities in Hollystown and the potential need for utility diversions to facilitate the construction of the cable circuit. This could require full road closures that would lead to significant levels of disruption to road users and the local community.

These issues required the project team to identify an alternative off-road route. While there is a preference for on-road sections in the routing principles, that preference is to be considered on balance with all factors. In this case, an off-road route was determined to be the Best Performing Option in this location.

Engagement with landowners to the north-east of Hollystown, between the L1007 and R121, helped to identify a viable route for the cable circuit. Potential impacts to the affected area have been considered and the route has sought to minimise these impacts.

The route will cross approximately eight hedgerows and treelines and traverse Ballymacarney Road. There are field drains along several hedgerows and treelines that will also require crossing. Where it is required, mitigation will be proposed in the Step 5 reports to avoid or reduce the potential impacts. There are cultural heritage features in this area that could be impacted. Further assessment will be undertaken at Step 5, and where it is required, mitigation will be proposed in the Step 5 reports to avoid or reduce the potential impacts.

3.5.6 R121 and R122

Figure 3-7: R121 and R122

This section of the route, illustrated in Figure 3-7, is predominantly in-road with two localised off-road sections. There are two watercourse crossings in this section of the route.

Following the off-road section at Hollystown, the route turns back on-road at Killamonan, following the R121 to the north-east. At the M2 Motorway, the route follows a localised off-road section, to allow for an HDD crossing to the south of overbridge (it was not possible to take the overbridge itself due to a lack of space for the cable). The route remains on-road to cross the roundabout with the R135 and continues to follow the R121 through the townlands of Ward Lower, Newpark and Shallon.

As the route passes from Newpark to Shallon, there is a localised off-road section in order to cross the Ward-030 watercourse to the south of the existing road.

At the junction with the R122 in Skephubble, the route turns to the south-east following an on-road route through Ballystrahan. At the junction with Toberburr Link Road (known locally as Kilreesk Lane), the route turns from the R122 onto Toberburr Link Road in an easterly direction towards St. Margaret's where the route stays on-road to cross the Ward_030 watercourse.

There are cultural heritage features in this section of the route (including four recorded monuments, of which two are also protected structures) that could be impacted. Further assessment will be undertaken at Step 5, and where it is required, mitigation will be proposed in the Step 5 reports to avoid or reduce the potential impacts.

3.5.7 St. Margaret's

Figure 3-8: St. Margaret's

At Step 4A, a wider area, as shown in Figure 3-8, was situated near St. Margaret's between the Toberburr Link Road and the R108.

As part of Step 4B, several routing options were considered in-line with the routing principles for the Proposed Project (see Chapter 2 of this report for further details). The option of an in-road section using Toberburr Link Road to connect to the R108 at Kingstown Crossroads was considered. However, this was not preferred due to the presence of airport infrastructure (runway landing lights) and the need for two crossings of a watercourse (Ward_020).

These issues required the project team to identify an alternative off-road route. This is in line with the routing principles for the Proposed Project, which aim to find the best overall option considering all issues. While there is a preference for on-road sections in the routing principles, that preference is to be considered on balance with all factors. In this case an off-road route was determined to be the Best Performing Option in this location.

Engagement with the landowner between Toberburr Link Road and the R108 near St. Margaret's helped to identify a viable route for the cable circuit. Potential impacts to the affected area have been considered and the route has sought to minimise the effects. This route also has the additional benefit of a shorter overall route with fewer bends.

The route will cross approximately three hedgerows and treelines. There are no watercourse crossings or field drains. Where it is required, mitigation will be proposed to avoid or reduce the potential impacts in the Step 5 reports. There are no known archaeological features directly impacted by the proposed route. An assessment of the potential impacts of the proposed route was undertaken in the Step 4A Report for the Proposed Project. However, further assessment will be undertaken at Step 5.

3.5.8 R108, L2020 and L2753

Figure 3-9: R108, L2020 and L2753

This section of the route, illustrated in Figure 3-9, is all in-road with no off-road sections. There are two watercourse crossings in this section of the route.

Following the off-road section near St. Margaret's, the route turns back on-road, following the R108 Naul Road to the east and remaining in-road over a watercourse (Ward_030). At the roundabout at Forest Great, the route remains on-road, following the L2020 to the east, passing through Forest Little and remaining in-road over a watercourse crossing (Sluice_010). The route remains on-road to cross the roundabout with the R132 and follows the L2753 in an easterly direction, through the townland of Cloghran towards the M1 Motorway.

There are cultural heritage features in this section of the route (including two recorded monuments) that could be impacted. Further assessment will be undertaken at Step 5, and where it is required, mitigation will be proposed in the Step 5 reports to avoid or reduce the potential impacts.

3.5.9 M1 to Belcamp

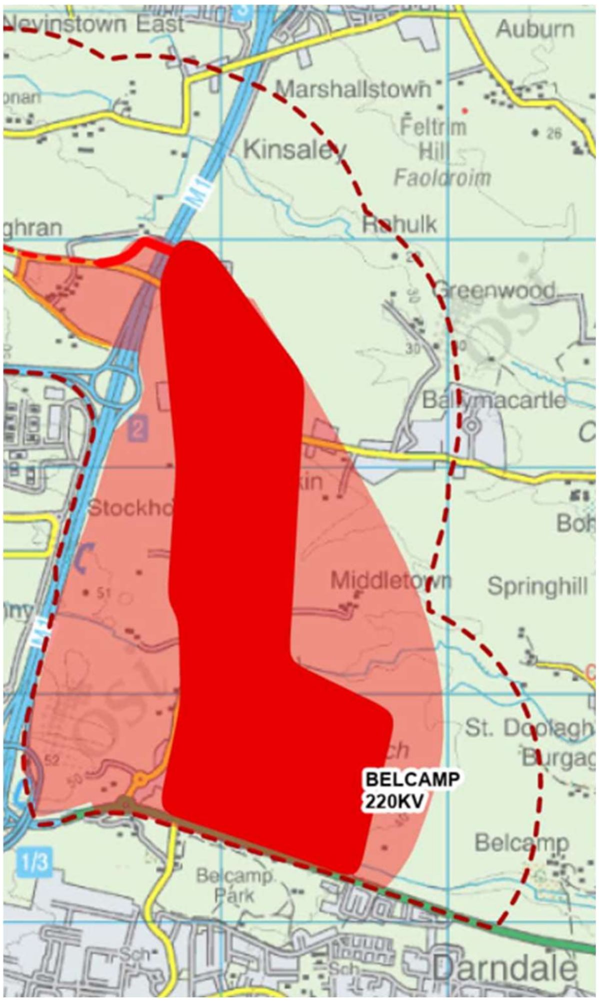


Figure 3-10: M1 to Belcamp

At Step 4A, a wider area, as shown in Figure 3-10, was situated from the M1 Motorway to Belcamp substation. As part of Step 4B, several routing options were considered in-line with the routing principles for the Proposed Project (see Chapter 2 of this report for further details). The option of an in-road section using the L2051 (Stockhole Lane) to connect to the R156 was considered. However, this was not preferred due to the presence of several existing and planned utilities and the potential need for utility diversion works. This would likely require full road closures that would lead to significant levels of disruption to road users, the local community and local businesses.

These issues required the project team to identify an alternative off-road route. This is in line with the routing principles for the Proposed Project, which aim to find the best overall option considering all issues. While there is a preference for on-road sections in the routing principles, that preference is to be considered on balance with all factors. In this case, an off-road route was determined to be the Best Performing Option in this location.

Engagement with landowners between the M1 Motorway and Belcamp substation is ongoing. Feasible route options have been developed at this location however the route remains subject to ongoing engagement with key stakeholders and local landowners and will be confirmed during Step 5.

3.6 Conclusion

Continued assessment, design and surveys, along with engagement with key stakeholders, including local communities and landowners, has enabled refinements of the Emerging Best Performing Option and the identification of the Best Performing Option.

The route refinements described herein have changed the length of the cable route from 36.5km to 37.7km, representing a difference of 1.2km. Within this 37.7km, there is also an increase to the off-road length, from 8.7km to 10.8km.

This increase in off-road length is largely due to the changes in the route design in the wider refinement areas, where the cable route is now predominantly crossing agricultural land. The increase in the overall length will slightly increase the overall cost of the Proposed Project. However, it was concluded that these route refinements were minor and did not materially alter the assessment of Option A (Red), as presented in the Step 4A Report. It has been concluded that Route Option A (Red) remains the Emerging Best Performing Option and that the route shown in this Step 4B Report is the Best Performing Option.

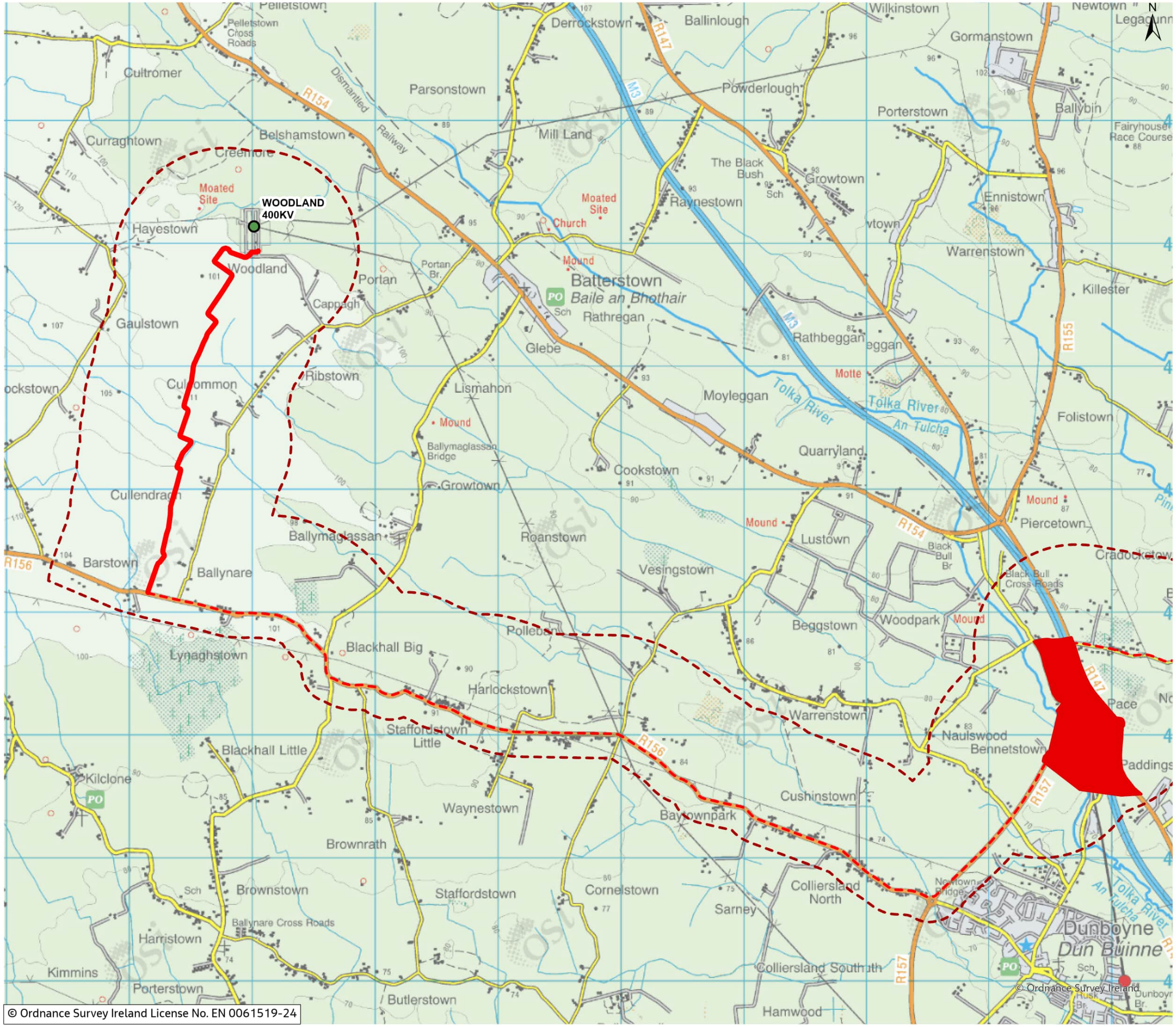
It is likely that further minor route refinement work will be required at Step 5, following additional design, surveys, engagement, and assessment. As in previous steps, feedback on the developing design will be sought from affected landowners, local communities, and prescribed bodies and further details will be provided to the public via EirGrid’s website. Additional design features may also be incorporated at Step 5, but these will generally be accommodated within the area of the route described. This will be determined at Step 5.

4. Next Steps

The following actions will be completed on the Proposed Project:

- Publication of this Step 4B Report and any feedback reviewed by the project team with amendments considered where appropriate;
- EirGrid will continue to engage with affected landowners, local communities, local councillors, the Community Forum, and other relevant stakeholders to discuss the Proposed Project;
- EirGrid will continue to engage with bodies such as Meath and Fingal County Councils, Transport Infrastructure Ireland, Inland Fisheries Ireland, Irish Rail, and utility providers such as Uisce Éireann and Gas Networks Ireland. Initial meetings have taken place and subsequent meetings will be facilitated to examine further details of the proposed route design;
- EirGrid will engage with environmental stakeholders such as Inland Fisheries Ireland, the National Parks and Wildlife Service, Uisce Éireann and local authority heritage officers. Matters discussed will include the agreement of watercourse crossing mitigation and reinstatement principles. EirGrid will incorporate biodiversity enhancement into the design (e.g., as a minimum, including species-rich reinstatement of hedgerows that are to be temporarily removed for passing bays). Natural recolonisation will be adopted, in lieu of sowing commercial wildflower seed in the reinstatement of semi-natural habitats. All biodiversity enhancement methods will be discussed in consultation with relevant stakeholders;
- Confirmation of Strategic Infrastructure Development status of the Proposed Project under the Planning and Development Act, 2000 (as amended) will be sought. Commencement of pre-planning consultation with An Bord Pleanála;
- Completion of a wide range of surveys to inform the development of the route design. This will include consideration of the approach to the construction phase and potential mitigation measures, such as traffic management, to minimise traffic disturbance. Surveys include archaeology, ecology, agriculture, ground investigations, utility surveys, hydrology and technical assessments. As these surveys are progressed and further information is gathered, new issues may be identified, resulting in changes to the route. This is a normal part of the design development process;
- Further design work will be progressed at the substations to determine the works required to connect the proposed cable into the grid;
- The project team will prepare the planning submission (Step 5) for the Proposed Project. This work will include planning and environmental reports, which will describe the final design of the Proposed Project, outline the potential impacts, and identify the mitigation measures that will be put into place to avoid or reduce any impacts; and
- Further updates will be published by EirGrid on the project website: https://www.eirgridgroup.com/the-grid/projects/cp1021/the-project/

Appendix A. Best Performing Option Figures



Drawing Number-

Legend

- Substation
- Study Area
- Proposed Cable Route - On-Road Section
- Proposed Cable Route - Off-Road Section
- Refined Off-Road Focus Area

0 — 1 Km

0	Sep 2023	Initial Issue	SMD	GS	GS	AS
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

Client: EirGrid

Project: East Meath to North Dublin Grid Upgrade

Drawing Title: Step 4B Report
Best Performing Option
Sheet 1 of 3

Drawing Status: DRAFT

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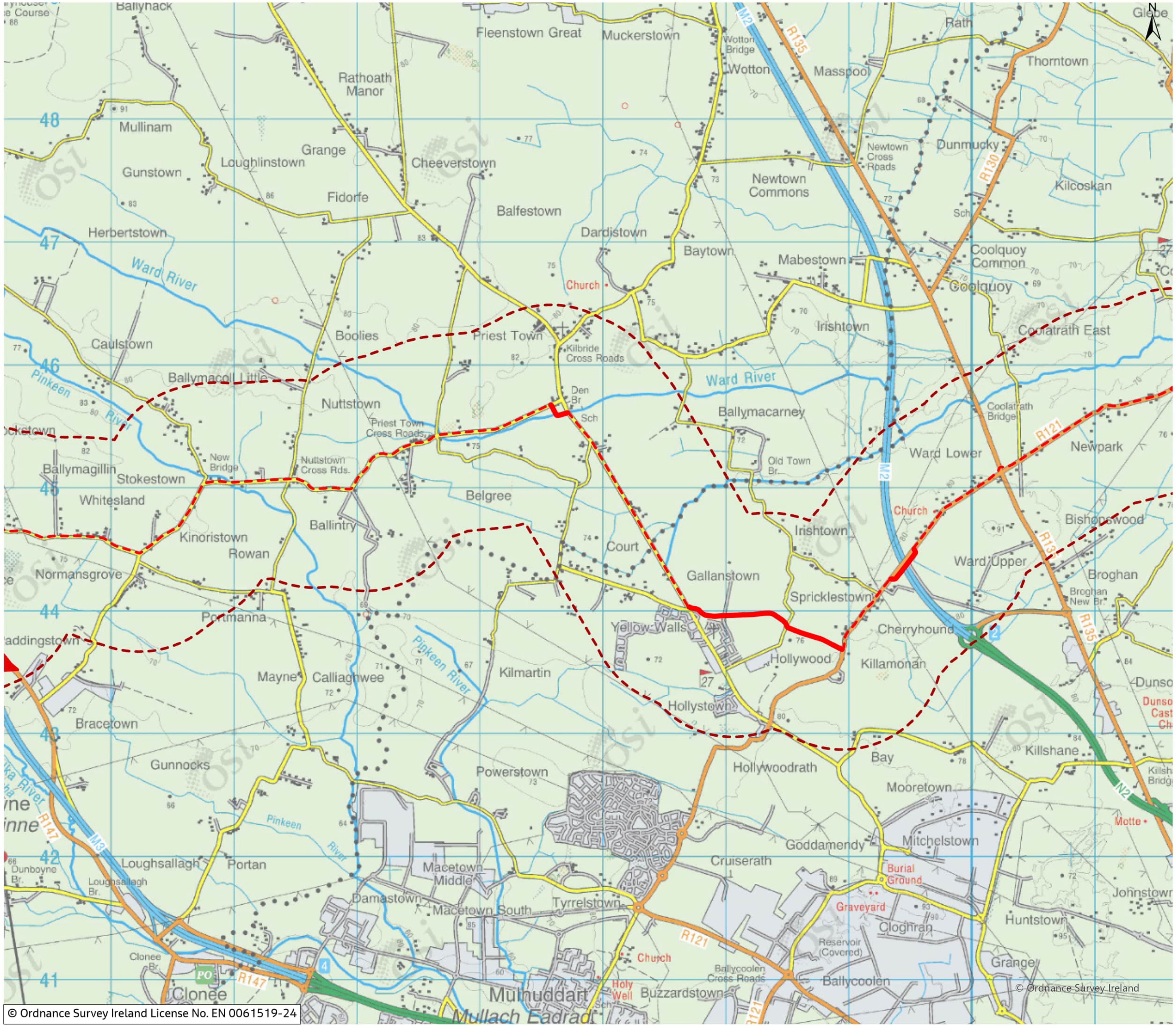
Jacobs No.	B321084AO	

Drawing No. Drawing Number -



Drawing Number-

Legend

- Study Area
- Proposed Cable Route - On-Road Section
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0 — 1 Km

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Sep 2023	Initial Issue	SMD	GS	GS	AS

Jacobs

Client: EirGrid

Project: East Meath to North Dublin Grid Upgrade

Drawing Title: Step 4B Report Best Performing Option Sheet 2 of 3

Drawing Status: DRAFT

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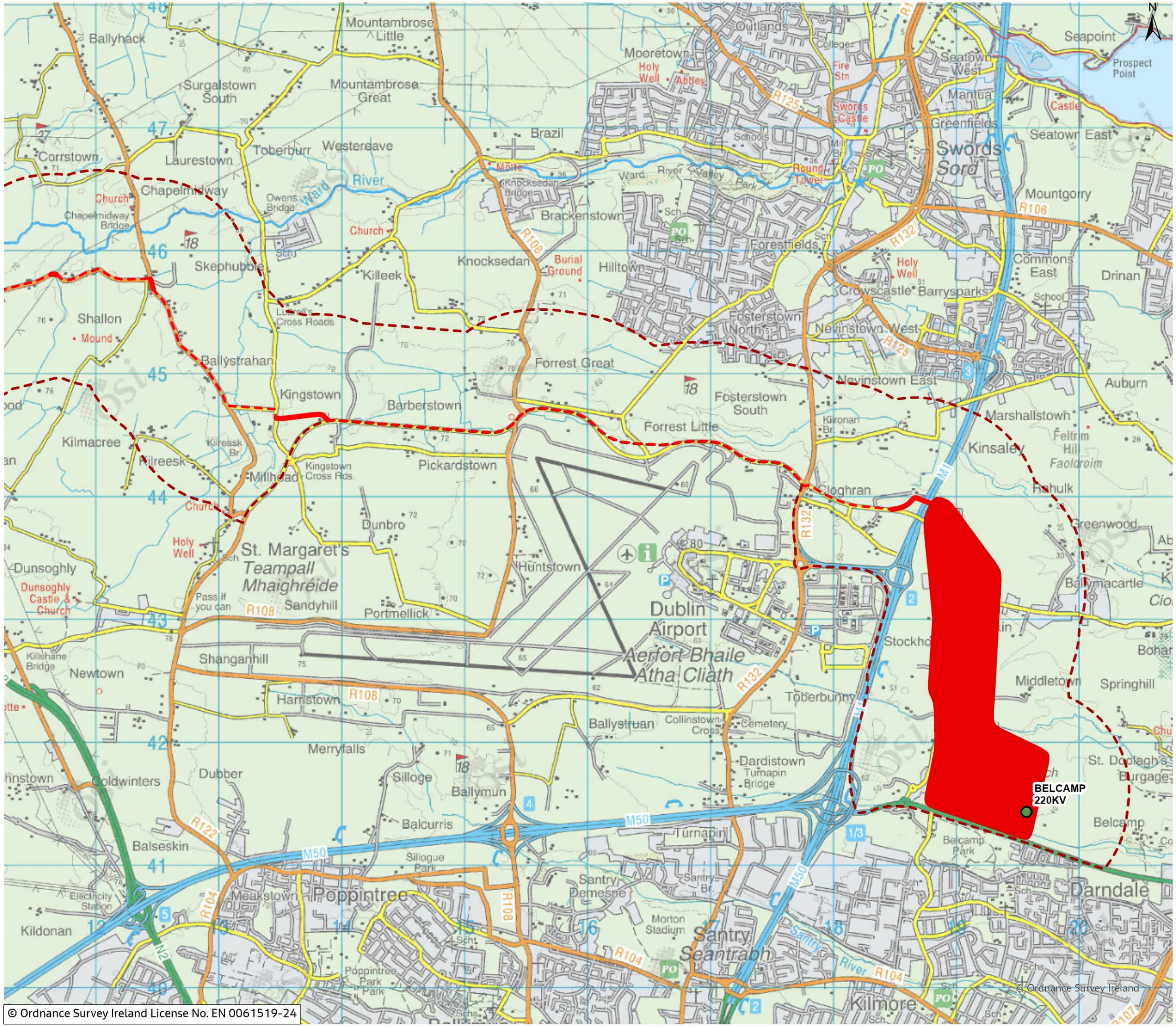

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Legend

- Substation
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0 1 Km

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	Sep 2023	Initial Issue	SMD	GS	GS	AS

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Client

EirGrid

Project

East Meath to North Dublin Grid Upgrade

Drawing Title

Step 4B Report
Best Performing Option
Sheet 3 of 3

Drawing Status

DRAFT

Scale @ A3	1:30,000	DO NOT SCALE
OSI Sheet No.		
Jacobs No.	B321084AO	
Drawing No.	Drawing Number -	

East Meath-North Dublin Grid Upgrade Step 4 Engagement and Consultation Summary Report

Document no: 321084AJ-REP-016
Revision no: 03

EirGrid
CP1021

East Meath – North Dublin Grid Upgrade
24 February 2023

Jacobs

East Meath-North Dublin Grid Upgrade Step 4 Engagement and Consultation Summary Report

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Project name:	East Meath – North Dublin Grid Upgrade		
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Executive summary

This report provides a summary of engagement and consultation activities carried out by EirGrid at Step 4 of the East Meath-North Dublin Grid Upgrade. The activities included a public consultation, which ran for 12 weeks from 7 September 2022 to the 30 November 2022. EirGrid also convened three focus groups in November 2022 and carried out several other engagement activities, including stakeholder meetings, in person information days and webinars.

EirGrid sought views on four different route options for the East Meath-North Dublin Grid Upgrade. Feedback was also invited on EirGrid's wider approach to the project and suggestions for any major events and festivals in the area that should be considered in scheduling the project.

Contents

1. Introduction

1.1 About the report

This report provides a summary of engagement carried out during Step 4 of East Meath-North Dublin Grid Upgrade project. Traverse, an independent consultancy specialising in engagement and consultation analysis, was commissioned to report on the findings. Jacobs was subsequently commissioned to audit these findings and prepare this report.

1.2 The East Meath-North Dublin Grid Upgrade

EirGrid is the state-owned operator of Ireland's electricity transmission grid. It is responsible for a safe, secure and reliable supply of electricity in Ireland. Since 2006, EirGrid has operated and developed the national high voltage electricity grid and wholesale market in Ireland. The grid moves wholesale power around the country by bringing energy from generation stations to heavy industry and high-tech users. The grid also supplies the distribution network operated by ESB (Electricity Supply Board) Networks that powers every electricity customer in the country.

This project is a proposed development to reinforce the network between east Meath and north Dublin. Reinforcement of this part of the network is needed to continue to ensure the security of the network feeding the east of Meath and the north of Dublin, between Woodland, Clonee, Corduff, Finglas and Belcamp substations.

The project will help meet the growing demand for electricity in the east of the country due to the increased economic activity and population growth in recent years in Kildare, Meath and Dublin.

It will also enable further development of renewable energy generation in line with Government policy. Renewable energy accounted for 36% of all electricity consumed in Ireland in 2019 and is expected to grow to 70% within 10 years. Ireland's Climate Action Plan 2023 calls for up to 80% of the country's electricity to come from renewable energy sources by 2030.

1.3 Engagement Approach and Background

EirGrid is following a six-step approach to developing the grid. This is set out in full in EirGrid's *Have your say* document:

https://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Have-Your-Say_May-2017.pdf

1) Identifying the future needs of the electricity grid;
2) What technologies can be used to meet these needs;
3) The best option and the areas affected;
4) The location of the grid;
5) The planning process; and
6) Construction, energisation, and benefit sharing.

In 2017 EirGrid confirmed the need for the East Meath – North Dublin Grid Upgrade. It took a shortlist of seven options into Step 2 which comprised of a range of technology options and different station nodes and held a public consultation in 2020.

The options were assessed under the following five categories:

- Technical,
- Economic,
- Environmental,

- Socio-Economic, and
- Deliverability.

Figure 1: EirGrid's assessment categories

Following the outcome of the multi-criteria assessment (MCA) process and the consultation, EirGrid identified four best-performing technology circuit options to explore in Step 3. In 2021 EirGrid carried out feasibility studies on each of the four options and concluded that only one of those options would be progressed further.

The option taken forward into Step 4 for this grid upgrade, is a 400kV underground cable from Woodland substation in County Meath to Belcamp substation in north Dublin. Four different route options were put forward and these can be seen in figure 2:

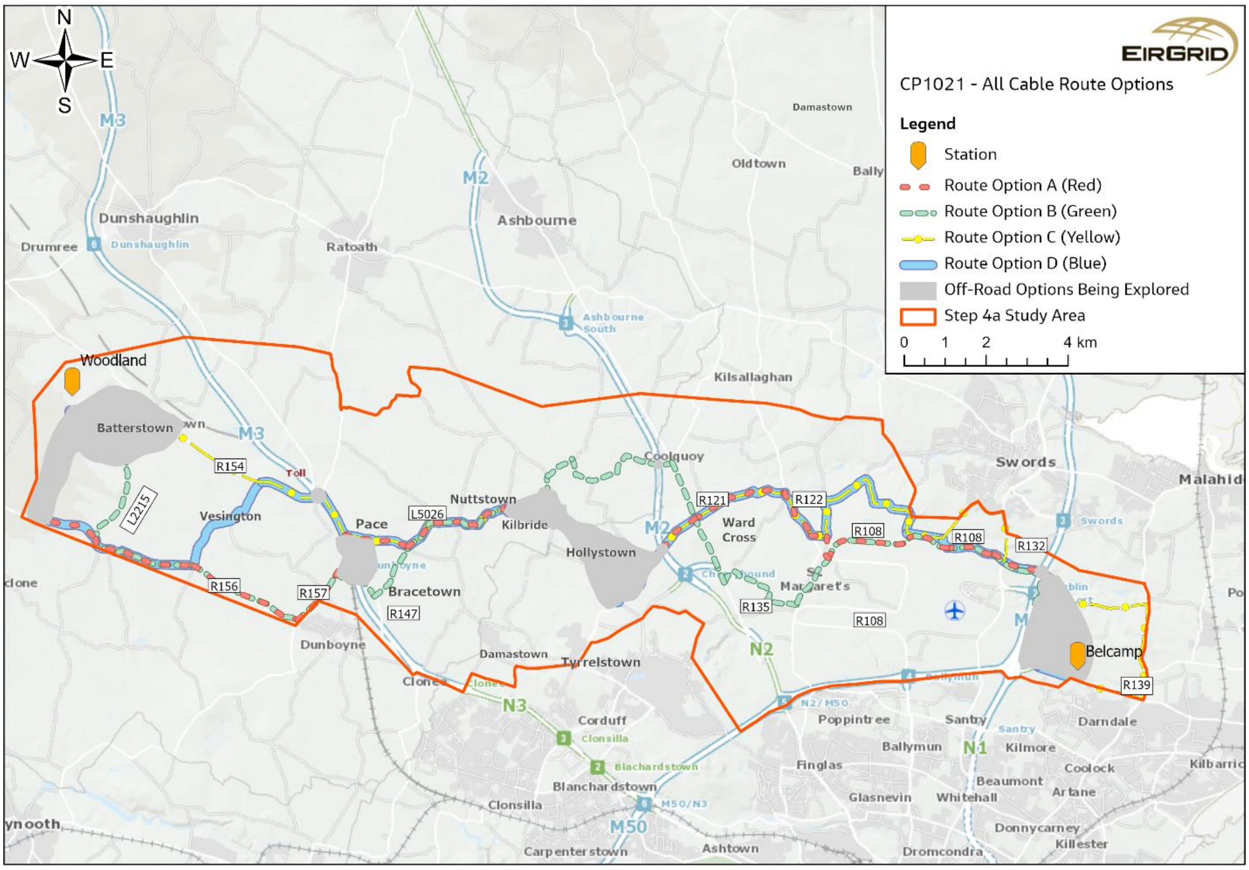


Figure 2: EirGrid's four proposed route options.

1.3.1 Step 4 Engagement and Consultation Plan

The six-step approach to public consultation provides the basis for all communications on East Meath to North Dublin.

The approach to engagement outlined in *Have Your Say* recommends:

- Involving members of the public and stakeholders early in the process so they are more able to influence plans;
- Providing information in plain English, online and in paper form;
- Providing enough time for people to contribute their views;
- Offering clear opportunities for engagement and ways to influence the decision-making process;
- Explaining decisions that need to be taken and factors that influence those decisions; and;
- Communicating with everyone who has taken the time to engage with the project.

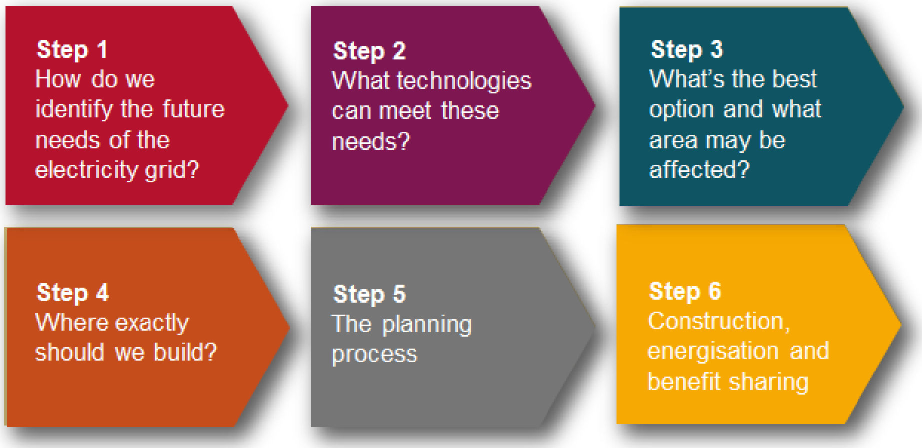


Figure 3: EirGrid's six step process to developing the grid.

EirGrid developed a Step 4 Consultation and Engagement Plan. The purpose of engagement at this step is as follows:

- Gain a better understanding of the local area and how the community will be affected by the project;
- Obtain feedback to influence the design;
- Understand which locations for new infrastructure are favoured by local people;
- Harness local knowledge to inform choice of preferred route or site;
- Ensure everyone has an opportunity to make their views known and that the consultation process is clearly understood.

Additionally, specifically for East Meath to North Dublin in Step 4, the purpose of the engagement included:

- To provide information about the project and each of the options under consideration so members of the public and stakeholders can provide informed feedback via engagement and consultation;
- Ensure local communities are part of the decision-making process and understand potential benefits;
- Mitigate risks to project delivery by addressing public concerns;
- Set up engagement methods for future engagement, for example a Community Forum.

2. Step 4 Engagement

This section details the engagement activities undertaken in Step 4.

2.1 Communication Activities

The following activities were carried out by EirGrid to promote the engagement process and raise awareness of the project.

- Email correspondence
- Freepost Questionnaire
- Print and online media
- Radio
- Social and digital media
- Stakeholder Meetings

2.1.1 Freepost Questionnaire

12,000 Freepost Questionnaires were printed and delivered in the first 2.5 weeks of the consultation between 7 and 28 of September 2022 across the study area. This was extended to up to 1km beyond the study area boundary in some areas to capture additional stakeholders and commuters through the study area. For a sample, please see Appendix B.

2.1.2 Radio

Three radio campaign bursts were scheduled on FM104 and LMFM between the launch on the 7 September and the close of the consultation on 30 November 2022. 504 spots in total ran across three bursts (168 per burst). Both FM104 and LMFM provided the best coverage in the target locations in the Study Area.

A Digital Audio campaign ran on Spotify targeting Meath and Dublin area with the overall delivered impressions of 433,494.

Radio Station	Dates
FM104 and LMFM	5 -25 September 2022
FM104 and LMFM	10 – 30 October 2022
FM104 and LMFM	14 – 30 November 2022

2.1.3 Press

21 Newspaper adverts were published across the Dublin People (Northside East, Northside West), Meath Chronicle and the Meath Herald over the 12-week consultation period.

A Press Release was issued to regional media six times over the consultation period and picked up by several regional and local press. For a sample of the press release see Appendix F.

2.1.4 Social Media

EirGrid shared information about the project, feedback mechanisms and the public events on their social media channels, Facebook, Twitter and LinkedIn.

Social ads ran on Facebook and Instagram (Meta) and Twitter for the duration of the consultation (7 September – 30 November 2022). On Meta, radius targeting was used to target the location within the study area and on Twitter geographical targeting was used to target by county. There were 2,655 link clicks on Meta and 2,707 on Twitter.

EirGrid published 64 posts organically on its social media channels. Of those posts, 32 were made on Twitter, 25 on Facebook and 7 on LinkedIn, reaching a total number of 1,494 engagements (reactions, comments, shares, post clicks).

EirGrid ran digital OOH (Out of Home) in 8 lifestyle screens, Tesco Live, Digitowers and Digihubs with the Study Area from 22 September to the close of the consultation on 30 November 2022. For a sample please see Appendix G.

2.2 Engagement Activities

The following engagement activity was undertaken and all feedback was documented after each engagement activity to feed into the overall findings during the consultation period. An overview of this feedback is provided in section 2.3

2.2.1 Key Stakeholder Meetings

EirGrid hosted seven online meetings with the following key stakeholders:

Stakeholder	Date
ESB	20 September 2022
Transport Infrastructure Ireland (TII)	25 October 2022
Ratoath Municipal District	27 October 2022
Fingal PPN Housing, Planning and Transport Linkage Group	27 October 2022
Meath County Council	10 November 2022
Irish Water	24 November 2022
Fingal County Council	10 January 2023

2.2.2 Mobile Information Unit

EirGrid engaged with approximately 40 stakeholders over the course of three days between 15 – 17 November 2022 as they travelled across the study area in a dedicated Mobile Information Unit (MIU). The MIU visited the following areas:

- Tuesday 15 November
  - Caffreys, Trim Road, Batterstown, Co Meath (10am-1pm)
  - Coolquoy Lodge, North Road Old N2, Dublin, Dublin 11 (2pm-5pm)
- Wednesday 16 November
  - Kinsealy Garden Centre, Malahide Road Dublin Co Dublin (10am-1pm)
  - Sweeneys, Kilbride Rd, Priest Town, Co. Meath (2pm-5pm)
- Thursday 17 November - Coachman's Inn, Cloughran, Airport Road Dublin (10am-2pm)

2.2.3 Open Days

EirGrid held six open days from 11am to 7pm at the following venues between 28 September and 27 October 2022:

- Wednesday 28 September – Atrium County Hall, Swords, Co Dublin
- Thursday 29 September – Coolquoy Lodge, North Road old N2, Dublin, Dublin 11
- Wednesday 12 October – Hilton Hotel, Malahide Road, Dublin 17
- Thursday 13 October – Sweeneys, Kilbride Rd, Priest Town, Co. Meath
- Wednesday 26 October – St Margaret's GAA , Ballystrahan, St Margaret's, Co. Dublin
- Thursday 27 October – Caffreys, Trim Road, Batterstown, Co Meath

Members of the EirGrid project team were in attendance to answer any queries from members of the public and interested parties.

2.2.4 Webinars

EirGrid held three webinars for members of the public and stakeholders on 13 September, 12 October, and 17 November 2022. Members of the public could register to attend via an online registration form on the project website.

Webinar	Date
One	Wednesday 14 September 2022
Two	Tuesday 4 October 2022
Three	Thursday 17 November 2022

2.2.5 Door-to-Door Engagement

Door-to-Door Engagement was carried by the EirGrid Community Liaison Officers (CLOs) to coincide with the public consultation that ran from the 7 September and 30 November 2022.

CLO's visited homes in the vicinity of Woodland Substation on the 7 and 8 September 2022. Over 125 homes and residents were visited.

Kilbride Village Door-Door Engagement was carried out on 24 November 2022 whereby circa 25 homes were visited. Several residents were recorded as not at home, so brochures were left in their post-boxes.

2.2.6 Community Forum

The East Meath – North Dublin Community Forum was set up at the end of Step 3 with the intention of bringing together people and organisations from across the project area so that stakeholder and community views can be discussed, understood, and carefully considered prior to and during project delivery. In addition, Fingal County Council and Meath County Council were invited to nominate elected representatives onto the forum.

The first Community Forum took place online on 10 August 2022. Four further community forums took place on dates between September and November 2022. Three meetings in September, October & November were online and the first face to face meeting with the group at Coolquay Lodge in October.

Forum	Date
One	10 August 2022
Two	6 September 2022
Three	6 October 2022
Four	17 October 2022
Five	21 November 2022

The forum will continue to meet regularly for the duration of the project to discuss project updates, provide feedback, and ensure two-way communication is ongoing.

2.2.7 Focus Groups

Three focus groups were convened in November 2022 across the study area to gain further insights from members of the local community. Further details can be found in section 2.4.

2.3 Overview of Step 4 Engagement Feedback – General

Feedback in this section represents data and responses collected from stakeholder that attended Community Forum meetings, door-to-door engagements, Open Days and the Mobile Information Unit (MIU) events.

2.3.1 Overview of Opinions

2.3.1.1 General Feedback and Communication

Stakeholders expressed broad support for the project. Some commented that they understood the need for the development due to increasing national demand.

Many praised the information provided at the MIU and the opportunity to have their questions answered. Stakeholders expressed support for the approach taken at the events and EirGrid's willingness to engage with the public.

Conversely, other stakeholders commented that they felt the approach taken for the project was incorrect, although did not supply further detail as to why.

Several expressed an interest in finding out more information about the nature of the project, particularly the construction process and the timeline. Stakeholders also asked for further information about how feedback received to date had been considered.

In addition, stakeholders requested that EirGrid keep them updated and asked for accurate communication throughout the project. Many suggested there was a need for more engagement and communication from EirGrid, including flyers in pubs and garages.

Stakeholders had queries about the impact of electromagnetic fields (EMF) and some commented that the open day events should have had information on EMF and potential health impacts of the project.

A few people also had queries about the routes of the underground cables and general queries but the nature of these was not recorded.

There was confusion amongst stakeholders on the naming conventions and location of Kilreesk Lane and Killeek Lane between Google Maps and local information. EirGrid provided clarification at the Community Forum.

Stakeholders requested information about the status of other EirGrid projects such as the North South Interconnector, including the Louth-Woodland 220 kV uprate.

2.3.1.2 Congestion and Disruption

Stakeholders expressed concerns about disruption, particularly traffic disruption, with one stakeholder questioning whether the construction works would affect the road on which they live close to Kilbride Village. Furthermore, stakeholders expressed concerns about access to their dwellings/ communities during construction.

A number also raised concerns about the impact on traffic on narrow roads, including the L5026 and roads in Kilbride, and on roads described as 'rat runs'. Other stakeholders did not specify roads but also expressed concern that narrow roads might necessitate road closures as well as expressing concerns about general traffic management.

Stakeholders requested details of road layouts and plans. Stakeholders asked that EirGrid avoid using Malahide Road due to its existing congestion issues. Other stakeholders requested that EirGrid avoid using any roads wherever possible.

Feedback was also received about the impact of the project on harvest time which requires the use of trailers.

Stakeholders expressed concerns about any potential impacts of the project on the overall price of electricity and whether it could lead to blackouts.

2.3.1.3 Design

One stakeholder requested the choice of a route which does not impact their land and noted that Irish Water mains were being built on their land.

Some suggested that the route chosen should use the old N3 near Pace.

Stakeholders also commented on the presence of a sewage route from the prison to the M2 southwards.

2.3.1.4 Environment

Stakeholders praised the project for its role in enabling the green agenda.

A number raised concerns about impacts of the project on cultural and heritage sites.

Stakeholders commented that they had experienced previous issues with flooding of the River Boyne and the tributaries of the River Tolka.

2.3.1.5 Utilities

Stakeholders asked whether there had been consideration of joined up thinking around the presence of other ongoing local utilities and renewable construction projects.

Stakeholders commented that there were too many culverts. Some noted the presence of fibre broadband on the R122/R108 after Keelings.

One stakeholder commented that they have an existing wayleave with Statkraft solar farm and requested that the Agricultural Liaison Officer contact them to walk the wayleave and gather data.

2.3.2 Option Specific Feedback

Option A (Red)

Stakeholders raised concerns that Option A would pass close to their properties and farms.

Stakeholders also expressed support for Option A on the basis that there is a new road from Broghan to Dublin Airport.

Stakeholders expressed concerns about potential impacts on traffic on roads on this route.

Option B (Green)

Stakeholders commented that Option B had the potential to impact on land intended for future development near St Margaret's and on their property.

Some commented that previous issues with Mabestown Road had been identified by Transport Infrastructure Ireland during the solar farm application which judged it to be unfit for use to hold cables. They therefore opposed the use of this route for the East Meath-North Dublin Grid Upgrade.

In addition, stakeholders noted the presence of farm HGVs (Heavy Goods Vehicles) on the green route.

Conversely, other stakeholders supported the green route as it was direct and on a main road.

Option C (Yellow)

Stakeholders raised concerns that Option C would pass close to their properties and farms.

Some expressed concern that this route could impact the health of a local resident with a condition that causes hypersensitivity to magnetic fields.

Stakeholders expressed concerns about potential impacts on traffic on roads on this route.

Option D (Blue)

Stakeholders expressed support for Option D.

A number also raised concerns that Option D would pass close to their properties and farms.

Stakeholders expressed concern that this route could impact the health of a local resident with a condition that causes hypersensitivity to magnetic fields.

2.4 Overview of Step 4 Engagement Feedback - Focus Groups

2.4.1 Context

The aim of the three focus groups is to add a qualitative insight to the consultation running between 7 September and 30 November 2022.

2.4.2 Objectives

The focus group has the following objectives:

- to provide another avenue to gain insight from local community members;
- to ensure insight comes from a diverse range of people;
- to establish what they as members of the community think about the different route options;
- to identify and understand any key issues and concerns related to the proposed options for the East Meath-North Dublin Grid Upgrade;
- to add qualitative understanding of any issues and concerns that may have arisen through the consultation process;
- to gauge community member awareness of EirGrid and the project; and
- to gain public opinion on the consultation and its method to date.

2.4.3 Methodology

2.4.3.1 Design and Process

Traverse worked with EirGrid to turn the objectives from their Step 4 consultation phase into a process plan with a set of research questions and a discussion guide suitable for qualitative focus group research.

2.4.3.2 Research Questions

1. What awareness of EirGrid and the project do community members have and from what avenues?
2. What comments do community members have and what in their view are the key opportunities and concerns about each of the proposed route options?
3. What do community members think about EirGrid's efforts to communicate and engage the public on these plans?
4. What more could EirGrid do to improve their engagement with communities affected by development of their grid infrastructure?

The focus groups were designed to explore what community members think about the four route options for the East Meath – North Dublin project, as well as EirGrid's efforts to consult the community about the project. To do this, participants were sent the project brochure ahead of the focus groups taking place. They were also introduced to the project, route options and programme of consultation by an EirGrid representative at the start of the event.

Participants were first asked to complete a survey about their initial awareness of EirGrid and the project, and where they have seen information. This was then followed by a group discussion where participants were encouraged to discuss each route option individually and consider any related concerns or opportunities. Lastly, participants were given time to look through EirGrid's consultation materials. This was followed by a discussion on what participants thought of EirGrid's efforts to communicate and engage the public in their plans.

2.4.3.3 Recruitment and Sampling

Traverse worked with a market research recruiter to recruit 36 community members living or working within the project study area or living up to a kilometre outside it (see appendix H for study area map and location spread). Each focus group had representation across the key demographics of gender, ethnicity, age, and principal status (see appendix B for a full demographic breakdown).

2.4.3.4 Delivery

A third-party provider facilitated three 90-minute evening focus groups across two weeks in November 2022 with some participants unable to attend on the night due to unforeseen circumstances:

Focus Group	Date	Place	Number of participants
One	Wednesday 9 November	Dublin Airport, Co. Dublin	11
Two	Thursday 10 November	Blanchardstown, Co. Dublin	11
Three	Tuesday 15 November	Dunboyne, Co. Meath	10

2.4.4 Findings

The findings under each section below are organised from most to least prominent in the focus group discussions.

2.4.4.1 General Feedback

General feedback centred on construction and travel disruption, with comments about the cumulative impacts of the construction of multiple development schemes in the area. Participants gave ideas for mitigation, such as effective communication and joined-up working.

Focus group participants were keen to share concerns about potential travel disruption. Many were particularly concerned about areas with narrow roads. They said that the added traffic associated with construction as well as the size of the construction vehicles could cause difficulties for the communities using these roads.

Focus group two participant "It would be interesting to see how to even fit all construction equipment on it (narrow roads) and they may not carry heavy trucks. It's not just construction on the routes but getting around other traffic routes."

Participants felt clear and timely information about future disruption to their community would help to mitigate some of the inconvenience and frustration. Some said it would also help them plan their journeys in advance, avoiding stress.

Focus group three participant: "What you would need is a plan given to residents about what parts of the roads will be closed, when [those roads will be closed]…residents want to know where they can go and when to go there."

Some participants expressed frustration at the amount of other infrastructure projects going on in the area. They cited traffic concerns as well as safety concerns about dirt on roads associated with construction.

Focus group two participant: "I know from the Amazon building site, they've been here for a lot of years, and the dirt to the road has irritated a lot of us…it's not about our car being dirty but the safety of hitting your brakes. It's been here for years and would drive a lot of us demented if the roads weren't being cleaned properly."

Participants felt that the community would benefit from collaboration and 'joined up thinking' by the parties involved so that disruption could be kept to a minimum.

Focus group one participant: "Why is there not joined up thinking with service providers? Cable is being done under the airport and St Margaret's so why aren't they just doing it together?"

A particular area of focus regarding multiple projects and traffic disruption was Kilbride where all four-route options pass through. Participants said that there has been a lot of construction in that area causing frustration for residents.

Focus group three participant: "Recently there was large construction along there which was awful. what I will say is that the road was narrow and local access was applied but it was an absolute nightmare for 6 weeks."

Some participants were keen to understand how the construction of the project might affect schools in the area. They expressed concern about getting their children to and from school if there was road disruption. A few suggested that work causing disruption near schools would be best planned in the summer while schools are closed.

Focus group two participant: "A lot of the routes are going past schools, and I know it's difficult to plan, but if you're near a school, summertime is the best time. It would reduce the number of annoying people then….even children might have an issue with a lot of noise around the school."

They were also worried about disruption to other utilities that might mean schools would have to close last minute.

Focus group one participant: "Communication is key, I want to know when and which roads will be closed since it happened before where the water was switched off and the school didn't know about it and all the kids were sent home from school in the St. Margaret's area."

A few participants were worried about local effects on the environment. They said that there was a lack of information about this, as well as restoration plans after the work is completed.

Focus group three participant: "Would hedgerows be affected? I live in a nice part of the road and would like to keep it that way… If there was any damage to trees done, would we be able to say the commitment to restoration has been given and not vague, in the future."

2.4.4.2 Option Specific Feedback

Option A (Red) - One participant wanted to draw attention to plans already in place for the GAA (Gaelic Athletic Association) and County Board near Hollystown Golf club. They wondered if this would affect EirGrid's ability to execute this route.

Option B (Green) - A few participants had concerns about the narrow roads surrounding the Ballymacarney solar farm. Work on the farm was very disruptive as the roads surrounding it had to be completely closed, and large construction vehicles on alternative routes was disruptive. They were also concerned about the effect the solar farm had on biodiversity in the area, from resurfacing roads for better access. However, they suggested this might be an opportunity for EirGrid to use the same access routes, minimising further disruption.

Option C (Yellow) – One participant living on R156 felt that R135 is a busy route but could be better as it is shorter and more direct. Another participant said that if the option through Batterstown would take a significantly shorter amount of construction time, then they felt that most people would be ok with the traffic.

Option D (Blue) – There were no comments about this route specifically.

2.4.5 EirGrid's Consultation Approach

2.4.5.1 Feedback on the consultation process so far

Participants were told about some of the ways EirGrid advertised the project locally. They were also given a chance to review the project brochure, part of EirGrid's consultation and engagement materials, both before and during the session.

Participants were also asked to fill out a survey to capture their initial awareness of EirGrid and the project, as well as where they got their information. Most participants knew a little about EirGrid and this was mostly from leaflets/mail and the EirGrid website. Most had not engaged with EirGrid before or knew anything or little about the East Meath North Dublin project. What they did know came from leaflets/mail and the EirGrid website (for full survey results see appendix B).

Most participants said the project brochure was informative and had the right level of information and detail.

Focus group two participant: "I like it as I didn't know anything about EirGrid or the project before coming into this room…I liked the bit where it calls out the other points. I like it."

However, a few said that the format of the information they received was much smaller, which made the map harder to see.

Focus group one participant: "The brochure that went through the door was half the size of this brochure which made it difficult to see the maps."

Participants wanted more information on where potential disruption would be and for how long but appreciated that this might be difficult at this stage of the project. However, as a community they expected to be notified when this information becomes available.

Focus group two participant: "It would be nice to know in advance where road closures will be and if I'm driving to the train if I need an extra 15 minutes to get there…knowing how long in advance and for how long before to manage it. It may be annoying but it's better to know in advance"

Some participants shared a sense of distrust. This was towards organisations associated with other infrastructure projects in the area, as well as local/national government. They felt that communication coming from an independent body could help this.

Focus group one participant: "EirGrid has done enough to communicate however we are wary this big company won't actually listen since most common people see a brochure from a large corporation and assume it'll happen and it's been decided for them…there needs to be a more independent body between EirGrid and the Local Council for communication."

2.4.6 Recommendations

Participants were keen to stress that it is easy to miss adverts online and on social media. A few participants said they had never seen project-related information on social media despite using it regularly. They suggested targeting closed, local community groups on social media to make sure the information reaches the right people, as well as local websites.

Focus group three participant: "When you talk about what EirGrid should do is get to the local Facebook groups…get to the people who are actually engaged with the community."

A few thought that information at the national level could be beneficial for those that don't engage with local news.

Focus group three participant: "I mean, even in national newspapers? I highly doubt anyone in this age group would read the Meath Chronicle…the Meath Chronicle comes to my door and I toss it in the bin."

Many were keen for ongoing updates, particularly around potential disruption. They suggested that the project website could have more immediate updates to the project, citing utility company disruption alerts on their websites as an example. They also suggested having smaller more detailed maps available and being supplied with a link to the portal. They suggested information about what will happen in the local area much closer to the time of construction and that this should continue throughout.

Focus group one participant: "Communication should be consistent from now; it shouldn't stop right before construction but there should be an advanced communication."

Offline, participants suggested engaging with schools and groups such as Tidy Towns to spread information and gain feedback. They also suggested depositing leaflets at churches as well as the GAA. Others suggested community radio such as Phoenix FM in Blanchardstown. Some saw an opportunity to enhance the community forum by eliciting deeper engagement with it.

A few participants felt that communicating the benefits of the project to individuals would support more engagement in the community.

Focus group two participant: "It would be great if you could tell the general public that in the long run, these are the benefits...If you had something in your brochure about how it'll benefit individuals, you'll get the general public more interested."

A few participants also suggested that EirGrid should be communicating more about the effects of the project on the environment.

Focus group three participant: "The only thing that doesn't seem to be there is information on environmental impacts. There isn't a lot of information of clear-felling, fish stocks, the general appearance of the area… damage to the general community just doesn't seem to be there."

They suggested having more focus groups about environmental impacts.

Focus group three participant: "We could have another night on the environmental impacts. The loss of trees along the route would be of utmost importance to me."

3. Step 4 Consultation

3.1 About The Consultation

The consultation took place between 7 September and 30 November 2022. EirGrid invited feedback on the 4 route options, on their overall approach to the project and any events or festivals planned that might affect scheduling of the East Meath – North Dublin project.

3.2 Responses Received

A total of 24 responses were received during the consultation period. Table 1 below gives a breakdown of the type of responses received.

Response Type	Count
Online response form & submissions	5
Hardcopy response form	11
Letters and emails	8

Table 1: Breakdown of responses received

Three channels were provided for submission of responses to the consultation:

Online: by using the consultation portal at consult.eirgrid.ie, accessible via the EirGrid website;

Email: by emailing the project's dedicated email address; EastMeathNorthDublin@eirgrid.com, administered by the project team at EirGrid;

Post: by sending in a hardcopy response to the address provided by EirGrid.

Published responses to the consultation are available for review on EirGrid's consultation portal: https://consult.eirgrid.ie/consultation/east-meath-north-dublin-grid-upgrade-step-4-consultation

3.3 Data Processing

EirGrid commissioned Traverse, an independent consultancy specialising in consultation analysis, to process and report on the responses received to the consultation.

Submissions received were recorded in a database and categorised into types (for example letter, email or response form). Traverse and EirGrid agreed on processes to ensure that all data was handled in accordance with the General Data Protection Regulation (GDPR).

The online and hardcopy response forms included statements on data protection, including respondents' rights under GDPR, explaining how data would be used and for what purpose. Though respondents who provided views in other formats did not receive a data protection statement, care has been taken to ensure that no individual respondents are identifiable in this report.

3.4 Overview of Consultation Feedback

3.4.1 Option A (Red)

Several respondents express support for Option A because they view it as the least disruptive and most direct route and because it avoids Hollystown which is regularly congested.

One respondent raises concerns that the narrower R156 used in Option A is less optimal for use than the wider R154.

One respondent expresses concerns that this route would be the most disruptive to agriculture.

One respondent raises concerns that Option A uses Ward Road which has water pipes near the road. They also comment on the presence of sewage pipes on the R135 between Coolquay and Finglas.

One respondent expresses concerns that this route uses the M2 motorway and that there is a proposed solar farm close to the M2 flyover.

One respondent raises concerns that this route is near GAA grounds and requests that EirGrid ensures 24/7 access to the grounds is maintained for both players and emergency services. Furthermore, they ask that access to the walkway around the main pitch is maintained as it provides a site for community exercise.

3.4.2 Option B (Green)

One respondent expresses support for Option B because it is shorter than Options C and D and is near the airport. One respondent praises Option B as the second best option after Option A.

Several respondents raise concerns that Option B includes Broughan Lane which is very small and narrow lane as they believe closure of this road could impact residents along this route. Furthermore, a small number of respondents commented that there is a large agricultural business on this lane which requires 24/7 access which may be limited if there is construction traffic or road closures.

One respondent expresses concern that Option B is near many tillage fields and that farmers would therefore need access to the roads along this route during harvest time to transport their produce.

One respondent expresses concern over potential road closures at R153 and R121 which would directly affect the logistics of staff and deliveries of their business.

3.4.3 Option C (Yellow)

One respondent supports Option C as it is the shortest route to Pace and maximises use of local roads including the recently widened and upgraded R154.

One respondent opposes Option C on the grounds that Batterstown is regularly disrupted by work at Woodlands.

One respondent expresses concern about the potential impact of Option C on local communities and the cost of Option C due to its length.

One respondent suggests that the Option C from Woodland would maximise the use of local roads. Another respondent highlights the route is located near a busy agricultural businesses which has no alternative to but to travel on a narrow lanes.

One respondent raises concerns that Option C uses Kileek Lane which they comment is very narrow. They feel that closure of this road could impact residents living along this route.

One respondent raises concerns that Option C would impact their equine business due to road closures which could limit access to the business and the potential noise disruption which would adversely impact their livestock. They suggest limiting this access could pose an animal welfare risk because of the nature of their business and comment that they require 24/7 access. The respondent also comments that there may be a requirement for EirGrid to access their land during construction and that the noise of the project could represent a safety issue for their clients and their livestock.

One respondent raises concerns that Option C uses Ward Road which has water pipes near the road. They also comment on the presence of sewage pipes on the R135 between Coolquay and Finglas.

One respondent expresses concerns that this route uses the M2 motorway and that there is a proposed sewage farm close to the M2 flyover.

3.4.4 Option D (Blue)

One respondent raises concerns that the narrower R156 used in Option A is less optimal for use than the wider R154.

One respondent expresses concern about the length of Option D compared to the other routes.

One respondent raises concerns that Option D uses Ward Road which has water pipes near the road. They also comment on the presence of sewage pipes on the R135 between Coolquay and Finglas.

One respondent expresses concerns that this route uses the M2 motorway and that there is a proposed solar farm close to the M2 flyover.

3.4.5 General Feedback and Suggestions

3.4.5.1 Congestion and Disruption

Transport Infrastructure Ireland TII comments that grid connection routing proposals which cross the motorway network require Works Specific Deeds of Indemnities, arrangements for third party access or consent from TII. They suggest arrangements for third party access are also likely to be necessary.

TII note a series of general requirements for drilling under a motorway including that:

- Launch and reception pits for the pipeline are located outside the motorway boundary;
- Installation of the pipeline at a depth that does not impact drainage for the motorway;
- Neither the works nor the pipeline damage or impact the motorway;
- Any maintenance or planned upgrades of the pipeline at the crossing location can take place without access to the motorway boundary;
- There are no bolted joints in the section of pipeline within the motorway fence-line; and
- A pre and post-construction survey is necessary along the length of the pipeline over the extents of the motorway boundary.

TII request that consultation is carried out with the relevant maintaining organisations and any access requirements are agreed with them through their third-party protocols. They also ask for consultation with relevant local authorities and National Roads Design Office in relation to the locations of current and future local national road schemes.

Transport Infrastructure Ireland (TII) raise concerns about the principle of the route options maximising use of national, regional and local roads. They express concerns about the impact of the route options on their management and maintenance of the national road network. They comment on the following potential impacts:

- Impacts on embankments, bridges, drainage and road furniture infrastructure which could led to maintenance liabilities in the future;
- Difficulties with future maintenance and operations activities;
- Challenges with future routine network improvements such as pavement overlay and strengthening and installation of new verge-side signs and other road infrastructure;
- Impacts on traffic flow during construction; and
- Difficulties with future on-line upgrades of national roads due to technical challenges and the additional cost of re-routing underground cables to accommodate road improvements.

TII would welcome EirGrid updating route options development principles to remove the reference to maximising use of the national road network to comply with policies relating to safeguarding the capacity and safety of the national road network.

One respondent expresses concerns about road closures during the construction process as they believe this would divert traffic to unsuitable rural roads and could impact the school bus route. They request that EirGrid carry out all works simultaneously and that diversion routes are chosen which include pull in space and minimise disruption for parents of school children.

One respondent raises concerns about the cumulative impact on congestion if the East Meath to North Dublin upgrade is carried out at the same time as proposed upgrades to Dublin Airport. They request that these projects do not take place at the same time.

3.4.5.2 Design

TII expresses support that the current route options do not include laying cable in the national road reservation.

One respondent requests information about any offroad options under consideration for this project.

A few respondents ask that the route chosen avoids the road from Pace to Kilbride which is currently included in every route option. They comment that they have already experienced recent disruptive roadworks which impacted access to their property and resulted in a poor-quality road surface which damaged cars. They express the following concerns about the East Meath to Dublin Upgrade:

- It may impact their daily lives;
- If the road surface is left in inferior quality after construction then it could damage their cars;
- It might impact access for emergency vehicles and school buses; and
- There have been no proposals from EirGrid about how to address disruption to drainage works of properties adjacent to the road which are in place to prevent flooding of the road and properties.

One respondent suggests that EirGrid consider an alternative route using the proposed Westerly Road from the roundabout at the Broughan on the M2 to the M1 North of Swords whilst a few respondents request an alternative route using new roads connecting the R135 to Dublin Airport to avoid impacting existing roads.

3.4.5.3 Environment

Inland Fisheries Ireland (IFI) expresses concern that the aspects of the project such as the construction phase access roads and the laying of cables that could have potentially detrimental impacts on the aquatic habitat where they are near a watercourse. They raise concerns that the development may impact a variety of fisheries waters on the Rivers Pinkeen, Tolka and Ward including areas designated as angling waters, adult holding areas and nursery and spawning waters. To minimise detrimental impacts, IFI suggest that works on rivers, streams and watercourses take place only during July to September and that all works follow IFI guidelines and all relevant environmental directives and legislation.

IFI requests that EirGrid recognises the importance of small channels and seasonal streams and their importance to fisheries. They also request an assessment of the soil type and structure at the proposed turbine locations and along the proposed access roads. IFI expresses concern about the possible impacts of discharge of silt-laden waters on fish, plant and macroinvertebrates and their habitats. They request the introduction of construction methods outlined in a comprehensive plan which minimise discharge of silt and other suspended solids into waters such as covering stockpiles of sand with sheeting when not in use and constructing silt traps. IFI discuss the following points in relation to silt traps:

- Locate silt traps where run-off is intercepted to the drainage network;
- Do not construct traps near natural watercourses;
- Design silt traps to account for particle size and volume of water through the traps; and
- Create a buffer zone between silt traps and watercourses and leave intact natural vegetation.

IFI ask that all natural watercourses impacted during site development are bridged before construction work begins and comment that the crossing of watercourses at fords is unacceptable due to uncontrolled sediment that may be created by their use. If temporary crossing structures are necessary, IFI suggests that EirGrid should request approval for the specification of the crossing structures and the timing of their installation as these structures must include passage for fish and macroinvertebrates.

They also note that access for angling and commercial fishing may be required and that the implementation of fords by stone and the repositioning of temporary crossing structures are prohibited.

IFI make the following points about the design of temporary crossing structures:

- Preferred option is clear span 'bridge type' structures on fisheries water;
- If clear span structures cannot be used, structures should:
    - use one or more metal or concrete pipes or prefabricated culverts;
    - maintain the existing stream profile;
    - avoid significant alternation of speed or hydraulic characteristics;
    - have capacity to accommodate the full range of flows including flood flows; and
    - be covered with a clean, inert material to enable safe crossing of all items of construction equipment without the cover material being dislodged.
- Design and install the approach and departure routes for drainage to fall away from the watercourse being crossed;
- Provide additional earthwork settlement areas where the fall of ground does not allow sufficient control on drainage;
- Fence with terram to prevent the wind carrying dust to waters;
- Use side armour to make sure machinery cannot drive over the edge of crossings;
- Ensure crossings can accommodate all construction machinery.

IFI comments that their approval is required for the crossing of any key fisheries where the connection from the proposed site occurs with the national grid. They also suggest that EirGrid should engage the Office of Public Works early in the planning and design process about flood risk management.

Regarding permanent crossing structures, IFI makes the following points:

- There should be no damage to fish habitat or blockages to the passage of fish and macroinvertebrates;
- The design and choice of structure should fulfil the requirement to protect spawning and over-wintering areas and maintain angling and commercial fishing access;
- Culverts can result in loss of valuable habitats;
- Clear span bridges are preferred with bridge foundations positioned at least 2.5 metres from the river bank;
- Bottomless culverts may be unsuitable for installation on narrow river channels as they could result in scouring or erosion;
- Pipe culverts are not acceptable on fisheries water;
- Embedded culverts must preserve the natural channel gradient, width and substrate configuration and be buried to a minimum of 500mm below the stream bed at natural gradient whilst box and pipe culverts must maintain the natural stream channel width and be 3 metres in height on angling waters;
- Designs should have capacity for a 1 in 100-year fluvial flood flow and should be in line with requirements from the Office of Public Works;
- Designs should allow maintenance of channel profile and existing gradient and sufficient light penetration;

- Designs should not exceed a slope of 5%; and
- If baffles are used then appropriate capacity provision should be included.

IFI include the following comments on bank protection works required around new structures:

- It is crucial that large enough boulders are used and positioned to ensure they cannot be undercut;
- Boulders should be back filled with a layer of top soil to encourage revegetation;
- The shape of boulders requires consideration to ensure their stability;
- The height of rock armour must account for the protection of the riparian zone and protection of kingfisher and sand martin habitat; and
- Gabions are not a preferred option due to their vulnerability and visual impact.

IFI suggests that natural flow paths should not be interrupted or re-routed to reduce potential for erosion. They request that materials used in road construction should not be crushed by vehicle movements as this could discharge particulates into waters.

IFI requests the use of pre-cast concrete rather than uncured concrete due to the latter's harmful effects on fish and macroinvertebrates. If uncured concrete must be used, they suggest all work should take place in the dry and be isolated from any water that could enter the drainage network. If cement, oils, and fuels are stored on site during the construction period, IFI suggests that they are kept in secure areas when not in use. IFI have the following additional requests about oils and fuels:

- All plant and equipment carry oil and fuel spill kits;
- If temporary fuel driven pumps are used, they should be located within portable temporary bunded units;
- If site works involve discharges of drained water to rivers and streams, then temporary oil interceptor facilities should be installed and maintained; and
- Waste oils and other hazardous materials should be disposed of in accordance with the Waste Management Act 1996.

IFI comments that biosecurity measures should be implemented to mitigate against the introduction of invasive species. They note that no instream works should be carried out without their written approval and that EirGrid should consider the national 'Blue Dots Catchment Programme'.

TII sets out the following recommendations for the preparation of an EIAR (Environmental Impact Assessment Report) which could impact the national road network:

- EirGrid should have regard to the Environmental Impact Statement, TII Publications, TII's Environmental Assessment and Construction Guidelines, any conditions imposed by An Bord Pleanála and any cumulative impacts;
- The EIAR should consider the Environmental Noise Regulations 2006 and how the project would affect future action plans by the relevant competent authority;
- A Traffic and Transport Assessment should, where appropriate, be carried out according to relevant guidelines;
- EirGrid should consult TII Publications to decide whether there is a requirement for a Road Safety Audit;
- The EIAR should identify methods proposed for any works in proximity to the national road network and for national road structures there should be early engagement with TII Structures Section;
- Haul routes should be identified and fully assessed. For abnormal weight loads, these may require separate approvals and licences and all structures on the haul route should be checked to ensure they can accommodate proposed abnormal weight loads.

One respondent queries whether the local environment will be improved as part of the schedule of works.

3.4.5.4 Health

One respondent objected to the route passing close to their home as they stated that exposure to electromagnetic radiation would have an adverse effect on a member of the family at risk from epilepsy. They also objected to the route passing close to their home and national school.

3.4.5.5 General

One respondent requests that EirGrid regularly update the community on the programming of construction works and the impacts they may have on residents. They also ask that EirGrid maintain close relations with community groups so that these groups may inform residents of proposed construction activities.

One respondent expresses support for the approach taken on this project without specifying further.

Fingal Chamber support EirGrid's aim to provide a safe, secure, and reliable supply of electricity. They note that their members have concerns surrounding security of electricity supply and request that EirGrid implement the infrastructure necessary to deliver long-term security of electricity supply as quickly as possible.

One respondent believes EirGrid should be aware of the best option and the consultation is 'eyewashing'.

One respondent comments that they were unaware of the Community Forum taking place.

3.4.5.6 Information and Materials

One respondent praises the consultation for providing residents with plenty of information and the opportunity to understand the project and the reasons behind route options development.

A few respondents raise concerns that the maps provided lack detail, particularly the map for Option D which they feel is not detailed enough at Ward Cross for them to identify impacted land. One respondent also comments that the online maps split in their area of interest.

In addition, one respondent feels that the maps provided do not correspond with current construction work and requests information about why that is the case. They suggest that the Pace to Kilbride work currently underway is not an underground route as residents have been told as well as questioning the route to Corduff which they view as 'obscure'.

4. Next Steps

4.1 Step 5 Planning Process

As part of Step 4, we identified four potential underground cable route options and consulted with you, our stakeholders on these.

The expected outcomes of Step 4 are to:

- publish a consultation report on the feedback received,
- announce an emerging best performing route option in spring 2023 and to consult locally with stakeholders on this, and
- a final option in summer 2023, identifying exactly where the project will be built. This step will not include applying for planning permission. This will be completed in Step 5.

Project timelines will be confirmed once Step 4 is complete.

As part of Step 5 EirGrid will submit a planning application to the planning authority – either An Bord Pleanála or the local planning body. They will publish a notice in newspapers when they lodge this application. They will also continue to provide regular project updates.

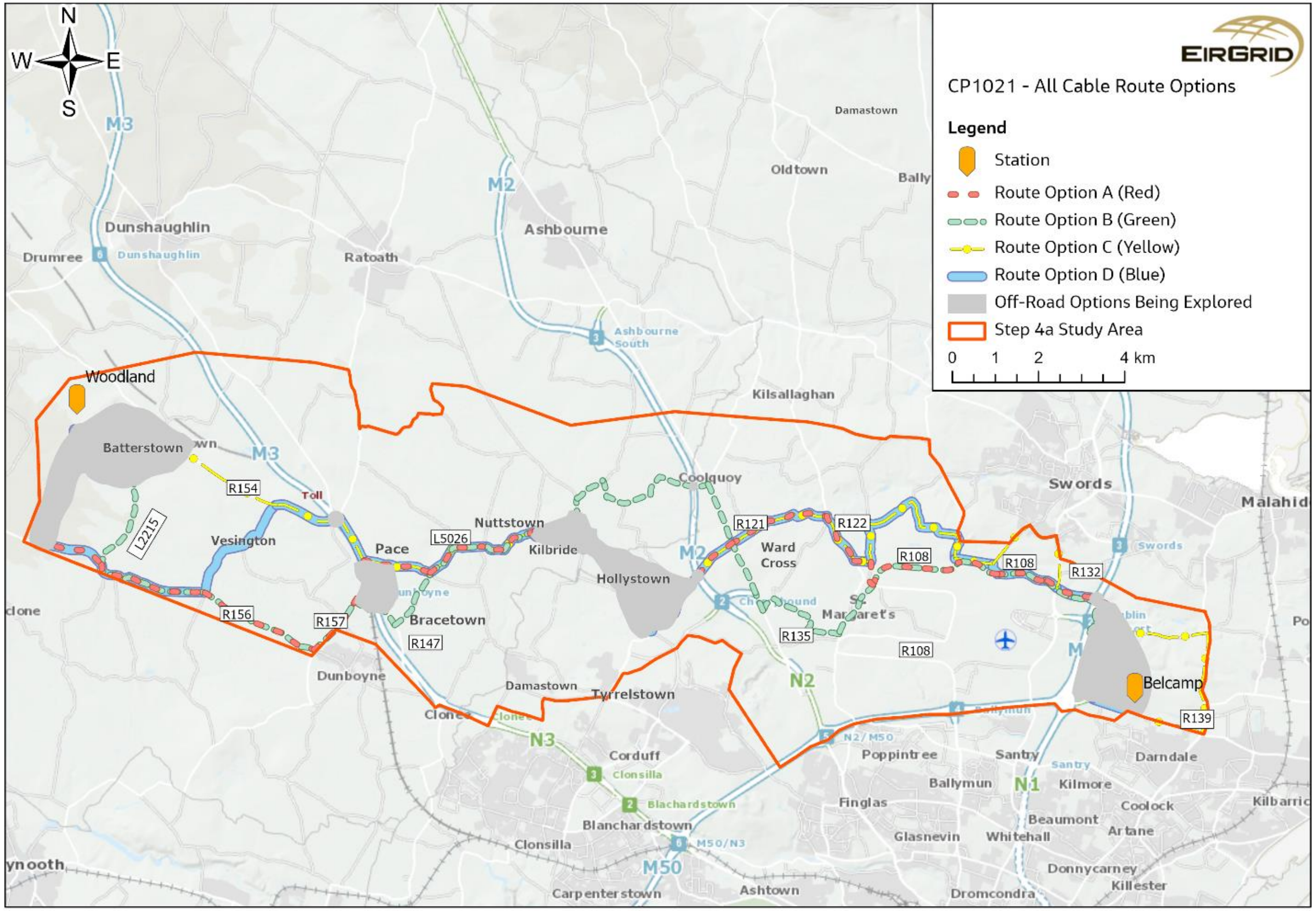
The planning authority will seek views on the application and will ask anybody with an interest in the project to send in a written submission of their views. Once they make an application, An Bord Pleanála may hold an oral hearing. This will give those who submitted a written opinion a chance to share their views about the project.

Where possible, EirGrid will respond to submissions from those who are directly affected by their plans.

At Step 5, EirGrid cannot make fundamental changes to their planning application but can consider small adjustments if they ease your concerns.

The planning authority can grant or refuse permission. It can also grant permission on the basis that EirGrid makes some changes to its application.

Appendix A Study Area Map



Appendix B Questionnaire

Freepost Address:
East Meath – North Dublin Grid Upgrade Consultation
EirGrid plc
Freepost FDN 5312
160 Shelbourne Road,
Ballsbridge,
D04 FW28

No Postage Stamp Required

Overview of the proposed route options

The following table provides an overview of the four underground cable options we are considering for this project. Please note that the route lengths referenced below are indicative only and will be finalised when a full and detailed route is agreed.

Option	Estimated overall length (km)	Estimated off-road sections (km)	Environmental impact	Social impact and potential disruption during construction	Other points
Option A (Red)	37	9	Low-Moderate	Low-Moderate	Shortest route but affects the most amount of agricultural land of all options.
Option B (Green)	38	7	Low-Moderate	Low-Moderate	Second shortest route and avoids Hollystown.
Option C (Yellow)	43	2	Moderate	Moderate	Longest route. Goes through Batterstown village and southern suburbs of Swords. Least agricultural land.
Option D (Blue)	41	4	Low-Moderate	Low-Moderate	Second longest route length, second lowest amount of agricultural land. Avoids Kilbride village.

EIRGRID
Delivering a cleaner energy future

East Meath – North Dublin Grid Upgrade Consultation

7 September 2022 to 30 November 2022

The Project
The East Meath-North Dublin Grid Upgrade will add a high-capacity 400 kV (kilovolt) underground cable electricity connection from Woodland substation near Batterstown in County Meath to Belcamp substation near Clonshaugh in north Dublin.

This upgrade will strengthen the electricity network in the east of Meath and the north of Dublin to improve the transfer of power across the existing transmission network.

We need to upgrade and strengthen the network to:

- address the increased electricity demand in east Meath and north Dublin due to economic development and population growth,
- reduce the use of and reliance on fossil fuels for electricity generation,
- facilitate further development of renewable energy generation, onshore and offshore, and;
- assist in achieving climate action targets of having up to 80% of electricity coming from renewable sources by 2030.

This project was identified as one of the candidate solutions in the Shaping Our Electricity Future Roadmap which was published in November 2021.

Share your feedback
This leaflet contains some information about this project. We have included a map to provide an overview of the route options.

This leaflet also contains a freepost questionnaire for you to complete, detach, and return to us by freepost. You can read more detailed information online at www.eirgrid.ie/EastMeathNorthDublin. If you would like more guidance or information, please contact your EirGrid Community Liaison Officers Eoghan O'Sullivan 087 247 7732 or Gráinne Duffy 085 887 4798 or email EastMeathNorthDublin@eirgrid.com
We will consider feedback on all route options before deciding on what the best option is to take into the next step of this project.

Scan me for more information

We are inviting you to give feedback on four route options for the East Meath–North Dublin Grid Upgrade.

The consultation period is **from 7 September to 30 November 2022**. We encourage you to engage with us and **have your say** as early as possible during this consultation period.

Where can I find out more?

You can find out more in a number of different ways. All information relating to this project is available on our website: **www.eirgrid.ie/EastMeathNorthDublin**

- Arrange to speak to a team member directly
- Sign up to a Webinar
- Visit our Consultation Portal
- Attend an open day

How can I have my say?

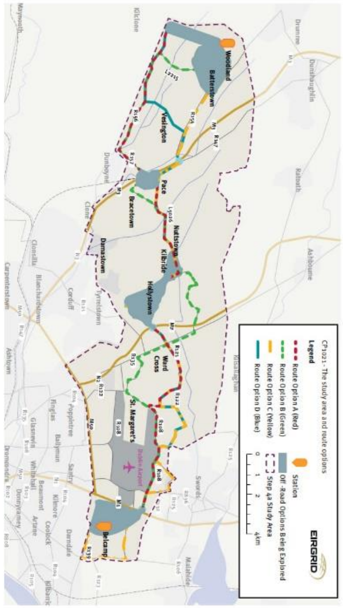
There are many ways you can give feedback, including:

- Submit your views online at consult.eirgrid.ie
- Email your submission to us at EastMeathNorthDublin@eirgrid.com
- Write your own submission and freepost it back to us

Our Freepost address is: East Meath – North Dublin Grid Upgrade Consultation, EirGrid plc, Freepost FDN 5312, 160 Shelbourne Road, Ballsbridge, D04 FW28

We have developed four potential underground cable route options for this project. We plan these using routing principles such as avoiding town and village centres and maximising the use of local roads. We also consider constraints such as environmental impact, the width of roads and other services in the road such as water, gas and drainage. All route options start in the Woodland substation and end at Belcamp substation. All route options cross motorways, however, we propose drilling under these. All route options also have off-road corridors ranging from 3km to 9km in length. Where off-road routing is unavoidable, we do not yet know what the exact route may be. For this reason, we highlight a corridor of space on the route maps. We will determine this after discussing it with the landowners affected. Please know that we will engage extensively with all relevant bodies, carry out all necessary studies and risk mitigation measures before starting these works.

Detailed interactive maps are available to view at consult.eirgrid.ie



Feedback Questions

Question 1: Please provide comments in relation to each route option. Your comments may include route-specific issues that you want us to be aware of or suggestions about alternative routing. Your comments may also express concerns or highlight opportunities.

Route Option A - Red

Route Option B - Green

Route Option C - Yellow

Route Option D - Blue

Question 2: Please provide comments you have about the approach we have taken on this project

Question 3: Are there regular or annual major events, festivals in your local area that you would like us to be aware of as we plan the scheduling of this project

If you need additional space, please add an additional page or complete your feedback online at consult.eirgrid.ie

Personal Information

Name

Address

Eircode

Organisation (if any)

Contact No:

Email:

If interested, how would you like to receive further updates on this project? (please tick all that apply)

☐ Phone ☐ Email ☐ Post

Data Protection and privacy statement

☐ I consent to EirGrid processing my data for the purposes of the East Meath North Dublin Grid Upgrade project. All information provided to EirGrid will be held by EirGrid's personnel and EirGrid's data processors only, for the purposes of engaging with me in the public consultation process. EirGrid's privacy statement is available at: www.eirgrid.ie/privacy

☐ I consent to EirGrid publishing my name with this submission. Otherwise this submission will be published anonymously

The questions in this section help us understand your views in relation to this consultation process and will help us best plan future engagement.

How did you hear about this consultation? (please tick all that apply)

☐ Member of the Community Forum
☐ An Elected Representative
☐ Newspaper, radio or advertising
☐ Leaflet or letter in the post
☐ Online or social media
☐ Word of mouth
☐ Other (please specify)

With which gender do you identify?

☐ Male ☐ Female ☐ Other ☐ Prefer not to say

Age?

☐ Under 18 ☐ 18-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60-64 ☐ 65+ ☐ Prefer not to say

Do you or anyone in your household have specific access needs that you would like us to be aware of.

Appendix C Newspaper Advert Sample

Appendix D Sample Stakeholder Email

Dear Stakeholder

EirGrid is responsible for a safe, secure, and reliable supply of electricity – now and in the future. We develop, manage, and operate the electricity transmission grid.

The East Meath-North Dublin Grid Upgrade involves a transmission network reinforcement centred on strengthening the network between east Meath and north Dublin to improve the transfer of power across the existing transmission network. The project will add a high-capacity 400 kV underground cable connection from Woodland substation near Batterstown in County Meath to Belcamp substation near Clonshaugh in north Dublin. As of 2020, around 40% of the electricity that we use in Ireland each year comes from renewable sources. The government's Climate Action Plan sets out the target to achieve up to 80% of electricity from renewable energy sources by 2030. The East Meath-North Dublin Grid Upgrade is an important project in reaching this target.

We need to upgrade and strengthen the network to:

- address the increased electricity demand in east Meath and north Dublin due to economic development and population growth
- reduce the use of and reliance on fossil fuels for electricity generation
- facilitate further development of renewable energy generation, onshore and offshore

In June 2022, EirGrid consulted with stakeholders on the shortlisted technology options. The 400 kV underground cable option was identified as the best performing option to progress for this project.

In this current phase (Step 4), we have identified four potential underground cable route options to upgrade the electricity grid between East Meath and North Dublin and have identified the study area, the proposed geographical area where the electricity infrastructure for The East Meath-North Dublin Grid Upgrade is proposed to be built.

Further detail on the East Meath-North Dublin Grid Upgrade, the four underground cable route options being considered, including a consultation portal, interactive map, video, and project brochure is available at https://www.eirgridgroup.com/the-grid/projects/cp1021/the-project/

A 12-week public consultation is now underway, and EirGrid are inviting feedback on the study area and four underground cable route options for the East Meath-North Dublin Grid Upgrade.

We will consider feedback on all four underground cable route options before deciding on what the best route option is to take into the next step of this project.

Please make your submission by Sunday 30 November 2022 via the following:

Email: EastMeathNorthDublin@eirgrid.com

Online: Consult.eirgrid.ie

Questionnaire: https://consult.eirgrid.ie/content/east-meath-north-dublin-grid-upgrade-consultation

Post: East Meath-North Dublin Grid Upgrade Consultation, EirGrid plc, Freepost FDN 5312, 160 Shelbourne Road, Ballsbridge, D04 FW28.

If submitting online, you can provide feedback through a short questionnaire or upload an online submission once registered on the Project Consultation Portal. We encourage you to engage with us and have your say as early as possible during the consultation period.

All feedback obtained will be reviewed and reflected and published in a post consultation report in the New Year 2023 followed by an Emerging Best Performing Route option in Spring 2023. EirGrid will consult locally with stakeholders on the Emerging Best Performing Route and announce a final route option in Summer 2023 as well as identifying and detailing where the project will be built.

EirGrid fully respects your right to privacy. We will not collect any personal information about you on the public consultation portal without your clear permission. View our updated Privacy Notice at https://consult.eirgrid.ie/content/privacy-statement which is in line with the General Data Protection Regulation (GDPR) effective from 25 May 2018.

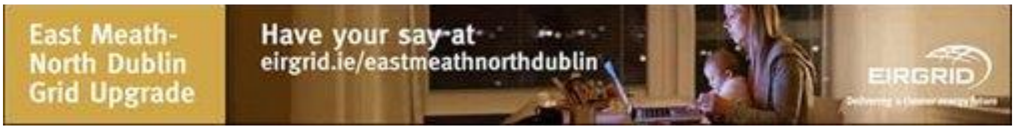
Please do not hesitate to contact us if you would like to receive a briefing or further information.

Yours sincerely,

Community Liaison Officer
East Meath-North Dublin Grid Upgrade

Appendix E Social Media and Display Samples

Display:


East Meath-
North Dublin
Grid Upgrade
Have your say at
eirgrid.ie/eastmeathnorthdublin
EIRGRID


East Meath-North Dublin Grid Upgrade
Have your say at
eirgrid.ie/eastmeathnorthdublin
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East Meath-North Dublin
Grid Upgrade
Have your say at
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Delivering a cleaner energy future

Appendix F Sample Press Release

Closing date approaches for East Meath - North Dublin Grid Upgrade public consultation

EirGrid is encouraging members of the public to submit their views on the East Meath - North Dublin Grid Upgrade before the public consultation closes on November 30 next.

The operator of Ireland's electricity grid commenced a 12-week public consultation in September, on four routes for the new 400kV underground electricity cable project.

The East Meath - North Dublin Grid Upgrade is a high-capacity electricity connection between Woodland electricity substation, near Batterstown in County Meath, to Belcamp electricity substation, near Clonshaugh in north Dublin.

This project is needed to address the increased electricity demand in east Meath and north Dublin, due to economic activity and population growth, while also reducing the use of fossil fuels for electricity generation and preparing the grid for increased volumes of renewable energy.

The extensive engagement process involved public information days, door-to-door engagement, public webinars and local landowner engagement, which saw the project team visit and speak to communities and stakeholders across the study area.

Briefings of chambers of commerce, local authorities, elected representatives and businesses in both counties took place, along with technical stakeholder briefings.

Speaking about the feedback to date, Michael Mahon, EirGrid Chief Infrastructure Officer said: "Submissions we have received from communities along the proposed routes shows us people want a say in how grid infrastructure is developed, and we are listening."

"The electricity system ultimately exists to serve the needs of communities and wider society, and as such, we believe that communities should be engaged in this process," said Mahon.

Members of the public can find out more about the four proposed route options at eirgrid.ie/eastmeathnorthdublin, and have their say by making a submission on, or before November 30, at consult.eirgrid.ie.

-ENDS-

Notes to Editor

The 400kV underground cable circuit was identified earlier this year as the best-performing technical option.

A community forum has been established for the project and will receive project updates and provide guidance to the EirGrid project team on any relevant community issues. The forum will also oversee the implementation of a community benefit fund and communicate information to a wider group of local stakeholders.

Appendix G OOH Displays

Appendix H Stakeholder List

Stakeholder	Stakeholder Type
OPW	Statutory Body
Inland Fisheries Ireland (IFI)	Statutory body
NMS	Statutory body
National Parks and Wildlife Services	Statutory body
Teagasc	Statutory body
Fingal Public Participation Network (PPN)	Interest/community group
Meath PPN	Interest/community group
Fingal Chamber of Commerce	Business
Meath Chamber of Commerce	Business
Meath County Councillors	Elected rep
Fingal County Councillors	Elected rep
Individual Stakeholders	Member of public
TDs and other elected Reps	Elected rep
Affected landowners	Landowner
Consumers	Customers
Commission for the Regulation of Utilities	Other
Department Environment Communication and Climate	Other
Pavee Point/local traveller group	Interest/community groups
Community Forum	Interest/community groups
Impacted community assets	Interest/community groups
Media (regional)	Other
Media(national)	Other
Social media users	Other
Trade press	Other
National Broadband Ireland	Other
Sports Clubs	Sporting Organisations
Retail	Business

East Meath-North Dublin Grid Upgrade

Engagement Summary Report

STEP 4 Emerging Best Performing Option

July 2023

Prepared by M-CO

M-CO

CONTENTS

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VERSION CONTROL

Document information	
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EXECUTIVE SUMMARY

Between September and November 2022, a 12-week consultation period took place as part of Step 4 (*Where exactly should we build?)* of EirGrids public engagement on the East Meath–North Dublin Grid Upgrade. The consultation focused on four route options and sought local knowledge and feedback relating to how these options might affect local communities and other key stakeholders.

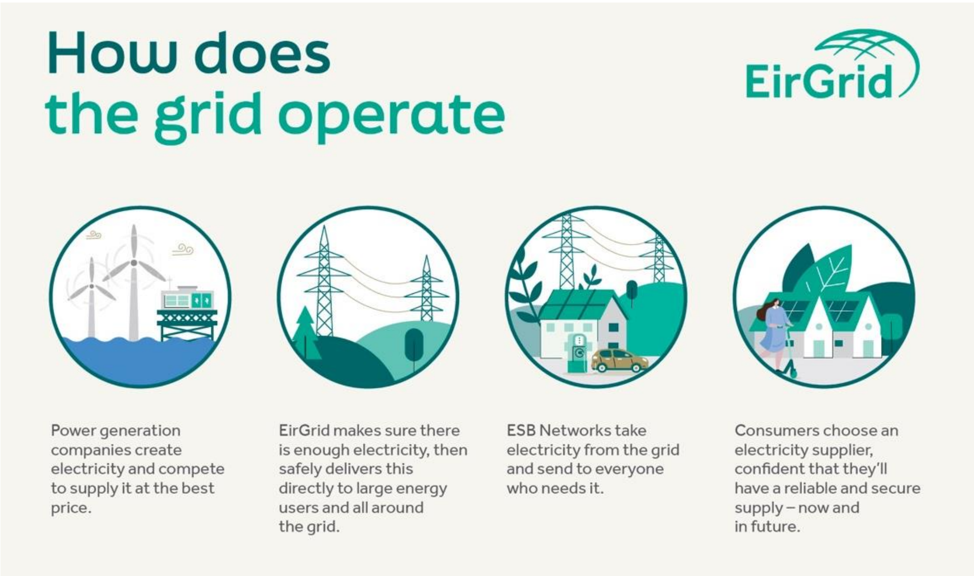
Informed by the outputs of this consultation, the route referred to as the "Red Route" was identified as the preferred option i.e. the Emerging Best Performing Option (EBPO). EirGrid then engaged with a range of stakeholders on the EBPO during the period from 29th March 2023 to 14th May 2023. This report provides a summary of engagement carried out and any further feedback received during this EBPO period. This report will be taken into consideration as input to decision making to determine the Best Performing Option (BPO)

This report has been prepared by M-CO, working as EirGrid's consultation and engagement partner.

1. BACKGROUND

1.1 Who are EirGrid and what do they do?

EirGrid develops, manages, and operates Ireland's electricity grid. On behalf of Ireland's energy users, big and small, it is responsible for the safe, secure and reliable supply of Ireland's electricity. EirGrid is also leading the secure transition to a sustainable low-carbon future.



The grid brings power from where it is generated to where it is needed throughout Ireland. It supplies power directly to industry and businesses that use large amounts of electricity. The grid also brings power from generators to the domestic network that supplies the electricity you use every day in homes, businesses, schools and hospitals.

The grid is a critical infrastructure that supports the development of our society and economy. Work carried out now to improve the grid will help to create a more sustainable future for the next generation.

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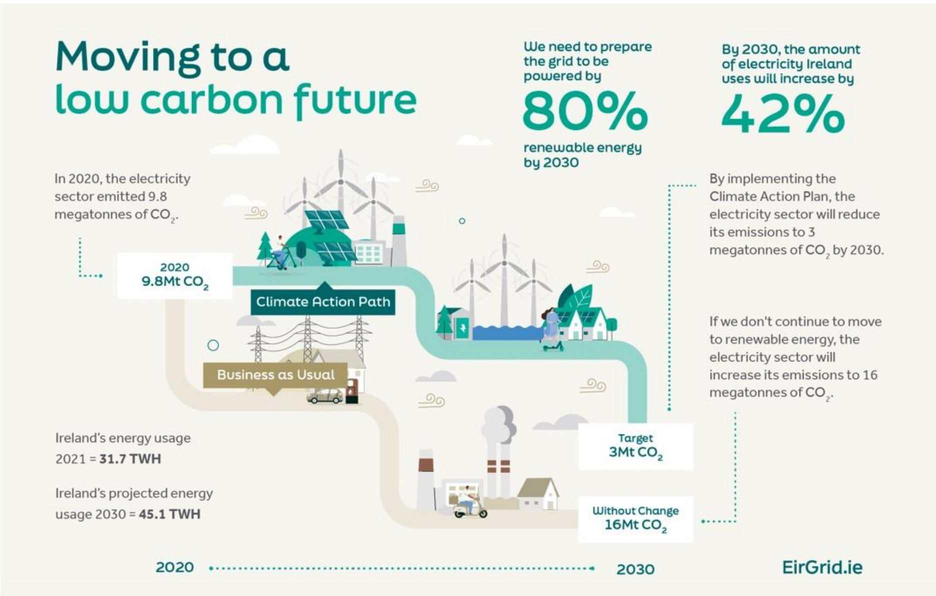
1.2. What is The East Meath–North Dublin Upgrade Project and why is it needed?

The East Meath–North Dublin Grid Upgrade is the proposed development to reinforce the grid network between east Meath and north Dublin. This proposed upgrade will help to meet the growing demand for electricity in the east of the country, that is due to the increased economic activity and population growth in recent years.

Meath and Dublin are ideally placed for optimal transport networks including air, road and rail, providing access to and from Dublin and the rest of Ireland. Over the past 25 years, the population in Meath has increased by 81.5% and doubled in north Dublin. Rapid population growth and proximity to Dublin City have led to thousands of businesses, including multi-national companies and Irish SMEs, being situated within the region, including important sectors such as construction, pharmaceuticals, information technology, energy and more. The growth in the area is set to continue and, with this, the energy demand.

The East Meath–North Dublin Grid Upgrade will prepare the grid for the delivery of more renewable electricity from sources such as wind, solar and hydro. This is in line with Government policy. Renewable energy accounted for 36% of all electricity consumed in Ireland in 2019. Ireland's Climate Action Plan 2023 calls for 80% of the country's electricity to come from renewable energy sources by 2030.

Upgrading and strengthening Ireland's electricity grid allows the system to send more energy, both traditional and renewable sources, from where it is generated to where it is needed. The grid needs to deliver a constant supply of energy to users while simultaneously managing a variable supply of energy generated from wind, solar and hydro sources. Grid upgrades will help Ireland to meet growing and changing energy demands while also facilitating a transition to renewable, sustainable electricity generation.



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2. EIRGRID'S APPROACH TO ENGAGEMENT

EirGrid follows a six-step approach to develop Ireland's electricity grid. What to expect, and the ways in which the public can influence projects at each step, is set out in full in EirGrid's *Have Your Say* document. This information is also available on EirGrid's website: www.eirgridgroup.com.

During the 6 steps of each project, EirGrid engages with stakeholders in a variety of ways.This allows EirGrid to inform and to listen, to exchange ideas and plans, to integrate stakeholder interests into project developments and rollouts, and to agree on solutions that suit as many people as possible.

For the East Meath–North Dublin Grid Upgrade, the four steps to date have been:

- In **Step 1**, in 2017, EirGrid confirmed the need for the East Meath-North Dublin Grid Upgrade (all assessment documents are available here).
- In **Step 2**, an initial list of 21 possible project solutions were identified. EirGrid compared all the options using technical and economical standards and then evaluated the options using the EirGrid Multi Criteria Assessment (assessment documents are available here). Four technical options emerged which were taken to Step 3 for in-depth feasibility assessments.
- In **Step 3**, the in-depth feasibility assessment found that three of four technical options involved significant challenges and would not be progressed further. The Woodland – Belcamp 400kV underground cable circuit was chosen as the Best Performing Technical Option for this project. An 8-week stakeholder awareness campaign informed the public of this grid upgrade and the upcoming public consultation on the possible route options.
- In **Step 4**, four possible route options were shortlisted for the Woodland-Belcamp cable circuit. A 12-week public consultation and engagement campaign was launched across the study area, to allow EirGrid to better understand how the upgrade will affect local communities and other key stakeholders. Local knowledge and insights helped EirGrid design the project to minimise negative impacts. A report was delivered on this phase of consultation and engagement which can be viewed on the EirGrid website. At the end of this step, a best performing option (BPO), developed through collaboration and shared understanding in affected areas, will be presented. This report will be taken into consideration as an input to the BPO.

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3. STEP 4 EMERGING BEST PERFORMING OPTION (EBPO) ENGAGEMENT

The focus of this report is to outline the 6-week post consultation engagement and to present any emerging feedback on the Emerging Best Performing Option (EBPO) i.e. the red route.

3.1 Consultation

Step 4 commenced with a 12-week consultation period, from the 7 September 2022 to 30 November 2022. A PR and advertising campaign was delivered during this time comprising:

- 504 radio spots on local radio
- 21 newspaper ads
- 6 Press Releases issued to regional media
- A social media campaign across Facebook, Twitter, LinkedIn and Instagram.

During the consultation period, EirGrid also convened three focus groups and carried out stakeholder meetings, public information days and webinars. There was also a strong door-to-door consultation in the area, with 150 homes visited by Community Liaison officers.

The consultation period sought views on the shortlisted four route options, as well as respondents' views and insights on project information more broadly. EirGrid requested feedback on major events and festivals in the affected area that should be considered in scheduling the project.

Consultation responses were received through email, free-post and the EirGrid consultation portal. The consultation received 24 responses in total. Full details of the outcomes of this consultation are available on the EirGrid website. Responses from the consultation have, together with the mix of technical data and development plans, helped inform the EBPO.

The Red Option, as seen on the map below, has been identified as the EBPO. It is the shortest of the four shortlisted route options. It is approximately 37km in length, with an estimated off-road section of 9km. The majority of the route follows existing roads. It travels south from Woodland substation, near Batterstown in County Meath, to Belcamp substation near Clonshaugh, in north Dublin.

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3.2 EBPO Engagement and Stakeholder Feedback

The post-consultation phase lasted 6 weeks, from 29 March 2023 to 14 May 2023. During this phase EirGrid stakeholders were informed about the Emerging Best Performing Option. Stakeholder engagement during this phase helped EirGrid to develop the route option further and to endeavour to minimise disruption to local stakeholders where possible. Eirgrid corresponded with stakeholders throughout the EBPO phase via email, phone calls, a webinar and the EirGrid website. Additionally, EirGrid built community awareness of the project through the following:

3.2.1 Awareness-Raising PR

To inform the communities that will be affected by the East Meath–Dublin Grid Upgrade, EirGrid shared project updates across a range of media including local and regional press and radio channels, including the Dublin Gazette, Dublin People, The Herald and The Meath Chronicle, 98FM, 104FM and LMFM, as well as across social media channels including Facebook and Twitter. An example of EirGrid's media campaign assets can be found in Appendix 1.

The radio campaign has proven effective for this phase and reached over 40 per cent of the EirGrid target audience within the project area at least once. Social media information videos were the social media content with the most reach for the period.

3.2.2 Open Day and Mobile Information Unit Events

In total, four Open Day events were held following the announcement of the EBPO. This included two in Dublin (in the Clayton Hotel Dublin Airport and in St Margarets GAA Club) and two in Meath (in Scoil Bhríde, Kilbride and The Hatchet Inn, Summerhill Road). For each of the Open Days, EirGrid's Community Liaison Officers (CLO), project managers and members of the EirGrid technical team were on site to answer questions and document feedback received. Approximately 50 people attended the Open Days during this phase in total.

In addition to Open Days, EirGrid organised four Mobile Information Unit (MIU) events, in Dunboyne AFC, Caffrey's Batterstown, The Coachman's Inn (Dublin Airport) and Sweeneys of Kilbride. The EirGrid MIU events are staffed by EirGrid's CLOs and two members of the project team and provided additional opportunities for the public to get project information and provide feedback to the EirGrid team.

3.2.3 Stakeholder Meetings

EirGrid had stakeholder meetings with representatives from Municipal Districts, County Councils, and Local Areas Committees to inform them about the EBPO and to invite feedback on the proposed development plans.

A learning from previous consultations has been that schools, libraries and post offices are effective distribution channels for project information, to boost community awareness of EirGrid's grid upgrade plans. EirGrid therefore placed project brochures in 5 libraries and post offices and engaged with 3 schools as part of Engineers Week in March. This included Schoil Bride NS Kilbride Co. Meath, St Margerets NS in St Margarets, Co. Dublin and Rathregan NS, Batterstown Co. Meath.

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3.2.4 Community Forums

Community Forums are one of the key mechanisms that EirGrid uses to harness local knowledge during the planning stages of grid upgrades. Community Forums act as an important consultative body to input to project planning and proposed project execution. They also support project communications, relationship building and benefit sharing on grid development projects.

The East Meath-North Dublin Community Forum was established in August 2022. During the EBPO engagement phase, the Community Forum met twice to get updates on the project and to discuss feedback from their respective organisations. Meeting minutes can be found here.

East Meath–North Dublin Community Forum Members	
Fingal Chamber	Fingal County Council
Meath County Council	St Margarets GAA
Meath Chamber	St. Margarets Parish Hall Committee
Tyrrelstown Residents Community Council	St. Margarets The Ward
St Margarets Action Group	Craobh Ciarans GAA
Dunboyne AFC	Dunboyne Community Centre
Blackhall GAA Club	Kilbride Tidy Towns
Scoil Bhríde Kilbride Parents Association	Grange Neighbours Group
Batterstown Village Enhancement Assoc.	St. Peter's G.A.A. Club Dunboyne
County Meath Chamber	

4. FEEDBACK ON THE EBPO

Feedback from the public and other stakeholders was captured at Open Days, Mobile Information Unit events, door-to-door engagements and stakeholder meetings by the CLOs.

Most stakeholders expressed that they were happy with the information and the mapping provided across engagement phases. The majority of stakeholders who engaged, clearly understood and accepted the need for the East Meath–North Dublin Grid Upgrade.

No new queries or areas of concern emerged during this period of engagement that had not previously been addressed during the initial Step 4 Consultation and Engagement phase. These themes are summarised under the following themes:

- Traffic management, road closures and traffic disruptions
- Construction / environmental and health concerns,
- Other utilities and coordination of project roll out,
- EirGrid engagement process and communications / information.

A few stakeholders had specific queries regarding construction disruption near their homes. All stakeholders who raised queries were followed up directly by the CLOs and members of the technical team who discussed their query in detail and noted this down for inclusion in the Step 4B technical report.

Recurring themes raised	
Traffic Management, Road Closures and Traffic Disruptions	Q: Will I be able to access my driveway – enter/exit my property without disruption? A: Yes, you will be able to access your driveway at all times during construction. All local residents and businesses will be contacted in advance of construction to provide details of the construction management plan and relevant points of contact throughout.
	Q: What diversions will be put in place – will proper signage be used to aid traffic movement? A: This will be part of the traffic management plan that will be provided and agreed with the Local Authority before commencing construction.
	Q: How do you cater for farm traffic? A: EirGrid will listen to local farmer/landowner concerns and include these in the construction plan. EirGrid will also endeavour to ensure construction does not commence during peak farm activities.
	Q. Will you accommodate school times by not having works ongoing during school run times? A: This will be done where possible, construction will factor in all these school run times, as well as sports and community events when working on the traffic management plan. While there will be disruption, it will be minimised as much as possible.
Construction and Environmental and Health Concerns	Q. How long will the overall construction of the East Meath – North Dublin take? A. Construction will be over a 3- year period, carried out in phases and will cover up to 100m per day in a certain area. No area will be disrupted continually over the 3 years.
	Q. What distance is covered (trenching / ducting) in any given day? A. Up to 100m per day.
	Q. When will construction begin and when will it finish? A. This is yet to be determined and depends on approval of the final planning application. Construction will begin in summer 2026 at the earliest
	Q. What levels of EMF are emitted from the cable? What effects will it have on me and my family?

	A. As this is a recurring question EirGrid have produced an EMF brochure – "The electricity grid and your health which is available on our website here. The maximum magnetic field strength from all high-voltage transmission infrastructure items measured falls well below the ICNIRP guideline reference level for the protection of public health. Full scientific reviews and studies are also available on the EirGrid website
	Q. How will the cables impact growth above / near the cable. A. This information will be available in the Environmental report.
Other utilities and coordination of project roll out	Q. What joined up thinking between existing utilities and those planned is being considered? A. In order to determine the final route, EirGrid works closely with all utilities to endeavour to minimise impact to communities
Feedback on the EirGrid process and communications/ information	Q. What happens between now and BPO announcement? A. EirGrid's technical teams will continue to assess and refine the route with technical surveys and analysis ongoing until the planning application is submitted. EirGrid ALO's will continue to engage with landowners for consent on the off-road sections, while the project team will continue to engage with technical stakeholders.

5. NEXT STEPS – BEST PERFORMING OPTION

It is expected that the Best Performing Option (BPO) will be announced in September 2023. This will be announced via a media campaign in local press, radio and targeted social media channels, along with community forum meeting, and in-person stakeholder meetings.

Following additional engagement with all associated stakeholders the BPO will be taken into Step 5 when a planning application will be developed and submitted to An Bord Pleanala in Q4 2023.

Stakeholder and public engagement will continue throughout Step 5 and Step 6 in line with EirGrid's six-step approach. Should planning permission be granted, a dedicated community benefit fund will be made available to provide direct benefits to communities who are closest to the cable. The first step is the appointment of an independent community benefit fund administrator who will work with the East Meath–North Dublin Community Forum and EirGrid to co-develop a community benefit strategy. The fund, which is proportional to the scale of the project, supports local good causes and helps communities transform their area. EirGrid's community benefit policy is available here.

More information on the East Meath-North Dublin Grid Upgrade can be found here:

www.eirgrid.ie/eastmeathnorthdublin

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Appendix 1

EirGrid East Meath-North Dublin EBPO Press Ad

East Meath-North Dublin Grid Upgrade

See the Emerging Best Performing Route Option

Thank you for taking part in EirGrid's recent public consultation. Having completed further studies and listened to your feedback, we now have an Emerging Best Performing Route Option for the new 400kV underground electricity cable, connecting Woodland substation in Co. Meath to Belcamp substation in North Dublin. This will help us to deliver a secure electricity supply and bring more renewable energy onto the electricity grid.

We'll keep you up to date as we work to finalise the route. Find out more at EirGrid.ie/eastmeathnorthdublin or scan the QR code above.

EirGrid

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Directors: Della O'Donoghue (MD), Judy Cardiff, Joe Moreau. Registered office as MCO Projects Ltd. Registered number: 177219

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EirGrid

East Meath-North Dublin Grid Upgrade

CP1021 | Summary of Engagement with the Public and Stakeholders (steps 1-5)

March 2024


halo

Executive Summary

In order to strengthen the electricity network in the east of Meath and the north of Dublin, EirGrid is proposing to develop a high-capacity 400 kV underground electricity cable between Woodland substation, near Batterstown in Co. Meath, and Belcamp substation, near Clonshaugh in north Dublin. This project is referred to as the East Meath-North Dublin Grid Upgrade, or CP1021.

The upgrade will improve the transfer of power across the existing transmission network and will help to meet the increasing electricity demand in east Meath and north Dublin. It is also key to achieving Ireland's renewable energy targets and reducing reliance on fossil fuels by enabling the grid to transfer increased levels of renewable energy from where it is generated to where it is needed. The project is considered essential to meet the Government of Ireland's Climate Action Plan target of 80% renewable energy generation, onshore and offshore, by 2030.

Following extensive technical analysis and public consultation between 2017 and 2023, EirGrid is now submitting a planning application to An Bord Pleanála for the East Meath-North Dublin Grid Upgrade, with the aim to commence construction once planning is successfully granted. This report provides a summary of the project development and all the public and stakeholder engagement carried out in line with EirGrid's 6-step approach to developing the Irish electricity grid.

To summarise, the key activities have included:

- **Step 1 (2017)** EirGrid confirmed the need for the East Meath-North Dublin Grid Upgrade.
- **Step 2 (2018-2020)** A number of potential technical solutions were analysed and reduced to four options including a mix of overhead lines and underground cables.
- **Step 3 (2021-2022)** The Woodland–Belcamp 400kV underground cable circuit was chosen as the Best Performing Technical Option for this project and an 8-week public awareness campaign about the project was conducted.
- **Step 4 (2022-2023)** Four route options were shortlisted for the Woodland-Belcamp underground cable circuit and a 12-week public consultation took place. The Emerging Best Performing Option (EBPO) was announced, and the public was given a further opportunity to provide feedback on the route. Following final refinements, EirGrid announced their Best Performing Option (BPO) in September 2023.
- **Step 5 (2024)** EirGrid will submit a planning application to An Bord Pleanála for the East Meath-North Dublin Grid Upgrade.

Contents

01 Introduction

1. Introduction

1.1. About EirGrid

EirGrid is the state-owned operator of Ireland's electricity transmission grid and is responsible for a safe, secure and reliable supply of electricity in Ireland. Since 2006, EirGrid has operated and developed the national high voltage electricity grid and wholesale market in Ireland. The grid moves wholesale power around the country, by bringing energy from where it is generated to heavy industry and high-tech users. The grid also supplies the distribution network operated by ESB Networks that powers every electricity customer in the country.

EirGrid is leading the secure transition of Ireland's electricity grid to a low carbon renewable future. Work carried out now will help create a more sustainable future for the next generation.

1.1.1. EirGrid's Statutory Role

EirGrid is the national electricity Transmission System Operator (TSO) for Ireland. The role and responsibilities are set out in Statutory Instrument No. 445 of 2000 (as amended); in particular, Article 8(1)(a) gives EirGrid, the exclusive statutory function:

"To operate and ensure the maintenance of and, if necessary, develop a safe, secure, reliable, economical, and efficient electricity transmission system, and to explore and develop opportunities for interconnection of its system with other systems, in all cases with a view to ensuring that all reasonable demands for electricity are met and having due regard for the environment."

Furthermore, as TSO, EirGrid is statutorily obliged to offer terms and enter into agreements, where appropriate, and in accordance with regulatory direction, with those using and seeking to use the transmission system. Upon acceptance of connection offers by prospective network generators and demand users, they must develop the electricity transmission network to ensure it is suitable for those connections.

1.1.2. Regulatory Targets

Part of EirGrid's responsibility is to develop the electricity transmission grid in accordance with the future needs of society. Careful analysis of different future energy scenarios specific to the area took place to establish that the transmission system is in compliance with the Transmission System Security Planning Standards (TSSPS).

1.2. About the East Meath-North Dublin Grid Upgrade

The East Meath-North Dublin Grid Upgrade (also referred to as Capital Project 1021) is intended to add a high capacity 400kV underground electricity cable from Woodland substation, near Batterstown in County Meath, to Belcamp substation, near Clonshaugh in north Dublin. The upgrade will strengthen the electricity grid in the east of Meath and the north of Dublin and improve the transfer of power across the existing transmission network.

It will be a key enabler in meeting the growing demand for electricity in the east region that is resulting from increased economic activity, the planned connection of new large-scale energy users, and population growth in the region, by improving the capacity of this region's network.

The East Meath-North Dublin Grid Upgrade will also prepare the grid for the delivery of more renewable electricity from sources such as wind, solar, and hydro, in line with Government policy. A significant number of Ireland's wind farms and modern, conventional generators are located in the South and South-West regions of the country. This power needs to be transported to where it is used in highly populated areas in the east of the country. The project is considered essential to meet the Government of Ireland's Climate Action Plan target of 80% renewable energy generation, onshore and offshore, by 2030, and will help reduce Ireland's reliance on fossil fuels.

For more information about the project visit the EirGrid website https://www.eirgrid.ie/eastmeathnorthdublin.

1.3 EirGrid's 6-Step Approach to Developing the Electricity Grid

The East Meath-North Dublin Grid Upgrade development followed EirGrid's established 6-step approach to developing the electricity grid as outlined in EirGrid's Have Your Say document.

Each step has a distinct purpose with defined deliverables and collectively they represent the lifecycle of a grid development project from conception through to energisation. At each step, a series of activities are carried out in order to inform, engage and consult with stakeholders and to facilitate their participation in the project development process.

This approach helps EirGrid to explore options fully and make more informed decisions. It is driven by EirGrid's commitment to putting the public at the heart of decision-making and to work towards solutions that have better landowner and public support.

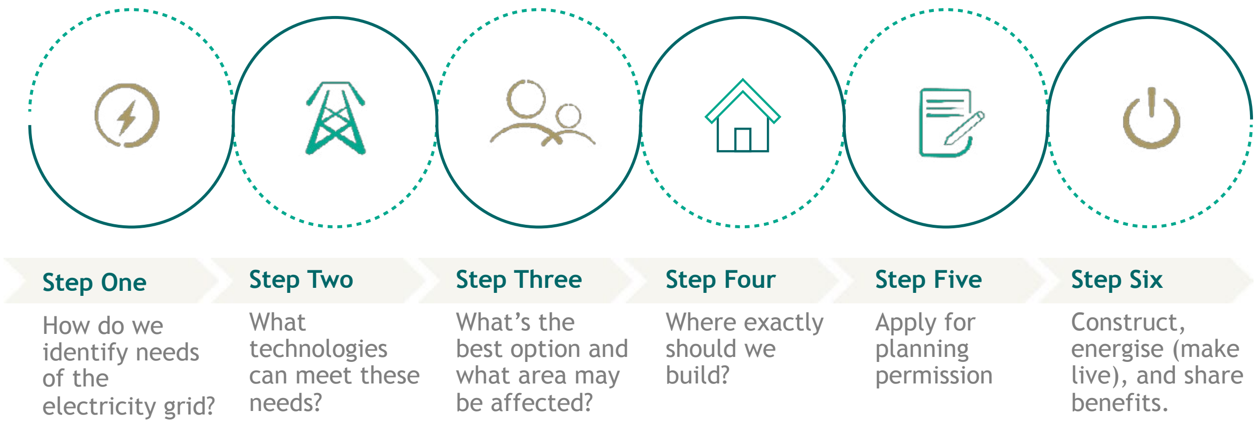

Figure 1: EirGrid Six-Step Grid Development Process

02 Step 1 (2017):

2. Step 1 (2017): How Do We Identify the Future Needs of the Electricity Grid?

The purpose of Step 1 is to identify the future needs of the electricity grid by considering future energy scenarios through a process of analysis.

2.1. Project Developments

During Step 1 for the East Meath-North Dublin Grid Upgrade, EirGrid identified a number of factors that highlight the need for increased energy capacity in the North Dublin area. These included:

1. Increased energy demand in North Dublin due to the changing nature of economic activity, new data centre demand, and population growth.
2. Low energy generation within the Dublin Area and the need to transport renewable energy generated outside of Dublin into the areas where it is needed most.

EirGrid conducted future energy scenarios for the area in question, choosing the year 2025 for analysis to assess the long-term strategic needs of the system and to design reinforcement options to address those needs. This process of scenario testing identified a shortage of capacity to transfer power along a corridor of 220 kV transmission lines between the Woodland 400kV substation to the northwest of Dublin, the key load and generation centres at Finglas, Corduff and Belcamp 220 kV stations, and load and generation in the city centre at Poolbeg and Shellybanks 220 kV stations. Analysis of the transmission network indicated that there were a number of issues that may be in breach of EirGrid's Transmission System Security Planning Standards (TSSPS) that must be addressed, which confirmed the need to reinforce the network.

Several options were explored for how additional capacity could be added to the North Dublin corridor, including additional circuits, uprating existing circuits, and reducing demand in the area. The full details of this analysis and findings were published in a Needs Report[1] in November 2017.

2.2. Stakeholder Engagement

During Step 1, EirGrid held discussions with the Commission for Regulation of Utilities (CRU), Local Authorities, elected representatives and the EirGrid National Advisory Committee.

1 https://www.eirgridgroup.com/site-files/library/EirGrid/CP1021-Step-1-Needs-Report.pdf

03 Step 2

3. Step 2 (2018-2020): What Technologies Can Meet These Needs?

The purpose of Step 2 is to look at the range of technical options that can meet the grid reinforcement need or needs, confirmed in Step 1, and to narrow this down to a short-list of options to bring forward for further investigation and evaluation in Step 3.

3.1. Project Developments

For the East Meath-North Dublin Grid Upgrade, a "long-list" of 21 viable and technically acceptable grid reinforcement options was identified early in Step 2. This list was then refined twice during Step 2. Step 2 was therefore broken down into a two-part approach - Part A and Part B.

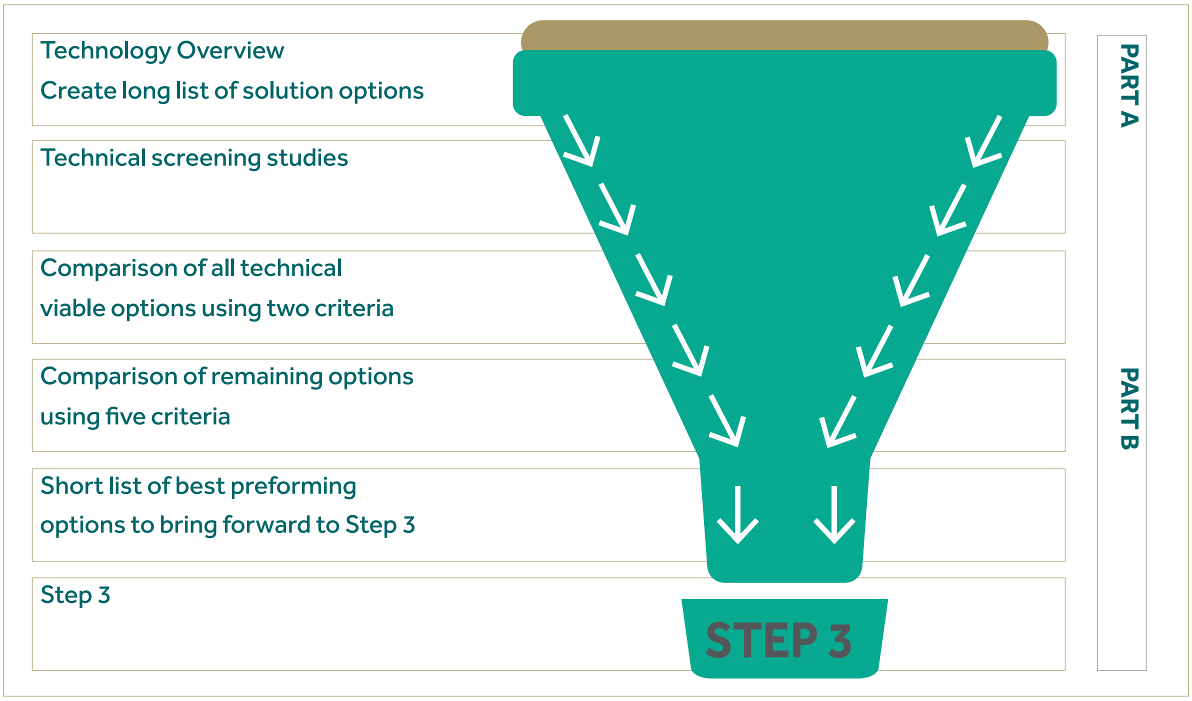

Figure 2. Illustration of the process of developing options in Step 2

3.2. Part A Project Developments

During Part A, EirGrid explored a range of solutions that would address the transmission issue identified in Step 1, namely the need to increase grid capacity into north Dublin. An initial list of 21 viable technology options were considered including overhead lines (OHL) and underground cables (UGC), alongside suitable voltage levels and potential grid connection points.

These 21 options were then compared and evaluated based on their technical performance and economic performance, and the list was narrowed down to seven best performing technical options to be brought forward for further investigation in Part B. All options involved a new connection commencing at Woodland 400/220 kV station and reaching in towards the Northern outskirts of Dublin:

1. Woodland – Corduff New 400 kV OHL Circuit
2. Woodland – Corduff New 400 kV UGC Circuit
3. Woodland – Corduff New 220 kV OHL Circuit
4. Woodland – Finglas New 220 kV OHL Circuit
5. Woodland – Finglas New 400 kV UGC Circuit
6. Woodland – Finglas New 400 kV OHL Circuit
7. Woodland – Belcamp New 400 kV OHL Circuit

In September 2019, the Step 2 Part A Options Report[2] was published.

3.3. Part A Stakeholder Engagement

Between November 2019 and January 2020, EirGrid identified and met with strategic stakeholders in the East Meath-North Dublin Grid Upgrade study area. The purpose of this stakeholder engagement was to build an understanding of the spatial and economic planning that was underway at local and regional levels and to identify the potential needs of large energy users in the future. It also allowed EirGrid the opportunity to brief key stakeholders in the area, to listen to their views about the opportunities and challenges of the project, and to receive feedback on chosen technologies and the refined short-list.

Stakeholders engaged included:

- Department of the Environment, Climate and Communications (DECC)
- Commission for Regulation of Utilities (CRU)
- Meath County Council Chief and Senior Executives
- Fingal County Council Chief and Senior Executives
- IDA Ireland
- Enterprise Ireland
- Eastern Regional Assembly
- Midlands Regional Assembly
- Meath Chamber of Commerce
- Fingal Chamber of Commerce

3.4. Part B Project Developments

During Part B, a broad study area was defined as the area investigated for the possible installation of any of the reinforcement options, paying special attention to the M50 corridor and the highly urban and built-up area south of it including; Dublin International Airport; significant towns and settlements such as Dunboyne, Blanchardstown, Swords and Malahide; environmental constraints such as Malahide Estuary; the need to take the shortest and straightest route possible, and to stay within the public road network wherever possible for the underground cable.

2 https://cms.eirgrid.ie/sites/default/files/publications/CP1021-Step-2-Part-A-Options-Report.pdf

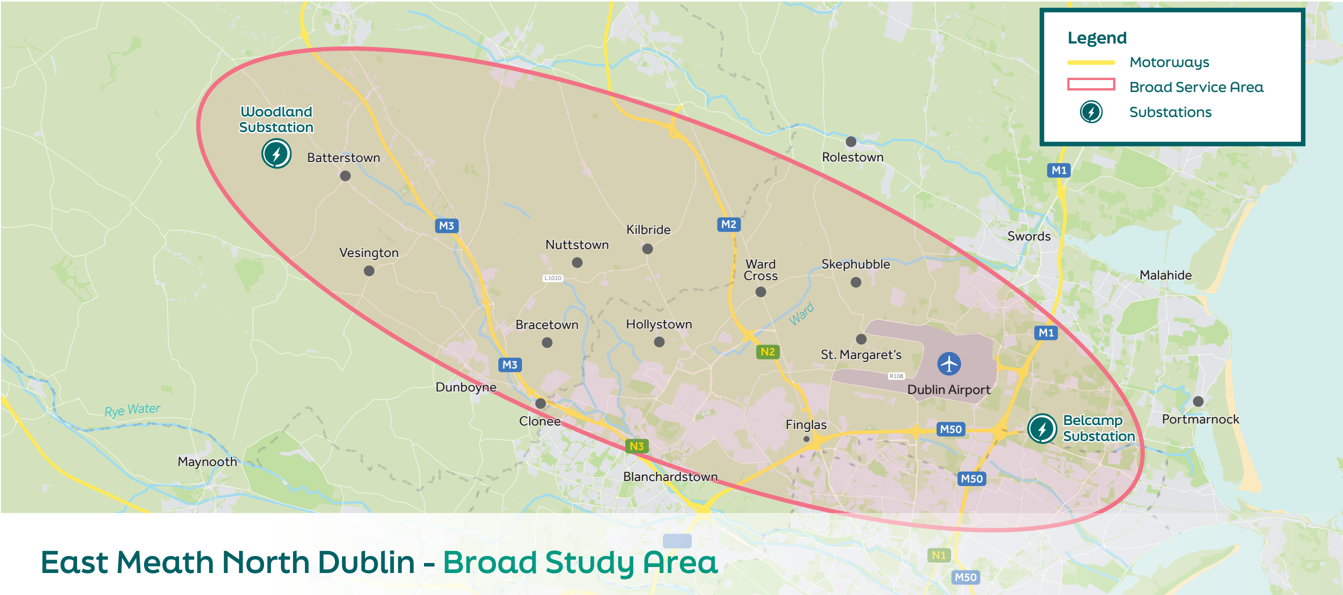

Figure 3: Step 2B East Meath-North Dublin Grid Upgrade Broad Study Area

The seven technical options, shortlisted in Step 2A, were then further evaluated using EirGrid's Multi-Criteria Assessment framework. This comprehensive and consistent multi-criteria analysis facilitated a balanced consideration of the following assessment criteria relating to the East Meath-North Dublin Grid Upgrade:

- **Environment.** This criterion assesses the potential environmental impact of an option on the following:
  - biodiversity;
  - geology and soils;
  - surface water and flood risk;
  - planning policy and land use;
  - landscape and visual impact;
  - cultural heritage;
  - noise & vibration; and
  - air quality.
- **Socio-economic.** This criterion assesses the potential social and economic impact and level of social acceptability of an option. Relevant considerations include:
  - traffic & transport;
  - amenity, such as overall pleasantness or attractiveness of surroundings;
  - human health;
  - employment and economy;
  - agriculture (including equine); and
  - utilities and critical infrastructure.
- **Technical.** This criterion assesses the technical performance of an option with reference to the security of supply and efficiency standards including
  - system reliability;
  - headroom and ratings;
  - maintainability;
  - operational risk; and
  - repeatability.

- **Deliverability.** This criterion assesses the ability to construct and deliver an option within an acceptable period of time. Relevant considerations include:
  - design complexity;
  - traffic disturbance;
  - dependence on other service providers;
  - permits and wayleaves; and
  - implementation timelines.
- **Economic.** This criterion assesses economic performance which considers investment costs and lifecycle costs.

The options were assessed on an equal basis with no weighting applied for any of the criteria.

3.5. Part B Public Engagement

During Part B, public engagement took place to communicate the findings to date with the general public, local communities and their elected representatives, and to receive feedback on chosen technologies and the refined short-list.

The initial focus of stakeholder engagement in Part B took place between August and December 2020. Engagement activities included:

- The launch of a dedicated East Meath-North Dublin Grid Upgrade webpage which included project information, updates, and project reports,
- The development of a project brochure which explained why the project was needed, EirGrid's project development process, the technologies under consideration, and the narrowing of the initial 21 technical options to seven.

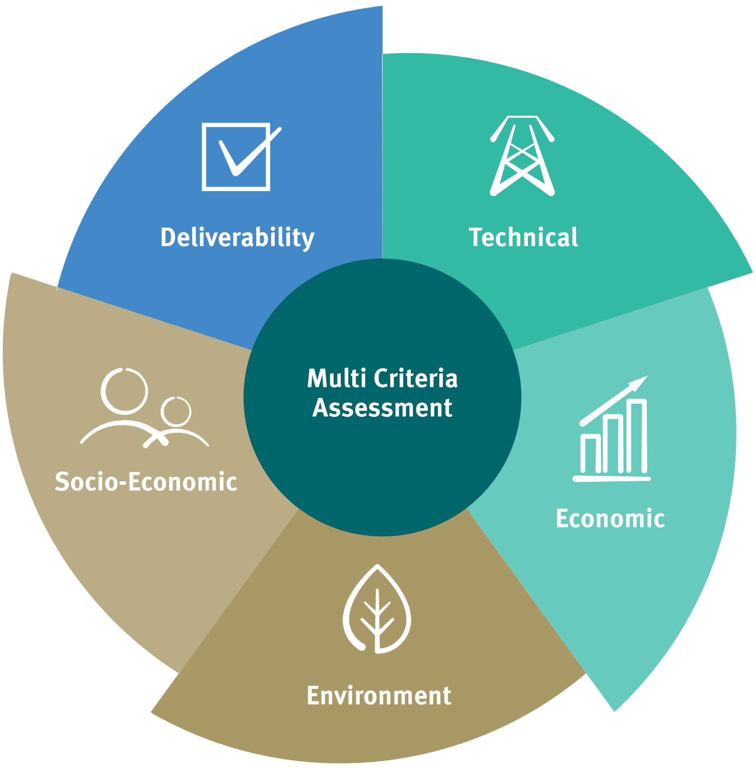

Figure 4: EirGrid's assessment categories

- A door-to-door letter drop to all residents within a 2 km radius of Woodland Substation in August 2020 which provided an introduction to CP1021 East Meath-North Dublin Grid Upgrade plus information on the status of the North-South 400kV Interconnector project (CP0466) and the Kildare-Meath Grid Upgrade (CP0966)
- Briefings offered to the Ratoath and Ashbourne councillors; Sword/Lusk/Balbriggan Area Committees, Meath and Fingal County Council Management Teams as well as TD's and Senators in the Meath East, Dublin Fingal, and Dublin West Dail constituencies.
- A press release to local media.
- Re-engagement with stakeholders from Part A.

3.6. Stakeholder Feedback

All stakeholders were invited to provide feedback in relation to the assessment carried out to date and the solutions to be brought forward for further consideration in Step 3. A small number of responses were submitted, largely with queries about the relationship between the East Meath-North Dublin Grid Upgrade and other ongoing projects around the Woodland substation, including the Kildare-Meath Grid Update (CP0966) and the North-South 400kV Interconnector project (CP0466). Many stakeholders reported that they welcomed the opportunity for early engagement.

3.7. Outcomes of Step 2

In January 2021, EirGrid published an Options Report Part B3 which detailed the evaluation and analysis of the seven grid refinement options, brought forward from Part A, using EirGrid's multi-criteria assessment.

The outcome of the multi-criteria assessment in Step 2 was that the options that connect Woodland to Finglas and Belcamp performed the best overall. The three options which connected Woodland to Corduff were removed from the shortlist as well as the Woodland to Finglas 220 kV OHL.

It was deemed prudent to include a UGC version of the Belcamp to Woodland 400 kV OHL option in Step 3. This solution had been set aside in Step 2A as overall it provided a less favourable combined technical and economic performance compared to other options. The reasons and justification for bringing the option back into the assessment were to take on board stakeholder feedback during Part A, as well as feedback from other new circuit developments, and to allow for the fact that the new grid development will traverse a mix of urban and rural environments to connect the two substations where underground cable is deemed necessary.

Our best performing technical options, using both overhead and underground technologies to link two substations, were brought forward to Step 3 for more detailed evaluation and analysis:

- **Option 1:** Woodland to Finglas 400 kV overhead line
- **Option 2:** Woodland to Finglas 400 kV underground cable
- **Option 3:** Woodland to Belcamp 400 kV overhead line
- **Option 4:** Woodland to Belcamp 400 kV underground cable

3 https://www.eirgridgroup.com/site-files/library/EirGrid/CP1021-draft-Step-2-Part-B-Options-Report_Website_Version-Signing-page-removed.pdf

Table 1: East Meath-North Dublin Grid Upgrade Step 2 Options Refinement

Step 2 the 'long list'	**Step 2A refined list** list brought to **Step 2B**	**2B refined list** list brought to **Step 3**
1. Woordland - Corduff new 220 kV UGC circuit	1. Woodland - Corduff new 400kV OHL Circuit	Option 1: Woodland - Finglas new 400 kV OHL circuit
2. Woodland - Corduff new 220 kV OHL circuit.	2. Woodland - Corduff new 400 kV UGC Circuit	Option 2: Woodland - Finglas new 400 kV UGC circuit
3. Woodland - Corduff new 400 kV UGC circuit	3. Woodland - Corduff new 220 kV OHL Circuit	Option 3: Woodland - Belcamp new 400 kV OHL circuit
4. Woodland - Corduff new 400 kV OHL circuit	4. Woodland - Finglas new 220 kV OHL Circuit	Option 4: Woodland – Belcamp new 400 kV UGC circuit
5. Corduff - Gorman new 220 kV OHL circuit	5. Woodland - Finglas new 400 kV UGC Circuit	
6. Corduff - Poolbeg new 220 kV UGC circuit.	6. Woodland - Finglas new 400 kV OHL Circuit	
7. Corduff - Inchicore new 220 kV UGC circuit.	7. Woodland - Belcamp new 400 OHL Circuit	
8. Corduff - Maynooth new 220 kV UGC circuit.		
9. Corduff - Castlebagot new 220 kV UGC circuit.		
10. Corduff - Carrickmines new 220 kV UGC circuit.		
11. Corduff - Poolbeg - Carrickmines 220 kV UGC circuit.		
12. Corduff – Steelstown (New station) new 220 kV UGC circuit.		
13. Corduff - Castelbagot – Steelstown (New station) new 220 kV UGC circuit		
14. Woodland - Belcamp new 220 kV UGC circuit.		
15. Woodland - Belcamp new 220 kV OHL circuit.		
16. Woodland - Belcamp new 400 kV UGC circuit.		
17. Woodland - Belcamp new 400 kV OHL circuit.		
18. Woodland - Finglas new 220 kV UGC circuit.		
19. Woodland - Finglas new 220 kV OHL circuit.		
20. Woodland- Finglas new 400 kV UGC circuit.		
21. Woodland - Finglas new 400 kV OHL circuit		

Key:

Green: technical options that progressed from Step 2 the 'long list' to Step 2A the refined list.

Gold: technical options that progressed from Step 2 the 'long list, to Step 2A and subsequently to Step 2B the refined list.

Blue: technical option that was brought straight from Step 2 the 'long list' to Step 2B refined list.


EirGrid

04 Step 3

4. Step 3 (2021-2022): What's The Best Option and What Area May Be Affected?

The purpose of Step 3 is to consider the technology options in more detail, and to look at the broad study areas where possible routes or sites may be located. At Step 3, the range of people and organisations consulted with is broadened, and the public have the opportunity to influence the choice of technology and where the project may be built. At the end of Step 3, a preferred option and refined study area is generally identified.

4.1. Project Development

In 2021, four technical reinforcement options were brought forward from Step 2 Part B for more detailed analysis in Step 3. They represent two different technologies - overhead lines (OHL) and underground cables (UGC) – which could connect Woodland 400 kV substation and either Belcamp 220 kV substation or Finglas 220 kV substation.

In Step 3, these four options were reassessed against the five criteria of EirGrid's multi-criteria assessment framework (described in Step 2 Part B). As a result, EirGrid identified Option 4, which would connect two existing substations, namely Woodland substation in Co. Meath and Belcamp substation in Co. Dublin, as the best performing technical option. This would strengthen the network between the two existing substations by a new 400 kV underground cable. This option had not initially been proposed by EirGrid during Step 2 Part A but had been added to the short-list following engagement with key stakeholders during Step 2.

A number of feasibility studies and assessments were then conducted to refine the study area. These considered a wide variety of factors including stakeholder and community feedback, technical requirements of the project, road networks, settlements, presence of existing electrical utilities, physical constraints e.g. motorway, river or rail crossings, and environmental constraints.

A refined study area was proposed which reflected:

- The removal of the area south of the M50 due to the proliferation and density of existing utilities, residential and industrial buildings and the significant disruption of traffic flows and congestion that would likely occur during construction.
- The removal of the area south of the N2 where it encroaches on the M50 for the same reasons.
- The omission of the M50 itself given that it is a protected road route which would not be feasible for accommodating grid infrastructure.
- The inclusion of the towns of Swords and Malahide to investigate the feasibility of bringing an OHL between the towns in order to avoid Dublin International Airport and its exclusion zone.

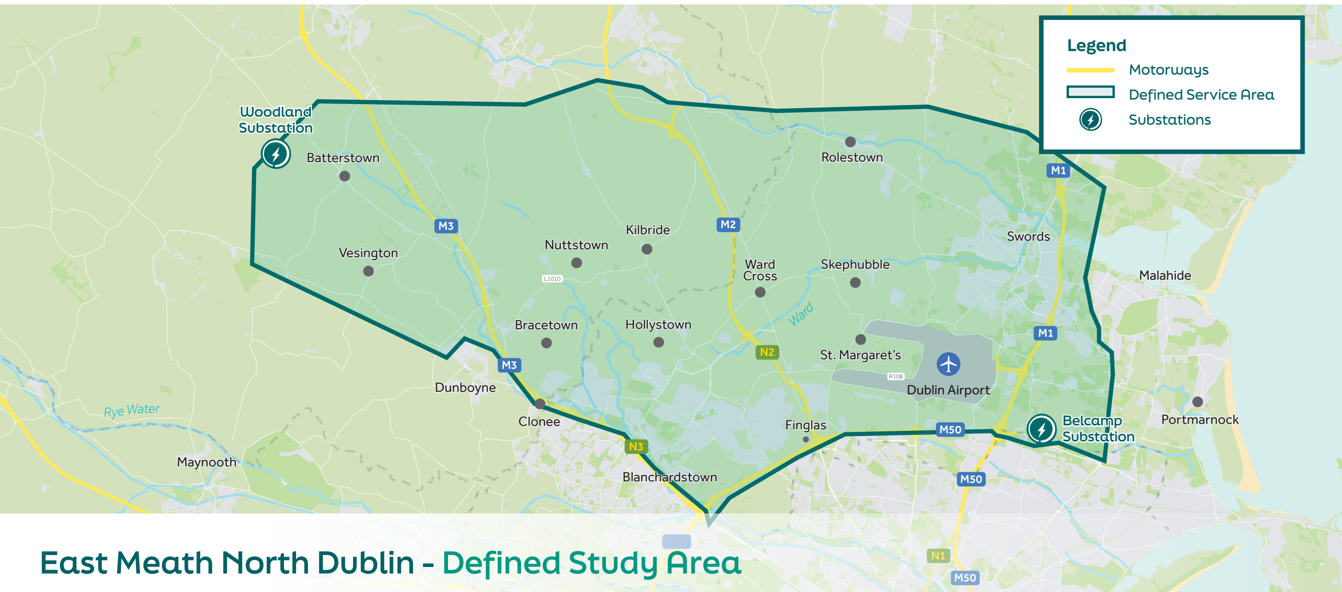

Figure 5: Step 3 East Meath-North Dublin Grid Upgrade Defined Study Area

4.2. Stakeholder Engagement

An 8-week public awareness and engagement campaign took place between May and June 2022 to present the Woodland to Belcamp 400 kV underground cable as the Emerging Best Performing Technical Option for this grid development project to all stakeholders within the chosen study area. This campaign aimed to:

- Build awareness of the project and ensure local communities understood the potential benefits of the project;
- Learn more about the local area and potential issues that could restrict options in the study area, and to understand any issues of public concern around the project;
- Inform stakeholders of the 12-week consultation period that would occur in Step 4 and to provide information about the project to enable informed feedback;

All stakeholders were invited to provide feedback in relation to the Emerging Best Performing Technical Option.

4.2.1. Awareness Raising

EirGrid's media campaign was live from 4th May - 29th June 2022. Communication activities included:

- Campaign advertising in print media including Meath Chronicle, The Herald, Irish Daily Mirror, The Star, Dublin Gazette, and the Dublin People.
- Bespoke letter-drop to over 10,000 residents within the study area outlining information about the project and how stakeholders could find out more.
- Radio advertising on LMFM, Radio Nova and Sunshine 106.8.
- Digital advertising on various hubs including Applegreen and SuperValu.
- Online digital media advertising on platforms including Facebook, Instagram and Twitter.

4.2.2. Stakeholder and Public Engagement

Key stakeholders, including local authorities, councillors, TDs, Public Participation Networks and Chambers of Commerce, were offered meetings to receive an update and as an opportunity to provide feedback on the project. Multiple public engagement activities were also undertaken to reach the wider public, including:

- A public webinar to provide project updates to attendees and offer the opportunity to engage in the Q&A sessions with the project manager on this grid development project.
- Open days where members of the public could drop in to learn more about the project within the study area including Tyrrelstown, Kinsealy Garden Centre, St. Margaret's GAA Club, Dunboyne, Kilbride, Airport Road in Fingal and Batterstown, Co Meath, and Swords County Hall.
- Attendance at the Fingal PPN Plenary meeting where over 80 community organisations were present.
- A presentation to members of the Fingal PPN housing, Planning and Transport linkage group.
- Door-to-door contact in the vicinity of the two substations at Woodland and Belcamp.

4.2.3. East Meath-North Dublin Grid Upgrade Community Forum

During Step 3, a community forum was established for the East Meath-North Dublin Grid Upgrade by EirGrid. The purpose of community forums is to bring together people and organisations from across grid infrastructure project areas so that stakeholder and community views can be discussed, understood, and properly considered prior to and during project delivery. Led by independent chairs, they create the opportunity for dialogue between EirGrid and stakeholders with diverse and direct interest in the project and allow for valuable local insights and knowledge to inform project delivery.

An information evening was held in July 2022 which invited members of local community groups with an interest in joining the forum to learn about the purpose, benefits, and scope of the forum. Expressions of interest for participation were invited and the forum was established in early August 2022.

The East Meath-North Dublin Grid Upgrade Community Forum is chaired by an independent facilitator and is composed of members of the local community who represent and have reach into a wider network of people.

Members include:

- Fingal County Council
- Meath County Council
- Meath Chamber of Commerce
- Fingal Chamber of Commerce
- Tyrrelstown Residents Community Council
- St. Margarets Action Group
- Dunboyne AFC
- Blackhall GAA Club
- St. Margaret's GAA
- Croabh Ciarans GAA
- St. Margaret's The Ward
- St. Margaret's Parish Hall Committee
- Dunboyne Community Centre
- Kilbride Tidy Towns
- Scoil Bhride Kilbride Parents Association
- Grange Neighbours Group
- St. Peter's G.A.A. Club Dunboyne
- Batterstown Village Enhancement Association

The first meeting took place on the 10th of August 2022. The forum meets as regularly as required during the development of the project. It will continue to meet 3-4 times per year for the duration of construction to receive project updates, provide feedback, and ensure two-way communications is ongoing. All forum meetings are minuted and published on the EirGrid website.

4.3. Summary of Feedback

A wide range of feedback was captured and assessed through the engagement activities during Step 3. This feedback included:

- Concerns about potential disruption during project construction to lives and businesses, especially from road closures and traffic diversions.
- Concerns about the possible negative impacts the project could have on the local environment.
- Questions about potential impacts of the project on Dublin Airport.
- Questions on how the grid upgrade is connected to other EirGrid projects in the area and how they might affect each other.
- Positive feedback regarding the early engagement with the public ahead of the Step 4 Consultation.
- Positive feedback in relation to high level of staff knowledge during engagement events.
- Support for the decision to route the cables underground and for the route to be road based.

This feedback was assessed and used to inform the route options developed and presented to the public for consultation during Step 4.

4.4. Outcomes of Step 3

Following the technical assessment and stakeholder engagement which took place in Step 3, the **Woodland to Belcamp 400kV underground cable option** was selected as the best performing technical option in terms of the choice of technology and end node substations and was approved for progression to the next step.

The study area was further refined to confirm the area within which a number of route options would be developed and brought to public consultation during Step 4.

A Step 3 technical report[4] was published on the project webpage in August 2022 which detailed the process of evaluating the options using the multi-criteria assessment tool, and the stakeholder and public engagement activities undertaken.

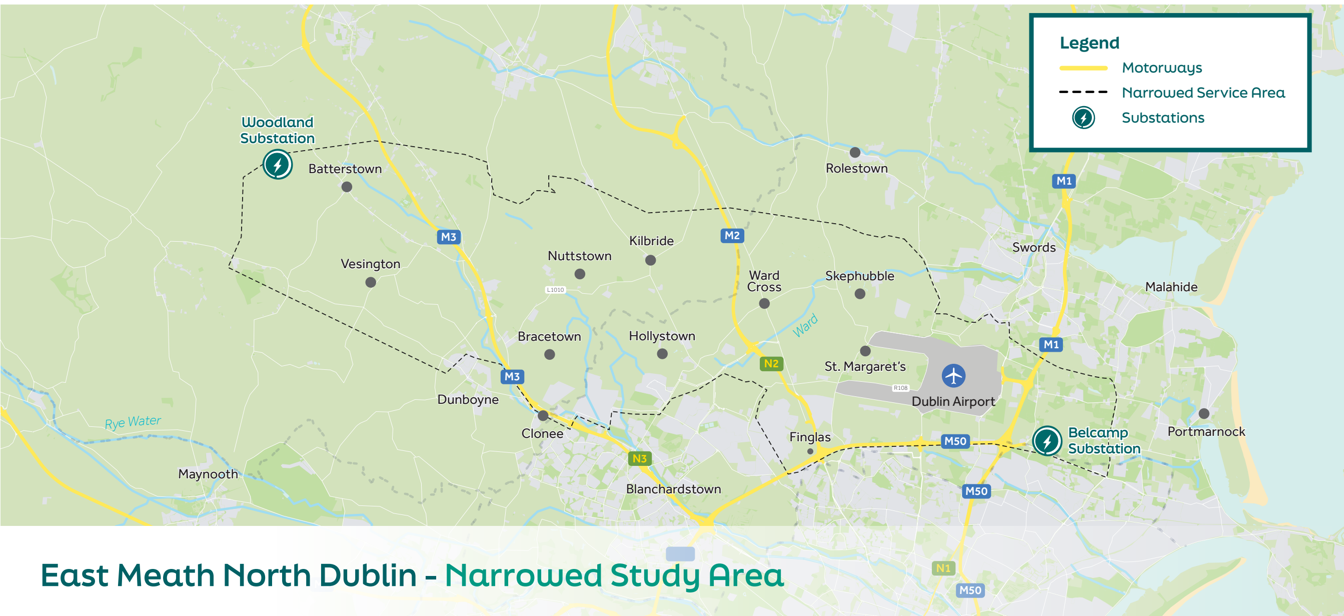

Figure 6: East Meath-North Dublin Grid Upgrade Narrowed Study Area

4 https://www.eirgridgroup.com/site-files/library/EirGrid/CP1021_Step-3-Report_FINAL-for-publication.pdf


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05 Step 4

5. Step 4 (2022-2023): Where exactly should we build?

The purpose of Step 4 is to assess exactly where is the most appropriate place to build a project. At this step EirGrid works closely with local stakeholders, including landowners, who will be directly affected by the project. The aim is to understand which locations for new infrastructure are preferred by local people, and to collaborate on the development of an agreed route or site.

5.1. Project Developments

Step 4 began with a refinement of the study area, as shown in Figure 7, which allowed EirGrid to identify a long-list of possible route options between the Woodland and Belcamp substations, taking into account the mapped constraints. These route options were then assessed against EirGrid's routing principles which include:

- Avoid motorways;
- Maximise the use of regional and local roads;
- Avoid town centres and industrial estates;
- Avoid going off-road, through private land and through agricultural land where possible;
- Avoid sensitive natural and built heritage locations;
- Minimise impact on communities where possible; and
- Minimise the overall length of the route

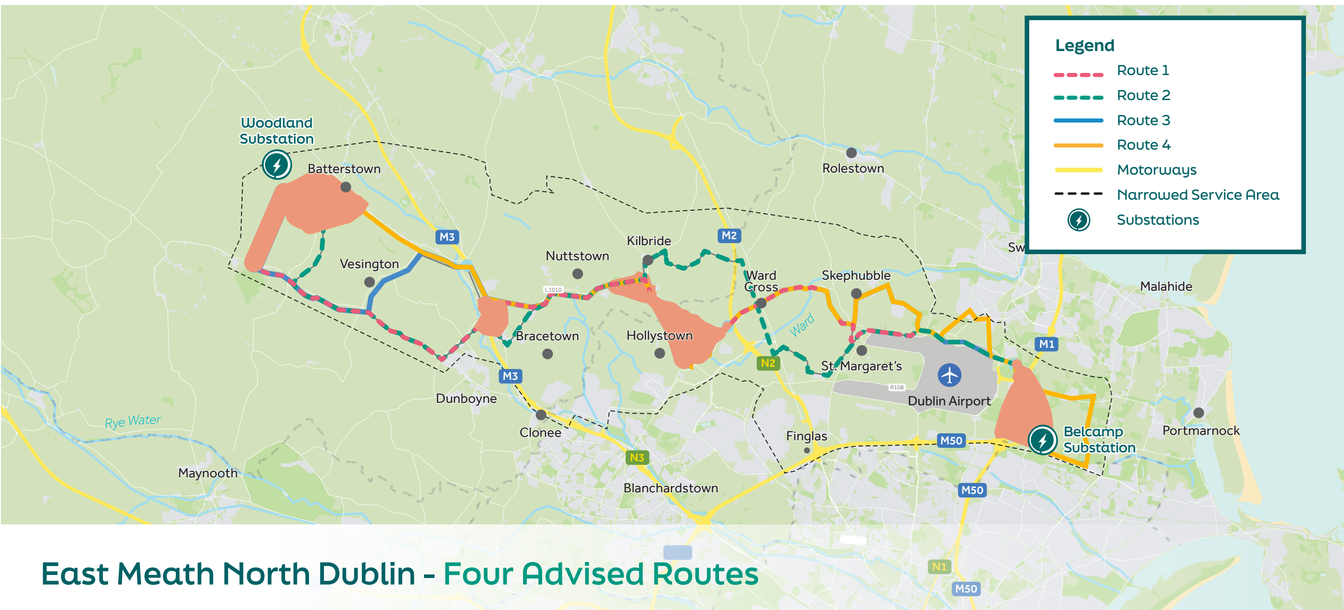

Figure 8: Step 4 East Meath-North Dublin Grid Upgrade Four Advised Routes

This assessment allowed EirGrid to develop a short-list of four end-to-end route options, each of which scored highly against the routing principles. An interactive map[5] of these route options was shared with stakeholders and published to the project website.

5.2. Step 4 Stakeholder and Public Engagement

These 4 routes were then brought to the public for feedback. A range of communication and engagement activities took place to reach the public with information about the project plans and about the ways to submit consultation responses and provide project feedback.

5.3. Public Consultation Period

5.3.1. Communications and Awareness Raising

Communications activities started at the end of August 2022, two weeks before the consultation opened, and continued for the duration of the consultation period. These included:

- A media campaign in regional press and radio, social media (paid and organic), locally targeted advertising on digital screens and ad-boards;
- GAA pitch sponsorship (3-year agreement) for 6 local pitches; St. Colmcille's GAA Club, Fingallian's GAA Club, Kilbride GAA Club, Innisfails, St Peters Dunboyne GAA Club, and Ballymun Kickhams;
- An informational video[6] about the project which was shared on social media; and
- 12,000 Freepost Questionnaires which were printed and delivered across the project study area plus a 1km buffer zone beyond.

5.3.2. Public Consultation

From the 7th September – 30th November 2022, a 12-week public consultation took place where the public and other stakeholders were invited to give feedback on the four short-listed route options, as well as views and insights on project information more broadly such as major events and festivals in the area that should be considered in scheduling the project.

Three channels were provided for submission of responses to the consultation:

- **Online:** by using the consultation portal[7]
- **Email:** at the project's dedicated email address; EastMeathNorthDublin@eirgrid.com, administered by the project team at EirGrid.
- **Post:** by returning the freepost questionnaire delivered to all homes and businesses along the route, or by sending a letter to the freepost address provided by EirGrid.

An updated project brochure[8] was developed, which was published on EirGrid's website and shared with stakeholders to give a summary of project updates and developments and to invite participation in the consultation.

A broad range of communications and engagement activities were used to promote the consultation to as wide an audience as possible.

5.3.3. Stakeholder Engagement

Strategic stakeholder engagement during Step 4 included meetings and/or written communications with:

- Transport Infrastructure Ireland (TII)
- Local Authorities (Meath County Council, Fingal County Council)
- Ratoath and Ashbourne Municipal District and three

5 https://jacobs.maps.arcgis.com/apps/webappviewer/index.html?id=00995c220d5b4a3081a5eb68e0933c2a
6 https://www.youtube.com/watch?v=Y7FvDIxXHYs
7 https://consult.eirgrid.ie/
8 https://www.eirgridgroup.com/site-files/library/EirGrid/210538-EirGrid-East-Meath-North-Dublin-Step-4-Consultation-v14.pdf

Dublin Area Committees

- Irish Water
- ESB Networks
- Meath Chamber of Commerce
- Meath PPN
- Fingal PPN Housing, Planning and Transport Linkage Group

5.3.4. Public Engagement

Multiple in-person public engagement activities were undertaken to reach the wider public and to direct them to the consultation portal, including:

- Six Open Days at Swords, Dublin 11, Dublin 17, Priest Town, St Margaret's and Batterstown;
- Mobile Information Unit (MIU) events, visiting Batterstown, Dublin 11, Malahide Road, Priest Town, Cloughran;
- Door-to-door engagement with 150 homes visited in the vicinity of the Woodland substation and in Kilbride Village;
- Three webinars for members of the public and stakeholders in September, October, and November;
- Participation at the Meath Energy Expo in Navan.

5.3.5. Focus groups

In order to add qualitative insights to the consultation, three focus groups were convened in November 2022. The focus groups were designed to explore what community members thought about the four route options for the East Meath–North Dublin Grid Upgrade, as well as EirGrid's efforts to consult the community about the project. To do this, 36 community members living and working within the project area were recruited with the help of a market research recruiter. Each group had representation across the key demographics of gender, ethnicity, age and socio-economic status of household.

Participants were sent the project brochure before attending one of three 90-minute evening sessions facilitated by an independent facilitator across two weeks. They were firstly asked to complete a survey about their initial awareness of EirGrid and about the project, as well as outlining the information sources they most commonly used to acquire such information. Participants were then presented with information about the project, route options and programme of consultation by an EirGrid representative. This was then followed by a group discussion where participants were encouraged to provide feedback on each route option individually and to consider any related concerns or opportunities.

Lastly, participants were given time to review EirGrid's consultation materials and to provide feedback on EirGrid's approach to communicating information on the East Meath-North Dubin Grid Upgrade Project and their efforts to engage the public.

The key research questions asked were:

1. What awareness of EirGrid and the project do community members have and from what avenues?
2. What comments do community members have and what, in their view, are the key opportunities and concerns about each of the proposed route options?
3. What do community members think about EirGrid's efforts to communicate and engage the public on these plans?
4. What more could EirGrid do to improve their engagement with communities affected by development of their grid infrastructure?

5.3.6. Community Forum Meetings

During Step 4, four community forum meetings were held in the lead-up to, and during, the public consultation period, aligning with the purpose of these forums – to facilitate the discussion, understanding and careful consideration of stakeholder and community views before and during project delivery. Meetings were held on the 6th September 2022, 6th October 2022, 17th October 2022 and 21st November 2022.

At the outset of each forum meeting, the EirGrid team delivered a presentation on recent project developments, including proposed route options and the assessment findings that influenced these decisions. EirGrid also outlined the planned media, PR and engagement activities for the consultation period and later the emerging themes from the public consultation.

During the 6th October 2022 meeting, Forum members actively participated in providing detailed feedback on the proposed route options. They carefully analysed and commented on each section of the four routes, contributing valuable local insights related to roads, residential, agricultural, and commercial areas.

The Forum members played an important role in providing feedback on EirGrid's communications activities and offered advice on enhancing local awareness of the project, the public consultation and ongoing engagement activities such as Open Days and MIUs.

Additionally, Forum members emphasised the importance for EirGrid in collaborating with other stakeholders involved in the delivery of large infrastructure projects, such as County Development and Local Area Plans or new road developments. EirGrid confirmed its commitment to engaging key stakeholders to align the East Meath-North Dublin Grid Upgrade route selection and construction timing with other proposed developments and hence minimise disruption.

During the discussions, Forum members shared important local information, including the temporary relocation of Tyrrelstown Community Centre to Hollystown Golf Club. This information proved valuable in ensuring that scheduled project site investigations were not disrupted.

Meeting minutes[9] are available on the project website.

5.4. Summary of Feedback – Consultation Period

A total of 24 consultation responses were received during the consultation period. This was indicative of the low level of objection to the proposed solution and the high level of acceptance following the public engagement campaign.

Table 2: Step 4 Consultation Responses

Response Channel	Volume
Online submissions	5
Hardcopy response form	11
Letters and emails	8

A high-level summary of positive comments from across the engagement activities, including stakeholder meetings, consultation submissions and focus groups, included:

- Broad support for the project and an understanding of the need for the upgrade due to increase in demand;
- Positive feedback for clarity of information available at MIUs and Open Days;
- Praise for the project's role in enabling the green transition in Ireland; and
- Satisfaction at the level of engagement publicity during the consultation process, including advertisements in regional newspapers.

Some stakeholders expressed concerns over disruption to local communities and businesses, particularly as a result of increased traffic movements.

9 https://www.eirgrid.ie/community/projects-your-area/east-meath-north-dublin-grid-upgrade

Among the concerns raised were the following:

- Concerns about traffic associated with construction as well as the size of the construction vehicles, especially on narrow roads;
- Potential safety issues arising from Electromagnetic Fields (EMF);
- Concerns about the impact of the project on culture and heritage sites as well as the local environment; and
- Requests for joined up thinking with ongoing local utility and renewable construction projects.

During the focus groups, feedback centred on construction and travel disruption, with concerns about the cumulative impacts of the construction with other development schemes taking place in the area. Participants gave ideas for mitigation, such as effective communications and joined up working.

Following the consultation period, EirGrid published a Step 4 Public Consultation and Engagement Report[10]. This report maps detailed feedback received across all the community and stakeholder engagement.

A summary of the queries received throughout Steps 3 and 4 and the responses provided are included in the appendix.

5.5. Project Developments – Post Consultation Period

Combining the technical analysis, consultation responses and stakeholder and public feedback from engagement events during the consultation period, Option A: The Red Route, was selected as the Emerging Best Performing Option (EPBO) in March 2023. The route map was then refined further to reduce any wider areas (corridors) and to provide more certainty on the specific location of the route. Five corridors then remained, all of which involved off-road sections that required further discussions with relevant stakeholders and landowners. Technical surveys and assessments identified several areas where minor route changes would result in an improved route, as they would reduce potential environmental impacts or avoid private lands.

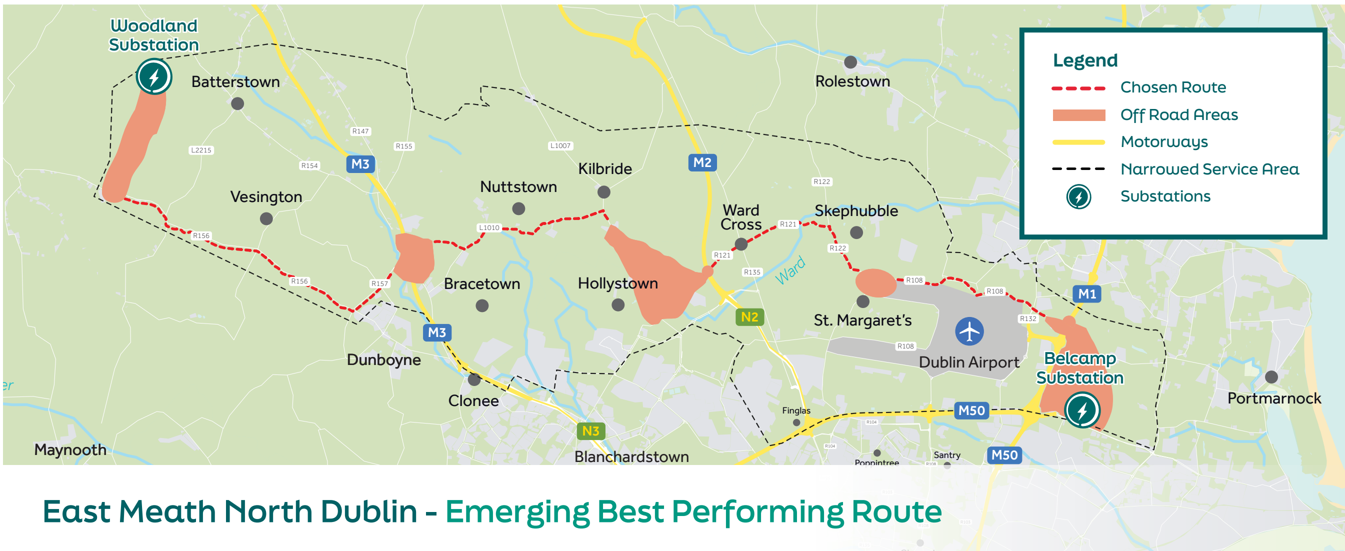

Figure 9: Step 4 Map of the Emerging Best Performing Route Option (EBPO)

10 https://www.eirgridgroup.com/site-files/library/EirGrid/CP1021_EastMeath_NorthDublin_Grid-Upgrade_PublicConsultationAndEngagementReport_Final.pdf

5.6. Stakeholder Engagement - EBPO

The EBPO was announced to the public in March 2023. This was accompanied by a 6-week public and stakeholder engagement period between March and May 2023. The purpose of this engagement was to inform stakeholders and local communities of the EPBO route and to provide opportunities for feedback. Engagement activities included:

- Landowner engagement to agree access to lands for walkover surveys and ground investigation works; and to refine routes through private lands;
- Meetings with Municipal Districts, County Councils and Local Area Committees;
- Media and PR awareness campaign including local and regional press and radio channels, as well as social media;
- Door-to-door engagement in and around Hollystown and Belcamp;
- Four Open days: at the Clayton Hotel Dublin Airport, St Margarets GAA Club, Scoil Bhríde, Kilbride and The Hatchet Inn, Summerhill Road;
- Mobile Information Unit (MIU) events in Dunboyne AFC, Caffrey's Batterstown, The Coachman's Inn (Dublin Airport) and Sweeneys of Kilbride; and
- Engagement with three local schools as part of Engineers Week in March: Schoil Bride NS Kilbride Co. Meath, St Margarets NS in St Margarets, Co. Dublin and Rathregan NS, Batterstown Co. Meath.

Feedback from stakeholders and the public highlighted that most stakeholders were happy with the information presented and communicated on the project, that the need for the project was clearly understood and that EirGrid's level of engagement across the project phases had been satisfactory.

No new queries or areas of concern arose during the EBPO engagement activities that had not been previously addressed during the consultation phase.

5.7. Outcomes - EBPO

Continued assessments, design surveys and feedback from the EBPO engagement period allowed EirGrid to confirm Option A: The Red Route as the Best Performing Option (BPO). EirGrid published a Step 4B Route Options and Evaluation Report[11] in September 2023, which outlined the Best Performing Route Option in detail.

Following the EBPO engagement period, EirGrid also published a Step 4 Emerging Best Performing Option Engagement Summary Report[12.] The report provides details of the engagement activities and the feedback received.

5.8. Stakeholder Engagement – BPO

The BPO was announced to the public in September 2023. Step 4 then concluded with a four-week information period of communications and engagement activities to ensure that stakeholders and communities were aware of the developments of the project plans and the BPO route and to provide a final opportunity for feedback or queries before the project moved into Step 5.

Information and engagement activities included:

- Media and communications materials presented and published in both English and Irish language across local radio and press;
- A social media campaign with video assets about the BPO shared across Facebook and Instagram;
- Door-to-door engagement with residents from Kilbride to Hollystown and in St Margarets;
- Mobile Information Unit (MIU) events in Hollystown, St Margarets and Dunboyne;

11 https://cms.eirgrid.ie/sites/default/files/publications/EMND-4B-Report-September-2023.pdf
12 https://cms-prd.eirgrid.dept.ie/sites/default/files/publications/East%20Meath-North%20Dublin%20Grid%20Upgrade%20Engagement%20Summary%20Report%20STEP%204%20Emerging%20Best%20Performing%20Option.pdf

- A digital feedback form was introduced to offer stakeholders a new and accessible way of providing feedback across the various in-person and online engagement activities; and
- Stakeholder meetings with local authorities, public representatives and local schools.

Feedback from stakeholders and the public was very positive about the project during the BPO engagement. Traffic disruptions due to project construction was the most frequently raised concern and questions were posed to the engagement team about joined up thinking when laying services and the reinstatement of roads are due.

Several stakeholders and members of the public expressed that real trust had been built between EirGrid and local people and businesses in the area through ongoing engagement and communications since the project began.

5.9. Best Performing Option: Red Route

The East Meath-North Dublin Grid Upgrade BPO is the refinement of the chosen route along the project corridor, which crosses the River Tolka, the railway at M3 Parkway, along with the M1, M2 and M3 motorways. The proposed project route has an overall length of approximately 38 kilometres and an off-road section of approximately 11 kilometres. Feedback captured across engagement activities during the public consultation and EBPO periods, helped inform the refinements of the project route. Stakeholder and public feedback, combined with technical assessment and design surveys, led to the shortening of the total length of the cable by 1.2 kilometres and an increase of the off-road length from 8.7 to 10.8 kilometres, leading to a reduction of possible disruption during the project construction phase.

An updated East Meath-North Dublin Grid Upgrade project brochure was developed which outlined the EBPO refinements and the Best Performing Option route, was published on the website in September 2023.

Following a period of additional engagement with landowners, the Community Forum, infrastructure owners and other key stakeholders, the BPO was taken into Step 5.

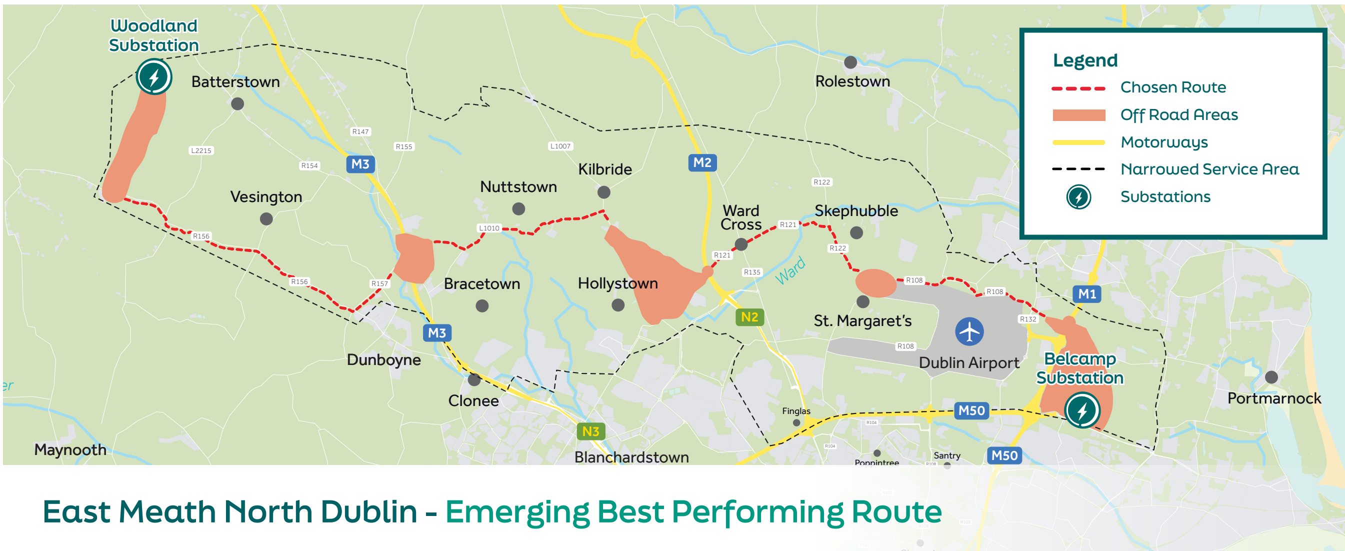

Figure 10: Step 4 East Meath-North Dublin Grid Upgrade Chosen Route (BPO)


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06 Step 5

6. Step 5 (2024): Apply for planning permission.

The purpose of Step 5 is to prepare the planning application that will be submitted to An Bord Pleanála.

6.1. The Planning Process

Having published the Route Options and Evaluation Report[13] in Step 4, the planning and design development process commenced. This included undertaking surveys and investigations within the preferred route corridor, developing the route design, identifying the land take required, junction and access requirements and the completion of an Environmental Impact Assessment Report. During this phase, the project team engaged with landowners and interested parties as part of the design development process.

Having developed the design, engaged substantively with landowners and interested parties, a planning submission and statutory orders are now ready for publication.

A statutory public consultation process will now be undertaken as part of the statutory approval process. Any person or body may make a submission or observation in writing to the Board in relation to the application. Further information on making a submission / observation in writing to the Board and oral hearing procedures are available from the Board's website www.pleanala.ie.

6.2. Stakeholder Engagement

During Step 5 there has been ongoing engagement with stakeholders.

A community forum meeting was held on the 22nd of February to inform the members of project updates. Community Forum meetings will be ongoing throughout Step 5 in preparation for Step 6: Construction, Energisation and Benefit Sharing.

As part of 2024 Engineers Week, which took place from the 2nd to the 8th of March, EirGrid undertook local engagements as part of the Engineers Ireland's STEPS programme. The Engineers Ireland STEPS Programme is a non-profit outreach programme that promotes interest and awareness in engineering as future career to students in all communities through a portfolio of projects.

EirGrid visited Rathbeggan National School, in Dunsaughlin, Co Meath, and Rathregan National School in Batterstown, Co Meath, to engage over 100 students from 3rd to 6th class and to discuss the exciting and creative work of engineering. A presentation from one of EirGrid's senior engineers outlined how engineering is at the heart of the work EirGrid does in developing the electricity grid and all students took part in an interactive quiz.

13 EMND-4B-Report-Septembehttps://cms.eirgrid.ie/sites/default/files/publications/EMND-4B-Report-September-2023.pdfr-2023.pdf (eirgrid.ie)

07 Step 6

7. Next Steps and Ongoing Engagement

7.1. Ongoing Engagement and Project Updates

Updates on the project will be available on the 'project website'[14] section of the project webpage for the lifecycle of this project. EirGrid will continue to engage with technical stakeholders, the Community Forum and the wider community throughout the project planning process and thereafter.

The technical stakeholders who have been engaged throughout the development of the project, and will continue to be engaged going forward, include:

- Meath County Council
- Fingal County Council
- Dublin Airport Authority
- Industrial Development Authority
- Transport Infrastructure Ireland
- Irish Rail
- Irish Aviation Authority
- Uisce Eireann
- Gas Networks Ireland
- ESBN
- National Parks & Wildlife Service
- Inland Fisheries Ireland
- National Monuments Services

At Step 6, EirGrid will work with ESB Networks to minimise the impacts of construction and will engage with landowners and local communities on traffic management and access requirements.

7.2. Community Forum and Benefit Fund

EirGrid recognise the importance of local communities and businesses who facilitate the upgrading of the electricity transmission network and the community benefit fund reflects this.

Should planning permission be granted and the project enters Step 6: Construction, Energisation and Benefit Sharing, the Community Forum will continue to play an important role throughout construction. A dedicated community benefit fund for the East Meath-North Dublin Upgrade area will be made available to provide direct benefits to communities who are closest to the grid developmen. This fund, which is proportional to the scale of the project, supports local good causes and help communities transform their area. The Community Forum will help support the implementation of the Community Benefit Scheme with the support of the EirGrid Public Engagement team and an independent Community Fund Administrator.

14 https://www.eirgrid.ie/community/projects-your-area/east-meath-north-dublin-grid-upgrade

The Community Forum will endorse the fund strategy developed by the Fund Administrator in conjunction with input from local stakeholders and will work with EirGrid to ensure fund administration alignment between the benefit scheme and the strategy. The strategy will also align with other local community plans, national policy, and the Sustainable Development Goals.

The community benefit is spread across three funding streams including:

- **Community –** to reinforce community, cohesion, wellbeing and education;
- **Sustainability –** to transform how communities think about, generate and use energy;
- **Biodiversity –** to leave the biodiversity of an area in a better condition than it was before we built a project.

Further Information

For updates and further information on this project you can go to the project page:

https://www.eirgrid.ie/community/projects-your-area/east-meath-north-dublin-grid-upgrade

08 Appendices

8.1 Step 3 Letter to residents living within the East Meath-North Dublin study area

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www.eirgrid.com
An tUbhchruth, 160 Bóthar Shíol Bhroin
Droichead na Dothra, Baile Átha Cliath 4, D04 FW28, Éire
The Oval, 160 Shelbourne Road
Ballsbridge, Dublin D04 FW28, Ireland
Fón / Telephone +353 1 677 1700
R-phost / Email info@eirgrid.com

May 2022

RE: East Meath-North Dublin Grid Upgrade

Dear Resident,

I am writing to you from EirGrid, the semi-state company that is responsible for developing, managing and operating the electricity transmission system in Ireland (the "grid").

We are currently developing a project, known as the East Meath-North Dublin Grid Upgrade, that will provide a 400kV underground electricity link from Woodland substation in County Meath to Belcamp substation in north Dublin. The project will involve the laying of an underground cable between these substations.

Why are we contacting you?

We want to make contact with all stakeholders within the study area to ensure you are aware of the development, give you an update on the project and inform you of ways you can engage with us.

What is the East Meath-North Dublin Grid Upgrade?

The East Meath-North Dublin Grid Upgrade will strengthen the electricity network in the east of Meath and the north of Dublin to improve the transfer of power across the existing transmission network.

The project will add a high-capacity 400 kV underground cable electricity connection from Woodland substation near Batterstown in County Meath to Belcamp substation near Clonshaugh in north Dublin.

Why do we need to upgrade the network?

- address the increased electricity demand in East Meath and north Dublin;
- reduce the use of fossil fuels for electricity generation in Dublin;

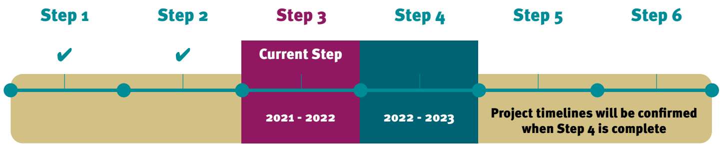
Broadly speaking, the project will support securing the electricity supply and strengthening the network in anticipation of the future development of renewable energy, onshore and offshore.

What is our six-step approach to developing the electricity grid?

We have a six-step approach to developing the electricity grid and gathering and understanding our stakeholders' views during this process.

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
How do we identify needs of the electricity grid?	What technologies can meet these needs?	What's the best option and what area may be affected?	Where exactly should we build?	Apply for planning permission.	Construct, energise (make live), and share benefits.

This project is now in Step 3. Working in collaboration with all key stakeholders, we plan to move to Step 4 in Autumn 2022, where we will examine different route options to decide exactly where to put the underground electricity cables. We will hold a public consultation to get your views on the various route options being assessed. We will also establish a community forum to ensure that the concerns and views of local community, resident and business groups are heard.



What has happened so far?

Step 1: In 2017, we confirmed the need for the East Meath-North Dublin Grid Upgrade.
Step 2: In 2020, we compiled a shortlist of seven technical options and held a public consultation on these.

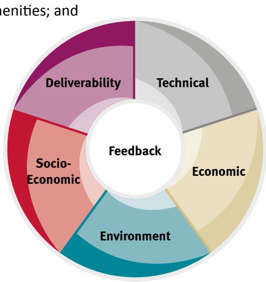
The seven options were:

- Woodland – Corduff 400 kV overhead line circuit
- Woodland – Corduff 400 kV underground cable circuit
- Woodland – Corduff 220 kV overhead line circuit
- Woodland – Finglas 220 kV overhead line circuit
- Woodland – Finglas 400 kV underground cable circuit
- Woodland – Finglas 400 kV overhead line circuit
- Woodland – Belcamp 400 kV overhead line circuit

We assessed these options further under the following five categories:

1. Technical aspects; Compliance with Electricity Standards/ Operational Aspects,
2. Economic factors; Project Implementation costs,
3. Environmental factors; Biodiversity / habitats/ ground conditions/ archaeology,
4. Socio-economic factors – such as the local economy and local amenities; and
5. Deliverability factors – such as timeline and potential risks.

Based on the evaluation and on feedback from consultation held in 2020, the best performing options at this stage of the project were the 400 kV options that connect Woodland substation to Finglas or Belcamp substations. As our standard practice is to examine both overhead and underground cable options, we added an additional option to the shortlist – a new Woodland to Belcamp 400 kV underground cable circuit.



In 2021, we published this assessment report on our project website, and it can be found at **www.eirgrid.ie/EastMeathNorthDublin**.

At the end of Step 2, we shortlisted four best-performing technical options to examine further in Step 3. These were:

- Woodland to Finglas 400 kV overhead line
- Woodland to Finglas 400 kV underground cable
- Woodland to Belcamp 400 kV overhead line
- Woodland to Belcamp 400 kV underground cable

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Step 3: In 2021, we carried out feasibility studies on the four best-performing technology options identified in Step 2. These were finalised in March 2022.

The studies found that three of the four technical options involved significant challenges and are not being progressed further. These include:

- **In Finglas –** There is not enough physical space at the existing station to support the additional equipment required for either a 400 kV overhead line or underground cable. The restricted physical space on this brownfield site impacts both this and future developments at this location. Also, using Finglas would require lengthy equipment outages which are difficult to grant while ensuring security of power supply to the Dublin area.
- **In Belcamp –** There were a number of constraints identified at this station. From an environmental perspective, an overhead line would have to cross the Malahide Estuary, a special area of conservation and special protection area.

We will proceed into Step 4 with the Woodland – Belcamp 400 kV underground cable circuit. In Step 4, we will examine the route options for this cable. We will hold a public consultation in Autumn 2022 to get your feedback on these.

What is the study area?

What is the East Meath-North Dublin Grid Upgrade Community Forum?

The purpose of the Forum is to ensure that stakeholder and community views are understood and properly considered during project delivery, ensuring that the voices of the local communities and those impacted most by our infrastructure are listened to. The Forum provides for open dialogue between stakeholders with interests in the project and the project team.

We are preparing to set up an East Meath-North Dublin Grid Upgrade Community Forum. The Forum will be independently chaired.

Membership of the Forum:

Membership of the Forum will consist of representatives from local resident and community associations, along with voluntary and sporting organisations in the project area. Membership is also extended to local public representatives.

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The forum will act as a consultative body during the project and will advise us on:

- how we communicate and engage with the public;
- what we need to consider when developing the route options; and
- what benefits we can provide for local communities along the route (for example, walkways, playing pitches, playgrounds, and so on).

Can I join the community forum?

We will hold an information meeting about the community forum in June 2022. We will then seek expressions of interest from potential forum members publicly and promote this through local media, our website and the public participation networks (PPNs) in Meath and Fingal.

PPNs are networks of community and voluntary groups in each local authority area. If your group is not already a member of your local PPN, we can help you to register with them. If you would like to be kept informed about this, please email **EastMeathNorthDublin@eirgrid.com**

Step 1 Completed identifying needs of the grid.

Step 2 Completed identifying the technologies that can meet these needs.

Step 3 What's the best option and what area may be affected?

Step 4 Where exactly should we build?

Step 5 Apply for planning permission.

Step 6 Construct, energise (make live), and share benefits.

Step 3 At a glance

What are the next steps and how can I keep up to date?

Having chosen the best technical option, a 400kV underground cable, between Woodland and Belcamp substations, we are now in the final stages of completing Step 3 of the East Meath-North Dublin Grid Upgrade.

In Step 4, we will identify potential routes for this underground cable. At the end of the summer, we will hold a public consultation to get your feedback on the best route for the cable.

How do I keep up to date?

You can find detailed project information and updates at: **www.eirgrid.com/EastMeathNorthDublin** and on our social media pages.

Who can I contact?

If you would like to get more information, register to receive update emails or give feedback on this project, you can:

- email **EastMeathNorthDublin@eirgrid.com**
- contact your local community liaison officer, **Eoghan O'Sullivan, on 087 247 7732**
- write to East Meath-North Dublin Project, EirGrid, Freepost FDN 5312, 160 Shelbourne Road, Ballsbridge, DO4 FW28.

Please don't hesitate to contact us if you have any questions or queries.

We look forward to engaging with you as the project progresses.

Yours sincerely,

Jason Kenna

Jason Kenna
Project Manager
East Meath-North Dublin Grid Upgrade Project

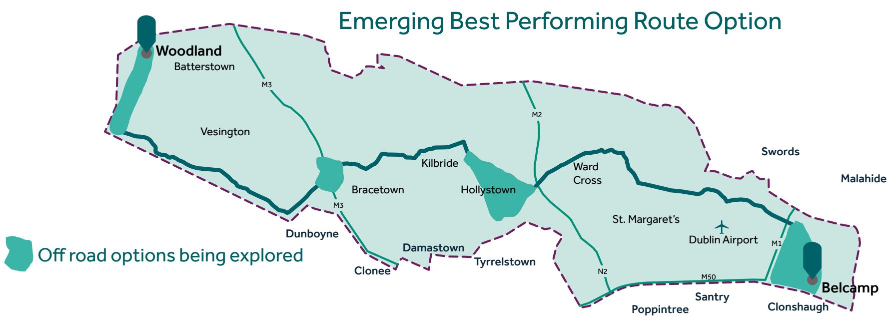
8.2 Media Campaign Assets

East Meath-North Dublin Grid Upgrade

See the Emerging Best Performing Route Option

Thank you for taking part in EirGrid's recent public consultation. Having completed further studies and listened to your feedback, we now have an Emerging Best Performing Route Option for the new 400kV underground electricity cable, connecting Woodland substation in Co. Meath to Belcamp substation in North Dublin. This will help us to deliver a secure electricity supply and bring more renewable energy onto the electricity grid.

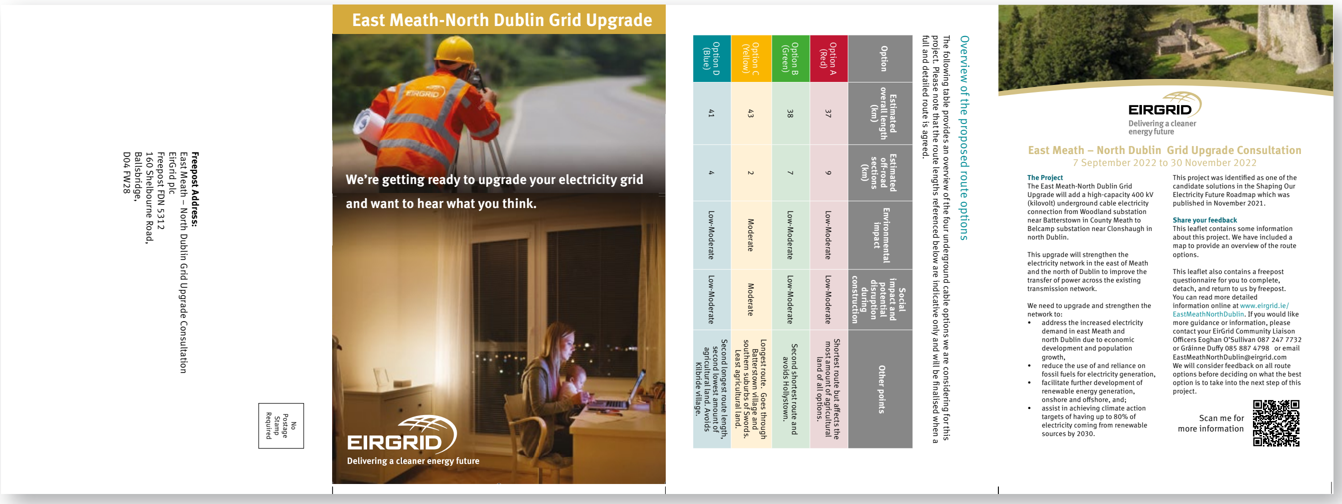
We'll keep you up to date as we work to finalise the route. Find out more at EirGrid.ie/eastmeathnorthdublin or scan the QR code above.

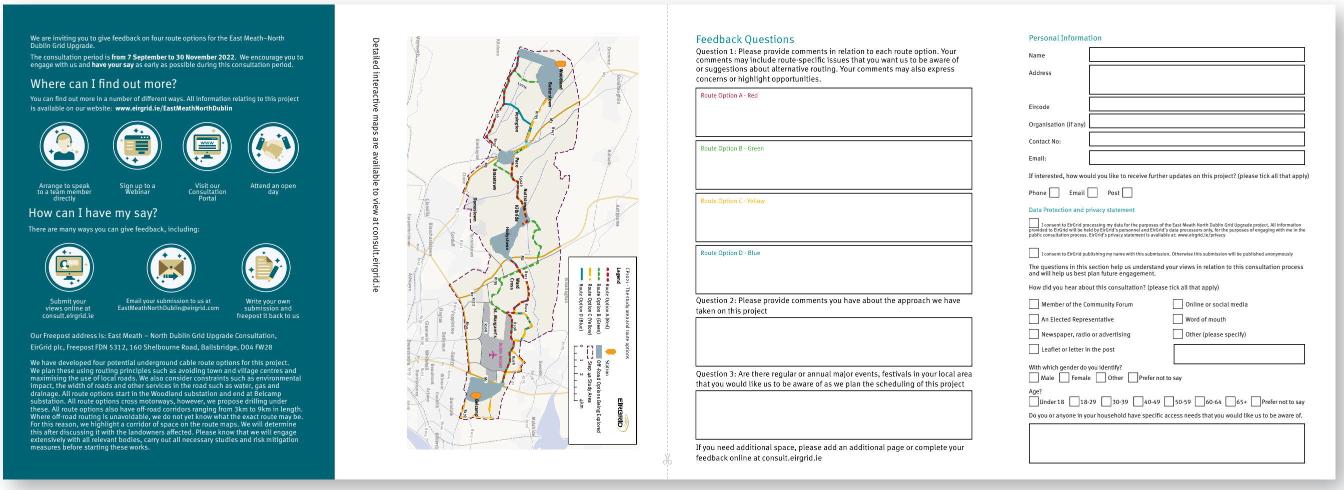


EirGrid

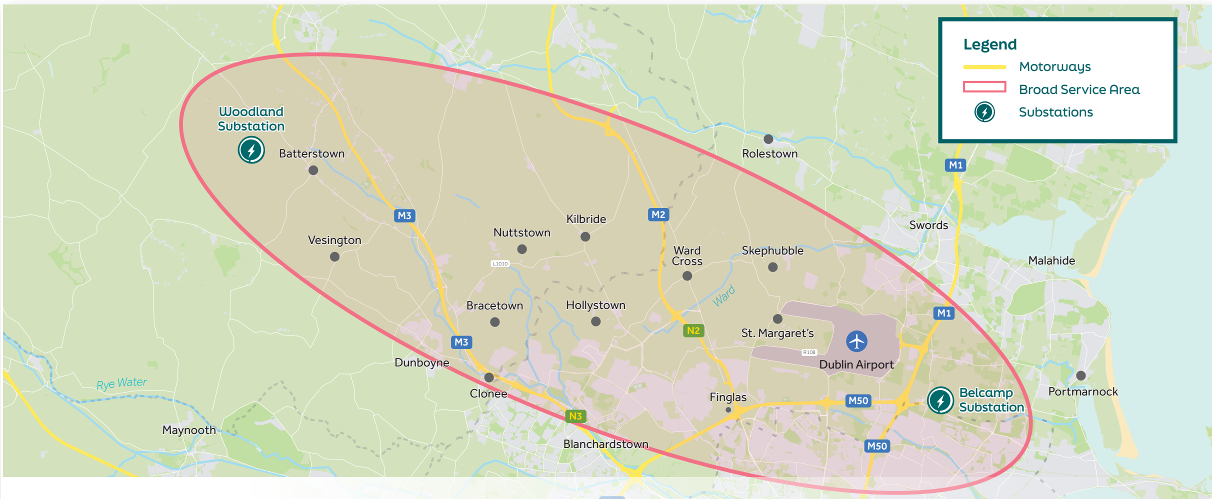

East Meath-North Dublin Grid Upgrade
EIRGRID
We're getting ready to upgrade your electricity grid and want to hear what you think.
At EirGrid, operator of the national grid, we're planning an upgrade to the electricity system in your area - with a new 400kV underground cable, connecting Woodland substation, near Batterstown in East Meath, to Belcamp substation, near Clonshaugh in North Dublin.
We have now identified four potential routes for this project, and during the coming weeks we'll be consulting with you to get your views. Your feedback will help us to deliver a safe and secure electricity supply, and bring more renewable energy onto the grid.
Find out more about the possible routes and have your say at eirgrid.ie/eastmeathnorthdublin
EIRGRID
Delivering a cleaner energy future

8.3. Step 4 Consultation Response Form / Questionnaire

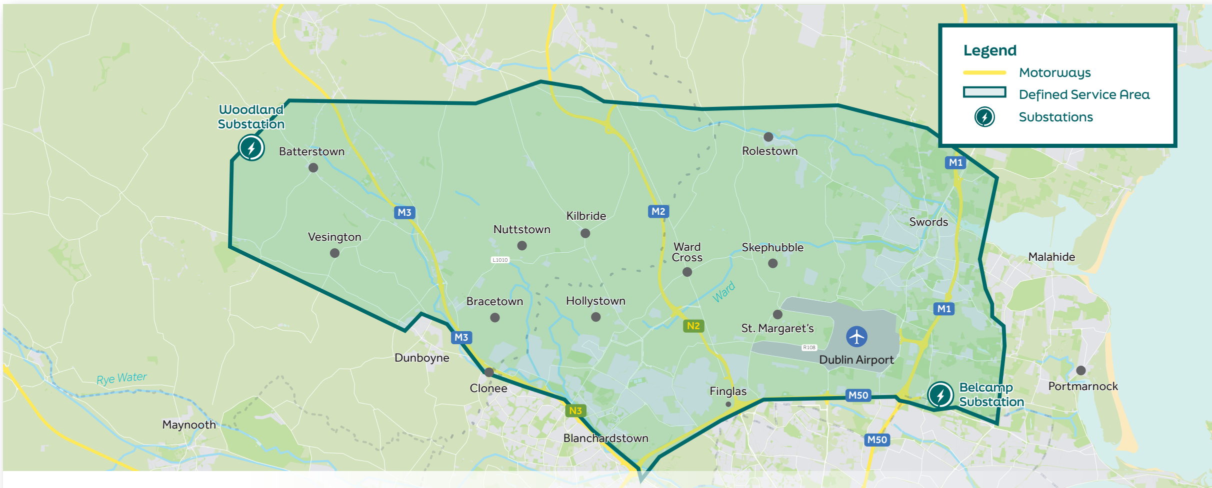




8.4. Mapping Journey

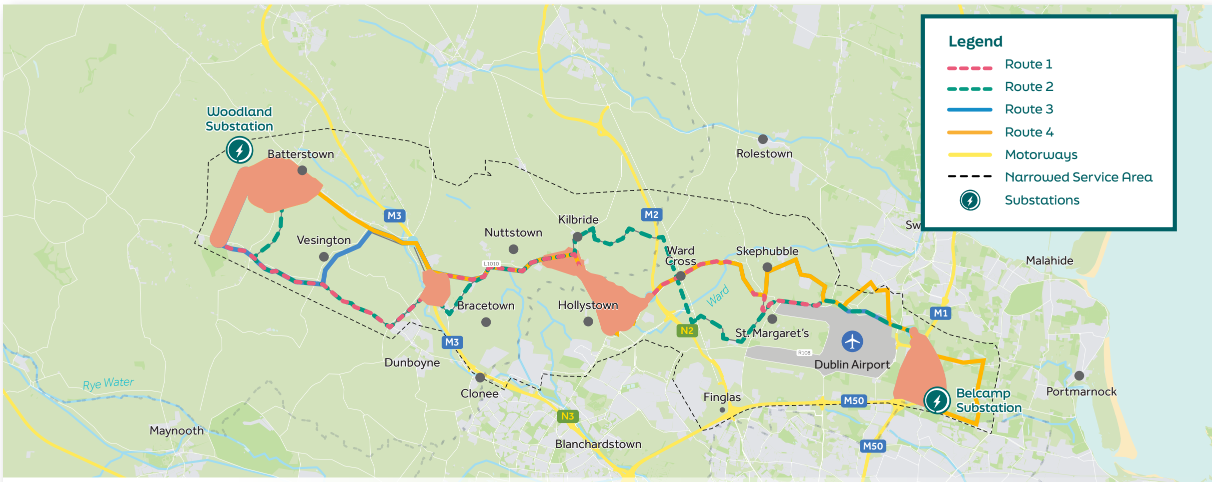


1: East Meath North Dublin - Broad Study Area



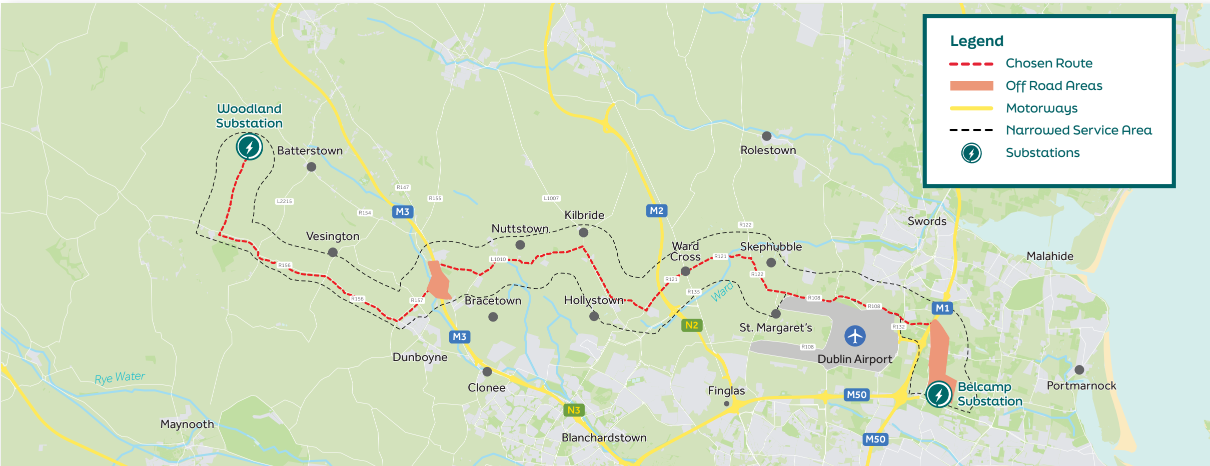
2: East Meath North Dublin - Defined Study Area

3: East Meath North Dublin - Narrowed Study Area



4: East Meath North Dublin - Four Advised Routes

5: East Meath North Dublin - Emerging Best Performing Route



6: East Meath North Dublin - Chosen Route

EirGrid

East Meath - North Dublin Grid Upgrade Environmental Impact Assessment Report (EIAR): Volume 5

Water Framework Directive Assessment

EirGrid

March 2024

Contents

1. Introduction

1.1 The Water Framework Directive

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy is known as, and hereafter referred to as the Water Framework Directive (WFD).

The WFD requires all water bodies to achieve both good chemical status and good ecological status (GES). For each River Basin District (RBD), a River Basin Management Plan (RBMP) outlines the actions required to enable natural water bodies to achieve this (refer to Table 1). Water bodies that are designated in the RBMP as Heavily Modified Water Bodies (HMWB) or Artificial Water Bodies (AWB) may be prevented from reaching GES by the physical modifications for which they are designated or purpose for which they were constructed (e.g., navigation, flood defence, urbanisation). Instead, they are required to achieve good ecological potential (GEP), through implementation of a series of mitigation measures outlined in the applicable RBMP (and in some cases updated since the publication of the RBMP).

Table 1: WFD Environmental Objectives

Objectives
Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water.
Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status by 2015.
Member States shall protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027.
Progressively reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances.
Prevent Deterioration in Status and prevent or limit input of pollutants to groundwater.

The WFD must be considered in the planning of all new activities in the water environment. The Environmental Protection Agency (EPA), as the competent authority in Ireland, is responsible for ensuring the giving of effect to the WFD in Ireland. The WFD was transposed into Irish law through S.I. No. 722 of 2003 - European Communities (Water Policy) Regulations 2003 (as amended) (hereafter referred to as the Water Policy Regulations).

Where there are sites protected under European Union (EU) legislation, the WFD aims for compliance with any relevant standards or objectives for these sites.

The Water Policy Regulations outline the water protection and water management measures required to maintain high status of waters where they exist, prevent any deterioration in existing water status and achieve at least 'Good' status for all waters.

Subsequently, S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended (hereafter referred to as the Surface Waters Regulations), and S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended (hereafter referred to as the Groundwater Regulations), were promulgated to regulate WFD characterisation, monitoring and status assessment programmes, in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments.

1.1.1 Article 4.7 of the Water Framework Directive

Member states must meet the conditions of the WFD unless they meet the criteria laid out in Article 4.7 of the WFD. Article 4.7 states:

> "*Member states will not be in breach of this Directive when:*
>
> - *Failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or*
> - *Failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities.*
>
> *and all the following conditions are met:*
>
> - *All practicable steps are taken to mitigate the adverse impact on the status of the body of water;*
> - *The reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;*
> - *The reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development; and*
> - *The beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.*"

1.2 Competent Persons

Rebecca Westlake BSc (hons), MSc, LLM, PhD, CSci, CMarSci, MIMarEST, Jacobs

Rebecca is a Subject Matter Expert (SME) for Water Science and Hydromorphology at Jacobs. She holds an honours bachelor of science degree (BSc) in physical geography from Plymouth University, a master of science (MSc) degree in coastal and marine resource management, an LLM degree in environmental law and practice, and a doctorate (PhD) in geomorphology. Rebecca is chartered with Institute of Marine Engineering, Science and Technology, and has approximately 25 years' relevant experience in water science and environmental assessment. Rebecca is highly experienced in many aspects of legislation and regulation, in addition to specific technical specialism in the WFD, and all stages of the environmental impact assessment (EIA) process, including Development Consent Orders. Rebecca is a technical lead for water chapters for major infrastructure projects including Development Consent Orders for roads, rail and water sectors, often undertakes peer reviewer.

Mark Johnson BSc (hons), MSc, MCIWEM, Jacobs

Mark Johnson is a Senior Environmental Scientist within Water Science and Hydromorphology at Jacobs. He holds an honours degree (BSc) in Geology from The University of Aberdeen and an MSc. in Integrated Petroleum Geoscience from the same institute. Mark is a member of the is Chartered Institution of Water and Environmental Management and is working towards full Chartership. Mark has 10 years of professional experience, five of which are in water science and environmental assessment. Mark is experienced in aspects of water EIA, regulation and compliance assessment, in addition to specific technical specialism in the WFD, all stages of the EIA process, geomorphology and surface water quality. Mark has originated and coordinated multiple surface water Environmental Impact Assessment (EIAR) chapters for various project types including pipelines, road, rail and utilities.

1.3 Outline of the Proposed Development

The East Meath – North Dublin Grid Upgrade (hereafter referred to as the Proposed Development) includes approximately 37.5 kilometres (km) of new 400 kilovolt (kV) underground cables between the existing Woodland Substation in the townland of Woodland, near Batterstown, County Meath and the existing Belcamp Substation in the townlands of Clonshagh and Belcamp in Fingal, north County Dublin. A new 400kV Gas Insulated Switchgear (GIS) Hall and associated transformers will be required at Belcamp Substation, and the installation of a 400kV feeder bay and associated works will be required at Woodland Substation. Approximately 20.5km of the proposed cable route will be located in County Meath and approximately 17km of the proposed cable route will be located in County Dublin. Approximately 70% of the proposed cable route will be located within public roads and approximately 30% will be located in private lands, to avoid location-specific constraints.

The Proposed Development is required to reinforce the public electricity network between East Meath and North Dublin. Reinforcement of this part of the network is needed to continue to ensure the security of the network feeding the east of Meath and the north of Dublin, between Woodland, Clonee, Corduff, Finglas and Belcamp Substations. The Proposed Development will help meet the growing demand for electricity in the east of the country due to the increased economic activity and population growth in recent years in Kildare, Meath and Dublin. It will also enable further development of renewable energy generation in line with Government policy.

In addition to the above, a culvert or bridge structure may be required to facilitate the proposed permanent access track watercourse crossing to a Joint Bay. The culvert or bridge structure will be designed in accordance with the Inland Fisheries Ireland (IFI) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI 2016) so that there are no significant environmental impacts.

The design of the Proposed Development has evolved through the application of a comprehensive design iteration process with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Development are maintained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and outline design development programme have been incorporated, where appropriate.

A full description of the Proposed Development is provided in Chapter 4 (Proposed Development Description) in Volume 2 of this Environmental Impact Assessment Report (EIAR).

1.4 Methodology

1.4.1 Study Area / WFD Screening

This WFD assessment covers only those components of the Proposed Development that could affect water body features. The United Kingdom (UK) Environment Agency's Water Framework Directive assessment: Estuarine and Coastal waters (Clearing the Waters for All) 2016 (updated 2017) (Environment Agency 2017) defines a 2km study area for the protected area quality elements. The remaining quality element study areas are based on professional judgement, taking into account the nature of potential impacts as a result of the Proposed Development.

1.4.2 Relevant Guidelines, Policy and Legislation

1.4.2.1 River Basin Management Plans

River Basin Management Plans (RBMPs) provide the mechanism for implementing and ensuring an integrated approach to the protection, improvement and sustainable management of the water environment and are published every six years.

The second cycle RBMP 2018 – 2021 was published by the Department of Housing, Planning and Local Government (DHPLG) in April 2018 and covers Ireland as a whole (DHPLG 2018). For the second cycle, the original (2009) Eastern, South-Eastern, South-Western, Western and Shannon River Basin Districts were merged to form one national River Basin District (RBD) which covers the whole of Ireland. For those waterbodies 'At Risk' of failing to meet the objectives of WFD, the RBMP 2018 – 2021 identified the most significant pressures impacting them as follows: agriculture (53%), hydromorphology (24%), urban wastewater (20%), forestry (16%), domestic wastewater (11%), urban runoff (9%), peat (8%), extractive industry (7%) and mines and quarries (6%).

In September 2021, the Minister for Housing, Local Government and Heritage, published the draft River Basin Management Plan for Ireland 2022-2027 (Department of Housing, Local Government and Heritage (DHLGH) 2021) for public consultation. The consultation period closed on 31 March 2022. The draft RBMP sets out, at the outset, that it is published in the context of a rapidly changing policy landscape at European and International levels and against a backdrop of "*widespread, rapid and intensifying climate change*". In addition, Ireland is now experiencing a sustained decline in water quality following many years of improvements, and so stronger measures are now required to achieve sustainable water management in order to address and adapt to the impacts of climate change and achieve the desired outcomes for biodiversity.

The draft RBMP sets out a Programme of Measures (PoMs) necessary to deliver the objectives of the WFD in full and to contribute to other environmental priorities.

Until the draft RBMP has been consulted upon and finalised, the existing RBMP has been used as a reference point for this assessment with respect to proposed measures as these have yet to be agreed; however, where waterbodies' 'At Risk' status has already been updated by the EPA online for the third cycle RBMP, this has been used in the assessment.

1.4.3 Data Collection and Collation

The EPA's Data Explorer (EPA 2024a) was used to assess water bodies present within the Proposed Development Study Area, and includes their WFD ID numbers, designation, and classification details. The WFD compliance mapping for groundwater risk (EPA 2024b) and status assessment was also reviewed along with any other supporting data.

1.4.4 Appraisal Method

In the absence of WFD assessment guidance in Ireland, the assessment has been carried out using the Water Framework Directive assessment: Estuarine and Coastal waters (Clearing the Waters for All) 2016 (updated 2017) (Environment Agency 2017). No specific guidance exists for freshwater water bodies. However, this guidance was used as the basis of the UK's Planning Inspectorate (PINS) Advisory Note 18 Water Framework Directive (June 2017) (PINS 2017) in which it sets out the stages of an assessment. On this basis, it was considered appropriate to use for the assessment of the Proposed Development. In line with this guidance, a 2km buffer zone was applied for assessing protected areas. For clarity and brevity purposes, the 2km buffer and the full list of identified protected sites (including those which are considered coastal water specific) are maintained for all assessments.

There follows a baseline assessment of the main water bodies, and a scoping assessment of the principal receptors potentially affected by the Proposed Development. This is followed by the impact assessment, which considers the potential impacts of an activity, identifies ways to avoid or minimise impacts, and indicates if an activity may cause deterioration or jeopardise the water body achieving GEP / GES.

There are several stages to this assessment:

- A scoping assessment of the main receptors including protected areas of nature conservation, bathing water etc. (Section 1.5);

- An assessment against quality elements including hydromorphology, biology, water quality, protected areas and invasive species (Section 1.6);
- A cumulative assessment against other Proposed Projects (Section 1.8); and
- Assessment against other EU Directives (Section 1.9).

1.5 Baseline Scoping

1.5.1 Water Body Scoping

Table 2 lists the WFD water bodies within the study area which have been scoped into the assessment (see Chapter 12 (Hydrology) in Volume 2 of this EIAR for more detail of these WFD surface water bodies).

Table 2: Water Body Status

Water Body ID	Name of Water Body in RBMP	Hydromorphological Designation	Current Status/ Potential (2016-2021)	Objective Status / Potential
Surface Water				
IE_EA_09T010600	Tolka_020	Not designated	Moderate	At risk
IE_EA_09D040500	Dunboyne Stream_010	Not designated	Poor	At risk
IE_EA_09R010400	Rye Water_030	Not designated	Poor	At risk
IE_EA_09P020500	Pinkeen_010	Not designated	Moderate	At risk
IE_EA_08W010070	Ward_020	Not designated	Moderate	At risk
IE_EA_08W010050	Ward_010	Not designated	Poor	Review
IE_EA_09P210700	Powerstown (Dublin)_010	Not designated	Poor	At risk
IE_EA_08W010300	Ward_030	Not designated	Moderate	At risk
IE_EA_09S071100	Sluice_010	Not designated	Poor	Review
IE_EA_09M030500	Mayne_010	Not designated	Poor	At risk
Groundwater				
IE_EA_G_031	Dunshaughlin	N/A	Good	Not at risk
IE_EA_G_008	Dublin	N/A	Good	Review

Note: Rye Water and Powerstown (Dublin)_010 are within the Study Area but have been scoped out of the assessment as there is no hydrological connection to the Proposed Development.

1.5.2 Assessment Scoping

1.5.2.1 Protected Areas

The WFD requires that activities are also in compliance with other relevant legislation, as considered below. The following designations within a 2km buffer zone from the Planning Application Boundary were looked at as part of the assessment:

- Nature conservation designations;
- Bathing waters;
- Nutrient Sensitive Areas; and
- Shellfish waters.

1.5.3 Nature Conservations Designations

Nature conservation designations are areas previously designated for the protection of habitats or species where, maintaining or improving the status of water is important for their protection. They comprise the aquatic part of the previously designated Natura 2000 sites (i.e., Special Protection Areas (SPAs) designated under Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds (as amended) (hereafter referred to as the Birds Directive) and Special Areas of Conservation (SACs) designated under Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (hereafter referred to as the Habitats Directive).

Ramsar sites are wetlands of International importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

The EPA online mapping system (EPA 2024b) was used to identify any nature conservation designations within 2km of the Proposed Application Boundary. There are no designated protected areas within 2km of the Planning Application Boundary. The closest protected area to the Proposed Application Boundary is the Malahide Estuary SAC and SPA which is approximately 3.6km north of where the Proposed Application Boundary crosses the M1 Motorway.

1.5.4 Bathing Waters

Bathing waters are those designated under Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water (hereafter referred to as the BWD), or the later Directive 2006/7/EC of the European Parliament and of the Council concerning the management of bathing water quality and repealing Directive 76/160/EEC (hereafter referred to as the revised BWD). S.I. No. 79/2008 - Bathing Water Quality Regulations 2008 was adopted in March 2008 (following a public consultation) transposing the revised BWD into Irish law. There are no designated bathing waters within 2km of the Planning Application Boundary.

1.5.5 Nutrient Sensitive Areas

Nutrient Sensitive Areas comprise Nitrate Vulnerable Zones and polluted waters designated under Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (hereafter referred to as the Nitrates Directive), in addition to areas designated as sensitive areas under Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment (hereafter referred to as the Urban Wastewater Treatment Directive (UWWTD)). The UWWTD aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban wastewater. Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

There are no designated nutrient sensitive areas within 2km of the Planning Application Boundary. Additionally, (specifically in relation to nutrient loading), there is no activity during construction or operation of the Proposed Development which will result in the discharge of nutrients to any surface water system or water body.

1.5.6 Shellfish Waters

Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters (hereafter referred to as the Shellfish Waters Directive) aims to protect or improve shellfish waters in order to support shellfish life and growth. It is designed to protect the aquatic habitat of bivalve and gastropod molluscs, which include oysters, mussels, cockles, scallops and clams. The Shellfish Waters Directive requires Member States to designate waters that need protection in order to support shellfish life and growth. It is implemented in Ireland by S.I. No. 268/2006 - European Communities (Quality of Shellfish Waters) Regulations 2006. The Shellfish Waters Directive also provides for the establishment of pollution reduction programmes for the designated waters.

There are no shellfish waters within 2km of the Planning Application Boundary.

1.6 Waterbody Assessment Against Quality Elements

This Section details a site-specific assessment of the Proposed Development against quality elements for biology, physico-chemical and hydromorphological elements for the in-scope riverine water bodies following the Water Framework Directive assessment: Estuarine and Coastal waters (Clearing the Waters for All) 2016 (updated 2017) (Environmental Agency 2016).

1.6.1 Hydromorphology

This Section provides a summary of the known existing hydromorphology risk issues for the transitional water bodies (refer to Table 3).

Table 3: Hydromorphology Scoping Summary

WFD Assessment Questions	Tolka_020	Dunboyne Stream_010	Pinkeen _010	Ward_020	Ward_010	Ward_030	Sluice_010	Mayne_ 010
Consider if your activity could impact on the hydromorphology (for example morphology or water flow) of a water body at high status?	No. Not High status.							
Consider if your activity could significantly impact the hydromorphology of any water body?	**Construction** – Yes each of the in-scope water bodies will be crossed by the Proposed Development via open cut trenching. Therefore, there is potential for temporary impacts to hydromorphology during the construction period. See Section 1.6.1.1 for the impact assessment. **Operation** – No, the Proposed Development will be entirely below ground within the vicinity and at the crossing locations of the in-scope water bodies and will therefore not interact with them. As such no operational impacts on hydromorphology are anticipated.							
Consider if your activity is in a water body that is heavily modified for the same use as your activity?	No. Not a HMWB.							
Consider if your activity is in a water body that is heavily modified for the same use as your activity?	No – None of the water bodies are designated as HMWB.							

1.6.1.1 Hydromorphology Impact Assessment

There will be a need to cross the in-scope water bodies during the construction of the Proposed Development. Crossing techniques will involve open cut trenching, and as such, provision of a dry working area will be required. The techniques employed to provide a dry working area will be subject to design by the appointed contractor but will likely consist of either temporary channel realignment, fluming or over pumping. Additionally, there will be a requirement for a temporary culvert crossing of Dunboyne Stream_010 to facilitate construction access. It is anticipated that this temporary culvert will also form a permanent water body crossing during the Operational Phase of the Proposed Development, to facilitate the access track extending north from the R156 Regional Road to a permanent Joint Bay. Works to construct water body crossings and proposed temporary construction access routes will be required adjacent to the water bodies to facilitate construction.

Working adjacent to water bodies along the bank tops has the potential to indirectly alter the structure and substrate of the bed via increased silty runoff which could smother any morphological features. The provision of a dry working area will temporarily remove flow from the channel, preventing downstream transport of sediment and removing any morphological features over the works footprint.

The impacts associated with the proposed construction access tracks and working adjacent to water bodies will be temporary and localised to the working footprint and are not anticipated to impact at the water body scale. Additionally, a Surface Water Management Plan (SWMP) is included as Appendix D to the Construction Environmental Management Plan (CEMP) within this planning application pack. This SWMP, and the mitigation measures outlined in the CEMP, will be implemented for construction management and sediment control measures respectively (refer to Section 1.4 to Section 5 of the SWMP). The only operational above-ground structure that will interact with surface water bodies will be the new culvert or bridge on Dunboyne Stream_010. At this stage of the design process, limited design information is available on the crossing, including the crossing type. This, alongside other pertinent design information, will be subject to detailed design, which will include the limitations outlined in Chapter 12 (Hydrology) in Volume 2 of the EIAR (specifically Section 12.5.2.1 and Section 12.5.2.2).

1.6.2 Biology

1.6.2.1 Habitats

Table 4 presents a summary of biology (habitat) considerations and associated risk issues for the works for the transitional water body.

Table 4: Biology (Habitat) Scoping Summary

WFD Assessment Questions	Tolka_020	Dunboyne Stream_010	Pinkeen_010	Ward_020	Ward_010	Ward_030	Sluice_010	Mayne_010
Is the footprint of the activity 0.5 km^2 or larger?	No – Not at crossing locations.							
Is the footprint of the activity 1% or more of the water body's area?	No – Not at crossing locations.							
Is the footprint of the activity within 500m of any higher sensitivity habitat?	No. The Proposed Development is primarily contained within the current road boundary, and hardstanding areas (see Chapter 10 (Biodiversity) in Volume 2 of the EIAR for further detail on habitats).							
Is the footprint of the activity 1% or more of any lower sensitivity habitat?	No. The Proposed Development is primarily contained within the current road boundary, and hardstanding areas (see Chapter 10 (Biodiversity) in Volume 2 of the EIAR for further detail on habitats).							

Risks to water bodies under the WFD include loss of habitat, loss of protected species and prey species. The potential for these impacts is not considered to be significant given that the construction impacts are considered to be temporary and short term and not at the water body scale. The WFD assessment primarily considers the operation of a development. However, for biological elements, potential construction impacts are often considered as they have the potential for long-term change if a potential impact is considered to be significant. Therefore, it is important to also note here that a CEMP and SWMP (which are included as standalone documents in the planning application pack) will be implemented for construction management and sediment control measures, respectively.

At this current design stage, it is unknown the form of which the permanent crossing of Dunboyne Stream_010 will take. This will be subject to options appraisal during detailed design. During construction there will be a removal of habitat under the proposed water body crossing footprint (should a culvert be identified as the preferred crossing method) which will also then be absent during the Operational Phase. This will be a permanent impact at the local scale. Mitigation measures outlined in Chapter 12 (Hydrology) in Volume 2 of the EIAR (specifically Section 12.5.2.1 and Section 12.5.2.2) will be implemented to offset this impact. Therefore, it is not anticipated to impact at the water body scale.

1.6.2.2 Fish

Activities occurring within an inshore environment could impact on normal fish behaviour such as movement, migration or spawning. Table 5 presents a summary of biology (fish) considerations and associated risk issues for the proposed works. As at least one biology (fish) consideration indicates that a risk could be associated with the proposed works, this receptor has been scoped into the impact assessment for the transitional water body.

Table 5: Biology (Fish) Scoping Summary

<table>
<tr><th>WFD Assessment Questions</th><th>Tolka_020</th><th>Dunboyne Stream_010</th><th>Pinkeen_010</th><th>Ward_020</th><th>Ward_010</th><th>Ward_030</th><th>Sluice_010</th><th>Mayne_ 010</th></tr>
<tr><td>Consider if your activity is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary?</td><td colspan="8">No - not in estuarine or transitional waters.</td></tr>
<tr><td>Consider if your activity could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)?</td><td colspan="8" rowspan="2">Construction – Yes: Open cut trenching to cross the in-scope waterbodies will require prevision of a dry working area. See Section 1.6.2.2.1 for further details.
Operation –Yes: The majority of the Proposed Development will be operated below ground level and will not therefore interact with surface water features. However, there is a requirement for a yet to be determined water body crossing on the Dunboyne Stream_010 which has the potential to impact on normal fish behaviour (see Section 1.6.2.2.1 for further details)</td></tr>
<tr><td>Consider if your activity could cause entrainment or impingement of fish?</td></tr>
</table>

1.6.2.2.1 Biology (fish) Impact Assessment

The risks to the receptor are due to noise from construction of the open cut trenches across the water bodies, and also the potential release of suspended sediment concentrations and the creation of plumes as a result. Additionally, the provision of dry working areas and temporary culverts (in the case of Dunboyne Stream_010) at the crossing locations could lead to the entrapment of fish and would prevent them from migrating past the works footprint.

These impacts will be temporary and localised during the period of construction. Suspended sediment concentrations released as a result of works, and due to disturbance of the water body bed and banks from construction plant, will be temporary and localised and will be minimised by mitigation contained within the CEMP and SWMP, which are included as standalone documents in the planning application pack.

Once the dry working areas are constructed, they will be sealed from additional runoff and any water that enters the area will be pumped to treatment prior to being discharged back to the water body downstream of the works.

Additionally, given the scale of the proposed crossings in relation to the overall water body scale, combined with the temporary and localised impacts during construction, there is not anticipated to be impacts at the water body scale. Therefore, residual impacts are predicted to be Imperceptible. However, if over-pumping methods are utilised to provide a dry working area all pumps will be fish friendly.

At the current design stage, it is unknown the form of which the permanent crossing of Dunboyne Stream_010 will take. This will be subject to options appraisal during detailed design.

Impacts associated with the water body crossing will be permanent and local to the crossing footprint. However, they could migrate upstream / downstream as a result of unsympathetic design. The design of the crossing will therefore adhere to the mitigation measures outlined in Chapter 12 (Hydrology) in Volume 2 of the EIAR (specifically Section 12.5.2.1 and/or Section 12.5.2.2, depending on the crossing type selected at detailed design). This will reduce and offset the localised impacts such that no impacts at the water body scale are anticipated.

1.6.3 Water Quality

Consideration is also given as to whether phytoplankton status and harmful algae could be affected by the Proposed Development, as well as identifying the potential risks of using, releasing or disturbing chemicals. Table 6 presents a summary of water quality considerations and associated risk issues of the Proposed Development works for the transitional water body.

Table 6: Water Quality Scoping Summary

Assessment Questions	Tolka_020	Dunboyne Stream_010	Pinkeen_010	Ward_020	Ward_010	Ward_030	Sluice_010	Mayne_010
Consider if your activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)?	**Construction** – Yes: Potential for increased silty runoff and sediment during construction as a result of open cut trenching crossing techniques. Dry working areas or temporary diversions (as described in Chapter 12 (Hydrology) in Volume 2 of this EIAR) will be installed to reduce potential impacts to imperceptible. Operation – No: The cable and associated infrastructure at water body crossings will operate below ground and will not interact with the surface water environment.							
Consider if your activity is in a water body with a phytoplankton status of moderate, poor or bad?	Waterbody does not have a phytoplankton status of moderate, poor or bad							
Consider if your activity is in a water body with a history of harmful algae?	No history of harmful algae							
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if the chemicals are on the Environmental Quality Standards Directive (EQSD) list?	**Construction** – No: Sediment disturbance will occur in the construction of the open cut trench crossings, joint bays and passing bays within the existing road infrastructure. Excavation of road material has the potential to contain substances contained within the EQSD list. The pathway to the receptor will d be via runoff. However, the watercourses will be sealed from outside runoff at the crossing location by the dry working area. Any runoff from the road would be contained within roadside drains which will be maintained, and where it is required. Where required temporary drainage will be provided to ensure appropriate runoff from the new road surface. Additionally, sediment control measures will be implemented as outlined in Section 12.5 of Chapter 12 (Hydrology) in Volume 2 of this EIAR to reduce the likelihood of silt runoff entering watercourses.							

Assessment Questions	Tolka_020	Dunboyne Stream_010	Pinkeen_010	Ward_020	Ward_010	Ward_030	Sluice_010	Mayne_010
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the Environmental Quality Standards Directive (EQSD) list?	No mixing zones anticipated.							
Consider if ancillary sources of discharge contribute to water quality status (e.g., Urban Waste Water Treatment Plant (UWWTP), Surface Water Overflow (SWO), Combined Sewer Overflow (CSO) etc.)	Yes. The study area is known to contain sources of known pressures including UWWTP SWOs and CSOs and several Industrial Licensed Emissions. However, the Proposed Development does not include any new discharge points and will not impact the flow or volume of current surface water drainage.							

1.6.3.1 Water Quality Impact Assessment

Risk to receptors occurs as result of silty runoff entering the water bodies, leading to a decrease in overall water quality as a result of increased turbidity, a reduction in dissolved oxygen, changes in pH and decreased water clarity. However, these impacts will be temporary (over the length of the Construction Phase at each water body crossing location) and localised. Additionally, any impacts can be mitigated using provisions to decrease and prevent silty runoff entering water bodies by applying construction best practices. These mitigation measures are outlined in the CEMP and SWMP (which are included as standalone documents in the planning application pack). Therefore, there are no significant overall changes to water quality elements assessed.

1.6.4 Protected Areas

Consideration should be made regarding whether WFD protected areas are at risk from a proposed activity. As the protected areas considerations indicate that a risk could be associated with the works, this receptor has been scoped into the impact assessment. Table 7 presents a summary of protected area considerations and associated risk issues of the works.

Table 7: Protected Areas Scoping Summary

WFD Assessment Questions	Nature Conservation Designations	Bathing Waters	Nutrient Sensitive Areas	Shellfish Waters
Consider if your activity is within 2km of any WFD protected area?	There are no designated sites within 2km of the Proposed Development	There are no bathing water sites within 2km of the Proposed Development.	The Liffey Estuary is designated a nutrient sensitive area and it is directly impacted by the Proposed Development. There are no other designated nutrient sensitive areas within 2km of the Proposed Development.	There are no shellfish waters within 2km of the Proposed Development

There are no WFD protected areas within 2km of the Proposed Development. However, downstream protected areas are potentially exposed to risk if there were to be a pollution incident (i.e., releasing hydrocarbons or sediment) in rivers adjacent to or crossed by the Proposed Development.

Dry working areas at the crossing locations will seal the water bodies off from their downstream elements. Any water pumped out of the dry working area will be treated to acceptable levels prior to discharge. Any runoff from the road crossings and Passing Bay locations will be captured by the existing or temporary drainage networks. Silty runoff prevention methods will be employed to minimise the risk of increased sediment loadings entering water bodies. Any sediment or potential contaminants will be significantly diluted prior to reaching protected areas that area located more than 2km downstream of the proposed works areas. Based on the above, no impacts to hydrologically connected downstream protected areas are anticipated during construction.

In addition, the Natura Impact Statement (NIS) (included as a standalone document in the planning application pack) for the Proposed Development concludes:

> *"Based on the best available scientific information and professional judgement, it is considered that with the mitigation measures detailed in the NIS, there will be no adverse effects on the integrity of those European sites, alone or in-combination with other plans or projects in light of those European sites' conservation objectives."*

During operation, the majority of the Proposed Development will operate below-ground with the exception of the upgrades at both Woodland and Belcamp Substations (refer to Chapter 4 (Proposed Development Description) in Volume 2 of the EIAR for further details on these locations). Additionally, there will be no new outfalls as part of the Proposed Development. Therefore, no operational impacts on downstream protected areas are anticipated.

1.6.5 Invasive Species

Consideration has been given to whether there is a risk that the Proposed Development could introduce or spread invasive species. Risks of introducing or spreading Invasive Non-Native Species (INNS) include materials or equipment that have come from, had use in, or travelled through other water bodies, as well as activities that help spread existing INNS, either within the immediate water body or other water bodies. Table 8 presents a summary of INNS considerations and associated risk issues of the Proposed Development.

Table 8: Invasive Species Scoping Summary

WFD Assessment Questions	Tolka_020	Dunboyne Stream_010	Pinkeen_010	Ward_020	Ward_010	Ward_030	Sluice_010	Mayne_010
Introduction or spread of IS.	No. No existing INNS identified. All plant will be subject to biological controls.				Yes – See Section 1.6.5.1 below this table for further details.			No. No existing INNS identified. All plant will be subject to biological controls.

1.6.5.1 Ward 20, Ward 30 and Sluice_010

The above water bodies contain INNS which were identified within 150m of the Proposed Development during ecological site walkover surveys. Further details on the identified species are provided in Table 9.

Table 9: Identified Invasive Species Locations

Common Name	Scientific Name	Location (GR)	Description	Associated Water Body
Giant Hogweed	*Heracleum mantegazzianum*	O 12480 45878	Mature 5x1m stand in a refuse pile.	Ward_030
		O 12516 45903	Juvenile individuals scattered throughout refuse pile.	
Japanese knotweed	*Reynoutria japonica*	O 02047 43698	Signposted area for Japanese Knotweed.	None – opposite side of the road from the Tolka_020 and therefore would not interact with the Proposed Development
		O 16226 44571	Mature 30x3m stand in a private landowner's back garden.	Sluice_010
Rhododendron	*Rhododendron ponticum*	O 05661 45435	1x1m individual growing over a river.	Ward-020
Spanish bluebell	*Hyacinthoides hispanica*	O 13457 44625	Scattered along a road verge.	Ward_030
		O 13256 44709	Scattered along a road verge.	
Three-cornered leek	*Allium triquetrum*	N 95657 44458	Stands scattered along road verge underneath a mature treeline.	Not associated with a WFD designated waterbody

The above INNS identified in Table 9 are located in areas where works are unlikely to disturb them. Additionally, biological controls for all plant and machinery will be in place and adhered to, as outlined in the CEMP and the Invasive Species Management Plan, which is included as Appendix E to the CEMP, and both are included as standalone documents in the planning application pack. Therefore, the risk of spreading INNS is assessed as Imperceptible.

1.6.6 Assessment Summary

The site-specific impacts of the Proposed Development on the biological, physico-chemical and hydromorphological quality elements of the water bodies are shown in the assessments in the sections above and summarised in Table 10.

Table 10: Scoping Summary

Receptor	Potential Risk to Receptor?	Note the Risk Issue(s) for Impact Assessment
Hydromorphology	Yes. Reduced to no following mitigation.	Temporary localised risks as a result of silty runoff from construction entering water bodies and open cut trench crossings of water bodies. Permanent localised risk during operation as a result of a new water body crossing on Dunboyne Stream_010. See Section 1.6.3.
Biology: habitats	Yes	Potential for localised permanent habitat loss under Dunboyne Stream_010 water body crossing footprint (dependant on crossing type selected) . See Section 1.6.2
Biology: fish	Yes. Reduced to no following mitigation.	Construction works sedimentation, temporary culverting. See Section 1.6.2.
Water quality	Yes. Reduced to no following mitigation.	Construction works and sedimentation, release of contaminated sediments. N/A. See Section 1.6.3.
Protected areas	No	N/A. See Section 1.6.4.
Invasive species	No	N/A. See Section 1.6.5.

1.7 Assessment of Programmes and Measures

There is a list of measures, or environmental improvements, which have been identified by the draft RBMP (DHLGH 2021) (known as the Programme of Measures (PoMs)), which need to be implemented in order to improve the ecology of water bodies by a specified date in order for Ireland to meet the target date set by the WFD. Part of the WFD compliance assessment is to consider these PoMs and assess whether the Proposed Development can contribute to them or prevent any of them from being delivered.

The PoMs refers to a set of actions and initiatives outlined to achieve and maintain good water status. These measures are designed to address any pressures or challenges identified in the river basin and promote sustainable water management. Broadly, the PoMs fall into one of the following categories:

- Water Quality Management: Implementing strategies to monitor and improve water quality, addressing issues such as pollution from various sources;
- Habitat Restoration: Initiatives focused on restoring and protecting natural habitats within the river basin, contributing to overall ecosystem health;
- Flow Management: Ensuring sustainable water flow regimes to support aquatic ecosystems and maintain ecological balance;
- Land Use Planning: Integrating water management considerations into land use planning to minimise negative impacts on water resources;
- Community Engagement: Involving local communities and stakeholders in water management efforts, raising awareness and encouraging sustainable practices;
- Infrastructure Upgrades: Implementing improvements to existing infrastructure to enhance water management and reduce negative environmental impacts;
- Climate Change Adaptation: Developing measures to address the potential impacts of climate change on water resources and ecosystems; and
- Monitoring and Assessment: Establishing robust monitoring systems to continually assess the effectiveness of implemented measures and adjust strategies accordingly.

The Proposed Development will not contribute to achieving any of the above PoMs, nor will it hinder their implementation.

1.8 Cumulative Assessment

All water bodies within the study area have been assessed for direct impacts. In addition, the Proposed Development has been assessed for the potential for cumulative impacts with other Proposed Projects, either individually, or in combination with the Proposed Development, within 1km of the Planning Application

Boundary (refer to Chapter 20 (Cumulative Impacts and Environmental Interactions) in Volume 2 of the EIAR for full details of this assessment).

This concludes that the Proposed Development will not compromise the achievement of the objectives of the WFD for any water body, in-combination with other proposed developments, following the implementation of mitigation measures outlined within this EIAR (refer to Chapter 21 (Summary of Mitigation and Monitoring Measures) and the CEMP, which is included as a standalone document in this planning application pack.

1.9 Assessment of the Proposed Development Against WFD Objectives: and Other EU Legislation

Taking into consideration the anticipated impacts of the Proposed Development on the biological, physico-chemical and hydromorphological quality elements, following the implementation of design and mitigation measures, it is concluded that it will not compromise progress towards achieving GES, or cause a deterioration of the overall GEP, of any of the water bodies that are in scope (refer to Table 11).

Table 11: Compliance of the Proposed Development with the Environmental Objectives of the WFD

Environmental Objective	Proposed Development	Compliance with the WFD Directive
No changes affecting high status sites.	There are no waterbodies with high status in the study area.	Yes
No changes that will cause failure to meet surface water good ecological status or potential or result in a deterioration of surface water ecological status or potential.	After consideration as part of the detailed compliance assessment, the Proposed Development will not cause deterioration in the status of the water bodies during construction following the implementation of mitigation measures; during operation, no significant impacts are predicted.	Yes
No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies.	The Proposed Development will not cause a permanent exclusion or compromise achieving the WFD objectives in any other bodies of water within the River Basin District.	Yes
No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status.	The Proposed Development will not cause deterioration in the status of the groundwater bodies.	Yes

The WFD also requires consideration of how a new development might impact on other water bodies and other EU legislation. This is covered in Articles 4.8 and 4.9 of the WFD.

Article 4.8 states:

> *"a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation."*

All water bodies within the study area have been assessed for direct impacts. The Proposed Development will not compromise achievement of the objectives of the WFD for any water body in the study area. In addition, the Proposed Development has been assessed for the potential for cumulative impacts with other Proposed Projects, either individually, or in combination with the Proposed Development, within 1km of the Planning Application Boundary (refer to Chapter 20 (Cumulative Impacts and Environmental Interactions) in Volume 2 of the EIAR for full details of this assessment). This concludes that the Proposed Development will not compromise the achievement of the objectives of the WFD for any water body, in-combination with other proposed developments, following the implementation of mitigation measures outlined within this EIAR (refer to Chapter 21 (Summary of Mitigation and Monitoring Measures) and the CEMP, which is included as a standalone document in this planning application pack. Therefore, the Proposed Development complies with Article 4.8.

The Habitats Directive promotes the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Habitats Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance. There are European designated sites in the vicinity of the Proposed Development which have been assessed and are presented in the NIS (included as a standalone document in the planning application pack). It concludes that the Proposed Development will not, by itself or in combination with any other plan or project, result in an adverse effect on the integrity of any European site. The Proposed Development is not considered to be a risk to designated habitats, and therefore, is compliant with the Habitats Directive.

The Nitrates Directive aims to protect water quality by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. The Proposed Development will not influence or moderate agricultural land use or land management.

The revised BWD was adopted in 2006, updating the microbiological and physico-chemical standards set by the original BWD and the process used to measure / monitor water quality at identified bathing waters. The revised BWD focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the BWD. Bathing waters under the revised BWD are classified as excellent, good, sufficient or poor according to the levels of certain types of bacteria (*intestinal enterococci* and *Escherichia coli*) in samples obtained during the bathing season (May to September). The Proposed Development will not impact any designated bathing waters, as there are none located within the study area, and is therefore compliant with the revised BWD.

1.10 Conclusion

Taking into consideration the impacts of the Proposed Development on the biological, physico-chemical and hydromorphological quality elements, it is concluded that with design and mitigation measures implemented, the Proposed Development will not compromise progress towards achieving GES or GEP or cause a deterioration of the overall status of the water bodies that are in scope. It will not compromise the qualifying features of protected areas and is compliant with other relevant Directives. In addition, there are no cumulative impacts with other proposed plans or projects. It can therefore be concluded that the Proposed Development is fully complaint with WFD and does not require assessment under Article 4.7 of the WFD.

1.11 References

DHLGH (2021). Draft River Basin Management Plan for Ireland 2022-2027

Environment Agency (2017). Water Framework Directive assessment: Estuarine and Coastal waters' 2016 'Clearing Waters for All' (updated 2017)

EPA (2024a). EPA's Data Explorer. [Online] Available at https://gis.epa.ie/. Accessed January / February 2024

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IFI (2016). Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.

Office of Public Works (OPW) (2009). Planning System and Flood Risk Management, Guidelines for Planning Authorities.

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Catchments.ie (2023) Water Dependent Habitats and Species and High Status Sites. [Online] Available at https://www.catchments.ie/download/water-dependent-species-habitats-guidance/

Directives and Legislation

Council Directive (76/160/EEC) Bathing Water and revised (2006/7/EC).

Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrates Directive).

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment.

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption.

Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU of the European Parliament and the Council of 13 December 2011 on the assessment of the impacts of certain public and private projects on the environment.

S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003.

S.I. No. 268/2006 - European Communities (Quality of Shellfish Waters) Regulations 2006.

S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010.

S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009.

S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014.

S.I. No. 351/2011 - Bathing Water Quality (Amendment) Regulations 2011.

S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011.