Kildare-Meath Grid Upgrade

Environmental Impact Assessment Report (EIAR)

Volume 2: Main Text

March 2024

This document is Volume 2: Main Text of the Kildare-Meath Grid Upgrade Environmental Impact Assessment Report (EIAR).

The whole EIAR consists of a number of documents and should be read together.

Kildare-Meath Grid Upgrade EIAR

- Volume 1: Non Technical Summary
- **Volume 2: Main Text**
- Volume 3: Appendices
- Volume 4: Figures
- Volume 5: Supporting Documents

Kildare-Meath Grid Upgrade EIAR

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1. Introduction

1.1 Introduction

In April 2023, EirGrid made an application for planning approval for the CP966 Kildare-Meath Grid Upgrade (hereafter the Proposed Development) to An Bord Pleanála (ABP) (Case Number ABP-316372-23). The Proposed Development was screened for Environmental Impact Assessment (EIA) but was not, at that time, of a project type described by the relevant classes detailed in either Part 1 or Part 2 of Schedule 5 of the Planning and Development Regulations 2001, as amended (the Planning Regulations). The April 2023 application was accompanied by a non-statutory Planning and Environment Consideration Report (PECR).

In July 2023, an amendment was made to the Planning Regulations by SI No 383/2023 - Planning and Development (Amendment) Regulations 2023. They introduced the project type whereby an EIA is required for certain restructuring of rural land holdings projects if certain thresholds are equalled or exceeded relating to field boundaries, re-contouring, or land restructuring. This is explained in detail in Section 1.5 of this chapter. Following a request from ABP, the Proposed Development was screened having regard to this new project type and that it is considered to trigger a mandatory EIA. Accordingly, this EIAR has been submitted as part of the planning application. Please refer to Section 1.5 of this chapter for further details.

Jacobs was therefore appointed by EirGrid plc (EirGrid) to prepare this EIAR in respect of the application for planning approval currently before ABP. This EIAR supplements the PECR that was submitted in April 2023.

This EIAR provides information relating to the likely significant effects of the Proposed Development on the environment. A detailed description of the Proposed Development is set out in Chapter 5 of this EIAR.

1.2 Who is EirGrid?

EirGrid is the state-owned Transmission System Operator and is responsible for a safe, secure and reliable supply of electricity, now and in the future.

EirGrid develops, manages and operates Ireland's national high voltage electricity grid (also called the 'Transmission System' (the grid)). This brings power from where it is generated to where it is needed throughout Ireland. EirGrid uses the grid to supply power to industry and businesses that use large amounts of electricity. The grid also powers the distribution network owned by the Transmission System Owner, ESB. This supplies the electricity used every day in homes, businesses, schools, hospitals and farms. EirGrid develops new electricity infrastructure only when it is needed.

The European Communities (Internal Market in Electricity) Regulations 2000 (S.I. No. 445 of 2000) sets out the role and responsibilities of the Transmission System Operator; in particular, Article 8(1) (a) gives EirGrid, as Transmission System Operator, the exclusive 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.*'

EirGrid is responsible for the planning and outline design of the Proposed Development and the consent application that this EIAR relates to. ESB will, as the Developer of the Proposed Development, be responsible for the development and construction of the Proposed Development.

1.3 What is the Kildare-Meath Grid Upgrade project?

The Proposed Development for which approval is being sought is called CP966 Kildare-Meath Grid Upgrade and includes 52.9 km of new 400 kV underground cable between the existing Woodland substation in the townland of Woodland, near Batterstown, County Meath and the existing Dunstown substation in the townland of Dunnstown, near Two Mile House, County Kildare, as well as upgrades to both substations.

There is 37.8 km of the proposed underground cable located in County Kildare and 15.1 km of the proposed underground cable is located in County Meath. Eighty-two percent of the underground cable will be located within public roads and 18% will be located in private lands, to avoid location-specific constraints.

The Proposed Development (see Plate 1.1) will assist in the transfer of primarily renewable electricity from the south and southwest region of Ireland to the east region, and its subsequent distribution within the network in Meath, Kildare and Dublin. A significant number of Ireland's electricity generators are in the south and southwest regions, where many wind farms and some modern electricity generators are located. The power that is generated in these regions needs to be transported to where it is needed – known as demand centres. The power is mainly transported cross-country on the two existing 400 kV lines from Moneypoint station in County Clare to Dunstown substation in County Kildare and Woodland substation in County Meath. The Proposed Development will connect these two nodes, and this will thereby strengthen the transmission network by improving reliability and security in the east region.

The Proposed Development is essential to meet the Government of Ireland's Climate Action Plan target of up to 80% renewable energy by 2030. The Proposed Development will also help meet the growing demand for electricity in the east region.

The need for the Proposed Development is addressed further in Chapter 2 of this EIAR.

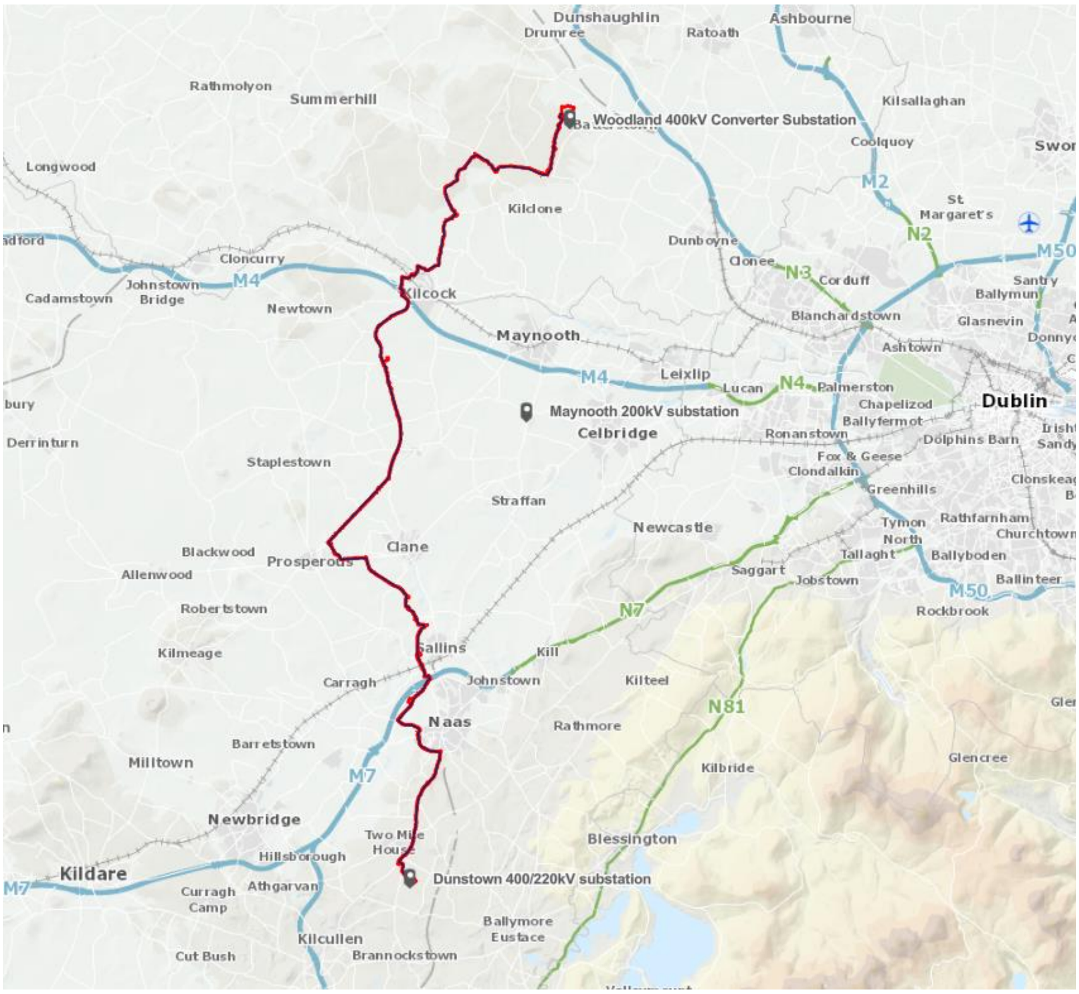


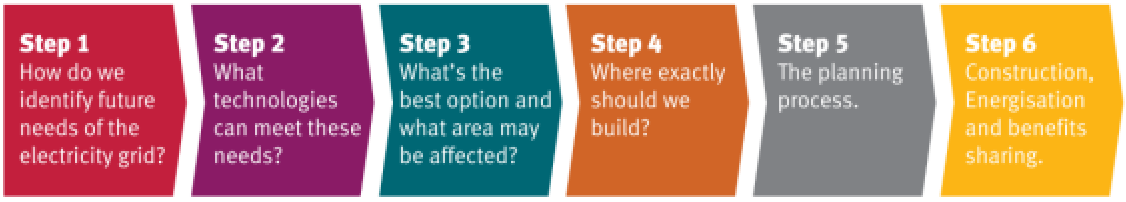
Plate 1.1: Proposed Development Location

1.4 EirGrid's Framework for Grid Development

EirGrid follows a six-step approach to identify a need to develop the transmission network and identify solutions to any identified transmission network problem. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[1]. Each step has a distinct purpose with defined deliverables and represents a lifecycle of a development from conception through to implementation and energisation.

The Proposed Development has developed in accordance with EirGrid's Framework for Grid Development, as illustrated in Plate 1.2.

[1] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/



Source: EirGrid

Plate 1.2: EirGrid's Six-Step Framework for Grid Development

The Framework ensures that project development occurs in a consistent and structured manner, with adequate and appropriate opportunities for public and stakeholder participation in project decision-making.

The consideration of alternatives for the Proposed Development must be understood as occurring in the context of, and from the early stages of, the Framework for Grid Development.

In accordance with EirGrid's Framework, a comprehensive and consistent multi-criteria analysis was applied to decision making within each of the steps of the project's development, including in considering a number of technical and routing alternatives. The multi-criteria analysis facilitated a balanced consideration of the following criteria relating to project development:

- Environmental;
- Social;
- Technical;
- Deliverability; and
- Economic.

This Proposed Development has been in development since 2017 when its need was identified and confirmed.

In Step 1, EirGrid identified the need. In this case it involved a transmission network problem in the transfer of power across the existing 400 kV transmission network from west to east along with the transfer of this power within the transmission network as it reaches the east coast. The issues encountered include limitations in both current carrying capacity and voltage stability.

In Step 2, EirGrid compiled a shortlist of best performing technical options, which went out for public consultation between November 2018 and February 2019. This included a mix of overhead line, underground cable and upvoltage[2] technologies. Four of those options were taken forward to Step 3 in April 2019.

In Step 3, EirGrid re-confirmed the need for the Proposed Development and investigated and consulted on the shortlisted technology options from September 2021 to November 2021, to strengthen the electricity network between the Woodland and Dunstown substations. In April 2021, EirGrid identified the 400 kV underground cable option as the best performing option to progress for this project.

EirGrid concluded Step 4 in June 2022 where extensive consultation with stakeholders and the community, identified exactly where the Proposed Development will be built.

The project is now at Step 5 which includes the preparation and submission of the application for approval to An Bord Pleanála.

[2] This is improving existing towers and overhead lines so that they can carry high voltages.

Details of the alternatives considered in Step 3 and Step 4 are provided in Chapter 4 (Consideration of Reasonable Alternatives).

Several documents about the Proposed Development and the project development phases are available on the project website[3] and are included in Volume 5 of this EIAR:

The relevant reports and documents are organised depending on which stage (step) of the project they refer to in EirGrid's Six Step Framework for developing projects in Ireland (they are provided in Volume 5 of this EIAR):

- *Step 1 – How do we identify needs of the electricity grid?*
  - *Step 1 - Needs Report (July 2017)*
- *Step 2 – What technology can meet these needs?*
  - *Step 2A - Long List Options Report (December 2017)*
  - *Step 2B - Short List Options Report (March 2019)*
- *Step 3 – What's the best option and what area may be affected?*
  - *Step 3A - Emerging Best Performing Technology Options Report (October 2020)*
  - *Step 3B - Best Performing Technology Option Report (March 2021)*
- *Step 4 – Where exactly should we build?*
  - *Step 4A – Emerging Best Performing Route Option Report (March 2022)*
  - *Step 4B – Best Performing Route Option Report (June 2022)*
- *Stakeholder Engagement:*
  - *Summary of engagement with the public and stakeholders in Steps 1-5*

1.5 EIA

1.5.1 Introduction

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU of the Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the EIA Directive) requires that public and private projects that are likely to have significant effects on the environment be made subject to an assessment prior to development consent being given. EIA is a process to be undertaken in respect of applications for specified classes of development listed in the EIA Directive before a decision in respect of development consent is made. The process involves the preparation of an EIAR by the applicant, consultations with the public, relevant prescribed bodies and any other affected Member States and an examination and analysis of the EIAR and other relevant information

[3] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

leading to a reasoned conclusion by the competent authority on the likely significant effects of the proposed development on the environment.

The requirements of the EIA Directive are transposed into Irish law through the Planning and Development Act 2000 (as amended) (the "PDA") and the Planning and Development Regulations 2001 (as amended) (the "Planning Regulations").

Schedule 6 of the Planning Regulations sets out the information to be contained in an EIAR. This EIAR complies with the requirements of Schedule 6 of the Planning Regulations. The EIA process can generally be summarised as follows:

- **Screening –** Determining whether or not an EIA is required for the Proposed Development. This included a review of the Proposed Development and understanding the legislative requirement for EIA under the EIA Directive and the PDA and the Planning Regulations.;
- **Consideration of the EIAR Scope –** The EIA team considered the characteristics of the Proposed Development and the likely relevant issues which could arise due to its construction and operation;
- **Baseline Data Collection –** Establishment of a robust baseline of the existing environment in the study area of the Proposed Development, including a review of existing available information and undertaking any surveys identified as required;
- **Impact Assessment –** Assessment of the potential environmental impacts of the Proposed Development with and without mitigation measures, and an iterative process of informing design to avoid impacts;
- **Mitigation –** Formulation of mitigation measures to ameliorate the potential impacts of the Proposed Development which cannot be avoided through design;
- **Consultation –** With statutory authorities, stakeholders, the public and other bodies;
- **Decision –** The competent authority, in this case ABP, will decide if the Proposed Development can be authorised, and if so, may specify conditions that must be adhered to;
- **Announcement –** The public is informed of the decision; and
- **Monitoring –** When required, monitoring of the effectiveness of implemented mitigation measures during construction and operation.

1.5.2 Relevant Legislation, Policy and Guidelines

This EIAR has been prepared in accordance with, but not limited to, the following legislation and guidance (chapter specific guidance and legislation are detailed in the relevant chapter where applicable):

- The EIA Directive 2014/52/EU;
- The Planning and Development Act 2000 (as amended);
- The Planning and Development Regulations 2001 (as amended);
- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022);
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (hereafter referred to as the European Commission EIAR Guidance) (European Commission 2017);
- Climate Action and Low Carbon Development (Amendment) Act 2021;
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission 2013);

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government (DHPLG 2018)),
- Advice Note 17: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects (The Planning Inspectorate 2019).

Key policy documents that inform the examination of all environmental topic areas include:

- Project Ireland 2040 National Planning Framework (Government of Ireland 2018);
- Project Ireland 2040 National Development Plan 2021 – 2030 (Government of Ireland 2021) (hereafter referred to as the Revised NDP);
- Climate Action Plan 2024 (Government of Ireland 2023);
- Eastern and Midlands Regional Assembly (EMRA) Regional Spatial and Economic Strategy for the Eastern and Midland Region 2019 – 2031 (EMRA 2019);
- National Energy and Climate Plan 2021 – 2030 (Department of Communications, Climate Action and the Environment 2021);
- Meath County Council Meath County Development Plan 2021 – 2027; and
- Kildare County Council County Development Plan 2023 - 2029.

1.5.3 EIA Screening

EIA Screening is making a decision on whether or not an EIA is required.

The Planning and Development (Amendment) (No. 2) Regulations 2023 came into force on 28 July 2023. These regulations inserted the following into Schedule Part 5 Part 2 paragraph 1 of the Planning Regulations.

> *'(a) Projects for the restructuring of rural land holdings, undertaken as part of a wider proposed development, and not as an agricultural activity that must comply with the European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011, where the length of field boundary to be removed is above 4 kilometres, or where re-contouring is above 5 hectares, or where the area of lands to be restructured by removal of field boundaries is above 50 hectares'.*

In response to the request by ABP in November 2023 for commentary in relation to the effects on the environment of the Proposed Development - specifically on the amount of field boundaries, re-contouring, land restructuring, and private roads, an updated EIA Screening exercise was carried out.

The Proposed Development will involve the removal of over 4 km length of field boundary and it:

a) Will restructure a rural landholding;

b) Will be undertaken as part of a wider proposed development; and

c) Is not an agricultural activity that must comply with S.I. No. 456/2011 - European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011.

A conservative approach has been taken and both temporary and permanent removal of field boundaries have been included in the updated EIA screening.

The updated EIA Screening exercise therefore concluded that the Proposed Development is of a nature or scale of a class of development within Schedule 5, Part 2 of the Planning Regulations, and will exceed the relevant limited specified amount in that part due to the removal of over 4 km of field boundary.

As outlined in Section 5.5.9 (Chapter 5) of this EIAR, the Proposed Development will result in the combined temporary and permanent removal of 5.4 km of hedgerows and treelines. For the purposes of this assessment, hedgerows and treelines are taken to be field boundaries. Other types of field boundaries exist (e.g. a fenceline or a stonewall) but as the combined temporary and permanent impacts to hedgerows and treelines are over the 4 km threshold, they have not been considered in the EIA screening. The Proposed Development triggers mandatory EIA and this EIAR is required to accompany the application for approval.

1.5.4 EIA Scoping

Section 3.3 (Page 23) of the EPA EIA Guidelines identify that:

> *"'Scoping' is a process of deciding what information should be contained in an EIAR and what methods should be used to gather and assess that information. It is defined in the European Commission guidance as:*
>
> *'The process of identifying the content and extent of the information to be submitted to the Competent Authority under the EIA process'*
>
> *Scoping is best carried out by personnel having appropriate expertise and relevant prior experience. Knowledge of the characteristics of the project type and of the sensitivities likely to be present in the receiving environment are particularly useful for scoping."*

The EPA EIA Guidelines continue (Section 3.3.2 – Page 24):

> *"The scope of the EIAR commonly emerges from a dialogue between some or all of the following:*
>
> - *The developer and their team, including competent experts, who may propose an initial draft of the scope on the basis of their knowledge of the project, the site and the likely relevant issues*
> - *The Competent Authority (CA) who will have extensive knowledge of the context and local issues and concerns, as well as detailed knowledge of statutory requirements*
> - *Other Authorities, Agencies and NGOs who typically have a detailed understanding of aspects of the environment that may be affected*
> - *The Public, either individually or in groups, who are likely to have either thematically specific or area-specific concerns. Local residents are likely to be key participants for most projects.*

The scope of the EIA was developed having regard to the characteristics of the Proposed Development and all likely significant environmental impacts which could arise due to its construction and operation. During the development of the non-statutory PECR (submitted April 2023), prescribed bodies and relevant non-statutory consultees were consulted to appraise them of the proposed approach and they were afforded the opportunity to provide comment on the approach. Comments received during this pre-application consultation process with prescribed bodies and non-statutory bodies were reviewed and considered in the preparation of the PECR. Please see Chapter 3 of this EIAR (Section 3.2) for further details.

Moreover, as a result of extensive public consultation in respect of the Proposed Development, submissions and observations received from the public and public concerns were considered and, where appropriate, issues raised in those submissions and observations are included in the EIAR.

The inputs of the authors of this EIAR (see Table 1.3), as competent experts, have added to the scope shaped by these stakeholders.

Section 3.3.5 of the EPA EIA Guidelines identified the consideration of other assessments (including other projects) as part of the scoping process. Other projects have been considered through the Cumulative Impact Assessment (presented in Chapter 21 of this EIAR).

Other assessments that have been considered as part of this EIAR are:

- Flood Risk Assessment: this is part of Chapter 12 (Hydrology) of this EIAR;
- Appropriate Assessment Screening and Natura Impact Statement: these have been prepared for the Proposed Development and further detail is provided in Section 1.6 of this chapter. A formal conclusion in the matter is the responsibility of An Bord Pleanála as Competent Authority for Appropriate Assessment of this application for Statutory consent; and
- Strategic Environmental Assessment (SEA) for EirGrid Grid Implementation Plan 2023 – 2028: this SEA Scoping Report outlines information on the Implementation Plan, including the need for the Implementation Plan, its geographical area and overall objectives. The Scoping Report is required to facilitate statutory consultation to ensure that the approach proposed for the SEA is appropriate. The results of consultation of the assessment within the report has helped to inform the scope of this EIAR by identifying key issues to be addressed and further gird projects that could be considered through the Cumulative Impact Assessment chapter of this EIAR.

1.5.5 Contents of the Environmental Impact Assessment Report

As set out in the European Commission EIAR Guidance (European Commission 2017), "*the EIAR is the document prepared by the developer [of a project] that presents the output of the assessment. It contains information regarding:*

- *the Project,*
- *the likely significant effect of the Project,*
- *the Baseline scenario,*
- *the proposed Alternatives,*
- *the features and Measures to mitigate adverse significant effects,*
- *as well as a Non-Technical Summary and,*
- *any additional information specified in Annex IV of the EIA Directive.*"

Schedule 6 of the Planning Regulations specifies the information to be contained in an EIAR. For clarity on the information to be contained in the EIAR, the relevant section of the legislation is reproduced in Table 1.1.

Table 1.1: Schedule 6 of the Planning Regulations

Information Referred to in Article 6 (Information to be Contained in EIAR)	Relevant Chapter of this EIAR
1. *(a) A description of the proposed development comprising information on the site, design, size and other relevant features of the proposed development.* *(b) A description of the likely significant effects on the environment of the proposed development.* *(c) A description of the features, if any, of the proposed development and the measures, if any, envisaged to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment of the development.* *(d) A description of the reasonable alternatives studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed development on the environment.*	Item (a) Chapter 5 (Proposed Development Description) Item (b and c) All environmental assessment chapters (Chapter 7 to Chapter 21) Item (d) Chapter 4 (Consideration of Reasonable Alternatives).
2. Additional information, relevant to the specific characteristics of the development or type of development concerned and to the environmental *features likely to be affected, on the following matters, by way of explanation or amplification of the information referred to in paragraph 1:* *(a) a description of the proposed development, including, in particular—* *(i) a description of the location of the proposed development,* *(ii) a description of the physical characteristics of the whole proposed development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases,* *(iii) a description of the main characteristics of the operational phase of the proposed development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used, and* *(iv) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases;*	Item 2 (a) (i and ii) Chapter 5 (Proposed Development Description) Item 2 (a) (iii) Chapter 5 (Proposed Development Description) and Chapter 19 (Waste). Water – Chapters 11 and 12. Land – Chapters 6, 7, 10, 11, 13, 15, 16, 17, and 19. Soil – Chapter 11 and 15. Biodiversity – Chapter 10. Item 2 (a) (iv) All environmental assessment chapters (Chapter 7 to Chapter 21)
2 (b) a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects;	Chapter 4 (Consideration of Reasonable Alternatives)
(c) a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge;	All environmental assessment chapters (Chapter 7 to Chapter 21) and Chapter 4 (Consideration of Reasonable Alternatives)

Information Referred to in Article 6 (Information to be Contained in EIAR)	Relevant Chapter of this EIAR
(d) a description of the factors specified in paragraph (b)(i)(I) to (V) of the definition of 'environmental impact assessment' in section 171A of the Act likely to be significantly affected by the proposed development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape;	All environmental assessment chapters (Chapter 7 to Chapter 21)
(e) (i) a description of the likely significant effects on the environment of the proposed development resulting from, among other things— *(I) the construction and existence of the proposed development, including,* *where relevant, demolition works,* *(II) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability* *of these resources,* *(III) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste,* *(IV) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters),* *(V) the cumulation of effects with other existing or approved developments, or both, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources,* *(VI) the impact of the proposed development on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the proposed development to climate change, and* *(VII) the technologies and the substances used, and* *(ii) the description of the likely significant effects on the factors specified in paragraph (b)(i)(I) to (V) of the definition of 'environmental impact assessment' in section 171A of the Act should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium- term and long-term, permanent and temporary, positive and negative effects of the proposed development, taking into account the environmental protection objectives established at European Union level or by a Member State of the European Union which are relevant to the proposed development;*	*Item (e) (i) (I to VII) and (ii)* Chapter 5 (Proposed Development Description) and all environmental assessment chapters (Chapter 7 to Chapter 21).
(f) a description of the forecasting methods or evidence used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information, and the main uncertainties involved;	All environmental assessment chapters (Chapter 7 to Chapter 21).
(g) a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of an analysis after completion of the development), explaining the extent to which significant adverse effects on the environment	All environmental assessment chapters (Chapter 7 to Chapter 21).

Information Referred to in Article 6 (Information to be Contained in EIAR)	Relevant Chapter of this EIAR
are avoided, prevented, reduced or offset during both the construction and operational phases of the development;	
(h) a description of the expected significant adverse effects on the environment of the proposed development deriving from its vulnerability to risks of major accidents and/or disasters which are relevant to it. Relevant information available and obtained through risk assessments pursuant to European Union legislation such as the Seveso III Directive or the Nuclear Safety Directive or relevant assessments carried out pursuant to national legislation may be used for this purpose, provided that the requirements of the Environmental Impact Assessment Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for, and proposed response to, emergencies arising from such events.	Chapter 18 Risk of Major Accidents and/or Disasters

While the EIAR has been prepared in compliance with the PDA and the Planning Regulations, it has also been written to make it accessible to a wider, non-specialist audience. Where technical terminology is used, an explanation is provided in the text, and / or in the glossary of terms which is provided at the beginning of Volume 2 of the EIAR.

The structure of the chapters in Volume 2 (Main Report) of this EIAR aligns with both the European Commission EIAR Guidance (European Commission 2017) and the EPA Guidelines (EPA 2022), and includes the following headings:

- **Introduction:** Provides an overview of the aims and objectives of the specific chapter in assessing the Proposed Development and outlines the scope of the assessment;
- **Methodology:** Describes the forecasting methods and evidence used to identify and assess the significant impacts on the environment;
- **Baseline Conditions:** The baseline refers to the current state of environmental characteristics. It involves the collection and analysis of information on the condition, sensitivity and significance of relevant environmental topics which are likely to be significantly impacted by the Proposed Development;
- **Potential Effects:** Reporting in the EIAR is structured to ensure that criteria and standards of significance, sensitivity and magnitude used as part of the assessment are identified and documented and that the level of certainty of data is recorded. An explanation is provided for the assessment criteria that have been applied within each environmental topic area, including reference to the appropriate published guidance;
- **Mitigation Measures**: This section sets out measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, identifies any proposed mitigation and monitoring arrangements. This section covers both the construction and operational phases;
- **Residual Effects:** Any effects that are predicted to remain after all mitigation measures have been implemented are referred to as ‘Residual Effects’. These are the remaining environmental effects of the Proposed Development that could not be reasonably avoided; and
- **Conclusion –** A summary of the findings of the chapter.

1.6 Appropriate Assessment (AA) Screening

An Appropriate Assessment (AA) Screening Report was prepared in April 2023 and revised in February 2024.[4] The previous 2023 version has been superseded by the 2024 version.

The conclusion of the Screening for Appropriate Assessment is that, on the basis of objective evidence, likely significant effects on the conservation objectives of any European site from the Proposed Development, individually or in combination with other plans or projects, could not be excluded and therefore it is respectfully submitted that an Appropriate Assessment of the Proposed Development is required. The Natura Impact Statement (NIS) was prepared in April 2023 and revised in February 2024. The previous 2023 version has been superseded by the 2024 version. The NIS examined whether, in view of best scientific knowledge and applying the precautionary principle, the Proposed Development either individually, or in combination with other plans or projects, may have an adverse effect on the integrity of any Natura 2000 Site (also known as European Sites).

On review of best scientific knowledge, applying the precautionary principle, and considering the conservation objectives of the relevant Natura 2000 sites, the NIS concludes that the Proposed Development, on its own or in combination with other plans or projects, will not have an adverse effect on the integrity of any Natura 2000 Site. Again, a formal determination in the matter is the responsibility of An Bord Pleanála as Competent Authority for Appropriate Assessment of this application for Statutory consent.

1.7 Construction and Environmental Management Plan (CEMP)

A Construction and Environmental Management Plan (CEMP) is provided in Appendix 5.4 of this EIAR. This represents the first iteration of the CEMP, based on the general arrangement and methodologies contained in this application submission and will be implemented as a minimum. The Contractor may update the measures in the CEMP during the detailed design phase, to the extent required to comply with any planning conditions in the planning permission (if granted) for the Proposed Development and as otherwise required by the relevant Planning Authorities. The CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment, are implemented.

1.8 Sustainability

The approach to sustainability is an overarching issue and it cannot be addressed within one assessment criterion (e.g. environment) and must be considered within all assessment criteria. Sustainability is at the core of the project and this section will outline how sustainability and its context with international and national sustainability measures are addressed.

It is recognised at National and Regional level that International, European, and national climate change commitments mean that power generation, transport and heat, increasingly have to be produced from sustainably produced electricity. Therefore, national and regional policy have a strong emphasis on the need for new energy systems and transmission grids.

EirGrid has identified that the project will help facilitate Ireland's transition to a low carbon energy future.

Sustainability has been at the heart of the project where the routing principles establish how the proposed route options considered social, economic and environmental issues. Assessment of EirGrid's five assessment criteria is the key to the consideration of sustainability on the Proposed Development.

[4] The AA Screening and NIS were revised following the designation of North-West Irish Sea Special Protection Area in September 2023.

Sustainability has been at the core of the design process for the Proposed Development. Sustainability has been central to the development of the Proposed Development, and which regulations, plans, policies and programmes have influenced the development. The Proposed Development will consider the following topics in line with the key state of the environment messages above:

- Population and Human Health;
- Air Quality;
- Noise and Vibration;
- Biodiversity;
- Soils; and
- Climate.

1.9 Structure of this EIAR

This EIAR provides a description of the Proposed Development and includes an analysis of its compliance with national, regional and local energy and planning policies, an assessment of potential environmental impacts and mitigation measures that are proposed to avoid or reduce any significant adverse effects as a result of the construction and operation of the Proposed Development.

This EIAR forms part of a planning pack that has been prepared in support of the application for approval to An Bord Pleanála. The planning pack also contains the following reports, documents and figures:

- Planning Application Form and associated Notices and Drawings submitted April 2023;
- Planning Report submitted April 2023;
- PECR submitted April 2023;
- AA Screening Report and NIS originally submitted April 2023, revised February 2024.

In order to assist with the reading and understanding of this EIAR, the EIAR has been structured into five volumes:

- **Volume 1 – Non-Technical Summary:** This summarises the findings of the EIAR in a clear, accessible format that uses non-technical language and supporting graphics. The Non-Technical Summary describes the Proposed Development, summarises the baseline environment, potential impacts and mitigation measures, and relevant topics of the EIAR in a manner that can be easily understood by the general public;
- **Volume 2 – Main Report:** This includes introductory chapters in addition to ‘assessment’ chapters for each environmental topic in accordance with Schedule 6 of the Planning Regulations. The front-end chapters provide the relevant Proposed Development context while the assessment chapters provide a description of the relevant environmental aspects, and likely significant impacts with cumulative impacts from other schemes in combination with the predicted impacts of the Proposed Development, and summary chapters provided thereafter;
- **Volume 3 – Appendices:** This provides the technical reports that support and are cross-referenced within Volume 2. This includes other relevant drawings, modelling outputs, background reports and / or supporting documents;
- **Volume 4 – Figures:** This provides drawings, maps and graphics that support, and are referenced within Volume 2; and
- **Volume 5 – Supporting Documentation**: This provides published technical reports about the development phases for the Proposed Development, prior to the final route selection assessed in this EIAR.

The structure of this volume of the EIAR (Main Text) is set out in Table 1.2.

Table 1.2: EIAR Chapter Structure

Chapter Number	Chapter Title
1	Introduction
2	Need for the Proposed Development
3	Stakeholder Engagement
4	Consideration of Reasonable Alternatives
5	Proposed Development Description
6	Planning
7	Population and Human Health
8	Air Quality
9	Noise and Vibration
10	Biodiversity
11	Soils, Geology, and Hydrogeology
12	Hydrology
13	Archaeology, Architectural Heritage, and Cultural Heritage
14	Traffic and Transport
15	Agronomy and Equine
16	Material Assets
17	Landscape and Visual
18	Risk of Major Accidents and Disasters
19	Waste
20	Climate
21	Cumulative Impacts and Environmental Interactions
22	Summary of Mitigation and Monitoring Measures
23	Summary of Significant Residual Effects

There were no limitations encountered, such as technical deficiencies or lack of knowledge, in compiling the information required to carry out the assessments detailed in this EIAR. Any other limitations are highlighted in the relevant chapters of this EIAR.

Details of the contributors that informed this EIAR are provided in Table 1.3.

Table 1.3: EIAR Contributors

Chapter	Chapter Author	
Introduction **Background to the Project** **Stakeholder Engagement** **Consideration of Reasonable Alternatives** **Population and Human Health** **Material Assets** **Waste** **Major Accidents and Disasters**	Fay Lagan	Fay Lagan BSc (Hons) MSc MIEMA CEnv has wide-ranging experience in the environmental field. He has over 20 years' experience in major infrastructure projects. Fay is a graduate of Queen's University with a Masters in Applied Environmental Sciences. Fay has lead EIA and other projects across the UK and Ireland on a wide diversity of projects. His extensive support to clients includes Transport Infrastructure Ireland and numerous Local Authorities, Highways England; Translink, Department for Infrastructure, SONI, EirGrid, Belfast City Council, and a range of private sector clients.
Cumulative Assessment and Interactions	Stephanie McGlynn	Stephanie McGlynn BSc MSc CEnv CWEM is a Principal Environmental Scientist with Jacobs Engineering Ireland and has over eight years of professional experience in the environmental sector. She holds a BSc degree in Environmental Science and Health from Dublin City University and a MSc degree in Applied Environmental Science from University College Dublin. She is a Chartered Environmentalist (CEnv) with the Society of the Environment and is a Chartered Water and Environmental Manager (C.WEM) with the Chartered Institute of Water and Environmental Management (CIWEM). Stephanie has worked on a range of both public and private sector environmental impact assessments of varying scales, and has carried out cumulative impact assessment for larger Strategic Infrastructure Development projects including the Greater Dublin Drainage Project, MetroLink and the East Meath – North Dublin Grid Upgrade. Stephanie has also coordinated the delivery of a number of Strategic Infrastructure Development projects including BusConnects Dublin and the Greater Dublin Drainage Project.
Climate	Kevin Turpin	Kevin Turpin BSc (Hons) PhD MIAQM MIEnvSc is a climate and air quality specialist. He has over 25 years' experience of assessing the impact of major infrastructure schemes, 12 of which included researching and developing environmental solutions. Kevin has worked with a range of government clients including National Highways, HS2 and the West Yorkshire Combined Authority as well as international clients in the middle east. As well as undertaking air quality impact assessments Kevin has overseen the production of carbon impact assessments, carbon management plans and climate chapters for EIAs. He has developed several emission modelling tools including the Jacobs Local Authority Carbon Tool (LACT). Kevin has represented clients at planning enquiries as part of EIA Regulations.

Chapter	Chapter Author	
Proposed Development Description	Nigel Edwards	Nigel Edwards BSc, MICE, is a chartered civil engineer with over 35 years' experience working on major linear infrastructure projects mainly within the water industry and for the last 14 years in the HV transmission and distribution industry. During that time Nigel has worked as a designer on these projects from inception, through feasibility, outline design and planning and detailed design. He has contributed to numerous planning applications for schemes. For the last 5 years he has been involved in the outline design and planning applications for various T&D projects in Ireland on behalf of EirGrid.
	Enda Casey	EUR ING Enda Casey, B.Eng (Hons) CEng MICE MAPM has over 20 years construction experience both in delivery and pre-construction phases. This is on various civil engineering projects in Ireland, the UK and internationally. Originally from an on-site delivery background, Enda brings this experience to assessment of potential construction impacts during the design and consenting phases. He has prepared numerous construction implication assessments in the UK – such as Hybrid Bill for the London stage of High Speed 2 Phase 1 and in Ireland as part of the MetroLink EIAR assessment. As well as preparing technical assessments for the PECR and supporting information, he acts as reviewer for works of others to ensure consistency and appropriate consideration of construction impacts.
	Peter Simpson	Peter is a Chartered Arboriculturalist (MICFor) and Professional Member of the Arboricultural Association (MArborA) Peter has over 25 years' experience working across the UK's Arboricultural, Forestry and Environmental sectors. With extensive experience of provided detailed planning support to complex construction, infrastructure and renewable energy schemes as well as providing clients with arboricultural services for their compliance with health and safety and public liability legal duties. Peter has a range of employment experience across the industry including public sector, charity and local authority. Peter has many cross-discipline skills including natural capital and carbon experience. Peter is an innovator and champions the use of digital survey skill and technology to deliver accurate and efficient services to his clients. Peter is an active member of the Institute of Chartered Foresters and sits on the Northern regional committee.
Planning	John Kehoe	John Kehoe BA MSc has wide experience of all aspects of land-use planning, in both the public and private sectors and provides ongoing planning advice to a number of clients in relation to planning law and practice. John has worked extensively on a wide range of strategic planning

Chapter	Chapter Author	
		studies at the national and regional level. He has also prepared local area plans and action area plans for a number of local authorities, and has provided analysis and studies for a range of project types, including retail, population estimates, leisure, housing and urban regeneration.
Air Quality	Gary Wilson	Gary Wilson BSc., MSc, is an experienced member of the Jacobs air quality team with over 17 years' experience and has undertaken a considerable number of projects that have included air quality assessment aspects in order to assess the potential air quality impacts. Gary manages leads on the air quality, dust and odour assessments for large scale infrastructure developments in Ireland, UK and internationally including EIA scoping, EIA assessments, environmental constraints and route/site options analysis and EIARs. Gary has prepared numerous chapters of EIARs for transmission, power generation and other linear transport projects. Gary is an experienced user of air quality dispersion modelling software including ADMS 5, AERMOD, CALPUFF and ADMS Roads. Modelling has been undertaken for various different sources and circumstances including: power, transport, industrial, waste, mining and construction. Gary has also planned and carried out baseline air quality, dust, odour and noise monitoring surveys.
Noise and Vibration	Chris Conroy	Chris Conroy MA (Hons) MSc MIOA, has over 10 years' experience in managing, coordinating and conducting noise and vibration impact assessments for large scale infrastructure developments in Ireland and the UK. He has successfully conducted operational and construction noise and vibration assessments for major environmental projects including Environmental Impact Assessment (EIA), Appropriate Assessment and planning applications. Chris has presented as an expert witness at An Bord Pleanála oral hearing. He authored and compiled the Roads Noise Action Plan for Northern Ireland Round 3. He also has a background in Geographical Information Systems (GIS).
Biodiversity **AA Screening and NIS**	Susie Coyle	Dr Susie Coyle BSc (Hons) MCIEEM MIFM MRSB is a chartered biologist with over 16 year consultancy experience carrying out environmental assessments. She is a highly skilled aquatic and terrestrial ecologist and is an Associate Director. She is the lead for Ecology in Ireland. Susie has coordinated Jacobs' ecologists both in Ireland and in the UK and has experience of multiple ecological survey techniques and associate reporting. She has over 20 years' experience of field surveys and environmental sampling techniques. Susie has delivered multiple Appropriate Assessment Screening Reports and Natura Impact Statements at both plan and project level along with many Environmental Impact Assessment Reports. She has undertaken options

Chapter	Chapter Author	
		assessment appraisals including EirGrid projects at Steps 4a and 4b, and has experience as an expert witness at oral hearing. Susie was supported in her role by the following ecologists, in surveys and report writing. Harry Jones is a Senior Environmental Consultant and an Associate Member of the Chartered Institute of Ecology and Environmental Management (ACIEEM). Harry has a Master's degree (MAI) in Civil, Structural and Environmental Engineering from Trinity College Dublin, as well as a Postgraduate Certificate (PGCert) in Ecological Surveying from Oxford University. He has more than five years' professional experience working predominantly in environmental coordination and ecological surveying. He has worked on a variety of projects of all sizes across various disciplines including water, wastewater, transportation, and infrastructure. Duncan Smith is a Principal Ecologist and Chartered Environmentalist. He has a BSc (Hons) in Zoology from the University of Leeds, an MSc in Environmental Technology with Ecological Management from Imperial College and as MSc in Marine Environmental Protection from Bangor University. He has twenty-four years professional ecological experience specialising in botanical surveying, habitat management and evaluation for Ecological Impact Assessment. During his career he has worked in the private, public, and voluntary sectors, including fifteen years in the private sector, seven years for UK Statutory Nature Conservation Bodies in England and Wales and two years in the voluntary sector. Dr Irene Bottero is an Ecologist in Jacobs and holds BSc (Hons) in Natural Science, MSc (Hons) in Evolution of Animal and Human Behaviour from University of Studies of Torino (Italy) and a PhD in Botany from Trinity College Dublin. Irene has authored several scientific papers and has worked in consultancy over a three-year period, carrying out multiple surveys for habitats, insects and river monitoring. Stuart Cossey is a Senior Ecologist and holds a BSc (Hons) in Conservation Biology and Ecology from Exeter University. Stuart has four years of consultancy associated project experience and three years' experience in conservation. Stuart has authored AA Screening Reports, NISs, Ecological Assessment Reports and Building Research Establishment Environmental

Chapter	Chapter Author	
		Assessment Method (BREEAM). Stuart has a strong background in ornithology and is well practiced in a range of survey techniques.
Soils, Geology and Hydrogeology	Vanina Saint-Martin	Vanina Saint-Martin MSc. Hydrogeology, has over 20 years technical expertise in hydrogeological matters. Vanina has worked on a large variety of projects including groundwater resources, hydrogeological-hydrological assessments, mining and quarrying issues, contaminated land and groundwater risk assessments, environmental impact assessments, landfills HRAs, groundwater flooding and groundwater dependent ecological assessments. She has worked on a significant number of multi-disciplinary projects working collaboratively with a strong EIA focus and ensuring client expectations are met. Her experience includes a number of infrastructure projects in Ireland (including Cork Light Rail System, N60 Balla to Claremorris, N69 Listowel Bypass), Scotland (including A9 Dualling Perth to Inverness, A96 Inverness to Nairn, Forth Road Crossing, Aberdeen Western Peripheral Route) and England (including A12, A14 Huntington to Cambridge, M1 A6, Haweswater Aqueduct Resilience Programme). She has previously acted as an Expert Witness.
Hydrology	Nick Stokes Andrew Picken	Nick Stokes BA Hons MSc MCIWEM, C.WEM Chartered Scientist/Environmental Engineer with over 20 - years' post graduate experience working in the water industry delivering projects for clients including: Irish Water, TII, Natural Resources Wales and the Environment Agency (UK). Nick's background is in flood risk management appraisal and civil engineering design, drainage analysis, surface water hydrology and hydraulic modelling and Nick is currently leading flood risk assessment and mapping work for the MetroLink and Eastern and Midlands Water Supply Project. Andrew Picken BSc (Hons), MSc, MCIWEM, C.WEM is a Chartered Water and Environmental Manager with over 14 years experience in hydrology and water resource assessments. Andrew has worked on a large variety of projects leading to gaining broad technical background in flood studies, water quality, peatland management and environmental impact assessment. His has managed and delivered environmental impact assessments covering the water environment on projects across Ireland and the UK across sectors including: renewables, highways, rail and utilities.
Archaeology, Architectural Heritage, and Cultural Heritage	Jonathan Dempsey	Jonathan Dempsey (MA (Hons)) is a Member of the Chartered Institute for Archaeologists with 26 years professional experience. During this time he has contributed to archaeological,

Chapter	Chapter Author	
	Abby Cooper	architectural and cultural heritage assessments for windfarms, energy transmission projects, roads, rail, WWTW, ports, prisons and retail and residential developments. This has included inputs into SEA, Constraints Studies and options appraisals, MCA, EIA scoping, screening and Environmental Impact Assessment Reports (EIAR). Jonathan was the heritage team lead for Steps 4 and 5 of this project, for Steps 4 and 5 of the CP1021 North Dublin East Meath to North Dublin Grid Upgrade and for Step 5 of the Maynooth GIS Substation Development. Jonathan was an expert witness at oral hearings for the N15 Bundoran to Ballyshannon Bypass (2001), the N21 Adare Bypass (2010) and Dunkettle Interchange (2013). He has been eligible to hold excavation licences in Ireland since 1999 and in Northern Ireland since 2003. Abby Cooper BA (Hons) MSc is a Principal Archaeologist with Jacobs and has over 9 years of professional experience in the historic environment sector. She holds a BA (Hons) in Archaeology and History from the University of Leicester and an MSc in Human Osteoarchaeology from the University of Edinburgh. She is a Member of the Chartered Institute for Archaeologists (CIfA). Abby has experience inputting to various stages of Environmental Impact Assessment on a range of projects, including high-profile infrastructure schemes and small commercial sites, across the UK and Ireland.
Traffic and Transport	David King	David King BSc MEng has over 20 years' professional experience in policy derivation, transport strategy preparation, modelling, traffic impact, multi-modal scheme appraisal, business case development, planning applications, EIA preparation, Compulsory Purchase Order (CPO), and Oral Hearings for all modes of transport including heavy rail, light rail, bus and BRT, and Metro. Traffic surveys were undertaken by Tracsis and were led by David Demery. David has a Diploma in Civil Engineering, a Bachelor's degree in Civil Engineering and Management, and a Master's in Energy Management He has been the Operations Manager for Tracsis in Ireland since 2014.
Agronomy and Equine	Con Curtin	Con Curtin B.Agric.Sc is an Agricultural Consultant with over 30 years of experience in farm consultancy and set up his own company in October 1996 – Curtin Agricultural Consultants Ltd (curtinagriculturalconstultants.com). He is a member of the Agricultural Consultants Association and Agricultural Science Association. He has a Level 6 Certificate in Land Drainage. A strong feature of his company is the wide range of agricultural services and expertise it provides to its clients. Con advises his dairy, beef, sheep, tillage and pig farmer clients on issues such as on farm production, financial advice, farm yard design and Department of Agriculture

Chapter	Chapter Author	
		Schemes. Con is agronomist for Gas Networks Ireland whom he advises on land re-instatement and drainage. He also acts as Agronomist for TII, Irish Water and various County Councils.
Landscape and Visual	Richard Barker	Richard Barker BA MSc is a Corporate Member of the Irish Landscape Institute and has 20 years of experience in the field of landscape and visual impact assessment. Richard was supported in the writing of the chapter and undertaking surveys by Rory Curtis BEng BA GDip MILI - a Landscape Architect with over 10-years of experience in the industry.

2. Need for the Proposed Development

2.1 Project Need

There are two drivers that underpin the need for this Proposed Development, namely:

1. Increased demand on East coast – An increase in electricity demand as part of natural growth is expected. In addition, there is a demand increase in the order of 1200 MW due to the planned connection of high energy users. This is based on executed and offered connection agreements mostly in the counties Kildare, Meath and Dublin. Part of this demand started to connect to the system in 2017 and is ramping up to the total demand figure in 2030. The interest is high, and it is expected that this trend will continue with further requests for connection.

2. Integration of generation from the South and South West regions – Significant levels of new renewable generation have connected or are in the process of connecting to the transmission and distribution system in the south and southwest of Ireland. This is also where the newer and more cost effective existing conventional generation units are located. This results in a scenario whereby a significant portion of the generation sources are located in the south and southwest of Ireland away from the main demand centres within the Dublin and Greater Dublin Area, and East region in general. The power produced will hence have to be transported to get to where it is needed (known as demand centres).

These two drivers introduce cross country power flows on the existing transmission system from the West to the East coast. The Proposed Development is needed to ensure compliance with EirGrid's Transmission System Security Planning Standards (TSSPS). To ensure transmission system reliability and security, the performance of the network is compared with the requirements of the Transmission System Security and Planning Standards which are available at www.eirgridgroup.com.

The violations occur for the unplanned loss of any of the existing 400 kV circuits between Moneypoint 400 kV station in the West and Dunstown 400 kV in County Kildare and Woodland 400 kV station in County Meath in the East. The violations relate to two aspects:

- Bringing required power to the East coast; and
- Transferring this power within Counties Dublin, Kildare and Meath once the power reaches the East coast.

The power is currently transported cross-country on the two existing 400 kV lines from the Moneypoint station in County Clare to the Dunstown substation in County Kildare and Woodland substation in County Meath (shown in Plate 2.1). Transporting large amounts of electricity on these 400 kV lines could cause problems that would affect the security of electricity supply throughout Ireland, particularly if one of the lines is lost unexpectedly. To solve this emerging issue, EirGrid needs to strengthen the electricity network between Dunstown and Woodland to avoid capacity and voltage problems. The Proposed Development will help transfer electricity to the east of the country and distribute it within the network in Meath, Kildare and Dublin, helping to ensure compliance and resolve the emerging issues identified above.

Plate 2.1: Cross-country 400 kV lines

The Proposed Development will help to meet the Government of Ireland's Climate Action Plan target of up to 80% renewable energy generation by 2030. This includes the transmission of electricity from offshore renewable sources. Significant levels of new renewable generation have connected or are in the process of connecting to the transmission and distribution system in the south and southwest of Ireland. This is also where the newer and more cost effective existing conventional generation units are located. This results in a significant proportion of the generation sources being located in the south and southwest of Ireland away from the main demand centres. The power produced will hence have to be transported to where it is needed. This Proposed Development will allow more renewable generation to be connected to the electrical grid and to supply this energy to where demand is largest.

EirGrid has identified that the Proposed Development will have the following benefits:

- Community - Deliver community benefit in the areas that facilitate the project infrastructure;
- Competition - Apply downward pressure on the cost of electricity;
- Sustainability - Help facilitate Ireland's transition to a low carbon energy future;
- Security of supply - Improve electricity supply for Ireland's electricity consumers; and
- Economic - Contribute to the regional economy and support foreign direct investment.

The Proposed Development will create a new circuit in the electricity transmission network and will enhance the network in the area and provide capacity to connect new demand for electricity to support economic growth in the area and to connect new renewable generation to help with meeting national Climate Action Plan targets.

The need for the Proposed Development has been established through a series of reports completed at Steps 1 to 4. The Step 1 - Needs Report (July 2017) and other reports are available on the project website[5] (also, see Volume 5 of this EIAR). This series of reports identified the need for a new connection between Woodland and Dunstown substations and that an underground cable is the best technology solution for this need. The Proposed Development is a high voltage (400 kV) underground cable between Woodland and Dunstown substations and the need for the Proposed Development remains of critical importance to the security of electricity supply.

[5] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

3. Stakeholder Engagement

3.1 Introduction

Public and Stakeholder engagement is a key tenet in EirGrid's Framework for Grid Development. EirGrid's Framework, which is outlined in EirGrid's publication 'Have your Say', is provided for the local community, landowners, elected representatives, media, and prescribed bodies and other stakeholders to be made aware of a project and most importantly provides opportunities to provide feedback as the project develops. Throughout the development of the project, the design of the Proposed Development has been revised and refined to take account of the findings of studies and surveys and from public consultation and stakeholder feedback. This has also included ongoing consultation and engagement with the planning authorities and other prescribed bodies.

Stakeholder Engagement Reports were prepared at key steps in the project, and they are available on the project website[6]. A summary Stakeholder Engagement Report has been provided to give an overview all of the consultation from Steps 1-5 in one report. It is available on the project website and is provided in Volume 5 of this EIAR. The following sections of this chapter do not repeat the contents of those reports but summarise the engagement carried out with statutory bodies insofar as it has informed what information should be contained in the EIAR.

3.2 An Bord Pleanála

The Strategic Infrastructure Development pre-application process with An Bord Pleanála (Reference ABP-314112-22) was commenced by letter from EirGrid to An Bord Pleanála under Section 182A of the Planning and Development Act 2000, as amended. Pre-application meetings were held with ABP on the following dates:

- 15 September 2022;
- 15 December 2022; and
- 16 February 2023.

As outlined in Chapter 1 of this EIAR, further correspondence with ABP took place in July and November 2023. In June 2023, ABP wrote to EirGrid to request a submission to the six observations received in relation to the Proposed Development. The observations were made by Meath and Kildare County Councils, Uisce Éireann, Health Service Executive (HSE), and Transport Infrastructure Ireland (TII). EirGrid respectfully summarised these as confirming the acceptance of the principle, need, and general nature, extent and location of the Proposed Development by these prescribed bodies. The five bodies also suggested a number of planning conditions. In addition to the five observations received by the Board from the five statutory bodies, one submission was received from an affected landowner. In August 2023, EirGrid made its submission in response to the request from ABP in June 2023. This addressed key points raised by the affected landowner and provided clarification where EirGrid believed it would assist ABP. EirGrid confirmed its thanks to the statutory bodies and confirmed it was broadly supportive of the suggested planning conditions. EirGrid did provide clarification on some of the suggested planning conditions but confirmed it was a matter for the discretion of the Board.

3.3 Prescribed Bodies and Agencies

Table 3.1 outlines some of the consultation that has taken place between EirGrid's project team and Prescribed Bodies and Agencies.

[6] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

Table 3.1: Prescribed Bodies and Agencies Engagement

Stakeholder	Form of Engagement	Key Comments Raised	Responses as Addressed in this Report
Meath County Council	Virtual Meetings: • 16/09/2021; • 30/09/2021; • 31/03/2022; • 16/08/2022; • 28/09/2022; • 02/12/2022 (in-person meeting); and • 16/01/2023.	EirGrid and Meath County Council held a series of meetings to discuss the ground investigations for the Proposed Development. Other meetings were held to discuss the proposed route, the impact to roads, road closures, impacts from joint bays, and the impacts to future developments.	Chapter 11 Soils, Geology and Hydrogeology Chapter 5 Proposed Development Description
Kildare County Council	Virtual Meetings: • 14/04/2022; • 01/06/2022; • 23/06/2022; • 16/09/2022; • 05/10/2022 (in-person meeting); • 25/10/2022 (in-person meeting); and • 11/01/2023 (in-person meeting).	EirGrid and Meath County Council held a series of meetings to discuss the ground investigations for the Proposed Development. Other meetings were held to discuss the proposed route, the impact to roads, road closures, impacts from joint bays, the impacts to future developments, and the use of Sallins Bypass Bridges.	Chapter 11 Soils, Geology and Hydrogeology Chapter 5 Proposed Development Description
Transport Infrastructure Ireland	Virtual Meetings: • 20/08/2021; and • 16/09/2022.	Crossing of the M4 and M7	Chapter 5 Proposed Development Description
Irish Rail	Virtual Meetings: • 05/11/2021; • 02/12/2021 (site visit); • 01/06/2022; • 14/09/2022; • 17/11/2022; and • 28/11/2022.	Crossing of the Dublin-Sligo and Dublin-Cork/Limerick railway lines.	Chapter 5 Proposed Development Description

Stakeholder	Form of Engagement	Key Comments Raised	Responses as Addressed in this Report
Waterways Ireland	Virtual Meetings: • 15/03/2022; and • 01/06/2022	Crossing of the Royal Canal and the Grand Canal.	Chapter 5 Proposed Development Description
Irish Water	Virtual Meeting: • 17/01/2023.	Discussion of the crossing of Irish Water assets.	Chapter 5 Proposed Development Description
Gas Networks Ireland	Emails: • 12/08/2022; and • 22/08/22.	Discussion of the crossing of Gas Networks assets.	Chapter 5 Proposed Development Description
National Monuments Service	Virtual Meeting: • 19/12/2022.	Discussion on the potential effects of the Proposed Development.	Chapter 13 Archaeology, Architectural Heritage and Cultural Heritage
Inland Fisheries Ireland	Emails and telephone calls: • 02/12/2022; and • 17/01/2023.	Discussion on the potential effects of the Proposed Development	Chapter 10 Biodiversity and Chapter 12 Hydrology
National Parks and Wildlife Service	Virtual meeting: • 07/02/2023	Discussion on the potential effects of the Proposed Development	Chapter 10 Biodiversity and Chapter 12 Hydrology

4. Consideration of Reasonable Alternatives

4.1 Introduction

The Proposed Development has been developed in accordance with EirGrid's Framework for Grid Development. As part of the previous steps of this Framework, a series of studies by or on behalf of EirGrid were conducted which assessed a range of reasonable and relevant options for the development. The following sections provide a summary of the alternatives considered. Further detail is provided in the Steps 1-4 reports, which are available on project website. The Step 3 and 4 reports are included in Volume 5 of this EIAR (Supporting Documents)[7].

EirGrid's approach to the development of projects is set out in Chapter 1 of this EIAR. EirGrid follows a six-step approach to develop the transmission network and identify solutions to any identified transmission network problem. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[8]. The six steps are shown in Chapter 1 of this EIAR. Each step has a distinct purpose with defined deliverables and together they represent a lifecycle of a development from conception through to implementation and energisation. The Proposed Development is currently in Step 5 'Applying for Planning Permission'.

4.2 Consideration Methodology

The EPA EIA Guidelines[9] state:

> *"The EIA Directive requires an EIAR to contain:*
>
> *"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*
>
> *"The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'an indication of the main reasons for selecting the chosen option'. It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."*

[7] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/
[8] http://www.eirgridgroup.com/the-grid/have-your-say/
[9] EPA. 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf

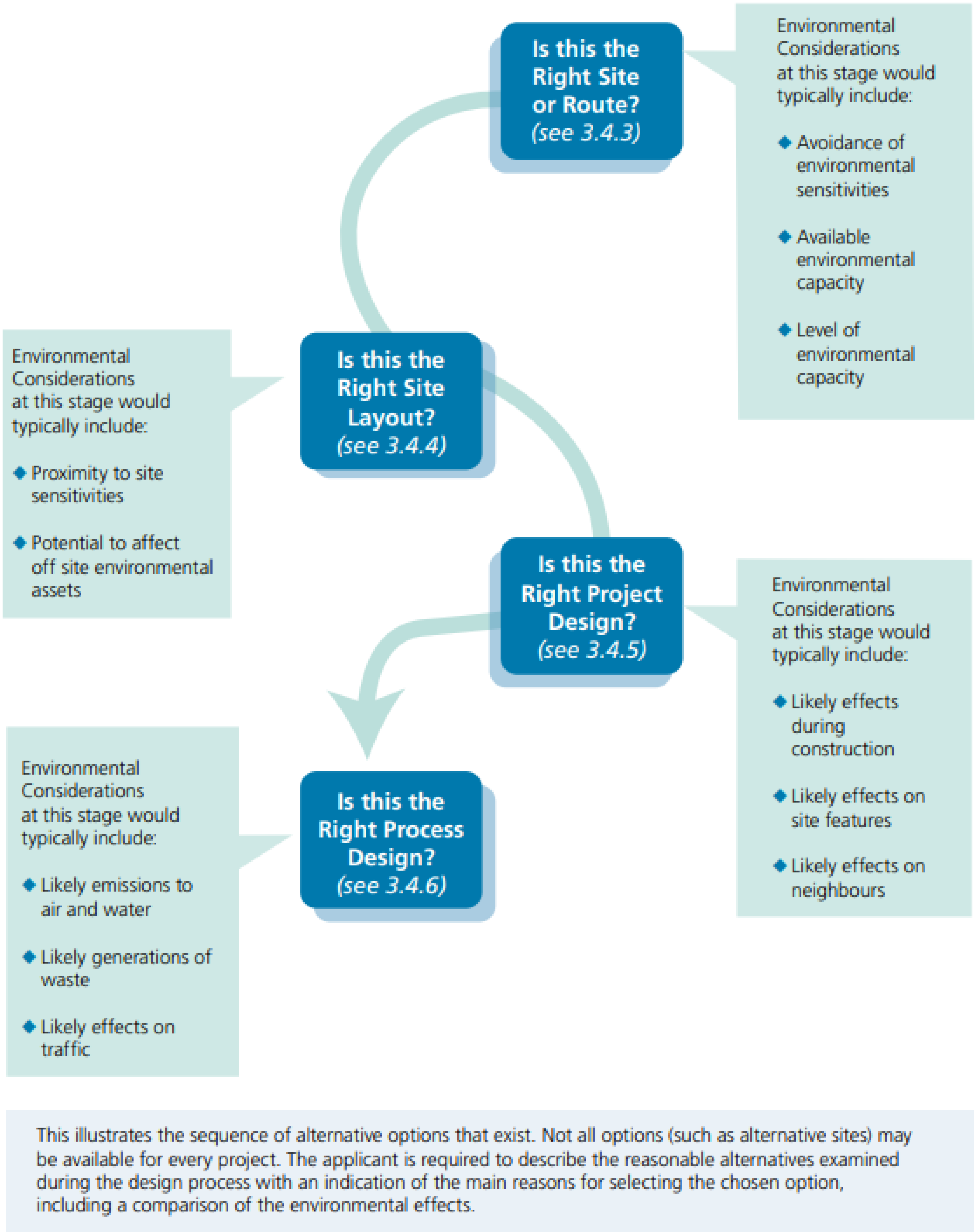


Plate 4.1: Considerations of Alternatives in an EIAR (extracted from EPA EIA Guidelines – Figure 3.3)

As outlined in Section 1.4 of this EIAR, EirGrid has a Framework for Grid Development, which provides a framework for the consideration of alternatives. This phased approach includes a comparison of potential environmental impacts, as part of multi criterial analysis. It is therefore relevant for the consideration of reasonable alternatives as required under the Article 1(d) of the Planning Regulations. EirGrid's Framework for Grid Development allows the assessment of the project need, technology type and what area is affected (Steps 1-3 of the Framework) and where the Proposed Development should be built (Step 4). This approach is consistent with the recommendations within the EPA Guidelines – ensuring that the Route, Layout, Project Design, and Process Design are fully considered and that environmental considerations are addressed.

The following sections of this chapter is presented in three parts:

- **Route Alternatives –** this section outlines how the need for the Proposed Development was established technology choice was selected (i.e., that it is an underground cable); and route options. This aligns with "Is this the Right Site or Route?" and "Is this the Right Design Process" as presented in Plate 4. 1above;
- **Design Alternatives –** this section outlines how the Proposed Development went from route options to the design presented in Chapter 5 of this EIAR and how environmental considerations fed into the selection of the design. This aligns with "Is this the Right Site Layout?" and "Is this the Right Project Design" as presented in Plate 4.1 above; and
- **Do-Nothing Alternative –** this section outlines what would occur if the Proposed development was not constructed (also called the Do Nothing Scenario). This aligns with Section 3.4.2 of the EPA EIA Guidelines.

4.3 Route Alternatives

This section sets out the route alternatives which were considered as part of the process to establish the Proposed Development.

4.3.1 Initial High-Level Route Alternatives

In Step 1, EirGrid identified the need for the Proposed Development in July 2017[10]. The Step 1 report is included in Volume 5 of this EIAR (Supporting Documents). The Need for the Proposed Development is outlined in Chapter 2 of this EIAR. However, the Step 1 report concluded the grid in this area required further development because of two drivers: increased demand in the East Coast; and Integration of generation in South and South West. The Step 1 Report also identified the issues if the grid was not developed. This is addressed in Chapter 2 of this EIAR.

In Step 2 (December 2017[11]), EirGrid compiled a shortlist of best-performing technical options (see Volume 5 of this EIAR), which went out for public consultation between November 2018 and February 2019. This included a mix of overhead line, underground cable, and upvoltage technologies. Four of those options were taken forward to Step 3 in April 2019.

4.3.2 Route Option Assessment

In Step 3 (October 2020), EirGrid re-confirmed the need for the Proposed Development and investigated and consulted on the shortlisted technology options to strengthen the electricity network between the Woodland and Dunstown substations.

To arrive at the Best Performing Option (BPO) for the Proposed Development and to conclude the Step 3 process, a Multi-Criteria Analysis was developed[12], and subsequently updated to incorporate consultation feedback and any new information received since October 2020.

The updated Multi-Criteria Analysis resulted in two options, Option 1 and Option 3B, having an equal overall combined performance across the criteria considered in the Multi-Criteria Analysis. The technical risk and deliverability challenges were used to help distinguish between the two options.

Option 1 (Upvoltaging – see Plate 4.2) was technically more straightforward but it is more difficult to deliver. This option would have required replacing or modifying part of the Gorman – Maynooth 220 kV overhead line and all of the Dunstown – Maynooth 2 220 kV overhead line. A section of overhead line would have been constructed to connect the existing overhead line into Woodland substation.

[10] https://www.eirgridgroup.com/site-files/library/EirGrid/Step-1-Needs-Report-Capital-Project-966.pdf
[11] https://www.eirgridgroup.com/site-files/library/EirGrid/Step-2-Part-A-Options-Report-Capital-Project-966.pdf and https://www.eirgridgroup.com/site-files/library/EirGrid/Step-2-Part-B-Options-Report-Capital-project-966.pdf
[12] https://www.eirgridgroup.com/site-files/library/EirGrid/Step-3-Emerging-Best-Performing-Options-Report-Kildare-Meath-Grid-Upgrade.pdf

The assessment of Option 1 in the October 2020 report (see Plate 4.3) found that the option performed well under the technical and economic criteria. As the option sought to maximise existing infrastructure with minimum new build, the impact on the environmental and socio-economic aspects were less compared with the other options which use new infrastructure. Deliverability of the option was considered to be challenging because of risks and unknown technical issues that would have to be solved during the subsequent stages of project development.

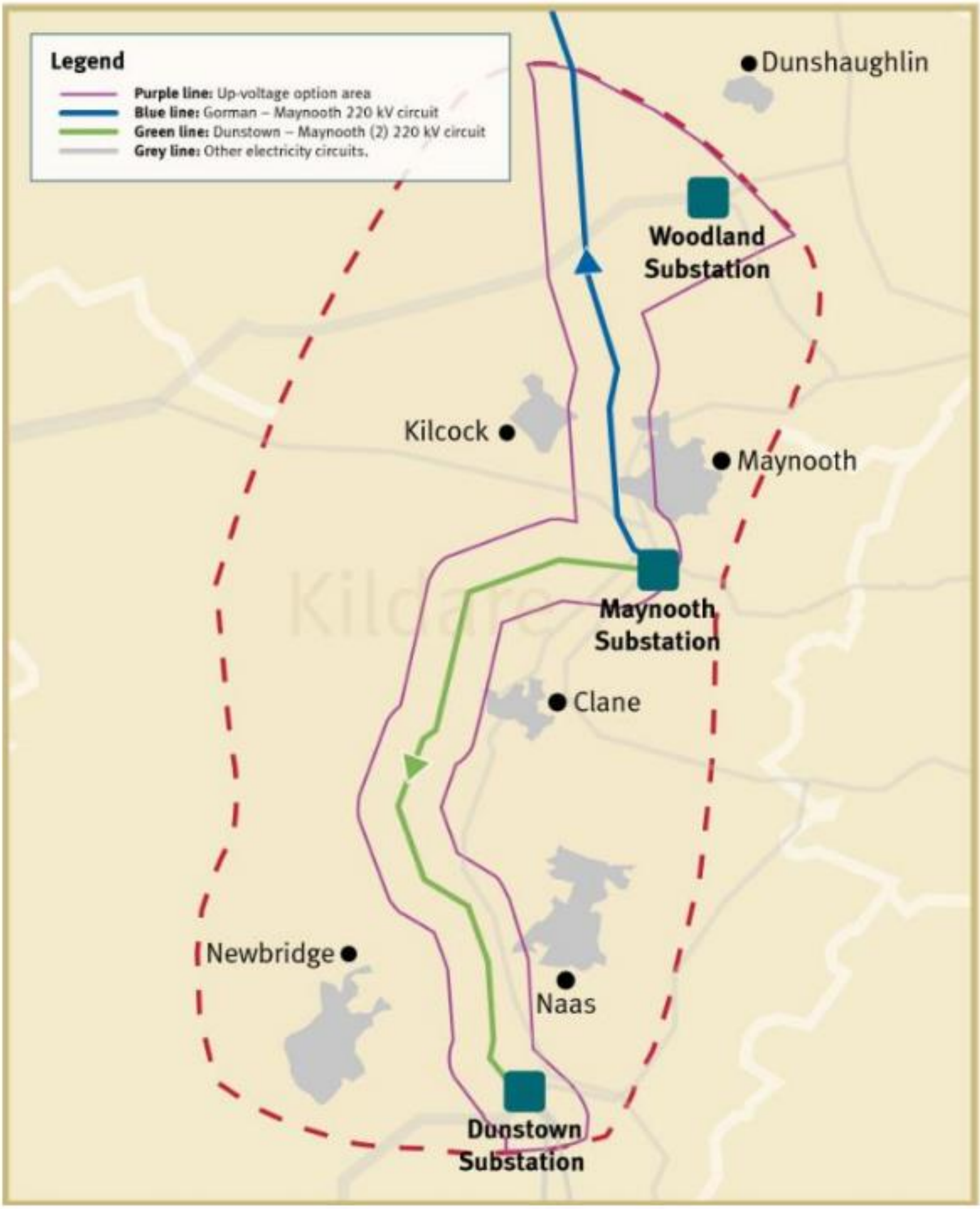


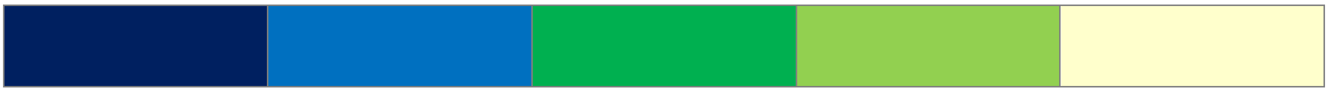
Plate 4.2: Step 3 Option 1 (Upvoltage Option) (Extracted from the October 2020 report)

	Option 1 Up-voltage 220 kV to 400 kV
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Plate 4.3: Step 3 Option 1 (Upvoltage Option) Assessment (Extracted from the October 2020 report)

Note: The Multi-Criteria Analysis (MCA) approach facilitates a balanced consideration of the technical, economic, environmental, socio-economic and deliverability aspects of a development project. The overall evaluation in MCA is based on expert judgement; this is informed by various tools such as publicly available datasets and established guidelines or other documents, as well as feedback received from public and stakeholder engagement. In this instance, the MCA also has had regard to assessment and analysis undertaken to date in respect of the Kildare-Meath Grid Upgrade project, as captured in the various reports available on the project website at www.eirgridgroup.com

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.

The key decision-making tool in the MCA approach is the performance matrix. This is a qualitative tool which uses the standard set of criteria to assess all options by means of colour coding from less constrained (yellow) to more constrained (blue). Evidence substantiating the colour coded matrix is also documented in this report. This ensures visibility and transparency in the evaluation process.

Option 3B (400 kV underground cable – this option would be later renamed Option 4 in the March 2021 report, see below for further details) was considered to be more straightforward to deliver but was considered more technically challenging to integrate onto the system. The October 2020 report did not show the location of the underground cable options as they were subject to further consideration (see Plate 4.4). However, two feasible route options for an underground cable were published as part of the assessment of the technology options for the project. These options, shown in Plate 4.5 below, were subject to a high-level assessment, and it was intended that these two route options would be subject to change as the project evolved. The routes shown were indicative and identified as part of a feasibility exercise only using the existing road network to facilitate discussion on underground cable route feasibility.

Option 3B was assessed in the October 2020 report (see Plate 4.6). Option 3B performed equally or better in all of the criteria compared with the other underground options. In terms of Deliverability and Socio-economics, challenges and risks during the construction phase were identified.

Plate 4.4: Step 3 Study Area for Underground Options (Extracted from the October 2020 report)

Plate 4.5: Step 3 Feasible Cable Options (extracted from the Step 3 Cable Feasibility Report for the Proposed Development)

Two possible cable routes are shown in red and blue. These routes were used to demonstrate the viability of the Proposed Development and were not taken forward to Step 4.

	Option 3B 400 kV UGC)
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Plate 4.6: Step 3 Option 3B (Underground Cable) Assessment (Extracted from the October 2020 report)

N.B. The legend for the colour coding is addressed in Plate 4.3 above.

The October 2020 report was published, and public participation and stakeholder engagement was undertaken for 10 weeks, lasting between October and December 2020. The feedback was fully considered in the decision-making process to select the BPO.

Ultimately, the decision between Option 1 and Option 3B came down to a fine balance. Option 1 was considered to be technically more straightforward but more difficult to deliver. Option 3B (renamed Option 4) was considered more straightforward to deliver but is more technically challenging to integrate on to the system.

In April 2021[13], EirGrid identified the 400 kV underground cable option (i.e., Option 3B) as the BPO to progress for this Proposed Development. The project then moved to 'Step 4 – Where Exactly Should We Build?'. It was concluded that Option 3B had a lower risk in terms of the delivery timeline when compared to the Option 1 and had lower impact on the existing transmission system in terms of outages and other maintenance and capital works that are routinely required on the system. Option 3B would introduce a new transmission pathway between Dunstown and Woodland stations while keeping the existing 220 kV overhead line intact. This meant that the existing 220 kV circuits between Dunstown and Woodland stations, which is essential for supplying the greater Dublin network, can remain in service during the implementation of the project. This would provide flexibility to the system operator to accommodate other outages (generation and transmission) whilst also minimising the risk to security of supply. The additional transmission pathway creates greater capacity on the network to accommodate growth.

Therefore, the Proposed Development was selected to be a 400 kV underground cable and was taken forward to Step 4.

[13] https://www.eirgridgroup.com/site-files/library/EirGrid/Kildare-Meath-Grid-Upgrade-Step-3-Best-Performing-Option-Report.pdf

4.3.2.1 Step 4A of the Framework for Grid Development

Step 4 was divided into two sub-steps:

- Step 4A Analysis of the Route Options; and
- Step 4B Best Performing Option.

The sections below provide an overview of the process undertaken at Step 4A and 4B.

4.3.3 Overview of Step 4A

The Step 4A Report was published in March 2022[14] (see Volume 5 of this EIAR) and presented an analysis of the four new proposed route options. It described the process followed to identify the four proposed route options and presented a comparative evaluation of those against a set of criteria. The Step 4A report identified what EirGrid, on the basis of information currently gathered, considered to be the Emerging Best Performing Option (EBPO) for the route of the underground cable. The Step 4A report was published and EirGrid considered all feedback arising from the report and further survey and analysis was undertaken, to confirm the BPO at Step 4B.

At the start of Step 4A, the project team re-examined the Project Study Area (please see Volume 5 of this EIAR, Step 4 Report for further details) to identify improved route options from the two feasible route options established during Step 3. The design of the proposed route options at Step 4A were based on the following routing principles:

- Avoid motorways;
- Maximise the use of national, 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.

Since the completion of the Step 4A process, the Government's Climate Action Plan 2024 has been published. As outlined in Chapter 2 of this EIAR, the Government has confirmed the use of the public road network for grid projects, like this one, as a measure to deliver the emissions ceilings. This helps to confirm that the routing principles for the project were a sound approach.

The routing principles align with EirGrid's five key assessment criteria - Environmental; Socio-economic; Technical; Economic; and Deliverability. By following the routing principles, improved route options were designed. The routing process was refined through a Route Section Assessment and an End-to-End Assessment. This process is summarised in Plate 4.7 and presented in detail in the Step 4A and 4B reports for the project.

[14] https://www.eirgridgroup.com/site-files/library/EirGrid/KMGU-JAC-TN-0017-Step-4A-Report-08-03-2022-Compressed.pdf

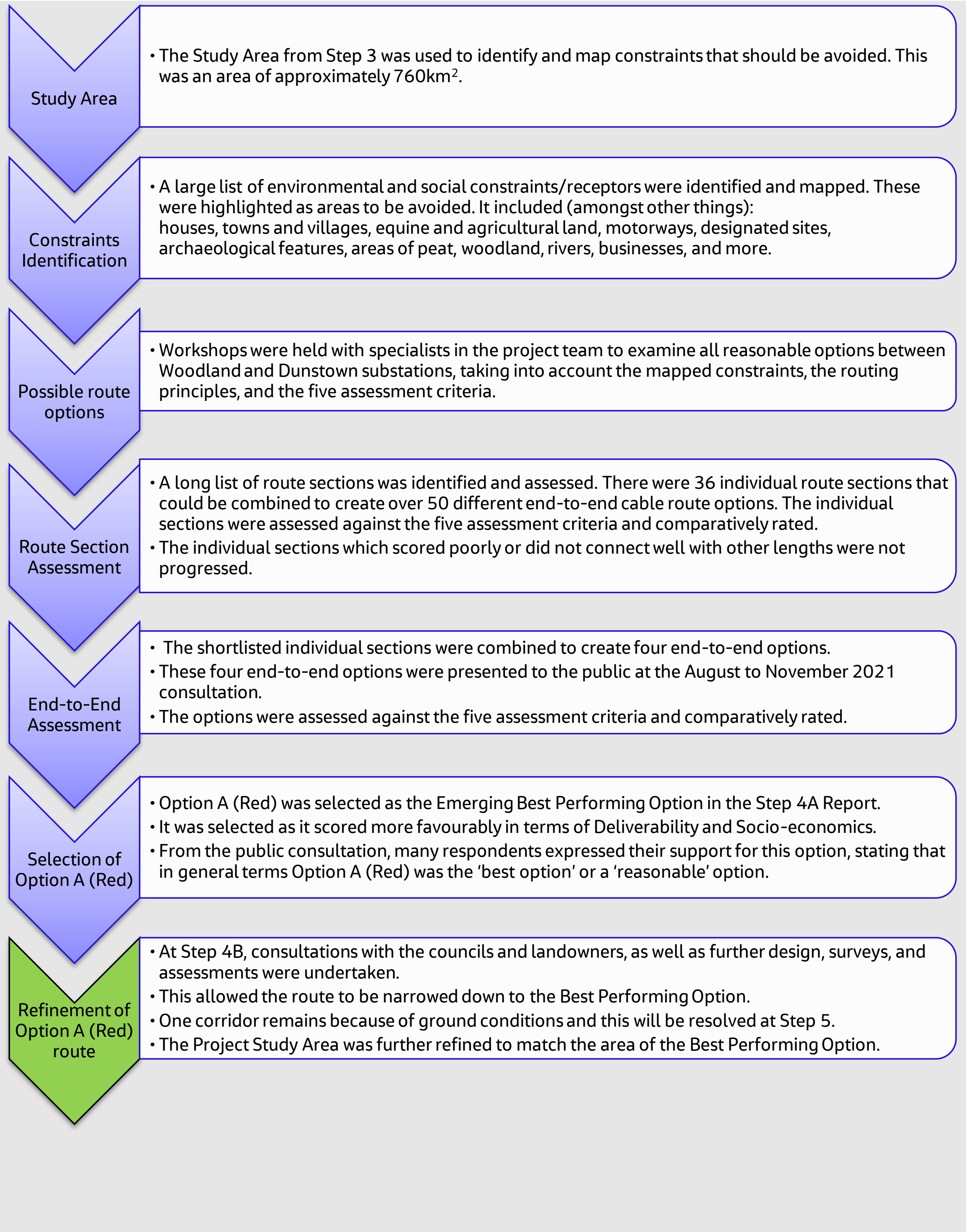


Plate 4.7: The Route Design Process for Step 4A and Step 4B

The Step 4A process culminated in four route options – as shown in Plate 4.8.

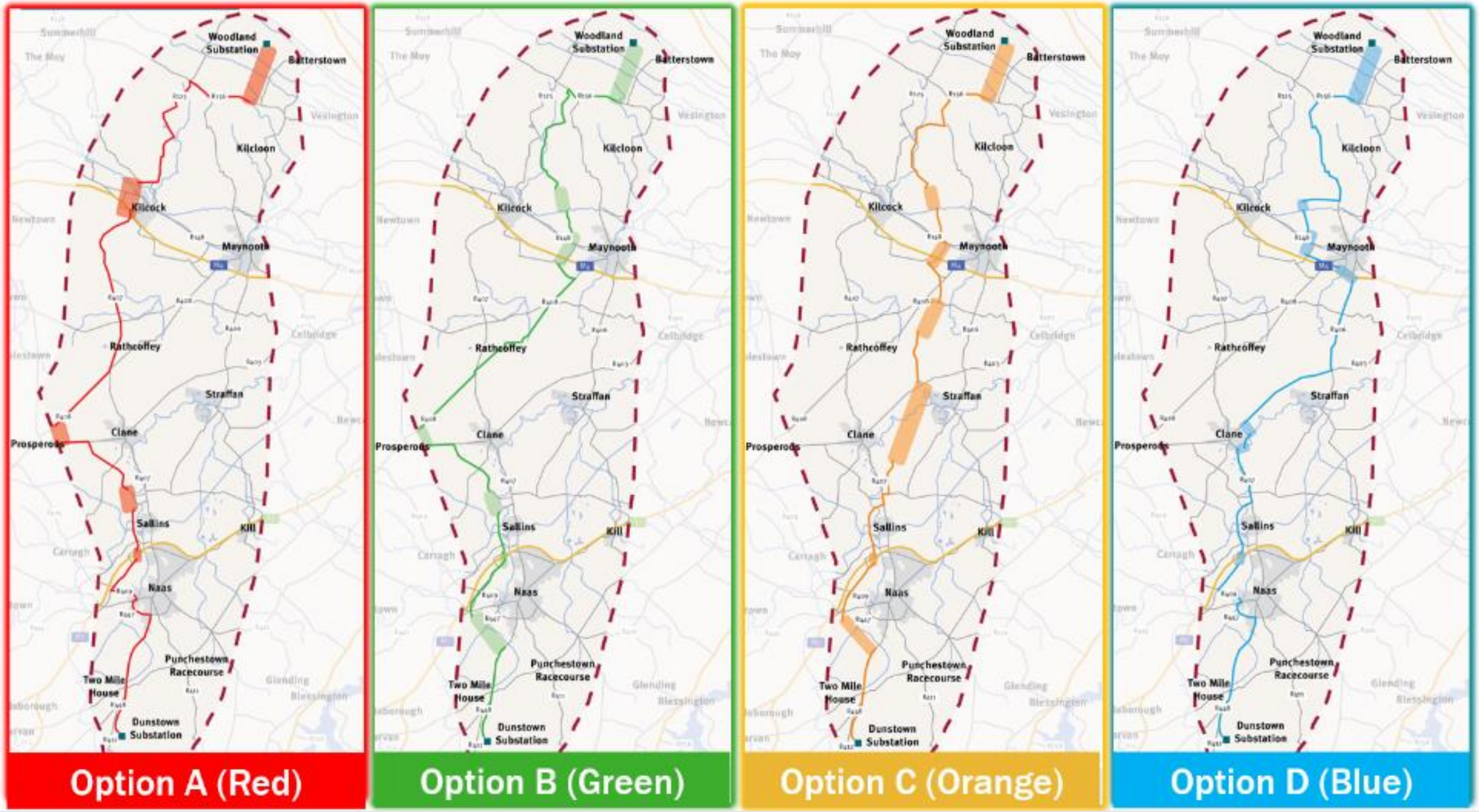


Plate 4.8: Shortlisted Options - shown in Step 4A Public Consultation (2021)

The four route options were presented for public consultation between August and November 2021.

An Engagement Summary Report, Step 4 has been prepared which outlines the consultation responses since the publication of the Step 4A report and the Emerging Best Performing Option. This report is available on the project website[15]. Table 4.1 below provides a summary of key issues raised and how the project team has considered the comments.

Table 4.1: Post Step 4A Engagement Summary (2022)

Comment	Project Team Response (provided in 2022)
Potential disruption arising from the construction of the Proposed Development, including lengthy roadworks and increased levels of traffic. The R125 should be closed because it is too narrow. The road between Mullagh and Kilcock should be closed and reinstated in better condition, meaning that the final route would have to be adjusted.	Response made in 2022: The Step 4A Report contained a multi-criteria assessment of the potential impacts at the construction phase, including traffic disruption. The construction phase impacts have been key considerations in the project to date and will be fully addressed in the Step 5 planning and environmental reports. Mitigation measures and traffic management are included in those reports, following further consultation with key stakeholders like Meath and Kildare County Councils. Update from Step 5 (current step in 2024): The Traffic Management Plan and Traffic and Transport Chapter of the EIAR have fully considered the impacts to roads and to traffic. Reinstatement measures are outlined in Chapter 5 of the EIAR and will be completed to the required standards.
Land use - that the cable route would go through private land, could damage crops, and that land used may not be returned to its original condition.	Response made in 2022: The routing principles have sought to avoid agricultural land as far as possible – roughly 15% of the total cable length is off-road (agricultural land). Agricultural liaison officers have met with the affected landowners and discussed potential impacts from the project, and they will continue to discuss the project going forward. Reinstatement will be provided to pre-construction conditions and will be agreed with the landowner during the construction phase. Update from Step 5: Reinstatement measures are outlined in Chapter 5 of the EIAR and in Chapter 15 Agronomy and Equine. The off-road section is approximately 18% of the total length of the cable.
Potential sterilisation arising from easement.	Response made in 2022: The easement will be discussed with the affected landowners to minimise impacts as far as possible.

[15] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

Comment	Project Team Response (provided in 2022)
	Update from Step 5: Extensive discussions have been held between the Agricultural Liaison Officers and the affected landowners and their feedback has been incorporated in the design.
Overhanging trees on the 'Red Road'; and that realigning the road could have potential adverse impacts on the Rath (in the area of the Red Road). The Red Road should be reinstated following completion of the project.	Response made in 2022: The Red Road will be avoided following routing at Step 4B. Update from Step 5: This has been incorporated into the Proposed Development.
Details requested with EirGrid's ecologist on planting.	Response made in 2022: Contacts are available and EirGrid is happy for any such discussions.
Potential impact to the 'North-South' Interconnector.	Response made in 2022: The Kildare Meath project does not cross the proposed North-South Interconnector and so there will be no impacts. Both are important projects for Ireland's electrical grid.
Cycling routes are considered during construction.	Response made in 2022: Provision will be allowed for cyclists in the construction traffic management. Mitigation measures and traffic management will be included in the Step 5 reports, following further consultation with key stakeholders like Meath and Kildare County Councils. Update from Step 5: The Traffic Management Plan, Traffic and Transport Chapter, and Material Assets Chapters of the EIAR have fully considered the impacts to cyclists.
Compensation is supplied for sterilisation from easement, per linear metre across farmland, and for crop loss and damages. That there should be arrangements to facilitate dairy farming, including milk and silage production.	Response made in 2022: Agricultural liaison officers have met with the affected landowners and discussed potential impacts from the project, and they will continue to discuss the project going forward.
More detailed maps should be provided so that residents can identify the proximity of the route in relation to their properties.	Response made in 2022: More detailed maps have been provided on the project website and in the Step 4B Report.
If the road is to be dug up, other utilities such as cables should also be placed underground.	Response made in 2022: EirGrid is consulting with key stakeholders like Meath and Kildare County Councils and utilities providers. Update from Step 5: Consultation complete is outlined in Chapter 3 of this EIAR.

Comment	Project Team Response (provided in 2022)
The route may run through their land and farms or be in close proximity to their residence.	Response made in 2022: Agricultural liaison officers have met with the affected landowners and discussed potential impacts from the project, and they will continue to discuss the project going forward. The cable route has tried to maximise the distance from all residential properties in line with the routing principles.

Option A (Red) was selected as the Emerging Best Performing Option as it scored more favourably in terms of Deliverability compared to the other options. Option A (Red) generally scored more favourably in four of the Deliverability topics compared to the other options – Design Complexity; Dependence on Other Projects; Permits and Wayleaves; and Implementation Timelines. Option A (Red) did score more highly than Options B and D and was equal to Option C for Traffic Disturbance because it has the most in-road sections and potentially impacts more regional roads than the other options, which will increase traffic disturbance. While the potential traffic impacts will be temporary and restricted to the construction phase, in order to minimise the disturbance, traffic surveys will be undertaken to confirm this assumption. Other survey and design work will be completed to confirm the assumptions made on the required working area. In addition, localised route changes could be designed and assessed to minimise potential impacts further. Consultation will be undertaken with Meath and Kildare County Councils and other key stakeholders (such as Transport Infrastructure Ireland) to agree the approach to traffic management and avoid or reduce the potential impacts.

Option A (Red) also had less Socio-economic (community) impacts compared to other options. This is reinforced by the feedback received from respondents during the consultation period. Option A (Red) impacted the least amount of agricultural land and avoided concerns that the other options would have resulted in, such as potential impacts to the settlement of Rathcoffey, and Ovidstown along the R403 and R406; and greater potential impacts to areas of amenity, such as Alexandra Bridge, near to Clane.

4.3.4 Inclusion of Environmental Considerations

The preceding text (Section 4.3.1 and 4.3.2) outlines how the Route Alternatives were considered for the Proposed Development. EirGrid's Framework for Grid Development was the key tool in taking a phased approach to the consideration of reasonable alternatives. Steps 1 and 2 were largely technical in nature and established the need for the Proposed Development. Step 3 ("What's the Best Option and What Area May be Affected?") took into account environmental considerations by assessing environment considerations as part of the multi-criteria analysis of the technology options. This assessment included a range of environmental and socio-economic factors and the details are provided in the Step 3 Reports included in Volume 5 of this EIAR. Each option was assessed against the following topics: Biodiversity; Soils and Water; Planning Policy and Land Use; Landscape and Views; Cultural Heritage; Amenity and Health; Local Economy; Traffic and Transport; and Utilities.

Section 4.3.2.1 of this chapter summarises the assessment of the technology options and identifies that while an underground cable (Step 3 Option 3B) was assessed to have greater environmental and socio-economic effects than an overhead line. However, the options were finely balanced and it was determined that the option of an underground cable was preferred on balance of all factors.

By assessing the technology options against Environmental and Socio-Economic criteria, the wider environmental considerations were identified and informed the decision that the Proposed development should be an underground cable.

In Step 4A of EirGrid's Framework for Grid Development, route options for the underground cable were identified and assessed. Section 4.3.2 of this chapter outlines that environmental considerations were identified and mapped and this, along with the Routing Principles, allowed key environmental and socio-economic receptors to be avoided through careful routing. Where receptors could not be avoided, an assessment was undertaken of the possible route sections. Those routes with larger environmental effects were not taken forward. Four route options were included in the Public Consultation of 2021. This allowed feedback from the public and statutory bodies on the route options to help decide which option should be taken forward. Option A (Red) was selected as it scored more favourably in terms of Deliverability and Socio-economics. Further details are provided in the Step 4A report contained in Volume 5 of this EIAR.

4.4 Design Alternatives

4.4.1 Development of the Best Performing Option - Overview of Step 4B

The Step 4B report was published in June 2022[16]. At Step 4B, the BPO (Option A (Red)) was re-examined to refine the route as far as possible to remove any wider areas (corridors) and to provide more certainty on the specific location. There were five wider areas shown because these were off-road sections and further discussions were required with the affected landowners. For example, the section of the cable route between Woodland substation and the R156 (chainage 0 – 3250) was modified from in-road along the Red Road to off-road along agricultural land. Consultations with affected landowners on both sections (along with technical considerations) determined that the cable route would be improved by being off-road in this section. Another example was in the Kilcock area (chainage 15000 – 15350), feedback from the landowner resulted in the cable route following the hedgerow along the R158. This was requested to minimise impact to the agricultural field and because the land is zoned for future development.

In addition, further surveys and design were needed 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. However, the Step 4B process identified several areas where changes would result in an improved route.

In Step 4B, Option A (Red) was re-examined to refine the route as far as possible to remove any wider areas (corridors) and to provide more certainty on the specific location. The five wider areas shown at Step 4A were shown in this way as these were off-road sections and further discussions were required with the affected landowners. Further surveys and design were needed to determine the best location for the cable route within these wider areas.

These changes are presented in Table 4.2 and Table 4.3 below. The changes were made for a number of reasons, such as reducing potential environmental impacts, reducing road closures, or avoiding private lands. As a result, 2.9% of the route (1.5 km out of 51.4 km[17]) was moved from the route shown at Step 4A. The maximum movement of the cable route was 240 m – this occurred on the approach to Dunstown substation where the route moved 240 m west from the location shown in Step 4A.

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 multi-disciplinary team, along with input from the stakeholders, landowners and the community ensured that the BPO would be selected through a consideration of all relevant issues.

Consultations were held with 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. Further surveys and assessment were undertaken to determine how the route could

[16] http://www.eirgridgroup.com/site-files/library/EirGrid/KMGU-JAC-TN-0048-STEP-4B-Final.pdf
[17] At Step 4A, the cable route length was 51.4 km.

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 90° turns) have been factored into the routing. This process also included the technical assessment of the roads affected by the cable, for example, stone arch bridges in the existing roads may not be suitable for the digging of a cable trench. This is because the depths of the bridges below the roads are generally quite shallow. In these cases, off-road crossings adjacent to the bridges were assessed to be the best solution, subject to the crossing methods including site-specific environmental mitigation.

Environmental and social considerations were addressed through aerial mapping, consultation with statutory bodies, field surveys, along with input from the landowners and the community, and discussions as a project team. This process allowed for the consideration of all factors and for the project team to discuss potential routing options for the cable route.

The Project Study Area at Step 4A was roughly 340 km^2 – 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 Step 4B Project Study Area is shown in Plate 4.9. It covered an area of 137 km^2 – a reduction from the Step 4A area of approximately 60%. These refinements have allowed community engagement to be focused to the relevant area of the route. This Study Area as shown in Plate 4.9 has been used for Step 5.

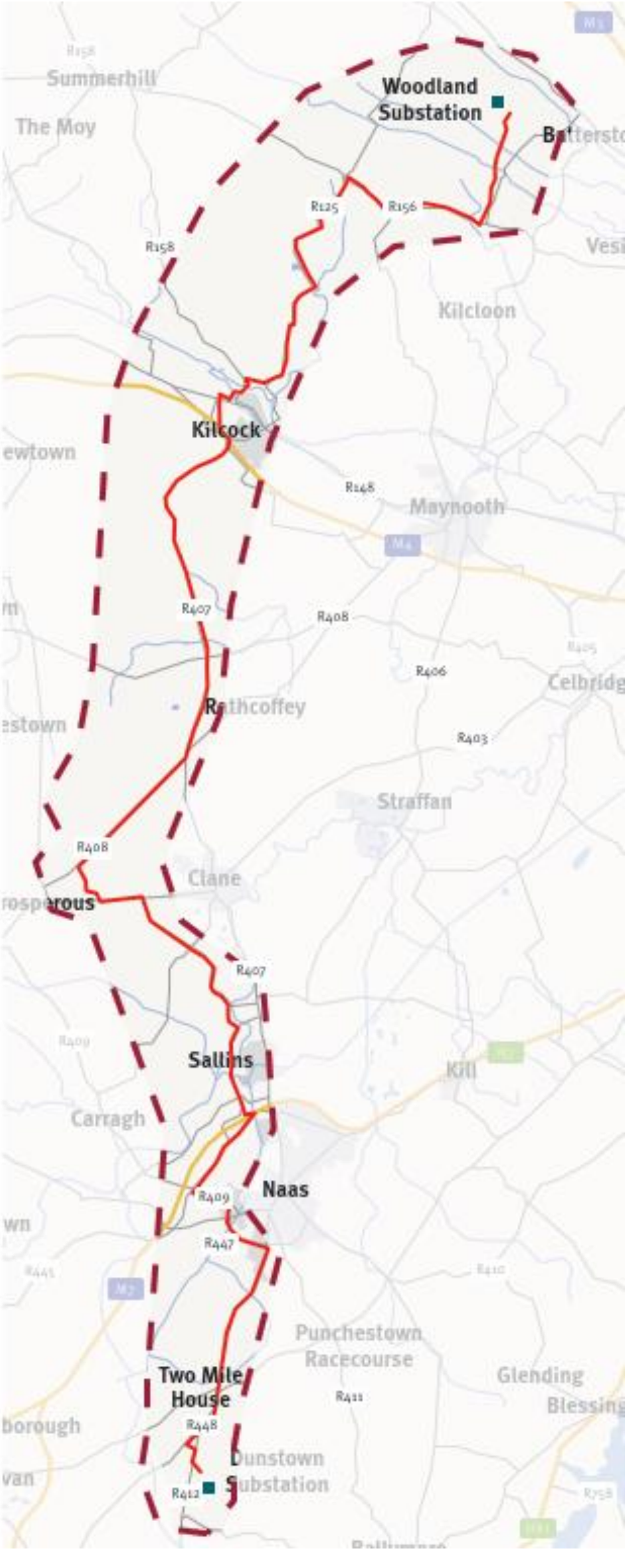
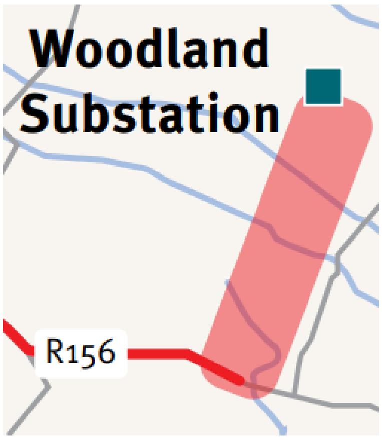


Plate 4.9: Step 4B Project Study Area

The work that was undertaken by the project team at Step 4B allowed the refinement of the Emerging Best Performing Option that was presented at Step 4A. Option A (Red), as shown as Step 4A, had five wider areas and these are shown in Plate 4.8. It was necessary to show these wider areas as further design, assessment and consultation were required. In Step 4B, only one wider area remained – the crossing point of the Grand Canal in Naas. Consultations with local stakeholders revealed that the area to the south of the canal is soft ground and was described as challenging in terms of ground conditions. Geological data from Geological Survey Ireland[18] have been reviewed and no recorded significant constraints to construction in this area were identified. However, it was determined by the project team that it would be prudent to undertake further surveys at this location before identifying the crossing type. Ground investigations have since been completed in this area and have not identified any challenges to the construction of the cable route in this area. A summary of the key changes at Step 4B are presented in Table 4.2 and Table 4.3.

Table 4.2: Changes to Step 4A Wider areas

Step 4A Wider Areas	Step 4B Route	Reason for the Change at Step 4B (Best Performing Option)
 **Woodland Substation to R156**		This is an off-road section approximately 3 km in length through agricultural land. The use of the local roads in this area were ruled out because of two stone arch road bridges on the Red Road. These bridges are too shallow for a trench to be dug into them.
 **West of Kilcock**		The route in this area is a mixture of an in-road along the R158 and R148, an off-road crossing under the Rye Water, and crossing under the canal, railway, and the M4. From Commons South, the route travels to the south on the R407.

[18] https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

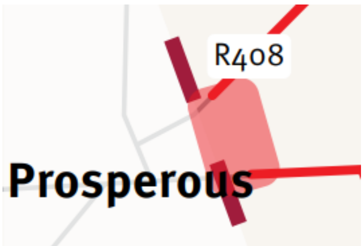
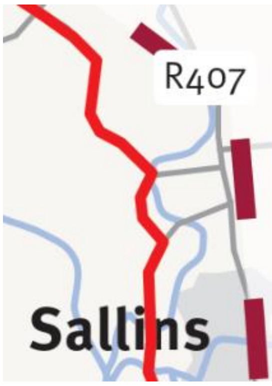
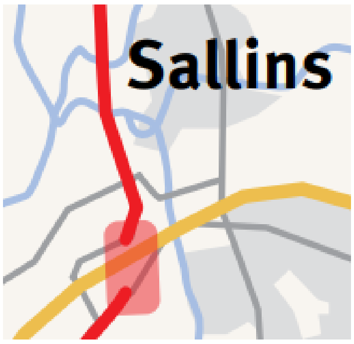
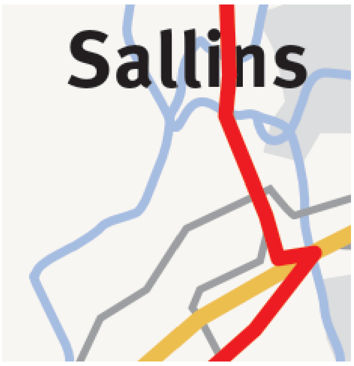
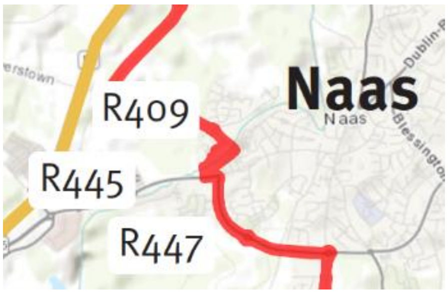
Step 4A Wider Areas	Step 4B Route	Reason for the Change at Step 4B (Best Performing Option)
 **East of Prosperous**		This is an off-road section approximately 1.1 km in length through agricultural land. The section passes slightly to the west of the Study Area previously shown by approximately 220 m. This decision was made in order to shorten the length of the cable route and to minimise potential impacts to landowners, hedgerows (through fewer hedge breaks), and agricultural land.
 **North of Sallins**		This section is a mixture of in-road sections and off-road crossing through agricultural land. It will also pass close to the River Liffey, and the design will help avoid impacts to the landscape and ecology.
 **Crossing of the M7**		This section is a mixture of in-road and off-road sections. The route comes off the Sallins Bypass and crosses over agricultural land. The route crosses under the M7 in the existing underpass (Osberstown Road). The route then connects to the R407 (Millennium Parkway).

Table 4.3: Route Changes from Step 4A

Additional Areas of Changes	Reason for the Change at Step 4B
 **Grand Canal Crossing in Naas**	This was a new wider area at Step 4B. A wider area was included in this section because further surveys on ground conditions are needed before the route can be finalised*. The Naas Sports Centre and adjacent residential properties will be avoided. The canal could be crossed along the R409 (New Caragh Road) or with a crossing under the canal.
 **Approach to Dunstown Substation**	This was a change from the route shown at Step 4A. The route was changed in this section to avoid a road bridge which is too shallow for the cable trench. The cable will now travel southwest along the R448 for a greater length, before turning east to connect with the R412. This change reduces potential environmental and social impacts.

*These have since been completed as part of the environmental assessment of the Proposed Development

These changes increased the length of the cable route from 51.4 km to 52.6 km – an increase of 1.2 km. Within this 52.6 km, there was also an increase of off-road length, from 6 km to 7.9 km.

This increase in off-road length was largely due to the changes at the Woodland substation, where the cable route is now off-road. This was because local roads in the area were considered unsuitable due to two road bridges, which do not have sufficient depth for the cable trench. The increase in the overall length will increase the cost of the project. However, it was concluded that these route refinements were minor and did not change the assessment of Option A (Red) as presented in the Step 4A Report.

It was concluded by the project team that Option A (Red) remained the Emerging BPO and that the route shown in the Step 4B Report was the BPO.

4.4.2 Amendments to the Best Performing Option at Step 5

In the Step 4B report, it was identified that further design, survey, assessment, and consultation would be undertaken at Step 5 and refinements to the BPO would be possible; and these refinements have been completed for the Proposed Development. This process is normal practice for infrastructure projects and allowed for further engagement with landowners to be taken into consideration and for the results of additional surveys and design work to be incorporated into the Proposed Development.

The changes between Step 4B and Step 5 are identified below.

4.4.2.1 Mullagh Crossroads

In the townland of Mullagh, north of Kilcock, approximately 7.5 km along the cable route from Woodland substation, the R156 road curves around in a horseshoe bend to connect with the Mullagh Crossroads. In line with the Step 4A routing principles, the use of the road for the cable route was preferred to the use of agricultural land. The cable route at Step 4A and 4B followed the road around the horseshoe bend. At Step 5, ecology surveys identified mature trees at the roadside with bat roosts at the northern end of the bend. This and a more detailed consideration of the construction of the cable around this bend led to a change in the cable route. It was determined that the cable route should be amended to cut out the bend in the road and to move across agricultural land. This change is shown in Plate 4.10 below. The change reduced the length of the cable route by approximately 307 m but increased the amount of agricultural land affected. It is considered that this change improved the BPO by avoiding proximity to bat roosts; reducing the length of the cable; and improving the construction challenges of laying the cable around a bend in the road.

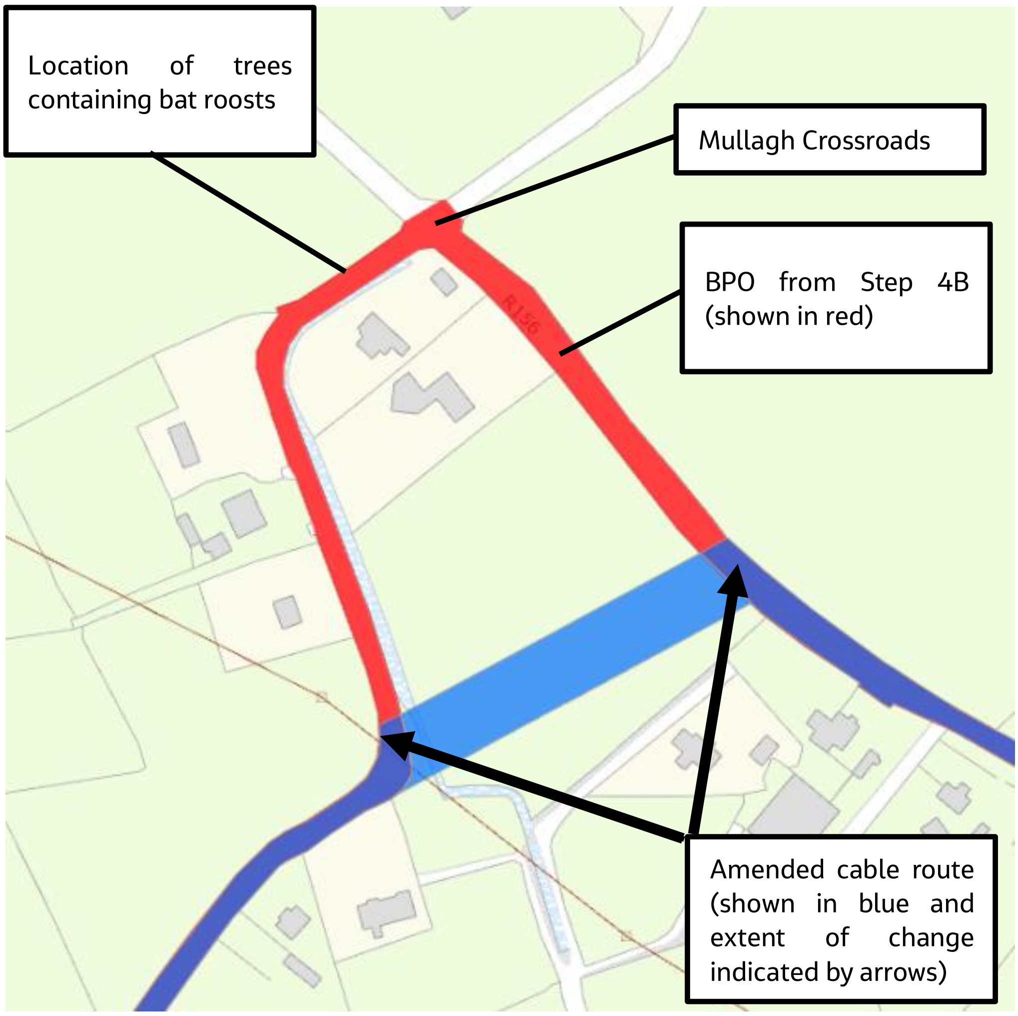


Plate 4.10: Step 5 Mullagh Crossroads Amendment

4.4.2.2 Baltracey

In the townland of Baltracey, south of Kilcock, approximately 22 km along the cable route from Woodland substation, the R407 crosses over a small watercourse with a stone bridge. The watercourse has been labelled as Lyreen tributary of the River Liffey_010 by the Environmental Protection Agency (EPA). It has been given the label WB20 in the Biodiversity chapter of this EIAR. At Step 5, it was determined that the existing bridge was unsuitable for an in-road crossing. This was because of the shallow depth of the road over the bridge. Other crossing types were considered for this location. These included:

- an in-road Horizontal Directional Drilling (HDD) crossing – this was ruled out because of the construction area that would have been required on the R407, resulting in significant impacts to the users of the road;
- a diversion off-road adjacent to the bridge – this was ruled out because of the residential properties adjacent to the bridge. A longer off-road diversion around the properties was also ruled out because of the additional length of cable that would have been required to avoid properties either side of the R407;
- an off-road HDD crossing – this was chosen as the preferred crossing type as it allowed the properties to be avoided and the disruption to the R407 at this location to be avoided. It was determined that a diagonal HDD under the bridge would be the optimal crossing type. This is shown in Plate 4.11 below.

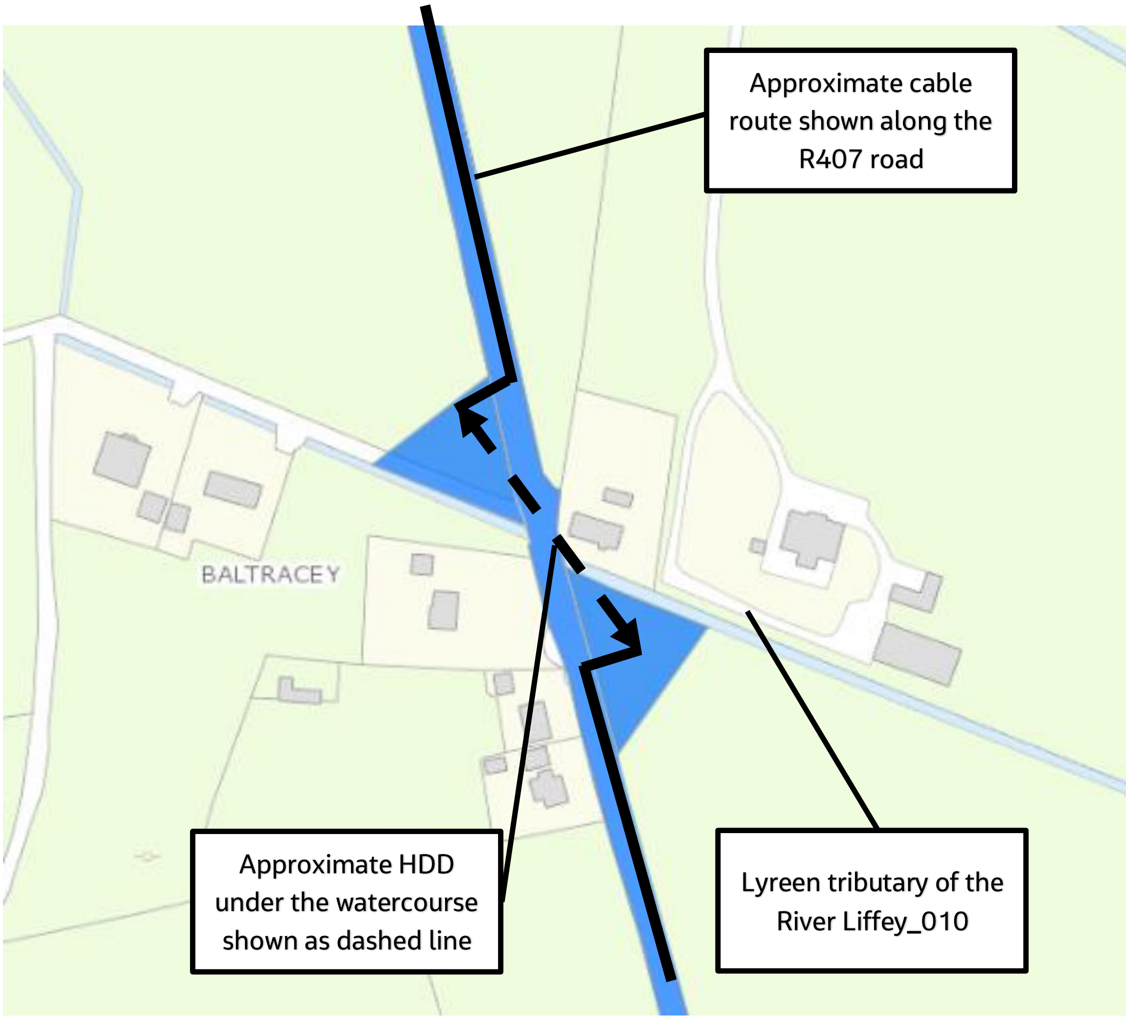


Plate 4.11: Step 5 Baltracey Amendment

4.4.2.3 Millicent Area

In the Millicent area, northwest of Sallins, approximately 37 km along the cable route from Woodland substation, the BPO at Step 4B was proposed to travel along the western bank of the River Liffey. At Step 5, this was reassessed following discussion with landowners. Concerns were raised about the cable route passing through the gardens of two residential properties. In addition, ecology surveys completed in Step 5 identified the presence of a number of protected species along the western bank of the River Liffey. Alternatives to the BPOs were considered and are shown in Plate 4.12 below.

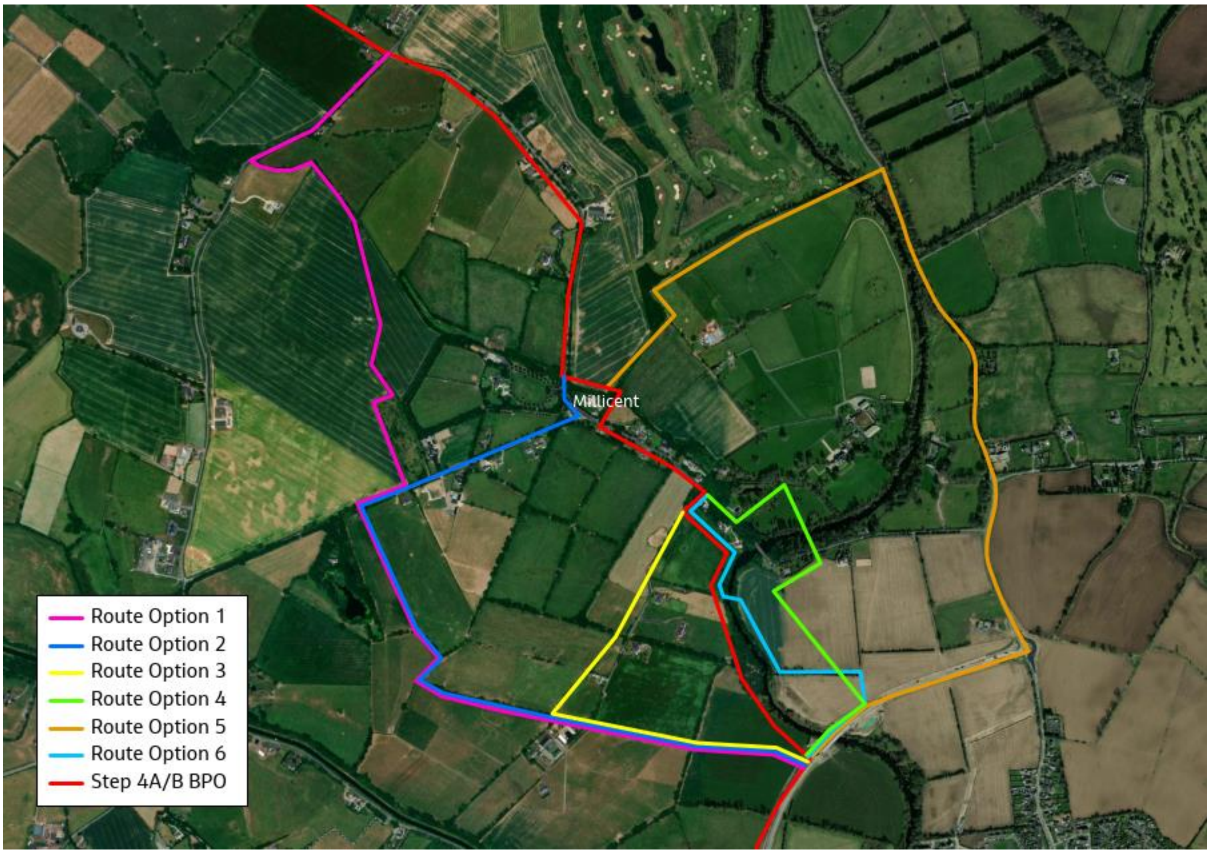


Plate 4.12: Millicent Amendments Considered at Step 5

It should be noted that other Route Options have been previously considered in this area through Step 4. Route Options to the west and east of the Route Options identified above were assessed and ruled out. Route Options to the west of Millicent were ruled out because of the length of the route, the number of landowners affected, lack of suitable roads, and the number of hedgerows and treelines affected (please see the Step 4A Report[19] for the Proposed Development – Chapter 3). Route Options to the east included Route Options C and D in the Step 4A Report (please see Chapters 6 and 7), which were ruled out.

The area around Millicent generally consists of narrow roads lined with mature trees, making both routing of the cable and siting of joint bays challenging. There are a number of residential properties in the area which could be impacted during construction. Along Millicent Road there is an old stone bridge over the River Liffey, which has a very shallow bridge deck and would not be able to accommodate a cable. It would also be difficult to cross adjacent to the bridge as there are residential properties on both sides of the river to the west of the bridge, and there is woodland to the

[19] https://www.eirgridgroup.com/site-files/library/EirGrid/KMGU-JAC-TN-0017-Step-4A-Report-08-03-2022-Compressed.pdf

east of the bridge which would need to be cut to facilitate the works. From a biodiversity and habitats point of view, this would have increased potential impacts when other Route Options exist.

To the northeast of the bridge, Millicent House is located, with its landscaped gardens. Millicent Demesne was described in the Step 4A Report as:

> *'The Garden and Designed Landscape to Millicent House. The extensive riverside demesne lands surrounding the principal house (RPS B14-26) include extant estate features such as lodges (including AH_15), a walled garden, drives, and areas of woodland and parkland depicted on historic mapping (Ordnance Survey 6", 1837 – 1842; Ordnance Survey 25", 1888 - 1913). Sections of rubble stone wall delimit the demesne and line the road from the entrance to Millicent Bridge.'*

In addition, directly north of Millicent there is a private airfield, and to the northeast of Millicent there is a golf course. These constraints, and those previously mentioned, are shown in Plate 4.13.

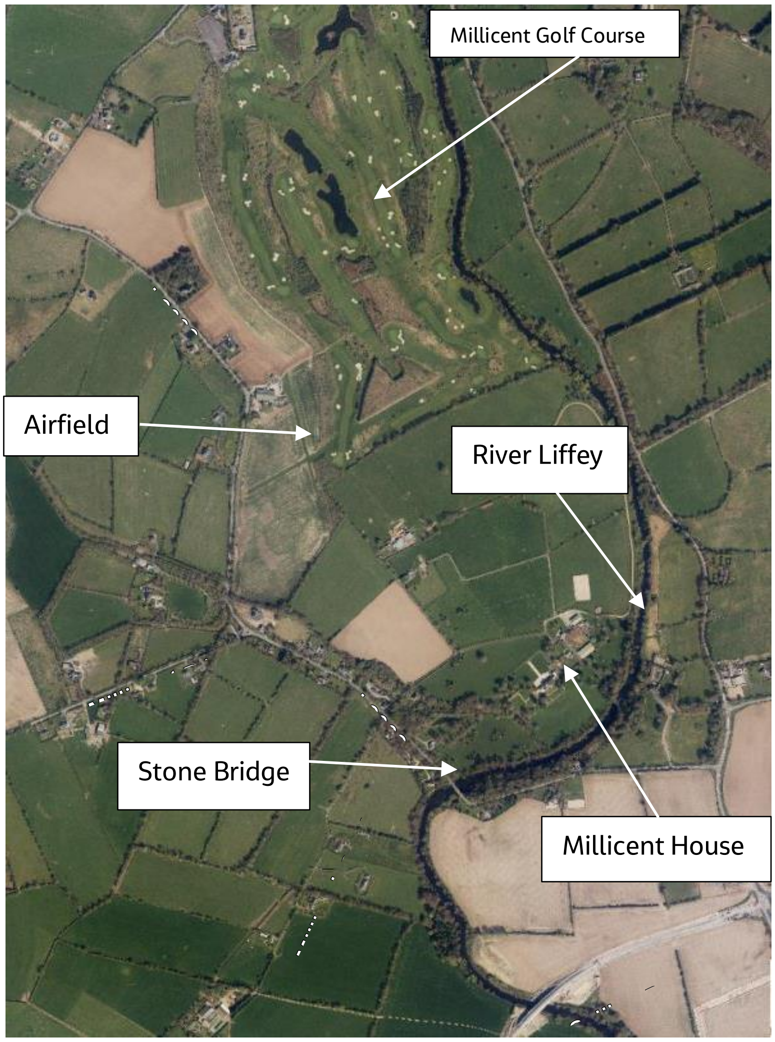


Plate 4.13: Key Constraints in the Millicent Area

Table 4.4 outlines the key measurements of each of the Route Options considered.

Table 4.4: Approximate Route Option Lengths

Route Option	Length	Length in Public Roads	Length in Fields	Net Change from Best Performing Option (BPO)
1	3,650 m	650 m	3,000 m	+810 m
2	2,520 m	820 m	1,700 m	+920 m
3	1,450 m	200 m	1,250 m	+560 m
4	1,330 m	330 m	1,000 m	+380 m
5	3,300 m	2,200 m	1,100 m	+1,860 m
6	1,240 m	230 m	1,010 m	+290 m

Please note that the net change is comparing the departure points of the Route Options from the BPO as shown in Plate 4.12.

Each of the proposed Route Options shown in Plate 4.12 will have effects in terms of each of EirGrid assessment criteria: Economy, Technical, Environment, Socio-economics (including landowners), and Deliverability. These issues have been considered and the preferred route option identified. Having regard to the preceding text, a performance matrix illustrating the evaluation set out above is provided in Table 4.5.

Table 4.5: Evaluation Performance Matrix

Route Option	1	2	3	4	5	6
Economic						
Technical						
Environmental						
Socio-economic						
Deliverability						

Route Option 6 is the shortest of the six assessed route options, which results in the option performing better in terms of the Economy, Technical, and Deliverability criteria. The shorter length also generally decreases the potential Environment and Socio-economics effects.

As the shortest of the assessed route options, Route Option 6 is also the most similar to the BPO – it has the smallest net change in route length. In addition, it is in a similar location to the BPO on the opposite bank of the River Liffey. Comparatively, Route Options 1, 2, and 5 are located much further away from the BPO. This larger divergence and increased length results in Route Options 1, 2, and 5 not performing as well as Route Option 6 in terms of Economy, Technical, and Deliverability criteria.

Route Option 6 avoids potential direct impacts to Millicent Demesne as compared to Route Option 4, which would have trenched through the designed gardens and may have had an increased impact on mature trees in the demesne.

Route Option 6 is also preferred to Route Option 3 because of its shorter length and decreased net change.

Overall, it is considered that Route Option 6 is preferred to the BPO and the assessed Route Options as shown in Plate 4.12.

In order to enter the Sallins Bypass, Route Option 6 moves to the east away from the River Liffey. The amendment to the cable route increased the length by approximately 200 m. This was required to allow the cable route to enter the R407 Sallins Bypass road at a suitable location. A location closer to the River Liffey is not possible as the road is elevated to cross the river. A location further to the east where the road is closer to the adjacent ground levels is more suitable for construction purposes.

It is considered that this change improved the BPO by avoiding impact to residential properties and their gardens and to protected species.

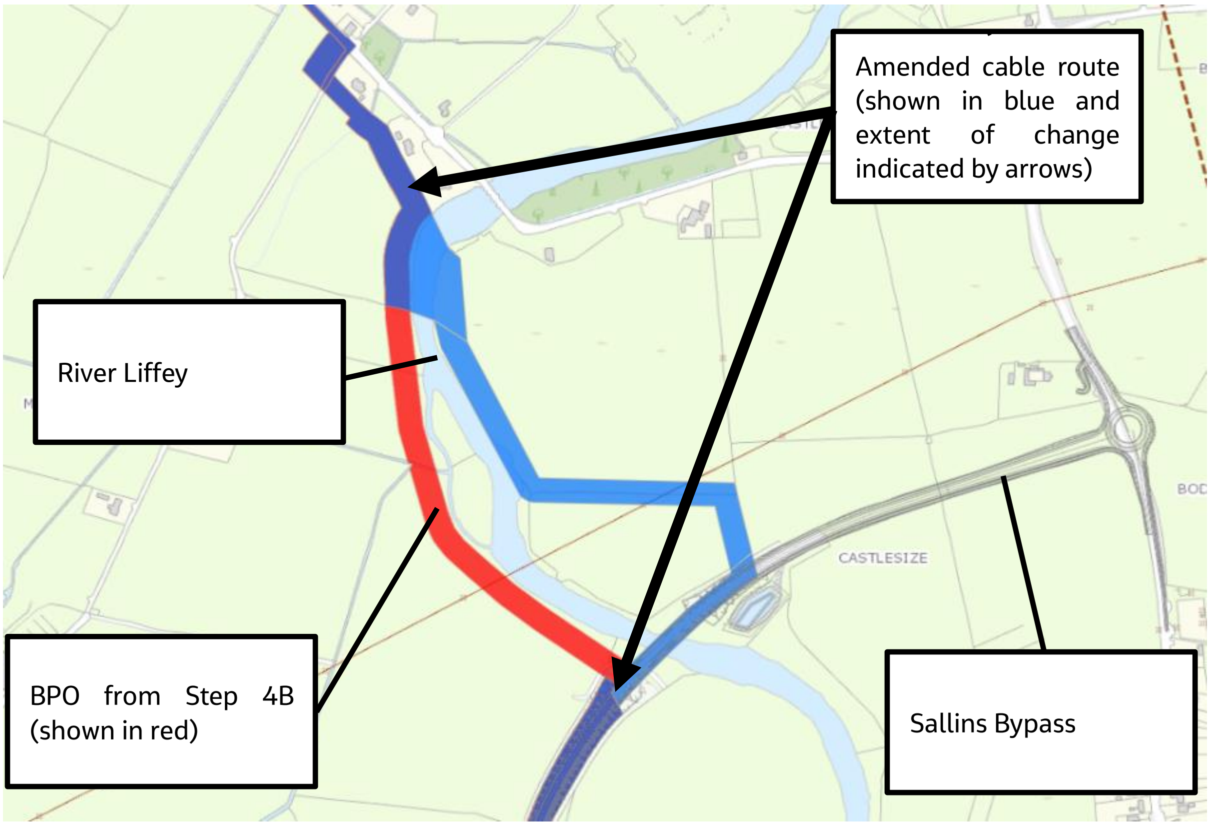


Plate 4.14: Selected Step 5 Millicent Amendment

4.4.3 Inclusion of Environmental Considerations

The preceding text (Section 4.4.1 and 4.4.2) outlines how the Design Alternatives were considered for the Proposed Development. The refinement of the design at Step 4B and Step 5 was driven by environmental surveys and assessment, as well as feedback from the public and statutory bodies. Environmental considerations such as protected species, hedgerows, impacts to landowners and agricultural land, help to refine the design. Additional consideration such as ground conditions and technical considerations (e.g. road width) also refined the design but where this occurred, the environmental considerations of changes were fully considered.

4.5 Do-Nothing Alternative

The 'Do-Nothing' alternative/scenario would mean the Proposed Development is not constructed and the existing network is maintained in line with normal practice. There are two aspects to the Do-Nothing alternative – the technical aspects of the electrical network; and the evolution of the baseline environment in the absence of the Proposed Development. The technical aspects are largely within EirGrid's control and are outlined below in this section. The evolution of the baseline environment is more difficult to predict as it will depend on the actions of third parties and events outside of EirGrid's control. The evolution of the baseline environment is separately addressed in Section 5.6.3, Chapter 5 of this EIAR. The assessment of the Do Nothing Alternative below is based on the available information and professional judgment.

In 2019 the Irish Government published its first Climate Action Plan[20] setting out the Irish State's climate objectives including to achieve at least 70% of electricity from renewables by 2030. This figure has since increased with the government now expecting up to 80% of electricity to come from renewables by 2030. The enactment of the Climate Action and Low Carbon Development (Amendment) Act 2021 has now put Ireland on a legally binding path to net zero emissions no later than 2050. Should the Proposed Development not proceed then it is likely to affect the ability to achieve climate action targets, through the lack of continued integration of renewable generation into the grid. Technically, the 'Do-Nothing' scenario could result in EirGrid failing to adhere to their legal obligation under the European Communities (Internal Market in Electricity) Regulations 2000 (S.I. No. 445 of 2000) and compliance with the TSSPS. To ensure transmission system reliability and security, the performance of the network is compared with the requirements of the Transmission System Security and Planning Standards (TSSPS), which are available at www.eirgridgroup.com.

The system analysis indicates that the network is experiencing significant challenges to the compliance with the TSSPS. The challenges occur for the unplanned loss of any of the existing 400 kV circuits between Moneypoint 400 kV station in the West and Dunstown 400 kV in County Kildare and Woodland 400 kV station in County Meath in the East.

The challenges observed can be further divided into three technical issues:

- Thermal overloads for unplanned losses of any of the 400 kV circuits between the west coast and the east coast. The following circuits are overloaded: Maynooth – Woodland 220 kV, Dunstown – Maynooth 220 kV, Maynooth – Ryebrook 110 kV, Killonan – Shannonbridge 220 kV, Maynooth – Shannonbridge 220 kV, Cashla – Prospect 220 kV and Bracklone – Portlaoise 110 kV. These circuits are also overloaded for maintenance trip combinations despite remedial action using generation dispatch of 400 MW;
- Voltage collapse: voltage collapse means that the voltage cannot be maintained in the transmission system. The voltage in the transmission system is supported by reactive power. During certain operating conditions, a lack of sufficient reactive power in Counties Dublin, Kildare and Meath have been identified; and
- Large phase angles: large phase angles are observed due to high power transfers on existing lines and the low connectivity between transmission stations during certain operating conditions.

Consequently, EirGrid must develop the grid in response to increased demand on East coast and Integration of generation in South and South West.

Table 4.6 presents the assessment of environmental effects in the Do Nothing scenario.

[20] The Climate Action Plan is updated annually. There has been no change to the 80% value in the most recent version published in December 2023.

Table 4.6: Environmental Assessment of Do Nothing Scenario

Topic	Do Nothing Potential Effects
Chapter 7: Population and Human Health	Under a 'Do Nothing' scenario, the Proposed Development would not be implemented, and therefore, there would be no changes to amenity, accessibility and severance, land use / land take and economy as a result of the Proposed Development. Therefore, there would be a neutral impact on these assessment topics under the Do Nothing Scenario. Under a 'Do Nothing' scenario, the Proposed Development would not be implemented, and therefore the health status of populations scoped into the assessment (described in Section 7.3), would be expected to change with time, in accordance with current trends across Ireland, as set out in Health in Ireland (Department of Health 2022).
Chapter 8: Air Quality	Under a 'Do Nothing' scenario, the Proposed Development would not be implemented, and there will be no significant change in air quality impacts. Therefore, there would be a Neutral impact on air quality in the Do Nothing scenario.
Chapter 9: Noise and Vibration	Under a 'Do Nothing' scenario, the Proposed Development would not be implemented, and noise levels are expected to increase through natural traffic growth and other noise sources in the area (e.g., agricultural machinery, industrial sites, etc). The impact is likely to be Neutral for noise and vibration.
Chapter 10: Biodiversity	Under a 'Do Nothing' scenario, the Proposed Development would not be implemented, the majority of the land proposed for development (excluding hardstanding areas) is managed for pasture and arable agriculture. The continued intensification of agriculture is expected to contribute to the ongoing declines in farmland birds and pollinators and the intensification of grasslands. Baseline activities for biodiversity include Local Community Biodiversity Action Plans with actions to conserve biodiversity, including for example planting pollinator friendly plants, habitat management of meadows, roadside verges and lawns (Meath County Council, 2016). Baseline natural events, such as storms, may expose features beneficial to wildlife such as cavities in trees made accessible to bats. EirGrid has ongoing nature restoration projects such as the East West Interconnector (EWIC) Biodiversity Project, started in 2019, to enhance biodiversity at Woodland substation.
Chapter 11: Soils, Geology and Hydrogeology	In the 'Do Nothing' scenario the Proposed Development would not be implemented and there would be no resulting impacts on the soils, geology and hydrogeology along the route of the Proposed Development. The impact would therefore be neutral.
Chapter 12: Hydrology	In the 'Do Nothing' scenario the Proposed Development would not be implemented and there would be no change to baseline surface water conditions as a result of any development. Baseline conditions would continue to be impacted by the pressures on each water body as listed in Section 12.3.

Topic	Do Nothing Potential Effects
Chapter 13: Archaeology, Architectural Heritage, and Cultural Heritage	In the 'Do Nothing' scenario the Proposed Development would not be implemented and there would be no adverse impacts to any of the archaeology, architectural heritage and cultural heritage assets. It is acknowledged that in the absence of the Proposed Development, other developments may take place which may impact archaeology, architectural heritage and cultural heritage.
Chapter 14: Traffic and Transport	In the 'Do Nothing' scenario the Proposed Development would not be implemented, traffic is still expected to increase due to natural traffic growth, as demonstrated in Section 14.3. Additional impacts due to the Proposed Development will, however, be avoided and the impact in this case will be Neutral.
Chapter 15: Agronomy and Equine	In the 'Do Nothing' scenario the Proposed Development would not be implemented, there would be no adverse effects on agronomy and equine from the Proposed Development. However, some adverse effects will arise from other developments. In the agricultural baseline environment along the proposed development there are pressures on agricultural land from developments for housing, industry and infrastructural projects which will have significant negative impacts on individual agricultural land parcels. While these developments will have significant negative impacts at an individual agricultural land parcel level, the effects on the entire agricultural baseline and at a regional level (agriculture in County Meath and County Kildare) will not be significant.
Chapter 16: Material Assets	In the Do Nothing scenario, the Proposed Development would not be implemented and there would be no changes to existing infrastructure or utilities as a result of the Proposed Development. Therefore, there would be a Neutral impact on infrastructure and utilities under the Do Nothing scenario.
Chapter 17: Landscape and Visual	With respect to landscape and visual, the 'Do Nothing' scenario means that the Proposed Development would not be implemented and associated changes to the landscape and visual environment as a result of the Proposed Development would not arise. Therefore, there would be a Neutral impact on landscape and visual under the Do Nothing scenario. It is noted that the study area is likely to remain predominately agricultural in the vicinity of Woodland Substation, but continue to experience increases in infrastructure projects (for example solar farms) and increases in pressure from encroaching urban development.
Chapter 18: Risk of Major Accidents and/or Disasters	With respect to Major Accidents and Disasters, the 'Do Nothing' scenario means that the Proposed Development would not be implemented. Therefore, there would be a Neutral impact on under the Do Nothing scenario.

Topic	Do Nothing Potential Effects
Chapter 19: Waste	In the 'Do Nothing' scenario the Proposed Development would not be implemented, and therefore the surplus materials would not be generated, and the required construction materials would not be consumed. Therefore the Do Nothing impact with respect to waste and resources would be Neutral.
Chapter 20: Climate	Under a 'Do Nothing' scenario, the Proposed Development would not be implemented, and it is anticipated that climate conditions experienced at the location of the Proposed Development will be the same as the existing baseline described in Section 20.3. There also would be no surplus materials, construction activities or operational maintenance required. It is therefore assumed that no Greenhouse Gas emissions are associated with the 'Do Nothing' scenario.

4.6 Summary

In line with EirGrid's six-step Framework for Grid Development, Environmental, Social, Technical, Deliverability and Economic considerations have informed the determination of the Proposed Development being brought forward for approval.

Having regard to each criterion, the BPO was selected to meet the specific circumstances of this Proposed Development, allowing it to meet its intended need as a strategic infrastructure development of National importance, while avoiding or minimising environmental impact on the receiving environment.

The Proposed Development has been refined through the different steps following surveys, design, assessment, and consultation with key stakeholders including Planning Authorities and prescribed bodies, the general public and landowners and communities. These changes have been presented in published reports such as the Step 4A and 4B reports – which are also appended to this EIAR (see Volume 5).

At Step 5, further amendments have been made to the cable route and these have been incorporated into the design and assessed in this EIAR.

This iterative process of consideration of alternatives has sought to avoid or reduce potential environmental effects through options appraisal and evaluation while having regard to feedback from consultation and engagement with a range of bodies, agencies, landowners, and the public.

The Proposed Development description is set out in Chapter 5 of this EIAR. Further information on the alternatives considered, is available in the reports contained in Volume 5.

5. Proposed Development Description

5.1 Introduction

The Proposed Development primarily comprises 52.9 km of new underground cable, with associated equipment, apparatus and structures, and site development works, between the existing Woodland substation located near Batterstown in County Meath, and the existing Dunstown substation located near Two Mile House, in County Kildare.

There is 37.8 km of the proposed underground cable located in County Kildare and 15.1 km of the proposed underground cable is located in County Meath. Eighty-two percent of the underground cable will be located within roads, while 18% will be located off-road, to avoid location-specific constraints.

There will also be works in the two substations to facilitate the connection of the underground cable into the electrical grid.

5.2 Proposed Development Description

The Proposed Development consists of the following principal elements:

A. Installation of an underground cable (UGC), approximately 53 km in length, connecting Woodland 400 kV Substation in the townland of Woodland in County Meath and Dunstown 400 kV Substation in the townland of Dunnstown in County Kildare. The development of the UGC will incorporate the following:

- Construction of a trench of approximately 1.5 m in width and approximately 1.3 m in depth in the public road (approximately 43.5 km) and approximately 1.7 m in depth in private lands (approximately 9.5 km) in which the UGC is laid;
- Construction of joint bays, each approximately 10 m in length and 2.5 m in width – with adjacent communication chambers and link boxes along the alignment of the UGC (on average every 750 m). Where the joint bays are located off-road, permanent hardstanding areas will be created approximately 3 m around the joint bays;
- The laying of communication links and fibre optic cables between both substations, running in the same trench as the UGC;
- The laying of 12 permanent access tracks (approximately 4 m in width, approximately 4.5 km in length) over private lands to access the off-road joint bays (and adjacent communication chambers and link boxes);
- The provision of six temporary construction compounds (approximately 5.7 ha total) and two no. construction laydown areas along the alignment of the cable route;
- The provision of temporary construction passing bays at 33 joint bay locations, each approximately 100 m in length and 5.5 m in width;
- The laying of 11 temporary construction tracks (approximately 9.5 km in total length);
- All associated water, rail, road and utility crossings using either trenchless drilling or open cut techniques; and
- All associated and ancillary above and below ground site development works, including works comprising or relating to permanent and temporary construction, roadworks, utility diversions and site and vegetation clearance.

B. Installation of additional electrical equipment and apparatus at the Woodland Substation in the townland of Woodland in County Meath. which is similar to the existing infrastructure and will be installed in a substation compound extension (Meath County Council Reference: 22/1550). This will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 8 m in height);

- Insulators, instrument transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.6 m in height) in order to connect the bay to the busbar;
- All ancillary site development works including site preparation works, temporary compound, underground cabling, and earthgrid, as required to facilitate the development.

C. Installation of additional electrical equipment and apparatus at the Dunstown Substation in the townland of Dunnstown in County Kildare which are similar to the existing infrastructure and does not require the extension of the substation compound. This will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 9 m in height);
- an extension to the 400 kV busbar to connect the 400 kV cable feeder bay to the existing 400 kV busbar;
- Ten lightning masts (approximately 41 m high);
- Insulators, instrument transformers, current transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.7 m in height) in order to connect the bay to the busbar; and
- An ancillary site development works including site preparation works, temporary compound, underground cabling and earthgrid, surface water drainage, and lighting poles as required to facilitate the development.

It is anticipated that the construction phase for the Proposed Development will last up to 42 months (excluding vegetation clearance). The construction activities will be phased. The basic elements of the construction phase are:

- **Enabling works:** These are works to allow the construction phase to progress, including site investigations and other survey activities, vegetation clearance, construction of access tracks and the temporary construction areas (e.g. compound areas and haul roads on off-road sections);
- **Phase 1: Installation of passing bays and joint bay structures:** The construction of passing bays (where required) at joint bay locations. On completion of the passing bays, it is proposed that the joint bays will be installed at the same time (see Section 5.5.1 below for further details);
- **Phase 2: Excavation and installation of ducts:** A trench will be dug along the cable route, ducts installed, and the road surfacing or agricultural land will be restored. This will also include physical crossings such as motorways, rivers and railways (see Sections 5.5.2 and 5.5.2.2 for further details);
- **Phase 3: Installation of cables:** The cables will be installed at joint bay locations within the ducts. The cables will then be jointed (connected) at each joint bay location to allow the installation of a continuous circuit. The circuits will then be tested to ensure they are ready to be commissioned for use (see Sections 5.5.3 and 5.5.3.2 below for further details);
- **Substation works**: Construction works are required in the existing Woodland and Dunstown substations to connect the underground cable to the existing electrical grid (see Section 5.4 below for further details); and
- **Decommissioning**: At this stage, the project will decommission the temporary construction compounds and passing bays and complete any agreed landscaping works (see Section 5.8 below for further details).

The proposed underground cable and substation equipment is highly specialised and is generally custom manufactured for such projects. The design of the Proposed Development is based on the current understanding of such equipment and also proposed construction techniques, statutory requirements, consultations with affected landowners, ground conditions, and environmental constraints.

In line with all large infrastructure projects, there will be a period of detailed design after planning consent and when the contractor is appointed. The contractor will confirm the detailed design of the development following on-site detailed, confirmatory surveys, albeit within the scope, nature and location of the approved development (should this proposed development be approved by the consenting authority). Further details of the Proposed Development and proposed construction activities are provided below.

The assessment in this EIAR is based on the Proposed Development design and construction methodology proposals described in this chapter. Where, as part of the detailed design process, the design and construction proposals will be further developed post-consent (if granted), such developments will be in accordance with the parameters set out in this EIAR. In those instances, the assessment has adopted a precautionary approach and identified whether the significance of any effects is predicted to change within the prescribed parameters.

This approach is a resilient method that provides conservatism within assessments in this EIAR while also facilitating the progression of the Proposed Development through the detailed design stage, including refinement, following inter alia the appointment of contractors and discharging of planning conditions requiring the agreement of matters of detail (e.g., the final location of Joint Bays, design of crossings, etc.)

The detailed design and construction methodology for the Proposed Development will be subject to confirmatory surveys and investigations to ensure that both will not result in any greater environmental impact than that being reported in this EIAR and being assessed by ABP. If the confirmatory assessments identify unanticipated impacts that are greater than those set out in this EIAR, mitigation will be implemented where required to ensure no significance residual effects arise.

5.3 Underground Cable

5.3.1 Overview

There are three key elements of the underground cable:

- **Cable trench –** an approximately 1.5 m wide, 1.3 or 1.7 m deep trench that will contain the underground cables (shown in Plate 5.1 below);
- **Joint bay –** The cable will be delivered in lengths and will need to be connected (jointed) together to create a continuous circuit. This happens at the underground joint bays; and
- **Passing bay –** a temporary traffic lane to allow traffic to flow around joint bays while construction works are ongoing.

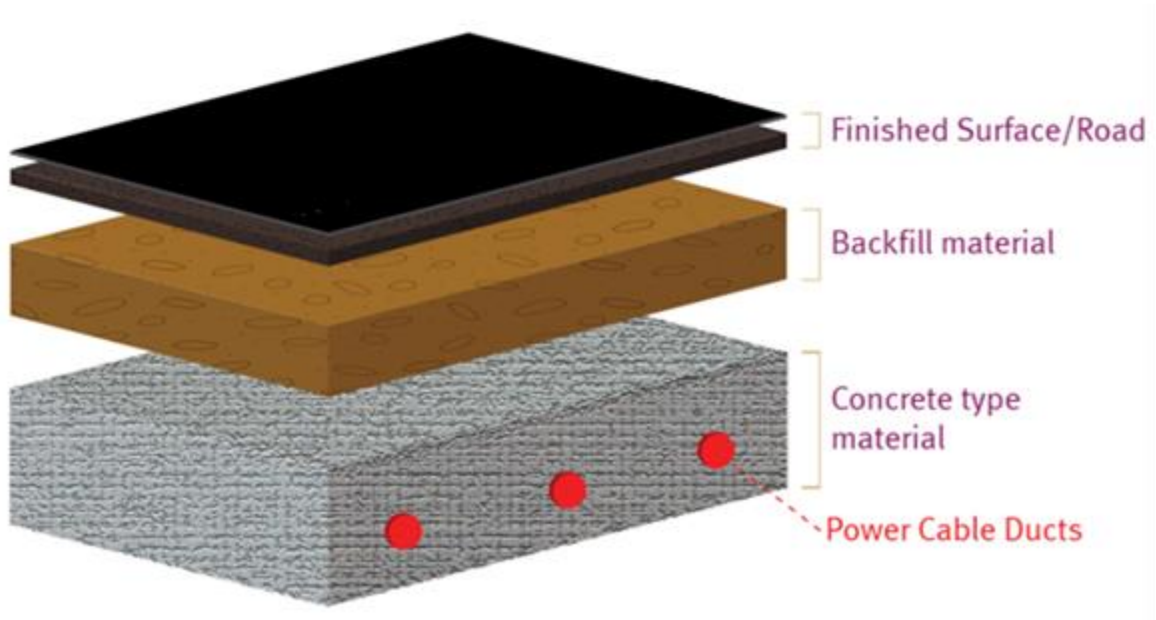


Plate 5.1: Proposed Cable Trench

The width and depth of the cable trench can vary for crossing of watercourses or utilities and for other technical reasons.

The cable will be delivered to site in individual lengths on cable drums. These lengths will be installed along the route by using 'joint bays'. A joint bay is an underground chamber located at various points on the route. These are used as locations to pull the cables into the pre-installed ducts and to connect ('Joint') together the individual cables and create a single, overall circuit.

Smaller buried chambers ('manholes') will be installed alongside various joint bay locations. There are two types:

- C2 chamber – used to join the fibre optic communication cables pulled into the pre-installed communications ducts; and
- Link box chamber – used to accommodate the link box, a device which earths the outer sheaths of the power cables.

As with any telecommunications facilities, the above two chambers are provided with removable lids to facilitate access for ongoing maintenance and commissioning works. While the joint bays have no ongoing maintenance, access from the surface is still required in the unlikely event of a cable failure needing replacement.

A typical joint bay under construction is shown in Plate 5.2. An image of a reinstated road after joint bay construction is shown in Plate 5.3. Passing bays to facilitate road traffic management around the joint bay construction locations will be required in some locations - these are where the joint bays are in the road carriageways. A typical passing bay is shown in Plate 5.4. Further detail on the construction of passing bays and joint bays is provided below.

EirGrid has carefully considered the previous investments made by Meath and Kildare County Councils in maintaining and upgrading their road surfaces. EirGrid intends to establish key principles and agree appropriate methodologies with the County Councils for road reinstatement where cable and associated infrastructure has been constructed. This could include reinstatement of road surfacing wider than the underground cable trench and joint bays. This will be in accordance with the accepted standard for underground cable development, the 'Purple Book – Guidelines for Managing Openings in Public Roads'[21]. This can also be assured by way of an appropriate Condition of Planning Approval. As identified in Section 5.2 above, the specific location and design of joint bays and passing bays are subject to refinement at the detailed design stage.

[21] https://www.gov.ie/en/publication/eda1ae-guidelines-for-managing-openings-in-public-roads-2017/

Plate 5.2: Typical Joint Bay During Construction

Source: EirGrid[22]

Plate 5.3: Reinstated road over joint bay (darker tarmac) with C2 communications chamber (steel chamber cover)

Source: EirGrid

[22] The photographs provided in this chapter are intended to help explain the Proposed Development. They have been taken from previous projects and may not be exactly like the Proposed Development. They are intended to be illustrative of the proposed works only.

Plate 5.4: Typical passing bay – ensuring road traffic continues around a working area and joint bay

Source: EirGrid

5.3.2 Underground Cable Route Description

The cable route moves out of south west corner of the Woodland substation and travels south to the townland of Jenkinstown. Where the cable route meets the R156, it is proposed to travel along that road to the north west towards the Mullagh Cross Roads. It will then travel south along the R125, and R158 towards Kilcock. The cable route will pass to the west of the town of Kilcock, where there will be an off-road crossing of the Rye Water, and an off-road crossing of the Royal Canal (a proposed NHA) and Dublin-Sligo railway line. To the south the railway line, the cable route re-enters the public road network on the R148. The cable route turns south towards the M4 motorway, where there will be an off-road crossing underneath.

To the south of Kilcock and the M4, the cable route will travel to the south along the R407 towards Clane. To the north of Clane at the Boherhole Cross Roads, the cable route turns to the west to avoid Clane, traveling along the R408 (the road to Prosperous). Close to the townland of The Cott, the cable route moves across agricultural land to the south east of the R408. This is required so that the cable route can continue to travel to the south towards the Dunstown substation.

The cable route will meet the R403, travelling along it until the Firmount Cross Roads, where it will continue south along the L2002. The cable route will approach the River Liffey, where it will turn off-road and cross underneath the river. On the eastern bank of the River Liffey, the cable route will connect with the Sallins Bypass where it will cross the River Liffey again, Grand Canal (pNHA), and the Dublin – Cork/Limerick railway line. To the north of the M7 motorway, the cable route will leave the Sallins Bypass to the east and will cross under the motorway in a local road (Osberstown Road). To the south of the motorway, the cable route will then travel along the Millennium Link Road (Western Distributor Road), travelling to the west around Naas. The cable route will connect with the R409 and travel east towards Naas, passing close to the Naas Sports Centre and under the Grand Canal (a proposed NHA). The cable route then travels along the R445 and the R447 (South Ring Road). The cable route connects with the R448 (Kilcullen Road) and travels south past Killashee. To the south west of the junction of R412, the cable route goes off-road across agricultural land and then connects to the R412. The cable route then travels into the Dunstown substation.

The majority (82%) of the proposed underground cable between the existing Woodland substation and the existing Dunstown substation will be installed within the existing public road network. Off-road routes are proposed at particular locations to avoid specific constraints. Table 5.1 below provides an overview of the underground cable route.

Laydown areas where construction materials can be temporarily stored, and construction compounds with vehicle parking and welfare facilities, will also be provided along the route. These are temporary and will be removed on project completion, and the land reinstated to its original condition. These areas are all within the planning application boundary for the Proposed Development and are described in more detail in Section 5.5 of this chapter.

Table 5.1: Route Section of the Proposed Underground Cable

Section Number	Section Name	Length (m)	Start Chainage	End Chainage	Type*	HDD	HDD Locations	Roads
1	Woodland	3,375	0	3375	Off-road – required as the local road in this area if not suitable. See Table 4.2, Chapter 4 of this EIAR.			
2	R156	3,740	3375	7235	In-road			R156
		120			Off-road watercourse crossing			
3	Mullagh	160	7235	7395	Off-road – required to avoid proximity to bat roosts; reducing the length of the cable; and improving the construction challenges. See Section 4.4.2.1, Chapter 4 of this EIAR.			
4	R125 North	3,385	7395	10900	In-road			R125
		120			Off-road watercourse crossing			
5	R125 South	3,610	10900	14750	In-road			R125
		240			Off-road watercourse crossing			
6	R158	235	14750	14985	In-road			R158
7	Balfeaghan	615	14985	15600	Off-road – required to provide a crossing of the watercourses and railway. In-road crossings were not feasible. See Table 4.2, Chapter 4 of this EIAR.	2	Rye Water; Royal Canal and Railway	
8	R148	545	15600	16145	In-road			R148
9	M4	665	16145	16810	Off-road – required to provide an off-road crossing of the motorway and railway.	1	M4	M4
10	R407 North	460	16810	17270	In-road			
11	R407	9,070	17270	26640	In-road	1	Tributary of Liffey_010	R407

Section Number	Section Name	Length (m)	Start Chainage	End Chainage	Type*	HDD	HDD Locations	Roads
		300			Off-road watercourse crossing			
12	R408	3,965	26640	30785	In-road			R408
		180			Off-road watercourse crossing			
13	Curryhills	1,045	30785	31830	Off-road – required to shorten the length of the cable route and to minimise potential impacts to landowners, hedgerows, and agricultural land. See Table 4.2, Chapter 4 of this EIAR.			
14	R403	1,170	31830	33000	In-road			R403
15	L2002 North	3,190	33000	36190	In-road			L2002
16	Millicent Demesne	275	36190	36465	Off-road – required to avoid a road junction and because of a stone bridge. See Section 4.4.2.3, Chapter 4 of this EIAR.			
17	L2002 South	335	36465	36800	In-road			L2002
18	Castlesize	1,005	36800	37805	Off-road – required to provide an off-road crossing of the River Liffey.	1	River Liffey	
19	Sallins Bypass	2,480	37805	40285	In-road			Sallins Bypass
20	Mills	320	40285	40605	Off-road - required to provide a crossing of under the M7 Motorway in a local road.			
21	Osberstown Road	60	40605	40665	In-road			Osberstown Road
22	M7	155	40665	40820	Off-road - required to connect from the Osberstown Road to the Millennium Parkway.			
23	Millennium Parkway	2,330	40820	43150	In-road			
24	R409	1,215	43150	44365	In-road			

Section Number	Section Name	Length (m)	Start Chainage	End Chainage	Type*	HDD	HDD Locations	Roads
25	Grand Canal	385	44365	44750	Off-road – required to provide an off-road crossing of the Grand Canal. See Table 4.3, Chapter 4 of this EIAR.	1	Grand Canal	
26	R447	1,440	44750	46190	In-road			R447
27	R448	5,200	46190	51450	In-road			R448
		60			Off-road watercourse crossing			
28	R448 South	440	51450	51890	In-road			R448
29	Stephenstown	250	51890	52140	Off-road - required to avoid a road bridge to shallow for the trench. See Table 4.3, Chapter 4 of this EIAR.			
30	R412	310	52140	52450	In-road			R412
31	Dunstown	450	52450	52900	In-road			Access Road

* Off-road watercourse crossing: The cable route travels over existing bridges along the in-road sections. Where existing bridges or culverts may not have sufficient cover for the cable trench, the route diverts off-road to cross under watercourses adjacent to the road. During detailed design, further assessment of the structures will determine if there is sufficient cover and if so, the cable route will be moved in-road.

Total length of the underground cable route is 52.9 km, of which in-road is: 43.6 km; and off-road is: 9.3 km

** Includes the off-road watercourse crossing.

There are a range of trenchless crossing types available. HDDs are one example and the assumed technique for the construction. Other methods could be used and would have similar environmental impacts as assessed in this EIAR. The term ‘HDD’ is used throughout this EIAR but the actual construction type could include other trenchless crossing types.

5.4 Substations

The existing Woodland and Dunstown substations require upgrading and extensions for additional electrical equipment and apparatus. These works are required in order to connect the 400 kV underground cable between Woodland and Dunstown and will be similar to the existing equipment within the substations.

5.4.1 Woodland Substation

The existing substation has a total size of approximately 10 ha, located within ESB's overall landholding of approximately 19 ha. The Proposed Development will take place within[23] and immediately adjacent to the existing substation. The feeder bay is approximately 0.5 ha in size. They will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 8 m in height);
- Insulators, instrument transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.6 m in height) in order to connect the bay to the busbar; and
- All ancillary site development works including site preparation works.

These proposed works are in shown in Planning Drawing Number 321084AH-JAC-ZZ-XX-DR-D-1410 and are shown in Plate 5.5.

The proposed electrical equipment at Woodland substation will be free-standing and has a minimal surface area. It will not require dedicated storm water drainage infrastructure as run-off can drain directly to ground via the permeable stone surfacing within the compound.

The Proposed Development is not anticipated to result in any additional staff/operatives over and above that of the existing substation. Therefore, an increase in loading on the foul drainage system is not anticipated nor will any of the proposed works impact on existing foul drainage infrastructure, which will continue to undergo regular maintenance and servicing during the operational phase.

[23] An extension to the Woodland Station has been applied for to Meath County Council - Reference: 22/1550

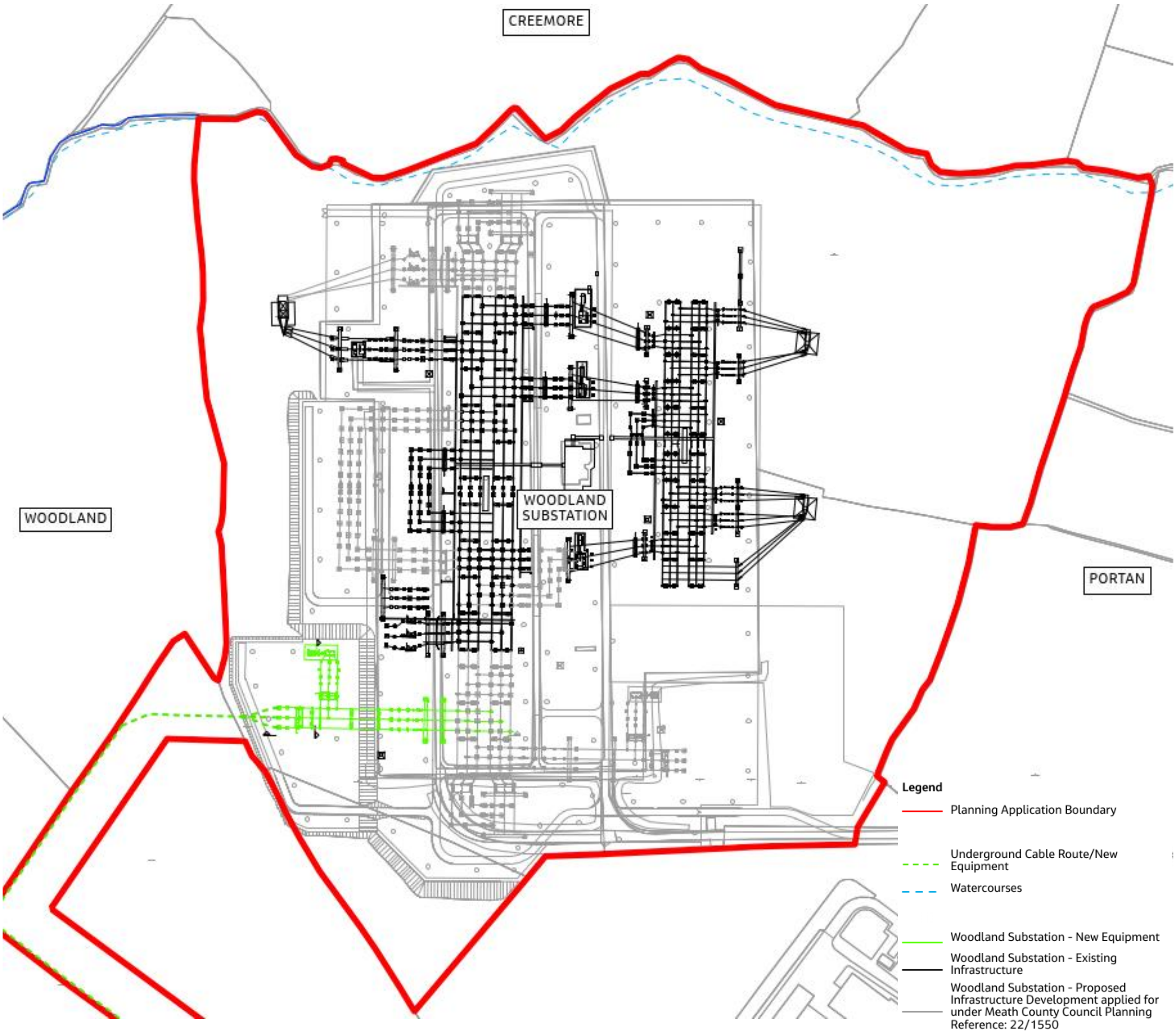


Plate 5.5: Woodland Substation

5.4.2 Dunstown Substation

The proposed works at Dunstown substation require the extension of the existing 400 kV busbars to accommodate a new 400 kV bay to connect the new underground cable.

The proposed works will take place within the existing substation and will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 9 m in height);
- An extension to the 400 kV busbar in order to connect the 400 kV cable feeder bay to the existing 400 kV busbar;
- Ten lightning masts (approximately 41 m high);

- Insulators, instrument transformers, current transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.7 m in height) in order to connect the bay to the busbar; and
- An ancillary site development works including site preparation works, laydown area; underground cabling and earthgrid, surface water drainage; and lighting poles as required to facilitate the development.

During the construction phase, temporary facilities will be provided within the ESB ownership boundary as illustrated in Planning Drawing Number 321084AH-JAC-ZZ-XX-DR-D-1315. Any discharges from the temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by an appropriately licensed waste contractor.

These proposed works are in shown in Planning Drawing Number 321084AH-JAC-ZZ-XX-DR-D-1315. and are shown in Plate 5.6.

Plate 5.6: Dunstown Substation

5.5 Cable Construction Phase Activities

The following sections describe the proposed construction phase activities associated with the installation of the new underground cable.

The laying of underground cables is a standard construction technique undertaken by a range of utility and other services providers. Cables will be installed in a flat formation in phases as follows:

A. Phase 1 - Installation of joint bays and passing bay structures;

B. Phase 2 - Excavation and installation of ducts; and

C. Phase 3 - Installation and jointing of cables.

Duct and joint bay installation are the most construction-intensive and invasive elements of cable route installation because digging of a trench is required. For in-road cable laying, this phase will have the largest potential impact on traffic, including the potential need for rolling road closures (to through traffic) and diversions.

While the specifics of any cable-laying schedule are dependent upon the contractor and nature and location of the project, it is generally the case that cable ducts can be laid in a road at a rate of approximately 40 m-50 m per day, although a rate of 20 m-50 m per day is anticipated in built up areas where utilities are more common.

Joint bays are located at average intervals of 745 m along the cable route of the Proposed Development. Shorter intervals may occur where the route alignment is more complex. Joint bays are typically installed in three days. The road is reinstated after cable installation. Road reinstatement along the route of the cable trench follows the completion of the trenching and ducting as it moves in sequence along the route.

Cable pulling and jointing, which commence when the trenching and ducting is well advanced along the route, is executed from the joint bay locations. Where this activity requires a road closure to be undertaken, the provision of a passing bay at the location of the joint bay will facilitate through movement of traffic along the road by means of a single traffic-signalled lane at the joint bay.

Plate 5.7 shows a typical cable trench in a public road after installation of ducts and prior to back fill. Marker boards can be seen within the trench prior to final reinstatement. Plate 5.8 presents a reinstated road following laying of underground cable.

Plate 5.7: Proposed Cable Trench In-Road

Source: EirGrid

Plate 5.8: Reinstated Road Following Laying of Underground Cable

Source: EirGrid

5.5.1 Phase 1 - Installation of Joint Bays and Passing Bay Structures

5.5.1.1 Joint Bays

Joint bays consist of precast concrete walls and bases located below ground. The joint bays are approximately 10 m long x 2.5 m wide x 2.6 m overall depth. Sand or lean mix concrete will be used as a foundation layer to the underside of the chamber. The ducts will be installed to each end of the chamber, then checked, cleaned and sealed.

The open concrete chamber will temporarily support the retained ground on the outside of the chamber during the ducting activities. Once these activities are completed, the open chamber will be temporarily backfilled with appropriate material and the road temporarily reinstated until cable installation.

During cable installation, the joint bay will be reopened and material within the chamber removed and replaced following completion of the cable installation.

The joint bay locations are provided in Table 5.2.

Table 5.2: Proposed Joint Bay and Passing Bay Locations

Joint Bay	Approximate Chainage	Approximate Distance from previous Joint Bay	Location	Passing Bay required?	Side of road Passing Bay is located	Hard Standing Area
JB 01	706	N/A	Off-road	N/A	N/A	Yes
JB 02	1494	788	Off-road	N/A	N/A	Yes
JB 03	2241	747	Off-road	N/A	N/A	Yes
JB 04	2978	737	Off-road	N/A	N/A	Yes
JB 05	3750	772	In-road	Y	North	No
JB 06	4521	771	In-road	Y	South	No
JB 07	5190	669	In-road	Y	North	No
JB 08	5919	729	Off-road	N/A	N/A	Yes
JB 09	6629	710	In-road	Y	South	No
JB 10	7283	654	Off-road	N/A	N/A	Yes
JB 11	8028	745	In-road	Y	North	No
JB 12	8585	557	Off-road	N/A	N/A	Yes
JB 13	9144	559	In-road	Y	South	No
JB 14	9914	770	In-road	Y	East	No
JB 15	10730	816	Off-road	N/A	N/A	Yes
JB 16	11457	727	In-road	Y	East	No
JB 17	12294	837	In-road	Y	East	No
JB 18	13036	742	In-road	Y	East	No
JB 19	13893	857	Off-road	N/A	N/A	Yes
JB 20	14758	865	Off-road	N/A	N/A	Yes
JB 21	15390	632	Off-road	N/A	N/A	Yes
JB 22	16144	754	Off-road	N/A	N/A	Yes
JB 23	16885	741	Off-road	N/A	N/A	Yes
JB 24	17546	661	Off-road	N/A	N/A	Yes

Joint Bay	Approximate Chainage	Approximate Distance from previous Joint Bay	Location	Passing Bay required?	Side of road Passing Bay is located	Hard Standing Area
JB 25	18296	750	In-road	Y	South	No
JB 26	19172	876	In-road	Y	East	No
JB 27	20010	838	In-road	Y	East	No
JB 28	20759	749	In-road	Y	East	No
JB 29	21507	748	In-road	Y	East	No
JB 30	22288	781	Off-road	N/A	N/A	Yes
JB 31	23010	722	Off-road	N/A	N/A	Yes
JB 32	23770	760	In-road	Y	West	No
JB 33	24439	669	In-road	Y	East	No
JB 34	25269	830	Off-road	N/A	N/A	Yes
JB 35	25950	681	In-road	Y	East	No
JB 36	26640	690	Off-road	N/A	N/A	Yes
JB 37	27380	740	In-road	Y	North	No
JB 38	28196	816	In-road	Y	North	No
JB 39	29029	833	In-road	Y	North	No
JB 40	29824	795	In-road	Y	South	No
JB 41	30656	832	In-road	Y	South	No
JB 42	31365	709	Off-road	N/A	N/A	Yes
JB 43	32062	697	In-road	Y	South	No
JB 44	32943	881	Off-road	N/A	N/A	Yes
JB 45	33656	713	In-road	Y	West	No
JB 46	34466	810	In-road	Y	North and South*	No
JB 47	35221	755	In-road	Y	North	No
JB 48	35998	777	In-road	Y	East	No
JB 49	36814	816	Off-road	N/A	N/A	Yes
JB 50	37431	617	Off-road	N/A	N/A	Yes
JB 51	38250	819	Off-road	N/A	N/A	No
JB 52	38920	670	Off-road	N/A	N/A	No
JB 53	39675	755	Off-road	N/A	N/A	No
JB 54	40378	703	Off-road	N/A	N/A	Yes
JB 55	41165	787	In-road	N	Not required due to road width	No
JB 56	41800	635	In-road	N	Not required due to road width	No
JB 57	42744	944	In-road	N	Not required due to road width	No
JB 58	43433	689	Off-road	N/A	N/A	No
JB 59	44073	640	Off-road	N/A	N/A	No
JB 60	44884	811	Off-road	N/A	N/A	Yes

Joint Bay	Approximate Chainage	Approximate Distance from previous Joint Bay	Location	Passing Bay required?	Side of road Passing Bay is located	Hard Standing Area
JB 61	45373	489	In-road	N	Not required due to road width	No
JB 62	46109	736	In-road	N	Not required due to road width	No
JB 63	46876	767	In-road	Y	East	No
JB 64	47635	759	In-road	Y	West	No
JB 65	48392	757	In-road	Y	East	No
JB 66	49148	756	In-road	Y	West	No
JB 67	49915	767	In-road	Y	West	No
JB 68	50689	774	In-road	Y	East	No
JB 69	51366	677	Off-road	N/A	N/A	Yes
JB 70	52116	750	Off-road	N/A	N/A	Yes

*A passing bay is currently on both sides of the road at Joint Bay 46. At detailed design stage, one location will be selected, and the other passing bay location will not be utilised.

5.5.1.2 Passing Bays

Passing bays are short sections of temporary roads around joint bays where space restrictions would otherwise have potentially closed the highway to traffic. The passing bays will include temporary traffic management arrangements as agreed with Local Authorities.

The installation of the passing bay requires removing and temporarily storing the ground top layers off-road, to the side of the carriageway. This material will be used to allow reinstatement later. The passing bays will then be constructed to a standard agreeable to Meath County Council and Kildare County Council. The passing bay will be constructed to be at the level of the existing road surface. This may require the importation of fill material in certain locations. Roadside drains will be maintained and where it is required; culverts and piping will be used to maintain the waterflow under the passing bay. Temporary drainage will be provided to ensure appropriate run-off from the new road surface. Plate 5.9 and Plate 5.10 show passing bays that have been developed for other cable projects. Drawing Number 321084AH-JAC-ZZ-XX-DR-K-2202 provides a typical plan of a passing bay and the location and dimensions of each proposed passing bay are shown in Drawing Numbers 321084AH-JAC-ZZ-XX-DR-Z-2101 to 2174.

Where the road is still not wide enough for a passing bay or where it is not suitable for a passing bay, a road closure may be required to undertake the work. Further detail on proposed road closures and diversions is provided in the construction phase Traffic Management Plan provided in Appendix 5.1 of the EIAR.

The passing bays will not be in use for the full duration of the construction period. The bays will be used during the joint bay construction and the cable pulling and jointing process. When the bays are not in use, measures will be put in place to ensure no illegal parking.

The reinstatement of the passing bays will occur on the completion of Phase 3 of the construction period. The materials used to construct the bays will be removed from site and taken to a suitably licensed facility. The area will be reinstated and relandscaped to reflect the previous landform at each location. Because of ash-dieback, no ash trees will be planted, only native species will be used, and where affected, species-rich hedgerows will be planted. The adjacent road surface, painted lines, and other requirements will be restored in line with the Purple Book.

Plate 5.9: Passing Bay in Construction

Source: EirGrid (on the Kilpaddoge- Knockanure 220 kV underground cable Project, Co. Kerry)

Plate 5.10: Operational Joint Bay with Passing Bay

Source: EirGrid (on the Kilpaddoge- Knockanure 220 kV underground cable Project, Co. Kerry)

5.5.2 Phase 2 - Excavation and Installation of Ducts

5.5.2.1 Duct Installation

The cables will be pulled into ducts pre-installed into the cable trench. When a length of trench has been excavated, the ducts are laid on bedding material of cement bound granular mixture. Once laid, the ducts are backfilled with a thermally suitable material and warning marker boards are laid above them. The fibre optic ducts will be laid and backfilled before the trench is reinstated. These fibre optic ducts are for the operational use of ESB and are not associated with internet provision. The trench reinstatement will match the local environment. In the case of roads, this will be to the surfacing standard agreed with Meath County Council or Kildare County Council.

Associated route marker posts (see Plate 5.11) will be positioned at regular intervals within the Planning Application Boundary. This is a common safety measure for underground utilities. The makers will located be at: field boundaries where the cable is laid in private land; at regular intervals in road verges when the cable route is in-road; in road verges where the cable crosses any roads; and at HDD crossing locations. The markers will be positioned to be visible for safety reasons but located in a manner that is not obstructive.

Plate 5.11: Examples of an Above-Ground Cable Route Marker Post

The duct installation will progress sequentially, starting at one joint bay and moving towards the next along the route. The construction area moves along in tandem with the progress of the duct installation, with only the minimal necessary area cordoned off. It is anticipated that multiple crews will work along the 53 km route simultaneously.

5.5.2.2 Duct Installation in Roads

The primary difference between construction in off-road areas and in-road areas is that there is generally little space within road areas for local storage of construction materials such as excavated material and new fill material. This means that designated laydown areas may be required along the road to support construction activities.

For trench excavation works in roads where there is good amount of space, vacuum excavation or mechanical excavators are typically used. The excavated material will be loaded into lorries for removal off site at a suitably licensed facility.

An average rate of construction for the cable route is assumed to be approximately 40 m-50 m per day.

Excavation for the underground cable areas of road with heavy utility congestion can become slower due to the challenges of working around high numbers of existing utilities. Generally, the intent will be to retain the existing services in place by working around them. The utilities may either be parallel to the Proposed Development (i.e. alongside the duct run) or may be crossing the duct run.

The project team for the Proposed Development will engage with the utility owners prior to construction. Significant consultation has already taken place with utility providers and construction principles have been established, subject to further detail at the detailed design stage. Arrangements will be in place to ensure that utilities are crossed by the underground cable safely and with appropriate methodologies to support and protect existing assets. In some instances, where there is an interface with a particularly sensitive utility, works may need prior agreement and/or supervision by the utility.

Hand digging methods and smaller excavators will be used if required. To protect the working area, temporary traffic management may be required to divert traffic.

For roads with heavy congestion of existing utilities, a progress rate for site preparation, excavation, cable duct installation and reinstatement are estimated at approximately 20 m-50 m per day.

5.5.2.3 Underground Cable Laying in Agricultural Lands

For agricultural lands such as grassland and tillage, the underground cable design is essentially similar to what is installed in the roads with the exception of restoration of sub and topsoil instead of road construction material. The methodology for duct construction is similar with construction of joint bays, ducting, and cable installation and jointing being essentially the same.

As these construction works are located off-road in agricultural lands, a temporary working strip of 30 m wide is proposed – as shown on Drawing Numbers 321084AH-JAC-ZZ-XX-DR-Z-2101 to 2174. While the cable trench is only approximately 1.5 m wide, the 30 m working strip is needed to:

- Facilitate temporary storage of subsoil and topsoil which must be removed from:
  - The footprint of the temporary construction access track (typically up to 4 m wide);
  - The footprint of the cable trench;
  - A safety buffer strip between temporary access track and the trench;
- Allow construction of a temporary construction access track alongside the cable trench to allow for the movement of construction equipment and materials along the section of the route on the agricultural land;
- Ensure sufficient working space for the excavation of the cable trench and the installation of the cable ducting; and
- Allow segregated storage of the various types of topsoil and subsoils from the cable trench for later re-use.

Plate 5.9 shows a typical temporary working strip on agricultural land for an electricity cable project. Stripped topsoil can be seen stored to the left of the strip with a temporary construction access road in the centre right. Subsoil is also temporarily stripped from areas either side to create space for trench installation, materials storage and subsoil storage.

For in-road sections, once the duct and joint bays are constructed, the road can be reopened. The cable installation and jointing can be a separate later exercise as access is via the public road network. On agricultural land, the temporary access tracks need to remain in place until after the completion of the cable pulling and jointing works. This is because there is no other way to provide access to these off-road locations. For this reason, it is anticipated that for the Proposed Development any off-road working strip will be unavailable to an affected landowner for the duration of the construction period. This will include from initial fencing-off to removal of the fence following reinstatement of land along the working strip.

After construction, the temporary access tracks will be removed. However, the Proposed Development will include 12 permanent access tracks, which will be stoned, 4 m wide and maintained by ESB. These are to allow access to off-road joint bays from either existing access tracks or entrances. These tracks will be used infrequently for operational maintenance by ESB. Where an access track crosses an existing field boundary, a gate will be provided to maintain the boundary. Where an access track crosses from one landowner to another, access will be for ESB only and measures will be put into place to ensure livestock do not escape during ESB access (e.g., double gates). The permanent access tracks are provided to the following joint bays: JB1-4 (one access track for all four joint bays); JB8; JB10; JB15, JB21, JB31, JB42, JB49, JB50, JB54, JB60, and JB70.

The access track to Joint Bay 15 will cross a watercourse called Jenkinstown stream_010 (labelled as WB07). This watercourse also will be crossed by the cable as an open-cut trench. A culvert will be used to cross the watercourse and will be designed to prevent any changes in flooding and in line with the Inland Fisheries Ireland (IFI) guidance so that there is no significant ecological impact.

Where possible, an off-road cable alignment seeks to follow field boundaries so as to minimise potential impact on farm operations. However, there will be a requirement to cross a number of fields, ditches, hedgerows, or other features as necessary.

Construction of HDDs below existing infrastructure e.g., water bodies will need temporary construction compounds. These areas are to create launch and reception pits for the HDD boring equipment and facilitate logistics and storage works. For watercourses where HDD is not used, these crossings will employ an open trench method. Where necessary, field boundaries will be removed, and ditches culverted to ensure continuity of drainage. Each work area is demarcated securely with fencing, and this will prevent works outside of the agreed areas.

Further details of HDD and open cut crossings are provided below.

Plate 5.12: Typical Underground Cable Construction in Agricultural Lands

Source: EirGrid

5.5.2.4 Cable Crossings (water, utility, bridges, etc.)

The cable route will cross existing structures, utilities and watercourses at various locations. These crossings will be facilitated by either open cut trenching or HDD as set out below. Location-specific detail is provided in Appendix 5.2. A description of open cut trenching and HDD methods is given below. The underground cable will be a minimum of 300 mm from existing services as per EirGrid's Functional Specifications[24]. This distance will increase depending on the utility type as set out in the specifications. Future utilities in the vicinity of the underground cable will need to consult with ESB and maintain the minimum distances.

Prior to the cable crossing works, there will be detailed utility and services surveys.

The identification of crossings along the proposed cable routes has been based on consultations with utility providers, site walkovers, field studies, and reviews of publicly available information such as Environmental Protection Agency (EPA) datasets and mapping. All crossings will be confirmed at the detailed design stage and the mitigation detailed and proposed as part of this EIAR will be implemented when dealing with any such features.

[24] https://www.eirgridgroup.com/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf

5.5.2.5 Watercourse Crossings

Details of the proposed watercourse crossings are provided in Appendix 5.3. In summary:

- Five watercourses will have an HDD crossing;
- 25 watercourses will have a trench crossing;
- Ten watercourses will be crossed in-road with no direct effects on the watercourse; and
- One watercourse will be affected by a passing bay.

The Proposed Development will cross the following significant watercourses:

- Rye Water (WB13[25]) – HDD crossing;
- Royal Canal (WB14) – HDD crossing;
- River Liffey (three crossings: WB35 – HDD; WB36 – crossed in-road; WB37 – crossed in-road); and
- Grand Canal (two crossings: WB38 - crossed in-road; WB42 – HDD).

Trench crossing through watercourses could stir up sediment in the waterbody and have negative impacts. To reduce this risk of discharging sediment, it is proposed to carry out all of these works in a dry works area.

The dry works area will be isolated by installing an impermeable barrier between the watercourse and the works area. Techniques include the use of inflatable dams, frame dams, or in smaller watercourses, sandbags.

Water pumped from the dry works area will be treated using settlement tanks to remove sediment prior to discharge back to the watercourse. Discharge water will be to a standard agreed with IFI. As a potential habitat enhancement measure, silt dewatering bags may be used. These trap silt and only allow clean water through. They can be left to biodegrade, enhancing the local habitat.

Water will be carried over or around the isolated dry works area. This may be either by pumping or temporary diversion. Where possible, provided there is no risk of excessive scour, the diversion will be within the footprint of the existing channel. Due to the use of a temporary impermeable barrier, the channel may have localised changes in water depth, velocities and sediment erosion and deposition.

The existence of a temporary impermeable barrier within the channel, will have a direct impact on the cross section of the channel and is expected to give rise to localised changes in water depth, velocities and sediment erosion / deposition. Once the underground cable crossing is completed, the landscape will be restored in accordance with agreed requirements. These works may include riverbank stabilisation, gravel replacements etc. In all cases, the site will be restored post-installation.

Open-cut trenching works will not be carried out during extreme rainfall or high flow events. Met Éireann provides a five-day weather forecast via its website (www.met.ie). Generally, works will not take place during certain categories (e.g., red weather warnings). Depending on the specific circumstances, works may also not take place during yellow and orange warnings based on the site-specific conditions and based on an assessment by the contractor. The Contractor's Environmental Clerk of Works (EnCoW) will monitor watercourse crossings and ensure appropriate records are maintained for audit.

Unless otherwise agreed with IFI, in-stream works will be restricted to the fisheries open season (i.e., restricted to July to September).

[25] As labelled within the Biodiversity chapter of this PECR.

5.5.2.6 Open-Cut Trenches at Utility Crossings

Numerous existing utility services cross the proposed cable route as described in Appendix 5.2. Where these occur, the proposed crossing options include the following:

- **Locate below the existing service:** The underground cable would be positioned locally below the existing service. This will be to the minimum allowed spacing, as per utility owner requirements;
- **Locate above the existing service:** The depth to the top of the underground cable ducts could be reduced to a minimum of 450 mm below surface level as per the Health and Safety Authority's paper entitled, 'Code of Practice for Avoiding Danger from Underground Services'. This depth would accommodate the required separation from the service being crossed and would provide protection to the underground cable system. Steel plates and steel mesh would be installed above concrete-encased ducts; and
- **Realignment of existing utility**: The works required to do so will be coordinated with the service / utility provider and a complete coordinated methodology would be mutually agreed between all parties prior to commencement of any work.

All proposed work methodologies will aim to prevent any outages or loss of service. If the risk cannot be avoided, prearranged agreements on outages would be set in place prior to works' commencement.

5.5.2.7 Horizontal Directional Drilling (HDD)

There are six HDD crossings proposed along the cable route:

- HDD1 – ch. 15+000 – crossing of the Rye Water (WB13), to the west of the R158. The HDD length is approximately 50 m;
- HDD2 – ch. 15+380 – crossing of the Grand Canal (WB14) and Dublin-Sligo railway line, to the west of Kilcock. The HDD length is approximately 220 m;
- HDD3 – ch. 16+640 – crossing of the M4 Motorway, to the south of Kilcock. The HDD length is approximately 120 m;
- HDD4 – ch. 22+000 – crossing of the Lyreen tributary of the River Liffey_010 (WB20), along the R407. The HDD length is approximately 100 m;
- HDD5 – ch. 37+100 – crossing of the River Liffey (WB35), north of Sallins. The HDD length is approximately 120 m; and
- HDD6 – ch. 44+600 – crossing of the Grand Canal (WB42), in Naas. The HDD length is approximately 150 m.

HDD technology has been widely used on infrastructure projects for several decades. Competent specialist contractors will be appointed to undertake the work.

The HDD Contractor will conduct the drilling works in a safe and controlled manner with appropriate planning for site and environmental constraints. The HDD design and the Contractor's methodologies will ensure that the proposed works do not adversely affect existing utilities, third-party infrastructure, and groundwater.

Temporary HDD compounds have been included within the planning application boundary for the Proposed Development. The sites will be temporarily covered with a gravel hardstanding to allow construction plant to operate safely. Launch and reception pits of approximately 3 m x 5 m will be constructed for the HDD holes.

The drill rig will bore a pilot hole between one side of the crossing to the other. The HDD technique uses a drilling fluid called bentonite to support the borehole during construction. The bentonite fluid also carries away flushings – the unwanted material removed by the drill bit. The drill bit is kept on its planned alignment using surveyors and sensors which are constantly monitored by the drill rig operator. The drilled arisings are flushed to the surface where they will be separated from the fluid fraction for disposal. The drilling fluid is maintained in a closed loop, meaning the bentonite is pumped, captured, cleaned and circulated again. There are a range of bentonite types and brands available – whichever one is used at construction, it will be non-toxic and non-corrosive. A typical HDD drilling rig is shown in Plate 5.13.

Plate 5.13: Typical HDD Drilling Rig

Source: EirGrid

Constant monitoring by the specialist drilling team of fluid volume pressure, pH, weight and viscosity will be carried out. The volume of cuttings produced will also be monitored to ensure that no over-cutting takes place and that hole cleaning is maintained. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses.

After the initial pilot hole is completed, it will be reamed in a number of passes. This will enlarge the hole to the required bore size to enable the cable ducts to be pulled through. The specialist drilling team constantly monitors the operation. This includes:

- Checking that actual load stress matches designed load stress, to ensure hoop stress and buckling stress is not exceeded; and
- Drilling progress monitoring to identify voids or changes in geological conditions.

When the HDD works are completed, the working platform will be removed, and the site reinstated to original condition.

The Contractor will monitor river/stream flows upstream and downstream of any directional drilling of watercourse crossings. The flow monitoring will be undertaken on a daily basis for five working days prior to the directional drilling, during the directional drilling and for five working days following completion of the directional drilling. The Contractor will record the results of such monitoring, and will provide these to ESB, EirGrid, the Local Authorities, and other bodies as required by any conditions.

5.5.2.8 Sallins Bypass Bridges

The Proposed Development seeks to minimise the impacts of off-road crossings by routing the underground cable along the existing public road network, so far as is reasonably practicable. See Chapters 2 and 4 of this EIAR for further details. This helps to avoid environmental and socio-economic impacts from crossing off-road sections (e.g., agricultural land).

Following consultation with Kildare County Council, it has been agreed that the Sallins Bypass will be utilised for the cable route. The cable route will generally follow the footpath along the eastern boundary of the road. There will also be five crossings of bridges on the Sallins Bypass. These are:

- Structure Number 6 (River Liffey Underbridge Number 2) – a clear-span crossing of the River Liffey, approximately 200 m in length;
- Structure Number 5 (River Liffey Underbridge Number 1) – a clear-span crossing of the River Liffey, approximately 100 m in length;
- Structure Number 4 (Grand Canal Underbridge) – a clear-span crossing of the Grand Canal, approximately 60 m in length;
- Structure Number 3 (Irish Rail Overbridge) – the Dublin-Cork/Limerick crossing over the Sallins Bypass, approximately 40 m in length; and
- Structure Number 2 (Osberstown Road Overbridge) – the L2002 Osberstown Road crossing over the Sallins Bypass, approximately 15 m in length.

Structures 4, 5, and 6 (crossing of the River Liffey and the Grand Canal) will be crossed by placing the cable ducts within the footpath. Works will involve removing the existing surfacing, placing the cable ducts and resurfacing the footpath and the carriageway. This will follow the layout and appearance of the bridges as they are currently designed, with a slight increase in footpath and carriageway height to accommodate the cable route.

Subject to detailed design, the footpath level will increase by approximately 125 – 150 mm (12.5 – 15 cm). The carriageway increase will vary from bridge to bridge but will be in the range of approximately 100 mm – 145 mm. Post-construction there will be no impact to the use of the shared cycleway/footpath on the bridge and the current width will be unaffected.

The Proposed Development will ensure the waterproofing and expansion joints on the bridges are maintained and an increase in height will be longitudinally graded out to ensure safety standards are met.

Structure Number 3 (Irish Rail Overbridge) will be crossed by reusing an existing spare duct in the bridge structure. During the construction of the bridge, a 900 mm wide duct was built across the width of the bridge. Consultations with Irish Rail and Kildare County Council have confirmed that there is no current use for the duct. The design will use the existing duct for the proposed cable route. A small retaining wall will be constructed on the north and south side of the bridge to facilitate the cable ducts to enter and exit from the duct. This retaining wall will support earth that will be used to cover the cables of the Proposed Development. The cable will continue either side of the bridge in the footpath of the Sallins Bypass.

Structure Number 2 (Osberstown Road Overbridge) will be crossed in the carriageway of Sallins Bypass. There are no spare ducts or sufficient space in the footpath at this bridge to facilitate a crossing, however, there is sufficient depth in the carriageway to accommodate the cable trench. At this point the Sallins Bypass is a dual carriageway and these construction works will require temporary traffic measures, as a lane of the Sallins Bypass southbound (towards Naas) will be required to be closed.

The details of the Bridges will be developed further at the detailed design stage, to the agreement of Kildare County Council. Agreement has been given by Kildare County Council for the use of these structures which will reduce environmental and socio-economic effects, decrease the construction costs and improve the technical and deliverability considerations of the Proposed Development, compared to an off-road route (see Chapter 4 of this EIAR for further details).

Impacts to pedestrian, cyclists, and other users of the footpath and cycleway, and road users on the Sallins Bypass are addressed in Chapters 14 (Traffic) and 16 (Material Assets).

5.5.3 Phase 3 - Installation and Jointing of Cables

5.5.3.1 Cable Installation

The cables will be brought to site on cable drums. The cable drums will be moved into position using specialist trailers. For in-road sections, these trailers will be lorry type, while for off-road sections, the trailers may be tractor type. The drums will be brought to the joint bay location for cable installation by 'pulling' the cable into the pre-installed duct.

Once the drum is set up, a winch system at the next joint bay including pulling cable will be attached to the nose of the cable and rollers will be used to guide the cable end towards the duct. The cables will then be pulled into the duct with lubrication being applied to the cable and duct throughout the process to control pulling tensions.

5.5.3.2 Cable Jointing

The individual lengths of cable need to be joined or 'jointed' together to create a single circuit. This is done at the joint bays along the cable route.

The cable jointing process is highly skilled, labour intensive, technically demanding and essential to the effective operation of the cables. For worker safety and comfort, a temporary waterproof shelter system with the same visual appearance as a shipping container is either placed or constructed around the joint chamber. This provides a clean environment for the jointing process to be undertaken in. In some areas, the width of the joint bay and shelter will mean temporary traffic management, including use of passing bays, will be required as set out below.

The width of the joint bays and the nature of the road network in the area means that road closures and diversions will be required in some areas along the route during construction and operation.

The cables will be pulled into each end of the chamber and the cable ends jointed together within the chamber. Jointing is expected to take approximately one to two weeks per joint bay.

Following jointing, the joint bay will be backfilled, and the road surface permanently reinstated. An example of cable pulling is shown in Plate 5.14. An example of a sheltered joint bay used during jointing is provided in Plate 5.15.

Plate 5.14: Typical Cable Pulling at a Joint Bay

Source: EirGrid

Plate 5.15: Typical Cable Jointing Bay Shelter

Source: EirGrid

5.5.4 Construction Traffic

A Traffic Management Plan has been prepared for the Proposed Development and is contained as Appendix 5.1 of this EIAR.

The proposed construction sequence to support the Temporary Traffic Measures for the in-road sections of the cable route is as follows:

- Phase 1 – Installation of passing bay and joint bay structures: The construction of the passing bays (where required) at the joint bay locations. On completion of the passing bays, it would be proposed that the joint bays are installed at the same time;
- Phase 2 – Excavation and installation of ducts: A trench will be dug along the cable route, ducts installed, and the trench backfilled, and the ground reinstated to match existing;
- Phase 3 – Installation of cables: The cables will be installed at joint bay locations within the ducts. The cables will then be jointed (connected) at each joint bay location to allow the installation of a continuous circuit.

The scale and nature of the Temporary Traffic Management will vary from phase to phase because of the different effects. Works during Phases 1 and 3 are discrete locations along the cable route, whereas Phase Two will be a rolling working area as the trench will run the entire length of the Proposed Development.

In Phases 1 and 3, the following measures will be applied:

- Single lane closure: Where the road width at the location of the joint bay is greater than 10.5 m, a passing bay will not be required and only a single lane closure required;
- Passing bay with single lane closure: Where the road width is less than 10.5 m and where there is suitable space, a passing bay with single lane closure will be constructed; and
- Full road closure (with local access arrangements): Where the road width is less than 10.5 m and where there is insufficient space to construct a passing bay, a road closure with local access arrangements will be provided for the affected area with signposted diversions.

In Phase 2, the following measures will be applied:

- Full road closure (with local access arrangements): Where the residual open carriageway is less than 2.5 m the road will be required to be closed, with local access arrangements where necessary. Allowing vehicles to pass on a carriageway less than this width would pose significant risk to road users and the delivery teams. Please note that the length of road that will be closed will be minimised and made appropriate to the area of the works. The closed section will be based on the nearest diversion point and the works required in that area;
- Lane Closure with Heavy Goods Vehicles (HGV) Diversion: Where the residual open carriageway is between 2.5 m and 3 m the road will be required to be closed to HGVs but open to Light Goods Vehicles (LGVs e.g., Ford Transit vans) and cars. All HGVs would be required to use the diversion route, requiring signage to mitigate the risk of HGVs passing the works sites; and
- Lane Closure: Where the residual open carriageway is greater than 3 m, it is proposed to keep the road open to all road users, using automated stop / go traffic signals. Automated signalling to account for the traffic flow and demand will reduce waiting times. The lane closures will remain during the entirety of the section of works (i.e., out of hours included) to ensure safety to all road users and delivery teams.

Table 5.3 below summarises the proposed Temporary Traffic Measures that will be applied for the Proposed Development. The cable route has been divided into a number of sections because of the different sections being in-road or off-road, the nature of the proposed works in that area, difference in road widths, and other factors. Table 5.3 contains only those sections where Temporary Traffic Measures are required. The table also identifies the maximum diversion length where they are required in certain sections. The diversions have been calculated on a like-for-like basis – where a regional road is affected by the Proposed Development, the proposed diversion only uses regional roads and does not include local roads in the area. In some areas, this approach significantly increases the length of the diversion.

Table 5.3: Summary of Proposed Temporary Traffic Measures

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.02	R156	3.9	7	Passing bay – single lane closure	Lane closure with HGV diversion	27.4
1.04	R125 North	3.5	5.7	Two measures will be used in this section (depending on the location): - Passing bay – single lane closure; and - Temporary construction platform – single lane closure.	Full road closure (with local access arrangements) *	21.5
1.05	R125 South	3.9	5.9	Two measures will be used in this section (depending on the location): - Passing bay – single lane closure; and - Temporary construction platform – single lane closure.	Full road closure (with local access arrangements) *	18.7
1.06	R158	0.2	7.7	No works required in Phases 1 and 3.	Lane closure	3.6
1.08	R148	0.5	7.8	Temporary construction platform	Lane closure	5
1.10	R407 North	0.5	8.2	Passing bay – single lane closure	Lane closure	3.9

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.11	R407	9.4	7.6	Three measures will be used in this section (depending on the location): - Passing bay – single lane closure; and - Temporary construction platform; - Temporary construction platform – single lane closure.	Lane closure	17.1
1.12	R408	4.1	6.1	Passing bay – single lane closure	Full road closure (with local access arrangements) *	9.6
1.14	R403	1.2	6.9	Passing bay – single lane closure	Full road closure (with local access arrangements) *	12.5
1.15	L2002 North	3.2	5.4	Passing bay – single lane closure	Full road closure (with local access arrangements) *	6.7
1.17	L2002 South	0.3	5.6	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	9.5

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.19	Sallins Bypass	2.5	15	Two measures will be used in this section (depending on the location): - Single lane closure; and - Single carriageway closure – lane crossover.	Lane closure	5.6
1.21	Osberstown Road	0.1	5.2	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	4.8
1.23	Millennium Parkway	2.3	9	Local road widening – single lane open	Lane closure	5.7
1.24	R409	1.2	11.6	Temporary construction platform	Lane closure	2.8
1.26	R447	1.4	11.2	Three measures will be used in this section (depending on the location): - Temporary construction platform; - Local road widening – single lane closure, and - Lane closure.	Lane closure	2
1.27	R448	5.3	6.7	Three measures will be used in this section (depending on the location): - Temporary construction platform; - Local road widening – single lane closure, and - Lane closure.	Full road closure (with local access arrangements) *	21.2

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.28	R448 South	0.4	6.9	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	14.1
1.30	R412	0.3	5.3	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	14.2

*Please note that the length of road that will be closed will be minimised and made appropriate to the area of the works. The closed section will be based on the nearest diversion point and the works required in that area.

The number of construction workers required during the construction phase at the substations is expected to peak at approximately 20 persons for each of the two substation sites.

Crew sizes for the construction of the cable trench, ducts, and the installation of the underground cable is estimated at approximately 10 persons per crew with three crews (teams) working simultaneously. Additionally, it is estimated that there will be approximately up to five traffic management operatives with each crew. The project offices located at the temporary construction compounds will have a maximum of 10 staff (engineers, project managers etc.) at three locations.

The estimated traffic movements associated with installation of the underground cable are presented in Table 5.4. It should be noted though that the ultimate approach will be determined by the appointed Contractor, within the parameters assessed in this EIAR.

Table 5.4: Approximate Estimates of Construction Vehicle movements

	2025			2026				2027				2028		
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Estimated vehicle movements for Construction Phase	5,624	4,684	9,662	2,148	926	320	10	234	780	0	0	0	2,418	0

5.5.4.1 Cable Drum Delivery

The cable will be delivered to site on cable drums with on average 750 m length of cable per drum – the exact lengths will be sized to suit the distance between each joint bay. Each cable drum will be 4.3 m in diameter, and 4 m wide. This will require a large trailer to allow for transport and will be classed as an abnormal load.

There are no high-voltage cable manufacturers in Ireland. Therefore, the cable drums will be delivered by ship from an overseas manufacturer. An assessment has been made of Dublin Port and Belview Port in Waterford for the arrival of these drums. Both ports are well suited for the delivery and transportation from the port to the construction area. However, due to the size of the cable drums these will be an abnormal load. An assessment has been undertaken as part of the Traffic Management Plan for the Proposed Development, but further consultation will be required at the detailed design stage (e.g. the exact timing of the deliveries, from which port, etc).

It is estimated that there will be 187 abnormal load deliveries. Depending on manufacturing details, these could be completed directly from the port to the construction area, or from the port to a construction compound and onwards to the construction area.

Following consultation with an abnormal load specialist (see Appendix 5.1), at this stage it is not foreseen that specific road closures will be required to transport the drums as they will be accompanied by escort vehicles. The escort vehicles are there to ensure the safety of all road users but also to support the oversized load vehicle with overcoming particular obstructions. The requirement and number of escort vehicles and Garda support is at the discretion of the Permits Officer for each council or consenting authority along the route. On agreement of the final number and design of cable drum, agreement of the delivery port, and specific abnormal load vehicle, the consenting authorities can be engaged and the exact requirements for permits can be jointly agreed.

A technical review of the abnormal load assessment has been provided in Appendix 5.1. This technical appendix outlines the options available for the delivery of the cable drums to site. As recognised by the EPA EIA Guidelines (2022), a degree of uncertainty is acknowledged for how the cables will be delivered to the Proposed Development at this stage in the project. The abnormal load assessment does present a range of options based on the current understanding of the issues, which still allows the major and reasonably foreseeable issues to be addressed in this EIAR, allowing the significant adverse effects to be identified and considered. As noted in Chapter 5 of this EIA, the cable will be manufactured overseas and will be designed and manufactured specifically for the Proposed Development. This EIAR has made an assessment of the cable and its impacts based on an informed estimate of the drum size and the likely equipment that will be required to transport the drum from a seaport to the Proposed Development.

Dublin Port, as the largest port on the island, has been assessed; however, there is also the possibility of using Bellview port in Waterford and this has also been included in the assessment. Routes from both ports have been reviewed by abnormal load specialists and both ports are viable options for delivery and transport. As outlined in the technical appendix, there is currently no requirement for significant enabling works along the transport routes identified based on the assessed options for delivery vehicles. It has been determined that transport from either port will not require adjustment of overhead lines and it will pass standard road bridges, and so there will be no likely significant effects as a result. It is assessed that localised tree/hedgerow/vegetation trimming will be required. The existing roadside vegetation is regularly trimmed for safety reasons by Local Councils, landowners, and others and any trimming required for the Proposed Development will be completed outside of the bird nest season (March-August). Therefore there will be no likely significant effect from vegetation trimming.

The abnormal load delivery vehicles outlined in the technical appendix are designed to optimise the pressure on the road surface. There will be no likely significant effects on the road network and surfacing.

As with any abnormal load, there is the possibility of delay from larger, slower-moving vehicles, along with their escorts. The deliveries will be optimised to be completed outside of peak traffic hours (7-9am and 3-6pm). Advance publicity and consultation with TII, and the Local Councils will be undertaken so that the impact of the traffic disruption will be minimised. Depending on route from the ports, the permits will be required from the following Local Councils: Kilkenny, Carlow, Kildare and Meath; and South Dublin and Fingal. The effect from traffic delays will be temporary, slight adverse.

The Traffic Management Plan (Appendix 5.1 of this EIAR) provides a minimum level of requirements for the Contractor. The plan will be further developed during detailed design based on specific design proposals, subject to planning conditions. A Temporary Traffic Management Designer will be appointed and will prepare Detailed Temporary Traffic Management Designs for all locations where works are planned on, or impact on, any public road. Prior to commencing the works, the plan will be updated by the Project Supervisor Construction Stage (PSCS). The appointed PSCS/Contractor of the Proposed Development is required to carry out the Safety Audit on Operational Traffic Management Plans prior to commencing the works. The PSCS shall coordinate the implementation of the developed Traffic Management Plan during construction of the works. The Traffic Management Plan requirements will include the provision of facilities for the safe passage of pedestrian and vehicular traffic and measures to keep the impact of the works on the roads, and local communities and road users, to a minimum. All traffic management controls proposed by the Contractor will be in accordance with standards and guidance documents referenced in the Traffic Management Plan.

5.5.5 Outline Construction Schedule and Timing of Works

Subject to the grant of statutory approvals, it is anticipated that the construction phase will commence in Quarter 2, 2025 with the underground cable element of the Proposed Development becoming fully operational after construction and testing in Quarter 3, 2028.

The works at the Woodland substation are expected to last approximately 24 months while the works at Dunstown substation are expected to last approximately 12 months and will run concurrently with the cabling works.

Construction activities will gradually phase out from pre-construction to predominantly civil activities followed by commissioning and testing. Construction will occur during normal working hours i.e., Monday to Friday 7 am to 7 pm and Saturday from 7 am to 2 pm. There may be localised instances where night-time working is required to facilitate traffic management, however, work outside these hours and days will only be undertaken with prior agreement with Meath and Kildare County Councils.

Clearance of hedgerow, treeline or scrub vegetation, where required, will take place after 31 August and before 1 March in order to protect breeding birds (i.e., outside of the bird breeding season). Clearance may take place during the restricted period, if a suitably qualified ecologist has determined that nesting birds and other protected species are absent.

Any element of the Proposed Development requiring in-stream works in watercourses with fisheries value will be restricted to the fisheries open season (i.e., will only take place during the period July to September), unless with the agreement of IFI. Indicative durations for the proposed works are detailed in Table 5.5. Subject to the grant of consents, it is anticipated that installation of the underground cable will take approximately 42 months in total. However, safety requirements for the installation operations / procedures, detailed design considerations and weather conditions will ultimately dictate the final programme.

The majority of the construction activities are not dependent on outages on the existing transmission system, however, specific activities associated with the connection at the existing Woodland and Dunstown substations on to the existing transmission infrastructure will be planned and programmed into EirGrid’s multi-year outage programme. This is because the existing live infrastructure needs to be switched off during such connection activities. EirGrid, as Transmission System Operator, develops a detailed plan for such outages each year to ensure the safe and efficient undertaking of construction and maintenance activities involving or in proximity to existing infrastructure.

Table 5.5: Indicative Preliminary Construction Programme

Description	Estimated Construction Programme (Months)	2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Proposed Development - Construction Duration																	
Overall Construction Duration	42																
Enabling Works	9 *																
Phase 1: Installation of joint bay and passing bay structures	36																
Phase 2: Excavation and installation of cable ducts	24																
Phase 3: Installation and jointing of cables	24																
Substation works	24																
Testing and commissioning	9																
Energisation and permanent works construction complete	3																

*Enabling works will be undertaken as required during this period. Habitat clearance will be completed outside of the bird nesting season.

The main contract works will be adapted to take account of planning and compliance requirements.

5.5.6 Temporary Construction Compounds

All temporary construction compounds will be secured with hoarding / fencing around their perimeter as appropriate. Temporary construction compounds will include facilities such as construction phase car parking, welfare facilities, and temporary material storage areas as necessary. Any sewage discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licensed contractor to an approved licensed facility.

Where an access road is required, engineering stone fill will be laid and compacted and maintained as required for the duration of the works. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition.

All construction workers will be required to use the designated access / egress routes only. Storage of fuel and refuelling will be undertaken within bunded areas. Water will be brought to site via tankers as required.

Security lighting will be directional and cowled. The Contractor will regularly review security lighting in this regard, to inform adaptive management if necessary and report the monitoring findings regularly to ESB, EirGrid and the local authority.

The temporary construction compounds are all located with the planning application boundary and are as follows:

- Compound No. 1: Chainage 3250, off the R156 – approximately 0.8 ha;
- Compound No. 2: Chainage 11000, off the R156 – approximately 0.7 ha;
- Compound No. 3: Chainage 21000, off the R407 – approximately 0.9 ha;
- Compound No. 4: Chainage 31000, off the R408 – approximately 1.5 ha;
- Compound No. 5: Chainage 35750, off the L2002 – approximately 1.1 ha; and
- Compound No. 6: Chainage 52000, off the R448 – approximately 0.7 ha.

Construction Laydown Areas Nos. 1 and 2 (Chainage 39750, off the Osberstown Road) are two compounds located either side of the railway line. These compounds will not be used for the storage of materials or for site offices but will be used to facilitate the works required adjacent to and under the railway bridge on the Sallins Bypass – the northern compound is approximately 0.2 ha in size and the southern compound is approximately 0.3 ha in size. There will also be a laydown area within the Dunstown substation as shown in the planning drawings, but as that area is within the existing substation site, it is not included in this list.

5.5.7 Construction and Environmental Management Plan

A Construction and Environmental Management Plan (CEMP) is included as Appendix 5.4 to this EIAR and will be implemented during the construction phase in consultation with Meath County Council and Kildare County Council. The CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment, are implemented.

The CEMP will remain a 'live' document which will be reviewed regularly and revised as necessary in consultation with the two Local Authorities to ensure that the measures implemented are effective as part of an ongoing review throughout the construction phase of the Proposed Development. This will confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in the application documentation.

The primary objective of the CEMP is to safeguard the environment, site personnel and nearby sensitive receptors from site activity which may cause harm or nuisance. As such, the CEMP sets out a project framework to ensure that key mitigation measures and conditions set out as part of the planning consent process are translated into measurable actions and are appropriately implemented during the construction phase of the Proposed Development. As part of this framework, transparent and effective monitoring of the receiving environment during construction will be used to inform and manage ongoing activities on site and to demonstrate effectiveness of the measures outlined therein.

ESB will monitor the Contractor's performance on a regular basis and will undertake various compliance checks throughout the duration of the construction period, including the following:

- Review Contractor documents against the requirements of the CEMP;
- Undertake regular audits;
- Ensure site records are checked regularly;
- Set up a Contractor reporting structure; and
- Conduct regular meetings (at least fortnightly) where Environmental Health and Safety is an agenda item.

5.5.7.1 Traffic Management Plan

The appointed Contractor will implement the construction Traffic Management Plan (TMP) included in Appendix 5.1 of this EIAR, in ongoing consultation with Meath County Council and Kildare County Council. The TMP may be subject to iterative updates in consultation with the two Local Authorities, as part of ongoing review and design development throughout the design and construction phases of the Proposed Development. The implementation of the TMP will mitigate potential construction traffic impacts on the public road network. All construction activities, including construction traffic, will be managed through the TMP.

5.5.7.2 Construction Resource Waste Management Plan

Prior to commencement of the Proposed Development, the appointed Contractor will implement the Construction Resource Waste Management Plan (see Appendix 5.5 of this EIAR) which will ensure that optimum levels of waste prevention, reduction, re-use, recycling, and recovery are achieved. As with the CEMP and TMP, the Construction Resource Waste Management Plan may be subject to iterative updates in consultation with the two Local Authorities.

The Construction Resource Waste Management Plan has been prepared in accordance with waste management guidance and principles as outlined in the EPA's '*Best Practice Guidelines For The Preparation of Resource and Waste Management Plans For Construction and Demolition Projects*'[26].

All operations during the construction phase will be managed and programmed in such a manner as to prevent / minimise waste production and maximise upper-tier waste management (i.e., re-use, recycling and recovery) in line with the Waste Hierarchy, where technically and economically feasible.

The requirement to develop, maintain and operate the Construction Resource Waste Management Plan will form part of the contract documents for the Proposed Development and will be updated by the Contractor (as set out above) in advance of the commencement of construction activities on site. Waste sent off site for recovery or disposal will only be conveyed by an authorised waste contractor and transported from the Proposed Development site to an authorised site of recovery/disposal in a manner which will not adversely affect the environment. All construction employees will be required to comply with the obligations under the Construction Resource Waste Management Plan.

5.5.8 Environmental Clerk of Works

The Contractor will appoint an Environmental Clerk of Works (EnCoW), who will have suitable environmental qualifications. The EnCoW will have the necessary experience and knowledge appropriate to the role (including experience of linear infrastructure projects and HDD) and will be a member of a relevant professional body, such as the Institute of Environmental Management and Assessment (IEMA)). The suitability of qualifications/ experience of proposed EnCoW will be confirmed by a senior/ principal environmentalist / ecologist from ESB. The EnCoW will be delegated sufficient powers under the construction contract so that they will be able to instruct the Contractor to stop works and to direct the carrying out of emergency mitigation / clean-up operations. The EnCoW will also manage consultation with environmental bodies including the National Parks and Wildlife Service (NPWS) and IFI. The EnCoW

[26] https://www.epa.ie/publications/circular-economy/resources/best-practice-guidelines-for-the-preparation-of-resource--waste-management-plans-for-construction--demolition-projects.php

will be responsible for carrying out regular monitoring of the CEMP and will report monitoring findings in writing to ESB on a regular basis (at least weekly, but immediately in the case of incidents or accidents).

5.5.9 Tree, Hedgerow, and Treeline Works

5.5.9.1 Approach to Hedgerow, Tree, and Treeline Loss

For off-road sections of the Proposed Development's cable route, a 30m wide construction area has been provided in the Planning Application Boundary. Within this 30m, the permanent easement for the cable route is 5m wide in off-road sections, except between Chainage 0 and 3400, where it is 15m wide (Woodland Corridor). This area also includes permanent access tracks, joint bays and associated hardstanding areas. There will be no clearance of hedgerows/trees beyond the 5m or 15m wide permanent easement (i.e., there will be retention of hedgerows/trees from edge of permanent easement out to the Planning Application Boundary). Where the Planning Application Boundary crosses a hedgerow, trees, or treeline, only the 5m or 15m wide permanent easement will be removed. The remaining length of 25m or 15m of hedgerow, trees, or treelines will be protected from construction.

Trees within the study area (the Planning Application Boundary and an additional 30m buffer) have been assessed to identify which are: be felled; at risk; or to be retained, and each tree is labelled accordingly (see Figure 5.2, Volume 4 of this EIAR). Similarly the length of hedgerows and treelines to be removed have been calculated (see Figure 5.3, Volume 4 of this EIAR).

As part of the mitigation measures for the Proposed Development, replanting of trees, hedgerows, and treelines will be undertaken within the Planning Application Boundary. In addition to the permanent easement of the proposed cable route, it will not be possible to replant trees and hedgerows above joint bays and permanent access tracks. All other areas directly affected by construction such as compounds, temporary access tracks, and passing bays will be replanted.

The species to be planted will be Irish native and will reflect the species that have been felled as far as possible. Please note that ash, which is suffering ash dieback, and non-native species such as beech will not be replanted.

At the time of writing, the latest specification (EirGrid, 2021[27]) stated:

"The easement area shall be cleared, and kept clear, of trees and other vegetation with deep root systems as these may damage the cable".

No replanting will be provided on top of the permanent easement for the cable route (5m or 15m wide depending on the section). However it is possible that some planting may be allowed in the future, with certain species. EirGrid is preparing a draft Over Cable Planting Strategy, which amongst other matters, will identify the types of vegetation which may be planted over a cable easement, is in advance development and may be implemented prior to the construction of the Proposed Development. If implemented, it will further reduce the assessed effect of tree and hedgerow loss but it has not been included in this assessment as it is still draft.

As assessed in this EIAR, where field boundaries are affected, replanting and fencing will be used to ensure the boundaries are maintained between landowners and within existing field systems. Therefore no permanent restructuring occurs of the affected land. As replanting in the permanent easement is not yet feasible, suitable stockproof fencing will be provided with standard agricultural gates provided where required. Access between landowners will not be provided except where required on the joint bay access tracks (e.g. between Chainage 700 and 3400 – access track to Joint Bays 1-4). Double gates will be provided at field boundaries between landowners on these access tracks. The gates will be locked and maintained by ESBN with no access provided to the landowners. Double fencing will be provided between separate landowners for biosecurity between adjoining farms.

[27] EirGrid (2021) 110kV/220kV/400kV Underground Cable Functional Specifications (CDS-GFS-00-001-R1). Available online at https://www.eirgridgroup.com/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf

5.5.9.2 Calculation of Hedgerow, Tree, and Treeline Loss

The extents of tree, hedgerow, and treeline removal within the Planning Application Boundary have been assessed.

The assessment of tree loss (see Appendix 5.6) used a combination of a baseline data set illustrating tree cover (based on LiDAR and aerial imagery via the National Tree Map (NTM), provided by BlueSky International Ltd, flown in 2022), and limited focused site survey work to address limitations which could arise from sole reliance on using the data set in this way. All tree locations have been located using Global Positioning System (GPS) and LiDAR data, obtained from the NTM data. Stem location is based on the centre of an indicative circular canopy spread, so stem location is subject to a small degree of variation. However it is considered that this has not affected the findings of the assessment.

The study area for the tree loss assessment for all trees is the Planning Application Boundary plus a 30m buffer from the edge of the Boundary. This is a precautionary assessment to allow for the spread of tree roots over a wider area.

The limitations for this assessment are that the exact location of tree roots is impossible to identify. The assessment has therefore taken a precautionary assessment in identifying which will be felled, at risk, or retained. Some trees identified for felling may be able to be retained when further site based detailed design is carried out. An example of this are trees shown as removed, which are located on the other side of a ditch feature construction works. The ditch would separate and the tree from the works and it will be retained despite being marked as removed.

The loss of hedgerow and treelines was calculated using the habitat mapping that was completed for the Proposed Development (please see Chapter 10 of this EIAR).

The loss of trees, hedgerows, and treelines is show in Table 5.6 and Table 5.7 below.

Table 5.6: Tree Loss

Category	Trees Removed	Trees at Risk	Trees Retained	Grand Total of Trees in the Study Area
Trees of <5 m in height and a canopy radius of 1 to 3 m	122	238	2399	2759
Trees of 5-10 m in height and a canopy radius of 3 to 6 m	185	370	4056	4611
Trees of 10-15 m in height and a canopy radius of 6 to 9 m	39	97	1280	1416
Trees of 15-20 m in height and a canopy radius of 9 to 12 m	2	4	208	214
Trees of >20 m in height and a canopy radius of >12 m	0	1	14	15
Grand Total	348	710	7957	9015

Table 5.7: Woodland, Hedgerow, and Treeline Loss

Habitat	Linear Features within PAB (ha/km)	Permanent Habitat loss (ha/km)	Temporary Habitat Loss (ha/km)	% Permanent Habitat lost within PAB
WD1- (Mixed) Broad-leaved woodland	2.26 ha	0.21 ha	0.7 ha	9.3
WD2 - Mixed broadleaved/conifer woodland	0.35 ha	0.06 ha	0.17 ha	17.1
WD4 - Conifer Plantation	0.15 ha	0.01 ha	0.12 ha	6.7
WL1 - Hedgerows	33.07 km	0.7 km	3.2 km	2.1
WL2 - Treelines	26 km	0.8 km	1.1 km	3.1

WD1, WD2, and WD4 woodlands have been included in this table for reference.

Within the tree study area, there is 60.83 ha of canopy cover, covering 12.3% of the study area. The Proposed Development will require the removal of 2.21 ha of canopy area of the trees assessed, with a further 4.58 ha of canopy at risk of removal. This would lead to a reduction of the canopy area within the study area from its present 12.3% to 12% if all at risk trees can be retained. The canopy area would reduce to 11%, if all at risk trees are removed.

Out of a total of 9,015 trees within the study area, 348 will be felled (4% of all the trees). A further 710 trees are at risk in the study area (8% of all trees). If combined, where all at risk trees will be felled, 1,058 trees would be removed, representing 12% of the total trees within the study area.

As assessed in Chapter 10 (Biodiversity) of this EIAR, there will be permanent loss of hedgerows and treelines within the Planning Application Boundary. Permanent losses will occur at joint bays, permanent access tracks and over buried cables (permanent easement) where replanting is not possible.

As assessed in Chapter 10 (Biodiversity) of this EIAR, off-site compensatory planting (to a minimum of 130% of permanent habitat extents lost) will be undertaken where in-situ replanting is not possible. The compensatory planting will deliver a net gain in hedgerow and treeline habitat extent.

The significance of effects from the loss of trees, hedgerows, and treelines are assessed in Chapter 10 (Biodiversity), Chapter 15 (Agronomy and Equine), and Chapter 17 (Landscape and Visual).

Seven significant tree 'features' were identified during the site survey (see Table 5.8). These features have been identified as significant based on the professional judgment of Jacobs's arboriculturist (see Chapter 1 of this EIAR for qualifications). The features are not subject to Tree Preservation Orders and have not been identified as veteran trees. However, they have been identified as notable features in the study area and have been highlighted to ensure their retention. Of the seven identified, four will be retained and three are at risk. It is predicted to be able to retain the three at-risk features with the implementation of mitigation measures during the construction phase.

Table 5.8: Impact on Significant Tree Features

Chainage	Target Note/ Area reference	Feature description	Impact from Proposed Development
1000	1	Three large mature trees in hedgerow, tree furthest south is on a townland boundary (TLB)	At risk, likely to be able to be retained with protective measures and adoption of Arboricultural Method Statement
1550	2	Hedgerow along ditch with larger mature trees	At risk, but damage unlikely due to presence of ditch. Potentially some pruning may be required, but unlikely
2400	3	Linear row of mature beech trees	Retained
3050	4	Linear feature of large ash trees	At risk, with some removals required of trees on works (west) side of ditch
24750	5	Larger mature trees along both sides of highway	Retained, works within road will not impact trees
35300	6	Mature trees in the grounds of Church and on the roadside opposite	Retained, works within road will not impact trees
35600	7	Linear feature of roadside trees	Retained, works within road will not impact trees

5.5.9.3 Hedgerow, Tree, and Treeline Mitigation

Within the Planning Application Boundary, where hedgerows and treelines have not been identified for removal (see Figure 5.3), a 10m protection area either side of hedgerows or treelines will be established to protect the habitat. This protection area will be outside of the permanent easement area, but set out perpendicular to it, and will be only within the Planning Application Boundary. This protected area will exclude any storage of soil, temporary access tracks, movement of construction vehicles, and any other construction works. The protected area will be highlighted with a temporary orange mesh barrier fencing, which will be set up to mark the edges of protection area within the Planning Application Boundary area. The protection area will be highlighted in relevant toolbox talks to construction staff and will be monitored by the Environmental/Ecological Clerk of Works.

Where trees are felled, this will be done outside of the bird nesting season and will be inspected for bat roosts prior to felling where identified in Chapter 10 (Biodiversity) of this EIAR. Although no bat roosts were known to be present, to avoid the risk of killing and injuring bats during construction, all trees to be removed will be subject to pre-construction surveys. Any roosts recorded will be felled under a derogation licence. The provision of an alternative roost (bat box) will be confirmed in consultation with NPWS. It will be located in a suitable, undisturbed location, away from the construction works, either within the Planning Application Boundary where works have been carried out or on third-party lands, and with the agreement of landowners.

The felled trees will be removed off-site and taken to a suitable licensed facility as identified in Chapter 19 (Waste) of this EIAR, unless agreement can be reached with the landowner for their own personal use of the wood.

Hedgerows will be replanted with species-rich varieties and with suitable fit for purpose fencing in-line with Teagasc and DAFM guidelines[28]. All planting will be native (only), reflecting the vegetation that has been removed and typical species of the Kildare/Meath landscape (with the exception of ash and non-native species).

A pre-construction confirmatory baseline survey of all hedges to be removed will be carried out to characterise its canopy, understorey and field layer species, and associated features (ditches, earth banks, walls etc.) to inform reinstatement.

Unless otherwise agreed with the Developer (ESBN) and the local authority, the Contractor will reinstate hedgerows and treelines to a species-rich condition (i.e., five woody species per 30 m), comprising only native species. All other sites will be returned as close as possible to their pre-existing condition, using the same woody species removed, under the supervision and direction of the Contractor's ECoW.

Hedging/hedgerow plants will be planted as a staggered double row, six plants per metre with 330mm between rows. Suitable individual protection from browsing animals will be provided by tube, spiral or similar held in place with a short cane. Group protection of new planting may be provided by suitable fencing, but individual plant protection of spirals will be provided to protect against browsing animals. Mulch mats or similar weed suppression materials (restricted to a biodegradable specification) will be used to promote successful establishment.

The appointed Contractor will make orders by the scientific name to ensure native plants are delivered and not a cultivated variety.

Nurseries prefer to grow trees to order, so the Contractor will make the order as soon as possible (up to a year in advance) to ensure the required species and stock specification can be secured.

Consideration will be given to the procurement of planting so that there are suitable lead-in times to ensure that plants are of the right age/height required for when they are planted.

The Contractor will manage the establishment phase of planting (1–2 years) in accordance with online Teagasc guidance (Teagasc, 2020), to include watering in, weed suppression (using biodegradable mulches), and (where required) protection from browsing animals.

Thereafter, the Developer (ESBN) will manage plantings from years 3-5 in agreement with the landowner.

In areas where excavation is required within the root protection zone of retained trees, the use of vacuum excavation will be considered. The feasibility of use and specific methodology will be advised by the project arboriculturist as appropriate. Where high pressure water is used to break up the soil prior to extraction, care shall be taken to avoid high pressure water damage to significant roots as they are exposed. Any machinery used to carry out the process of excavation will be sited outside of the root protection area, or be located on suitable loadbearing temporary ground protection specified to avoid excessive ground compaction. Works will be carried out under appropriate supervision.

When roots between 10-25mm in diameter may be encountered, these will be retained undamaged wherever possible, and protected from desiccation/frost by damp hessian sacking or a similar protective material until the excavation is back filled. Roots below 10mm in diameter are proposed to be trimmed back neatly in line with the edge of the excavation trench using secateurs. Once construction work commences on the Proposed Development specific methodologies that may be required around trees will be implemented to protect retained trees. This information will be contained within an Arboricultural Method Statement (AMS) which will be compiled by a qualified arboriculturalist.

[28] https://www.teagasc.ie/media/website/crops/forestry/advice/stockproofhedge.establishment.factsheet_2.pdf

As noted above, EirGrid has identified precedence from Germany and the Netherlands; for safely planting certain shrubs over High Voltage underground cables. EirGrid has engaged closely with ESBN, and relevant Dutch and German Transmission System Operators across Europe, to understand feasibility of planting over HV underground cables in Ireland. A draft Over Cable Planting Strategy is in advance development in consultation with ESBN, for which the Design Risk Assessment was ongoing at time of writing (including calculations to assess a possible cable de-rating). The draft strategy combines the requirement for a minimum cable burial depth of 1m (to top of Cement Bound Granular Mixture in the cable trench), use of a high performing Root Barrier Membrane, and a strictly defined shrub species list with known maximum root depths less than 1m. It is possible the DRA may conclude that over cable planting cannot be delivered while guaranteeing cable performance and security. There are also risks that the strictly defined shrub species list is not compatible with landowner farm boundary requirements and/or agricultural farm payments. As such, applying a precautionary principle, the possibility of over cable planting in accordance with the draft Over Cable Planting Strategy has not been factored into the assessment, and instead in this assessment offsite compensatory planting is assumed for all permanent losses within the easement (Section 10.5.4 of Chapter 10 of this EIAR).

Subject to consent, the compensatory planting will commence in advance of, or in parallel with, the construction phase. EirGrid has identified candidate sites in Co. Meath and Dublin in consultation with a charity partner, who provides compensatory planting options on third-party lands. Whether these candidate sites or other sites are used for compensatory planting, there will be no planting in semi-natural habitats of significant ecological value, which will be verified by the Ecologist employed the compensation supplier. All planting will comply with planning requirements. The off-site compensatory planting will be entirely outside the Planning Application Boundary. A minimum of 130% compensatory off-site planting will be delivered by the Developer (ESBN), in consultation with EirGrid. The surplus will deliver an overall biodiversity net gain.

To ensure that the proposed mitigation measures remain effective, particularly in regard to reinstatement and compensation, the Contractor and ESBN will collectively deliver a five-year monitoring landscape aftercare regime.

5.6 Operation and Maintenance

5.6.1 Underground Cable

A permanent easement of 5 m will generally be required above the area of the cable trench. This will be increased on certain land holdings for permanent access tracks, joint bays, HDD locations, and the section of cable between Woodland substation and the R156 or other features. This will be discussed and agreed with the affected landowners and are all within the planning application boundary shown for the Planning Application Boundary.

Routine maintenance will be required along the cable route. Access to link boxes and communications chambers will be required on an annual basis for inspection and for any necessary maintenance. ESB will undertake maintenance of the Proposed Development as electricity Transmission System Owner, through its business unit ESB Networks. A crew size of three persons is expected for inspection of the joint bays and associated communications chamber and link box. Traffic management may be required by those joint bay locations positioned in-road or on verges. Access to off-road joint bays will be provided via the permanent access tracks as described in Section 5.5.2.3). Access to these locations will be coordinated with the landowners to minimise disruption. Consultation will be undertaken with the Local Authorities prior to the works commencing. The traffic management will likely be stop-go systems in line with the measures outlined in the Traffic Management Plan.

5.6.2 Substations

Following the construction phase, operation and maintenance of the Woodland and Dunstown substations will be managed by ESB. The substations do not require any personnel for operation. Scheduled maintenance of the substations will continue to occur approximately once a year, in line with the current maintenance schedule. It is expected that approximately five persons would attend each of the substation sites.

5.6.3 Evolution of the Baseline Environment

The evolution of the baseline environment in the absence of the Proposed Development would likely mean existing land management practices in the area will continue and any planning development will occur regardless of the Proposed Development. The County Development Plans and Local Area Plans are the key indicators of how the local baseline environment will evolve in the absence of the Proposed Development. It is assumed that development around the settlements of Kilcock, Clane, Prosperous, Sallins, and Naas, will continue in-line with these plans. This development will result in the loss of agricultural and scrub land on the edge of these settlements. The Proposed Development is largely located outside of the settlements, in agricultural land managed for pasture and arable agriculture. It is assumed that this land will continue to be managed for agricultural purposes. There is the possibility of some development on this agricultural land (e.g., agricultural business expansion, one-off housing, other developments that are unknown at this stage, etc). This development would be in-line with the County Development Plans and other planning requirements, which will generally discourage large-scale development on agricultural land, without a full consideration of the environmental effects.

The continued intensification of agriculture will contribute to the ongoing declines in farmland birds and pollinators and the intensification of grasslands. However, this could be balanced by the Eco-Scheme announced by the Department of Agriculture, Food and the Marine[29]. The Eco-Scheme along with other existing measures encourage farmers to undertake farming with consideration for the environment such as "Space for Nature; Limiting chemical nitrogen use; Planting on native hedgerow/trees; Planting a break crop" and other measures.

Baseline activities for biodiversity include Local Community Biodiversity Action Plans with actions to conserve biodiversity, including for example planting pollinator friendly plants, habitat management of meadows, roadside verges and lawns. Baseline natural events, such as storms, may expose features beneficial to wildlife such as cavities in trees made accessible to bats. EirGrid has ongoing nature restoration projects such as the East West Interconnector (EWIC) Biodiversity Project, started in 2019, to enhance biodiversity at Woodland Substation.

As outlined in Chapter 20 (Climate) of the EIAR, climate change is expected to result in more rainfall, with wetter winters and drier summers. Local annual mean temperatures are projected to increase by as much as 3°C by 2100, with increases in temperature across all seasons. Mean summer maximum temperatures in the region are projected to increase by up to 4.1°C by the end of the century. This would have the effects of increasing flooding in the area and affecting the biodiversity of the area. The impact to Irish biodiversity from increased rainfall and temperature is not fully understood but it is likely that native species will decline as they cannot adapt to the change and non-native species will increase. The EPA states that the predicted impacts from climate change to Ireland are:

- "*changes in wind speeds and storm tracks*
- *increased likelihood of river and coastal flooding*
- *changes in distribution of plant and animal species and in the phenology (the timing of lifecycle events) of native species*
- *water stress for crops, pressure on water supply and adverse impacts on water quality*
- *negative impacts on human health and wellbeing*"[30]

Overall, it is assumed that the baseline environment within the study area will see increased development in-line with the County Development Plans and Local Area Plans. Agricultural practices in the majority of the study area will continue and the effects will be affected by any intensification and the application of measures such as the Eco-Scheme. Climate change is anticipated to result in a decline in native biodiversity; increased flooding; and changes in agricultural practices that cannot be fully predicted at this time. Measures such as the Local Community Biodiversity Action Plans may help to alleviate some of the results of climate change but the effects are uncertain at this time.

[29] https://www.gov.ie/en/service/e5ed0-eco-scheme/
[30] https://www.epa.ie/environment-and-you/climate-change/what-impact-will-climate-change-have-for-ireland/

Table 5.9 presents the assessment of environmental effects against the predicated evolution of the baseline environment without the Proposed Development.

Table 5.9: Assessment of the Evolution of the Baseline

Topic	Evolution of the Baseline in the Absence of the Proposed Development
Chapter 7: Population and Human Health	In the absence of the Proposed Development, rural and urban areas will continue to evolve. The existing rural land and amenity uses surrounding the Proposed Development are likely to remain relatively unchanged; however, existing zoned land will be developed, and development will be consolidated within and around existing urban settlements in line with national planning policies for compact growth. This will result in a further concentration of development around transport nodes (e.g., Kilcock). The economy outlook is positive in the short – medium term because of a resilient labour market, decelerating inflation and rising real incomes. Necessary adjustments to the economy for long term sustainable growth will be influenced / facilitated by public policy. In the absence of the Proposed Development, the health status of the population would be expected to change with time, in accordance with current trends across Ireland, as set out in Health In Ireland (Department of Health 2022).
Chapter 8: Air Quality	In the absence of the Proposed Development, background air pollutant concentrations will remain similar. Construction activities will continue focused in existing urban areas and at the Airport which could leave to short term and long term concentrations of fine particulate matter. Current trends in road traffic emissions will continue in the short term, however increased numbers of electric vehicles will reduce associated air pollutants in the longer term.
Chapter 9: Noise and Vibration	In the absence of the Proposed Development, traffic volumes are expected to increase along existing roads through natural growth and other noise sources in the area (e.g., agricultural machinery, industrial sites, etc.). This would result in an increase in noise levels over and above the current scenario.
Chapter 10: Biodiversity	In the absence of the Proposed Development, the rural and urban areas will continue to evolve. The existing rural land uses surrounding are likely to remain relatively unchanged; however, existing zoned land will be developed. Current biodiversity trends are likely to continue in for pasture and arable agricultural lands. Any effects on biodiversity are likely to be moderated by the environmental and biodiversity policies of the existing and future County Development Plans, Biodiversity Plans, and the overarching pollution control objectives of River Basin Management Plans. **Designated Sites for Nature Conservation:** Designated sites within the ZoI of the proposed Project would likely remain as described in the baseline section of the EIAR into the medium-term future. The current pressures and threats affecting these sites would remain in the absence of the Project. **Habitats and Flora:** Habitats within the ZoI of the proposed Project would likely remain as described in the baseline section of this the EIAR into the medium-

Topic	Evolution of the Baseline in the Absence of the Proposed Development
	term future. The current pressures and threats affecting these habitats would remain in the absence of the Project. **Fauna:** Fauna within the ZoI of the proposed Project would likely remain as described in the baseline section of this report into the medium-term future. The current pressures and threats affecting these species would remain in the absence of the Project.
Chapter 11: Soils, Geology, and Hydrogeology	In the absence of the Proposed Development, the current soils, geological and hydrogeology profiles within the study area are not expected to change.
Chapter 12: Hydrology	In the absence of the Proposed Development, the current hydrological regime within the study area is not expected to change significantly. The watercourses and estuaries in the study area are expected to maintain their current water quality, pressures and ecological status designations. They may see improvement overtime due to inter alia: • Local government planning polices such implementation of SuDS features in the Development Plans. • Improved wastewater management infrastructure along with future strategic infrastructure identified by Uisce Éireann. However, while these are positive projects which should improve the overall water quality and ecological status of rivers in the study area, it is premature to rely on their complete implementation.
Chapter 13: Archaeology, Architectural Heritage, and Cultural Heritage	In the absence of the Proposed Development, other developments requiring road alteration or development in the off-road sections will take place. These other developments may impact below or above ground archaeological, architectural heritage, or cultural heritage assets.
Chapter 14: Traffic and Transport	In the absence of the Proposed Development, traffic volumes are expected to increase along existing roads due to natural traffic growth.
Chapter 15: Agronomy and Equine	Agricultural practices by their nature change over time. In the last one hundred years there have been considerable changes in farming in Ireland, with average farm sizes increasing while the numbers of people involved directly with farming has decreased, with increased mechanisation and intensification. This trend is likely to continue. In addition, the area farmed in the country had decreased in the last 100 years from 216,000 ha in 1915 to 197,450 ha in 2020. This is due to development of the various towns and villages in the country, but also due to the development of infrastructure. In the absence of the Proposed Development, these trends are likely to continue.
Chapter 16: Material Assets	In the absence of the Proposed Development, the current utilities and services identified will continue to exist and planned / permitted infrastructure will be built out. General improvements and changes along the route will occur, such as new connections to the various services driven by legislative and local policy

Topic	Evolution of the Baseline in the Absence of the Proposed Development
	driven measures as well as new service lines / connections associated with new development.
Chapter 17: Landscape and Visual	In the absence of the Proposed Development, the rural parts of the study area are likely to remain predominately agricultural with limited / discrete changes to the landscape and visual environmental – including the introduction of inter alia solar farms into the landscape. Around urban areas and zoned land, further development will occur within the next five to 10 years consolidating an urban / peri urban landscape.
Chapter 18: Risk of Major Accidents and/or Disasters	In the absence of the Proposed Development, it is anticipated that climate conditions will remain the same. Risk of natural disasters will not change except for those worsened by climate change (e.g. storms). Industrial and Seveso sites in the study area are likely to continue to operate and will do so in-line with national safety and emissions legislation.
Chapter 19: Waste	In the absence of the Proposed Development, available capacity in waste management facilities will continue to be used by new developments and infrastructure, in line with planning commitments but guided by the existing and future National Waste Management Plans.
Chapter 20: Climate	In the absence of the Proposed Development, it is anticipated that climate conditions will remain the same. Future climate effects will be influenced by structural and behavioural change to enable the transition to a climate neutral, climate-resilient country consistent with the overarching government's Climate Action Plans, as filtered down to regional plans and policies.

5.7 Health and Safety Considerations

5.7.1 Project Supervisor for the Construction Stage

A Project Supervisor for the Construction Stage (PSCS) will be appointed for the Proposed Development when contractors are appointed to carry out the works. The PSCS will be responsible for developing the construction stage Health and Safety Plan, coordinating the works of Contractors and providing the Project Supervisor Design Process (PSDP) with information required in the Safety File.

5.7.2 Project Supervisor Design Process

The PSDP ensures coordination of the work of designers throughout the Proposed Development. This is to ensure they are addressing and coordinating safety and health matters from the very early stages of the Proposed Development.

5.8 Reinstatement and Decommissioning

All temporary works such as passing bays, HDD and construction compounds, and working areas within the planning application boundary will be restored to their current land use. The materials such as temporary culverts of roadside drains or stoning will be removed in the reverse of the process described above. Planting will be provided where existing vegetation has been removed. Species-rich hedgerows will be provided where existing hedgerows are affected to seek to improve on existing biodiversity levels. Trees will also be provided where it is appropriate ensuring sufficient set-back from the cable route.

Permanent works will include the joint bays and 12 permanent access tracks, and a 3 m hardstanding area around the off-road joint bays. These areas will be maintained by ESB as necessary.

All affected landowners will be provided with detailed mapping which provides the location of permanent works on their land. The location of the cable route and associated permanent works will be provided to all statutory undertakers, Meath and Kildare County Councils, and will be included on ESB's register for its 'Dial Before You Dig' programme[31].

The works within the substations will also be permanent features.

Affected roads will be resurfaced in agreement with Meath and Kildare County Councils in line with the principles of the Purple Book.

It is not intended to decommission the proposed electricity infrastructure. Equipment will be replaced but decommissioning is not intended. In the highly unlikely event that decommissioning is required, the effects would be similar but less than those assessed during construction of the underground cables.

[31] https://www.esbnetworks.ie/staying-safe/contractor-safety-/digging-and-excavation-work

6. Planning

This chapter of the EIAR provides a summary of the relevant policy which underpins the Proposed Development at European Union (EU), national, regional, and local level. It is considered in further detail in the separate Planning Report accompanying the application.

6.1 National Plans and Policies

It is recognised at international and European level, that climate change commitments mean that power generation, transport and heat have increasingly had to derive power from sustainably produced electricity. Therefore, national and regional policy place a strong emphasis on the need for new energy systems and transmission grids. This section outlines how the Proposed Development accords with national, regional and local planning policy. A full policy appraisal can be found in the accompanying Planning Report.

The following are those national-level plans, policies and strategies relevant to the Proposed Development:

- **Project Ireland 2040 – National Planning Framework (NPF) –** Sets out key policy principles via National Strategic Outcomes, which include supporting and strengthening the economy and a transition to a low carbon, climate resilient society, providing access to quality services, and achieving sustainable growth and better environmental resource management. It states that Ireland's National Energy Policy is focused on three pillars: sustainability, security of supply, and competitiveness.

- **National Development Plan (NDP) 2021-2030 –** represents the national capital investment strategy plan for delivering the NSOs of the NPF, achieved via Strategic Investment Priorities to the year 2030. A core strategic investment priority is a focus on decarbonising energy, in order to 'create greater links between different energy carriers (such as electricity and hydrogen); infrastructures; and consumption sectors (such as transport and heating).' Doing so requires a coordinated programme of investment in, among other things, 'an expanded and strengthened electricity transmission and distribution network', to support an increase in both renewable and conventional electricity generation.

- **National Energy and Climate Plan (NECP) 2021-2030 –** a ten-year plan mandated by the EU to each of its Member States, in order for the EU to meet its overall greenhouse gas emissions targets. The plan establishes key measures to address the five dimensions of the EU Energy Union: decarbonisation, energy efficiency, energy security, internal energy markets and research, innovation and competitiveness. The Proposed Development is compliant with the NECP.

- **Government White Paper –** Ireland's Transition to a Low Carbon Energy Future 2015-2030 **–** sets out a framework to guide Ireland's energy policy development. The Proposed Development is considered to be an 'enhanced and extended energy infrastructure' development, which will be critical for economic development, regional development and the secure provision of energy and other services for the Irish society and economy.

- **Climate Action and Low Carbon Development (Amendment) Act 2021 and Climate Action Plan (CAP) 2021, 2023 and 2024 –** Commits to achieving 51% reduction in overall greenhouse gas emissions by 2030 and setting Ireland on a path to reach net-zero by no later than 2050. States that in order to do so there is a need for transformational policies, measures and actions, including strengthening the grid.

The Proposed Development facilitates the delivery of all three pillars of national energy policy outlined in the NPF: sustainability, security of supply, and competitiveness, and aids in moving Ireland towards a low carbon, climate-resilient society as outlined in the National Strategic Outcomes.

It also delivers on the NDP Strategic Development Priorities through the delivery of an expanded and strengthened electricity transmission and distribution network. It is compliant with the NECP and is considered to be an 'enhanced and extended energy infrastructure' development in terms of the Government White Paper.

Finally, in terms of the Climate Action and Low Carbon Development (Amendment) Act 2021 and Climate Action Plan (CAP) 2021, 2023, and 2024, the Proposed Development and EirGrid's wider programme of work, outlined in the roadmap 'Shaping Our Electricity Future', facilitates climate action via strengthening of the electricity grid.

6.2 Regional Plans and Policies

In terms of the regional context, the Proposed Development is located in the Eastern and Midlands Region of Ireland and, therefore, the relevant regional policy is the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Regional Assembly (EMRA) 2019-2031 (Hereafter referred to as the RSES). The RSES locates the majority of the project, excluding a small portion in the north, within the Dublin Metropolitan Area. Key points from the RSES are as follows:

- Climate action is one of three key principles underpinning the RSES vision to create a sustainable and competitive region, to be achieved by securing the transition to a low carbon economy. The RSES expresses support for of the NPF, seeking 'Alignment of growth with enabling infrastructure' to ensure quality infrastructure provision and capacity improvement is provided in tandem with new development.

- The RSES states, in relation to the Dublin Metropolitan Area, that the 'Development of the energy distribution and transmission network in the region will enable distribution of more renewable sources of energy to facilitate future energy demand in strategic development areas'. The RSES specifically identifies the need for the 'expansion and upgrading of the grid with the aim of increasing the share of variable renewable electricity that the all-island system can accommodate'.

- The EMRA RSES expresses support for EirGrid's Implementation Plan 2017 – 2022 and Transmission Development Plan (TDP) 2016 and any subsequent plans prepared during the lifetime of the RSES, while it specifically references the Proposed Development, stating 'Support reinforcement of the Greater Dublin Area between Dunstown and Woodland substations to increase the capacity of the often congested and highly loaded Dublin transmission network to enable the transmission system to safely accommodate more diverse power flows and also facilitate future load growth in the area'.

The Proposed Development delivers on core objectives of the RSES to facilitate the transmission of renewable energy across Ireland and delivers grid improvements that will both align with and facilitate the economic and population growth envisaged within the EMRA RSES. The fact that the Proposed Development is specifically referenced within the EMRA RSES also serves to demonstrate the importance of delivering this specific grid infrastructure improvement to the wider region.

6.3 Local Plans and Policies

This section outlines planning policy documents and key policy drivers against which the application for approval will be assessed. Key plans are as follows:

- Kildare County Development Plan (KCDP) 2023-2029 **–** The KCDP recognises the importance of providing a strong electricity transmission network for the environmental, social and economic viability of the county, and states that EirGrid and ESB will generally be supported in delivering energy transmission projects in the county. The KCDP also specifically mentions the Proposed Development, stating 'The Maynooth 220 kV and Dunstown substations are both electrical substations of regional significance and the Council will seek to support any reinforcement of the Greater Dublin Area between Dunstown and Woodland substations.' (p245).

- Meath County Development Plan 2021 – 2027 (MCDP) **–** The MCDP emphasises the importance of reliable service provision and infrastructure for sustainable future growth and asserts that the strengthening of the national grid is important to improve security of supply for the domestic, residential and enterprise market as well as attracting high-end enterprise.

- Kilcock Local Area Plan (KLAP) – The Proposed Development is located within the Kilcock Local Area Plan (KLAP) Boundary. There is currently no Kilcock Local Area Plan in force.

- Naas Local Area Plan (NLAP) 2021-2027 – The Proposed Development passes through the functional area of the NLAP. Policy I4 – Energy and Communications, sets out a number of objectives in relation to the energy transmission infrastructure, including supporting the statutory providers of national grid infrastructure. It also seeks to ensure the undergrounding of all electricity, telephone and television cables in the town including the town centre and in residential and amenity areas.

- Sallins Local Area Plan (SLAP) 2016-2022 – The Proposed Development is located within the Sallins Local Area Plan (SLAP) boundary. There is currently no Sallins Local Area Plan in force. The previous SLAP states that a more sustainable energy sector incorporating power generation and energy efficiency in all sectors is vital for reducing greenhouse gas emissions, requiring a focus on renewable energy generation and improving energy efficiency. It also states, 'The availability of appropriate energy and communications infrastructure is essential for the successful future development of the town'.

The Proposed Development accords with the policies within the respective County Development Plans and Local Area Plans. Both County Development Plans identify the clear need for improved energy grid infrastructure alongside new development, and outline general policies that facilitate grid infrastructure improvements, with the Kildare plan outlining support specifically for the Proposed Development. The respective LAPs also express support for such improvements to the electrical grid. Taking this into account, the Proposed Development accords with local planning policy.

7. Population and Human Health

7.1 Introduction

This chapter of the EIAR assesses the effects of the Proposed Development on population and human health during the construction phase and operational phase. This chapter describes and assesses the likely significant effects arising from the Proposed Development on population and human health, based on the information presented in Chapter 5 (Proposed Development Description) of this EIAR.

This assessment has considered and assessed potential impacts in terms of how the Proposed Development may affect the way in which people live, work, relate to one another, organise to meet their needs, and generally operate as members of society. In doing so, this assessment considers demographics, community composition, land use, the location of residential, commercial, community receptors and recreational (including tourism) amenities as well as economic activity in general.

7.2 Methodology

The following sections outline the parameters considered in respect to establishing study area(s), in compliance with relevant guidelines, policies and legislation, the data collection and collation undertaken, as well as the appraisal method(s) for the assessment of impacts on people and communities.

This assessment of the potential impacts on people and communities as a result of the construction and / or operation of the Proposed Development comprises the assessment of potential impacts on the following assessment topics:

- Population:
  - Demographic and Economic Profile;
  - Land Use; and
  - Tourism, Recreation and Amenities.
- Human Health.

7.2.1 Study Area

The study area(s) for this assessment of the potential impacts on people and communities during the construction and operational phases of the Proposed Development has been determined with these assessment topics in mind. Given the different spatial scales that apply to assessment topics, different study areas have been set accordingly, as follows:

- For the assessment topics of Tourism, Recreation and Amenities, the study area comprises an area of 300 m from the edge of the Planning Application Boundary (see Figure 7.1). Based on professional judgement, 300 m is considered to be the likely distance in which potential impacts associated with air quality, noise and vibration, visual and traffic are likely to occur and potentially combine to have a potential impact on amenity;
- For the assessment topic of Land Use, the study area consists of the footprint of the Proposed Development (i.e. within the Planning Application Boundary);
- For the assessment topic of Demographic and Economic Profile, the study area comprises the area of County Meath and County Kildare, as these are the areas in which the Proposed Development is to be

situated and therefore likely to be the extent to which potential impacts on the economy are experienced; and

- For the assessment topic of Human Health, the study area comprises is illustrated in Figure 7.1 and comprises a 300 m radius extending from the proposed cable route and substations. The study area is considered to be sufficient to capture the exposure impacts of the Proposed Development such as construction noise and air pollution, as well as encompassing any potential impacts on land uses. Beyond this distance there is no likelihood of exposure to significant noise or air pollution impacts from the Proposed Development, and the intervening distance and land use is likely to reduce the physical and psychological influence of the Proposed Development on local communities, and therefore no significant effects on human health are anticipated. The EPA Guidelines (2022) identify 'sensitive receptors' as neighbouring landowners, local communities and other parties which are likely to be directly affected by the Proposed Development. In particular, homes, hospitals, hotels and holiday accommodation, schools and rehabilitation workshops and commercial premises are noted. Regard is also given to transient populations including drivers, tourists, cyclists, and walkers.

7.2.2 Relevant Guidelines and Policy

The methodological approach for this assessment has been undertaken with in compliance with following relevant guidelines, policies and legislation:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022);
- Environmental Impact Assessment of Projects. Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Government of Ireland 2018);
- EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects (Fáilte Ireland, 2023);
- Meath County Development Plan 2021-2027;
- Kildare County Development Plan 2023 – 2029;
- Human Health: Ensuring a High Level of Protection. A reference paper on addressing Human Health in Environmental Impact Assessment (hereafter referred to as the IAIA and EUPHA Guidance) (International Association for Impact Assessment (IAIA) and European Public Health Association (EUPHA), 2020);
- Institute of Public Health Ireland (IPH) Health Impact Assessment Guidance for Ireland and Northern Ireland (IPH, 2021); and
- Determining Significance for Human Health in Environmental Impact Assessment (Pyper et al. on behalf of IEMA, 2022).

The European Commission's Guidance on the Preparation of the Environmental Impact Assessment Reports (European Commission, 2017) notes that '*human health is a very broad factor*' that is '*highly project dependent*'. It states that:

> '*The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living*

conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study.'

7.2.3 Data Collection and Collation

A desktop study (December 2023) was undertaken to assess all relevant information. The following data sources and guidance records were used (accessed December 2023):

- Central Statistics Office;
- County Kildare Local Economic and Community Plan (LECP) 2016-2021[32];
- County Meath Local Economic and Community Plan 2023-2029[33];
- EirGrid Evidence Based Environmental Study 9 Settlement and Landuse (EirGrid, 2016)[34];
- GeoDirectory Ireland;
- Kildare County Council Development Plan 2023-2029;
- Meath County Council Development Plan 2021-2027;
- Ordnance Survey of Ireland (OSI) mapping and aerial photography; and
- Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Region (2019-2031)[35].

Data collated during the early stages of the Proposed Development, such as the identification of large urban settlements within the study area, current land use and land zoning for the area, were used in the preparation of this chapter.

7.2.4 Appraisal Method for the Assessment of Impacts

7.2.4.1 Tourism, Recreation and Amenities

'Amenity' describes the perceived character or attractiveness of an area in which people live, work, or socialise. Changes in the amenity of an area (as a result of a development or project) can affect how people perceive or recognise their communities or how they go about their daily routine or use community / recreational facilities and / or commercial resources.

Factors that influence the amenity of an area include those that contribute to the 'look and feel' of a particular location or space. As such, potential impacts on air quality, noise and vibration, visual and traffic resulting from the construction and / or operation of the Proposed Development are important contributing factors that are most likely to determine whether a considerable or notable change in amenity is likely.

Therefore, the assessment of potential impacts on amenity essentially comprises an in-combination assessment of the findings of the following accompanying environmental assessments of the Proposed Development within this EIAR:

- Chapter 8 (Air Quality);

[32] https://kildarecoco.ie/AllServices/Community/KildareLCDC/LocalEconomicandCommunityPlan/
[33] https://www.meath.ie/system/files/media/file-uploads/2024-01/Meath%20Local%20Economic%20and%20Community%20Plan%202023-2029_0.pdf
[34] https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Evidence-Based-Environmental-Study-9-Settlement-and-Landuse.pdf
[35] https://emra.ie/final-rses/

- Chapter 9 (Noise and Vibration);
- Chapter 14 (Traffic and Transport); and
- Chapter 17 (Landscape and Visual).

Potential impacts on amenity have been considered during the construction and / or operational phase of the Proposed Development and have been considered and assessed using professional judgement (aided by the EPA Guidelines (EPA 2022)), whereby only significant residual impacts (either negative or positive), as reported by these environmental assessments are considered within the assessment of potential impacts on amenity.

7.2.4.2 Land Use

The assessment of potential impacts on land use considers and assesses the implications of the temporary and permanent land take required from residential and commercial receptors and community / recreational facilities during the Construction and / or Operation Phase of the Proposed Development. Temporary land take is typically short-term and only required for the duration of the construction phase. However, permanent land take is long-term and often is required from the outset of construction activities and throughout the lifetime of the Proposed Development.

Given the nature of the Proposed Development, there is not expected to be any permanent land take requirements from private residential and commercial properties or public community lands during the operational phase. Therefore, all potential impacts are considered to be temporary land take requirements that will occur during the construction phase only.

Only potential impacts on the land use of private land holdings and public community lands are included in this assessment. All potential impacts on the land use of agricultural businesses (including land holdings) are considered in Chapter 15 (Agronomy and Equine) of this EIAR.

7.2.4.3 Demographic and Economic Profile

The assessment of potential impacts on the local economy as a result of the Proposed Development is considered to be a high-level assessment of the potential impacts of the Proposed Development, especially on local businesses in the Study Area. This assessment is not considered to be an attempt to calculate or measure the economic benefits or otherwise of the Proposed Development. A wider economic assessment has therefore been scoped out of this assessment. Potential impacts on local businesses and the proposed mitigation measures are assessed below.

7.2.4.4 Human Health

A desk-based study of the available data was undertaken (December 2023) to identify the populations of interest and characterise them in terms of their population size, socio-economic status, burden of disease and the distribution of those existing factors.

Baseline data from the assessments of other chapters in this EIAR were then reviewed to understand baseline determinants of health. Information on air pollution levels and existing noise was obtained from Chapter 8 (Air Quality) and Chapter 9 (Noise and Vibration) of this EIAR, respectively. Other relevant information on access to community and health facilities, facilities used for outdoor recreation, land use and local economic conditions as outlined in this chapter. Information on walking and cycling facilities and existing traffic patterns were obtained from Chapter 14 (Traffic and Transport) of this EIAR. These were considered the most relevant aspects of the environment to understand in terms of human health.

Consultation is identified as an important part of the health assessment process as identified within the IPH Guidance (Pyper et al. 2021) and IEMA Guidance (IEMA 2022a). This approach is considered proportionate for the nature of the Proposed Development.

Table 7.1 identifies the health determinants which are considered to potentially be affected by the Proposed Development, and are therefore scoped in for further assessment, or which have been scoped out.

Table 7.1: Summary of Health Scope

Determinant	Scoped into Assessment?	
	Construction	Operation
Open space, leisure and recreation	Yes	Yes
Transport modes, access and connections	Yes	No
Employment and income	Yes	No
Air quality	Yes	No
Noise and vibration	Yes	No

EirGrid requires all electricity infrastructure to operate under existing public exposure guidelines from the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and as such, there will be no direct impact on human health from electromagnetic fields (also known as EMF). As a result, they are scoped out of further assessment within this chapter as no significant effects on health as a result of exposure to EMF are considered likely.

7.2.4.5 Determination of Sensitivity, Magnitude and Significance

There is no prescribed method for determining the sensitivity (of receptors), magnitude of change, and / or significance of impacts in respect to the assessment of potential impacts on people and communities. Therefore, professional judgement and past experience on other major infrastructure projects has been used, aided by, and in accordance with, the EPA Guidelines (EPA 2022) to establish an appraisal method for the assessment of potential impacts and determine the sensitivity of receptors, magnitude of change, and / or significance of potential impacts. Table 7.2 presents the sensitivity of receptors for each of the assessment topics.

Table 7.2: Sensitivity of Receptors Being Assessed

Assessment Topic	Receptors	Level of Sensitivity
Tourism, Recreation and Amenities	Residential, commercial, community and recreational receptors	High
Land Use	Residential, commercial, community and recreational receptors	High
Demographic and Economic Profile	Local economy and commercial receptors	High
Human Health	People living in or visiting the Study Area	High

Table 7.3: Magnitude of Effects

Magnitude	Description of Magnitude
Very Low	No change would occur as a result of the Proposed Development which would alter the exiting baseline conditions (adverse or beneficial)
Low	Change in an environmental and/or socio-economic factor(s) as a result of the Proposed Development which would not result in change to existing baseline conditions at a population level, but may still result in an individual impact (adverse or beneficial)

Magnitude	Description of Magnitude
Medium	Change in an environmental and/or socio-economic factor(s) as a result of the Proposed Development which would result in a medium change to existing baseline conditions (adverse or beneficial)
High	Change in an environmental and/or socio-economic factor(s) as a result of the Proposed Development which would result in a high change to existing baseline conditions (adverse or beneficial)
Very High	Change in an environmental and/or socio-economic factor(s) as a result of the Proposed Development which would result in a major change to existing baseline conditions (adverse or beneficial)

The significance of impacts matrix, as set out in Table 7.4 (based on the EPA Guidelines) was used, together with professional judgement, to determine the significance of potential impacts associated with the construction and operational phases of the Proposed Development.

Table 7.4: Significance Matrix

		Sensitivity				
Magnitude		**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Very Low	Imperceptible	Not Significant	Slight	Slight	Slight
	Low	Not Significant	Slight	Moderate	Moderate	Moderate
	Medium	Slight	Moderate	Moderate	Significant	Significant
	High	Slight	Moderate	Significant	Very Significant	Profound
	Very High	Slight	Moderate	Significant	Profound	Profound

7.3 Baseline Conditions

The Proposed Development is located in County Kildare and County Meath. The full description of the Proposed Development is provided in Chapter 5 of this EIAR.

For the purposes of this chapter, the assessment of the receiving environment has been conducted with regard to the Study Area, settlements in which the Proposed Development is situated, as well as those within close proximity to it, which are likely to be influenced. Information on demography, land use, tourism community and amenities, economic activity and employment, and human health have been analysed and considered to ensure a robust understanding of the population within the Study Area.

7.3.1 Study Area

The Study Area lies within the Mid-East Region of Ireland. Project Ireland 2040 describes this region as having experienced high levels of population growth in recent decades, at more than twice the national growth rate. The Proposed Development will be primarily situated within the public road network with a number of locations off-road in agricultural lands, and at the existing Woodland and Dunnstown substations.

7.3.2 Demographic Profile

Demographics are used to study the characteristics of a population at a specific point in time. In this assessment, demographics such as population, housing, health and employment have been examined.

Central Statistics Office (CSO) census 2016 data have been used to collate the most recent statistics. While these census statistics are now some seven years old, 2022 results remain preliminary and so having regard to the nature, extent and general pattern of development in the receiving environment, these figures are representative of population and settlement in the identified area.

According to CSO 2016 census data, the population of County Kildare was 222,504 persons, 110,546 of which were male, and 111,958 were female. The population of County Meath in 2016 was 195,044 persons, 96,776 of which were male, and 98,268 were female. The populations of both counties have increased by approximately 5.9% since 2011. According to the Eastern and Midlands Regional Spatial and Economic Strategy (RSES), population in the region grew by 15% from 2006 to 2016, exceeding the state average growth rate of 12% over the same period.

The population is predicted to increase further with an overall population growth allocation of 500,000 for the region by 2040. The RSES set out population projections for the counties which are illustrated in Table 7.5.

Table 7.5: RSES Population Projections (RSES 2022)

Local Authority	2016	2026 low	2031 high
Kildare	222,500	249,000-254,000 12-14% increase from 2016	259,000-266,500 16-20% increase from 2016
Meath	195,000	216,000-221,000 11-13% Increase from 2016	225,000-231,500 15-19% Increase from 2016

The nearest settlements to the Proposed Development and their populations are illustrated in Table 7.6.

Table 7.6: Total Population of the nearest Settlements to the Proposed Development (RSES 2022)

Settlement	Population
Kilcock	6,093
Prosperous	2,333
Sallins	5,849
Naas	21,393

Outside of the settlements, much of the population live in linear communities alongside regional and local roads. In addition to residential populations, these settlements host community facilities such as schools, churches, parks, recreational, employment and retail areas.

7.3.3 Land Use

The majority of the underground cable will be installed in the public road network. Off-road sections are proposed at particular locations to enable the works and avoid constraints. According to Corine Data 2018, the majority of the off-road sections are located in pasture and arable land comprising open agricultural greenfield (refer to Chapter 11 (Soils, Geology, and Hydrogeology) of this EIAR).

A number of areas across Kildare and Meath have been zoned for development, including a number of business and industrial zones such as Ladytown Business Park between Naas and Newbridge and a large tourism-related zone to the south of Kilcock. All of the main settlements have approved applications for strategic housing developments of more than 100 houses, with some developments up to 400 houses some of which have either been constructed, are under construction, or are at the pre-development planning stage. Areas of discontinuous urban fabric are associated with the towns / villages of Kilcock, Prosperous, Clane, Naas and Two Mile House. The two substations of Woodland and Dunstown are located in relatively remote areas around Two-Mile House and Batterstown respectively. These areas are largely agricultural with the exception of one area of commercial peat extraction located to the north of Prosperous.

Findings from the EirGrid's evidence-based Environmental Study on settlement and land use (EirGrid, 2016) have established that there is no evidence of any significant impact arising from the construction or existence of transmission infrastructure in terms of patterns of settlement and land use. Notwithstanding, the study concluded that transmission infrastructure can be a local physical constraint on subsequent development. As such, land-use, communities and supporting social infrastructure within and linked to the Proposed Development were evaluated.

7.3.4 Tourism and Recreation

Counties Kildare and Meath are located within the Eastern and Midlands region, having the benefit of close proximity to Dublin, providing national and international connectivity. The eastern counties have a very strong tourism and leisure offering, including heritage sites of international importance, infrastructure for outdoor recreation and areas of natural beauty.

Tourism is one of Ireland's most vital economic sectors. Tourism and recreation are noted as key sectors in both the economic and social development in the Kildare County Development Plan (CPD) and Meath's CDP, providing opportunities for employment and wealth generation, facilities and infrastructure that enhance the quality of life for residents. Kildare's Tourism Strategy 2022-2026 states that in 2019 tourism contributed €141.6 million to visitor spend and supported 3,823 jobs in tourism in the county.

Fáilte Ireland's 'Destination Towns' Initiative[36] highlights the importance of maintaining and enhancing the quality of place that visitors experience. Funding has been allocated through the local authorities as part of the €15.5 million 'Destination Towns' Initiative. A list of destination towns has been established and includes Kildare town in Co. Kildare and Trim in Co. Meath. The Destination Towns' Initiative is part of the National Tourism Development[37] which aims to boost the attractiveness and tourism of towns nationally.

Kildare and Meath have a range of natural and built heritage attractions and a variety of festivals and events aimed at attracting visitors to the counties. Festivals in Meath include Púca-Halloween festival (October); Fairyhouse racecourse festivals; as well as events associated with the Boyne Valley and Newgrange (on the northside of the county). Festivals and events in Kildare include the annual Derby Festival (July), St. Brigid's Festival (February), Punchestown Festival (April); Greenfields (May). Many other events and festivals occur within both counties.

Meath has traditionally been known as the 'Royal County', being the seat of the ancient Kings of Ireland to the Hill of Tara and the birthplace of Ireland's ancient east (Fáilte Ireland). Some of Ireland's most important archaeological monuments are located here which attracts a large number of tourists every year.

Kildare's major attractions are the equestrian facilities and centres, it is famous around the world for its equine facilities at the Irish National Stud, and its picturesque landscapes. Surrounding towns and villages benefit from these attractions and welcome tourists every year. Horse racing in Kildare takes place at the Curragh, Punchestown, and Naas.

Significant tourism and recreational activities in the counties include festivals and equestrian, golfing, and outdoor adventure activities including angling and water sports.

A number of important tourism centres including castles, racecourses, golf clubs and equestrian centres are located within 300 m of the proposed underground cable centreline.

Significant tourism venues include:

- Larchill Arcadian Gardens (Tourist Destination), Kilcock, Co. Kildare;
- St Bridget's Well (Religious Destination) Calgath, County Meath;
- Firmount House (Events Venue), Firmount Demesne, Co. Kildare; and
- Jigginstown Castle, Naas West, Co. Kildare.

[36]https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/Failte-Ireland-Tourism-Destination-Towns-Guidelines.pdf?ext=.pdf
[37] https://www.failteireland.ie/about-us.aspx

Equestrian facilities also include:

- The Cottage Stud, Knockanally, Co. Kildare;
- Damastown Stud, Ballybrack, Co. Kildare;
- Terr Grove Stud, Painestown, Co. Kildare; and
- Rheindross Stud, Rathcoffey, Co. Kildare.

These tourist destinations support employment and aid the growth of the local and regional economy, and this has been considered in the routing of the Proposed Development. There will be no direct impacts to any of the facilities listed above.

7.3.5 Community and Amenities

There are a wide range of publicly accessible community, sports and arts facilities across Kildare and Meath, with nearly two-thirds of these facilities within the urban areas of Kildare County.

The alignment of the Proposed Development passes through both rural and urban areas along its length. The closest settlements to the Proposed Development are Kilcock, Prosperous, Sallins and Naas. There are 32 community and 40 commercial receptors located within 300 m of the underground cable route, outlined in Appendix 7.1. All residential, commercial, and community (and recreational) receptors are shown in Figure 7.1. The Proposed Development is routed in close proximity to or within a number of built-up areas, such as the western edge of Kilcock the eastern edge of Prosperous and the western / southern extent of Sallins and Naas.

The Proposed Development passes through a more industrial and larger-scale commercial section around Naas before continuing through the residential community areas of Prosperous, Sallins and Kilcock. A large number of schools, sports and GAA clubs are located around Naas, attracting large numbers of residents from local communities during peak times of sports matches.

7.3.6 Economic Profile

7.3.6.1 Employment

According to the most recent CSO 2016 census, 83,259 people were employed in County Meath and 95,947 were employed in County Kildare. Table 7.7 shows employment by industry in County Kildare and County Meath.

Meath Local Economic and Community Plan (LECP) highlighted that the county has proportionately more workers in agriculture / farming compared with the country as a whole. County Kildare LECP states that the highest proportion of the Kildare workforce is employed in the wholesale, retail, transportation and food service sectors, higher than the national average.

Table 7.7: Employment by Industry per county 2016

Industry	County Kildare	Percentage	County Meath	Percentage	National Average %
Agriculture, Forestry and Fishing	3,190	3.3	3,734	4.5	4.4
Building and Construction	5,838	6.1	6,147	7.4	5.1
Manufacturing industries	11,310	11.9	9,568	11.5	11.4
Commerce and Trade	25,524	26.6	20,332	24.4	23.9

Industry	County Kildare	Percentage	County Meath	Percentage	National Average %
Transport and Communications	8,272	8.6	7,975	9.6	8.5
Public administration	6,163	6.4	4,776	5.7	5.3
Professional services	21,919	22.8	17,895	21.5	23.5
Other	13,731	14.3	12,832	15.4	17.8
Total	**95,947**	**100**	**83,259**	**100**	**100**

The LECP for both County Kildare and County Meath state that the counties are in the top three from which workers commute into Dublin city and suburbs.

County Meath had a resident workforce of 82,605 persons while the total number of jobs recorded in the county was approximately 50% of this figure at 41,757. A total of 82% of the working-age population are employed, higher than the average for the State and the Greater Dublin Area. The unemployment rate is considerably lower. More than 53% of people commute outside the county as the rapid growth is not matched by the growth of a sustainable employment base, illustrating a clear disparity in the location of jobs in the Municipal Districts.

Kildare had the 6th highest rate of outbound commuters in the State. Of the 95,345 workers residing in Kildare, 39.1% commute to areas outside the county and 33% of Kildare's resident workers are employed in the Dublin Metropolitan Area. Of the key employment settlements within the Study Area, Naas has the largest concentration of jobs, which accounts for 17.5% of all jobs in Kildare.

The labour force will continue to increase, and it will be important to promote employment-generating activities that reflect the education and skills base of both Kildare and Meath's population. The LECP plans seek to foster employment creation and maximise the jobs potential in appropriate locations throughout the counties, to achieve alignment between population and employment opportunities.

7.3.7 Human Health

The following chapters provide detail regarding the baseline environment in terms of air quality, noise, land, water, cultural heritage, traffic, material assets, and landscape:

- Chapter 8 – Air Quality;
- Chapter 9 – Noise and Vibration;
- Chapter 11 – Soils, Geology and Hydrogeology;
- Chapter 12 – Hydrology;
- Chapter 13 – Archaeology, Architectural Heritage and Cultural Heritage;
- Chapter 14 – Traffic and Transport;
- Chapter 15 – Agronomy and Equine; and
- Chapter 17 – Landscape and Visual.

7.3.7.1 General Health

The majority of the overall populations in Kildare and Meath described their own self-perceived health as 'Very Good' (63%) or 'Good' (26.4%), representing an overall total of 89.4%. This is slightly higher than the national average of 87% responding either 'Very Good' or 'Good' (59.4% and 27.6%, respectively).

Table 7.8 illustrates that the general health of the population living in Counties Kildare and Meath and the health of the local population living in close proximity to the Proposed Development is considered to be higher than the national average.

Table 7.8 General Health of Kildare, Meath and settlements in close proximity to the Proposed Development

	General Health					
County	Very Good	Good	Fair	Bad	Very Bad	Not Stated
Kildare	140,402	58,752	15,064	2,527	549	5,210
Meath	123,170	51,649	13,037	2,019	395	4,774
Settlement	Very Good	Good	Fair	Bad	Very Bad	Not Stated
Kilcock	4,147	1,465	314	43	6	118
Prosperous	1,468	605	161	30	3	66
Sallins	3,905	1,514	291	49	8	82
Naas	13,299	5,889	1,437	293	63	412

Electromagnetic Fields (EMFs) surround any object that is generating, transmitting or using electricity, including appliances, wiring, office equipment, batteries and any other electrical devices. Therefore, electric and magnetic fields are common in modern life. EMFs are invisible and cannot be felt or heard. In many cases, domestic electrical appliances and tools can generate much higher magnetic and electric fields, if in close proximity to a sensitive receptor, than transmission lines at standard separation distances. EirGrid designs, develops and operates the transmission grid in accordance with stringent safety recommendations which are made by national and international agencies. Several of these recommendations come from the International Council on Non-Ionising Radiation Protection (ICNIRP). This is an independent body, funded by public health authorities around the world. ICNIRP has reviewed the safety of EMFs and recommended limits on exposure that are far below levels where adverse effects might occur. Electricity cables have been placed underground in Ireland since the 1960s. There are currently approximately 320 km of underground transmission cables in Ireland, with multiples of this figure of underground cabling associated with the lower-voltage distribution system. Given that EirGrid requires all electricity infrastructure to operate under existing public exposure guidelines from ICNIRP, there will be no direct impact on human health from EMF. As a result, they are scoped out of further assessment within this chapter as no significant effects on health as a result of exposure to EMF are considered likely.

The design of the transmission infrastructure has ensured that the strength of the electric and magnetic fields during operation of the Proposed Development will comply with the ICNIRP and EU guidelines on exposure of the general public to EMF.

7.4 Potential Effects

This section provides an assessment of potential effects of the Proposed Development. As previously noted, the assessment of population and human health that might occur on air and water, noise and traffic, are addressed in the relevant environmental topic chapters in this EIAR.

7.4.1 Construction Phase

The section considers construction phase effects relating to:

- Demographic and Economic Profile;
- Land Use;
- Tourism, Recreation and Amenities; and
- Human Health.

7.4.1.1 Demographic and Economic Profile

Potential impacts during the construction phase are the result of combined effects of construction activities leading to reduced amenity and potential health effects as a result of stress and fears, a loss of community cohesion as a result of severance if roads were fully or partially closed and reduced access to facilities. Potential impacts on amenity will occur during the construction phase only as a result of combined noise, air quality, traffic and visual impacts of construction activities.

There will be a temporary increase in economic spend in the local communities during the works as a result of construction workers spending in the area. Construction is not expected to have a permanent impact on the population of the wider environs in terms of the demographic profile (population or housing). It is anticipated they will not be high enough numbers to have a significant impact in the counties with a combined population of more than 400,000 located on the edge of the Greater Dublin Area. It is assessed to have a Not Significant effect.

The increasing population in this area and in the Greater Dublin area in addition to economic growth in Ireland supports the requirement for the reinforcement of the transmission network.

7.4.1.2 Land Use

Due to the width of the joint bays and nature of the road network in the area, temporary road or lane closures will be required along the route during the cable laying and joint bay elements of the construction phase. There is potential for temporary negative effects during construction as a result of traffic effects. Passing bays will facilitate vehicle movements around joint bays. Accessibility to private properties and lands will be maintained at all times during the construction.

There is potential for temporary negative effects on housing, land use and facilities during the construction phase of the development as the majority of the underground cable follows the existing road network. However, the potential impact will be temporary in nature.

The presence of the underground cable is unlikely to have an impact on potential future development of industrial and commercial land.

Trees can provide a multitude of economic, environmental, and social benefits to individuals and communities including (but not limited to) visual amenity and landscape value, ecosystem services and habitats. Trees can also hold historic and cultural importance by providing links to the past that create a sense of pace and belongs for individuals and communities. The Proposed Development will result in the loss of trees and this is further assessed in Chapter 10 (Biodiversity) and Chapter 17 (Landscape and Visual) of this EIAR.

7.4.1.3 Tourism, Recreation and Amenities

There will be no direct impact to tourism, recreation, and amenities from the Proposed Development. The routing of the Proposed Development has been carefully considered to avoid such areas. While amenities such as the Royal Canal and Grand Canal and their towpaths will be crossed, there will be no impacts to the enjoyment of these facilities as the cable will cross by HDD or on an existing bridge. The cable will pass within the grounds of Naas Sport Centre and within the cycleway/footpath of the Sallins Bypass. The impacts to these facilities are assessed in Chapter 17 of this EIAR (There will be no permanent significant effects to either facility).

The cable route will pass the main entrance to the Larchill Arcadian Gardens (chainage 10000), passing along the R125. Details of the proposed traffic management are contained in Appendix 5.1 of this EIAR. The section of the R125 in front of the Larchill Arcadian Gardens to Kilcock has been fully assessed and because of the width of the road, road closures with local and emergency access will be necessary during parts of the construction phase. See Section 7.5.1 of this chapter for details of the mitigation measures.

The Proposed Development will pass along the R448 to the south of Naas. In the townland of Killashee, approximate chainage 47500, there is a complex of community facilities located just off the regional road. The construction of the cable trench has the potential to result in significant disruption to traffic using the facilities including:

- Killashee National School;
- St David's National School;
- Piper Hill College;
- Gaelscoil Nás Na Ríogh;
- Education and Training Boards;
- Killashee Leisure Centre; and
- Other local businesses and housing.

This section of the R448 has been assessed to have an average width of 6.9 m and is a busy road in and out of Naas. This is an average figure and there are sections where the road is wider and where there is a large roadside verge. During the construction of the cable trench, it has been assessed that this section of the R448 will be closed with local and emergency access provided. Diversions will be signed, to allow for alternative routes in and out of Naas. The details and duration are addressed in Chapter 14 (Traffic and Transport) of this EIAR. See Section 7.5.1 of this chapter for details of the mitigation measures.

7.4.1.4 Human Health

The requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2006, as amended, will be implemented and complied with in full during the construction phase of the Proposed Development. As with any construction project, however, there is still potential for adverse effects associated with the natural environment and nuisance (such as noise and dust emissions). Potential for these effects is discussed separately within the respective chapters.

Potential impacts to human health during construction could occur as a result of combined effects of construction activities leading to reduced amenity and potential health effects as a result of stress and fears and the potential loss of community cohesion as a result of severance if roads were fully or partial closed with reduced access to facilities. There is potential for adverse impact due to the construction of the project, however, these are expected to be short in duration, temporary in nature and mitigation will be implemented using the Traffic Management Plan and Construction Environmental Management Plan (Appendix 5.1 and Appendix 5.4 of this EIAR)to reduce any stress or disturbance to the local community and environs.

7.4.2 Operational Phase

As detailed previously, given the nature of the Proposed Development, potential effects on population and human health are associated with the construction phase. However, for completeness, operational phase effects considered include:

- Demographic and Economic Profile;
- Land Use;
- Tourism, Recreation and Amenities; and
- Human Health.

7.4.2.1 Demographic and Economic Profile

No long-term effects are predicted on the demographic profile or economic profile during the operational phase of the development due to the 'unmanned' nature of the development.

7.4.2.2 Land Use

The underground cable will require no invasive maintenance work along the cable trench or joint bay locations. Access may be required at joint bays on rare occasions to facilitate cable replacement if a failure occurs.

No long-term effects are predicted on land use and facilities during the operational phase of the Proposed Development as the majority of the underground cable will be located in the road. Agricultural land impacts are assessed in Chapter 15 of this EIAR.

It is not expected that the Proposed Development will result in a demand for land use or facilities which will impact materially on the Proposed Development area and its environs.

7.4.2.3 Tourism, Recreation and Amenities

No long-term effects are predicted on tourism, recreation and amenities during the operational phase, due to the nature of the Proposed Development.

7.4.2.4 Human Health

Concerns relating to EMFs can lead to increased stress and health issues. EirGrid requires all underground cables to operate to existing public exposure guidelines from the ICNIRP. As such, no direct effect from EMFs related to underground cables are predicted, and therefore no significant effect on local communities.

7.4.2.5 Summary of Assessment of Potential Effects

Table 7.9 provides a summary of the assessment of potential impacts on people and communities from the Proposed Development.

Table 7.9: Summary of Assessment of Potential Construction Effects

Assessment Topic	Sensitivity of Receptors	Magnitude of Change	Nature of Impact	Significance of Impact
Demographic and Economic Profile	High	Low	Positive	Positive, Slight and Temporary[38]
Land Use	High	Low	Negative	Negative, Moderate and Temporary
Tourism, Recreation and Amenities	High	Medium	Negative	Negative, Significant and Temporary
Human Health	High	Very Low	Neutral	Neutral

7.5 Mitigation Measures

7.5.1 Construction Phase

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable.

Construction activities have the potential to create a nuisance and cause disruption. All work will be carried out in compliance with national legislation, and in accordance with best practice guidance, as detailed in the topic-specific chapters of this EIAR. The assessment has been informed by the residual impacts reported in Chapter 8: (Air Quality), Chapter 9 (Noise and Vibration), Chapter 14 (Traffic and Transport), and Chapter 17 (Landscape and Visual). The reported residual impacts in these chapters take into account any topic-specific mitigation identified within the respective chapters. No further mitigation is proposed over and above that set out in individual chapters.

A CEMP is included in Appendix 5.4 of this EIAR. The CEMP will be updated by the appointed contractor(s) in consultation with Kildare County Council and Meath County Council to incorporate any mitigation measures that might be attached as conditions to the planning permissions for the Proposed Development, if granted. The CEMP will be a key contract document and the appointed contractor will be contractually obliged to implement it in full during the construction phase to safeguard the environment, site personnel, and nearby sensitive receptors, i.e. occupiers of residential and commercial properties, from site activities which may cause harm or nuisance. The appointed contractor(s) will liaise closely with local community representatives, landowners and statutory consultees throughout the construction period. This is likely to include circulating information about ongoing activities, particularly those that could cause disturbance, including due to traffic. The appointed contractor(s) will also implement the Traffic Management Plan included as Appendix 5.1 of this EIAR, which will be updated following detailed design (in accordance with the CEMP in Appendix 5.4 of this EIAR) and in consultation with Kildare County Council and Meath County Council to mitigate construction traffic on the public road network. All construction activities, including construction traffic, will be managed through the CEMP. Specific measures to mitigate effects on human health during the construction phase (i.e. noise and vibration, air quality and climate, hydrology, landscape and visual, and traffic and transport) are dealt with separately in the relevant chapters of this EIAR.

To mitigate potential traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 for further details) between Chainage 7395 and 14750 will be subject to traffic management measures set out in Chapter 14 to ensure access for visitors and tourists is maintained to the Larchill Arcadian Gardens. Phases 1 and 3 of the construction sequence are not affected by this restriction.

[38] Does not include the economic benefits of the Proposed Development as outlined in Chapter 2 of this EIAR.

To mitigate potential traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 of this EIAR for further details) between Chainage 46190 and 51450 will be timed to minimise disruption to school traffic. This will include avoiding road and lane closures during the morning drop off and evening school pick up times and avoiding closures during school term times for those schools along the R448 (subject to programming). Phases 1 and 3 of the construction sequence are not affected by this restriction.

7.5.2 Operational Phase

The location and nature of the Proposed Development is not predicted to have a permanent effect on the population of the area and wider environs. Regular planned maintenance will be infrequent and at the joint bay locations only.

7.6 Residual Effects

There will be temporary disturbance associated with the Proposed Development during construction, but this will be mitigated with the successful incorporation of specific mitigation measures detailed in this EIAR. Disruption will include temporary delays to traffic as a result of traffic management. The traffic effects are assessed in Chapter 14 (Traffic and Transport), of this EIAR; however, there will be temporary slight effects to the population of the area from the resulting traffic delays. Traffic mitigation measures will be incorporated to avoid impacts to sensitive receptors such as Larchill Arcadian Gardens and schools in the Killashee area. By carefully planning the construction phase, impacts to access will be avoided and the effects will be Not Significant to these receptors. No significant adverse long-term residual effects are predicted during the operational phase.

Section 7.2.4 of this chapter outlines the approach that has been taken to the assessment of human health. The following topics were scoped into the assessment: Open space, leisure and recreation; Employment and income; Transport modes, access and connections; Air quality; and Noise and vibration. Table 7.10 outlines the residual human health effects.

Table 7.10: Predicted Residual Effects on Human Health

Determinant	Potential Impact		Mitigation identified	Predicted Residual Effects	
	Magnitude	Significance of Impact		Magnitude of Impact	Significance of Effect
Open space, leisure and recreation	Negligible (all populations)	Negative, Imperceptible and Temporary (all populations)	Mitigation measures set out in Section 8.5 of Chapter 8 (Air Quality), including: • Implementation of 'highly recommended' measures for 'medium risk' dust soiling impacts as identified in the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction	Negligible (all populations	Negative, Imperceptible and Temporary (all populations)

Determinant	Potential Impact		Mitigation identified	Predicted Residual Effects	
	Magnitude	Significance of Impact		Magnitude of Impact	Significance of Effect
			(Version 2.1) (IAQM 2023). • Mitigation measures set out in Section 9.5 of Chapter 9 (Noise and Vibration), including: • Provision of noise barriers around HDD Compounds and use of enclosures around HDD plant; and • Compliance with British Standard (BS) 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Noise (BSI 2014).		
Employment and income	Negligible (general population in all small areas) Medium (farming population in all small areas)	Neutral, Imperceptible and Short-Term (general population) Negative, Moderate and Short-Term (farming population in all small areas)	Mitigation measures set out in Section 15.5 of Chapter 15 (Agronomy and Equine), including: • Close liaison with local community representatives and landowners; • Agreement on construction scheduling with landowners; and • Ensuring adequate access to land severed by the Proposed Development during construction to allow the landowner to continue to	Negligible (general population in all small areas) Low (farming population in all small areas)	Neutral, Imperceptible and Short-Term (general population in all small areas) Negative, Slight and Short-Term (farming population in all small areas)

Determinant	Potential Impact		Mitigation identified	Predicted Residual Effects	
	Magnitude	Significance of Impact		Magnitude of Impact	Significance of Effect
			effectively farm the severed land.		
Transport modes, access and connections	Low	Negative, Slight and Short-Term	Mitigation measures set out in Section 14.5 of Chapter 14 (Traffic and Transport), including: • Adoption of a regulated and approved Traffic Management Plan (TMP); • Signed diversion routes provided where necessary; and • Use of predefined routes for construction activity generated vehicles.	Low	Negative, Not Significant and Short-Term (all populations)
Air quality	Low (all populations)	Negative, Not Significant and Short-Term	Mitigation measures set out in Section 8.5 of Chapter 8 (Air Quality), including: • Implementation of 'highly recommended' measures for 'medium risk' dust soiling impacts as identified in the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (Version 2.1) (IAQM 2023).	Low (all populations)	Negative, Not Significant and Short-Term (all populations)
Noise and vibration	Low (all populations)	Negative, Not Significant and Short-Term	Mitigation measures set out in Section 9.5 of Chapter 9 (Noise and Vibration), including:	Low (all populations)	Negative, Slight and Short-Term (all populations)

Determinant	Potential Impact		Mitigation identified	Predicted Residual Effects	
	Magnitude	Significance of Impact		Magnitude of Impact	Significance of Effect
			• Provision of noise barriers around the HDD Compounds and use of enclosures around HDD plant; and • Compliance with British Standard (BS) 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Noise (BSI 2014).		

7.7 Conclusion

The Proposed Development has considered potential effects on Population and Human Health from the outset. Community facilities, tourism sites, towns, villages, businesses and other key receptors have been mapped and avoided where feasible through the careful routing of the cable and through the mitigation measures that will be implemented. Mitigation measures will be implemented at sensitive receptors sensitive receptors such as Larchill Arcadian Gardens and schools in the Killashee area to further reduce potential impacts.

During the construction phase, the key impacts of the Proposed Development will be disruption to traffic while the construction takes place in public roads. Traffic Management will aim to minimise the effects but there will be some disruption to road users and to the communities of the area. These effects will be temporary but have been carefully considered by the project team. Further assessment of the traffic effects is provided in Chapter 14 (Traffic and Transport), of this EIAR.

Overall, it is anticipated that through appropriate mitigation and monitoring measures there will be no significant adverse effects on population and human health.

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<u>Directives and Legislation</u>

Planning and Development Act 2000 (as amended)

8. Air Quality

8.1 Introduction

This chapter presents the assessment of the potential impacts of the Proposed Development on air quality at sensitive human and ecological receptors during the construction and operational phases. A full description of the Proposed Development is presented in Chapter 5 (Proposed Development Description) of this Environmental Impact Assessment Report (EIAR). This chapter describes the methodology and guidance used, identifies the potential impacts on sensitive receptors, and provides details of required mitigation to reduce any potential effects.

Air quality is affected by both natural and human sources. A wide range of human activity can generate emissions of air pollutants, including transport (e.g. petrol/diesel-fuelled road vehicles, diesel-fuelled rail, and as a result of vehicular brake, tyre and road wear), heating buildings (e.g. fuel oils and natural gas in home central heating), power generation (particularly fossil fuel powered) and chemical processes and production. Air quality can also be affected by dust generation, which may affect health or give rise to annoyance due to the soiling of surfaces through deposition. Air pollution, including dust, can also affect sensitive vegetation and ecosystems (i.e. ecological receptors).

Specifically, this chapter considers the following elements:

- Dust impacts generated by construction activities;
- Increases in air pollutant concentrations due to additional vehicle movements during the construction phase;
- Emissions of pollutants to air from construction plant and machinery; and
- Increases in air pollutant concentrations due to additional vehicle movements during the operational phase.

The key pollutants considered relevant to the Proposed Development are:

- Nitrogen dioxide (NO_2);
- Dust[39] emissions from construction activities; and
- Particulate matter (PM_{10}, particles with an aerodynamic diameter of 10 microns or less and $PM_{2.5}$, particles with an aerodynamic diameter of 2.5 microns or less).

Any descriptions of the characteristics of the Proposed Development in this chapter should be read in conjunction with Chapter 5 (Proposed Development Description) of this EIAR.

8.2 Methodology

8.2.1 Study Area

There are several different types of potential air quality effects or emission sources that require assessment. The study areas for the different air quality effects are set out in this section.

39 Solid particles that are suspended in air, or have settled out onto a surface after having been suspended in air. The terms dust and particulate matter (PM) are often used interchangeably, although in some contexts one term tends to be used in preference to the other.

8.1.1.1 Construction Dust Emissions

For dust emissions during the construction of the Proposed Development, the assessment of human receptors focused on areas extending up to 250 m from the edge of the Proposed Development. This distance is based on the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (Version 2.1) (hereafter referred to as the IAQM Guidance) (IAQM, 2023), which identifies when an assessment of dust effect is required. The effects of 'trackout[40]' also need to be determined up to 50 m from the edge of the local road network used by construction vehicles, within 250 m of the site exit(s) associated with construction works areas and construction compounds. Trackout is defined as the transport of dust or mud from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the road network. In line with the IAQM Guidance, the assessment also considers relevant ecological receptors up to 50 m from the planning application boundary and up to 50 m from the edge of the local road network used by construction vehicles, within 250 m of the site exit(s) associated with construction works and construction compounds.

8.1.1.2 Site Plant and Machinery Emissions

Emissions from plant and machinery (e.g. generators and Non-Road Mobile Machinery (NRMM)) during construction and operation of the Proposed Development have the potential to affect sensitive receptors up to 200 m from the planning application boundary, depending upon the scale of the activities.

8.1.1.3 Road Traffic Emissions

The study area for the assessment of changes in emissions from road traffic for human receptors is based on identifying where the construction or operation of the Proposed Development will lead to a change in road alignment, traffic flows or vehicle speeds on the road network which exceed relevant thresholds. The relevant thresholds are set out in the Transport Infrastructure Ireland (TII) Guidance Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document PE-ENV-01106 (TII, 2022) and are used to identify road links where:

- Annual average daily traffic (AADT) (i.e. the total volume of vehicle traffic of a highway or road for a year divided by 365 days) flows will change by 1,000 or more; or

- Heavy duty vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more.

Road links where the change in traffic flows exceed these thresholds are considered to be 'affected' roads. Air quality impacts from road sources are highest the closer to the road and concentrations of pollutants drop off quickly with distance - 200 m is an accepted distance beyond which specific impacts are likely to be negligible, assessments focus on receptors closest to the road generally, as per relevant guidance for assessing road traffic emissions, which define a study area of 200 m. Therefore, a study area is defined based on a distance of 200 m from the 'affected' roads, as set out in the TII Guidance Document PE-ENV-01106 (TII, 2022).

8.2.2 Relevant Legislation, Policy and Guidance

8.2.2.1 Ambient Air Quality

Directive 2008/50/EC on ambient air quality and cleaner air for Europe (hereafter 'Ambient Air Quality Directive'), sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter (i.e. PM_{10} and $PM_{2.5}$) and NO_2. The Ambient Air Quality Directive also sets legally binding limits (i.e. critical levels) for the protection of vegetation (i.e. sulphur dioxide (SO_2) and oxides of nitrogen (NOx)).

[40] The transport of dust and dirt from the construction site onto the public road network.

Statutory Instruments (S.I.) No. 739/2022 – Ambient Air Quality Standards Regulations 2022 (Government of Ireland, 2022) (hereafter referred to as 'the Air Quality Standards Regulations 2022') transposed the air quality Limit Values set out in the Ambient Air Quality Directive into Irish legislation.

Table 8.1 presents the relevant air quality standards and target values for the pollutants relevant to this assessment as prescribed by the European Union (EU) and Irish legislation. For the purposes of this chapter, these standards and target values are collectively referred to as Limit Values.

The Limit Values set for ecological receptors are also presented in Table 8.1 (European Union, 2008).

Table 8.1: Relevant Air Quality Standards

Pollutant	Averaging period	Limit value (μg/m^3)	Basis of application of the limit value
Human receptors			
NO_2	One hour	200	Not to be exceeded more than 18 times in a calendar year
	One calendar year	40	-
PM_{10}	24 hours	50	Not to be exceeded more than 35 times in a calendar year
	One calendar year	40	-
$PM_{2.5}$	One calendar year Stage 1	25	-
	One calendar year Stage 2	20	-
Ecological receptors			
NOx	Annual mean limit value for the protection of vegetation (referred to as the "critical level")	30	-
SO_2	Annual mean limit value (and winter period 1 October – 31 March) for the protection of vegetation (referred to as the "critical level")	20	-
Note: μg/m^3 – micrograms per metre cube			

The Limit Values presented in Table 8.1 for the protection of human health only apply at locations of relevant exposure (i.e. locations where people are likely to be directly or indirectly exposed for a period which is significant in relation to the averaging period of the Limit Value(s)). However, the Air Quality Standards Regulations 2022 refers to Annex III of the Ambient Air Quality Directive, which states that:

'*compliance with the limit values directed at the protection of human health shall not be assessed at the following locations:*

- *any locations situated within areas where members of the public do not have access and there is no fixed habitation;*
- *in accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply;*
- *on the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access to the central reservation'.*

8.2.2.2 Guidance

This air quality assessment has been completed in accordance with the following guidance:

- IAQM Guidance (IAQM, 2023);
- TII Guidance Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document PE-ENV-01106 (TII, 2022); and
- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022).

The IAQM Guidance was produced by air quality professionals and regulators and although aimed at developments in the UK, the process and principles of the assessment set out in the guidance are applicable for other geographical locations and construction projects. It is also the approach recommended by TII (TII, 2022), and therefore considered best practice in Ireland.

8.2.3 Data Collection and Collation

As background ambient concentrations applied in this assessment are well below the relevant Limit Values (see Section 8.3) and sufficient data are available to determine the background concentrations of pollutants, it was not considered necessary to undertake supplementary air quality monitoring to aid this assessment. Therefore, this air quality assessment is a desk-based assessment with relevant data taken from Environmental Protection Agency (EPA) Air Quality website (EPA, 2023).

8.2.4 Appraisal Method for the Assessment of Impacts

With regard to the determination of the significance of air quality impacts, the assessment methodology differs from that described in Chapter 1 of this EIAR, as defining a level of significance beyond either 'Significant' or 'Not Significant' is not appropriate for air quality impacts. The full details of how the significance of the air quality impacts has been determined are set out below.

The process for defining significance is prescribed in accepted practice guidance documents developed by regulatory authorities and working groups comprising experienced air quality professionals, local authority officers and public healthcare bodies (IAQM, 2023). The relevant guidance on this subject relates to defining whether an air quality impact would be significant or not across the study area as a whole, rather than at individual human receptors such as residential properties.

The value of a receptor is incorporated into the specific methods prescribed in the IAQM Guidance (IAQM, 2023). The approach described does not directly align with the overall approach to the categorisation of the value of receptors, magnitude of change and determination of the significance level set out in the EIA significance matrix. This is because the IAQM Guidance (IAQM, 2023) on this subject relates to defining whether an air quality impact is significant or not across the study area as a whole, rather than at individual properties, or at ecological receptors. As set out above and in the IAQM Guidance (IAQM, 2023), it is not appropriate to define a level of significance to air quality impacts at individual receptors.

8.1.1.4 Construction Dust Emissions

The assessment of dust during construction has been carried out using a qualitative risk-based appraisal with reference to the location of the Proposed Development, and associated construction activities, in relation to sensitive receptors, the planned process and site characteristics, as described in the IAQM Guidance (IAQM, 2023) and recommended by TII (TII, 2022).

The methodology for the assessment of construction dust emissions is based on a five-step approach (IAQM, 2023), as set out in Plate 8.1.

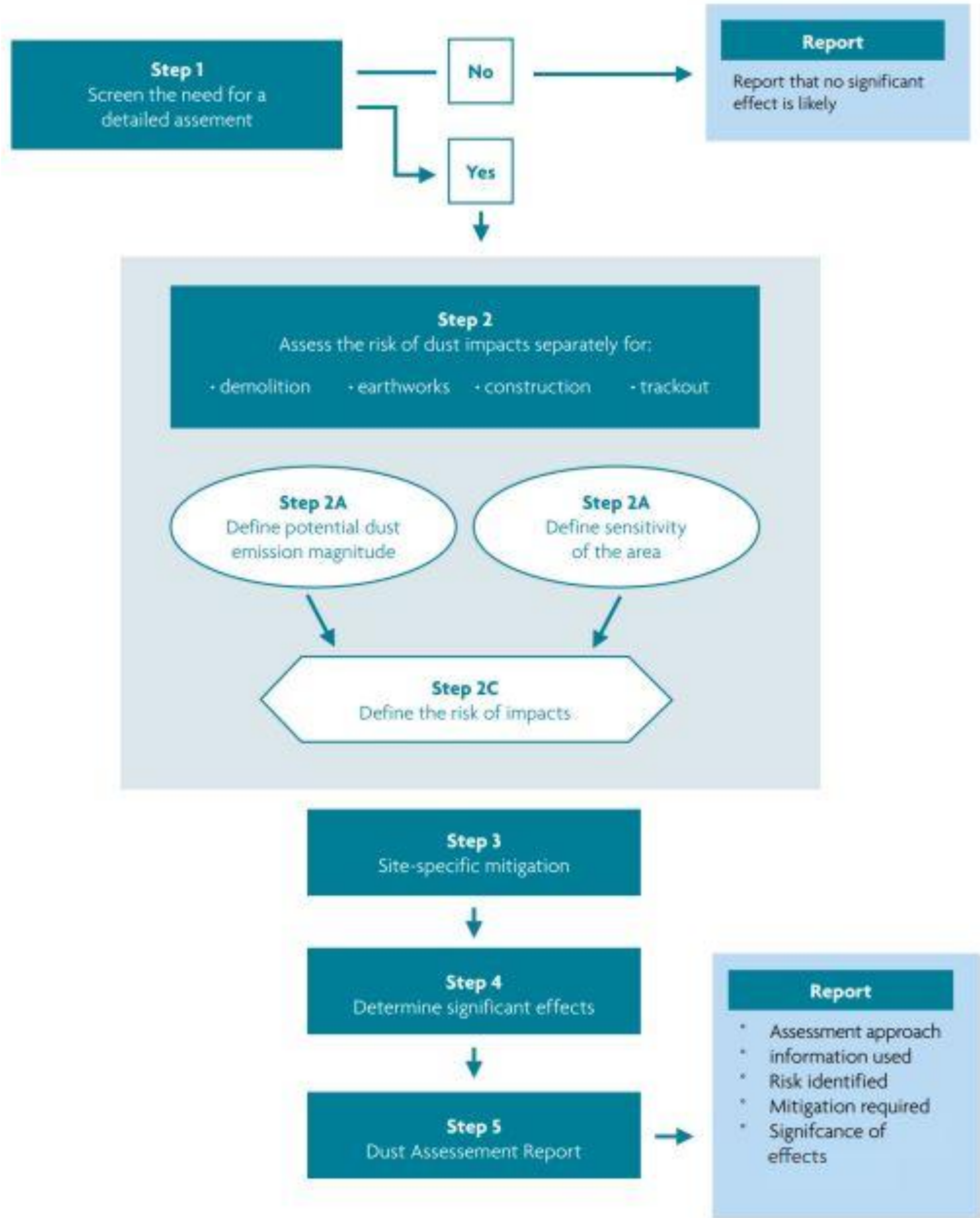

Plate 8.1: Structure of the Dust Risk Assessment (IAQM, 2023)

Based on the IAQM Guidance (IAQM, 2023), the assessment aims to estimate the impacts of both PM_{10} and dust together, through a combined risk-based assessment procedure. The IAQM Guidance (IAQM, 2023) provides a methodological framework but notes that professional judgement is required throughout the assessment to determine the risk of impacts and mitigation requirements. Based on the calculated risk level, the IAQM Guidance (IAQM, 2023) sets out clear requirements for the recommended mitigation measures, which can be used to avoid or reduce the impact of dust during the construction phase of the Proposed Development. These mitigation measures to avoid or reduce dust emissions are included in Section 8.5 and set out in the Construction and Environmental Management Plan (CEMP) (see Appendix 5.4 in Volume 3 of this EIAR).

This assessment does not consider the air quality impacts of exposure to contaminated dust that could arise from the excavation of any contaminated material. Although $PM_{2.5}$ is not specifically included as a parameter within the assessment, the risk levels associated with PM_{10} and any subsequent mitigation measures also apply to $PM_{2.5}$ as $PM_{2.5}$ is included within the PM_{10} fraction.

Larger dust particles (greater than 30 μm) make up the greatest proportion of dust emission from mineral workings or earthworks and will largely deposit within 100 m of sources (Scottish Office, 1998). Intermediate sized particles (10 μm – 30 μm) are likely to travel between 250 m to 500 m. PM_{10}, including the smaller $PM_{2.5}$ particulates are reported to make up a smaller proportion (approximately 10%) of dust emitted from most workings and the emissions become diluted as they disperse downwind (Ove Arup and Partners, 1995).

In accordance with the IAQM Guidance (IAQM, 2023), a 'human receptor' refers to any location where a person spends time or a property which may experience the adverse effects of airborne dust or dust soiling, or exposure to PM_{10}. An 'ecological receptor' refers to any sensitive habitat which could be affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats).

The study area to define where an assessment is required is set out in Section 8.1.1.1.

The key potential construction dust emission sources have been categorised according to the IAQM Guidance as demolition, earthworks, construction and trackout. These have been defined as follows:

- Demolition: any activity involved with the removal of an existing structure (or structures). This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time;
- Earthworks: covers the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction activities: any activity involved with the provision of a new structure (or structures), its modification or refurbishment. Structures include residential dwellings, office buildings, retail outlets, roads, etc; and
- Trackout: 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.

The IAQM Guidance construction dust methodology provides techniques for three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors (any sensitive habitat which could be affected by dust soiling).; and
- The risk of human effects due to increased exposure to PM_{10}.

The IAQM Guidance uses a consistent approach to define the risks associated with the construction activities (i.e. demolition, earthworks, construction and trackout), in order to specify the required level of mitigation required to reduce those risks. The risk is defined from the dust emission magnitude (i.e. the scale of the activities being undertaken) and the sensitivity of the study area (i.e. the number and proximity of sensitive receptors to the Proposed Development, their sensitivity to dust deposition and PM_{10} concentrations, and existing PM_{10} concentrations). Risks are described in terms of there being a low, medium or high risk of dust impacts for each of the four potentially dust emitting activities (i.e. demolition, earthworks, construction and trackout).

This risk classification is then used to define the recommended site-specific mitigation measures to avoid or reduce the potential impacts of construction dust emissions to a 'Not Significant' residual effect. It is not necessarily the case that a low risk of dust impact, in the absence of mitigation, would lead to a significant effect. However, in the absence of good practice mitigation there could be occasions where short-term impacts could affect sensitive receptors, leading to a potentially significant effect. The assessment is used to provide a commensurate level of good practice mitigation regardless of the identified level of risk. Higher risks would require more comprehensive good practice mitigation to ensure there would not be a significant effect than low risk. These mitigation measures to avoid or reduce dust emissions are included in Section 8.5 and in the air quality management strategies set out in the CEMP (see Appendix 5.4 in Volume 3 of this EIAR).

A full description of the methodology including further explanation on how the dust emission magnitudes and area sensitivity are defined is provided in Section 7.2 and Section 7.3 of the IAQM Guidance.

8.1.1.5 Construction site plant and machinery emissions

As per TII Guidance (TII, 2022), the assessment of emissions from construction plant and machinery takes into account the number of anticipated construction plant and machinery and their operating hours to assesses whether a significant effect is likely to occur (IAQM, 2023).

8.1.1.6 Road traffic emissions (Construction and Operational Phase)

Criteria based on changes in road traffic flows are set out in Section 8.2.1. Should changes in road traffic flows exceed these thresholds, an assessment is required to determine the potential air quality impacts at receptors within 200 m of these affected roads. Conversely, roads that experience a change in traffic flows below these thresholds do not require further assessment, as the change in concentrations of pollutants at receptors close to these roads will be imperceptible. If that was the case for all roads, no specific study is required to assess changes in road traffic emissions.

8.2.5 Assumptions and Limitations

The following assumptions have been made as part of the assessment:

- The IAQM Guidance (IAQM, 2023) recommends that the receptor distance is based on the distance from the source rather than the works boundary. This study was undertaken on the basis that all activities (i.e. demolition, earthworks, construction and trackout) could take place at the edge of the planning application boundary. This represents a conservative assumption, as in practice most activities will not take place at the edge of the planning application boundary, thus increasing the distance between the source and the receptor.

8.3 Baseline Conditions

8.3.1 Overview

Information on existing air quality in Ireland was obtained from the EPA which undertakes monitoring at a number of locations across the country (EPA 2023). For the purpose of air quality, Ireland is split into four main regions:

- Zone A: Dublin conurbation;
- Zone B: Cork conurbation;

- Zone C: 23 cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise; and

- Zone D: Rural Ireland, i.e. the remainder of the state excluding zones A, B and C.

The Proposed Development is located primarily within Zone D – Rural Ireland, with the exception of where the cable route traverses Naas, County Kildare, which encroaches Zone C – cities and large towns.

8.3.2 Background Air Concentrations

The closest monitoring site to the Proposed Development within Zone D is located in Edenderry (Edenderry library, County Offlay), 21 km northwest of the Proposed Development at its closest point. Table 8.2 presents the annual mean NO_2, PM_{10} and $PM_{2.5}$ monitoring results from this site in 2022 (EPA, 2023). It should be noted the annual mean concentrations monitored at this monitoring site are well below the relevant Limit Values. These background concentrations are considered representative of the conditions experienced at the assessed locations associated with the Proposed Development (see Section 8.4).

Table 8.2: Monitored Concentrations at Edenderry Library, County Offlay Monitoring Location

Site Name	Location		Limit Value (μg/m³)	2022 Annual mean concentration (μg/m³)
	Lat	Long		
Edenderry Library, Co. Offaly	53.3425°N	-7.0475°E	40 (NO_2) 40 (PM_{10}) 20 ($PM_{2.5}$)	7.3 (NO_2) 17.7 (PM_{10}) 13.4 ($PM_{2.5}$)

8.4 Potential Effects

This section presents the potential impacts that may occur due to the Proposed Development, in the absence of mitigation. This informs the need for mitigation or monitoring to be proposed (refer to Section 8.5). In the context of the Proposed Development, the potential air quality impact on the surrounding environment must be considered for both the construction and operational phases.

8.4.1 Construction Phase

8.4.1.1 Construction Dust Emissions

Activities carried out on construction sites can give rise to emissions of dust that could cause annoyance to people or damage to vegetation due to the soiling of surfaces. These activities can also lead to increased short-term and long-term concentrations of fine particulate matter (e.g. PM_{10} and $PM_{2.5}$) at off-site locations, which may affect human health, unless the appropriate mitigation measures are implemented.

IAQM Guidance (IAQM, 2023) states that, where appropriate, a site can be divided into 'zones' for the dust risk assessment to allow appropriate mitigation measures to be applied to each zone. As the Proposed Development will consist of several different construction activities at different locations (spanning 53 km), four separate construction dust risk assessments have been carried out for the following:

- The excavation of a section of cable trench and laying of a section of underground ducting and cable;

- The formation of a temporary construction compound;

- Construction works at the Dunstown Substation; and

- Construction works at the Woodland Substation.

These construction activities represent those activities associated with the Proposed Development, which have the greatest potential for dust generation at source.

The construction of the Proposed Development will be over a length of 53 km, where there will be a range of dust risks due to variations in the proposed activities and sensitivity of the areas (i.e. number and proximity of sensitive receptors to the activities) close to the construction activities. A precautionary approach was undertaken to identify the highest dust risks by assessing at the location(s) with the greatest number, and proximity of, sensitive receptors to the planning application boundary. This precautionary approach was adopted to determine the highest possible dust risks and identify the appropriate level of mitigation for application across the Proposed Development construction work area, underground cable and temporary construction compound described above, specific locations have been selected based on the sensitivity of the area. This approach ensures the highest dust impact risk is assessed.

As dust emissions from the Proposed Development will only occur during the construction phase, all effects from the construction dust emissions are described as either temporary or short-term.

The dust emission magnitude and sensitivity descriptors for the construction dust assessments are presented in Section 7.2 and Section 7.3 of the IAQM Guidance (IAQM, 2023), respectively.

<u>Excavation of the cable trench and laying of a section of underground cable</u>

The majority of the underground cable route (43.5 km in length) will be installed within the existing public road network. Off-road (cross-country) routes (9.5 km in length) are proposed at particular locations to avoid constraints as described in Chapter 5 (Proposed Development Description). The cable will be delivered to site in individual lengths on cable drums and installed along the route using joint bays (i.e. an underground chamber used to pull the cables into the pre-installed ducts and connected together to create a single, overall circuit).

During the cable trenching works, trenched and trenchless techniques will be utilised. The trench is proposed to be approximately 1.5 m in width, 1.3 m in depth relative to existing ground level within public roads and 1.7 m in depth on private lands. These trenches will then be backfilled before moving on to the next section of the cable route.

For the construction dust assessment, a 100 m section of the proposed underground cable route was assessed between chainage 45000 and 45250, which is located on Primrose Gardens, approximately 1 km east of the neighbourhood of Jigginstown. This section of cable route was selected for assessment based on the sensitivity of the area being categorised as the highest of all assessment locations along the cable route. As described above, a precautionary assessment was undertaken. The risk of dust impacts at all other chainages, with less receptors nearby, is less than the risk identified for this section of cable route. Therefore, any proposed mitigation identified by this assessment would be sufficient to control dust emissions for the other sections of the cable route.

It should be noted other construction activities associated with the cable trench and route include two temporary laydown areas, passing bays (at 33 joint bays locations) and 70 joint bays. These activities are likely to experience similar dust emission magnitudes to the cable trench and route. Therefore, separate construction dust assessments have not been undertaken as the mitigation measures recommended are also appropriate for these associated activities.

Table 8.3 presents a summary of the dust emission magnitude assigned to each construction activity associated with the excavation and construction of the proposed underground cable.

Table 8.3: Dust Emission Magnitude – Excavation and Construction of the Proposed Underground Cable

Activity	Dust emission magnitude	Justification
Demolition	Small	For the considered 100 m section of the cable route, the total volume of existing structures to be demolished will be <12,000 m^3. Demolition activities will be <6 m above ground level.
Earthworks	Small	For the considered 100 m section of the cable route, the total site area will be <18,000 m^2. There will be fewer than five units of heavy earth-moving equipment active at any one time.
Construction	Small	For the considered 100 m section of the cable route, the total building volume is estimated to be <12,000 m^3.
Trackout	Medium	For the considered 100 m section of the cable route, the total number of outward HDV movements is predicted to be between 20 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding this section of the proposed underground cable is primarily residential in nature with residential properties within 50 m of the planning application boundary. Plate 8.2 presents the assessed section of proposed underground cable.

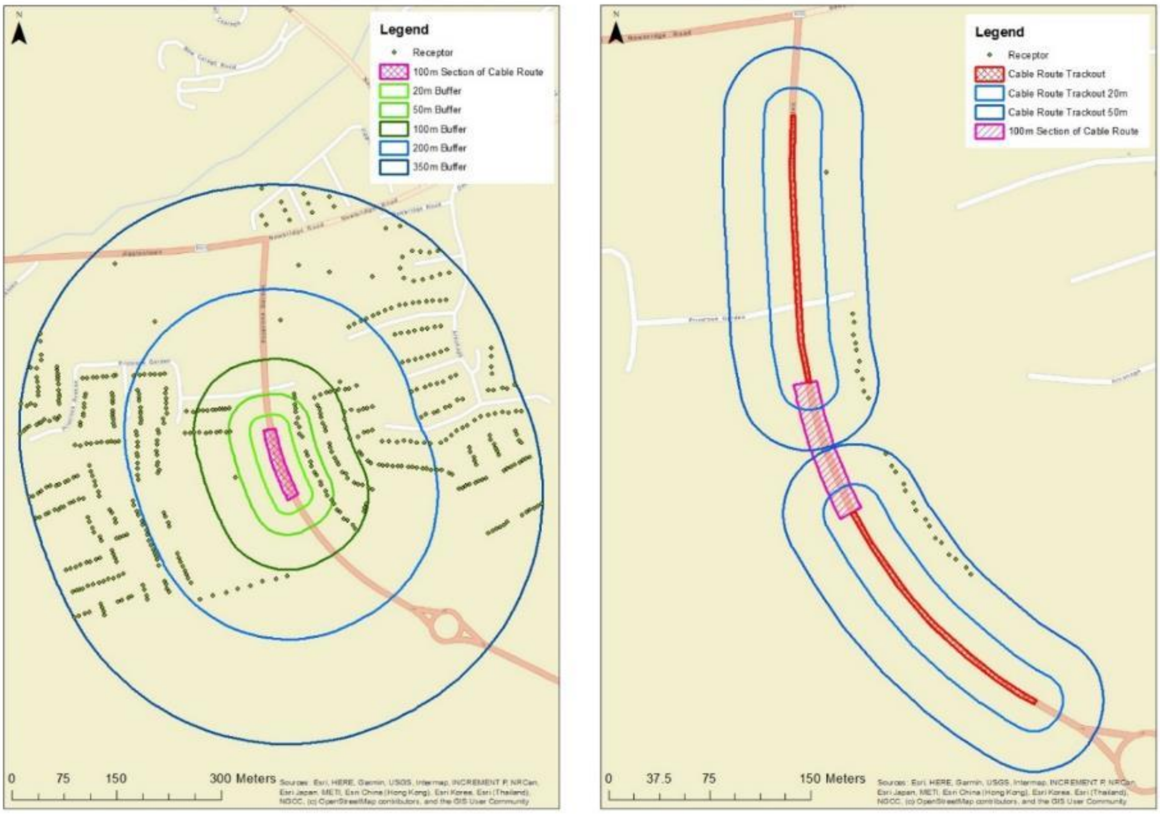

Plate 8.2: The Assessed Section of Proposed Underground Cable Study Areas

Table 8.4 presents the sensitivity of the area to effects caused by construction activities associated with the excavation of the proposed underground cable.

Table 8.4: Sensitivity of the Area Associated with the Assessed Section of Proposed Underground Cable

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
Demolition	Medium	There are no residential properties within 20 m of the planning application boundary. However, there are 20 residential properties within 50 m of the planning application boundary.	Low	Based on the number of receptors in proximity of the considered section of the cable route and the background PM_{10} concentration applied (see Table 8.2), the sensitivity of the area for human health impacts is categorised as low for all stages.
Earthworks	Medium		Low	
Construction	Medium		Low	
Trackout	Medium	There are no residential properties within 20 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s). However, there are 26 residential properties within 50 m of the potential routes up to 200 m from the site exit(s).	Low	

At the considered section of cable route, there are no ecological receptors (sensitive habitats which could be affected by dust soiling) within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). However, the cable route does cross the Royal Canal and Grand Canal proposed national heritage area (pNHA) approximately 200 m north of the assessed section and has been included in the assessment as a conservative approach.

The Royal Canal and Grand Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Tarmonbarry. A number of different habitats are found within the canal boundaries including hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The hedgerow, although diverse, is dominated by Hawthorn (*Crataegus monogyna*). On the limestone soils of the midlands, Spindle (*Euonymus europaeus*) and Guelder-rose (*Viburnum opulus*) are present.

Table 8.5 presents the sensitivity of the area to ecological effects caused by construction activities associated with the excavation of the proposed underground cable.

Table 8.5: Sensitivity of the Area Associated with the Assessed Section of Proposed Underground

Activity	Ecological impacts	
	Sensitivity assigned	Justification
Demolition	Low	Based on the proximity to the Proposed Development and value of the site's ecological assets, inline with IAQM Guidance (IAQM 2023), the Royal Canal and Grand Canal pNHA is considered a Low sensitivity receptor for all stages.
Earthworks	Low	
Construction	Low	
Trackout	Low	

Using the dust emission magnitudes for the various activities in Table 8.3 and the sensitivity of the area provided in Table 8.4 and Table 8.5, the potential risk level in the absence of mitigation associated with the excavation of the proposed underground cable are provided in Table 8.6 for dust soiling, human health and ecological impacts.

Table 8.6: Summary of the Dust Risk from the Assessed Section of Proposed Underground Cable

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	Low risk	Low risk	Low risk	Medium risk
Health effects	Negligible risk	Negligible risk	Negligible risk	Low risk
Ecological	Negligible risk	Negligible risk	Negligible risk	Low risk

The results in Table 8.6 indicate that for potential dust soiling impacts, there is predicted to be a *medium risk* from trackout activities and a *low risk* from demolition, earthworks and construction activities associated with the assessed proposed underground cable. For potential human health impacts, there is predicted to be a *negligible* to *low risk* for all stages.

At Royal Canal and Grand Canal pNHA, there is predicted to be a *negligible* to *low risk* of dust impacts (i.e. dust deposition).

It will therefore be necessary to adopt an appropriate level of good practice dust mitigation measures, to avoid or reduce the risks of causing impacts to amenity, human health or nearby ecological receptors. This will also prevent or reduce potential dust or PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions. Mitigation is considered in Section 8.5 of this chapter.

Formation of a Temporary Construction Compound

Temporary construction compounds (See Chapter 5 of this EIAR for details) will be utilised at six different locations along the cable route and will include facilities such as construction phase car parking, welfare facilities, and temporary material storage areas as necessary. Further information on the temporary construction compounds is provided in Chapter 5 (Proposed Development Description) of this EIAR. The temporary construction compound selected for assessment (i.e. Compound No.4, off the R408) is located at chainage 31000, approximately 1.2 km east-northeast of the town of Prosperous. It is the largest of the construction compounds (1.5 ha) and has the highest number of human receptors within the study area, and so the sensitivity of the area is categorised as the highest of all construction compounds. The spacing of the compounds means that there is no potential for cumulative effects from the compounds and so by assessing this compound, the findings can be applied to the other locations.

Table 8.7 presents a summary of the dust emission magnitude assigned to each construction activity associated with the temporary construction compound.

Table 8.7: Dust Emission Magnitude for Compound No.4

Activity	Dust emission magnitude	Justification
Demolition	n/a	No demolition works are anticipated.
Earthworks	Small	As the total site area is <18,000 m^2 (i.e. 15,000 m^2), a small magnitude has been assigned.
Construction	Small	The total volume of construction is anticipated to be <12,000 m^3.
Trackout	Medium	The total number of outward HDV movements is expected to be between 20 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding Compound No.4 is primarily rural in nature with sporadic residential properties within 250 m of the planning application boundary. Plate 8.3 presents the assessed Compound No.4 and route study areas.

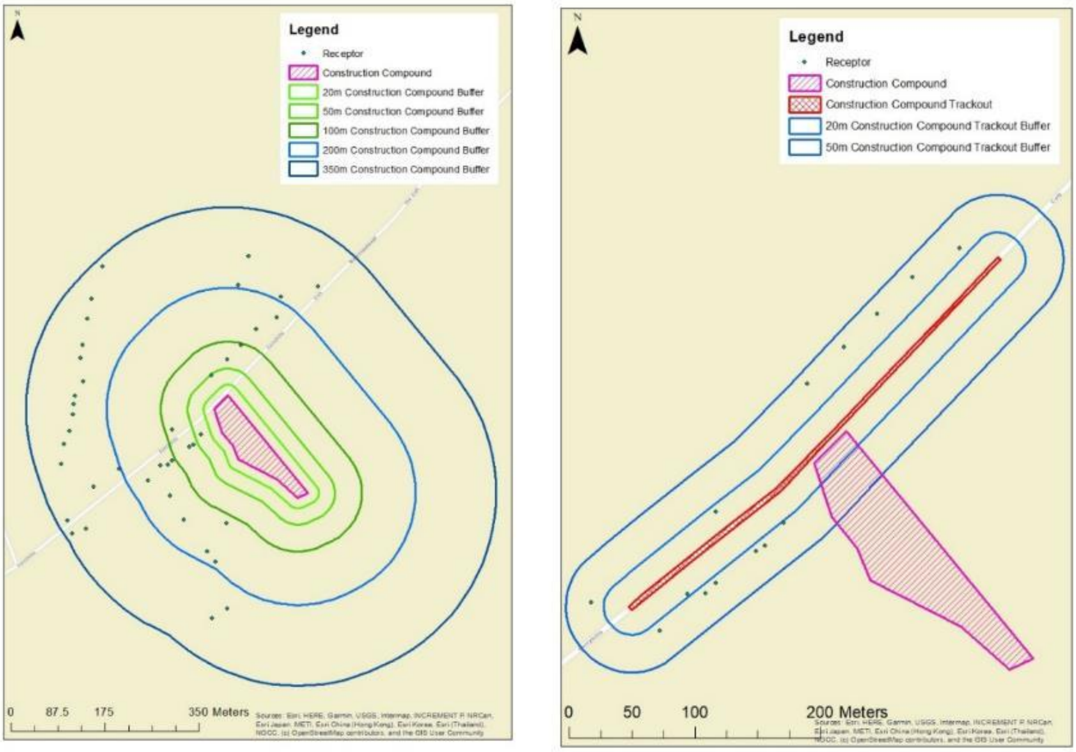

Plate 8.3: Compound No.4 and Route Study Areas

Table 8.8 presents the sensitivity of the area to effects caused by construction activities associated with the formation of the assessed temporary construction compound.

Table 8.8: Sensitivity of the Area Associated with Compound No.4

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
Demolition	n/a	No demolition activities are anticipated.	n/a	No demolition activities are anticipated.
Earthworks	Low	There are no residential properties within 20 m of the planning application boundary. However, there are 2 residential properties within 50 m of the planning application boundary.	Low	Based on the number of receptors in proximity of the considered construction compound and the background PM_{10} concentration applied (see Table 8.2), the sensitivity of the area for human health impacts is categorised
Construction	Low		Low	
Trackout	Medium	There are between two residential	Low	

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
		properties within 20 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).		as low for all relevant stages.

At the assessed Compound No.4, there are no ecological receptors (sensitive habitats which could be affected by dust soiling) within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). Therefore, as per IAQM Guidance (IAQM, 2023), an assessment of ecological impacts is not required.

Using the dust emission magnitudes for the various activities in Table 8.7 and the sensitivity of the area provided in Table 8.8, the risks associated with the formation of the assessed temporary construction compound are provided in Table 8.9 for dust soiling and human health impacts.

Table 8.9: Summary of the Dust Risk from the Assessed Compound No.4

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Negligible risk	Negligible risk	Medium risk
Health effects		Negligible risk	Negligible risk	Low risk

The results in **Table 8.9** indicate that for potential dust soiling impacts, there is predicted to be a *medium risk* from trackout activities and a *negligible risk* from earthworks and construction activities. For potential human health impacts, there is predicted to be a *negligible* to *low risk* for all relevant stages.

It will therefore be necessary to adopt an appropriate level of good practice dust mitigation measures, to avoid or reduce the risks of causing impacts to amenity and human health. This would also prevent or reduce potential dust or PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions. Mitigation is considered in Section 8.5 of this chapter.

Dunstown Substation

The existing Dunstown Substation is located near Two Mile House in County Kildare. The proposed works involve the extension of the existing 400 kV busbars to accommodate a new 400 kV bay to connect the new underground cable. Ancillary site development works include site preparation works, a construction compound and laydown area, underground cabling and earthgrid, surface water drainage and lighting poles as required to facilitate construction.

Table 8.10 presents a summary of the dust emission magnitude assigned to each construction activity associated with the construction of Dunstown Substation.

Table 8.10: Dust Emission Magnitude for Dunstown Substation

Activity	Dust emission magnitude	Justification
Demolition	n/a	No demolition works are required.
Earthworks	Large	As the total site area is >110,000 m^2, a large magnitude has been assigned.
Construction	Medium	The total volume of construction is expected to be between 12,000 m^3 and 75,000 m^3.
Trackout	Medium	The total number of outward HDV movements is expected to be between 20 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding the proposed Dunstown Substation is primarily agricultural in nature with sporadic residential properties within 250 m of the planning application boundary. Plate 8.4 presents the proposed Dunstown Substation and route study areas.

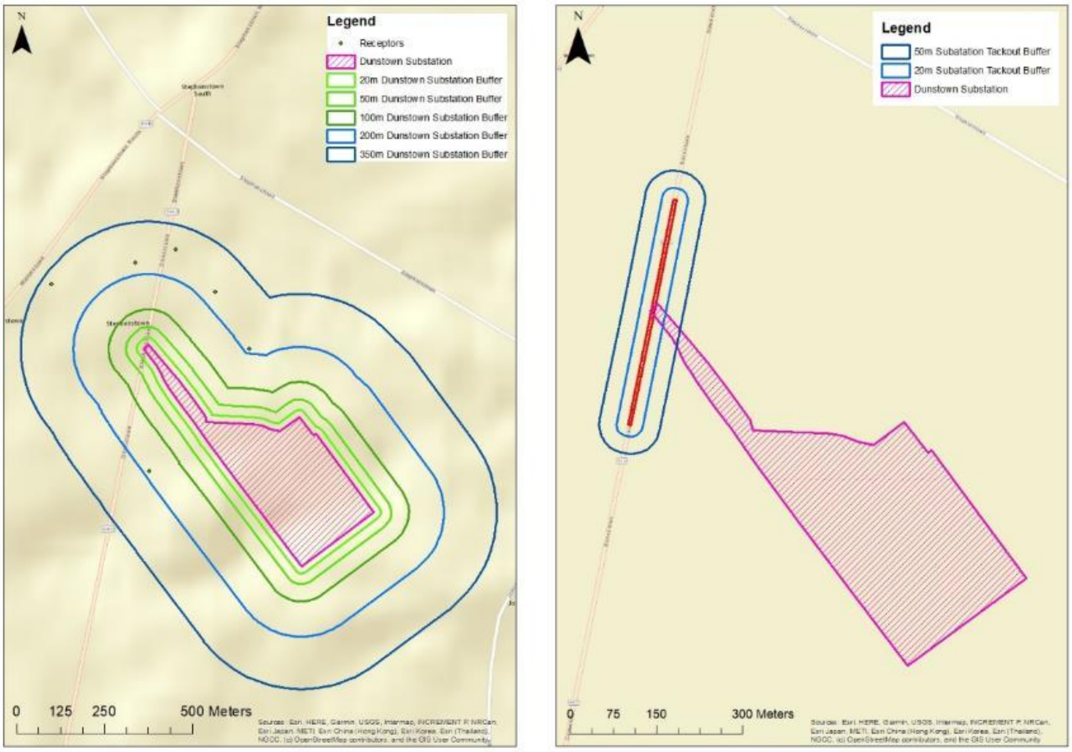

Plate 8.4: Dunstown Substation and Route Study Areas

Table 8.11 presents the sensitivity of the area to effects caused by construction activities associated with the Dunstown Substation.

Table 8.11: Sensitivity of the Area Associated with the Dunstown Substation

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
Demolition	n/a	No demolition activities are anticipated.	n/a	No demolition activities are anticipated.
Earthworks	Low	There is one residential property between 100 m and 200 m of the planning application boundary	Low	Based on the number of receptors in proximity of the considered section of the cable route and the background PM_{10} concentration applied (see Table 8.2) the sensitivity of the area for human health impacts is categorised as low for both stages.
Construction	Low		Low	
Trackout	n/a	There are no sensitive human receptors within 50 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).	n/a	There are no sensitive human receptors within 50 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).

At the Dunstown Substation, there are no ecological receptors within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). Therefore, as per IAQM Guidance (IAQM, 2023), an assessment of ecological impacts is not required.

Using the dust emission magnitudes for the various activities in Table 8.10 and the sensitivity of the area provided in Table 8.11, the risks associated with the Dunstown Substation are provided in Table 8.12 for dust soiling and human health impacts.

Table 8.12: Summary of the Dust Risk from the Dunstown Substation

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Low risk	Low risk	n/a
Health effects		Low risk	Low risk	

The results in **Table 8.12** indicate that for potential dust soiling and human health impacts, there is predicted to be a *low risk* from all relevant activities associated with the construction of the Dunstown Substation.

It will therefore be necessary to adopt an appropriate level of good practice dust mitigation measures, to avoid or reduce the risks of causing impacts to amenity and human health. This would also prevent or reduce potential dust or

PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions. Mitigation is considered in Section 8.5 of this chapter.

Woodland Substation

The Woodland Substation requires upgrading and extensions for additional electrical equipment and apparatus. The Proposed Development will take place within and immediately adjacent to the existing substation. Proposed construction activities include installation of a 400 kV feeder bay and associated electrical shunt reactor (8 m in height), insulators, instrument transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (12.6 m in height) in order to connect the bay to the busbar and ancillary site development works including site preparation works.

Table 8.13 presents a summary of the dust emission magnitude assigned to each construction activity associated with the upgrading of Woodland Substation.

Table 8.13: Dust Emission Magnitude for Woodland Substation

Activity	Dust emission magnitude	Justification
Demolition	n/a	No demolition works are anticipated.
Earthworks	Large	As the total site area is >110,000 m^2, a large magnitude has been assigned.
Construction	Medium	The total volume of construction is expected to be between 12,000 m^3 and 75,000 m^3.
Trackout	Medium	The total number of outward HDV movements is expected to be between 20 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding the proposed Woodland Substation is primarily agricultural in nature with the existing Portan converter station and substation adjacent to the southern planning application boundary.

Plate 8.5 presents the proposed upgrading of Woodland Substation and route study areas. Although Plate 8.5 indicates that the human receptor location representing Portan Converter Station and Substation as being outside of the trackout buffer area, the Portan Converter Station and Substation carpark is within the trackout buffer and has been included accordingly.

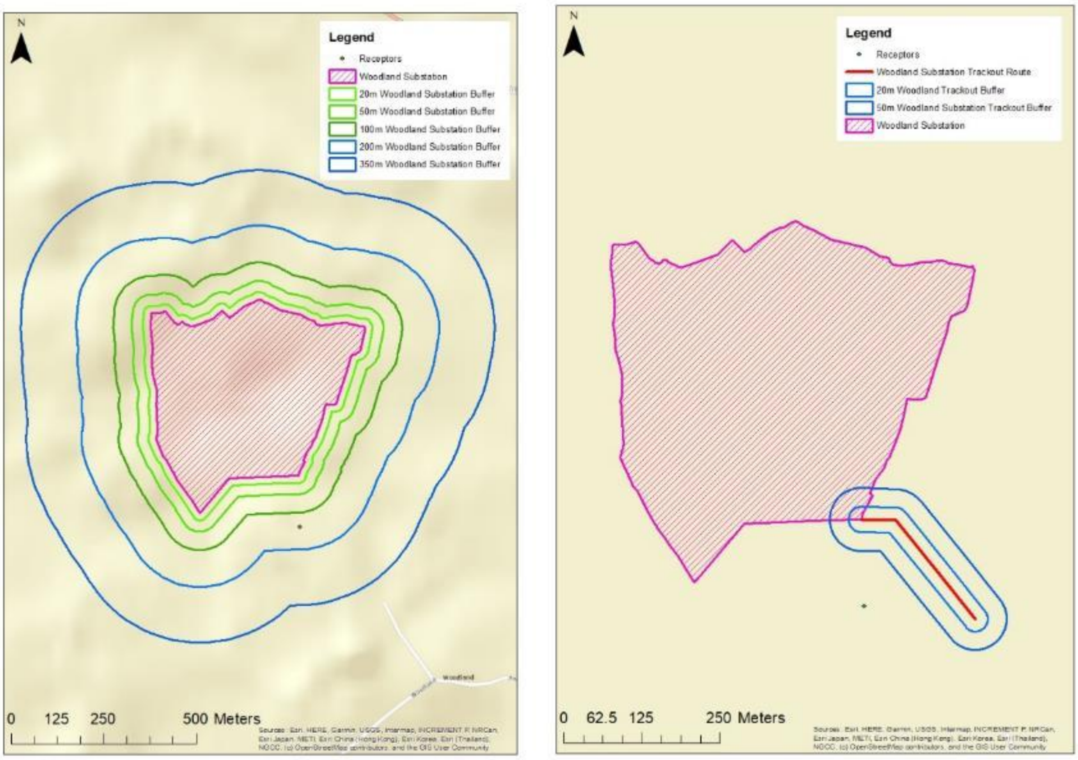

Plate 8.5: Woodland Substation and Route Study Areas

Table 8.14 presents the sensitivity of the area to effects caused by construction activities associated with the Woodland Substation.

Table 8.14: Sensitivity of the Area Associated with the Woodland Substation

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
Demolition	n/a	No demolition activities are anticipated.	n/a	No demolition activities are anticipated.
Earthworks	Low	There is one human receptors (representing Portan converter station and substation) between 100 m and 200 m of the planning application boundary	Low	Based on the number of receptors in proximity of the considered section of the cable route and the background PM_{10} concentration applied (see Table 8.2), the sensitivity of the area for human health impacts is categorised as low for all stages.
Construction	Low		Low	
Trackout	Low	There is one human receptor (representing Portan converter station and substation car park) between 20 and 50 m of the potential routes used by construction	Low	

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
		vehicles on the public highway, up to 200 m from the site exit(s).		

At the Woodland Substation, there are no ecological receptors within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). Therefore, as per IAQM Guidance (IAQM, 2023), an assessment of ecological impacts is not required.

Using the dust emission magnitudes for the various activities in Table 8.13 and the sensitivity of the area provided in Table 8.14, the risks associated with the Woodland Substation are provided in Table 8.15 for dust soiling and human health impacts.

Table 8.15: Summary of the Dust Risk from the Woodland Substation

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Low risk	Low risk	Low risk
Health effects		Low risk	Low risk	Low risk

The results in Table 8.15 indicate that for potential dust soiling and human health impacts, there is predicted to be a *low risk* from all relevant activities associated with the construction of the Woodland Substation.

It would therefore be necessary to adopt an appropriate level of good practice mitigation measures for all of the dust risks identified to reduce the risks of causing impacts to amenity, human health or ecological receptors. This would also prevent or reduce potential dust or PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions.

Summary

As discussed previously, the IAQM Guidance (IAQM, 2023) does not advocate determination of significance pre-mitigation and recommends that significance is only assigned to the impact after considering the construction activity with mitigation. This is the case for the Proposed Development, where a CEMP (see Appendix 5.4 in Volume 3 of this EIAR) is proposed as mitigation (with the full list of mitigation measures set out in Section 8.5).

To simplify, and for ease of management and control, a single risk level for each construction activity (i.e. demolition, earthworks, construction and trackout) has been used as a basis for the selection of the required mitigation measures. A summary of the overall potential dust risk in the absence of mitigation measures is provided in Table 8.16.

Table 8.16: Summary of the highest Dust Risk from assessment[1]

Risk	Demolition	Earthworks	Construction	Trackout	General [2]
Excavation of the cable trench and laying of a section of underground cable	Low risk	Low risk	Low risk	Medium risk	Medium risk
Formation of a Temporary Construction	n/a	Negligible	Negligible	Medium risk	Medium risk
Dunstown Substation	n/a	Low risk	Low risk	n/a	Low risk
Woodland Substation	n/a	Low risk	Low risk	Low risk	Low risk
Dust risk for identifying mitigation measure selection	Low risk	Low risk	Low risk	Medium risk	Medium risk

Note 1: dust risk listed in the table is the highest risk from each assessment for dust soiling, health effects and ecological impacts.
Note 2: the general column represents the highest risk level for each assessed construction activity, to be used to determine the selection of general dust management mitigation measures which are not specific to demolition, earthworks, construction or trackout activities.

As shown in Table 8.16, the dust risk used for the selection of the required level of good practice mitigation measures is low risk for demolition, earthwork and construction activities, and medium risk for trackout and the general mitigation measures.

As described in Section 8.1.1.4, significance of any dust impact is only defined with the application of mitigation. Proposed good practice mitigation for identified dust risk is identified in Section 8.5, and the significance of effect with mitigation in place is set out in Section 8.6.

8.4.1.2 Construction Site Plant and Machinery Emissions

The IAQM Guidance (IAQM, 2023) specifies the following in relation to the assessment of emissions to air from construction plant and machinery (i.e. non-road vehicles):

> *'Experience of assessing the exhaust emissions from on-site plant (e.g. excavators) and generators (also known as non-road Mobile Machinery or NRMM) suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed.'*

The primary construction activities associated with the Proposed Development will require the use of plant and machinery including excavators, cranes and on-site generators.

Based on the likely duration and low number of diesel-powered plant and machinery items that are likely to be required to operate simultaneously at the same location, the potential impact on local air quality at sensitive human and ecological receptors in the vicinity of the Proposed Development planning application boundary is considered to be Negligible, and therefore, is assessed as a Not Significant impact. As a result, emissions from construction plant and machinery are not considered further from an air quality perspective.

8.4.1.3 Road Traffic Emissions

The maximum number of construction related HDV trips per day during peak construction across the considered Temporary Traffic Management (TTM) sections is predicted to be 140, which is at TTM Section 31 – Dunstown. The network peak construction traffic predicted at any of the 30 considered Automated Traffic count (ATC) / Junction

Turning Count (JTC) locations is 92, which is at ATC / JTC 5. This means the predicted change in HDV flows across the road network will be less than the threshold (i.e. 200 AADT) (TII, 2022) for requiring an air quality assessment, as set out in Section 8.1.1.3. As the total estimated number of workers across the Proposed Development at any one time is unlikely to exceed 171, the associated AADT flow is unlikely to change by 1,000 or more. Therefore, the associated change in the concentrations of pollutants at sensitive human and ecological receptors will be Negligible, and therefore, is a Not Significant effect. Further description is presented in Chapter 14 (Traffic and Transport).

8.4.2 Operational Phase

8.4.2.1 Site Plant and Machinery Emissions

There would only be occasional plant and machinery required for maintenance of the Proposed Development. Based on the short duration and low number of diesel-powered plant and machinery items that are required, the potential impact on local air quality at sensitive human and ecological receptors in the vicinity of the Proposed Development is considered to be Negligible, and therefore, is assessed as a Not Significant effect. As a result, emissions from operation plant and machinery are not considered further from an air quality perspective.

8.4.2.2 Road Traffic Emissions

Apart from occasional maintenance visits, there will be very few road traffic movements or operation of other plant and machinery associated with the operational phase of the Proposed Development. The increase in traffic movements associated with the operational phase is therefore likely to be substantially less than the thresholds (TII, 2022) for requiring an air quality assessment, as set out in Section 8.1.1.3. Therefore, the change in the concentrations of pollutants at sensitive human and ecological receptors will be Negligible, and therefore, is a Not Significant effect.

8.5 Proposed Mitigation

8.5.1 Construction Phase

8.5.1.1 Dust Emissions

Good practice dust mitigation measures to manage the generation of dust at source will be implemented. Required mitigation measures, as per the IAQM Guidance (IAQM, 2023), are presented below. These mitigation measures are based on low risk for, earthwork and construction activities, and medium risk for trackout and the general mitigation measures, are ‘highly recommended’ as per the IAQM Guidance (IAQM, 2023).

As discussed previously, the mitigation measures will be included in the CEMP (see Appendix 5.4 in Volume 3 of this EIAR). If the planning permission conditions any additional mitigation measures, these can be included in an updated CEMP with the agreement of the local authority:

- **Communication:**
    - Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
    - Display the name and contact details of the person(s) accountable for air quality and dust issues on the temporary construction compound site boundary. This may be the environment manager / engineer or the site manager; and
    - Display the head or regional office contact information for the developer and contractor.
- **Site management:**
    - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;

- Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and / or air emissions, either on-site or off-site, and the action taken to resolve the situation in the log book.

- **Monitoring:**
  - Carry out regular site inspections to monitor compliance with the CEMP, record inspection results, and make an inspection log available to the local authority when asked; and
  - Increase the frequency of site inspections by the person accountable for air quality and dust issues on-site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Regular site inspections to monitor compliance with the CEMP will be carried out and inspection results will be recorded.
- **Preparing and maintaining the site:**
  - Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable;
  - Erect solid screens or barriers around dusty activities;
  - Fully enclose specific operations where there is a high potential for dust production and impacts on nearby receptors;
  - Avoid site runoff of water or mud, as defined in Chapter 12 Hydrology; and
  - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- **Operating vehicles/machinery and sustainable travel:**
  - Ensure all vehicles switch off engines when stationary (i.e. no idling vehicles); and
  - Avoid the use of diesel, or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- **Operations:**
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction (e.g. suitable local exhaust ventilation systems);
  - Ensure an adequate water supply can be made available for dust / particulate matter suppression where required;
  - Use covered skips;
  - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment as far as practicable, and use fine water sprays on such equipment wherever appropriate; and
  - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

- **Waste management**
  - Avoid bonfires and burning of waste materials.
- **Measures specific to trackout:**
  - Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site;
  - Avoid dry sweeping of large areas;
  - Ensure vehicles entering and leaving sites containing friable materials are covered to prevent escape of materials during transport;
  - Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
  - Record all inspections of haul routes and any subsequent action in a site log book;
  - Install a hard surfaced (gravel etc) haul route to the temporary construction compounds, which will be regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned, if required;
  - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
  - Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
  - Locate access gates at least 10 m from receptors where feasible, to reduce effects from trackout.

8.5.2 Operational Phase

Based on the findings of the assessment as outlined in Section 8.4.8, it is not considered necessary to implement additional mitigation measures for the operational phase, as impacts are assessed to be Negligible.

8.6 Residual Effects

A precautionary approach has been adopted throughout this assessment, such as the activities take place at the site boundary, reducing the distance between construction activities and receptors. Therefore, this allows flexibility of where construction activities take place within the planning application boundary. In addition, the suite of mitigation measures set out in Section 8.5 and in the CEMP would remain appropriate for any flexibility being applied for.

8.6.1 Construction Phase

Following the implementation of the dust mitigation measures outlined in Section 8.5, the dust impact associated with the construction phase of the Proposed Development is not significant at nearby receptors. It should be noted that the measures taken forward from this assessment will be reviewed on a regular basis during construction to ensure that they are appropriate for the works taking place, and any complaints received.

Based on the findings of the assessment for emissions from construction plant and machinery and associated road traffic movements, there will be no significant residual air quality impacts associated with the construction phase of the Proposed Development.

Table 8.17 summarises the residual impacts of the Proposed Development during the construction phase.

Table 8.17: Summary of Residual Impacts Before and Following Mitigation

Assessment Topic	Impacts / Effects	Significance	Mitigation / Offsetting Measures	Significance of Residual Impact
Construction dust emissions	Construction dust emissions affecting human health and or causing annoyance through deposition	Negligible to Medium risk of dust impacts.	Implementation of measures set out in Section 8.5 and the CEMP (see Appendix 5.4 in Volume 3 of this EIAR).	Not Significant
Construction site plant and machinery emissions	Emissions affecting human health and sensitive habitats	Not Significant	None required	Not Significant
Construction related traffic emissions	Emissions affecting human health and sensitive habitats	Not Significant	None required	Not Significant

8.6.2 Operational Phase

Based on the findings of the assessment, there will be no significant residual air quality impacts associated with the operation of the Proposed Development.

8.7 Conclusion

This chapter provides an assessment of the potential effects on air quality arising from the construction and operation of the Proposed Development.

The potential impact on local air quality, at sensitive human and ecological locations in the vicinity of the Proposed Development, associated with emissions from plant and machinery and associated vehicle traffic are anticipated to be Negligible, and therefore Not Significant effects.

A qualitative assessment of construction dust effects has been undertaken for the different construction activities associated with the Proposed Development. The construction activities selected represent those activities which have the greatest potential for dust generation at source. The assessed section of cable route and temporary construction compound represent those locations with the highest number of sensitive receptors in close proximity to the planning application boundary.

Based on the matrix of relationships between sensitivity of the area and the dust emission magnitude for the various activities set out in the IAQM Guidance (IAQM 2023), it is considered that overall, there is a low risk for demolition, earthwork and construction activities, and medium risk for trackout for potential dust soiling impacts at human receptors. There is the potential for infrequent, short-term episodes when baseline dust deposition rates could be increased by an amount that residents could perceive. With regard to human health, there is a *negligible* to *low risk* as there is limited potential for emissions of PM_{10} and $PM_{2.5}$ to increase baseline concentrations to a value that is above the Limit Values set for the protection of human health.

At Royal Canal and Grand Canal pNHA, there is predicted to be a *negligible* to *low risk* of dust impacts from the Proposed Development.

The IAQM Guidance (IAQM 2023) notes that with the application of good practice mitigation measures of the type available for use on the Proposed Development, construction dust emissions should not lead to significant effects at any off-site receptor. The IAQM Guidance (IAQM 2023) also notes that, even with a rigorous package of mitigation measures in place, such as those taken forward from this assessment and included in the air quality management strategies set out in the CEMP, occasional impacts may occur. The CEMP will provide a framework by which the level of mitigation is adapted to respond proactively to the changing risk of dust emissions, so that significant effects are prevented. Beyond the good practice mitigation measures set out in Section 8.5 and the CEMP, no additional mitigation measures are required.

As discussed previously, the changes in the concentrations of pollutants at sensitive receptors from emissions from plant and machinery and associated road traffic is considered to be Negligible. Therefore, this would represent a Not Significant effect on air quality.

As the air quality effects associated with the Proposed Development are Not Significant and ambient pollutant concentrations will be well below the relevant Limit Value, no exceedances of the relevant Limit Value are anticipated.

8.8 References

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9. Noise and Vibration

9.1 Introduction

This chapter considers noise and vibration arising from the Proposed Development and the corresponding effects on noise and vibration-sensitive receptors based on information presented in Chapter 5 (Proposed Development Description), and Chapter 6 (Planning) of the EIAR.

This assessment considers the potential for the following activities to give rise to noise and vibration effects:

- Construction activity within the Planning Application Boundary (PAB), including open cut trenching, joint bays and passing bays, cable pulling and jointing, reinstatement, Horizontal Directional Drilling (HDD), site haul routes, temporary construction compounds and upgrades to the Woodland and Dunstown substations;
- Construction vehicle movements on public highways and access routes;
- Diversion routes used during the construction phase; and
- Operational aspects of the Proposed Development, including resulting from the upgrades to the Woodland and Dunstown substations.

The likely effects associated with the above activities on human receptors (i.e. dwellings, schools, hospitals, places of worship, vibration sensitive commercial premises and other noise and vibration sensitive locations are considered within this chapter).

The main sources of noise and vibration will be during the construction phase of the Proposed Development. The construction noise and vibration assessment has been undertaken based on the effects of the construction activities that are proposed, based on experience of construction of these types of electricity and civil infrastructure development.

9.2 Methodology

9.2.1 Legislation and policy

The Environmental Noise Regulations (ENR)[41] transposes EU Directive 2002/49/EC[42] (commonly referred to as the Environmental Noise Directive) for the strategic control of environmental noise in Ireland.

Nuisance due to noise is dealt with by the Environmental Protection Agency Act S.I. No. 7/1992 (as amended), and the Environmental Protection Agency Act, 1992 (Noise) Regulations, 1994 S.I. No. 179/1994. The Protection of the Environment Act 2003 S.I. No.27/2003 (as amended) requires Best Available Techniques in controlling noise as a result of human activity 'which may be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment'.

Other policy documents relevant to the assessment include:

- Kildare County Council Third Noise Actions Plan 2019-2023[43]; and

[41] Environmental Noise Regulations, 2006 (S.I. No. 140/2006), European Communities (Environmental Noise Regulations) 2018 (S.I. No. 549/2018) and European Communities (Environmental Noise) (Amendment) Regulations 2021 (S.I. No. 663/2021).
[42] The European Parliament and the Council of the European Union, 2002. Directive 2002/49/EC of 25 June 2002 relating to the assessment and management of environmental noise. Commission Directive 2020/367/EC amends Annex III of Directive 2002/49/EC as regards the establishment of assessment methods for harmful effects of environmental noise.
[43] Kildare County Council Third Noise Action Plan 2019-2023. (Kildare County Council, 2019).

- County Meath Noise Action Plan 2019[44].

9.2.2 Guidance

The guidance documents used in this assessment are:

- BS 5228-1:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 1 – Noise'[45] (BS 5228-1) - used for all construction noise calculations and assessment;

- BS 5228-2:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 2 – Vibration'[46] (BS 5228-2) - Assessment of the likelihood of significant effects as a result of ground-borne vibrations, has been carried out using the guidance contained within this standard;

- Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Assessment Reports[47] - used to determine EIA significance;

- Environmental Protection Agency (EPA) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)[48];

- National Roads Authority Guidelines for Treatment of Noise and Vibration in National Road Schemes[49];

- Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes[50];

- Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration[51];

- Calculation of Road Traffic Noise[52] (CRTN);

- BS 7385-2 Evaluation and measurement for vibration in buildings Guide to damage levels from groundborne vibration[53]; and

- EN 14388:2015 Road Traffic Noise Reducing Devices – Specifications[54].

9.2.3 Study Area

The study area for the assessment of construction noise is 300 m from the cable route or any other area used for construction including HDD compounds, construction compounds and works to the substations.

The study area for the construction vibration assessment is 100 m from the Proposed Development, as vibration effects due to the proposed types of construction activity are not known to occur beyond this distance.

The study area of 300 m for construction noise and 100 m for construction vibration is taken from Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration (hereafter referred to as LA 111).

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[44] County Meath Noise Action Plan 2019. (Meath County Council, 2019).
[45] BS 5228-1:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 1 - Noise' (BSI, 2014).
[46] BS 5228-2:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 2 – Vibration' (BSI, 2014).
[47] EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports. (EPA, 2022)
[48] Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4). (EPA, 2016).
[49] National Roads Authority Guidelines for Treatment of Noise and Vibration in National Road Schemes. (TII, 2004).
[50] Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes. (TII, 2014).
[51] Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration, Revision 2. (Highways England, 2020).
[52] Calculation of Road Traffic Noise (CRTN). Department of Transport Welsh Office. (HMSO, 1988).
[53] BS 7385-2 Evaluation and measurement for vibration in buildings Guide to damage levels from groundborne vibration. (BSI, 1993).
[54] EN 14388:2015 Road Traffic Noise Reducing Devices – Specifications. (EN, 2015).

The construction traffic noise study area is defined in LA 111 as 50 m from the carriageway edge of any public roads where there is the potential for an increase in Basic Noise Level (BNL) of 1 dB(A) or more. The procedure for calculating a BNL is set out by the 'Calculation of Road Traffic Noise' (CRTN) document.

9.2.4 Construction Noise

The potential noise effects from the Proposed Development have been assessed according to British Standard (BS) 5228 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise' (2009+A1:2014).

A detailed plant list for each construction activity has been developed in conjunction with the project construction engineers, including the likely duration of the various activities.

Noise levels have been predicted for each noise-sensitive receptor in the study area for each construction activity. Where activities varied over time, or moved geographically, this has been taken into account by predicting a series of daily noise levels in order for the variation in noise levels to be characterised.

Baseline noise monitoring has not been carried out at construction noise receptors since the use of the most stringent thresholds from BS 5228-1 ensures that a conservative and proportionate assessment has been achieved. The most stringent BS 5228-1 thresholds are known as Category A and are set out in Table 9.1.

Table 9.1: Construction noise thresholds – Category A BS 5228-1

Assessment category and threshold value period	Threshold value in decibels (dB) L_{Aeq}
	Category A
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65
Evenings and weekends	55
Night-time (23:00 to 07:00)	45

Table 9.2 presents the magnitude of impact scale for construction noise based on guidance from LA 111 which has been developed from assessment criteria set out in BS 5228-1. In accordance with LA 111, construction noise impacts are considered to constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- A period of 10 or more days or nights of working in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

Table 9.2 also presents the EPA Guidelines (2022) for the determination of Significance based on the magnitude and the duration of impact.

Table 9.2: Construction noise Magnitude of Impact, Duration and EPA Guidelines Determination of Significance

LA 111 Magnitude of Impact	Construction noise level	Duration	EPA Guidelines Determination of Significance
Major	Above or equal to BS 5228-1 Category A threshold +5 dB	> 10 days/nights over 15 consecutive days/nights; or > 40 days over six consecutive months	Significant
Moderate	Above or equal to BS 5228-1 Category A threshold and below BS 5228-1 Category A +5 dB		Moderate to Significant
Minor/ Negligible	Below BS 5228-1 Category A threshold		Not Significant

A major or moderate impact with a duration of less than 10 days/nights over 15 consecutive days/nights or less than 40 days over six consecutive months is considered Not Significant.

The proposed construction programme is presented in Chapter 5. The overall length of the construction period is anticipated to be 42 months with construction due to begin, subject to obtaining planning permission, in Quarter 1 of 2025 and finish at the end of Quarter 3 of 2028. In general, except as noted in this paragraph, it is anticipated that construction will occur during normal working hours i.e. Monday to Friday 7 am to 7 pm and Saturday from 7 am to 2 pm. However, there may be localised instances (e.g. during HDD works) where construction work outside normal working hours is required, and this will only be undertaken with prior agreement with Meath and Kildare County Councils.

The construction activities have been divided into two categories:

- Those that remain in a fixed location, for example an HDD compound or a joint bay; and
- Those where the activities move geographically, for example the enabling works or the trenching and ducting activities.

The construction activities will be phased and full details of the phasing works are presented in Chapter 5. The elements of the construction phases are as follows:

- Enabling works;
- Phase 1: Installation of passing bays and joint bay structures;
- Phase 2: Excavation and installation of ducts; and
- Phase 3: Installation of cables.

Based on the programme information presented in Chapter 5, the following durations are set out in terms of assessing the construction noise impact from fixed work locations:

- The duration of the installation of each joint bay and each passing bay structure (Phase 1 of the works) is anticipated to be seven days. Installation of the joint bays and passing bays structures is expected to start at the beginning of construction (Q2 2025) and last until Q1 2028, a period of around 36 months:
- The duration of the construction of each temporary construction compound is anticipated to be 90 days, though they will be in operation for the full 42 months of the construction period. Construction of the compounds is likely to begin in Q1 2025. These works will be carried out during the enabling works phase:

- The duration of each HDD construction works is anticipated to be 60 days. Construction is likely to begin in Q3 2025 and be undertaken during Phase 2 of the works:

- Construction of installation and jointing of cables (Phase 3 of the works) is likely to begin in Q3 2026 and is anticipated to last 21 months; and

- Construction works to upgrade the substations is anticipated to begin in Q2 2025 and last until Q1 2027.

Based on the programme information presented in Chapter 5, the following rates of progress are anticipated for construction activities which move geographically:

- Enabling (vegetation clearance) works are expected to progress at a rate of 50 m per day. Construction is likely to begin in Q1 2025 and last one to two months: and

- Excavation and installation of ducts (Phase 2 of the works) are expected to progress at a rate of 50 m per day. Construction is likely to begin in Q3 2025 and last around 24 months.

Construction noise levels have been predicted using the CadnaA noise prediction software. Two separate noise models have been constructed, one for the fixed works and another for the works which move geographically.

For the fixed works model, noise sources have been positioned in the approximate centre of the works areas to represent the plant and equipment operating during each construction activity. The distances between the sensitive receptors and the construction areas have been calculated based upon supplied Ordnance Survey Ireland (OSi) Prime 2 data. Construction area locations have been identified using the planning drawings submitted with the planning application. The sensitivity of the receptor has been identified using the OSi Prime 2 data. Contour data was obtained from the Earth Data website (https://www.earthdata.nasa.gov/technology/lidar, accessed February 2023) and all buildings have been assumed to be 6 m high as typical of two storey buildings. Noise predictions in the absence of influence from reflections from nearby surfaces (known as free field) have been made, which have been converted to façade levels (+3 dB) through post-processing of the results. Receiver points have been positioned 1.5 m above ground to represent ground floor noise levels. First floor predictions have been made at 4.0 m above ground. Ground cover between noise sources and receivers has been assigned in the noise model as follows:

- Acoustically hard areas (e.g. car parks and water bodies) are assigned G=0;
- Urban or mixed areas are assigned G=0.5; and
- Greenfields are assigned G=1.

For the moving works model, flat terrain between noise sources and receiver points has been assumed and no screening objects have been included within the noise model. Ground cover between noise sources and receivers has been assumed as acoustically hard with G=0. All noise sources are assumed to be operating at a height of 2.0 m above ground level, and noise predictions at receiver points have been made at 1.5 m (ground level) and 4.0 m (first-floor level) above ground. The predicted noise levels from the noise model have been included within an analysis tool that calculates noise levels at the closest sensitive receptor to each construction activity. The tool assesses whether a receptor is likely to exceed the BS 5228-1 Category A threshold noise levels (65 dB on weekdays and Saturday mornings) and for a period of 10 or more days in any 15 consecutive days or a total number of days exceeding 40 in any six consecutive months.

A list of proposed construction activities and plant/equipment has been developed using the information in Chapter 5 along with additional information gathered from the engineering team and experience of similar projects. Table 9.3 presents a list of the proposed construction activities and plant items along with the percentage on-time and sound power level taken from BS 5228-1.

Table 9.3: Proposed Construction Activities and Items of Plant

Activity	Item of Plant (BS 5228-1 Ref)	% On-time	Sound Power L_w dB
Enabling Works (Removal of vegetation, etc)	Tracked Excavator (C.2.14)	40	107
	Circular Bench Saw (C.4.71)	20	113
Trenching and Ducting	Tracked Excavator (C.2.14)	50	107
	Concrete Mixer Truck (C.4.27)	30	107
	Lorry (C.2.34)	50	108
	Backhoe mounted hydraulic breaker (C.5.1)	25	116
Joint Bays and Passing Bays	Tracked Excavator (C.2.14)	50	107
	Concrete mixer truck (C.4.20)	25	108
	Concrete pump and cement mixer truck (discharging) (C.4.24)	25	95
	Vibratory Roller (C.5.20)	20	103
	Asphalt Paver (and tipper lorry) (C.5.31)	20	105
Cable Pulling and Jointing High Voltage	Tracked Excavator (C.2.14)	50	107
	Telescopic Handler (C.4.54)	30	107
	Wheeled Loader (C.4.13)	30	99
	Diesel Generator (C.4.83)	100	93
Cable Pulling and Jointing High Voltage	Tracked Excavator (C.2.14)	50	107
Reinstatement	Articulated Dump Truck (C.4.1)	40	109
	Wheeled Excavator (C.4.12)	40	105
	Vibratory Roller (C.5.25)	30	103
	Asphalt Paver (and tipper lorry) (C.5.31)	25	105
Horizontal Directional Drilling (HDD)	Cable Percussion Drilling Rig (C.2.43)	40	102
	Directional Drill (Generator) (C.2.44)	100	105
	Wheeled Backhoe Loader (C.4.66)	30	97
	Tracked Excavator (C.2.14)	30	107
	Vibratory Roller (C.5.25)	30	103
Haul Road	Lorry (C.2.34)	50	108
	Dozer (C.2.11)	50	103
Temporary Construction Compound	Tracked Excavator (C.2.14)	40	107
	Diesel Generator (C.4.76)	100	89

Activity	Item of Plant (BS 5228-1 Ref)	% On-time	Sound Power L_w dB
	Telescopic Handler (C.4.54)	30	107
	Dozer (C.2.11)	40	107
	Vibratory Roller (C.5.25)	30	103
Substation Works	Tracked Excavator (C.2.14)	40	107
	Diesel Generator (C.4.76)	100	89
	Vibratory Roller (C.5.25)	25	103
	Telescopic Handler (C.4.54)	30	107

9.2.5 Construction Vibration

The potential vibration effects from the Proposed Development have been assessed according to BS 5228 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2 Vibration' (2009+A1:2014) (BS 5228-2).

For the vibration calculations, ground compaction has been considered as a possibility everywhere within the Planning Application Boundary and vibratory piling as a possibility at all HDD compounds which represents a precautionary approach. Vibration levels experienced during construction will be influenced by factors including the number of surface layers, the thickness, density and stiffness of surface layers, the depth of the water table, the topography of the site and the operating frequency of the plant.

Table 9.4 presents the magnitude of construction vibration impacts for human perception at residential receptors which have been reproduced from LA 111 and BS 5228-2. In accordance with LA 111, construction vibration impacts are considered to constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- A period of 10 or more days or nights of working in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

Table 9.4 also presents the EPA Guidelines for the determination of Significance based on the magnitude and duration of the impact.

Table 9.4: Construction Vibration Effects

LA 111 Magnitude of Impact	Construction noise level	Duration	EPA Guidelines Determination of Significance
Major	Above or equal to 10.0 mm/s peak particle velocity (PPV)	> 10 days/nights over 15 consecutive days/nights; or > 40 days over six consecutive months	Significant
Moderate	Above or equal to 1.0 mm/s PPV and below 10.0 mm/s PPV		Moderate to Significant
Minor	Above or equal to 0.3 mm/s PPV and below 1.0 mm/s PPV		Not significant
Negligible	Below 0.3 mm/s PPV		Not significant

A major or moderate impact with a duration of less than 10 days/nights over 15 consecutive days/nights or less than 40 days over six consecutive months is considered Not Significant.

BS 5228-2 states that vibration levels of 1.0 mm/s PPV can be tolerated if prior warning and explanation has been given to residents.

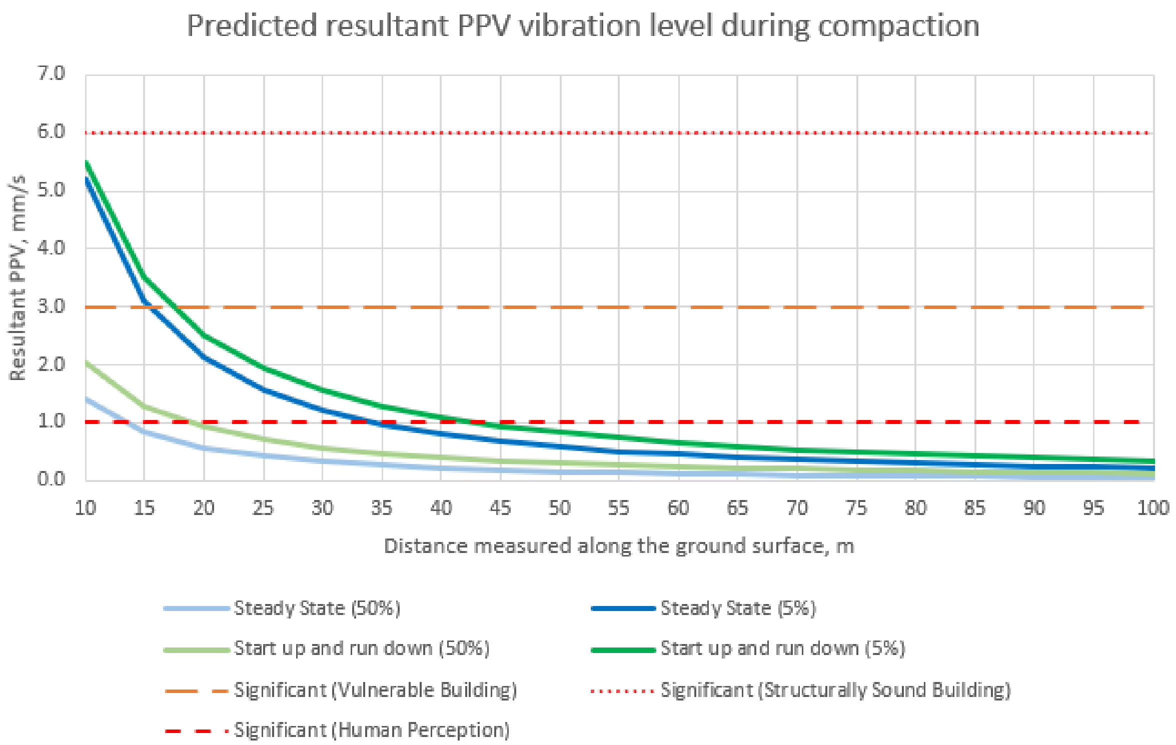
LA 111 recommends that the risk of structural damage due to construction vibration is also considered by reference to criteria set out in BS 7385-2. Based on this British Standard, BS 5228-2 and the professional experience of the assessment team, the criteria presented in Table 9.5 has been adopted.

Table 9.5: Construction vibration criteria to prevent cosmetic damage to buildings

Time period	Potentially vulnerable building	Structurally sound building
All time periods	3.0 mm/s PPV	6.0 mm/s PPV

Vibration predictions during vibratory compaction have been made using the prediction formulae presented in Table E.1 of BS 5228-2. This section presents the data inputs, assumptions and predictions. Predictions of vibration levels during compaction have been undertaken using technical data from a BOMAG BW211 Soil Compactor. This is a large single drum compactor with an operating weight of 13 tonnes, gross power of 98 kW and a compaction width of 2.1 m.

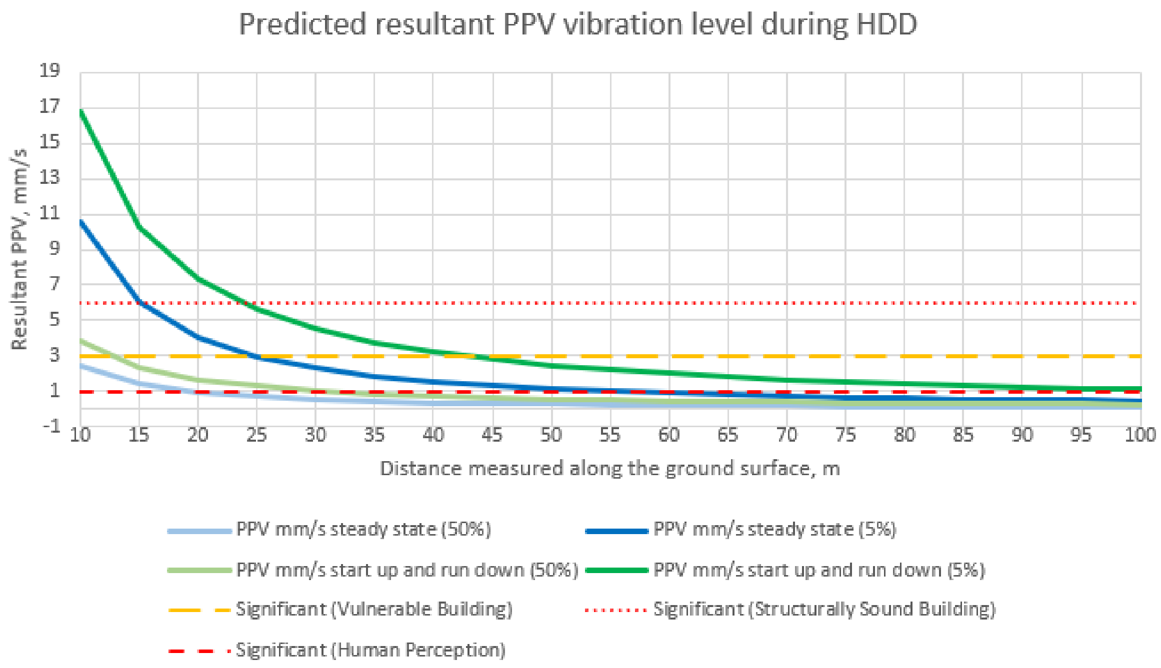
Graph 9.1 shows the resultant peak particle velocity (PPV) vibration levels predicted for steady state and start up / run down (transient) compaction with 50% and 5% scaling factors, denoting the probability of the predicted value being exceeded.



Graph 9.1: Predicted resultant PPV vibration level during compaction.

As Graph 9.1 shows, during steady state working and up to a distance of approximately 14 m, there is a 50% probability of 1.0 mm/s PPV being exceeded, with a 5% probability of 1.0 mm/s PPV being exceeded up to a distance of approximately 35 m. During the transient start up and run down conditions, the distances at which 1.0 mm/s PPV is predicted to be exceeded, are up to approximately 20 m (50% probability) and up to 45 m (5% probability).

Graph 9.2 presents the resultant PPV vibration levels predicted for steady state and start up / run down (transient) during HDD works with 50% and 5% scaling factors, denoting the probability of the predicted value being exceeded. The only input parameter for the prediction method adopted (Table E.1 of BS 5228-2) was the distance measured along the ground surface. All other conditions are included in the constants and scaling factors within the empirical calculation.



Graph 9.2: Predicted resultant PPV vibration level during HDD

During steady state working, and up to a distance of approximately 18 m, there is a 50% probability of 1.0 mm/s PPV being exceeded, with a 5% probability of 1.0 mm/s PPV being exceeded up to a distance of approximately 55 m. During the transient start up and run down conditions the distances at which 1.0 mm/s PPV is predicted to be exceeded are up to approximately 30 m (50% probability) and up to 100 m (5% probability).

9.2.6 Construction Traffic Noise and Vibration

Construction traffic noise predictions have been undertaken using the CRTN methodology to predict the BNL at each road on the day with the largest number of construction vehicles to ensure the peak impacts are assessed. All traffic flow data have been provided by the project traffic and transport team and are presented in Chapter 14 (Traffic and Transport).

The calculations included the following standard assumptions in accordance with CRTN:

- Speed of 88 km/hr;
- Impervious road surface; and
- No allowance for road gradient.

Table 9.6 presents the magnitude of impact for construction traffic noise based on guidance from LA 111 and EPA Guidelines for the determination of Significance based on the magnitude and the duration of impact. According to LA 111, construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- A period of 10 or more days or nights of working in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

Table 9.6: Magnitude of Impact, Duration and Determination of Significance for Construction Traffic Noise

Magnitude of Impact	Change in Basic Noise Level (BNL resulting from construction traffic noise)	Duration	EPA Guidelines Determination of Significance
Major	Greater than or equal to 5.0	> 10 days/nights over 15 consecutive days/nights; or > 40 days over six consecutive months	Significant
Moderate	Greater than or equal to 3.0 and less than 5.0		Moderate to Significant
Minor	Greater than or equal to 1.0 and less than 3.0		Not Significant
Negligible	Less than 1.0		Not Significant

9.2.7 Operational Noise and Vibration

Underground cables are not considered a noise source because soil covering the cables acts as an insulator preventing any significant noise emission above the ground. Therefore, operational noise impacts are not expected as a result of the underground cabling element of the Proposed Development. However, there is the potential for a permanent increase in noise at local receptors close to upgraded / extended substations during the operation of the Proposed Development. At both Woodland and Dunstown substations compensation reactors[55] are to be installed as part of the Proposed Development which have the potential to produce audible levels of noise.

An assessment has been carried out using the NG4 Guidance Note for Noise[56] to predict whether the reactors are likely to result in permanent noise impacts at receptors close to the substations. As a precautionary approach the areas around the substations have been considered as areas of 'low background noise' due to the rural location of the substations with corresponding noise limits shown in Table 9.7.

Table 9.7: Noise Limit Criteria reproduced from NG4 Guidance Note for Noise

Scenario	Daytime Noise Criterion, dB $L_{ar,T}$ (07:00 to 19:00 hrs)	Evening Noise Criterion, dB $L_{ar,T}$ (19:00 to 23:00 hrs)	Night-time Noise Criterion, dB $L_{ar,T}$ (23:00 to 07:00 hrs)
Areas of Low Background Noise	45 dB	40 dB	35 dB

Where noise limits from Table 9.7 are exceeded as a result of operational noise from the Proposed Development then the impact would be considered Significant. However, where operational noise levels are below the limits from Table 9.7 then the impact would be considered Not Significant.

Operational vibration impacts due to the Proposed Development are considered unlikely as the plant to be installed at the substations does not generate any vibration during operation. Also, the underground cables are not likely to generate any vibration during the operational phase.

[55] A type of power transformer that improves the system's energy efficiency.
[56] Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4). (Environmental Protection Agency Office of Environmental Enforcement, 2016).

9.2.8 Sensitive Receptors

Receptors that are particularly sensitive to noise and / or vibration have been identified using guidance from 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' and LA 111. Examples of such receptors are dwellings, schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet areas. Counts have been made up to 300 m from the Proposed Development using guidance from 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes'.

Both the TII noise guidelines and LA 111 note that receptors may have various sensitivities to noise, but do not specifically define a sensitivity scale. All sensitive receptors have been categorised as residential or 'other' sensitive receptor. Commercial and industrial receptors have not been assessed as they are generally considered less sensitive to noise and/or vibration.

9.2.9 Limitations of the Assessment

Baseline noise surveys have not been carried out for this assessment as the approach has been to use the most stringent noise limits from BS 5228-1, known as Category A, to determine the magnitude of impact and the significance of effect.

9.3 Baseline Conditions

9.3.1 Introduction

Baseline noise levels are likely to vary along the Proposed Development with higher noise levels closer to transport infrastructure and during peak periods of transport activity. The main noise source is likely to be from road traffic noise. The route crosses the M4 and the M7 and other regional roads including the R156, the R125, the R158, the R148, the R407, the R408, the R403, the L2002, the R409 and the R448. Other noise sources include rail noise. Railway lines include the Dublin to Cork line south of Sallins and the Dublin to Galway line at Kilcock.

No baseline noise surveys have been undertaken for this assessment because the approach has been to use the most stringent threshold values to assess the construction and operational noise impacts from the Proposed Development.

9.3.2 Strategic Noise Maps

Strategic noise maps for Round 4[57] have been produced under the requirements of the Environmental Noise Directive by the Environment Protection Agency (EPA) for road, rail, airport and industrial noise. The road noise maps show the strategic noise mapping of roads, which were identified as those roads exceeding the flow threshold of 3 million passages per year, in the form of noise contours for the L_{den} (day, evening, night) period and the L_{night} period for Dublin, Limerick and Cork agglomerations and the major roads outside the agglomerations. The rail noise maps show the strategic noise mapping of rail, identified as those railway lines exceeding the flow threshold of 30,000 vehicle passages per year, in the form of noise contours for the L_{den} (day) and L_{night} (night) periods for Dublin, Limerick and Cork agglomerations and the major roads outside the agglomerations. The airport noise maps show the strategic noise mapping of airports, in the form of noise contours for the L_{den} (day) and L_{night} (night) periods for Dublin, Limerick and Cork agglomerations airports.

The strategic noise mapping shows road traffic noise levels are high at receptors in the following parts of the study area and are likely to be exposed to noise levels exceeding the BS 5228-1 Category A thresholds:

- The M4 to the south-west of Kilcock (e.g. in the Commons South and Commons West areas);
- Where the route follows the R407;

[57] Environmental Protection Agency (EPA) Strategic Noise Maps https://gis.epa.ie/EPAMaps/. Accessed November 2023.

- Where the route joins the R403 east of Prosperous;
- Where the route crosses the M7 in the northern area of Naas;
- Millennium Link Road including Naas Community College;
- Where the route follows the R409;
- Where the route crossed the R445 Newbridge Road;
- Where the route follows the R448 Kilcullen Road.

The strategic noise maps show that rail noise levels are elevated where the route crosses the Dublin-Cork railway line west of Sallins. The route does not cross any location where strategic airport or industrial noise mapping contours are present.

9.3.3 Woodland Substation

The existing Woodland substation is located in a rural area around 2 km from the village of Batterstown in County Meath. The closest sensitive receptor is located over 500 m from the substation. The main noise source in the baseline noise environment in the study area is likely to be from the transformers on the substation and road traffic noise.

9.3.4 Dunstown Substation

The existing Dunstown substation is located in a rural area around 2 km from the village of Two Mile House in County Kildare. The closest sensitive receptor is located on the R412 around 250 m from the substation. The main noise source in the baseline noise environment in the study area is likely to be from the transformers on the substation and road traffic noise.

9.3.5 Temporary Construction Compounds

There are a total of six temporary construction compounds associated with the Proposed Development.

Construction compound No. 1 is located at Chainage 3250 around 120 m from the R156 in a rural area. The main noise source in the baseline noise environment in the study area is likely to be from road traffic noise. The closest sensitive receptor is located around 60 m from the proposed temporary construction compound.

Construction compound No. 2 located at Ch. 11000 is in a rural area next to the R125. The main noise source in the baseline noise environment is likely to be from road traffic noise. The closest sensitive receptor is located around 20 m from the proposed temporary construction compound.

Construction compound No. 3 located at Ch. 21000 is in a rural area next to the R407. The baseline noise environment is likely to be dominated by road traffic noise. The closest sensitive receptor is located around 90 m from the compound with outbuildings acting as a barrier between the proposed temporary construction compound and the receptor.

Construction compound No. 4 located at Ch. 31000 is around 600 m from the village of Prosperous next to the R408. The baseline noise environment here is likely to be dominated by road traffic noise. The closest sensitive receptor is located around 37 m from the proposed temporary construction compound.

Construction compound No. 5 located at Ch. 35750 is in a rural area next to the L2002. The main noise source in the baseline noise environment is likely to be from road traffic noise. The closest sensitive receptor is located around 80 m from the proposed temporary construction compound.

Construction compound No. 6 at Ch. 52000 is located around 800 m from Dunstown substation next to the R448. The baseline noise environment is likely to be dominated by road traffic noise. The closest sensitive receptor is located around 20 m from the compound.

Construction Laydown Areas Nos. 1 and 2 at Chainage 39750, off the Osberstown Road, are located either side of the railway line. These areas will not be used for the storage of materials or for site offices but will be used to facilitate the works required on the railway bridge on the Sallins Bypass. The northern area (No. 1) is approximately 0.2 ha in size and the southern area (No. 72 is approximately 0.3 ha in size. The closest sensitive receptor is located around 20 m from the southern area No. 2.

There will be a laydown area within the Dunstown substation as shown in the planning drawings, but as that area is within the existing substation site, it is not included in this list. However the noise and vibration from this laydown area has been already assessed as part of Dunstown substation below.

9.3.6 HDD Compounds

HDD is proposed at key crossings where there are significant constraints. There will be a launch and reception pit either side of the drilling and those temporary HDD compounds will be within the Planning Application Boundary. There are six HDD sites proposed along the cable route:

- HDD1 Ch. 15000 – Crossing of the Rye Water to the west of the R158. The baseline noise environment is dominated by road traffic noise. The closest sensitive receptor is located around 107 m away.
- HDD2 Ch. 15380 – Crossing of the Grand Canal and Dublin-Sligo railway line, to the west of Kilcock. The baseline noise environment is mainly from road traffic noise with rail noise also present. The closest sensitive receptor is located around 59 m away.
- HDD3 Ch. 16640 – Crossing of the M4 Motorway to the south of Kilcock. The baseline noise environment is dominated by road traffic noise. The closest sensitive receptor is located around 210 m away.
- HDD4 Ch. 22000 – Crossing of the Lyreen tributary of the River Liffey along the R407. The baseline noise environment is dominated by road traffic noise. The closest sensitive receptor is located around 18 m away.
- HDD5 Ch. 37100 – Crossing of the River Liffey north of Sallins. The baseline noise environment is made up mainly from road traffic noise. The closest sensitive receptor is located around 68 m away.
- HDD6 Ch. 44600 – Crossing of the Grand Canal in Naas. The baseline noise environment is made up mainly from road traffic noise. The closest sensitive receptor is located around 32 m away.

9.3.7 Joint Bays

It is anticipated that joint bays will be located every 745 m along the cable route and there are 70 joint bays in total. The noise environment is likely to be dominated by road traffic noise particularly in the in-road sections. The closest sensitive receptor is located 30 m from Joint Bay 67.

9.3.8 Passing Bays

Passing bays are temporary traffic mitigation measures and are located at 33 of the in-road joint bays. The baseline noise environment at the passing bays is likely to be dominated by road traffic noise. The closest sensitive receptor is located 40 m from Passing Bay 67.

9.3.9 Sensitive Receptor Counts

Table 9.8 shows the noise and vibration sensitive receptor counts within the 300 m study area associated with the Proposed Development. Sensitive receptor counts were undertaken using desktop data including OSI Prime 2 data.

There are a total of 2,301 receptors within 300 m, made up mainly of dwellings but also other sensitive receptors including primary and secondary schools, a health centre and a nursing home.

Table 9.8: Sensitive Receptor count from the Proposed Development

Buffer Distance	Number of Dwellings	Number of Other Sensitive Receptors	Total Number of Receptors
0-20 m	31	0	31
20-50 m	334	2	336
50-100 m	372	2	374
100-200 m	720	2	722
200-300 m	835	3	838
Total	2,292	9	2,301

9.3.10 Vibration Baseline

There are no significant sources of vibration within the Planning Application Boundary for the Proposed Development. Road traffic, in particular HGVs may produce vibration, but the levels are likely to be negligible and not perceptible by humans at sensitive receptors.

9.4 Potential Effects

9.4.1 Construction Noise

The potential construction noise levels from the fixed works have been predicted at each receptor in the study area using CadnaA noise modelling software. Table 9.9 presents a summary of the receptors which meet or exceed the 65 dB threshold as shown in Table 9.1 for each fixed construction activity, the magnitude of impact, the corresponding duration of the works and the determination of significance. As a precautionary approach some activities close to each other may run concurrently and where this is the case, this has been taken into account. There are no receptors within 500 m of Woodland substation so no noise predictions have been undertaken at this location.

Table 9.9: Summary of receptors exceeding 65 dB threshold for weekdays and Saturday mornings in the absence of mitigation for fixed construction activities

Receptor	Construction Activity	Highest Predicted noise level (dB L_{Aeq},T)	LA 111 Potential Impact Magnitude and Significance	Duration of Impact at Sensitive Receptor	Potential significance
R70568 (Residential Dwelling)	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	71	Major - Significant	60 days	Adverse, Significant and Temporary
R70713 (Residential Dwelling)	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	71	Major - Significant	60 days	Adverse, Significant and Temporary
R70718 (Residential Dwelling)	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	69	Moderate - Significant	60 days	Adverse, Moderate to Significant and Temporary
R70708 (Residential Dwelling)	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	68	Moderate - Significant	60 days	Adverse, Moderate to Significant and Temporary
R70567 (Residential Dwelling)	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	65	Moderate - Significant	60 days	Adverse, Moderate to Significant and Temporary
R66012 (Residential Dwelling)	HDD5 Crossing of the River Liffey north of Sallins	67	Moderate - Significant	60 days	Adverse, Moderate to Significant and Temporary
R138303 (Residential Dwelling)	Joint Bay 67	76	Major – Not Significant	7 days	Adverse, Not Significant and Temporary
R136021 (Residential Dwelling)	HDD6 Crossing of the Grand Canal in Naas and Joint Bay 60	67	Moderate - Significant	60 days	Adverse, Moderate to Significant and Temporary

Table 9.9 shows that for HHD4 and HDD5 the weekday and Saturday morning threshold of 65 dB has been exceeded, the LA 111 magnitude of potential impact is either moderate or major for HDD4 and moderate for HDD5 and the duration of works is expected to be for a period of more than 10 days in any 15-day period. Therefore, the potential effects during construction are Adverse, Significant and Temporary for HDD4 and Adverse, Moderate to Significant and Temporary for HDD5. It is expected that certain activities within the HDD works will begin during daytime but may

extend into the evening and night-time. For example, the pullback element of the HDD works is likely to take place during night-time hours but only last around 24 to 48 hours. Therefore, the evening and night-time potential effects are considered Adverse, Not Significant and Temporary. Plates 9.1 and 9.2 show the location of receptors for which potential for significant effects has been identified during construction works at HDD4 and HDD5, respectively.

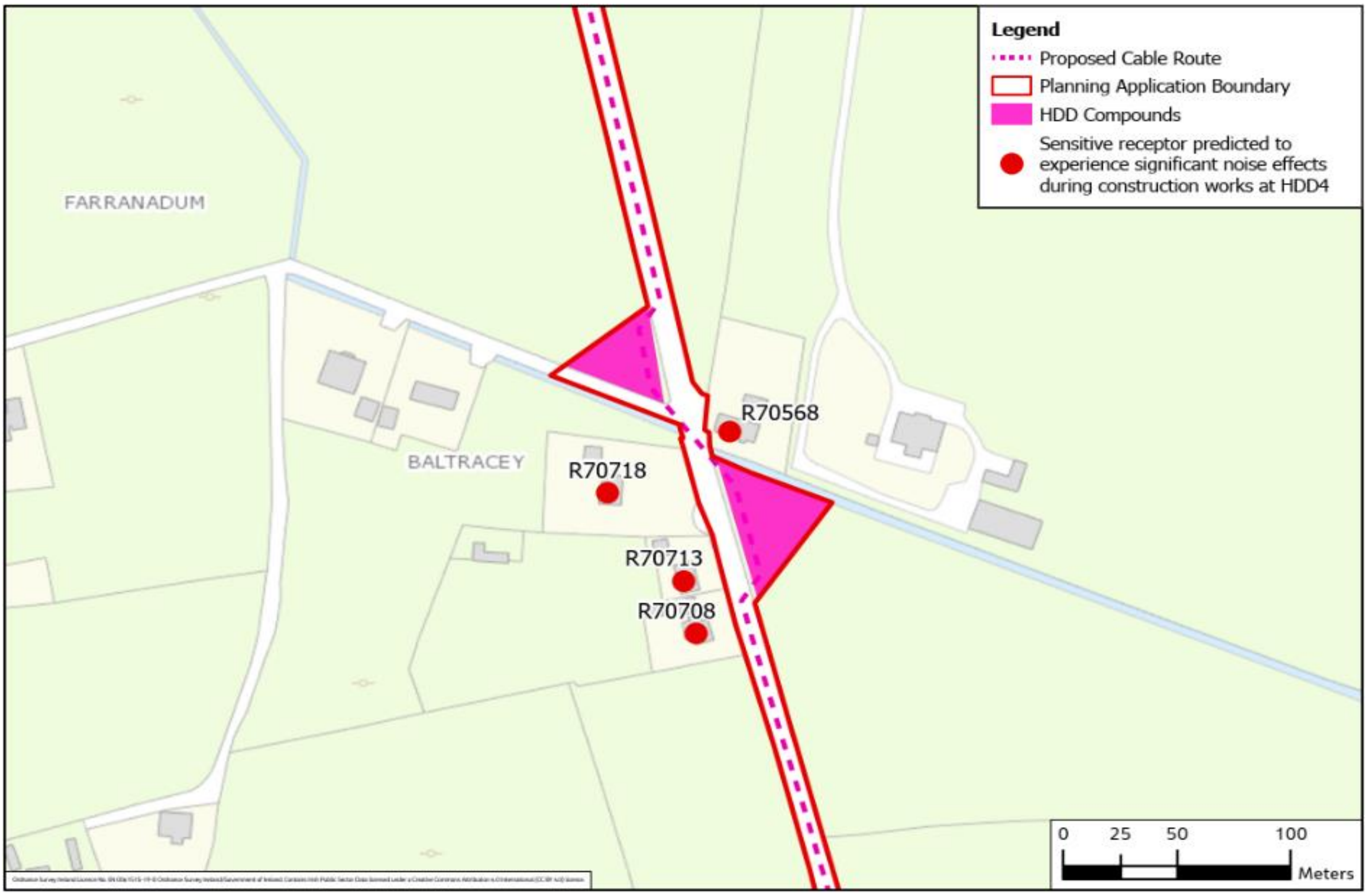


Plate 9.1: Noise-sensitive receptors with potential Adverse, Significant and Temporary effects during construction works at HDD4

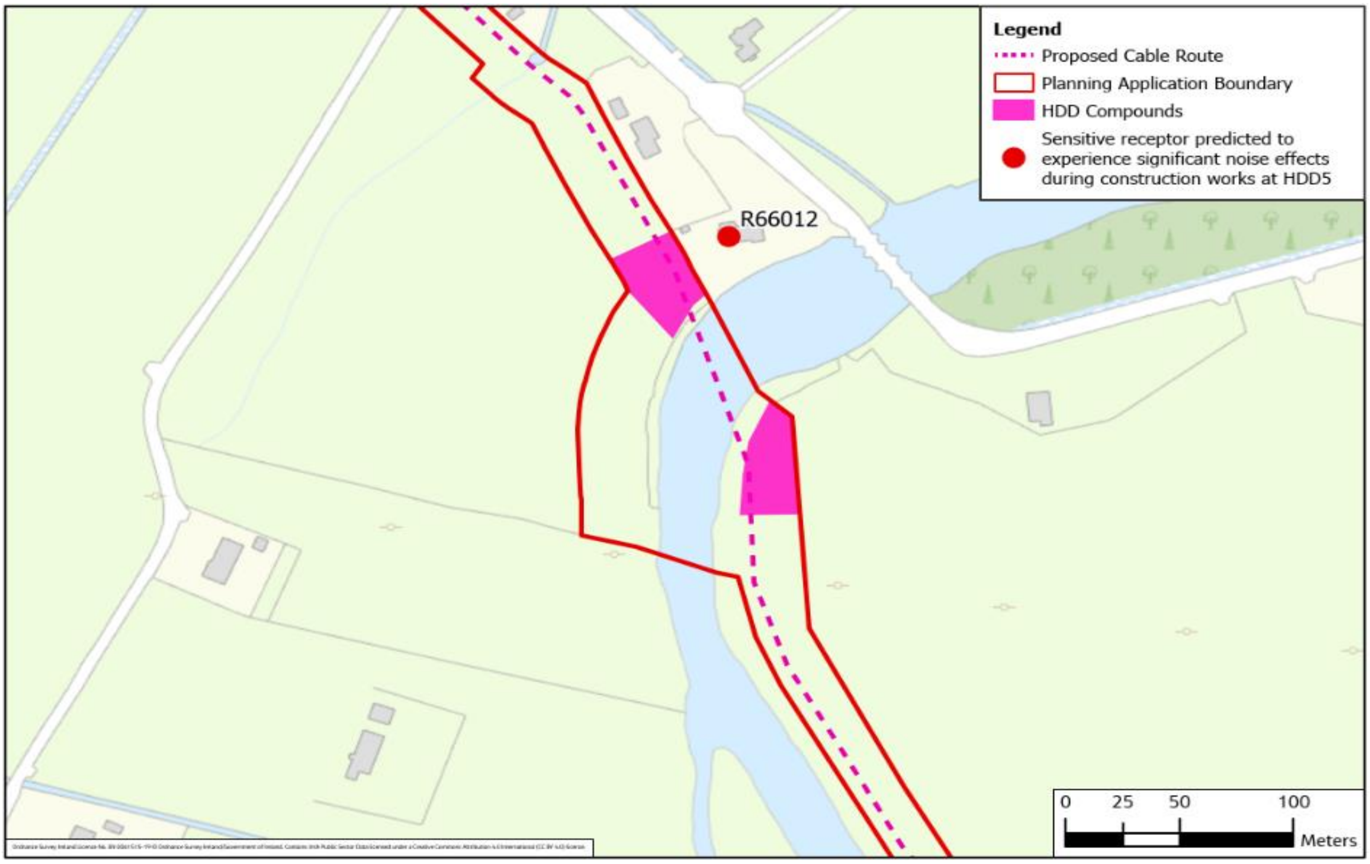


Plate 9.2: Noise-sensitive receptors with potential Adverse, Moderate to Significant and Temporary effects during construction works at HDD5

The highest noise level associated with the construction of the joint bays is at Joint Bay 67 with predicted noise levels of 76 dB and a major potential impact according to LA 111. However, due to the short duration of the works the effects at all the joint bays and passing bays are considered Adverse, Not Significant and Temporary.

Noise levels associated with works to Joint Bay 60 and HDD6 Crossing of the Grand Canal exceed the weekday and Saturday morning threshold resulting in a moderate potential impact according to LA 111. Works are due to last for a period of approximately 60 days therefore the potential effects are considered Adverse, Moderate to Significant and Temporary.

Plate 9.3 shows the location of receptors for which potential for significant effects has been identified during construction works at HDD6 and Joint Bay 60I.

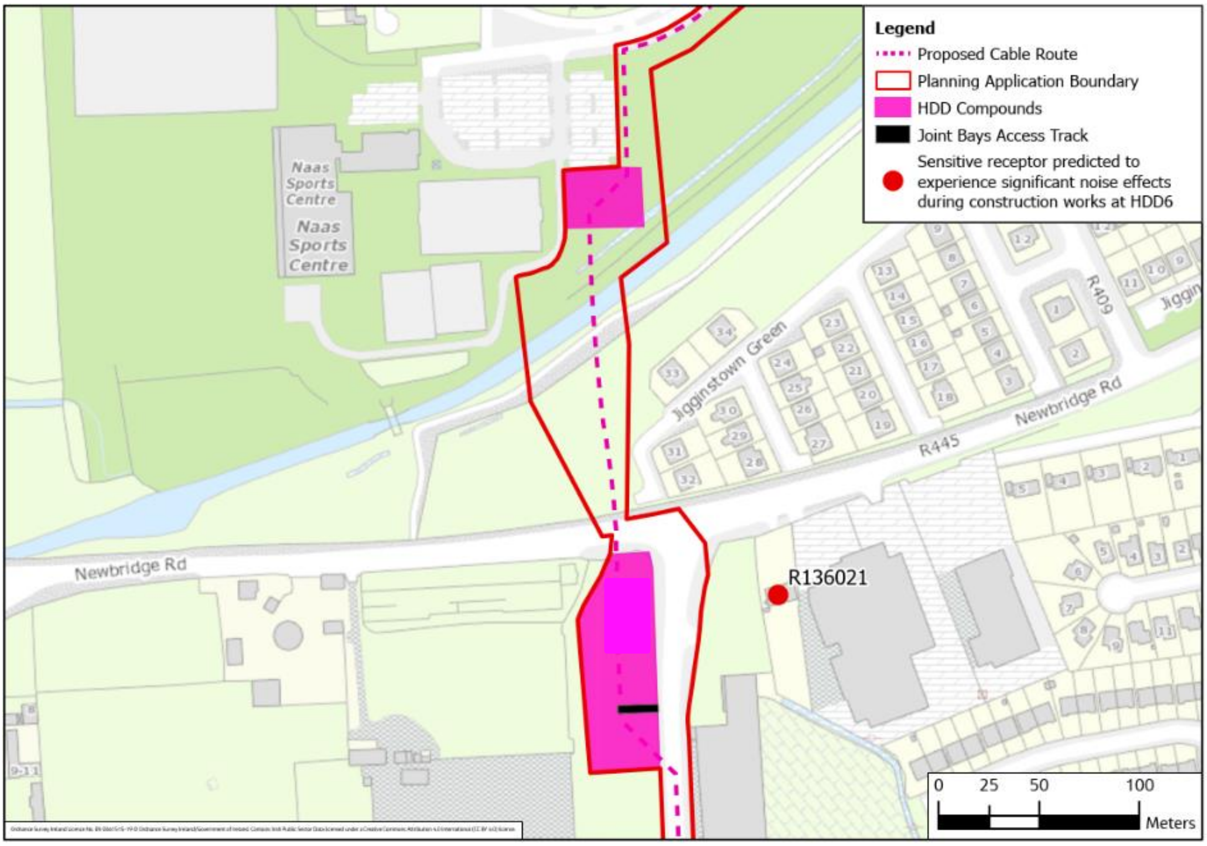


Plate 9.3: Noise-sensitive receptors predicted to experience Adverse, Moderate to Significant and Temporary effects during construction works at HDD6 and Joint Bay 60

Noise levels associated with the Temporary Construction Compounds, access roads and Phase 3 of the works do not exceed the noise thresholds therefore the effects are considered Adverse, Not Significant and Temporary.

Construction noise levels for the works which progress at a daily rate have been calculated for the enabling works phase and Phase 2 of the works. The highest noise levels predicted during the enabling works phase was 79 dB while the highest noise level during Phase 2 was 83 dB. Both levels are above the weekday and Saturday morning threshold and a major impact according to LA 111. However, as the works are proposed to progress at a rate of 50 m a day, the 10 days in any 15-day period is not likely to be exceeded and therefore the effects are considered Adverse, Not Significant and Temporary.

9.4.2 Construction Vibration

During construction of the Proposed Development the main activities likely to result in perceptible vibration levels are Vibratory Compaction and HDD.

Table 9.10 shows the potential impacts from vibratory compaction using the information presented in Graph 9.1. The results are based upon a 5% probability of the relevant thresholds being exceeded.

Table 9.10: Potential Impacts from Vibratory Compaction

Vibratory Compaction	Threshold (mm/s PPV)	Distance from work site (m)	Number of receptors potentially affected	LA 111 Potential Magnitude and Significance	Potential Significance
	Human Perception at Residential Receptors				
Steady State	0.3	35-80	374	Minor - Not Significant	Neutral and Not Significant
	1	6-35	210	Moderate - Not Significant as works will be completed in less than 10 days.	Adverse, Not Significant and Temporary
	10	<6	0	Major - Not Significant as works will be completed in less than 10 days.	Neutral and Not Significant as no receptors affected
Transient (start up and run down)	0.3	45-115	517	Minor - Not Significant	Neutral and Not Significant
	1	6-45	331	Moderate - Not Significant as works will be completed in less than 10 days.	Adverse, Not Significant and Temporary
	10	<6	0	Major - Not Significant as works will be completed in less than 10 days.	Neutral and Not Significant as no receptors affected
	Cosmetic Damage for Buildings				
Steady State	3	10-16	0	-	-
	6	<10	0	-	-
Transient (start up and run down)	3	10-18	0	-	-
	6	<10	0	-	-

Table 9.10 shows that impacts relating to human perception at residential receptors are not considered to be significant. This is because, although moderate impacts are predicted in some instances, the receptors will experience the effects for less than 10 days, therefore the effects are considered Adverse, Not Significant and Temporary. Minor impacts are considered Neutral and Not Significant and there are no major impacts. In terms of cosmetic damage, there are no buildings anticipated to experience cosmetic damage as a result of vibratory compaction.

Table 9.11 shows the potential impacts from vibratory piling at HDD works using the information presented in Graph 9.2. The results are based upon a 5% probability of the relevant thresholds being exceeded which is in accordance with BS 5228-2 guidance.

Table 9.11: Potential Impacts from HDD works.

HDD Works	Threshold (mm/s PPV)	Distance from work site (m)	Number of receptors potentially affected	LA 111 Magnitude and Significance	Determination of Significance
	Human Perception at Residential Receptors				
Steady State	0.3	55-115	51	Minor - Not Significant	Neutral and Not Significant
	1	11-55	7	Moderate - Potentially significant as works will take around 60 days to complete	Adverse, Moderate to Significant and Temporary
	10	<11	0	Major - No receptors affected therefore not significant	Neutral and Not Significant as no receptors affected
Transient (start up and run down)	0.3	105-255	432	Minor - Not Significant	Neutral and Not Significant
	1	16-105	37	Moderate - Potentially significant as works will take around 60 days to complete	Adverse, Moderate to Significant and Temporary
	10	<16	0	Major - No receptors affected therefore not significant	Neutral and Not Significant as no receptors affected
	Cosmetic Damage for Buildings				
Steady State	3	15-25	0	-	-
	6	<15	0	-	-
Transient (start up and run down)	3	24-42	0	-	-
	6	<24	0	-	-

Table 9.11 shows that vibration impacts from HDD works at HDD4, HDD5 and HDD6 related to human perception at residential receptors are Adverse, Moderate to Significant and Temporary given the works are proposed to take 60 days to complete. Minor impacts are considered Neutral and Not Significant and there are no major impacts. HDD vibration impacts related to cosmetic damage to buildings are not likely to occur as a result of the construction works.

9.4.3 Construction Traffic

The traffic data, BNLs and the expected construction traffic noise change are presented in Table 9.12. The calculations show that the highest traffic noise change is 0.5 dB which is a negligible magnitude of impact according to LA 111. Therefore, a Neutral and Not Significant impact is expected in relation to construction traffic on surrounding roads.

Table 9.12: Construction Traffic Data

Road Link	Construction Stage 2025: Base			Construction Stage 2025: Base + Construction Traffic			Construction Traffic Noise Change
	AADT	% HGV	BNL	AADT	% HGV	BNL	
1 Woodland	4,095	8.5	65.8	4,181	9.6	66.1	0.3
2 R156	8,894	8.5	69.2	9,046	10.0	69.5	0.3
3 Mullagh	3,526	8.5	65.1	3,548	11.0	65.6	0.5
4 R125 North	958	8.5	59.5	1,018	7.2	59.5	0.0
5 R125 South	2,892	8.5	64.3	2,936	10.1	64.6	0.3
6 R158	7,526	8.5	68.4	7,560	11.2	68.9	0.5
7 Balfeaghan	11,494	8.5	70.3	11,534	11.3	70.7	0.4
8 R148	10,963	8.5	70.1	10,993	11.4	70.5	0.4
9 M4	17,724	8.5	72.2	17,746	11.6	72.7	0.5
10 R407 North	12,072	8.5	70.5	12,076	11.7	71.0	0.5
11 R407	9,115	8.5	69.3	9,269	10.0	69.6	0.3
12 R408	3,996	8.5	65.7	4,098	9.3	65.9	0.2
13 Curryhills	5,715	8.5	67.2	5,737	11.3	67.7	0.5
14 R403	7,892	8.5	68.6	7,928	11.2	69.1	0.5
15 L2002 North	3,824	8.5	65.5	3,884	10.1	65.8	0.3
16 Millicent Demesne	3,780	8.5	65.4	3,798	11.2	65.9	0.5
17 L2002 South	3,780	8.5	65.4	3,810	10.9	65.9	0.5
18 Castlesize	10,983	8.5	70.1	11,027	11.3	70.5	0.4
19 Sallins Bypass	10,469	8.5	69.9	10,511	11.3	70.3	0.4
20 Mills	11,319	8.5	70.2	11,347	11.5	70.7	0.5
21 Osberstown Road	10,491	8.5	69.9	10,515	11.5	70.4	0.5
22 M7	10,491	8.5	69.9	10,513	11.5	70.4	0.5
23 Millennium Parkway	11,388	8.5	70.2	11,474	10.9	70.7	0.5
24 R409	7,141	8.5	68.2	7,169	11.3	68.7	0.5
25 Grand Canal	10,290	8.5	69.8	10,312	11.5	70.3	0.5
26 R447	13,439	8.5	71.0	13,469	11.5	71.4	0.4
27 R448	8,806	8.5	69.1	8,892	10.6	69.5	0.4
28 R448 South	9,663	8.5	69.5	9,693	11.4	70.0	0.5
29 Stephenstown	2,575	8.5	63.8	2,593	10.9	64.2	0.4
30 R412	1,670	8.5	61.9	1,694	10.2	62.2	0.3
31 Dunstown	1,670	8.5	61.9	1,810	6.4	61.9	0.0

Construction traffic is not anticipated to give rise to perceptible ground borne vibration at receptors within the Planning Application Boundary. For example, an HGV over an irregular road surface is likely to result in PPV levels below 0.3 mm/s which is Neutral impact and Not Significant.

9.4.4 Operational Phase Considerations

Once constructed the majority of the Proposed Development will make no perceptible noise or vibration. Notwithstanding, compensation reactors are to be installed as part of the works at the Woodland and Dunstown substations. Noise data for the proposed reactors show the maximum noise levels from the reactors is 70 dB. There are no receptors within 500 m of the Woodland substation, therefore no impacts are anticipated at the Woodland substation. There is a receptor around 290 m from the Dunstown substation and a CadnaA[58] noise model has been used to calculate the noise level from the reactor at this receptor. Refer to Table 9.13 for the results of the predicted noise level at the closest receptor along with night-time noise criterion taken from NG4 Guidance Note for Noise.

Table 9.13: Operational noise assessment Dunstown substation

Distance to Closest Receptor	Noise level predicted from reactor at closest receptor	Night-time noise criterion (23:00 to 07:00)
290 m	20 dB(A)	35 dB(A)*
* Taken from NG4 Guidance Note for Noise Table 1 for areas of low background noise		

Table 9.13 shows that the predicted noise levels at the closest receptor are comfortably below the 35 dB night-time noise criterion, therefore the impact is considered Neutral and Not Significant.

In terms of the Environmental Noise Regulations 2018, future noise action plans by the relevant competent authorities are not likely to be affected as they deal with managing the operational impacts from road, rail, air and industry noise sources. The Proposed Development is not likely to result in any significant increase in operational noise which would require noise management by the relevant authorities in the future.

9.5 Proposed Mitigation

The construction works will comply with the recommendations of BS 5228-1, and the mitigation measures that will be implemented include the following:

- Noise barriers will be installed around the HDD compounds:
    - HDD4 Ch. 22000 – Crossing of the Lyreen tributary of the River Liffey along the R407. The closest sensitive receptor is located around 18 m away. Noise barriers will be placed on the perimeter of both the launch and reception HDD compounds to screen the receptors identified in Plate 9.1;
    - HDD5 Ch. 37100 – Crossing of the River Liffey north of Sallins. The closest sensitive receptor is located around 68 m away. Noise barriers will be placed on the northern perimeter of the HDD compound on the western bank of the River Liffey to screen the receptors identified in Plate 9.2;
    - HDD6 Ch. 44600 – Crossing of the Grand Canal in Naas. The closest sensitive receptor is located around 32 m away. Noise barriers will be placed on the northern perimeter of the southern HDD compound to screen the receptors identified in Plate 9.3;
    - The noise barriers will be within the Planning Application Boundary. The exact location, height and type of noise barriers to be installed will be confirmed pre-construction and agreed with the local planning authority;

[58] CadnaA Noise Prediction Software. (DataKustik, 2023).

- BS 5228-1 states that a noise barrier which blocks the line of sight between the source and the receptor would result in an approximate attenuation of 10 dB which would reduce the exposure of the effects. Therefore the noise barriers will be designed in order to block the line of sight between the noise sources and the affected receptors;

- Noise barriers will comply with the standard EN 14388;

- The Contractor will be obliged to comply with Local Authority controls on noise and vibration during construction.

- The location of the noise barrier will be set out and agreed in advance of the works and designed to keep noise levels within the limits;

- The routing, depth, locations, and drilling types of the proposed HDD works will be carefully selected to avoid / mitigate effects. Confirmatory structural surveys will be completed pre-construction at all structures that will be crossed or that are within 50 m of the HDD locations. These locations will be monitored by the Contractor during the HDD works, and the surveys will be repeated post-construction. In the extremely unlikely event of repairs being required, these will be immediately undertaken in agreement with the structure owner;

- During the HDD works, constant monitoring by the specialist drilling team will be carried out. The volume of cuttings produced will also be monitored to ensure that no over-cutting takes place and that hole cleaning is maintained. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses. The CEMP will be updated pre-construction with further information about HDD monitoring when the Contractor is appointed and will be agreed with stakeholders including the Local Authorities, TII, Waterways Ireland, and Irish Rail;

- There is potential for some elements of the HDD works to extend into the evening and the night periods and advanced notice will be given to nearby residents when this is occurring;

- The Contractor will develop and implement a stakeholder communications plan prior to the commencement of construction to ensure residents understand the nature and duration of noise and vibration effects, and the measures that will be put in place to manage and reduce them.

- Only plant conforming with or exceeding relevant national or international standards (including BS 5228), directives or recommendations on noise or vibration emissions will be used. Construction plant will be maintained in good condition with regards to minimising noise and vibration emission;

- Plant will be operated and maintained appropriately, in compliance with manufacturer recommendations. All vehicles, plant and equipment will be switched off when not in use;

- Routes for the transport of construction materials, spoil and personnel will be carefully selected to reduce the risk of increased noise and vibration impacts during construction;

- Vehicle and mechanical plant / equipment used for the works will be fitted with effective exhaust silencers, to be maintained in good working order and operated in a way that minimises noise emissions;

- Construction plant and activities will be positioned to minimise noise at sensitive locations;
- Equipment that breaks concrete by pulverising or similar, rather than by percussion, will be used where practicable;
- Mufflers will be used on pneumatic tools;

- Works will be programmed to minimise the need for working outside normal working hours;

- Unnecessary revving of engines will be avoided and idling of engines will be kept to a minimum;
- Plant and vehicles will be started-up sequentially rather than all together;
- Drop height of materials will be minimised;
- Rubber linings will be used in, for example, chutes and dumpers to reduce impact noise;
- Any plant, such as generators, which are required to operate before 07:00 or after 19:00 will be surrounded by an acoustic enclosure or portable screen;

In terms of vibration levels giving rise to human discomfort, the following additional measures will be implemented during the construction phase:

- A clear communication programme will be established between the Contractor and the affected residents prior to works which may give rise to significant vibration effects. The nature and duration of works will be clearly set out in all communications;
- Activities capable of generating significant vibration effects in relation to human response will be restricted to daytime hours where practicable;
- Appropriate vibration isolation will be applied will be applied to plant where required and where feasible;
- Low vibratory or non-vibratory plant will be used when working close to a vibration sensitive receptor; and
- Vibratory equipment will be started up and turned off as far away from sensitive receptors as practicable.

9.6 Residual Effects

9.6.1 Construction Noise

Table 9.14 shows the construction activities associated with either moderate or significant noise impacts before and after the application of appropriate mitigation as outlined in Section 9.5.

Table 9.14: Construction activities with Significant Noise Impacts Pre and Post Mitigation

Construction Activity	Significance of Impact (Pre-Mitigation)	Significance of Impact (Post-Mitigation)
HDD4	Adverse, Significant and Temporary in the absence of mitigation measures	Adverse, Not Significant and Temporary with mitigation measures in place
HDD5	Adverse, Moderate - Significant and Temporary in the absence of mitigation measures	Adverse, Not Significant and Temporary with mitigation measures in place
HDD6	Adverse, Moderate - Significant and Temporary in the absence of mitigation measures	Adverse, Not Significant and Temporary with mitigation measures in place

Table 9.14 shows that with the addition of mitigation measures the significance of impact for HDD4, 5 and 6 is Adverse, Not Significant and Temporary.

Residual effects in relation to all other construction noise activities are considered Adverse, Not Significant and Temporary.

9.6.2 Construction Vibration

Table 9.15 shows that vibration impacts associated with some of the HDD works in relation to human perception at residential receptors are considered Adverse, Moderate to Significant and Temporary in the absence of mitigation measures. With the addition of mitigation measures set out in Section 9.5 including prior warning to affected residents the impacts are considered Adverse, Not Significant and Temporary.

Table 9.15: Construction activities with Significant Vibration Impacts Pre and Post Mitigation

Construction Activity	Significance of Impact (Pre-Mitigation)	Significance of Impact (Post-Mitigation)
HDD4	Adverse, Moderate - Significant and Temporary in the absence of mitigation measures	Adverse, Not Significant and Temporary with mitigation measures in place
HDD5	Adverse, Moderate - Significant and Temporary in the absence of mitigation measures	Adverse, Not Significant and Temporary with mitigation measures in place
HDD6	Adverse, Moderate - Significant and Temporary in the absence of mitigation measures	Adverse, Not Significant and Temporary with mitigation measures in place

Residual effects in relation to all other construction vibration activities are considered Adverse, Not Significant and Temporary.

9.6.3 Construction Traffic

Residual effects in relation to construction traffic on surrounding roads are considered Neutral and Not Significant.

9.6.4 Operational Phase Considerations

No significant impacts relating to operational noise or vibration have been identified therefore no residual effects are expected.

9.7 Conclusion

A noise and vibration assessment has been undertaken for the Proposed Development in line with relevant guidelines, policies, legislation and standards. Mitigation measures, including noise barriers around the HDD compounds, will ensure that construction noise effects are likely to be at worst Adverse, Not Significant and Temporary at sensitive receptors in the study area.

Standard good practice mitigation measures, including a risk assessment and community engagement, will ensure that vibration effects are likely to be at worst Adverse, Not Significant and Temporary at sensitive receptors in the study area. The CEMP, which forms part of this EIAR, contains mitigation measures for construction noise and vibration to ensure there are no significant effects at sensitive receptors in the study area.

Neutral and not significant impacts are anticipated as a result of construction traffic on surrounding roads. The operational noise and vibration assessment concluded that Neutral and Not Significant impacts will occur as a result of the Proposed Development.

9.8 References

Kildare County Council Third Noise Action Plan 2019-2023. (Kildare County Council, 2019).

County Meath Noise Action Plan 2019. (Meath County Council, 2019).

BS 5228-1:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 1 - Noise' (BSI, 2014).

BS 5228-2:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 2 – Vibration' (BSI, 2014).

EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports. (EPA, 2022).

Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4). (EPA, 2016).

National Roads Authority Guidelines for Treatment of Noise and Vibration in National Road Schemes. (TII, 2004).

Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes. (TII, 2014).

Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration, Revision 2. (Highways England, 2020).

Calculation of Road Traffic Noise (CRTN). Department of Transport Welsh Office. (HMSO, 1988).

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OSI Prime 2 Data. (OSI, 2023).

NASA Contour data. Available from https://www.earthdata.nasa.gov/. Accessed February 2023.

BS 7385-2 Evaluation and measurement for vibration in buildings Guide to damage levels from groundborne vibration. (BSI, 1993).

Environmental Protection Agency (EPA) Strategic Noise Maps https://gis.epa.ie/EPAMaps/. Accessed November 2023.

EN 14388:2015 Road Traffic Noise Reducing Devices – Specifications. (EN, 2015).

9.8.1 Directives and Legislation

Environmental Noise Regulations, 2006 (S.I. No. 140/2006), and European Communities (Environmental Noise Regulations) 2018 (S.I. No. 549/2018) and European Communities (Environmental Noise) (Amendment) Regulations 2021 (S.I. No. 663/2021).

The European Parliament and the Council of the European Union, 2002. Directive 2002/49/EC of 25 June 2002 relating to the assessment and management of environmental noise. Commission Directive 2020/367/EC amends Annex III of Directive 2002/49/EC as regards the establishment of assessment methods for harmful effects of environmental noise.

Number 7 of 1992 - Environmental Protection Agency Act, 1992 (as amended).

Number 27 of 2003 - Protection of the Environment Act 2003 (as amended).

S.I. No. 179/1994 - Environmental Protection Agency Act, 1992 (Noise) Regulations, 1994.

10. Biodiversity

10.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) considers the potential effects of the Proposed Development on biodiversity during the construction and operational phases, and identifies, describes and assesses the potential direct and indirect significant effects. Assessment is in accordance with the requirements of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the EIA Directive). Particular attention is made to species and habitats protected 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) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (hereafter referred to as the Birds Directives), and species protected pursuant to Number 39 of 1976 - Wildlife Act, 1976 (as amended) (hereafter referred to as the Wildlife Acts).

The EIA Directive does not provide a definition of biodiversity. The Convention on Biological Diversity, however, gives the following formal definition of biodiversity in its Article 2:

"biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems".

Alongside the term 'biodiversity', the terms 'ecology' and 'ecological' are also used throughout this chapter as a broader term to consider the relationships of biodiversity receptors to one another and to their environment.

The following sections of the Chapter comprise:

- Section 10.2 presents the methodology including underpinning legislation and guidance (including Section 10.2.3.2.3 which describes the difficulties encountered in compiling information);
- Section 10.3 describes the existing baseline environment;
- Section 10.4 summarises the main characteristics of the Proposed Development which are of relevance for biodiversity, and evaluates the potential impacts of the Proposed Development on biodiversity;
- Section 10.5 describes the measures proposed to mitigate and monitor potential impacts; and
- Section 10.6 describes the residual impacts and proposed compensatory measures; and
- Section 10.7 presents the conclusion.

10.2 Project Description

The Proposed Development is a 52.9km underground cable (UGC) between Dunstown 400 kV substation in Kildare and Woodland 400 kV substation in Meath, of which 9.5km (18%) is off-road and 43.3km (82%) is in-road. On road sections are proposed to be sited within the existing roads and will be installed a trench excavated to 1.3 m deep and 1.5 m wide. Approximately every 750 m (on average) the cables will be joined together at a 'joint bay', of which there will be 70 in total. Joint bays are pre-cast concrete underground chambers approximately 2.5 m wide by 10 m long by 2 m deep with two associated manhole covers to the side of the chamber. There are 31 off-road and 39 in-road joint bays. Where the joint bays are off road a permanent hard standing area in a 3 m radius around the joint bay will be provided. At joint bays, there will be additional land take to facilitate construction. At each joint, except for those which are off-road, there will be provision for cars to pass around it at a passing bay. Passing bays are temporary structures, which will be in place for a maximum of two years. Each temporary passing bay will be on average 5.5 m wide with length of 100 m (exact length to be determined by engineering constraints). The passing bays will not be in use for the full duration of the construction period. The bays will be used during the joint bay construction and the cable pulling and jointing process. When the bays are not in use, measures will be put in place to ensure no illegal parking. Passing bays will be reinstated post-construction.

The routing of the cable and associated jointing and passing bays took into consideration the location of mature trees along the route. The route and bay positions were moved to avoid mature trees where possible. However, due to narrow treelined roads in several locations and the requirement for set distances between jointing bays, avoidance of vegetation loss was not possible in all areas and to accommodate the trenches for the UGC there will need to be significant removal of hedgerows, trees, including mature trees, which are lining the road network where the Proposed development is located.

Six temporary construction compounds are proposed, each approximately one hectare in size. All temporary construction compounds will be secured with hoarding/ fencing around their perimeter as appropriate. Temporary construction compounds will include facilities such as construction phase car parking and welfare facilities and temporary material storage areas as necessary.

The temporary construction compounds are all located with the planning application boundary and are as follows:

- Compound No. 1: Chainage 3250, off the R156 – approximately 0.8 ha;
- Compound No. 2: Chainage 11000, off the R156 – approximately 0.7 ha;
- Compound No. 3: Chainage 21000, off the R407 – approximately 0.9 ha;
- Compound No. 4: Chainage 31000, off the R408 – approximately 1.5 ha;
- Compound No. 5: Chainage 35750, off the L2002 – approximately 1.1 ha; and
- Compound No. 6: Chainage 52000, off the R448 – approximately 0.7 ha.

Both temporary and permanent access track are proposed. Where a permanent access track is required to access off-road joint bays, this will comprise of approximately 300 mm of fill material and finished to approximately 100 mm above ground level. The access track will remain in place to allow access to cables should future maintenance works be required. The permanent access track will be designed and constructed to accommodate heavy plant (5t axel loading) movement. The permanent access tracks are provided to the following joint bays: JB1-4 (one access track for all four joint bays); JB8; JB10; JB15, JB21, JB31, JB42, JB49, JB50, JB54, JB60, and JB70. Where a temporary access track is required, engineering stone fill will be laid and compacted and maintained as required for the duration of the works. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition.

Horizonal directional drilling (HDD) is proposed at major watercourse crossings or where there are significant constraints. Launch and reception pits of approximately 3 m x 5 m will be constructed for the HDD holes and will be constructed within the Planning Application Boundary. HDD is proposed at six locations, with a compound for launch and a compound for receptor, along the cable route including at Rye Water (WB13) which is approximately 6 km direct distance over land and approximately 8 km hydrologically, at the closest point to the Planning Application Boundary. The HDD temporary construction compound will comprise welfare facilities, car parking, security lighting, launch or receptor pit, areas for material laydown, material storage, waste storage and HDD ducting storage. The site will have gravel hardstanding and security fencing.

- HDD Compound Location No. 1: Chainage Centre Point 15100, Rye Water – approximately 0.9 ha and 0.08 ha;

- HDD Compound Location No. 2: Chainage Centre Point 15500, Royal Canal and railway– approximately 0.019 ha and 0.17 ha;
- HDD Compound Location No. 3: Chainage 1 Centre Point 6700, M4 – approximately 0.38 ha and 0.40 ha;
- HDD Compound Location No. 4: Chainage Centre Point 22000, Tributary of Liffey_010– approximately 0.08 ha and 0.14 ha;
- HDD Compound Location No. 5: Chainage Centre Point 37350, River Liffey – approximately 0.11 ha and 0.12 ha; and
- HDD Compound Location No. 6: Chainage Centre Point 44600, Grand Canal – approximately 0.12 ha and 0.39 ha.

Chapter 5 of this EIAR provides further information on the Proposed Development including substations proposed works.

10.3 Methodology

An ecological impact assessment was carried out to determine the likelihood of significant adverse effects on ecological habitats and species of interest as a result of the Proposed Development. This chapter of the EIAR provides a description of the existing ecological environment, the potential effects likely to occur due to the Proposed Development as well as an assessment of the significance of such effects from an ecological perspective.

A separate Appropriate Assessment (AA) Screening Report (Jacobs, 2024a) and Natura Impact Statement (NIS) (Jacobs, 2024b) has been prepared for the Proposed Development (which is included as part of the planning application pack) which focuses on the European designated sites and the Qualifying Interests (QIs) / Special Conservation Interests (SCIs) for which such sites are designated. The NIS concluded that, with mitigation measures adopted, there will be no adverse effects on the integrity of any European sites, either alone or in-combination with other plans or projects.

Mitigation for the effects of the Proposed Development and enhancement on biodiversity are provided in Section 10.5 and residual effects after mitigation are provided in Section 10.6.

10.3.1 Study Area

The study area was determined following best practice guidance (Chartered Institute of Ecology and Environmental Management (CIEEM) 2018) and by professional judgment, taking into account the likely significant effects from the Proposed Development on the receiving environment during construction and / or operation. Table 10.1 details the study areas adopted for each of the biodiversity (ecological) receptors within the study area specified to assess potential impacts within the Zone of Influence (ZoI) of the Proposed Development. The ZoI is the area over which ecological features may be affected by biophysical changes caused by the Proposed Development and associated activities (CIEEM 2018). When determining the ZoI, the 'source-pathway-receptor' model has been applied taking consideration of all potential impact pathways connecting elements of the Proposed Development to the ecological receptor in view of their conservation objectives (where available).

Note that in this EIAR, and throughout this chapter, 'waterbody' is used generically to refer to a watercourse, river, drainage ditch or pond, although it is most frequently used to refer to a river or watercourse with flowing water. Sometimes the specific terms drainage ditch or pond are used, to avoid confusion.

Table 10.1: The Study Areas for Ecological Receptors within the ZoI of the Proposed Development

Ecological Receptor	Study Area Description NOTE 1
Terrestrial Habitats **(Including rare and / or protected flora, and non-native invasive plant species[59])**	A corridor along the Proposed Development where works are proposed and habitats that could be directly or indirectly affected during construction / operation. Habitats within a minimum of 150 m of the Proposed Development (i.e. from the Planning Application Boundary) were mapped using a combination of survey and aerial photographs. All hedgerows / tree lines at proposed joint bays were inspected and where vegetation could be impacted / lost, e.g., narrow roads. Habitats classified using A Guide to Habitats in Ireland (referred to as Fossitt 2000) (reprinted in 2007) (The Heritage Council 2000).
Wintering birds	Wintering bird surveys were carried out for all the route options as a preferred route was not available at that time. Each of the four route options (See Chapter 4 of this EIAR for further details) was surveyed to 800 m on either side of the option from vantage points and drive-by. This was considered the distance in which birds count be directly or indirectly affected by construction/operation operations. Therefore, some birds were recorded up to 9 km away from the Proposed Development and are included in the results to provide as much data as possible. The survey focused on areas of suitable habitat for foraging / roosting winter birds, including waterbodies and wetlands.
Breeding birds	A corridor along the Proposed Development where works are proposed, and in locations where breeding birds could be directly or indirectly affected during construction / operation. Transect surveys (17 transects completed) undertaken within a 250 m survey corridor however, extended outside of the 250 m corridor on occasions at transects 1 (wholly outside the 250m due to a route change at Stage 5), 4, 9, 10, 11, 12 and 16. The surveys focused on areas of suitable bird nesting habitat.
Bats	Only trees / structures potentially directly impacted by the Proposed Development during construction / operation were surveyed for potential bat roosts (i.e. those within the Planning Application Boundary). Trees with identified bat roost potential were subject to emergence / return surveys. Static detectors were also deployed at key locations for a minimum of five days for each deployment (see Table 10.18 for further details).
Fauna species **(other than bats, i.e. otter, badger, other small mammals, amphibians, reptiles, terrestrial invertebrates and fish)**	A corridor of 100 m from the Proposed Development (i.e. the Planning Application Boundary) was surveyed for fauna species that could be directly or indirectly affected during construction/operation of the Proposed Development. The study area extended to at least 150 m from the Proposed Development (i.e. along watercourses hydrologically linked to the Planning Application Boundary).

[59] Non-native invasive plant species are not considered as IER, as they can result in adverse effects on biodiversity and it is in that context they are included within the impact assessment.

Ecological Receptor	Study Area Description NOTE 1
Aquatic habitats assessment	Watercourse crossing points and a minimum of 100 m to either side of the Proposed Development Planning Application Boundary were visually assessed for their potential to support fish of conservation interest and white-clawed crayfish (where access and/or H&S constraints prevented the full 100m extent of survey, data was collected from the nearest safe point of access to inform the overall assessment) Assessments identified sites that had appropriate habitat to support different age classes of fish and in particular for spawning and juvenile nursery areas. White-clawed crayfish habitat was assessed for features that provide suitable refuge such as substrates large enough to provide cover and not armoured.
eDNA sampling	Following the aquatic habitats assessment, eDNA samples was undertaken at eleven waterbodies (rivers / tributaries) considered to have the potential to support the following species: • Atlantic salmon (*Salmo salar*); • European eel (*Anguilla anguilla*); • White clawed crayfish (*Austropotamobius pallipes*); eDNA sampling for smooth newt was also undertaken at WB05 (a pond) and WB19 (Baltracey Tributary of the Lyreen)
Marsh fritillary	Habitats within 100 m of the Proposed Development were assessed for their suitability to support marsh fritillary butterfly. Incidental sightings of marsh fritillary and other terrestrial invertebrates of conservation interest were recorded where present.

NOTE 1 This column refers to minimum specified study areas. The study area was widened further than these areas in instances where potential or confirmed ecological features of interest were noted beyond that should be incorporated into the baseline and subsequent impact assessment.

10.3.2 Relevant Guidelines, Policy and Legislation

The assessment of the likely impacts of the Proposed Development on ecological resources has been carried out in accordance with legislation and policy documents listed below for the purposes of preparing this chapter of the EIAR. The European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011 (as amended) contain additional relevant provisions such as for invasive species, and licensing of Annex IV species.

10.3.2.1 International and National Legislation

The following International legislation was adhered to in the preparation of this chapter:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended); hereafter the ‘Habitats Directive’;
- Council Directive 2009/147/EC on the Conservation of Wild Birds (as amended); hereafter the ‘Birds Directive’; and

- Directive 2000/60/EC; EU of the European Parliament and of the Council establishing a framework for Community action in the field of water policy (hereafter referred to as the Water Framework Directive (WFD)).

The following National legislation c was adhered to in the preparation of this chapter:

- The Wildlife Act 1976 (as amended) (hereafter referred to as the Wildlife Act): At a National level, the Wildlife Act (as amended) is the principal piece of legislation for the protection and control of activities that may harm wildlife;

- Number 30 of 2000 - Planning and Development Act, 2000 (as amended) (hereafter referred to as the Planning and Development Act). The Planning and Development Act is the basis for land use planning in Ireland. Under this legislation, mandatory objectives for the conservation of natural heritage and for the conservation of European sites must be included in development plans (usually implemented at local authority level);

- The Planning and Development Regulations 2001 (as amended) (hereafter referred to as the Planning Regulations);

- S.I 477 of 2011 (as amended) - The Birds and Habitats Regulations. The transposition of the Habitats Directive and the Birds Directive into Irish law is through this legislation. Regulations (49 and 50) that deal with invasive species (those included within the Third Schedule) are also included;

- S.I. No. 235 of 2022 - Flora (Protection) Order 2022 (hereafter referred to as the FPO). Species of plant which receive protection under Section 21 of the Wildlife Acts are listed in this legislation; and

- The Fisheries (Consolidation) Act 1959 (as amended) (hereinafter referred to as the Fisheries Act).

10.3.2.2 Policy and Planning Documents

The following National and local authority plans and policies are considered relevant to the Proposed Development:

- Project Ireland 2040 - National Planning Framework (hereafter referred to as the NPF) (Government of Ireland 2018);

- Project Ireland 2040 - National Development Plan 2021-2030 (hereafter referred to as the NDP) (Government of Ireland 2021);

- Ireland's 4th National Biodiversity Action Plan 2023-2030 (Department of Housing, Local Government and Heritage 2022);

- All Ireland Pollinator Plan 2021-2025 (hereafter referred to as AIPP) (National Biodiversity Database 2021);

- Meath County Council (MCC) Meath County Development Plan 2021-2027 (MCC 2021) HER POL 37 (to encourage the retention of hedgerows), HER39 (to recognise the importance of hedgerows), HER POL40 (woodland management);

- Kildare County Council (KCC) Kildare County Development Plan 2023-2029 (KCC 2021) BI P4 (to ensure mitigation for plant and animal species), BI P5 (to conserve locally important biodiversity sites), BI P6 (to recognise the importance of hedgerows and trees), BI P8 (ensure retention of Kildare's wetlands and watercourses) and Objectives BI 026 and 033 (relating to hedgerows and trees).

- County Meath Biodiversity Action Plan 2015-2020 (hereafter referred to as the Meath BAP) (MCC 2015); and

- County Kildare Biodiversity Action Plan 2021 – 2025 (hereafter referred to as the Kildare BAP) (KCC 2021).

EirGrid's Biodiversity Policies are as follows (Grid Implementation Plan 2023-2028, Draft, 2023)[60]:

- BIODP1: To protect flora, fauna and habitats, and sites designated in the Habitats Directive, the Birds Directive, the Wildlife Act 1976 (as amended), the Flora Protection Order (S.I. no. 235 of 2022), and the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended);

- BIODP2: To minimise the impact of grid development on existing trees and hedgerows, and all semi-natural habitats;

- BIODP3: To protect and wherever possible enhance wooded, wetland and other habitats which function as wildlife corridors, in accordance with Article 10 of the EU Habitats Directive; and

- BIODP4 To design habitat creation, restoration and enhancement into project scopes wherever possible, in collaboration with ESB for onshore assets, while complying with relevant technical and safety standards.

EirGrid's Climate Change Policies are as follows (Grid Implementation Plan 2023-2028, Draft, 2023)[61]:

- CLIMP1: To integrate measures to address climate change into grid development, through effective mitigation and adaptation responses, in accordance with available guidance and best practice;

- CLIMP2: To support, through all activities, and in particular connection of low-carbon and renewable energy generation onshore and offshore, delivery of the Government's target of up to 80% electricity consumption generated from renewable energy sources by the year 2030; and

- CLIMP3: That there is no increase in flood risk as a result of grid development, and to ensure any flood risk to the development is appropriately managed.

10.3.2.3 Relevant Guidelines

Key guidance used in the assessment included the following:

- Ecological Guidelines for Electricity Transmission Projects. A Standard Approach to Ecological Impact Assessment of High Voltage Transmission Projects (EirGrid 2020);

- A Guide to Habitats in Ireland (referred to as Fossitt 2000) (reprinted in 2007) (The Heritage Council 2000);

- Bat Mitigation Guidelines for Ireland – V2 (Marnell, Kelleher and Mullen 2022);

- Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition) (Collins 2023);

- The Bat Workers' Manual, 3rd Edition (Mitchell-Jones and McLeish 2004);

[60] The Plan will be adopted, and associated SEA Environmental Report and Statement will be published in FY24 (i.e. before October 2024).
[61] The Plan will be adopted, and associated SEA Environmental Report and Statement will be published in FY24 (i.e. before October 2024).

- National Roads Authority (NRA) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA 2006a);
- Bird Monitoring Methods (Gilbert *et al*. 1998);
- Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers Ecology Series No. 1. (Holdich 2003);
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA 2008a);
- Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Impact Assessment Report (European Commission 2017);
- Hedgerow Appraisal System – Best Practice Guidance on Hedgerow Survey, Data Collation and Appraisal (Foulkes *et al*. 2013);
- Scottish Environment Protection Agency (SEPA) Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA 2017);
- Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater, Coastal and Marine (CIEEM 2019);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009);
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA 2008b);
- Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA 2006b);
- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA 2010);
- The Irish Bat Monitoring Programme 2015-2017. Irish Wildlife Manuals, No. 103 (Aughney *et al*. 2018);
- National Parks and Wildlife Service (NPWS) The Status of EU Protected Habitats and Species in Ireland. Volume 1. Summary Overview. (NPWS 2019a);
- The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments. Volume 2. (NPWS 2019b);
- The Status of EU Protected Habitats and Species in Ireland. Species Assessments. Volume 3. (NPWS 2019c);
- The Irish Vegetation Classification (Perrin *et al*. 2018);
- The Irish Semi-natural Grasslands Survey 2007-2012. Irish Wildlife Manuals No. 78 (O'Neill *et al*. 2013);
- The Monitoring and Assessment of Three EU Habitats Directive Annex I Grassland Habitats. Irish Wildlife Manuals 102 (Martin *et al*. 2018);

- Monitoring Guidelines for the Assessment of Petrifying Springs in Ireland. Irish Wildlife Manuals No. 94 (Lyons and Kelly 2016);
- Guidance on the Strict Protection of Certain Animal and Plant Species under the Habitats Directive in Ireland (NPWS 2021);
- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022);
- Aerial imagery (Bing 2023; Google Earth 2023; ESRI 2023);
- National Tree Map (BlueSky 2022); and
- National Land Cover Map (Ordnance Survey Ireland 2023).

10.3.3 Data Collection and Collation

The ecological impact assessment comprised a desk-based study and field surveys which are set out in Section 10.4. The ZoI for the Proposed Development varied according to the ecological receptor and the ZoIs are described in Section 10.4. The methodologies used to collate information on the baseline biodiversity environment are shown in Appendix 10.1 in Volume 3 of this EIAR.

10.3.3.1 Desk Study

A desk-based study was carried out in March and July 2022 and again in December 2023 to inform the initial scope of the ecological surveys required to inform the assessment. The desk-based study involved collection and review of relevant published and unpublished sources of data, collation of existing information on the ecological environment and consultation with relevant statutory bodies. Details of the data sources and search distances used to inform the desk-based study and subsequent ecological assessment are presented in Table 10.2.

Table 10.2: Desk Study Data Sources

Receptor	Search Distances	Data Source
Statutory designated sites of European and national value	Source-receptor-pathway model	• NPWS Mapping of European site boundaries (NPWS 2023a); • Ballynafagh Bog SAC (Site code 000391). Conservation Objectives (NPWS 2015a); • Mouds Bog SAC (Site code 002331). Conservation objectives (NPWS 2015b); • Rye Water Valley/ Carton SAC (Site code 001398). Conservation Objectives (NPWS 2021a); • Pollardstown Fen SAC (Site code 000396). Conservation Objectives (NPWS 2022a); • River Boyne and River Blackwater SAC (Site code 002299). Conservation Objectives (NPWS 2021b);

Receptor	Search Distances	Data Source
		• North Dublin Bay SAC (Site code 000206). Conservation Objectives (NPWS 2013a); • South Dublin Bay SAC (Site code 000210). Conservation Objectives (NPWS 2013b); • Howth Head SAC (Site code 000202). Conservation Objectives (NPWS 2016); • Rockabill to Dalkey Island SAC (Site code 003000). Conservation Objectives (NPWS 2013c); • Codling Fault Zone SAC (Site code 003015). Conservation Objectives (NPWS 2023b); • Poulaphouca Reservoir SPA (Site code 004063). Conservation Objectives (NPWS 2022b); • River Boyne and River Blackwater SPA (Site code 004232). Conservation Objectives (NPWS 2022c); • South Dublin Bay and River Tolka Estuary SPA (Site code 004024). Conservation Objectives (NPWS 2015c); • North Bull Island SPA (Site code 004006). Conservation Objectives (NPWS 2015d); • North-west Irish Sea SPA (Site code 004236). Conservation Objectives (NPWS 2023c); • Howth Head Coast SPA (Site code 004113). Conservation Objectives (NPWS 2022d);
WFD water bodies	2km	• EPA rivers and water quality data WFD status online at EPA Maps (2023)
Protected and notable species (excluding plants and fungi – see below for reduced search area)	2km	• Protected and invasive species data from the National Biodiversity Data Centre (NBDC) 2023; • The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill (NPWS 2019a); • The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill (NPWS 2019b); and

Receptor	Search Distances	Data Source
		• The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill (NPWS 2019c).
Plants and fungi, and invasive species	200m	• Protected and invasive species data from the NBDC online (NBDC 2023).

10.3.3.2 Field Survey Dates

Field surveys were undertaken by Jacobs between October 2021 and January 2023 informing the EIAR and are summarised in Table 10.3 below.

Table 10.3: Ecological surveys (and dates) informing the EIAR

Species/Habitat	Survey methodology/target species	Survey date(s)
Habitat Survey	Habitat classification (Fossitt, IVC etc.)	June 2022 to October 2022 (weeks commencing: 06.06.2022, 27.06.2022, 11.07.2022, 18.07.2022, 22.08.2022, 05.09.2022, 26.09.2022, 12.10.2022)
Habitat Suitability Assessment	Reptile and amphibian	December 2021 to June 2022 (weeks commencing 13.12.21; 27.6.22)
	Terrestrial invertebrate (marsh fritillary)	December 2021 to June 2022 (weeks commencing: 13.12.21, 27.6.22)
	Fish, white-clawed crayfish	June 2022 to October 2022 (weeks commencing: 06.06.2022, 27.06.2022, 11.07.2022, 18.07.2022, 22.08.2022, 05.09.2022, 26.09.2022, 12.10.2022)
Birds	Winter Bird Surveys	October 2021 to April 2022 (weeks commencing: 11.10.2021, 01.11.2021, 06.12.2021, 10.01.2022, 07.02.2022, 07.03.2022, 11.04.2022)
	Hen harrier winter roost surveys	October 2021 to March 2022 (weeks commencing: 11.10.2021, 18.10.2021, 01.11.2021, 06.12.2021, 10.01.2022, 07.02.2022, 07.03.2022)
	Breeding bird surveys	March to May 2022 (Week commencing: 28.03.2022, 25.04.2022, 23.05.2022, 30.05.2022)
Bats	Identification of potential roost features (PRFs) in trees/buildings	February 2022 to September 2022 (weeks commencing: 21.02.22, 21.03.22, 06.06.22, 15.07.22, 22.08.22, 05.09.22)
	Static detector surveys	May 2022 to August 2022 (weeks commencing: 16.05.2022, 23.05.2022, 30.05.22, 06.06.2022,

Species/Habitat	Survey methodology/target species	Survey date(s)
		27.06.2022, 04.07.2022, 18.07.2022, 25.07.2022, 01.08.2022, 08.08.2022)
	Emergence/re-entry surveys (structures and trees)	May 2022 to July 2022 (weeks commencing: 16.05.2022, 23.05.2022, 30.05.2022, 06.06.2022, 17.06.2022, 18.07.2022, 25.07.2022)
Mammal Survey	Mammal species other than bats i.e. otter, badger, red squirrel, etc.	October 2021 to April 2022
Smooth newt	eDNA Sampling for smooth newt at waterbody 19 (WB19) and west of WB04	August 2022 – October 2022 (weeks commencing: 08.08.2022, 19.09.2022, 10.10.2022)
Fish	eDNA Sampling for Atlantic salmon and European eel	August 2022 – September 2022 (weeks commencing: 08.08.2022, 19.09.2022)
Aquatic Invertebrates	eDNA Sampling for white-clawed crayfish	August 2022 – September 2022 (weeks commencing: 08.08.2022, 19.09.2022)

10.3.3.3 Scoped out Surveys

The following surveys were scoped out:

- Amphibians and Reptiles. Amphibian and reptile presence / potential absence surveys were scoped out. Habitat suitability was used as a proxy for species presence with the exception to two smooth newt (Lissotriton vulgaris) eDNA surveys which were undertaken at waterbody 19 (WB19) and WB05. Amphibians and reptiles are assumed present where suitable habitat is found within the study area unless otherwise stated;

- Bats. Structures / trees not directly impacted were not subjected to survey. Only structures / trees to be directly impacted were subject to survey and as no structures were impacted none were surveyed;

- Aquatic Receptors. An aquatic habitat assessment was undertaken to identify the presence of suitable habitat for aquatic species. No electrofishing, invertebrate or macrophytes surveys were carried out. A combination of existing Water Framework Directive (WFD) publicly available data along with data record searches was used to inform decision making; and

- Marsh Fritillary. Surveys for marsh fritillary (Euphydryas aurinia), comprised checks for the presence of devil's bit scabious (Succisa pratensis) which is the caterpillar's preferred foodplant. No searches for larval webs or adult butterflies were carried out. The species is assumed present where suitable habitat is found within the study area unless otherwise stated.

10.3.3.4 Consultation

The following consultation has taken place (see Chapter 3 of this EIAR):

- Meath County Council (16/01/23);

- Kildare County Council (11/01/2023);

- NPWS (07/02/2023);

- Inland Fisheries Ireland (17/01/2023);
- Waterways Ireland (01/06/2022); and
- An Bord Pleanála pre-application consultation (15/09/22;15/12/22; and 16/02/23).

10.3.3.5 Difficulties Encountered in Compiling Information

Ecological surveys are limited by a variety of factors which affect the presence of flora and fauna (for example, climatic variation, season and species behaviour). Evidence of protected species is not always present during a survey. This does not mean that a species is absent, and hence, the surveys also record and assess the suitability of habitats to support species, and (where appropriate, for species with dynamic distributions) further pre-construction confirmatory surveys are proposed to verify any locations requiring additional mitigation. Ecological surveys provide evidence of ecological activity for a snapshot of time. No major limitations were encountered in gathering data. It is considered that the baseline data collected is sufficient to inform a robust and thorough assessment of potential impacts.

General: Surveys were limited at times due to access constraints which equated to 7% of the total Planning Application Boundary. Lack of access to certain land packages within the study area but outside of the Planning Application Boundary may have limited the selection of trees with bat roost potential, identification of mammal signs such as badger setts and required habitat surveys to be undertaken via binoculars and desk-based reviews. This is in-line with CIEEM guidelines and is not considered to have affected the assessment.

Bat survey limitation: Location 10 was only surveyed once due to cattle being present in the fields on two occasions when surveys were scheduled. These surveys were not rescheduled, but static detectors were placed at the location on two different occasions and one dusk emergence survey was carried out. No emergences were detected during the dusk survey and there was overall low activity in the area. While this is not considered suitable to eliminate the possibility that the features being examined were bat roosts, it does reduce the likelihood. A further pre-construction check is recommended within the mitigation which would be suitable for eliminating all risk associated with roosting bats in the feature.

Wintering birds limitation: Surveys were caried out using a combination of drive-by assessment and VPs, both standard methodology for wintering bird surveys. Where surveys were carried out from inside cars driving along busy roads some birds may well have been missed due to reduced visibility on the day. However, given that surveys were repeated monthly over a six-month period and in same locations, any aggregations of birds not fully seen in one month would be counted in subsequent visits and therefore it is considered that there is no limitation to the data collected during drive-by survey. There were no limitations due to site access or weather. Two hen harrier (*Circus cyaneus*) surveys at vantage points were cancelled due to weather conditions and were not rescheduled due to time constraints. Where present however hen harriers were noted as incidental sightings during wintering bird surveys and desk-based data was used to supplement field data and such the cancelation of two VP surveys was not considered a limitation for the assessment.

Breeding birds limitation: Transects 4, 7, 10, 11 and 17 were not walked due to land access issues. These transects were changed to vantage point surveys at each location and all surveys were carried out without limitations due to weather. Where access was not permitted, this is not likely to have had a limitation in terms of detecting priority species within the study area, as all habitat types within the study area were fully covered and as such all species that would use these habitat types were also captured. For Transect 1, the cable route subsequently changed and as a result none of the records lie within 250 m of the updated route. However, the habitat for Transect 1 was similar to the habitat within the study area at this location and as such it is not expected that the species composition would be different in the area not subject to survey. Consequently, there is no limitation for the assessment.

Watercourses: Several watercourses surveyed during summer 2022 were initially found to be dry due to the persistent heatwave across Ireland. These surveys were reorganised and carried out later in September 2022 and the slight delay in assessment was considered not to have been a limitation in the assessment as these watercourses were fully characterised.

Tree value: The classification of mature and veteran trees to assist in determination of the level of residual impact was carried out by desk-based inspection of freely available aerial and street view imagery, supported with field survey data where collected. Photographs and detailed description of all mature and veteran trees was not collected for every tree as sometimes a tree was part of a treeline and characterised using Fossitt rather than individually. This was not considered a limitation as each tree was classified using either field data, desk-based review or a combination of both.

Lakes and ponds: Osberstown attenuation pond is a constructed waterbody along the M7, 50 m to the east of Millennium Park on the north-west suburbs of Naas (grid reference: N 88162 21266), but which was not possible to fully survey given protective boundary fencing. An aquatic assessment was carried out using binoculars from a distance. The pond was approximately 330 m long and 60 m wide with aquatic vegetation and what appeared to be floating algal mats. Osberstown attenuation pond is hydrologically connected to the Proposed Development by a drainage ditch (WB39), with the EPA name of 'Oldtown_Demesne'. The pond is surrounded on all sides by roads and is fenced. Wintering bird surveys were conducted at this site and therefore a survey was completed for the pond and as such the distance assessment only of the pond was considered not to have been a limitation in the assessment.

Habitat survey: Not all the habitats within the survey boundary were visited during field surveys. Where there were gaps these were addressed using desk based aerial imagery. Presence of invasive species at such locations will be addressed through pre-construction surveys.

10.3.4 Appraisal Method for the Assessment of Effects

The criteria used to assess the ecological value and significance of the study area for habitats and species present follows the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009) and the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM 2019).

10.3.4.1 Valuing the Ecological Receptors

The value of an ecological feature is considered within a defined geographic context (e.g. International / National, Regional / Local). Habitats are assessed as a whole with the highest valuation provided. For example, the overall valuation of drainage ditches (FW4) is considered of Local Importance (Higher Level), although there are many ditches that are individually considered of Local Importance (Lower Level).

Impact assessment is only undertaken of Important Ecological Receptors (IERs) that are within the ZoI of the Proposed Development and are "*both of sufficient value to be material in decision making*" and "*likely to be affected significantly*" (NRA 2009). To qualify as IERs, features must be of Local Ecological Importance (Higher Value) or higher, as per the criteria from the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009). Features valued at Local Ecological Importance (Lower Value) are not subject to impact assessment.

10.3.4.2 Impact Assessment Process

The impact assessment process (CIEEM 2019) involves:

- Identifying and characterising impacts and their effects;
- Incorporating measures to avoid and mitigate (reduce) these impacts and effects;
- Assessing the significance of any residual impacts, after mitigation;

- Identifying appropriate compensation measures to offset significant residual impacts; and
- Identifying opportunities for ecological enhancement.

In Ecological Impact Assessment (EcIA), it is only essential to assess and report significant residual impacts (i.e. those that remain after mitigation measures have been taken into account). However, it is considered good practice for the EcIA to make clear, both the potential significant impacts without mitigation, and the residual significant impacts following mitigation, particularly where the mitigation proposed is experimental, unproven or controversial. Alternatively, it should demonstrate the importance of securing the measures proposed through planning conditions or obligations (CIEEM 2018).

Positive and negative impacts / effects are determined according to whether the change is in accordance with nature conservation objectives and policy (if no significant impacts / effects are foreseen, the impact is considered neutral):

- Positive impact – a change that improves the quality of the environment (e.g. by increasing species diversity, extending habitat or improving water quality). Positive impacts may also include halting or slowing an existing decline in the quality of the environment; and
- Negative impact – a change which reduces the quality of the environment (e.g. destruction of habitat, removal of species foraging habitat, habitat fragmentation, pollution).

Positive and negative impacts and effects on ecological features are characterised based on predicted changes as a result of the proposed activities. In order to characterise the impacts and effects on each feature, the following parameters are considered:

- The magnitude of the impact. This refers to size, amount, intensity and volume;
- The spatial extent or geographical area over which the impact / effect would occur;
- The temporal duration of the impact and whether it relates to the construction or operational phase of the Proposed Development. Impacts and effects may be short, medium, or long-term and permanent or temporary;
- The timing and frequency of the impact; and
- Whether the impact is reversible and over what time frame.

10.3.4.3 Conservation Status

Consideration of conservation status is important for evaluating the effect of impacts on individual habitats and species and assessing their significance:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure, and function as well as its typical pieces within a given geographical range; and
- Species: conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area (CIEEM 2019).

Favourable condition is the satisfactory condition of an ecological feature. In some cases, favourable condition is specifically defined (e.g., for some designated sites).

10.3.4.4 Impact Significance

In accordance with the EPA Guidelines (EPA 2022) and with CIEEM Guidance (CIEEM 2018), all impacts are either significant or not significant. Significant effects encompass impacts on structure and function of defined sites, habitats, or ecosystems and the conservation status of habitats and species within a given geographical area. The ecological value of a feature (i.e. Local, County, National, International) is related to the level of impact.

10.3.4.5 Cumulative Impacts and Effects

Consideration is also given to the potential for the Proposed Development to have significant impacts and effects in-combination with other proposed developments in the local area.

10.3.4.6 Overall Assessment

An overall assessment of value and impact is provided. This is based upon the highest level or value of any of the features or species present, or likely to be present on the site. Similarly, the overall assessment of impact is the impact of greatest significance.

10.3.4.7 Mitigation Hierarchy

The following principles underpin EcIA and have been followed, where applicable, in this assessment:

- Avoidance - Seek options that avoid harm to ecological features (for example, by locating the Proposed Development on an alternative site or safeguarding on-site features within the site layout design);

- Mitigation - Negative impacts should be avoided or minimised through mitigation measures, either through the design of the Proposed Development or subsequent measures that can be guaranteed (e.g., through a condition or planning obligation);

- Compensation - Where there are significant residual negative ecological effects despite the mitigation proposed, these should be offset by appropriate compensatory measures; and

- Enhancement - Seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation or compensation.

10.4 Baseline Environment

The following section describes the existing ecological environment within the Zone of Influence (ZoI) of the Proposed Development. Data on this ‘ecological baseline’ was obtained from a combination of desk-based review and field surveys. The ZoI varied according to the ecological receptor as shown in Table 10.1. The methodologies used to collate information on the ecological baseline are described in Appendix 10.1.

10.4.1 Desk study

10.4.1.1 European designated sites

Applying the source-pathway-receptor model, all European sites that were potentially within the ZoI of the Proposed Development due to their connectivity (proximity / ecological / hydrological etc) were assessed. The two European designated sites potentially within the ZoI and Qualifying Interest habitats and species for which these sites are designated are shown in Table 10.4. This report uses the term Qualifying Interest for European sites rather than Species of Conservation Interest. The two sites are:

- Rye Water Valley/ Carton SAC (Site code 001398) - 6.2km; and

- River Boyne and River Blackwater SAC (Site code 002299) – 14.2km.

Fourteen additional European sites were considered to be within the vicinity of the Proposed Development but outside the ZoI and as such, no direct or indirect impacts are anticipated. The fourteen sites outside the ZoI are Ballynafagh Bog SAC (Site code 000391), Ballynafagh Lake SAC (Site code 001387), Mouds Bog SAC (Site code 002331), Pollardstown Fen SAC (Site code 000396), North Dublin Bay SAC (Site code 000206), South Dublin Bay SAC (Site code 000210), Howth Head SAC (Site code 000202), Rockabill to Dalkey Island SAC (Site code 003000), Poulaphouca Reservoir SPA (Site code 004063), River Boyne and River Blackwater SPA (Site code 004232), South Dublin Bay and River Tolka Estuary SPA (Site code 004024), North Bull Island SPA (Site code 004006), North-west Irish Sea SPA (Site code 004236) and Howth Head Coast SPA (Site code 004113).

Table 10.4: European Designated Sites (two sites) and their Qualifying Interest Habitats and Species Within the ZoI of the Proposed Development

Site Name	Qualifying Interest Habitats and Species	Location	Within the Zone of Influence
SAC			
Rye Water Valley / Carton SAC 001398	[7220] Petrifying springs with tufa formation (*Cratoneurion*)* [1014] Narrow-mouthed whorl snail (*Vertigo angustior*) [1016] Desmoulin's whorl snail (*Vertigo moulinsiana*)	Direct distance: 7 km south Hydrological distance 8.15km	Yes - The Proposed Development is in the same catchment and the shortest hydrological distance between the Proposed Development and this SAC is 8.15km, commencing at Kilcock (Rye Water, WB13)
River Boyne and River Blackwater SAC 002299 west	[7230] Alkaline fens [91E0] Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [1099] River lamprey (*Lampetra fluviatilis*) [1106] Atlantic salmon (*Salmo salar*) [1355] Otter (*Lutra lutra*)	Direct distance: 14.2 km	No - Not hydrologically linked as in separate catchment.

10.4.1.2 Nationally designated sites

Natural Heritage Areas (NHAs) are designated under the Wildlife (Amendment) Act 2000 and encompass nationally important semi-natural and natural habitats, landforms and geomorphological features. In addition to NHAs there are proposed NHAs (pNHAs). These are also sites of significance for wildlife and habitats and were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. Proposed NHAs are offered protection in the interim period under the county or city development plans which requires that planning authorities give due regard to their protection in planning policies and decisions. Prior to statutory designation, pNHAs are subject to limited protection, in the form of:

- Agri-environmental farm planning schemes such as Rural Environment Protection Scheme (REPS 3 and 4) and Agri Environmental Options Scheme (AEOS) supported the objective of maintaining and enhancing the conservation status of pNHAs up until 2014. These were then replaced with the Green Low-Carbon Agri-Environment Scheme (GLAS) which operated from 2014-2023 and then the Agri-Climate Rural Environment Scheme (ACRES) which commenced in 2023;
- Forest Service requirement for NPWS approval before they will pay afforestation grants on pNHA lands; and
- Recognition of the ecological value of pNHAs by Planning and Licencing Authorities (NPWS, Natural Heritage Areas web site).

Hodgestown Bog, the closest NHA - located 3.7km west of the Proposed Development. There are two pNHA within the ZoI of the Proposed Development: the Proposed Development directly crosses the Royal Canal pNHA at Kilcock and crosses the Grand Canal pNHA at two locations, once at Sallins and once at Naas. A further five pNHAs (Liffey Valley Meander Belt pNHA, Liffey at Osberstown pNHA, Ballynafagh Bog pNHA, Donadea Wood pNHA, and Ballynafagh Lake pNHA) were considered to be in the vicinity of the Proposed Development, but outside the ZoI due to there being either no hydrological link present or the pNHA being upstream of the Proposed Development. Therefore, no direct or indirect impacts to these pNHAs were anticipated. Table 10.5 below lists these designated sites, their distance from the Proposed Development, and includes a site description outlining each site's ecological interest.

Table 10.5: Natural Heritage Areas (NHA) and Proposed Natural Heritage Areas (pNHA) in the vicinity of the Proposed Development (those within the zone of influence are coloured grey)

Site Name	Site Summary	Distance from the Proposed Development	Within the zone of influence
Hodgestown Bog NHA (001393)	The site comprises a raised bog that includes both areas of high bog and cutover bog. This raised bog was originally part of a much larger area of bog that has now been cutover and reclaimed for forestry and agriculture	3.69 km west	No, no hydrological link present
pNHAs			
The Royal Canal pNHA (002103)	The Royal Canal pNHA comprises the central channel and the banks on either side of it. Its ecological value lies in the diversity of species it supports along its linear habitats rather than the presence of rare species. Habitats within the	0	Yes as the route directly

Site Name	Site Summary	Distance from the Proposed Development	Within the zone of influence
	canal boundaries include hedgerows, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The rare and protected opposite-leaved pondweed *Groenlandia densa* (Flora Protection Order 01987) is present at one site in Dublin. The stonewort *Tolypella intricate* (a stonewort listed as Vulnerable in the Red Data Book) is present in the canal in Dublin.		crosses the canal
Grand Canal pNHA (002104)	The Grand Canal pNHA comprises the canal channel and the banks on either side of it. Its ecological value lies in the diversity of species it supports along its linear habitats rather than the presence of rare species. Habitats within the canal boundaries include hedgerows, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The diversity of the water channel is high on the eastern section of the Main line between Summit level at Lowtown and Inchicore. The rare and protected opposite-leaved pondweed *Groenlandia densa* (Flora Protection Order 01987) is present in a number of sites in the eastern section of the Main Line between Lowtown and Ringsend Basin in Dublin.	0	Yes as the route directly crosses the canal
Liffey Valley Meander Belt pNHA (000393)	The Liffey Valley Meander Belt site is located 1 km to the west of Ballymore Eustace, Co. Kildare. Located on the north bank of the river the site is an ash woodland which is grazed and contains a variety of tree and herb species. A calcicolous seepage line is present at the base of the sloping site and the ash wood merges with a marsh wetland at this point.	0.42km south-east	No, no hydrological link present
Liffey at Osberstown pNHA (001395)	This site is a good example of riverside vegetation, with two scarce plants. Although cleared of woodland in 1983, remnants may remain, or regeneration may have occurred.	0.78km west	No, pNHA is upstream of the proposed project
Ballynafagh Bog pNHA (000391)	This site is a raised bog situated about 1 km west of Prosperous in Co. Kildare. This pNHA is also a SAC selected for its raised bog, degraded raised bog and its rhynchosporion vegetation.	1.64km west	No, pNHA is upstream of the proposed project
Donadea Wood pNHA (001391)	This site is located about 6 km north of Prosperous in Co. Kildare. It is the old demesne woodland of Donadea Castle. The soil of the area is glacial drift. The entire site has been planted with a mix of deciduous and coniferous trees.	1.88 km west	No, pNHA is upstream of the

Site Name	Site Summary	Distance from the Proposed Development	Within the zone of influence
			proposed project
Ballynafagh Lake pNHA (001387)	Ballynafagh Lake is located about 2 km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. This pNHA is a SAC selected for its alkaline fens, Desmoulin's whorl snail (*Vertigo moulinsiana*) and marsh fritillary butterfly (*Euphydryas aurinia*)	2.67 km west	No, pNHA is upstream of the proposed project

10.4.1.3 Other Nationally Important Sites

Harristown Common candidate (c) NHA (grid reference 288100, 213100) lies 113 m, to the west of the Planning Application Boundary at its nearest location. Foss and Wilson carried out a habitat survey of this site (2012) and gave it a value of 'nationally important' following their survey. They reported that the alkaline fen on site corresponded to EU habitat type Alkaline fens (7230 – an Annex I habitat). Habitats recorded on site were:

- 7230 Alkaline fens. The survey description states that the area of alkaline fen was being grazed by Highland cattle that the site appeared to be drying out somewhat. Channels run through site with fen flushes. Ridges run through the northern half of the site which is where gorse increases, and scrub is frequent. Man-made pool at eastern end. An area of only PF1 was identified to the north of L6073 road and a mixture of PF1 and GS4 to the south.
- Main Fossitt habitats on site were:
    - FL8 Other artificial lakes and ponds
    - FW4 Drainage ditches
    - GS2 Dry meadows and grassy verges
    - GS4 Wet grassland
    - PF1 Rich fen and flush
    - WS1 Scrub

No other Annex 1 habitats, with the exception of alkaline fens Annex 1 (7230) alkaline fens at Harristown cNHA, were recorded by NPWS within the ZoI and no other Annex I habitats (with exception of Harristown alkaline fen) were recorded during Jacobs surveys.

10.4.1.4 Annex I Habitats

There were no desk study records of Annex I habitats, other than Harristown Common cNHA, within the study area defined in Table 10.1.

The walkover survey noted a potential Annex I grassland which was subject to further study which established that this was not Annex 1 habitat (see Appendix 10.3, Volume 3).

10.4.1.5 Aquatic Environment

The Waterbodies (WB) crossed by the Proposed Development are shown in Table 10.6 below and illustrated in Figure 3 of the Appropriate Assessment Screening Report (Jacobs, 2024a). The table shows all waterbodies in the study area and the river waterbody Water Framework Directive (WFD) status for the 2016-2021 monitoring period, and the risk rating where available (Environmental Project Agency (EPA) Maps web site, 2023). The risk rating does not affect the assessment as the assessment takes cognisance only of the 2016-2021 status and is provided for completeness only.

Table 10.6: Identified WFD Water Bodies (Rivers are Listed from West to East)

Waterbody name	No. river interactions and their locations according to the EPA.	No. of river interactions after the site visit.	WFD status 2016-2021	Risk rating
Tributary of the Tolka_020 **(IE_EA_09T010600)**	1 crossing WB01: N 95028 46797	1 crossing	Moderate	At risk
Dunboyne Stream_010 **(IE_EA_09D040500)**	1 crossing WB02: N 94782 46269	1 crossing	Poor	At risk
Rye Water_030 **(IE_EA_09R010400)**	1 crossing WB03: N 93930 45180	1 crossing	Poor	At risk
Jenkinstown stream_010 **(IE_EA_09J010950)**	4 crossings: WB04: N 91730 45313 WB06: N 90246 45483 WB07: N 89775 43468 WB08: N 89661 43153	4 crossings	Moderate	At risk
Pond	1 crossing WB05: N 90677 45988	1 crossing	N/A	N/A
Unassigned Stream	1 crossing WB09: N 89419 43023	1 crossing	N/A	N/A

Waterbody name	No. river interactions and their locations according to the EPA.	No. of river interactions after the site visit.	WFD status 2016-2021	Risk rating
Rye Water_020 (Brides Stream) **(IE_EA_09R010300)**	1 crossing WB10: N 89243 42178	1 crossing	Good	Under review
Newtownmoyaghy Stream **tributary of Rye Water_020**	1 crossing WB11: N 89076 40939	1 crossing	N/A	N/A
Rye Water_020 (Padistown) **(IE_EA_09R010300)**	1 crossing WB12: N 88410 40767	1 crossing	Good	Under review
Rye_Water_010 **(IE_EA_09R010100)**	1 crossing WB13: N 88065 40613	1 crossing	Moderate	At risk
Royal Canal **(IE_09_AWBRCMLE)**	1 crossing WB14: N 87874 40210	1 crossing	Good	Under review
Lyreen_010 **(IE_EA_09L020035)**	1 crossing WB15: N 86262 37369	1 crossing	Poor	At risk
Drainage ditches	1 crossing WB16: N 86442 36490	1 crossing	N/A	N/A
Drainage ditches	1 crossing WB17: N 86592 36149	1 crossing	N/A	N/A
Drainage ditches	1 crossing WB18: N 86589 36154	1 crossing	N/A	N/A
Lyreen_010 (Baltracey Tributary Lyreen) **(IE_EA_09L020035)**	1 crossing WB19: N 86673 35787	1 crossing	Poor	At risk

Waterbody name	No. river interactions and their locations according to the EPA.	No. of river interactions after the site visit.	WFD status 2016-2021	Risk rating
Tributary of Lyreen_010	1 crossing WB20: N 86754 35459	1 crossing	N/A	N/A
Drainage ditch	1 crossing WB21: N 86823 35188	1 crossing	N/A	N/A
Clonshanbo_010 **(IE_EA_09C030300)**	1 crossing WB22: N 87176 33938	1 crossing	Poor	At risk
Drainage ditch	1 crossing WB23: N 87298 33417	1 crossing	N/A	N/A
Clonshanbo_020 **(IE_EA_09C030600)**	1 crossing WB24: N 86916 31840	1 crossing	Poor	At risk
Kilmurry_010 **(IE_EA_09K260890)**	1 crossing WB25: N 86272 30537	1 crossing	Poor	Under review
Tributary of Kilmurray_010	1 crossing WB26: N 86151 30369	N/A	N/A	N/A
Liffey_130 **(IE_EA_09L011600)**	3 crossings: WB27: N 84449 28586 WB29: N 84425 28283 WB31: N 84807 27542	3 crossings	Good	Not at risk
Tributary of Liffey_130	1 crossing WB28: N 84283 28429	1 crossing	N/A	N/A
Tributary of Slate_010	1 crossing WB30: N 84237 27559	1 crossing	N/A	N/A

Waterbody name	No. river interactions and their locations according to the EPA.	No. of river interactions after the site visit.	WFD status 2016-2021	Risk rating
Liffey_120 **(IE_EA09L011500)**	4 crossings: WB32: N 87519 25081 WB35: N 88001 24231 WB36: N 88281 24006 WB37: N 88110 23008	4 crossings	Good	Not at risk
Drainage ditch	1 crossing WB33: N 87844 24820	1 crossing	N/A	N/A
Drainage ditch	1 crossing WB34: N 87950 24710	1 crossing	N/A	N/A
Grand Canal **(IE_09_AWB_GCMLE)**	2 crossings WB38: N 88152 22604 WB42: N 88288 19245	2 crossings	Good	Not at risk
Liffey_110 **(IE_EA_09L011300)**	3 crossings WB39: N 88249 21068 WB40: N 87711 20395 WB41: N 87394 20021	3 crossings	Good	Under review
Liffey_100 **(IE_EA_09L011200)**	1 crossing WB43: N 88310 18467	1 crossing	Good	Under review
Drainage ditch	1 crossing WB44: N 88077 15749	1 crossing	N/A	N/A
Dunstown Stream	1 crossing WB45: N 87555 12433	1 crossing	N/A	N/A

Waterbody name	No. river interactions and their locations according to the EPA.	No. of river interactions after the site visit.	WFD status 2016-2021	Risk rating
Tributary of Liffey_120	1 crossing WB46: N 88017 24231	1 crossing	N/A	N/A

Several drainage ditches, some wet and some dry, were identified predominantly along field boundaries in the vicinity of the Proposed Development. It should be noted, however, that these contained water intermittently.

10.4.1.6 Protected and Rare Species

Records of legally protected, rare and / or notable species within 2 km of the Proposed Development Planning Application Boundary are listed in Table 10.7. Records of legally protected, rare and / or notable species within 150 m of the Proposed Development Planning Application Boundary are listed in Table 10.8.

Table 10.7: Records of protected, rare and other notable flora and fauna within 2 km of the Proposed Development (data from NPWS and the NBDC, accessed March and July 2022, and December 2023).

Species Name	Scientific Name	Protection[62]	Conservation Status
Barn swallow	*Hirundo rustica*	WA	Birds of Conservation Concern – Amber List
Black-headed gull	Chroicocephalus *ridibundus*	WA	Birds of Conservation Concern – Red List
Brown long-eared bat	*Plecotus auritus*	HDIV, WA	Least concern
Common coot	*Fulica atra*	BDIII, WA	Birds of Conservation Concern – Amber List
Common frog	*Rana temporaria*	WA	Least concern
Common pheasant	*Phasianus colchicus*	BDIII, WA	Least concern
Common pipistrelle	*Pipistrellus pipistrellus*	HDIV, WA	Least concern
Common snipe	*Gallinago gallinago*	BDIII, WA	Birds of Conservation Concern – Amber List
Common starling	*Sturnus vulgaris*	WA	Birds of Conservation Concern – Amber List

[62] HDII/IV = Habitats Directive Annexes II/IV/V; WA = Wildlife Acts; BD IIII = Birds Directive Annexes I/II/III;

Species Name	Scientific Name	Protection[62]	Conservation Status
Common swift	*Apus apus*	WA	Birds of Conservation Concern – Amber List
Common wood pigeon	*Columba palumbus*	BDIII, WA	Least concern
Daubenton's bat	*Myotis daubentonii*	HDIV, WA	Least concern
Eurasian badger	*Meles meles*	WA	Least concern
Eurasian curlew	*Numenius arquata*	WA	Birds of Conservation Concern – Red List
Eurasian red squirrel	*Scirus vulgaris*	WA	Least concern
European otter	*Lutra lutra*	HDII, HDIV, WA	Near threatened
Glutinous snail	*Myxas glutinosa*	N/A	Endangered
House martin	*Delichon urbicum*	WA	Birds of Conservation Concern – Amber List
House sparrow	*Passer domesticus*	WA	Birds of Conservation Concern – Amber List
Hen Harrier	*Circus cyanus*	WA, BDI	Birds of Conservation Concern – Amber List
Yellowhammer	*Emberiza citronella*	WA	Bird of Conservation Concern – Red List
Lesser black-backed gull	*Larus fuscus*	WA	Birds of Conservation Concern – Amber List
Lesser bulin	*Merdigera obscura*	N/A	Endangered
Lesser noctule	*Nyctalus leisleri*	HDIV, WA	Near threatened
Little egret	*Egretta garzetta*	BDI, WA	Least concern
Little grebe	*Tachybaptus ruficollis*	WA	Birds of Conservation Concern – Amber List

Species Name	Scientific Name	Protection[62]	Conservation Status
Mallard	*Anas platyrhynchos*	BDIII, WA	Least concern
Marsh fritillary	*Euphydryas aurinia*	HDII	Vulnerable
Merlin	*Falco columbarius*	WA, BDI	Bird of Conservation Concern - Amber List
Mute swan	*Cygnus olor*	WA	Birds of Conservation Concern – Amber List
Natterer's bat	*Myotis nattereri*	HDIV, WA	Least concern
Northern lapwing	*Vanellus vanellus*	WA	Birds of Conservation Concern – Red List
Pine marten	*Martes martes*	WA	Least concern
Red deer	*Cervus elaphus*	WA	Least concern
Rock pigeon	*Columba livia*	WA, BDIII	Birds of Conservation Concern – Amber List
Sand martin	*Riparia riparia*	WA	Birds of Conservation Concern – Amber List
Skylark	*Alauda arvensis*	WA	Birds of Conservation Concern – Amber List
Smooth newt	*Lissotriton vulgaris*	WA	Least Concern
Soprano pipistrelle	*Pipistrellus pygmaeus*	HDIV, WA	Least concern
Tufted duck	*Aythya fuligula*	BDIII, WA	Birds of Conservation Concern – Amber List
West European hedgehog	*Erinaceus europaeus*	WA	Least concern
Yellowhammer	*Emberiza citrinella*	WA	Birds of Conservation Concern – Red List

Table 10.8: Records of protected, rare and other notable flora and fauna within 150 m of the Proposed Development (data from NPWS and the NBDC, accessed March and July 2022, and December 2023).

Species Group	Common Name	Scientific Name	Protection[63]	Conservation Status Mammals[64]; Birds[65]; Amphibian, reptile, and freshwater fish[66];
Lower Plants	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Higher Plants	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Invertebrates	Large red tailed bumble bee	*Bombus lapidarius*	N/A - notable	Near threatened
Fish	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Amphibians	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Amphibian	Common frog	*Rana temporaria*	WA	N/A
Reptiles	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A

[63] HDII/IV = Habitats Directive Annexes II/IV; WA = Wildlife Acts; BD I/III = Birds Directive Annexes I/III;

[64] Marnell, F., Looney, D. and Lawton, C (2019). Ireland Red List No.12: Terrestrial Mammals. National Parks and Wildlife Service, Department of Culture, Heritage and Gaeltacht, Dublin, Ireland.
[65] Birds of Conservation Concern in Ireland (Gilbert *et al.* 2021);
[66] Amphibian, reptile and freshwater fish red list (King *et al.* 2011).

Species Group	Common Name	Scientific Name	Protection[63]	Conservation Status Mammals[64]; Birds[65]; Amphibian, reptile, and freshwater fish[66];
Birds	Common Snipe	*Gallinago gallinago*	BDIII, WA	Birds of Conservation Concern – Amber List
Birds	Common Wood Pigeon	*Columba palumbus*	WA. BDII	N/A
Birds	Eurasian curlew	*Numenius arquata*	WA	Birds of Conservation Concern – Red List
Birds	Lesser black-backed gull	*Larus fuscus*	WA	Birds of Conservation Concern – Amber List
Birds	Little egret	*Egretta garzetta*	BDI, WA	Least concern
Terrestrial mammals	Lesser noctule	*Nyctalus leisleri*	HDIV, WA	Least concern
Terrestrial mammals	Common pipistrelle	*Pipistrellus pipistrellus*	HDIV, WA	Least concern
Terrestrial mammals	Soprano pipistrelle	*Pipistrellus pygmaeus*	HDIV, WA	Least concern
Terrestrial mammals	Eurasian badger	*Meles meles*	WA	Least concern
Terrestrial mammals	European otter	*Lutra lutra*	HDII, HDIV, WA	Near threatened
Terrestrial mammals	Pine marten	*Martes martes*	HAV, WA	Least concern
Terrestrial mammals	West European hedgehog	*Erinaceus europaeus*	WA	Least concern

Birdwatch Ireland returned the following incidental winter bird records at two locations in the vicinity of the Proposed Development. One record was from the Waterstown, Co. Kildare area which is located to the west of Sallins town and 30m to the west of the Proposed Development route. Six records were from the Lakelands area within Naas Town which is located 330m from the Proposed Development route. Both locations are within the Proposed Development study area and these records are included in Table 10.9.

Table 10.9: Incidental winter bird records at Waterstown and Lakelands Naas

(Column 5 shows the number of birds comprising 1% of the national population and column 6 shows the number of birds comprising 1% of the international population of each species)

Site Code	Site Name	Winter	Species	1% National	1% International	Sep	Oct	Dec	Jan	Feb	Mar
0SS10	Waterstown near Sallins	2015/16	Whooper swan	150	340					10	
0S397	Lakelands Naas	2018/19	Mute swan	90	100	12	4	10	8	6	8
S397	Lakelands Naas	2018/19	Mallard	280	53000	42	60	50	45	22	32
0S397	Lakelands Naas	2018/19	Little grebe	20	4700	4	2	6		2	4
0S397	Lakelands Naas	2018/19	Moorhen			11	9	10		4	3
0S397	Lakelands Naas	2018/19	Black-headed gull			29	15	103	19	33	28
0S397	Lakelands Naas	2018/19	Herring gull			2		1			1

10.4.1.7 Hen harrier

The closest designated site for breeding hen harrier to the Proposed Development is Slive Bloom SPA which is 49 km to the west of the Proposed Development. Hen harrier can range widely in the winter months and outside of the breeding season (late-July to March). They have a core range of 2 km with a maximum range of 10 km (Scottish Natural Heritage (SNH) 2016). Hen harrier roost communally in the winter months and can use a wide variety of habitats for winter roosting. Hen harrier is listed on Annex I of the Birds Directive (Directive 2009/147/EC) and is amber listed on the Birds of Conservation Concern in Ireland (Gilbert *et al.* 2021). Hen harriers are highly susceptible to disturbance and are particularly vulnerable during the winter due to the short days and limited foraging time. A disturbance event could cause a roosting individual to be flushed causing exposure to weather elements, unnecessary energy expenditure and exposure to predators.

The desk study returned three records of wintering hen harrier within 2 km of the Proposed Development. The most recent records within 2 km of the Proposed Development are from the NBDC data from Bird Atlas surveyed between 2007 and2011. The Bird Atlas captures both roving records of species at 10 km resolution and timed tetrad visits at 2km resolution. Wintering hen harrier was found to occur in two 10km squares within 2km of the proposed development. More recent records were also returned (2017 – 2021) within 10 km of the Proposed Development. These record returns encompassed all four potential options from Step 4A (please see Chapter 4 of this EIAR for further details), and not just the Proposed Development, and as such includes a larger area and the preferred option reported for all other receptors.

10.4.1.8 Fish and aquatic invertebrates

The study area is hydrologically linked to two main river catchments, River Tolka, located to the north of the Proposed Development, and the River Liffey which flows west and then north from Poulaphouca Reservoir through Kildare and Clane before heading east at Leixlip towards Dublin.

One of the major tributaries of the River Liffey is the Rye Water which flows through the Rye Water Valley / Carton SAC. Although there are no QI fish species of the SAC, it is noted for its spawning habitat for Atlantic salmon and trout and the presence of white-clawed crayfish (*Austropotamobius pallipes*). The River Liffey catchment has historically suffered from water quality issues and some of those issues remain today. Furthermore, the river is subject to habitat fragmentation due to the many obstacles and barriers, with twenty on the main channel alone. Nevertheless, the main channel and its tributaries do provide spawning and nursery opportunity for salmon and trout with the middle reaches of the River Liffey considered important area for both species. With the exception of the River Morell, most of the tributaries in the middle reach are narrow (<3 m wide) and short and support low densities of trout and salmon. Brown trout were recorded in 22 main stem survey sites and all five tributary rivers (Lemonstown, Millstream, Ladyswell, Morell (Hartwell and Painestown) and Gollymochy during electrofishing surveys undertaken on the River Liffey in 2021 (Delanty *et al.* 2022). Salmon were also recorded but in lower densities and at less sites.

Lamprey sp. were recorded on Gollymochy and Ladyswell tributaries whilst eels were recorded on seven main stem sites. Other fish species encountered included minnow (*Phoxinus phoxinus*), stoneloach (*Barbatula barbatula*), pike (*Esox lucius*), gudgeon (*Gobio gobio*), roach (*Rutilus rutilus*) and three-spined stickleback (*Gasterosteus aculeatus*).

The Tolka River which has headwaters near Dunboyne and Dunshaughlin flows through agricultural land in the upper reaches towards urban development in the lower catchment. Significant pressures which impact fish populations include man-made barriers and poor water quality. Low densities of salmon, trout, lamprey and eels are present within the catchment. Other species include minnow, stoneloach and three-spined stickleback (Matson *et al*. 2018)**.**

10.4.1.9 Freshwater pearl mussel

The NPWS *Margaritifera* Sensitive Area Map was consulted for the desk study (NPWS, 2017[67]). The Proposed Development is not within any freshwater pearl mussel catchments (FWPM). The nearest FWPM catchment is Barrow (outside ZoI - the source of the River Barrow is at Glenbarrow in the Slieve Bloom Mountains in County Laois, approximately 50km west of the Proposed Development) which has 'catchments with previous records of *Margaritifera*, but current status unknown' (NPWS 2017).

10.4.1.10 White-clawed crayfish

White-clawed crayfish have been recorded on the River Liffey from the upper catchment at Naas (south of the Proposed Development) to middle and lower catchments at Clane, and tributaries including the Rye Water (NBDC 2022). These records are shown in Table 10.10 below.

[67] Margaritifera Sensitivities Area Map: https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=2fae3c393baa4b79b7dfb1e3c19f3fab

Table 10.10: Records of white-clawed crayfish within 5 km of the Planning Application Boundary (NBDC, 2023)

Watercourse (South to North) Nearest distance to Proposed Development	NGR	Year	Catchment	WFD Sub catchment	Downstream connectivity	Same catchment at Project
River Liffey (4.6 km south-east)	N922103	2013	Liffey and Dublin Bay	Liffey	No	Yes
River Liffey (2.93 km west)	N842194	2010	Liffey and Dublin Bay	Liffey	No	Yes
River Liffey at Castlekeely Ford (1.52 km east	N869216	2013	Liffey and Dublin Bay	Liffey	No	Yes
River Liffey at Clane (1.33 km north-east	N880270	2016	Liffey and Dublin Bay	Liffey	Yes (WB29)	Yes
Morell River (Tributary of Liffey)	N927288	2016	Liffey and Dublin Bay	Liffey	No	Yes
Rye Water at Maynooth (4.21 km west)	N930394	2016	Liffey and Dublin Bay	Rye Water	Yes (WB12 and WB13)	Yes

10.4.1.11 Invasive species

Records of floral and faunal invasive species (NBCD) are shown in Table 10.11 below.

Table 10.11: Records of Invasive species within 2km of the Planning Application Boundary (NBCD 2023)

Common Name	Scientific Name	Species group	Designation	Impact
American mink	*Mustela vison*	terrestrial mammal	Regulation S.I. 477 (Ireland)	High
Brown rat	*Rattus norvegicus*	terrestrial mammal	Regulation S.I. 477 (Ireland)	High
Budapest slug	*Tandonia budapestensis*	mollusc	N/A	Medium
Cherry laurel	*Prunus laurocerasus*	flowering plant	N/A	High

Common Name	Scientific Name	Species group	Designation	Impact
Common garden snail	*Cornu aspersum*	mollusc	N/A	Medium
Eastern grey squirrel	*Sciurus carolinensis*	terrestrial mammal	EU Regulation No. 1143/2014 Regulation S.I. 477 (Ireland)	High
European rabbit	*Oryctolagus cuniculus*	terrestrial mammal	N/A	Medium
Fallow deer	*Dama dama*	terrestrial mammal	Regulation S.I. 477 (Ireland)	High
Greater, white-toothed shrew	*Crocidura russula*	terrestrial mammal	N/A	Medium
Harlequin Ladybird	*Harmonia axyridis*	Insect – beetle	Regulation S.I. 477 (Ireland)	High
Japanese knotweed	*Reynoutria japonica*	flowering plant	Regulation S.I. 477 (Ireland)	High
Jenkins' spire snail	*Potamopyrgus antipodarum*	mollusc	N/A	Medium
New Zealand flatworm	*Arthurdendyus triangulatus*	flatworm	N/A	High
Parrot's-feather	*Myriophyllum aquaticum*	flowering plant	EU Regulation No. 1143/2014 Regulation S.I. 477	High
Spanish bluebell	*Hyacinthoides hispanica*	flowering plant	Regulation S.I. 477 (Ireland)	N/A
Sycamore	*Acer pseudoplatanus*	flowering plant	N/A	Medium
Three-cornered garlic	*Allium triquetrum*	flowering plant	Regulation S.I. 477 (Ireland)	Medium

10.4.2 Results of the Site Visit

10.4.2.1 Habitats

Habitats recorded across the study area are described below and shown in Figure 10.2A, Volume 4.

Habitats within the study area comprised a combination of natural, semi-natural and artificial habitats. No Habitats Directive Annex 1 habitats were recorded within the study area. An incidental record of devils-bit scabious was found at one location on Harristown Common, within an area of wet grassland/fen, close to Dunstown substation at the south of the Proposed Development. The dominant habitats throughout the study area comprised improved agricultural grassland bordered by hedgerows. Habitats recorded across the study area are summarised in Table 10.12.

Table 10.12: Fossitt Habitats Recorded within the Study Area

Broad habitat group	Fossitt habitat code	Fossitt Habitat Name	Annex I habitat on site
Water feature	FW2	Depositing lowland river	No
	FW3	Canals	No
	FW4	Drainage Ditch	No
	FS1	Reed and large sedge swamps	No
	FL8	Other artificial lakes and ponds	No
Grassland and marsh	GA1	Improved agricultural grassland	No
	GA2	Amenity grassland	No
	GS1	Dry calcareous grassland	No
	GS2	Dry meadows and grassy verges	No
	GS4	Wet grassland	No
Cultivated and built land	BC1	Arable crops	No
	BL3	Building or artificial	No
Exposed rock / disturbed ground	ED2	Spoil and bare ground	No
	ED3	Re-colonising bare ground	No

Broad habitat group	Fossitt habitat code	Fossitt Habitat Name	Annex I habitat on site
Woodland and Scrubs	WS1	Scrub	No
	WL1	Hedgerows	No
	WL2	Treeline	No
	WD1	Broadleaved woodland	No
	WD2	Mixed broadleaved / conifer woodland	No
	WD4	Conifer plantation	No
	WN6	Wet willow-alder-ash woodland	No
	WD5	Scattered trees and parkland	No

Hedgerows (WL1)

Hedgerows were present lining the roadside along the majority of the cable route and in certain off-road sections of the Proposed Development route (see Figure 10.2, Volume 4 for extents of hedgerows). Hedgerows were primarily in good condition and were dominated by hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), ash (*Fraxinus excelsior*), bramble (*Rubus fructicosus*), dog rose (*Rosa canina*) and cherry laurel (*Prunus laurocerasus*).

Broadleaved woodland (WD1)

Broadleaved woodland habitat was present in small areas predominantly in the northern extent of the Proposed Development (see Figure 10.2, Volume 4). These habitats primarily consisted of ash, sessile oak (*Quercus petraea*), silver birch (*Betula pendula*), beech (*Fagus sylvatica*), hazel (*Corylus avellana*) and sycamore (*Acer pseudoplatanus*).

Scrub (WS1)

Areas of scrub habitat were present at the northern extend of the project route in close proximity to Kilcock Town and at the southern extent of the route (see Figure 10.2A, Volume 4). Scrub habitats consisted primarily of bramble, blackthorn, hazel, hawthorn, willow (*Salix* sp.), ivy (*Hedera helix*), thistle species (*Cirsium spp*.) and foxtail (*Alopecurus pratensis*).

Treeline (WL2)

Trees lines were present along the extend of the Proposed Development cable route and in road and off-road sections of the Proposed Development route. (see Figure 10.2A, Volume 4 for extent). Treelines typically consisted of ash, hazel, hawthorn, sessile oak, pedunculate oak (*Quercus robur*), sycamore and horse chestnut (*Aesculus hippocastanum*). Treelines along road edges typically had a hedgerow understory and there was evidence of ash dieback along the entire extent of the Proposed Development.

Depositing lowland rivers (FW2)

Several watercourses within the study area fall within this habitat category including the River Liffey, the Rye Water and the River Lyreen.

River Liffey Catchment

The Proposed Development crosses the main stem River Liffey (at WB37) and a number of its small and medium sized tributaries Further details of the waterbody crossing methods are provided in Volume 3, Appendix 5.3 and Appendix 10.4. The River Liffey had a variety of in-stream habitat features with flow types including run / riffle / pool sequence with slack areas and a mixture of substrates providing suitable habitat for different fish species of different age classes. Several tributaries such as the Lyreen, Clonshanbo and Baltracey include headwater reaches which were small and shallow which provide a mix of substrates and flows suitable for fish. Other unnamed watercourses were ephemeral, had been dredged and over deepened and provided few substrates for spawning or fish refuge. The River Liffey catchment waterbodies had vegetation typical of FW2, for example heavily vegetated banks with Himalayan balsam (*Impatiens glandulifera*), sedges and occasional willow. Emergent species such as common reed (*Phragmites australis*), and floating vegetation such as pondweeds (*Potamogeton spp*.) were also present.

Rye Water Catchment

The Proposed Development crosses the Rye Water (at WB13) and a small tributary on the north outskirts of Kilcock (at WB12). The river was 2 m wide at this point with good habitat including run/riffle flows and a variety of substrates. There was a high potential for salmonids, eels and white clawed crayfish to be present in this area. The Rye Water catchment waterbodies also had vegetation typical of FW2, such as emerging common reeds and sedges along the banks.

Several smaller watercourses, such as the Brides Stream (which the Proposed Development crosses WB10), were present in this area but were heavily modified, straightened and were culverted under roads or fields with limited potential for fish or invertebrates species of conservation concern. The Jenkinstown Stream had a mixture of habitats ranging from poor with in-stream features not suitable for fish to moderate with adequate flows and substrates that are suitable for fish. Two of the water crossing locations were polluted on the day of the surveys.

Canals (FW3)

Two of the watercourses within the study area fall within this habitat category, the Grand Canal and the Royal Canal, which are described below.

- The Grand Canal: The Proposed Development crosses the Grand Canal at WB38 and WB42 At these locations in the south of the Proposed Development the surrounding landscape was urban development. The straightened walled canal was 8 m wide and 1 m deep with emergent vegetation such as common reed, timothy (*Phleum pratense*), willowherb (*Epilobium sp*.) and common vetch (*Vicia sativa*) on either bank. Substrates were dominated by mud and silt. Free floating vegetation such as duckweed (*Lemnoideae sp*.) were also present, which is typical of FW3 canals; and

- The Royal Canal: The Proposed Development crosses the Royal Canal at WB14 (north-west of Kilcock). At this location, the walled canal was 1.5 m deep with clay / organic substrates not suitable for spawning. Emergent macrophytes were present typical of FW3 canals such as reeds and a sedge species (*Carex sp*.). Free floating macrophytes were also present such as water lilies (*Nymphaea sp.).*

Drainage ditches (FW4)

A number of drainage ditches both wet and dry were recorded (waterbodies WB01, WB02, WB03, WB04, WB06, WB09, WB12, WB14, WB19, WB22, WB27, WB29). Several of these ephemeral ditches were not on the EPA maps tool application and were mostly associated with areas flowing alongside roads and housing developments or farmland drains. Many were heavily modified, artificial, straightened, narrow and dredged for flood prevention. Habitat features recorded stagnant water, shallow water depths and had vegetation and detritus covering the substrates. Several were culverted under roads and fields and although hydrologically linked to larger downstream tributaries, many were dry when surveyed and unsuitable for fish or invertebrates. These had wetland vegetation typical of FW4 drainage ditches such as meadowsweet (*Filipendula ulmaria*) at WB19 and common reeds at WB29.

Dry meadows and grassy verges (GS2)

Small areas of varying sizes of dry meadow and grassy verge habitat were present along the Proposed Development cable route (see Figure 10.2, Volume 4). Roadside verges are mown to allow for vehicle drive visibility. These habitats are characterised by a variety of grass species including false oat-grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*) and cock's foot (*Dactylis glomerata*). Further species include common knapweed (*Centaurea nigra*), white clover (*Trifolium repens*) and meadow foxtail (*Alopecurus pratensis*).

Wet grassland (GS4)

Wet grassland habitats were present in two small areas at the northern extend of the Proposed Development cable route (see Figure 10.2, Volume 4). These habitats are present in areas of poorly drained pastureland and are grazed by cattle and sheep in some areas. Abundant species present in these habitats included soft rush (*Juncus effusus*), meadow sweet (*Filipendula ulmaria*), crested dogstail (*Cynosurus cristatus*) and marsh thistle (*Cirsium palustre*).

Improved agricultural grassland (GA1)

Improved agricultural grassland is the dominant habitat form within the study area along the Proposed Development cable route. These agricultural fields are managed for hay production or grazed intensively by sheep and cattle. These habitats are dominated by perennial rye grass (*Lolium perenne*), Yorkshire fog, thistle sp., common nettle (*Urtica dioica*), crested dogstail and chickweed (*Stellaria media*).

Arable crops (BC1)

As the majority of the Proposed Development cable route is in agricultural areas, arable crop habitats were present throughout the Proposed Development cable route (see Figure 10.2, Volume 4). These habitats are managed for the production of cereal, root, lead, energy and / or fibre crops. Cereal crops such as barley and oats dominated the habitats used for arable crops along the project route.

Amenity grassland (GA2)

These habitats include playing fields and green areas within housing estates. Habitat within housing estates showed evidence of ornamental planting and regular cutting regimes. Small areas of amenity grassland were present through the Proposed Development cable route with a particular prevalence in Nass Town (see Figure 10.2, Volume 4). These amenity grassland habitats were dominated by daisy (*Bellis perennis*), plantains (*Plantago* sp.), yarrow (*Achillea millefolium*), and red clover (*Trifolium pratense*).

Building or Artificial (BL3)

This habitat classification includes all domestic, agricultural, industrial and community buildings and also includes areas covered by artificial surfaces such as roads. As over 80% of the Proposed Development cable route is within road this habitat is dominant throughout the footprint of the Proposed Development. This habitat is also prevalent near and in built up urban areas such as Naas Town and is present at the Dunstown and Woodland substations.

Spoil and bare ground (ED2)

One area of recolonising bare ground was present north of Naas along the Proposed Development cable route (see Figure 10.2, Volume 4.

Recolonising bare ground (ED3)

Small areas of recolonising bare ground were present through the Proposed Development cable route and were particularly prevalent near urban areas of Kilcock and Naas Town. These are areas of bare or disturbed ground, often in derelict sites, with over 50% vegetation cover. Vegetation recorded in these areas included common nettle, dandelion (*Taraxacum* sp.) and knotgrass (*Polygonum aviculare*).

Reed and large sedge swamps (FS1)

One area of reed and large sedge swamp was identified on the banks of the Royal Canal to the west of Naas Town. The Proposed Development will cross this area of the canal. The habitat was dominated by common reed, rosebay willowherb (*Chamaenerion angustifolium*) and silverweed (*Potentilla anserina*).

Conifer plantation (WD4)

There were three examples of conifer plantations along the Proposed Development cable route. All three plantations were in close proximity to one another and were located to the northeast of Prosperous Town. One small area is within the Planning Application Boundary (see Figure 10.2, Volume 4). These habitats were made up of over 75% conifer species for commercial use and are planted with a mix of pine species (*Pinus* sp.), larch species (*Larix* sp.) and spruce species such as Sitka spruce (*Picea sitchensis*) and Norwegian spruce (*Picea abies*).

Wet willow-alder-ash woodland (WN6)

There was one habitat area of wet willow-alder-ash woodland located to the northeast of Prosperous Town, approximately 0.24 km from the Proposed Development cable route at its nearest location to it and as such is not shown on Figure 10.2, Volume 4, as only habitats within the Planning Application Boundary are depicted. This habitat is made up of willow, alder and ash tree species, common reed, common nettle, dogwood (*Cornus sangunea*) and horse-tail (*Equisetum sp.*) with the Ballynagappagh River running through it. The woodland is not considered to be Annex I as the wet woodland has been planted.

Mixed broadleaved / conifer woodland (WD2)

There were five small areas of mixed broadleaved / conifer woodland along the Proposed Development cable route (see Figure 10.2, Volume 4). The area which was located to the northeast of Prosperous Town was an immature plantation of sequentially planted trees with drains every 10 m and a mixed understory of common nettle and bramble.

Scattered trees and parkland (WD5)

There was one example of this habitat located to the southwest of Naas Town. This habitat was in a small park area, planted with wildflowers, within a housing estate (see Figure 10.2, Volume 4).

Dry calcareous and neutral grassland (GS1)

Areas of dry calcareous grassland (12.67 ha) were present at the northern extend of the Proposed Development, in particular around the Woodland substation. This grassland comprised of foxtail (Alopecurus pratensis), cock's foot (*Dactylis glomerata*), perennial rye grass, creeping buttercup (*Ranunculus repens*), meadow buttercup (*Ranunculus acris*), soft rush, bush vetch (*Vicia sepium*), meadow vetchling (*Lathyrus pratensis*), common knapweed, ragwort (*Jacobaea vulgaris),* greater plantain (*Plantago major*), self-heal

(*Prunella vulgaris*), thistle sp. and common nettle. GA1 was scattered within the GS1 in localised areas and was characterised by areas more densely dominated by perennial rye grass. None of these species are rare or notable or are strong indicators of calcareous grassland.

Other artificial lakes and ponds (FL8)

There was a pond at WB5, where eDNA sampling for smooth newt was carried out at. Osberstown attenuation pond is a recently constructed waterbody along the M7, 50 m to the east of Millennium Park on the north-west suburbs of Naas (grid reference: N 88162 21266), but which was not possible to survey given protective boundary fencing (habitat suitability was used as a proxy for species presence in this location).

Ground Water Dependent Terrestrial Ecosystems (GWDTE)

Wet grassland (GS4) and wet willow-alder- woodland (WN6) are Ground Water Dependent Ecosystems (GWDTE). These GWDTE were recorded at a number of locations and those that were within 250 m of the Proposed Development are shown in Volume 4 figures and detailed in Table 10.13. Further information is presented in Chapter 11 (Soils, Geology, and Hydrogeology) of this EIAR.

Table 10.13: Locations of ground water dependent ecosystems in relation to the Proposed Development

GWDTE site number (*potential connectivity)	Fossitt Habitat	Location of GWDTE in relation to the nearest landmark	GWDTE Distance from Planning Application Boundary	Grid ref
1	Wet willow-alder-ash woodland (WN6)	1.4 km west of Prosperous	236 m north	N 84745 27498
2*	Wet willow-alder-ash woodland (WN6)	Western suburb of Naas	30 m west	N 88044 19009
3.1	Rich fen and flush (PF1)	Adjacent to Dunstown substation GWDTE is part of Harristown Common cNHA	Cable route is 240 m west of PF1 rich fen and flush habitat, part of Harristown Common cNHA (edge of route width) at south of site.	N 87763 12623
3.2	Rich fen and flush (PF1)	770 m north of the boundary of Dunstown substation GWDTE is part of part of Harristown Common cNHA	Cable route is 233 m north-west of G4 wet grassland, part of Harristown Common cNHA at south of site.	N 87773 12748
4.1	Wet grassland (GS4)	2.7 km southwest of Batterstown	On route (Proposed Development cable route	N 94394 46764

GWDTE site number (*potential connectivity)	Fossitt Habitat	Location of GWDTE in relation to the nearest landmark	GWDTE Distance from Planning Application Boundary	Grid ref
			passes through wet grassland field)	
5*	Wet grassland (GS4)	Northwest suburb of Naas	0 m immediately adjacent. East of Naas. Grassland	N 88410 21146
6.1*	Wet grassland (GS4)	0.28 km south of Rathcoffey	0 m adjacent	N 87094 31950
6.2	Wet grassland (GS4)	1.9 km west of Clane	0 m adjacent	N 85588 27160
6.3	Wet grassland (GS4)	1.9 km west of Clane	0 m adjacent	N 85653 27053
6.4	Wet grassland (GS4)	0 m adjacent to Kilcock	20 m south-east of the route	N 87744 39186
6.5	Wet grassland (GS4)	0.1 km west of Kilcock	80 m east of the route	N 87657 39425
6.6	Wet grassland (GS4)	0.6 km west of Kilcock	95 m west of the route	N 87143 39802
6.7	Wet grassland (GS4)	0.3 km west of Kilcock	95 m north of the route	N 87576 39599
6.8	Wet grassland (GS4)	1.9 km west of Clane	95 m west of the route	N 85664 26944
7.1	Wet grassland (GS4)	0.94 km south of Rathcoffey	100 m east of the route	N 87055 31761
7.2	Wet grassland (GS4)	0 m adjacent to Kilcock	105 m east of the route	N 87829 39259
8	Wet grassland (GS4)	2.43 km northeast of Kilcloon	100 m east of the route.	N 94527 45746
9	Wet grassland (GS4)	0.67 km west of the western suburbs of Sallins	On route (Proposed Development cable route	N 88022 22987

GWDTE site number (*potential connectivity)	Fossitt Habitat	Location of GWDTE in relation to the nearest landmark	GWDTE Distance from Planning Application Boundary	Grid ref
			passes through wet grassland field)	
10	Wet grassland (GS4)	1.45 km east of Prosperous	0 m adjacent	N 84713 27284
11	Wet grassland (GS4)	0.36 km west of Prosperous	0 m adjacent	N 84760 27409
12	Reed and large sedge swamps (FS1)	Western suburb of Naas	61 m west	N 87965 18989
13	Wet grassland (GS4)	Jenkinstown	150 m south	N 91740 45103
14	Wet grassland (GS4)	Dunstown	56 m east	N 88054 12417

Aquatic Environment

Forty-six water bodies were identified within the study area and assessed using professional judgement and in accordance with best practice in terms of the following characteristics: the stream width and depth; the substrate type; the flow type; the presence/absence of instream and bankside vegetation; and the level of shading.

In this EIAR, and throughout this chapter, 'waterbody' is often used generically to refer to a watercourse, river, drainage ditch or pond, although it is most frequently to refer to a river/watercourse. Sometimes the specific terms drainage ditch or pond are used, to avoid confusion.

It is important to note that WFD water bodies are referenced as 'WB', whereas all non-WFD waterbodies are referenced as Drainage Ditch ('DD'). Further details relating to the assessment of each waterbody is presented in Appendix 10.4) in Volume 3 of this EIAR. The location of the water bodies is shown in Figure 9.3 in Volume 4 of this EIAR.

Plants and Fungi

No records were returned for protected or notable plant or fungi species within 200 m of the Proposed Development and none were recorded during the site survey. Protected and notable plants and fungi are therefore considered to likely be absent from the ZoI and are not considered any further within this chapter.

Habitat Condition Assessment

No Annex I habitats were identified during the desk study (with the exception of Harristown Commons cNHA). However, one meadow was identified during the initial walkover survey as a potential lowland hay meadow (i.e. an Annex I grassland) and required a more detailed survey. This meadow was located at the northern extent of the Proposed Development 2.2 km south of Woodland substation. A condition assessment of this meadow took place on 5th May 2022 to assess the species present, including indicators or grassland quality, within three 2 x 2 m plots, which included the surrounding 20 m area. The site was later confirmed as not Annex I habitat.

The plot data were analysed using ERICA (Perrin *et al*. 2018) and found the meadow to resemble an improved grassland rather than an Annex 1 Lowland hay meadow. All three plots gave the community type as Yorkshire fog – perennial rye grass *(Lolium perenne*) and the group type as creeping bent (*Agrostis stolonifera*) – creeping buttercup (*Ranunculus repens*). Overall, the three plots included one high quality indicator for lowland hay meadow (yellow rattle *Rhinanthus minor*), two positive indicators (ribwort plantain *Plantago lanceolata* and meadow foxtail *Alopecurus pratensis*) and two negative indicators (perennial rye grass *Lolium perenne* and white clover *Trifolium repens).* The results are summarised in Table 10.14 and shown in full in Appendix 10.3, Volume 3.

Table 10.14: Summary of three grassland plots taken to establish the grassland community type

Plot Number	Grid Reference	ITM Reference	Community (ERICA code)	Group	Notes on species composition
Q1	N 94318 45695	X: 694261 Y: 745718	*Holcus lanatus – Lolium perenne* (Erica code GL2)	*Agrostis stolonifera – Ranunculus repens*	Includes: two positive indicators and one negative indicator
Q2	N 94349 45747	X: 694292 Y: 745770	*Holcus lanatus – Lolium perenne* (Erica code GL2)	*Agrostis stolonifera – Ranunculus repens*	Includes: one high quality indicator, two positive indicators and two negative indicators.
Q3	N 94328 45850	X: 694270 Y: 245850	*Holcus lanatus – Lolium perenne* (Erica code GL2)	*Agrostis stolonifera – Ranunculus repens*	Includes: one high quality indicator, one positive indicator and one negative indicators.

10.4.2.2 Wintering birds

The winter bird surveys recorded infrequent occurrences of bird species across the 800 m study area, the results of which are summarised in Table 10.15 and Figure 10.3, Volume 4. Initially the survey area was larger than 800 m to encompass all four proposed route options. The results in Table 10.15 show the birds within 800 m of the preferred route option (i.e. the Proposed Development). The wintering bird surveys recorded a total of 21 species across the study area, including six species listed as SCI for SPAs within 50 km, two Annex I species, four Red listed bird species and ten Amber list bird species.

Table 10.15 below provides a summary of the findings of the winter bird surveys with respect to those species which are of highest conservation concern, and were recorded during winter bird surveys:

- Special Conservation Interests (SCI) of wintering populations of SPAs in the ZoI of the Proposed Developments;
- Species listed under Annex I of the Birds Directive (2009/147/EC); and
- Red and Amber BoCCI species listed for their wintering populations.

Table 10.15: Birds of Conservation Concern Recorded during the Winter Bird Survey

Common name/Latin name/BTO Code	Peak count	Distribution in the study area	Within the ZoI (Yes/No)	Conservation Importance		
				BoCCI	Annex I	Nearest SPA designated for SCI species, with nearest distance to Proposed Development
Black-headed gull ***Chroicocephalus ridibundus*** **(BH)**	300	Recorded across the study area on 14 occasions primarily foraging / loafing in lakes / ponds in aggregations ranging from 1 to 45 birds. The majority of records were in waterbodies away from the Proposed Development.	.	Amber	-	South Dublin Bay and River Tolka Estuary SPA (c25.4 km)
Lesser black backed gull ***Larus fuscus*** **(LB)**	42	Recorded twice foraging in fields.		Amber	-	Poulaphouca Reservoir SPA (c8 km)
Cormorant ***Phalacrocorax carbo*** **(CA)**	1	Recorded on one occasion along the Grand Canal.		Amber	-	-
Coot ***Fulica atra*** **(CO)**	10	Concentrated within several ponds and lakes across the study area.		Amber	-	-
Herring gull ***Larus argentatus*** **(HG)**	2	Recorded on eleven occasions mainly in flight or foraging in ponds or fields.		Amber	-	The Murrough SPA (c44 km)
Mallard ***Anas platyrhynchos*** **(MA)**	50	Recorded foraging / loafing frequently mainly within ponds and lakes.		Amber	-	Dundalk Bay SPA (c47.4 km NW)
Golden plover ***Pluvialis apricaria*** **(GP)**	7	Recorded on one occasion within the study area feeding in recently sown winter barley.		Red	Yes	North Bull Island SPA (28.7 km SW)

Common name/Latin name/BTO Code	Peak count	Distribution in the study area	Within the ZoI (Yes/No)	Conservation Importance		
				BoCCI	Annex I	Nearest SPA designated for SCI species, with nearest distance to Proposed Development
Linnet ***Carduelis cannabina*** **(LT)**	90	Recording on two occasions in flight and foraging in fields / marginal re-colonising land.		Amber	-	-
Kingfisher ***Alcedo atthis*** **(KF)**	1	Recorded on two occasions along the River Liffey. Both records were observed from the Sallins Bypass bridge.		Amber	Yes	The River Boyne and River Blackwater SPA (18.7 km NW)
Mute swan ***Cygnus olor*** **(MS)**	9	Recorded frequently within lakes and ponds. Resident birds.		Amber	-	-
Kestrel ***Falco tinnunculus*** **(K.)**	1	Recorded hunting on two occasions.		Red	-	-
Redwing ***Turdus iliacus*** **(RE)**	110	Recorded on two occasions foraging on stubble.		Red	-	-
Snipe ***Gallinago gallinago*** **(SN)**	10	Recorded twice within wet / rank grassland.		Red	-	-
Teal ***Anas crecca*** **(T.)**	9	Recorded on two occasions within ponds.		Amber	-	North Bull Island SPA (28.7 km)

'-' means not recorded/not applicable

Six bird species listed as wintering SCIs for SPAs in the vicinity were recorded during the survey: black-headed gull, lesser black-backed gull, herring gull, mallard, golden plover and teal. The nearest SPA is the Poulaphouca Reservoir (8 km distant from the Proposed Development Planning Application Boundary), for which lesser black-backed gull is an SCI species and the Proposed Development is within the foraging range of this species. Lesser black-backed gulls will forage in a range of grassland and arable fields, however 82% of the works proposed to take place will be within the road and the majority of habitat within and adjacent to the Proposed

Development is unsuitable for them as it comprises predominantly trees and hedgerows. Kingfisher and golden plover were the only bird species recorded that are listed on Annex I of the Birds Directive (2009/147/EC). Four Red listed bird species were recorded: golden plover, kestrel, redwing and snipe. Ten Amber list bird species were recorded: black-headed gull, lesser black-backed gull, cormorant, coot, herring gull, mallard, linnet, kingfisher, mute swan and teal.

10.4.2.3 Hen-harrier winter roost survey

Vantage point surveys for roosting hen harrier within 2 km of the Proposed Development were conducted monthly between October 2021 and March 2022. No hen harrier observations were recorded during the surveys. Several other notable and protected species were recorded during the VP surveys, shown in Table 10.16 – please see Appendix 10.2 for further details.

Table 10.16: Protected and notable species recorded during VP surveys

Common name	Scientific name	Conservation Status
Lapwing	*Vanellus vanellus*	Red list
Golden plover	*Pluvialis apricaria*	Red list, Annex 1
Merlin	*Falco columbarius*	Amber list, Annex 1
Peregrine	*Falco peregrinus*	Special Conservation Interest (SCI of Wicklow Mountains SPA)
Snipe	*Gallinago gallinago*	Red list
Whooper swan	*Cygnus cygnus*	Amber list, Annex 1

All incidental records were recorded outside the ZoI / study area for the main wintering bird survey and included either birds in flight or utilising bog habitats away from the Proposed Development. Since no hen harrier are known to utilise winter roosting habitat within 2 km of the Proposed Development, no disturbance impacts to winter roosting hen harrier are predicted. Therefore, no significant effects on winter roosting hen harrier are predicted from the construction or operational phase of the Proposed Development and hen harrier will not be considered further in this EIAR.

10.4.2.4 Breeding birds

Three visits for breeding bird surveys were carried out across seventeen transects and a total of 54 species were recorded, including two Annex I species, seven Red listed bird species and 14 Amber listed bird species. The breeding bird results are tabulated in Table 10.17 below and shown in Figure 10.4, Volume 4.

Red, Amber and Green listed bird species (non-SCI breeding populations) are considered of Local Importance (Higher Value).

Table 10.17: Breeding Bird Survey Results, Species of Conservation Importance and Distance to Nearest SPA Where Applicable.

Common name	Scientific name	BTO Code	Total recorded across all visits	Estimated Minimum number of territories across all visits [68]	BTO Breeding Evidence	BoCCI	Birds Directive	Nearest SPA designated for SCI Species
Cormorant	*Phalacrocorax carbo*	CA	2	0	Non-breeding	Amber	-	Skerries Island SPA, 40 km from proposed development (breeding)
Goldcrest	*Regulus regulus*	GC	43	26	Confirmed breeding	Amber	-	N/A
Grey wagtail	*Motacilla cinerea*	GL	2	1	Possible breeding	Red	-	N/A
Greenfinch	*Chloris chloris*	GR	7	5	Probable breeding	Amber	-	N/A
Herring gull	*Larus argentatus*	HG	2	0	Non-breeding	Red	-	River Nanny Estuary and Shore SPA, 30 km from proposed development (wintering)
House martin	*Delichon urbicum*	HM	19	0	Non-breeding	Amber	-	N/A

[68] Confirmed, probable and possible breeding behaviours (as per BTO categories) were used to determine minimum breeding territories across all visits.

Common name	Scientific name	BTO Code	Total recorded across all visits	Estimated Minimum number of territories across all visits [68]	BTO Breeding Evidence	BoCCI	Birds Directive	Nearest SPA designated for SCI Species
House sparrow	*Passer domesticus*	HS	91	25	Probable breeding	Amber	-	N/A
Kingfisher	*Alcedo atthis*	KF	3	2	Possible breeding	Amber	Annex I	River Boyne and River Blackwater SPA, 29 km from proposed development (breeding)
Lapwing	*Vanellus vanellus*	L.	9	2	Probable breeding	Red	-	Cahore Marshes SPA, 73km from proposed development (wintering)
Linnet	*Linaria cannabina*	LI	8	2	Probable breeding	Amber	-	N/A
Meadow pipit	*Anthus pratensis*	MP	15	5	Possible breeding	Red	-	N/A
Mute swan	*Cygnus olor*	MS	4	1	Probable breeding	Amber	-	N/A
Skylark	*Alauda arvensis*	S.	3	3	Possible breeding	Amber	-	N/A

Common name	Scientific name	BTO Code	Total recorded across all visits	Estimated Minimum number of territories across all visits [68]	BTO Breeding Evidence	BoCCI	Birds Directive	Nearest SPA designated for SCI Species
Snipe	*Gallinago gallinago*	SN	1	0	Non-breeding	Amber	-	N/A
Starling	*Sturnus vulgaris*	SG	178	40	Probable breeding	Amber	-	N/A
Swallow	*Hirundo rustica*	SL	32	18	Possible breeding	Amber	-	N/A
Swift	*Apus apus*	SI	9	0	Non-breeding	Amber	-	N/A
Woodcock	*Scolopax rusticola*	WK	1	0	Non-breeding	Red	-	N/A
Yellowhammer	*Emberiza citrinella*	Y.	5	2	Possible breeding	Red	-	N/A

10.4.2.5 Bats

Identification of Bat Potential Roost Features

The ground level assessments identified a total of 74 trees and six individual groups of trees to have potential roost features (PRF) for bats, as follows:

- 25 trees and one beech tree group were assessed as having high potential to support roosting bats;
- 46 trees and five groups of trees were assessed as having moderate potential to support roosting bats; and
- three trees were assessed as having low potential to support roosting bats.

These trees are shown in Figure 5, Appendix 10.6. The buildings within the survey area did not have features suitable for roosting bats, and therefore had negligible potential to support bats.

Bat Activity

Static detectors were deployed along the Proposed Development at twelve locations representative of the 74 trees BRF i.e. with potential to support roosting, commuting and foraging bats. Habitat descriptions at each static location are shown in Table 10.18. The percentage breakdown of the total number of passes of bats recorded at each static location is shown in Graph 10.1, and the average number of passes per night by each species in each deployment for each of these locations is provided in Graph 10.2.

Table 10.18: Habitat description at each static detector location

Static bat detector location number	Recording height	Recording duration	Location and habitat	Irish Grid Reference	Dates deployed	Description of weather
Location 1	1.5m	8 days	Static located in treeline dominated by ash and beech trees with hawthorn understorey. Agricultural field to the east of treeline and R448 road to the west.	N 88212 16261	27/06/2022 – 05/07/2022	11°C - 17°C. Cloudy with 2 nights of light rain and 1 night of moderate rain
Location 2a	1.5m	4 days	Static located in treeline to the east of Millicent Road. Treeline dominated by ash, hawthorn and oak. Agricultural field to the east of treeline and Longtown Demesne watercourse to the south.	N 87530 25055	18/07/2022 – 22/07/2022	13°C - 28°C. Mostly sunny, no rain

Static bat detector location number	Recording height	Recording duration	Location and habitat	Irish Grid Reference	Dates deployed	Description of weather
Location 2a	1.5m	7 days	Static located in treeline to the east of Millicent Road. Treeline dominated by ash, hawthorn and oak. Agricultural field to the east of treeline and Longtown Demesne watercourse to the south.	N 87530 25055	24/05/2022 – 31/05/2022	8°C - 16°C. Mostly sunny with occasional clouds, no rain
Location 3	2m	1 day	Static located within mature tree line of oak, ash and hawthorn with Millicent Road to the east and agricultural field to the west.	N 87557 25586	02/08/2022 – 03/08/2022	17°C - 21°C. Sunny with light clouds, no rain
Location 2b	1m	8 days	Static located in residential garden, with immature tree line of ash and mature treeline of sycamore and ash to the east. Longtown Demesne watercourse adjacent to the north.	N 87647 24996	27/06/2022 – 05/07/2022	11°C - 17°C. Cloudy with 2 nights of light rain and 1 night of moderate rain
Location 5	1m	20 days	Static located in hedgerow dominated by blackthorn, hawthorn and goat willow with frequent mature ash trees interspaced along hedgerow. Hedgerow borders agricultural field to the northeast and rural road to the southwest.	N 86082 30256	06/07/2022 – 26/07/2022	12°C - 24°C. Varies between sunny and cloudy, one day of light rain
Location 3	2m	7 days	Static located within mature tree line of oak, ash and hawthorn with Millicent Road to the east	N 87557 25586	24/05/2022 – 31/05/2022	8°C - 16°C. Mostly sunny with occasional

Static bat detector location number	Recording height	Recording duration	Location and habitat	Irish Grid Reference	Dates deployed	Description of weather
			and agricultural field to the west.			clouds, no rain
Location 7	1.5m	7 days	Static located in stand of mature ash trees bordered by hedgerow dominated by hawthorn and blackthorn. Agricultural field adjacent to treeline to the east and R125 road to the west of treeline.	N 89391 44485	19/07/2022 – 26/07/2022	12°C - 24°C. Mostly sunny with occasional clouds, one day of light rain
Location 4	1.5m	7 days	Static located in hedgerow dominated by blackthorn, and hazel. Hedgerow borders agricultural field to the south and R403 road to the north.	N 84984 27268	24/05/2022 – 31/05/2022	8°C - 16°C. Mostly sunny with occasional clouds, no rain
Location 9	1m	7 days	Static located in treeline of sycamore, ash and elder with low hedge of bramble, blackthorn and hawthorn. An abandoned residential property is to the northwest of the static with small areas of grassland and treeline surrounding it. R156 road is directly adjacent to the treeline to the southeast.	N 91876 45515	02/08/2022 – 09/08/2022	10°C - 22°C. Mostly sunny with occasional clouds, no rain
Location 5	1m	7 days	Static located in hedgerow dominated by blackthorn, hawthorn and goat willow with frequent mature ash trees interspaced along hedgerow. Hedgerow borders agricultural field to the northeast and	N 86082 30256	01/06/2022 – 08/06/2022	9°C - 18°C. Mostly cloudy, two nights of light rain

Static bat detector location number	Recording height	Recording duration	Location and habitat	Irish Grid Reference	Dates deployed	Description of weather
			rural road to the southwest.			
Location 11	1.5m	7 days	Static located in treeline bordering agricultural fields. Treeline dominated by ash, oak, ivy and hawthorn.	N 84068 27871	02/08/2022 – 09/08/2022	10°C - 22°C. Mostly sunny with occasional clouds, no rain

The static detectors recorded the following species:

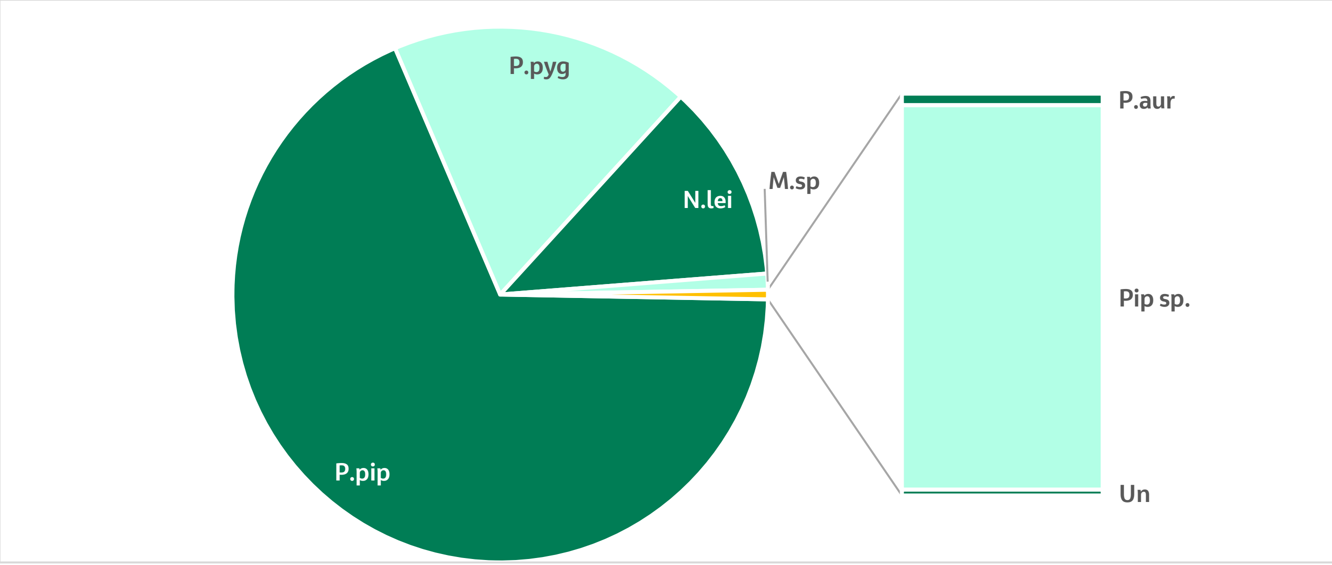
- Common pipistrelle *Pipistrellus pipistrellus*;
- Soprano pipistrelle *Pipistrellus pygmaeus*;
- Nathusius' pipistrelle *Pipistrellus nathusii*;
- Leisler's bat *Nyctalus leisleri*;
- Brown long-eared bat *Plecotus auritus*; and
- Unidentified *Myotis* spp.

The proportion of bat activity recorded for each bat species for all the static locations based on their average number of passes per night is shown in Graph10.1. In summary, bat activity was recorded for at least six species along the Proposed Development comprising common pipistrelle (66%), soprano pipistrelle (17%), Leisler's bat (14%) *Myotis spp.* (1%), *Pipistrellus* sp. (1%), brown long-eared bat (<1%) and unconfirmed species (<1%).

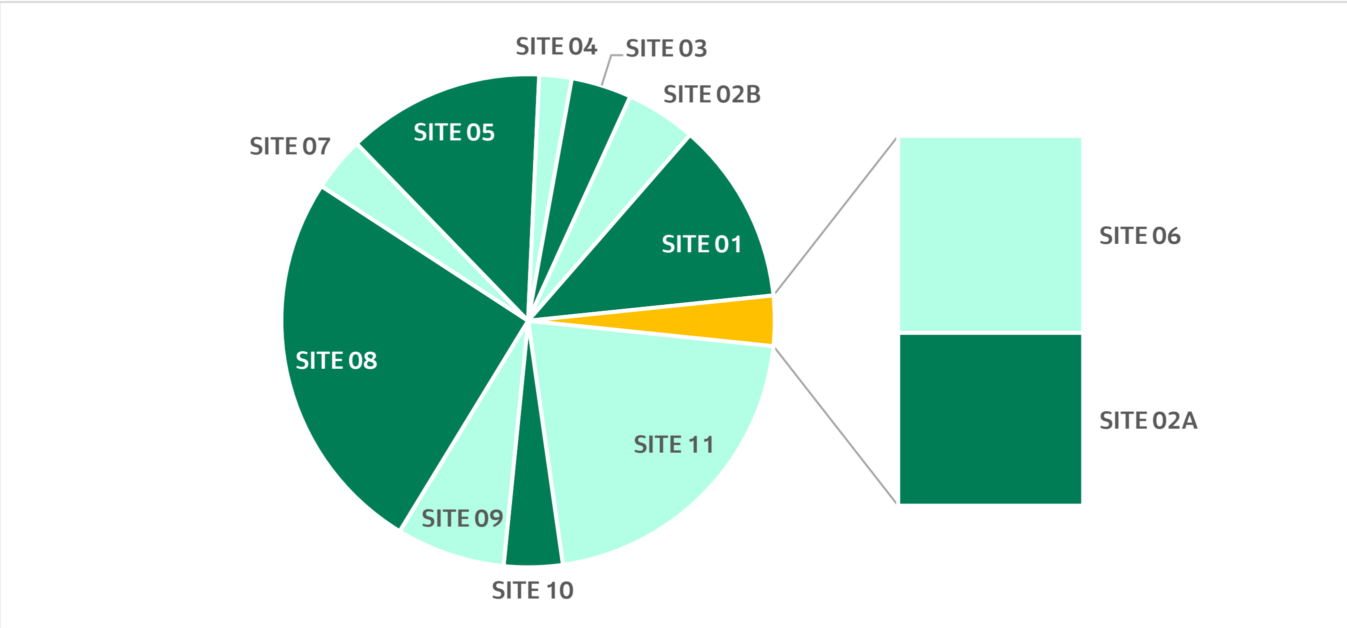
Brown long-eared bat was recorded at locations three, four and six. *Myotis spp.* were recorded in relatively low numbers at all locations apart from location eight where no calls were recorded. All other species were recorded (at various activity levels) at all sites.

In summary, bat activity was recorded across all 12 locations with the most activity recorded at location 8 (25%) and the least recorded at Site 2 (1.5%).

There were no Annex II Lesser Horseshoe bat (*Rhinolophus hipposideros*) species recorded during the static survey period, as the ZoI of the Proposed Development is outside the range for the species.



Graph 10.1: Proportion of average passes per night of bat activity associated with each bat species recorded between May and August 2022.



Graph 10.2: Proportion of average passes per night of bat activity associated with each static bat detector location surveyed between May and August 2022.

Emergence / re-entry surveys

No bat roosts were recorded in any trees. Bat foraging was relatively constant along the treelines surveyed, see Table 10.19**Table 10.1** for a summary of bat species recorded at each location. The hedgerows and treelines are considered to provide suitable foraging and commuting habitat for common bat species present within the study area i.e. common and soprano pipistrelle and Leisler's bat. *Myotis* spp were also recorded.

Table 10.19: Summary of bat species recorded flying outside trees but not emerging or re-entering trees during emergence / re-entry surveys (- indicated No)

Location	Survey number	Dawn/ Dusk	Bat species recorded flying outside trees but not emerging or re-entering during emergence / re-entry surveys							Date	Weather
			P.pip	P.pyg	P sp.	N.lei	M sp.	P.aur	P.nat		
Site 01	1	Dawn	YES	YES	-	YES	YES	YES	-	22/05/22	13°C, cloudy, no rain, light breeze
	2	Dusk								27/06/22	11°C, cloudy, no rain, light wind
	3	Dusk								18/07/22	17°C, clear sky, no rain, no wind
Site 02A	1	Dawn	YES	YES	-	YES	YES	-	-	18/05/22	11°C, clear sky, no rain, light breeze
	2	Dusk								23/05/22	10°C, cloudy, no rain, light breeze
	3	Dusk								28/06/22	8°C, clear sky, no rain, no wind
Site 02B	1	Dusk	YES	YES	-	YES	YES	YES	-	20/06/22	9°C, clear sky, no rain, light breeze
	2	Dawn								21/06/22	13°C, clear sky, no rain, light breeze
	3	Dawn								27/06/22	11°C, slightly cloudy, no rain, no wind

Location	Survey number	Dawn/ Dusk	Bat species recorded flying outside trees but not emerging or re-entering during emergence / re-entry surveys							Date	Weather
			P.pip	P.pyg	P sp.	N.lei	M sp.	P.aur	P.nat		
Site 03	1	Dawn	YES	YES	-	YES	YES	YES	-	24/05/22	8°C, clear sky, no rain, no wind
	2	Dusk								01/06/22	9°C, cloudy, no rain, light wind
	3	Dusk								09/07/22	15°C, cloudy, no rain, light wind
Site 04	1	Dusk	YES	YES	-	YES	-	YES	-	24/05/22	8°C, clear sky, no rain, no wind
	2	Dawn								01/06/22	9°C, cloudy, no rain, light wind
	3	Dusk								19/07/22	20°C, clear sky, no rain, no wind
Site 05	1	Dusk	YES	YES	-	YES	-	YES	YES	17/05/22	13°C, cloudy, intermittent rain, moderate wind
	2	Dawn								25/05/22	15°C, cloudy, no rain, no wind
	3	Dusk								19/07/22	20°C, clear sky, no rain, no wind
Site 06	1	Dusk	YES	YES	-	YES	YES	YES	-	16/05/22	14°C, cloudy, intermittent rain, moderate wind

Location	Survey number	Dawn/ Dusk	Bat species recorded flying outside trees but not emerging or re-entering during emergence / re-entry surveys							Date	Weather
			P.pip	P.pyg	P sp.	N.lei	M sp.	P.aur	P.nat		
	2	Dawn								29/06/22	13°C, clear sky, no rain, light wind
	3	Dawn								21/07/22	13°C, cloudy, no rain, no wind
Site 07	1	Dusk	YES	YES	-	YES	YES	-	-	18/05/22	11°C, cloudy, no rain, light wind
	2	Dawn								24/05/22	8°C, clear sky, no rain, no wind
	3	Dusk								25/07/22	15°C, cloudy, no rain, light breeze
Site 08	1	Dusk	YES	YES	-	YES	YES	-	YES	23/05/22	10°C, cloudy, no rain, light breeze
	2	Dawn								26/05/22	11°C, cloudy, no rain, light breeze
	3	Dusk								26/07/22	12°C, cloudy, no rain, light breeze
Site 09	1	Dusk	YES	YES	-	YES	-	YES	-	24/05/22	8°C, clear sky, no rain, no wind
	2	Dawn								27/05/22	10°C, clear sky, no rain, no wind

Locatio n	Survey numbe r	Dawn/ Dusk	Bat species recorded flying outside trees but not emerging or re-entry during emergence / re-entry surveys							Date	Weather
			P.pip	P.py g	P sp.	N.lei	M sp.	P.aur	P.nat		
	3	Dusk								27/07/22	11°C, cloudy, no rain, light breeze
Site 10	1	Dusk								29/06/22	13°C, clear sky, no rain, light wind
	2 (Cancelled – cattle)	-	YES	-	-	YES	YES	-	YES	Cancelled	-
	3 (Cancelled – cattle)	-								Cancelled	-
Site 11	1	Dusk								30/06/22	13°C, clear sky, no rain, light wind
	2	Dusk	YES	YES	-	YES	YES	-	YES	20/07/22	16°C, cloudy, no rain, no wind
	3	Dawn								22/07/22	16°C, cloudy, intermittent rain, moderate wind

10.4.2.6 Otter

Suitable habitats for resting, commuting and foraging otter were recorded throughout the survey area, including wet drainage ditches, lowland rivers and broadleaved woodland. One potential otter holt was identified during the 2021/22 survey season which falls within the Planning Application Boundary and an otter slide was recorded upstream from the potential holt, as follows (Figure 10.7, Volume 4).

- A potential otter holt was recorded along the River Liffey at ITM E687929 N724445 (this grid reference lies along the route of the proposed HDD where it crosses the River Liffey, WB35). This was a single hole on a bank overgrown with ivy. The entrance to the holt was well worn; and

- A single otter slide close to the bank of the River Liffey at ITM E687940, N724511 (this grid reference lies 16 m east of the cable route).

10.4.2.7 Badger

Sensitive information relating to the location of badger setts is provided in a confidential appendix (Appendix 10.6).

Habitat suitable for badger to excavate their setts was present within the survey area, including areas of scrub and broadleaved woodland. Hedgerows, treelines, grassland and broadleaved woodland all provide suitable foraging and commuting habitats for badger.

Multiple signs of badger were recorded throughout the survey area, including prints, latrines, snuffle holes, a live sighting, four potential badger holes, three inactive outlier setts and two active main setts. One potential badger hole and one badger sett, which was identified as an active main sett at the time of survey, were recorded within the Planning Application Boundary. Further to this, two potential badger holes were identified within 30 m of the Planning Application Boundary(see Table 10.20). Exact locations of setts are not provided due to persecution of this species.

Badger is considered of Local Importance (Higher Value).

Table 10.20: Summary of Badger Setts

Sett Number	Sett type	Distance from Planning Application Boundary (PAB)	Survey notes
1	Potential sett	Within PAB	Disused. Overgrown vegetation but path and potential bedding present.
2	Main Active Sett	32 m from PAB	Active main sett. Main entrance behind thick hedge and dry ditch on other side. Field side one entrance and evidence of two crowning holes. Well-worn badger path within scrub behind fence. Fresh spoil heap.
3	Main Active Sett	40 m from PAB	Active main sett. 11 m from sett no. 2. Flattened surroundings.
4	Inactive (likely Outlier) Sett	50 m from PAB	Disused. One entrance. Appears to have been filled in.
5	Inactive (likely Outlier) Sett	Within PAB	Disused. Six entrances. Debris in tunnels. Was active during an earlier survey but disused when most recently surveyed.

Sett Number	Sett type	Distance from Planning Application Boundary (PAB)	Survey notes
6	Inactive Outlier	Within PAB	Latrine and tracks. Badger latrine on edge of arable field, looks to be mammal track leading from field into hedgerow.
7	Sighting – Alive- two adults	Within PAB	Two adults observed during a separate bat survey. Both travelled along hedge from the east at 21:45 with one passing through hedge opening at oak tree and the other spooked towards drain. Prints noted along tramline towards field gate also.
8	Inactive outlier	6 m from PAB	Latrine. Badger latrine near margin of field.
9	Potential sett	61 m from the PAB	One entrance under ash tree. No field signs for badger around entrance, no rabbit droppings. Possibly fox or badger.
10	Active Main Sett	150 m from PAB	Active main sett. 13 entrances, mammal paths and fresh bedding found.
11	Inactive outlier	Within PAB	Prints. Badger print in mud along road. Badger latrine found 93 m from works in this same location.

10.4.2.8 Other Protected Mammals

A dead red squirrel was recorded within the PAB (see Figure 10.7, Volume 4). Although red squirrel typically prefers conifer woodland habitat, of which none was recorded within the survey area, they can be found in broadleaved woodland which was recorded within the survey area.

Other protected mammals such as the Irish stoat, Irish hare and hedgehog are likely to be present within the study area within the areas of suitable habitat (i.e. agricultural fields bordered by hedgerows, treelines, etc.). Hedgehog have been recorded within 2 km of the study area previously based on desktop data. Pygmy shrews could be present in the wet grassland as it is suitable to host this species. However, no signs of pygmy shrew were noted during field surveys.

Other protected mammal species are considered of Local Importance (Higher Value).

10.4.2.9 Amphibians and Reptiles

During the multi-disciplinary walkover surveys, no incidental sightings of amphibians were recorded across the survey area. Although no direct observations of amphibians were recorded, habitats for common frog (*Rana temporaria*) and smooth newt were identified and are likely to be widespread across the study area, in particular near wetter areas of fields, tall herb swamps and scrub. The wet ditches and ponds identified throughout the survey area are likely to provide adequate breeding habitat for these amphibians.

Two eDNA surveys were carried out to determine the presence or likely absence of smooth newt WB05 and at WB19; WB05 was an ephemeral pond and WB19 was at the Lyreen, a tributary of the River Lyreen. The results of the eDNA surveys were negative for smooth newt, indicating it is likely absent at both these waterbodies. The full results of the eDNA surveys are shown in Appendix 10.4, Volume 3 and the locations of the waterbodies sampled is shown in Figure 10.8, Volume 4.

During the multi-disciplinary walkover surveys, no incidental sightings of common lizard were recorded across the survey area. Although no direct observations of reptiles were recorded, lizards are likely to be widespread across the study area where suitable habitat exists. This includes breeding habitat such as scrub, hedgerows, dry meadows and grassy verges. Stonewalls, which offer suitable basking and hibernation habitat, were also identified within the study area.

Reptiles and amphibians are considered of Local Importance (Higher Value).

10.4.2.10 Fish

At or near to waterbody crossings points, or at smaller watercourses, a visual assessment was carried out over a 200 m stretch of the waterbodies' potential to support fish of conservation interest (Atlantic salmon, European eel and lampreys).

Of the 46 waterbodies assessed, the majority of waterbodies (29) were assessed to have little supporting habitat and / or showed signs of pollution (cloudy water and / or fine grey sediments covering the substrate). Seventeen were considered to have the potential to support protected and notable fish species due to presence of supporting habitat (variety in sediment sizes and refugia, silt beds for juvenile lamprey and unpolluted water). Due to the high quality of supporting habitat and absence of pollution, five were assessed as having high potential to support protected and notable species. These five waterbodies will be crossed by HDD will and therefore they did not require eDNA sampling.

Where an assay was available eDNA was carried out at the remaining eleven waterbodies. No assay is currently available for lamprey. Supporting habitat for lamprey, in the form of silt beds, was present in a tributary of the River Liffey (WB32) and a tributary of the Tolka (WB01 although the Proposed Development does not cross this latter waterbody). Waterbody assessments are presented in Appendix 10.4, Volume 3 and locations of Waterbodies sampled is shown in Figure 10.8, Volume 4.

The summary of the positive result of the eDNA surveys for fish is as follows:

- Atlantic salmon was present on Rye Water_020_Padinstown (WB12) and Jenkinstown Stream_010 (WB08); and
- European eel was present at Jenkinstown Stream_010 (WB08) and two tributaries of the River Liffey (WB 32 and WB46).

Atlantic salmon are considered of County Importance. Other fish species (including trout) are considered of Local Importance (Higher Value).

10.4.2.11 White-clawed crayfish

White-clawed crayfish occurs in areas with relatively hard, mineral rich water on calcareous and rapidly weathering rocks. It is found in a wide variety of environments including canals, streams, rivers lakes, reservoirs and water filled quarries. It is typically found in watercourses of 0.75 m to 1.25 m deep but may occur in very shallow streams (about 5cm deep) and in deeper rivers (2.5 m deep). The species typically occupies cryptic habitats under rocks and submerged logs, among tree roots, algae, and macrophytes, although it usually emerges to forage for food. Juveniles may be found among cobbles and detritus. Adults may burrow into suitable substrates, particularly in the winter (Holdich, 2003).

The results of the eDNA sampling confirmed the presences of white-clawed crayfish in the following two waterbodies:

- WB46 (tributary of the River Liffey); and
- WB32 (tributary of the River Liffey) which lies 1.7 km north-west of Castlefen.

The full results of the white-clawed crayfish eDNA surveys are shown in Appendix 10.10.

White-clawed-crayfish are considered of County Importance.

10.4.2.12 Marsh fritillary butterfly

Marsh fritillary (*Euphydryas aurinia*) is listed on Annex II of the EU Habitats Directive. The species has a wide but patchy distribution across Ireland (Phelan *et al*. 2021). It has experienced a population decline due to loss of suitable habitat. It is more common in the midlands and west of Ireland. Marsh fritillary adult butterflies feed on plants including buttercups (*Ranunculus* spp.), common knapweed and tormentil. However, caterpillars are monophagous and only feed on devil's bit scabious (DBS) (*Succisa pratensis*). Marsh fritillary is found in damp or heathy grassland dominated by tussock forming grasses. Despite known long distance dispersal (Zimmerman *et al*. 2011) adults rarely fly more than 50-100 m but a small proportion can disperse further (Butterfly Conservation, Marsh Fritillary factsheet). The nearest SAC designated for this species is Ballynafagh Lake SAC, which lies 1.6 km to the west of the Planning Application Boundary at its nearest location, and well beyond the expected dispersal range of this species.

Marsh fritillary was not recorded during the site visits, although its main food source devil's bit scabious was recorded at one location on Harristown Common (Grid Reference N 87879 12976), which lies 462 m from the Planning Application Boundary at its nearest location and 17km from Ballynafagh Lake SAC at its nearest point. The location of the devil's bit scabious is well beyond the footprint of the Proposed Development at 462 m and separated from it by an amenity sports pitch.

10.4.2.13 Non-native Invasive plant species

The following Third Schedule invasive species were recorded in the 2022 survey. Locations are shown in Figure 10.9 Volume 4.

- Himalayan balsam (*Impatiens glandulifera*) along route of Proposed Development between chainage (ch) 37000 and 37250 at N 87990 24456. Chainage along the cable route is shown in Figure 2, Appendix B of the Appropriate Assessment Screening Report (Jacobs 2023a). Two other stands noted at ch 39000 (at N 87995 23009 and N 88030 22991) c50 m west of the Proposed Development. There could be more in this vicinity, unrecorded; and
- Giant rhubarb (*Gunnera tinctoria*) – ornamental planting by a pond, c. 120 m from cable route.

Other non-Third Schedule species that were recorded and are reported for completeness only are as follows:

- Montbretia (*Crocosmia crocosmiiflora*) – in garden;
- Butterfly bush (*Buddleja* sp) – in garden;
- Cotoneaster (*Cotoneaster* sp.) – in hedgerow c.15 m from cable route; and
- Sycamore (*Acer pseudoplatanus*) – dispersed throughout the Proposed Development (not included on Figure 10.9, Appendix 10.11 for that reason).

Such non-scheduled populations are not known to pose risk of impact to protected species or those of conservation concern.

10.4.3 Evaluation

The key ecological receptors in this chapter have been valued within a defined geographical context (International, National, County, Local Importance), in compliance with the methodology described in Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM 2019) and Guidelines for Assessment of Ecological Impacts of National Roads Schemes (NRA 2009). The geographic categories of ecological receptor valuation (i.e., International, National, County and Local) are fully defined in Appendix 10.3 (NRA 2009). 'Local importance' has two categories, 'higher' and 'lower'. The value of the ecological receptors described in this chapter are shown in Table 10.21. The valuation of ecological receptors shown in this table represents the geographical level which potential impacts are considered significant, "*there is potential for negative effects from mortality, disturbance and pollution at county level"*). Receptors with a value of Less than Local importance (lower value), are not considered to be a IER and are not included in this EIAR. However, it does not mean that they have no ecological value, rather that they are widespread, unthreatened and resilient to impacts from the Proposed Development and will remain viable and sustainable during construction and operation.

All designated areas for nature conservation that lie within the ZoI of the Proposed Development are considered to be IERs, given that they are sites selected specifically for biodiversity conservation and are potentially at risk of impacts from the Proposed Development. Those designated areas for nature conservation that lie beyond the ZoI of the Proposed Development are not considered to be at risk of impact, and are therefore not considered to be IERs.

Non-native invasive plant species are not considered as an Important Ecological Feature, as they can result in negative effects on biodiversity, and it is in that context they are included within the impact assessment.

Table 10.21: Ecological Evaluation of Important Ecological Features. Those important for this project are shown in grey.

Ecological Receptor		Ecological Valuation	IER for the Proposed Development?
Designated Sites	**Rye Water Valley / Carton SAC**	**International Importance**	**Yes**
	River Boyne and River Blackwater SAC	International Importance	No, no potential for LSEs identified in the AASR
	Water Bodies	**International Importance – connection to the Rye Water Valley / Carton SAC**	**Yes**
	Hodgestown Bog NHA	**National Importance**	**Yes**
	The Royal Canal pNHA	**National Importance**	**Yes**
	Grand Canal pNHA	**National Importance**	**Yes**

Ecological Receptor		Ecological Valuation	IER for the Proposed Development?
	Liffey Valley Meander Belt pNHA	National Importance	No
	Liffey at Osberstown pNHA	National Importance	No
	Ballynafagh Bog pNHA / SAC	National Importance	No
	Donadea Wood pNHA	National Importance	No
	Ballynafagh Lake pNHA/SAC	National Importance	No
	Harristown Common cNHA	**National Importance**	**Yes**
Habitats	**Hedgerows (WL1) species rich**	**County Importance**	**Yes**
	Hedgerows (WL1) species poor	**Local Importance (Higher Value)**	**Yes**
	Broadleaved woodland (WD1)	**Local Importance (Higher Value)**	**Yes**
	Scrub (WS1)	**Local Importance (Higher Value)**	**Yes**
	Treeline (WL2)	**Local Importance (Higher Value)**	**Yes**
	Canals (FW3)	**Local Importance (Higher value)**	**Yes**
	Drainage ditches (FW4)	**Local Importance (Higher Value)**	**Yes**
	Dry meadows and grassy verges (GS2)	**Local Importance (Higher Value)**	**Yes**
	Wet grassland (GS4)	**Local Importance (Higher Value)**	**Yes**

Ecological Receptor		Ecological Valuation	IER for the Proposed Development?
	Recolonising bareground (ED3)	**Local Importance (Higher Value)**	**Yes**
	Reed and large sedge swamps (FS1)	**Local Importance (Higher Value)**	**Yes**
	Wet willow-alder-ash woodland (WN6)	**Local Importance (Higher Value)**	**Yes**
	Mixed broadleaved / conifer woodland (WD2)	**Local Importance (Higher Value)**	**Yes**
	Dry calcareous grassland (GS1)	**Local Importance (Higher Value)**	**Yes**
	Improved agricultural grassland (GA1)	Local Importance (Lower Value)	No
	Arable crops (BC1)	Local Importance (lower value)	No
	Amenity grassland (GA2)	Local Importance (Lower Value)	No
	Building or Artificial (BL3)	Local Importance (Lower Value)	No
	Coniferous plantation (WD4)	Local Importance (Lower Value)	No
	Scattered trees and parkland (WD5)	Local Importance (Lower Value)	No
	Other artificial lakes and ponds (FL8)	Local Importance (Lower Value)	No
Protected, Notable and Invasive Species and Species Groups	**SCI bird species**	**International Importance**	**Yes**
	All other Red, Amber or Green listed bird species	**Local Importance (Higher Value)**	**Yes**

Ecological Receptor		Ecological Valuation	IER for the Proposed Development?
	(non-SCI breeding populations)		
	Bats	**Local Importance (Higher Value)**	**Yes**
	Otter	**County Importance**	**Yes**
	Badger	**Local Importance (Higher Value)**	**Yes**
	Other mammal species protected under the Wildlife Acts	**Local Importance (Higher Value)**	**Yes**
	Smooth newt	**Local Importance (Higher Value)**	**Yes**
	Common frog	**Local Importance (Higher Value)**	**Yes**
	Common lizard	**Local Importance (Higher Value)**	**Yes**
	Atlantic salmon	**County Importance**	**Yes**
	Lamprey spp.	**County Importance**	**Yes**
	European eel	**County Importance**	**Yes**
	White-clawed crayfish	**County Importance**	**Yes**
	Other fish species (including trout)	**Local Importance (Lower Value)**	**Yes**
	Marsh fritillary	County to National Importance	No
	Non-native invasive plant species	**N/A**	**Yes**

10.5 Potential Effects

This section describes the potential effects of the Proposed Development on IERs during the construction and operational phases. using the broad categories outlined in Table 10.22. This includes consideration of the 'Do Nothing' impact scenario (i.e. the existing trends with the potential to affect biodiversity in the absence of the Proposed Scheme). All potential effects in this section of the Chapter are described in the absence of mitigation.

Table 10.22: Potential impact types and effects, receptors impacts and ZoI

Potential Impact and Effect	Potential receptor	ZoI
Direct habitat loss due to vegetation removal associated with land take including earth banks, removal of mature trees and hedgerows. Habitat loss results in disturbance / displacement / fragmentation / degradation Effects are temporary or permanent during construction and / or operation	Protected sites / designated sites Terrestrial and aquatic habitats Terrestrial and aquatic species	Land under the footprint of the Proposed Development including access routes and compounds.
Changes in water quality from hydrological impacts Effects are temporary during construction	Aquatic plant and animal species	Changes in surface water quality from the Proposed Development associated with contaminated water run-off, including bentonite slurry from HDD, are assessed downstream of the Proposed Development / waterbody crossings, but the potential spatial extent of effects is difficult to quantify due to the significant variables including the varying concentrations / types of contaminants which could be released during construction / operation (e.g. sediment, hydrocarbons etc.) the resilience of different receiving waterbodies (i.e. assimilative capacity) and the sensitivity of the receiving waters.
Direct mortality Effects are permanent during construction	Terrestrial species	Land within the footprint for the Proposed Development, including construction compounds, HDD platforms and access routes.
	Aquatic plant and animal species	Includes all freshwater species under the footprint of the Proposed Development and downstream of the proposed waterbody crossings.

Potential Impact and Effect	Potential receptor	ZoI
Spread of invasive non-native species resulting in habitat degradation. Effects are temporary or permanent during construction and operation	Protected sites/designated sites; Sensitive habitats; Terrestrial species; Aquatic plant and animal species	Land within and adjacent to the footprint for the Proposed Development. Proposed Development footprint, access routes, construction compounds and HDD works areas.
Disturbance from noise, light and vibration for example impacting foraging/roosting SCI birds Effects are temporary during construction	Terrestrial species	Assessed within 500 m of the Proposed Development (e.g. for wintering birds) but can be a significantly lower distance (e.g. 150 m for otter and or badger resting places).
Human / machinery presence resulting in disturbance to highly sensitive bird species at significant distance from works. Effects are temporary during construction	Bird species	Assessed within 500 m of the Proposed Development (e.g. for wintering birds).

10.5.1 'Do Nothing' Scenario

10.5.1.1 Evolution of the Baseline in the Absence of the Proposed Scheme

In the absence of the Proposed Development, the rural and urban areas will continue to evolve. The existing rural land uses surrounding are likely to remain relatively unchanged; however, existing zoned land will be developed. Current biodiversity trends are likely to continue in for pasture and arable agricultural lands.

Any effects on biodiversity are likely to be moderated by the environmental and biodiversity policies of the existing and future County Development Plans, Biodiversity Plans, and the overarching pollution control objectives of River Basin Management Plans.

Designated Sites for Nature Conservation: Designated sites within the ZoI of the proposed Project would likely remain as described in the baseline section of the EIAR into the medium-term future. The current pressures and threats affecting these sites would remain in the absence of the Project.

Habitats and Flora: Habitats within the ZoI of the proposed Project would likely remain as described in the baseline section of this the EIAR into the medium-term future. The current pressures and threats affecting these habitats would remain in the absence of the Project.

Fauna: Fauna within the ZoI of the proposed Project would likely remain as described in the baseline section of this report into the medium-term future. The current pressures and threats affecting these species would remain in the absence of the Project.

10.5.1.2 Do Nothing Potential Impact

The majority of the land proposed for development (excluding hardstanding areas) is managed for pasture and arable agriculture. The continued intensification of agriculture is expected to contribute to the ongoing declines in farmland birds and pollinators and the intensification of grasslands. Baseline activities for biodiversity include Local Community Biodiversity Action Plans with actions to conserve biodiversity, including for example planting pollinator friendly plants, habitat management of meadows, roadside verges and lawns (Meath County Council 2016). Baseline natural events, such as storms, may expose features beneficial to wildlife such as cavities in trees made accessible to bats. Eirgrid has ongoing nature restoration projects such as the East West Interconnector (EWIC) Biodiversity Project, started in 2019, to enhance biodiversity at Woodland substation.

10.5.2 Construction Phase

For clarity is should be noted that potential effects from permanent loss of habitat is assessed in the construction phase only and not in the operational phase of the Proposed Development.

10.5.2.1 European designated sites

The AA Screening Report (included as a standalone document in this planning application pack) concluded that there is no potential for LSEs on the River Boyne and River Blackwater SPA, designated for otter, given the overland distance of 14 km at the closest point and lack of hydrological connectivity (being in a separate catchment) / ecological connectivity this SPA.

The following sites were considered to be outside the ZoI for the following reasons:

- Ballynafagh Bog SAC is located 1.6 km west at its nearest point and designated for active raised bog and other habitats. No potential for LSEs was identified due to lack of a hydrological link to the QI habitats of this SAC;

- Ballynafagh Lake SAC is located 2.8 km west at its nearest point and is designated for alkaline fen, whorl snail land marsh fritillary. No potential for LSE on whorl snail or fen was identified due to lack of hydrological connectivity. The food plant of marsh fritillary was recorded at one location in the study area, but this was c17 km from this SAC, and well beyond the furthest distance this butterfly in known to migrate (7.6 km). Therefore, there are considered to be no LSE for this SAC;

- Mouds Bog SAC is located 6 km west at its nearest point and designated for active raised bog, degraded raised bods still capable of natural regeneration and depressions on peat substrates of the Rhynchosporion There is no potential for LSE due to lack of a hydrological link to the QI of this SAC;

- Pollardstown Fen SAC is located 9 km west of the Proposed Development and designated for fen habitats and whorl snails. Given the overland distance and lack of hydrological/ hydrogeological connectivity / ecological connectivity there are considered no LSE;

- River Boyne and River Blackwater SAC is located 14.2 km at its nearest point and designated for habitats and lamprey, Atlantic salmon and otter. There is no potential for LSE due to lack of a hydrological link to the QI of this SAC;

- North Dublin Bay SAC is located 29 km east at its nearest point and is designated for coastal habitats and plants. There is a hydrological link 31 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts;

- South Dublin Bay SAC is located 31.6 km east at its nearest point and is designated for coastal habitats. There is a hydrological link 40 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts;

- Howth Head SAC is located 33.5 km east at its nearest point and is designated for coastal cliff habitats. There is a hydrological link 36.7 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts;

- Rockabill to Dalkey Island SAC is located 35 km east at its nearest point and is designated for reef habitats. There is a hydrological link 37.2 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts;

- Poulaphouca Reservoir SPA is located 8 km east of the southern extent of the Proposed Development. It is designated for greylag goose and lesser black-backed gull. Greylag geese are usually present at coastal sites. Given lesser black-backed gulls have a preference for the coast, and many agricultural fields are available between the SPA and the Proposed Development, no LSE for this SPA is expected;

- South Dublin Bay and River Tolka Estuary SPA is located 25.5 km east at its nearest point and is designated for coastal and wetland birds. There is a hydrological link 27.7 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts;

- North Bull Island SPA is located 29 km east at its nearest point and is designated for coastal and wetland birds. There is a hydrological link 31 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts;

- North-west Irish Sea SPA is located 29.7 km east at its nearest point and is designated for coastal and wetland birds. There is a hydrological link 33.3 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts; and

- Howth Head Coast SPA is located 36.2 km east at its nearest point and is designated for coastal birds. There is a hydrological link 39.5 km in length which is considered *de minimus* due to the intervening distance of and dilution rates to cause significant impacts.

Rye Water Valley/Carton SAC

The AA Screening Report concluded that there is potential for significant effects on Rye Water Valley/Carton SAC. A summary on the number of attributes of the QI features likely to be impacted are provided below in this section. An NIS has been prepared that addresses in detail the potential for adverse effects on the integrity of Rye Water Valley/Carton SAC (Jacobs, 2024b).

The Proposed Development is hydrologically linked to the Rye Water Valley/Carton SAC by the following waterbodies:

- WB03 (Cullendragh);

- WB04 (Jenkinstown Stream);

- WB09 (un-named ditch flows into Rye Water);

- WB10 (Bride Stream);

- WB12 (un-named ditch, flows into Rye Water);
- WB13 (Rye Water);
- WB26(un-named ditch, flows into River Lyreen);
- WB16 (River Lyreen);
- WB20 (un-named ditch, flows into River Lyreen); and
- WB22 (Baltracey River, flows into River Lyreen).

The shortest hydrological distance between the Proposed Development and Rye Water Valley/Carton SAC is c8.15 km, commencing at Kilcock (Rye Water, WB13). The qualifying interest features of this SAC are petrifying springs with tufa formation and the species narrow mouthed whorl snail (*Vertigo angustior*) and Desmoulin's whorl snail (*Vertigo moulinsiana*). In the absence of mitigation:

- three out of nine attributes of the conservation objectives of the petrifying springs;
- three out of four attributes of narrow mouthed whorl snail; and
- four out of six attributes of Desmoulin's whorl snail were considered to have the potential to be undermined by a hydrologically linked pollution event.

Therefore, there is potential for adverse effects at an International Level on the on the SAC from a pollution event.

10.5.2.2 Waterbodies

Notable watercourses where HDD is proposed are the Rye Water (WB13), the Royal Canal (WB14), the River Liffey (WB33), the Grand Canal (WB41) and the River Lyreen (WB19). Eleven watercourses are proposed to be crossed in-road (i.e. using an existing structure) and a further 16 watercourses crossed by a diversion from in-road to off-road trench. There are six watercourses crossed by trench in an off-road section. Further details of the waterbody crossing methods are provided in Volume 3, Appendix 5.3 and Appendix 10.4.

There is potential for adverse effects due to pollution from bentonite slurry, run-off, sedimentation, chemical spillage for all waterbodies crossed by the Proposed Development during in-stream trenching and during HDD activities or general construction activities. These include the waterbodies described under European Designated sites where these are hydrologically linked to the Rye Water Valley/Carton SAC. The waterbodies crossed are shown in Figure 2, Appendix B of the NIS (Jacobs, 2024b).

Pollution may result in habitat degradation, loss and fragmentation and there are potential changes to hydrology, all of which have the potential for negative effects on water bodies at a Local Level.

10.5.2.3 Nationally Designated Sites

One NHA, seven pNHAs and a cNHA are in the vicinity of the Proposed Development (see Section 10.4 for further details). These sites are designated for a variety of habitats and species including bogs, canals, woodlands and whorl snail.

As per the baseline conditions (Section 10.4), one NHA (Hodgestown Bog) and five pNHAs (Liffey Valley Meander Belt; Liffey at Osberstown; Ballynafagh Bog; Donadea Wood; and Ballynafagh Lake) are considered out of the zone of influence of the Proposed Development due to the large intervening distance and/or absence or hydrological connectivity in-between the Proposed Development and designated sites (as summarised in Table 10.5). Conversely, two pNHAs (Grand Canal and Royal Canal) and one cNHA (Harristown Common) are considered within the zone of influence due to proximity and/or hydrological connectivity to the proposed development as expanded upon below.

There is potential for Grand Canal pNHA and Royal Canal pNHA to be impacted by bentonite slurry during HDD activities as the proposed cable route crosses underneath both protected areas (at WB38 and WB43 for the Grand Canal pNHA and WB14 for the Royal Canal). Harristown Common cNHA is a GWDTE and as such there may be changes in hydrology due to trenching given that this GWDTE habitat is 200 m away from the Planning Application Boundary at its closest point. The geohydrological assessment for GWDTE notes that small adverse impacts to groundwater quality at secondary receptors such as GWDTE and watercourses were predicted, especially where the receptor is in close proximity/ adjacent to the cable route. Further from the cable route elsewhere within the 1 km study area negligible impacts to groundwater quality are predicted. Therefore, it is unlikely that there would be any impacts to Harristown Common cNHA given that is not in proximity or adjacent to cabling trenches.

The description for the Grand Canal pNHA states that the diversity of the water channel is high on the eastern section of the main line between summit level at Lowtown and Inchicore and that the rare and protected opposite-leaved pondweed *Groenlandia densa* is present in the eastern section. This includes the canal stretch at WB38 and WB43 The Plant Atlas stats that *G. densa* requires clear, base rich water and is more frequent in canals than lakes and rivers[69]. Therefore, it is likely that this stretch is sensitive to bentonite slurry from HDD entering the canal, which could result in turbidity, as well as pH changes. *G. densa* is also sensitive to eutrophication and slurry input could increase the nutrient supply. A likely significant effect could result from the HDD on the Grand Canal pNHA.

The Royal Canal pNHA is less sensitive to HDD than The Grand Canal pNHA, since its description does not refer to sensitive plant species in the vicinity of the Proposed Development, but only in the vicinity of Dublin, which is outside the project's ZoI.

There is potential for negative effects from pollution on both Royal Canal and the Grand Canal pNHA and from habitat degradation on Harristown Common cNHA.

10.5.2.4 Habitats

The landscape that the Proposed Development crosses is predominantly agricultural, comprising arable fields and improved grassland. In non-urban areas 70% to 80% of the route is lined with hedges (comprising species-rich and species-poor hedges) and / or mature trees on one or both sides of the road in some sections. Within the joint bays and passing bays, the length of hedgerow comprising species rich is 2,782 m and species poor comprises 716 m.

Further details on the approach to trees, hedgerows, and treelines are provided in Chapter 5 of this EIAR (Section 5.5.9). That text outlines the approach to reducing the amount of trees, hedgerows, and treelines affected by the Proposed Development, and the mitigation that will be put into place to minimise the effects.

Out of a total of 9,015 trees within the tree study area, 348 need removing (4% of all the trees). A further 710 trees are at risk in the study area (8% of all trees). Three significant tree features (as defined in Appendix 5.6 Arboricultural Assessment) were identified as at risk from removal from the Proposed Development., however none were assessed as veteran or ancient. The significant tree features included: three large mature trees in a hedgerow at chainage 1000; a hedgerow along a ditch with larger mature trees at chainage 1550; and a linear feature of large ash trees at chainage 3050.

The habitats within 150 m of the Planning Application Boundary are described in Section 10.4 and their locations are shown in Figure 10.2. To accommodate the trenches, joint bays and passing bays for the underground cable there will

[69] *Groenlandia densa* | Online Atlas of the British and Irish Flora (brc.ac.uk)

need to be removal of hedgerows, road verge and loss of trees, including mature trees, which are lining the road network along the cable route (as quantified in Table 10.23).

Table 10.23 below shows the habitat types (with Fossitt habitat codes) are likely to be lost, either temporarily or permanently, within the Planning Application Boundary (PAB) and includes area and percentage loss along with the significance of the loss. There is potential for negative effects from loss of habitat. Permanent habitat loss includes permanent access tracks, joint bays and hardstanding, 5 metre permanent easement and 15 metre permanent easement (Woodland – R156 section only). Temporary habitat loss is considered as all remaining areas that are not permanently affected.

There will be no clearance of hedgerows/trees beyond the 5m or 15m wide permanent easement (i.e., there will be retention of hedgerows/trees from edge of permanent easement out to the Planning Application Boundary. Where the Planning Application Boundary crosses a hedgerow, trees, or treelines, only the 5m or 15m wide permanent easement will be removed. The remaining length of 25m or 15m of hedgerow, trees, or treelines will be protected from construction (see Section 5.5.9, Chapter 5 of this EIAR for clarification of the approach to losses and planting).

Table 10.23: Habitat areas (Fossitt habitat codes) within PAB, Showing Areas of Permanent and Temporary Loss and % Habitat Loss in the Absence of Mitigation

Habitat	Linear Features within PAB (km)	Area habitats within PAB (ha)	Permanent Habitat loss (ha/km)	Temporary Habitat Loss (ha/km)	% Permanent Habitat lost with PAB	% Temporary habitat loss with PAB	Likely significant effect (Yes/No)	Geographical scale of impact
BC1 - Arable crops	-	12.52	1.26	9.41	10	75	No – less than local value	Less than local
BL3 - Buildings and artificial surfaces	-	86.69	21.14	18.37	24	21	No – less than local value	Less than local
ED2 - Spoil and bare ground	-	0.87	0.09	0.28	10	32	No – less than local value	Less than local
ED3 - Recolonising bare ground	-	0	0	0	0	0	No – less than local value	Less than local
FS1 - Reed and large sedge swamps	-	0.02	0	0.02	0	100	Yes – local impact and scale of habitat loss	Local
FL8 - Other artificial lakes and ponds	-	0	0	0	0	0	No – no impact	No impact
GA1 - Improved agricultural grassland	-	27.32	6.52	17.51	24	64	No – no impact	No impact
GA2 - Amenity grassland (improved)	-	2.28	0.22	0.59	10	26	No – less than local value	Less than local

Habitat	Linear Features within PAB (km)	Area habitats within PAB (ha)	Permanent Habitat loss (ha/km)	Temporary Habitat Loss (ha/km)	% Permanent Habitat lost with PAB	% Temporary habitat loss with PAB	Likely significant effect (Yes/No)	Geographical scale of impact
GS1 - Dry calcareous grassland	-	12.67	0	12.57	0	99	Yes – local value and scale of habitat loss	Local
GS2 - Dry meadows and grassy verges	-	6.76	0.67	1.15	10	17	Yes – local value and scale of habitat loss	Local
GS4 - Wet grassland	-	1.52	0.78	0.74	51	49	Yes – local value and scale of habitat loss	Local
WD1 - (Mixed) broadleaved woodland	-	2.26	0.51	1.23	23	54	Yes – local value and scale of habitat loss	Local
WD2 - Mixed broadleaved/conifer woodland	-	0.35	0.07	0.17	20	49	No – no impact	No impact
WD4 - Conifer plantation	-	0.15	0.01	0.12	7	80	No – less than local value	Less than local
WN6 - Wet willow-alder-ash woodland	-	0	0	0	0	0	No – no impact	No impact
WS1 - Scrub	-	0.86	0.44	0.36	51	42	Yes – local value and scale of habitat loss	Local

Habitat	Linear Features within PAB (km)	Area habitats within PAB (ha)	Permanent Habitat loss (ha/km)	Temporary Habitat Loss (ha/km)	% Permanent Habitat lost with PAB	% Temporary habitat loss with PAB	Likely significant effect (Yes/No)	Geographical scale of impact
WS2 - Immature woodland	-	0.18	0	0.18	0	100	No – no impact	No impact
FW2 - Depositing/ lowland rivers	0.14	-	0	0.14	0	-	No – no impact	No impact
FW3 - Canals	0.09	-	0	0	0	-	No – no impact	No impact
FW4 - Drainage ditches	3.19	-	0.18	3.02	6	-	Yes – local impact and scale of habitat loss	Local
WL1 - Hedgerows	33.07	-	0.7km	3.2km	2.1	9.7	Yes – local-county impact and scale of habitat loss	Local-County
WL2 - Treelines	26	-	0.8km	1.1km	3.1	4.2	Yes – local-county impact and scale of habitat loss	Local-County
Total	62.49	154.45						

10.5.2.5 Ground Water Dependent Terrestrial Ecosystems (GWDTE)

As outlined in the baseline conditions, wet grassland and wet willow-alder- woodland were identified as potential GWDTE within the study area. There is a risk of excavation during trenching interfering with groundwater yield, quality or flow direction where groundwater is required to be abstracted.

Guidance by the Scottish Environmental Protection Agency (SEPA)[70] states that excavations greater than 1 m pose a risk to GDWTE up to 250 m away and less than 1 m depth GWDTE up to 100 m away there is a risk where such excavation would also require the abstraction of water (SEPA 2017). The depth of the proposed excavation is 1.3 m or 1.7 m and as such there is a risk to GWDTE sites that is assessed in Chapter 11 of this EIAR; which notes that small negative impacts to groundwater quality at secondary receptors such as GWDTE are predicted, especially where the receptor is in close proximity/ adjacent to the cable route. Further from the cable route elsewhere within the 1 km study area negligible impacts to groundwater quality are predicted.

There is potential for negative effects on GWDTE habitats resulting in potential habitat loss or degradation at a Local Level.

10.5.2.6 Wintering birds (including SCI species)

The desk study found that greylag goose wintering at Poulaphouca Reservoir were in the vicinity at distances of between 5 to 17 km from the Proposed Development. Jacobs' 2023 survey did not record any greylag goose. Most records during Jacobs' wintering birds survey were from, or in the vicinity of, several ponds or lakes, none of which will be directly impacted by the Proposed Development. The remaining records were of birds in flight or occasionally foraging in agricultural fields.

During the winter bird surveys, six bird species listed as wintering SCIs for SPAs in the vicinity were recorded in the study area. The nearest SPAs designated for these SCI species are as follows:

- Lesser black backed gull (Poulaphouca Reservoir SPA, c8 km to the west of the Proposed Development);
- Golden plover (North Bull Island SPA, 28 km SW of the Proposed Development);
- Teal (North Bull Island SPA, 28.7 km SW of the Proposed Development);
- Black-headed gull (South Dublin Bay and River Tolka Estuary SPA, c25 km to the west of the Proposed Development);
- Herring gull (The Murrough SPA, c44 km east of the Proposed Development); and
- Mallard (Dundalk Bay SPA, c47.4 km NW of the Proposed Development).

The only bird species recorded within the ZoI that are listed on Annex I of the Birds Directive: were:

- Kingfisher (River Boyne and River Blackwater SPA (18.7 km NW of the Proposed Development); and
- Golden plover (as above).

It is unlikely given the distances from the nearest SPAs and species core foraging ranges (SNH, 2016) that many of the SCI species recorded in the study area would be associated with any of the SPAs listed above with the exception of lesser black-backed gull as Poulaphouca Reservoir SPA is c.8km distant. However, given that the majority of the works will take place in habitats unsuitable for foraging lesser black-backed gulls, and that the temporary or permanent loss of small areas of improved grassland which this species is known to use but not where it comprises

[70] Used in the absence of similar Irish guidance but itis considered to be applicable.

field margins is not expected to have a significant effect on these SPA bird populations, there is no potential for negative effects on wintering birds.

Disturbance

The works will involve excavating and laying of an underground cable and as a result, habitats immediately under the footprint and either side of the cable excavation are the predominant habitats affected. There will also be temporary disturbance during construction. Treelines, hedgerows and scrub and to lesser extent arable and grassland field margins will be impacted, particularly at joint bays. Typically, the linear habitats do not support wintering birds. Where the Proposed Development extends into surrounding farmland margins it has been shown during surveys that these areas do not support wintering birds. Indeed, no wintering birds were recorded in the Planning Application Boundary of the Proposed Development. The majority of winter bird records were concentrated around several ponds and lakes (Figure 3, Appendix 10.4) none of which will be impacted through habitat loss from the Proposed Development. Of the 142 records within the study area 90 records were within Lakelands pond, Naas (grid reference N 89326 18712) which is c.347 m from the Proposed Development Planning Application Boundary at its nearest point and Osberstown attenuation pond along the M7 (grid reference: N 88162 21266), which is c. 190 m from the Proposed Development Planning Application Boundary at its nearest point. Lakeside pond is outside the 300 m suggested by Cutts *et al*. (2013) as the 300 m ZoI for noise and visual disturbances. Osberstown Pond is, however, within the 300 m distance for noise and visual disturbance. However, due to natural screening of the pond from scrub and topography i.e. the pond is below the level of the road and shielded from the road by a raised embankment, no disturbance to wintering birds is predicted. Note the winter bird surveys did not record any SCI bird species on Osberstown Pond.

There is no potential for negative effects on wintering birds from disturbance.

Habitat loss

The remaining winter bird survey records were of birds in flight or occasionally foraging in agricultural fields. The Proposed Development will not traverse across any habitats utilised by wintering birds. As the habitat under the footprint of the Proposed Development (predominantly road surface, roadside verge and field margins) was either deemed unsuitable to support winter birds or was not recorded as being used by wintering birds during the surveys.

There is no potential for negative effects on wintering birds from habitat loss at a Local Level.

Pollution

Lakelands Pond, Naas is not hydrologically connected to the Proposed Development, so no pollution effects on this waterbody are likely, and no negative effects on the birds using the reservoir. Osberstown attenuation pond is hydrologically connected to the Proposed Development by a drainage ditch (WB39), with the EPA name of 'Oldtown_Demesne'.

There is potential for negative effects on wintering birds from pollution at a Local Level.

10.5.2.7 Breeding Birds

Habitat loss

The Proposed Development will result in the loss of breeding bird nesting and foraging habitat, and displacement of breeding birds, particularly due to impacts to trees and hedgerows as shown in Table 10.23. The habitat areas that will be lost as a result of the Proposed Development are common in the locality but there would still be a potentially negative effect at the Local Level.

Habitat fragmentation

None of the habitats to be lost or fragmented are unique to the locality and, either individually or collectively, are not likely to support a significant proportion, or the only population, of any given breeding bird species locally. Neither will the temporary works likely impede commuting or foraging on flightpaths or foraging ability beyond the crossing point and not in the long term.

The baseline conditions also indicate kingfisher (Annex I species) will not be impacted by habitat fragmentation. The species was recorded on two occasions along the River Liffey, from Sallins Bypass Bridge, during Survey 1 and Survey 2 (see Figure10.4 for location observations). Subsequent watches upstream and downstream of the Sallins Bypass bridge crossing recorded no kingfisher nests and bankside habitats around the proposed cable crossing point were too unstable to support kingfisher nests. The River Liffey does, however, support commuting and foraging kingfisher, but not associated with the River Boyne and River Blackwater SPA (18.7 km NW of the Proposed Development.

There is no potential for negative effects to breeding birds from habitat fragmentation at a Local Level.

Disturbance

No waterbody or wetland of ecological importance will be impacted by the Proposed Development. The majority of waterbodies in the ZoI are not expected to be significantly impacted by disturbance during the Proposed Development as a result of existing screening through vegetation, infrastructure and topographical. Although a temporary decline in overall breeding bird abundance could potentially occur at a very local level (i.e. the footprint of the Proposed Development), this is unlikely to affect the local range of the breeding bird species present in these habitats nor is it likely to affect the ability of these breeding bird populations to maintain their local populations in the long-term.

The noise, vibration, increased human presence and the visual deterrent of construction traffic associated with site clearance during construction will disturb breeding bird species and is likely to displace them from habitats within and adjacent to the Proposed Development boundary. Breeding bird disturbance impacts are similar to disturbance impacts to wintering birds, above. Increased noise levels during construction may disturb bird species affecting bird abundance and occurrence in the locality. Although it is not possible to quantify the magnitude of this potential impact it could potentially extend for several hundred metres from the Proposed Development. Given the temporary to short-term nature of the construction works, disturbance or displacement effects will also be over a relatively short-term and are therefore not likely to affect the conservation status of red or amber species breeding bird species in the long term.

There is potential for temporary negative effects to breeding birds from disturbance at a local Level.

Pollution

A pollution event during construction could change the water quality and reduce the prey availability of kingfisher at and downstream of the pollution event. Kingfisher diet is predominantly fish, although they will also eat aquatic insects, freshwater shrimps and tadpoles (Royal Society for the Protection of Birds (RSPB) 2020). The breeding birds survey also recorded the waterbirds grey heron, little egret, moorhen, mute swan, reed bunting and reed warbler, whose food source could be affected by water pollution.

There is potential for negative effects on breeding birds from a pollution event on a Local Level.

Mortality

The Proposed Development poses a mortality risk to breeding birds associated with destruction of nests during vegetation clearance. If site clearance works were to be undertaken during the bird breeding season (i.e. March to August, inclusive) it is likely that nest sites holding eggs or chicks will be destroyed and birds killed.

No breeding bird SCI were recorded in the footprint of the Proposed Development. Birds recorded during the 2022 survey are shown in Table 10.17 and shown in Figure 10.4, Volume 4. Mortality of birds during site clearance works is not predicted to affect the conservation status of any of the breeding bird species present within the study area at any geographic scale, however, mitigation measures will be incorporated to avoid mortality impacts.

There is potential for negative effects from vegetation clearance resulting in mortality to breeding birds at a Local Level.

10.5.2.8 Bats

Mortality

No bat roosts were recorded within the construction footprint, and therefore no direct impacts on known roosts are predicted. The Proposed Development will require the felling of 90 mature trees with moderate to high roosting potential. As bats switch tree roosts regularly, there is a risk that bats might colonise trees within which none were recorded previously in the 2022 survey season. Therefore, without mitigation, there is a risk that roosts could be lost and bats killed, injured or disturbed. The precise character of the potential impact would depend on the species and number of bats affected.

There is potential for negative effects from vegetation clearance resulting in mortality to bats at a Local Level.

Habitat loss

The overall effect on bats from losses of foraging habitat differs according to individual species. Generally, larger impacts would be expected for habitat specialists and / or those species with smaller feeding ranges, such as brown long-eared bats (woodland specialists) and *Myotis* bats (bats of woodland and waterbodies) or where habitat is located near a roost.

The works will involve excavating and laying of an underground cable and will result in the removal of habitats immediately under the footprint and either side of the cable excavation. The majority of the Proposed Development is 'in-road' therefore the habitat under the footprint is predominantly road surface, roadside verge, treelines, hedgerows and scrub, and to a lesser extent arable and grassland field margins. These habitats provide foraging opportunities for bats. As bats have large foraging ranges (with core sustenance zones around roost sites ranging between 2 km to 3 km for the bats recorded within the study area) the loss of these habitats is unlikely to lead to significant negative effects on roosts. Core sustenance zones for the bats recorded during static surveys and the emergence-re-entry surveys are as follows (Collins 2016):

- Common pipistrelle: 2 km;
- Soprano pipistrelle: 3 km;
- Leisler's bat: 3 km;
- Grey long-eared bat: 3 km; and
- Nathusius' pipistrelle: 3 km.

However, the loss of hedge and trees could lead to severance effects. Works will lead to permanent gaps (where cables are overlain by permanent access tracks of up to 4 m wide and above the permanent easement of 5 m or 15 m between ch 0 and 3250), but temporary gaps (where no permanent roads are required, and over-cable planting is viable) could require gaps in hedgerow of up to 30 m wide (i.e. the width of the planning application boundary).

Bats are known to avoid gaps of open spaces within linear features, the smallest size suggested which bats are known to avoid is 5m (BCI 2022). The range of permanent minimum break width for the loss of habitats/treelines along the cable route is 4m which is not anticipated to cause any fragmentation or alter bat foraging range in the long term. The range of permanent maximum break width for the permanent easement offroad is 15 m (typically 5 m but is 15 m at ch 0 – 3250), which may alter or sever bat foraging ranges by removing linear features but is not likely to have an impact where no linear features are altered.

There is potential for negative effects from habitat loss resulting in severed bat habitats at a Local Level.

Disturbance

Construction activities will result in noise, lighting and vibration in habitats within and adjacent to the Proposed Development, although no roosts have been recorded within these areas. The footprint of the Proposed Development is largely along existing roads that all have some form of lighting. However, off-road sections are currently unlit. Pipistrelle bats are relatively tolerant of disturbance such as noise and lighting, as are Leisler's which are often observed hunting insects that are attracted by street lighting. *Myotis* and *Plecotus* bat species are relatively intolerant of noise and lighting.

There is potential for negative effects from disturbance to bats at a Local Level.

10.5.2.9 Otter

Mortality, Disturbance and Pollution

Otters are likely to be present within the study area of the Proposed Development, with one suspected holt and one otter slide identified during the field surveys. There is optimal commuting, foraging and resting habitat for otter throughout the survey area, however, the majority of habitat to be impacted by the construction works is considered sub-optimal for otter as it comprises hedgerows, tree lines and agricultural land away from watercourses. Disturbance or direct mortality to this species could arise from the construction works. Additionally, a pollution event from the works may impact on water quality and reduce otter prey availability.

There is potential for negative effects from mortality, disturbance and pollution for otter at a County Level.

10.5.2.10 Badger

Mortality, Habitat Loss and Disturbance

Badgers are known to be present within both the survey area and within the footprint of the Proposed Development as field signs, two potential badgers holes, two inactive outlier setts and three active main setts, were recorded during field surveys (exact locations of setts are not provided due to persecution of this species).

Exact locations of setts are not provided due to persecution of this species.

Badger is considered of Local Importance (Higher Value).

Two of the active setts are within 50 m of the Proposed Development (sign number 2, and 3, Table 10.20), which therefore have potential to be negatively affected and require a licence. There is one potential badger hole within the PAB (sign 1, Table 10.20), one disused badger hole within the PAB (sign 5, Table 10.20) and one disused badger hole 50 m from the PAB. One active sett lies 150 m from the PAB (sign 10, Table 10.20) and one potential sett 61 m from the PAB. There is optimal foraging and commuting badger habitat within the survey area and the loss of badger habitat arising from construction would have an insignificant impact on the locally available suitable habitat for badger, particularly given how common and widespread suitable habitats for badger are. Disturbance and direct mortality towards badger could arise from the construction works, as it has potential to disrupt commuting routes between foraging grounds by creating obstacles and hazards.

There is potential for negative effects from mortality and disturbance for badger at a Local Level.

10.5.2.11 Other Protected Mammals

Mortality, Habitat Loss, Habitat Fragmentation and Disturbance

Habitat with the potential to support a variety of small mammal species was recorded or likely to be present within the survey area. Construction works are unlikely to result in any significant level of mortality to the larger and more mobile species such as red squirrel, as they can migrate away from the works. Squirrels breed in winter, which is when trees are scheduled to be felled, so breeding squirrels could be affected by the works. It is also probable that vegetation clearance will result in mortality to the smaller mammals such as pygmy shrew if present, since small mammals have less ability to disperse. The potential effect would be expected to be greater during the breeding season when juveniles would be present in burrows (April-October), or in the case of hedgehog, impacts will be greater during their hibernation period (November-March). There is also potential for localised habitat loss and fragmentation, and disturbance to small mammal species. Impacts would be in the short term and would only occur during construction works.

There is potential for negative effects from mortality, habitat loss / fragmentation and disturbance for small mammals at a Local Level.

10.5.2.12 Amphibian and Reptiles

Mortality and Disturbance

No amphibian or reptile species were recorded within the study area during field surveys and there were no breeding ponds with habitat connectivity within 500 m of the Proposed Development. However, terrestrial habitat with the potential to support both amphibians and reptiles could be lost as part of construction works, which will require the removal of habitats within the footprint of the Proposed Development. Given the relatively small amount of habitat required to be cleared, it is unlikely that the site clearance works would have a significant impact on the locally available suitable habitat for these species, particularly given how common and widespread suitable habitats for these species is. Nevertheless, construction works could lead to disturbance and direct mortalities of these species, particularly during the hibernation (November- February) or breeding season (January-July).

There is potential for negative effects from mortality and disturbance to amphibians and reptiles at a Local Level.

10.5.2.13 Fish

The River Liffey catchment including the Rye Water sub-catchment throughout the study area, contains a variety of riverine habitats suitable for fish and is a productive catchment, despite apparent water quality issues in some smaller tributaries. The Tolka River also has suitable in-stream fish habitat and has recorded low densities of fish species of conservation concern. Overall although there were supporting habitats for a variety of fish species of different age classes may of the smaller watercourses showed signs of pollution.

Jacobs eDNA sampling confirmed the presence of:

- Atlantic salmon in the Rye Water (WB12) and Jenkinstown Stream (WB08).
- European eel was confirmed to be present in the Jenkinstown Stream_010 (WB08) and two tributaries of the River Liffey (WB 32 and WB46), see Figure 10.8 Volume 4.

However, as fish populations can be naturally highly variable over time and the migratory behaviour and life history of salmon and eel can affect their presence or absence in a particular watercourse from one year to the next, it is important to consider that these species may be present in a catchment where survey results have previously recorded their likely absence.

Mortality

Fish may be directly or indirectly impacted by construction activities when working in water. Such activities including plant machine works and excavations can cause mortality whilst inappropriate in-stream timing of works can impact fish during spawning and fish emergence periods. Dewatering activities or temporary channel diversions which may be required to lay the cable can strand fish.

There is potential for negative effects from mortality to fish species at a Local to County level.

Habitat Loss, Fragmentation or Changes in Hydrology

Temporary loss of habitat will occur in the footprint of construction works within aquatic habitats. Works can remove habitat beneficial to fish and includes in-stream habitat such as gravel / cobble substrates and woody debris and bankside vegetation which provides cover. Dewatering activities or temporary channel diversions which will be required to lay the cable can strand fish or create barriers to upstream and downstream migrations and cause habitat fragmentation. Changes in hydrology can occur during in-stream works where streams are bunded or when incorrect stream reinstatement has been carried out. This may cause alterations though erosion, deposition and sediment suspension, which in turn could affect water quality and distribution of habitats.

There is potential for negative effects from habitat loss, fragmentation or changes in hydrology to fish species at a Local to County Level.

Pollution

Pollution of watercourses can occur when construction activities can lead to the release of contaminated surface water run-off, fine sediments and hydrocarbons (e.g. fuel, oils). There is also the potential for bentonite break out (or slurry run-off from launch pits) to contaminate watercourses where HDD is taking place of the following watercourses: Rye Water (WB13), unnamed drain of the Lyreen/Liffey (WB20) and the River Liffey (WB35). These can impact different life stages of fish with some species more sensitive to pollution than others.

There is potential for a pollution event (release of contaminated surface water run-off and sediments) into watercourses during construction to result in negative effects on fish species at a Local to County Level.

Disturbance

Noise and vibration caused by construction activities within or in close proximity to aquatic habitats have the potential to cause physical injury to fish in the immediate area. Salmonid eggs are also sensitive to mechanical shock and eggs buried in gravels may be impacted if spawning areas are nearby.

A disturbance event in watercourses during construction has the potential to have a negative effect on fish species at a Local to County Level.

10.5.2.14 White-clawed Crayfish

Pollution

White-clawed crayfish were recorded from Jacobs' eDNA survey on WB32 (Longtown_Demesne, a tributary of the River Liffey and WB46 (River Liffey). The desk study has records of WCC in the River Liffey at Clane, with hydrological connectivity to cable crossing at WB29 and Rye Water at Maynooth with hydrological connectivity to cable crossing at WB12 and WB13.

Construction activities including HDD, vegetation and soil striping, site drainage, plant movement and construction of structures may cause a pollution event from the potential release of contaminated surface water run-off, fine sediments and hydrocarbons at these WBs which could affect WCC within the River Liffey catchment including the Rye Water.

There is potential for negative effects from pollution to white-clawed crayfish at a County Level.

Mortality, Disturbance, Habitat Loss/Degradation

Site preparation and construction works involving cable laying across watercourses may cause disturbance or the permanent damage or loss of in-stream crayfish habitat. Activities including dewatering operations, trenching, construction of retaining walls and bankside works including regrading and tree removal may remove crayfish habitat or cause mortality.

There is potential for negative effects from mortality and disturbance and loss or degradation of habitat for white-clawed crayfish at a County Level.

10.5.2.15 Invasive species

Habitat loss/degradation

The following Third Schedule invasive species were recorded in the 2022 survey.

Himalayan balsam (*Impatiens glandulifera)* was present along the route of the Proposed Development between ch 37000 and 37250 at N 87990 24456. This location lies within the Proposed Development's Planning Application Boundary and 40m from the HHD launch platform on the west bank of the River Liffey. The species is also present 70m south of the Planning Application Boundary at N 87999 24353. There were two other stands recorded at ch 39000 (at N 87995 23009 and N 88030 22991), c50 m west of the Proposed Development. The nearest location is 16m to the west of the Planning Application Boundary, and the most distant was on an in-river island 50 m west of the Planning Application Boundary.

There is potential for negative effects from disturbance (and spread) of Himalayan balsam resulting in the loss or degradation of habitat at a Local to County Level.

Giant rhubarb (*Gunnera tinctoria*) – ornamental planting by a garden pond, c120 m from Planning Application Boundary. There is no potential for negative effects from disturbance to giant rhubarb given the distance from the Proposed Development.

A summary of the potential impacts during the construction phase is provided in Table 10.24.

Table 10.24: Summary of Potential Construction Phase Impacts in the absence of mitigation

Ecological Receptor		Ecological Valuation	Potential impacts	Likely significant effect (Yes/No) and geographic scale of impact
Designated Sites	Rye Water Valley / Carton SAC	International Importance	Habitat degradation (pollution)	Yes, international level
	Water Bodies	International Importance – connection to the Rye Water Valley / Carton SAC	Habitat degradation (hydrology-pollution) Disturbance / displacement	Yes, international level
	Hodgestown Bog NHA	National Importance	Habitat degradation (hydrology-pollution) Disturbance / displacement	No
	The Royal Canal pNHA	National Importance	Habitat degradation (hydrology-pollution) Disturbance / displacement	Yes, national level

Ecological Receptor		Ecological Valuation	Potential impacts	Likely significant effect (Yes/No) and geographic scale of impact
	Grand Canal pNHA	National Importance	None	Yes, national level
	Liffey Valley Meander Belt pNHA	National Importance	Habitat degradation (hydrology-pollution)	No
	Liffey at Osberstown pNHA	National Importance	None	No
	Ballynafagh Bog pNHA	National Importance	Habitat degradation (hydrology-pollution)	No
	Donadea Wood pNHA	National Importance	None	No
	Ballynafagh Lake pNHA	National Importance	Habitat degradation (hydrology-pollution)	No
	Harristown Common cNHA	National Importance	Habitat degradation (hydrology-pollution)	No
Habitats	Hedgerows (WL1) species rich	County Importance	Habitat loss	Yes, local to County level
	Hedgerows (WL1) species poor	Local Importance (Higher Value)	Habitat loss	Yes, local level
	Broadleaved woodland (WD1)	Local Importance (Higher Value)	Habitat loss	Yes, local level
	Scrub (WS1)	Local Importance (Higher Value)	Habitat loss	Yes, local level
	Treeline (WL2)	Local Importance (Higher Value)	None	No
	Canals (FW3)	Local Importance (Higher value)	None	No
	Drainage ditches (FW4)	Local Importance (Higher Value)	Habitat loss	Yes, local level

Ecological Receptor		Ecological Valuation	Potential impacts	Likely significant effect (Yes/No) and geographic scale of impact
	Dry meadows and grassy verges (GS2)	Local Importance (Higher Value)	Habitat loss	Yes, local level
	Wet grassland (GS4)	Local Importance (Higher Value)	Habitat loss and degradation (hydrology)	Yes, local level
	Recolonising bareground (ED3)	Local Importance (Higher Value)	None	No, less than local
	Reed and large sedge swamps (FS1)	Local Importance (Higher Value)	Habitat loss	Yes, local level
	Wet willow-alder-ash woodland (WN6)	Local Importance (Higher Value)	Habitat degradation (hydrology)	Yes, local level
	Mixed broadleaved / conifer woodland (WD2)	Local Importance (Higher Value)	None	No
	Dry calcareous grassland (GS1)	Local Importance (Higher Value)	Habitat loss	Yes, local level
	Improved agricultural grassland (GA1)	Local Importance (Lower Value)	Habitat loss	No
	Arable crops (BC1)	Local Importance (lower value)	Habitat loss l	No, less than local
	Amenity grassland (GA2)	Local Importance (Lower Value)	Habitat loss	No, less than local
	Building or Artificial (BL3)	Local Importance (Lower Value)	Less than local	No, less than local
	Coniferous plantation (WD4)	Local Importance (Lower Value)	None	No, less than local
	Scattered trees and parkland (WD5)	Local Importance (Lower Value)	None	No

Ecological Receptor		Ecological Valuation	Potential impacts	Likely significant effect (Yes/No) and geographic scale of impact
	Other artificial lakes and ponds (FL8)	Local Importance (Lower Value)	None	No
Protected, Notable and Invasive Species and Species Groups	SCI bird species	International Importance	None	No
	All other Red, Amber or Green listed bird species (non-SCI breeding populations)	Local Importance (Higher Value)	Habitat degradation (pollution)	Yes, local level
	Bats	Local Importance (Higher Value)	Habitat loss, fragmentation and disturbance	Yes, local level
	Otter	County Importance	Mortality, disturbance and habitat degradation (pollution)	Yes, county level
	Badger	Local Importance (Higher Value)	Mortality, habitat loss and disturbance	Yes, local level
	Other mammal species protected under the Wildlife Acts	Local Importance (Higher Value)	Mortality, habitat loss and fragmentation and disturbance	Yes, local level
	Smooth newt	Local Importance (Higher Value)	Habitat loss and fragmentation, mortality and disturbance	Yes, local level
	Common frog	Local Importance (Higher Value)	Habitat loss and fragmentation, mortality and disturbance	Yes, local level
	Common lizard	Local Importance (Higher Value)	Habitat loss and fragmentation, mortality and disturbance	Yes, local level

Ecological Receptor		Ecological Valuation	Potential impacts	Likely significant effect (Yes/No) and geographic scale of impact
	Atlantic salmon	County Importance	Habitat loss, degradation (pollution), disturbance and mortality	Yes, county level
	Lamprey spp.	County Importance	Habitat loss, degradation (pollution), disturbance and mortality	Yes, county level
	European eel	County Importance	Habitat loss, degradation (pollution), disturbance and mortality	Yes, county level
	White-clawed crayfish	County Importance	Habitat loss, degradation (pollution), disturbance and mortality	Yes, county level
	Other fish species (including trout)	Local Importance (Lower Value)	Habitat loss, degradation (pollution), disturbance and mortality	Yes, local level
	Marsh fritillary	County to National Importance	None	No
	Non-native invasive plant species	N/A	Habitat loss and degradation	Yes, local to county level

10.5.3 Operational Phase

The effects of operation of the Proposed Development are expected to be minimal on the IEF, with most of the impacts to them occurring during the construction stage. Following completion of the works, the road will be reinstated for public use, and vegetation removed will be reinstated, except along the permanent easement, at joint bays, along permanent access tracks, and where over-cable planting is not technically viable due to asset risk.

10.5.3.1 Habitat Loss

The width of the joint bays and the nature of the road network in the area means that road closures and diversions will be required in some areas along the route during maintenance in the operational phase. There is no potential for negative effects from habitat loss during these works as replacement vegetation planting will be positioned so that no removal would be necessary (except in the case of unexpected and/or emergency maintenance).

It will be necessary to provide permanent access for infrequent use to all off-road joint bays during the operational phase. These will be stoned access tracks. The topsoil will be stripped and taken off site to a suitably licensed facility. The tracks will be filled with 300 mm of fill material and finished to 100 mm above ground level. There are 12 no. separate access tracks which are provided for 13 no. joint bays: 1 to 4 (one access track to these four bays); 8; 10; 15; 21; 31, 42; 49, 50; 54; 60 and 70 (please see Chapter 5 of this EIAR for their locations). There is potential for negative effects from loss at these locations. However, these have been assessed under permanent loss during construction and as such are not described further here.

10.5.3.2 Mortality, Pollution, Habitat Degradation and / or Fragmentation

Should unexpected and/or emergency maintenance of the cable be required during the operational phase, excavation would be required, and this could occur on (in-road) and / or off-road. As per the construction phase there is the potential for the same negative effects to occur to IEF as noted in the relevant section above.

There is therefore potential for negative effects at a local scale from mortality and disturbance and loss or fragmentation of habitat for Important Ecological Features.

10.6 Mitigation Measures

This section sets out mitigation measures envisaged to avoid, prevent, reduce or, if possible (having regard for third-party landowners) offset any identified significant adverse effects on the IERs environment and, where appropriate, identify any proposed monitoring arrangements. It covers both the construction and operational phases.

10.6.1 Ecological Clerk of Works

An on-site Ecological Clerk of Works (ECoW)[71] will be appointed by the Contractor to carry out pre-construction surveys (see below) to ensure that the baseline is current and, where required, will implement appropriate mitigation measures as needed. Where sensitive habitats or species have the potential to be impacted, the ECoW will be on site to implement all mitigation measures as described below. The ECoW will have sufficient experience and will be a member of a professional body such as CIEEM or similar.

10.6.2 Pre-Construction Surveys

In advance of enabling works, the Contractor's ECoW will complete pre-construction confirmatory surveys of selected ecological features whose distribution is dynamic over time, and which are known to have potential to occur within the ZoI of the PAB. Any of the small number of areas that could not be surveyed during baseline data collection will also be surveyed at this time. As noted above, an assessment of these non-accessed areas has been made in this chapter, based on the available data (e.g. aerial photograph, desktop data, access from adjacent area, etc). This is in-line with the CIEEM guidelines. These surveys will confirm the findings of the surveys completed between October 2021 and October 2022 (survey dates as detailed in Table 10.1), and will consist of the following:

- Bat trees previously identified as having roosting potential and within the ZoI;

[71] An Environmental Clerk of Works (EnCoW) with sufficient experience and membership of a professional body may also be used.

- Otter breeding/resting sites within the ZoI of the PAB (minimum 50 m, up to150 m at HDD sites, where access allows; noting that guidance recommends 20 m for non-breeding sites);
- Badger setts within the ZoI of the PAB (minimum 50 m, up to 150 m at HDD locations where access allows);
- Squirrel (grey and red), where dreys are identified within trees to be felled within the PAB;
- Amphibians and reptiles: a pre-construction survey will be undertaken by the ECoW of previously identified area suitable to host these species: reptile habitat (dry calcareous grassland, dry meadows and grassy verges and recolonising bare ground) and of amphibian habitat (drainage ditches, wet grassland and reed and sedge swamps) within the PAB. A suitable safe receptor site will be pre-identified, and if amphibians or reptiles are found the ECoW will translocate animals if necessary to the suitable receptor habitat;
- Invasive species within the PAB; and
- A baseline survey of all hedges to be removed will be carried out to characterise its canopy, understorey and field layer species, and associated features (ditches, earth banks, walls etc.) to inform reinstatement.

Bat surveys will be carried out in accordance with guidance from Bat Mitigation Guidelines for Ireland – 2 (Marnell *et al*., 2022) and Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA, 2006a). Surveys will be carried out by a licenced bat worker, who will determine the locations where they are required, using best practice techniques such as tree climbing and night vision equipment.

All surveys will be undertaken by suitably qualified ecologists with demonstrable experience in the survey and assessment of the feature.

10.6.3 Reporting

The results of pre-construction confirmatory surveys will inform the refinement of mitigation measures and monitoring measures (if required) in the Contractor’s method statements (in accordance with the commitments set out in this EIAR), and all results will be incorporated into the Contractor’s constraint mapping.

Survey reporting and mapping will be provided to the Developer’s Ecologist (ESB), EirGrid’s Planning and Environmental Unit (PEU) within the Chief Infrastructure Office, and to any prescribed bodies as additionally required by any planning conditions.

10.6.4 Construction Phase

10.6.4.1 Site-Wide Mitigation

A number of site-wide mitigation measures will be applied across the Proposed Development to avoid the impacts associated with pollution of watercourses and impacts to small mammal species, amphibians and breeding bird species. In addition to this, there are mitigation measures specific to the various Proposed Development elements.

Ecological Clerk of Works (ECoW)

The appointed contractor’s ECoW will be on site during the construction for any works deemed to be of sensitive nature due to the number of sensitive ecological receptors and the works taking place within watercourses connected to European sites. Where sensitive habitats or species could be impacted, the ECoW will be on site to oversee the implementation of all mitigation measures as described below. The ECoW will be at sensitive locations for example where there will be in-stream works and where a watercourse is hydrologically connected to European site and at locations where there is potential for disturbance to SCI birds and where hording will be erected, and in areas of vegetation reinstatement, including tree planting. Table 10.25 shows the indicative location of proposed silt fencing locations. To note, some of these locations are not yet determined. The final locations will be determined by the ECoW onsite to ensure that the locations are suitable and are in-line with the requirements of this EIAR.

Table 10.25: Indicative silt fencing locations where an Ecological Clerk of Work will be required.

Waterbody name	European Site with Hydrological Connection	Indicative Location of silt fencing (NGR)
Tributary of the Tolka 020	N/A	1 location: • N 95028 46797
Dunboyne stream_010	N/A	1 location: • N 94782 46269
Rye Water_030	Rye Water Valley/Carton SAC	1 location: • N 93930 45180
Jenkinstown stream_010	Rye Water Valley/Carton SAC	4 locations: • N 91730 45313 • N 90246 45483 • N 89775 43468 • N 89661 43153
Unassigned stream	Rye Water Valley/Carton SAC	1 location: • N 89419 43023
Rye Water_020	Rye Water Valley/Carton SAC	2 locations: • N 89243 42178 • N 88410 40767
Newtownmoyaghy Stream tributary of Rye Water_020	N/A	1 location • N 89076 40939
Rye Water_010	Rye Water Valley/Carton SAC	1 location: • N 88065 40613
Royal Canal	Rye Water Valley/Carton SAC	1 location: • N 87874 40210

Waterbody name	European Site with Hydrological Connection	Indicative Location of silt fencing (NGR)
Lyreen_010	N/A	2 locations • N 86262 37369 • N 86673 35787
Tributary of Lyreen_010	N/A	1 location: • N 86754 35459
Clonshambo_010	N/A	1 location: • N 87176 33938
Clonshambo_020	N/A	1 location: • N 86916 31840
Kilmurry_010	N/A	1 location: • N 86272 30537
Tributary of Kilmurray_010	N/A	1 location: • N 86151 30369
Liffey_130	N/A	3 locations: • N 84449 28586 • N 84425 28283 • N 84807 27542
Tributary of Liffey_130	N/A	1 location: • N 84283 28429
Tributary of Slate_010	N/A	1 location: • N 84237 27559
Liffey_120	N/A	4 locations: • N 87519 25081

Waterbody name	European Site with Hydrological Connection	Indicative Location of silt fencing (NGR)
		• N 88001 24231 • N 88281 24006 • N 88110 23008
Grand Canal Main Line (Liffey and Dublin Bay)	N/A	1 location: • N 88152 22604
Liffey_110	N/A	3 locations: • N 88249 21068 • N 87711 20395 • N 87394 20021
Grand Canal Naas Line (Liffey and Dublin Bay)	N/A	1 location: • N 88288 19245
Liffey_100	N/A	1 location: • N 88310 18467
Tributary of Liffey_120	N/A	1 location: • N 88017 24231

The ECoW will give toolbox talk to all site personnel to highlight any environmental sensitivities and the boundaries of sensitive habitats. Toolbox talks will include findings of pre-construction surveys on baseline changes and any adaptive mitigation measures required. The ECoW will propose adaptive mitigation measures in response to, for instance, extreme weather events (amber and red Met Éireann weather warnings), or mitigation requirements arising from pre-construction surveys which identify unexpected receptors. Method statements in relation to trenched crossings prepared prior to the start of works and will be in accordance with particular IFI standards unless otherwise agreed with the IFI or planning authority. No sensitive works will be permitted without the prior approval of the ECoW.

Pollution Control

The measures set out below will be implemented to ensure that there will be no pollution of surface water during the construction phase of the Proposed Development. The measures have been incorporated into the CEMP (Appendix 5.4) which is key contract document and will be implemented in full by the appointed contractor. The CEMP will be updated to include any pollution control mitigation measures prescribed by the local authority as a condition to the planning permission (if granted). The CEMP has been developed in accordance with the following guidance documents and legislation:

- CIRIA C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams *et al*. 2001);
- CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane *et al*., 2006a);
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane *et al*. 2006b);
- CIRIA C741 Environmental Good Practice on Site (Charles and Edwards 2015); and Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA 2005);
- S.I. No. 113/2022, (European Union (Good Agricultural Practice for Protection of Waters) (Amended Regulations).

Mitigation measures with respect to accidental pollution are focused on prevention, safeguarding the approach to the storage and handling of materials, and managing vehicles during the temporary construction phase.

Control of Silt-Laden Runoff

Specific measures to control silt will be implemented at each of the Proposed Development infrastructure sites. Surface water run-off at the construction sites will be managed to prevent silt-laden surface water flowing into surface water receptors:

- The appointed contractor will ensure no deleterious discharges are released from construction sites to the nearby water bodies during construction. If a discharge to a watercourse is necessary, the water will pass through a suitable drainage system such as a swale and/or silt buster prior to discharge. Levels of suspended solids in any discharge will be no greater than 25 mg/l (milligrams per litre) as per Inland Fisheries Ireland (IFI) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI 2016), and flows will be controlled to levels appropriate to the receiving water. It is possible that such a discharge may require a licence under the Water Pollution Acts 1977 and 1990 (as amended), and the Arterial Drainage Act 1945 and 1995 (as amended). The appointed contractor will liaise with the regulatory authorities at an early stage to determine the need for licences and include the appropriate application time required in any construction programme;
- Silt fences will be erected along the boundary of water bodies to prevent any silt laden runoff from impermeable surfaces, temporary or permanent, as well as spoil heaps within the construction working width:
    - Silt fencing will also be applied to areas that are within 30 m of a watercourse and hydrologically linked to a European site, where concrete pouring is to be undertaken and where there is a risk to European designated sites. Where required this may be double silt fencing;
    - Silt fences will be installed downgradient of the potential source of the silt / sediment;
    - The silt curtain will contain the area where silted waters are being generated and will terminate on high ground;
    - They will be constructed using permeable filter fabric (Hy-Tex Terrastop silt fence or similar) rather than a mesh material and its base will be embedded at least 15 cm into the ground and staked at 2 m intervals;
    - Vegetation will be retained where possible, however, where targeted vegetation removal is required, additional measures will be put in place including additional silt fencing in these areas.

  - The vegetated turves will be peeled back and not detached from the ground, the materials inserted and the turves replaced to hold the base in place;
  - The silt fence will be inspected regularly by the ECoW and appointed contractor, and in particular following heavy rainfall;
  - Silt fences will remain in-situ until the vegetation on the disturbed ground is re-established, as determined by the ECoW;
  - The fence will not be pulled from the ground, but cut at ground level and the stakes / posts removed;
  - Should water build up behind the fences, the sediment will settle to the bottom. Water can be released, but sediments will remain;
  - Two lines of silt fencing will be installed in sensitive areas, based on the ECoW's professional judgement;
  - A record of its installation, inspection and removal will be maintained by the ECoW; and
  - Reinstatement of any banks affected by silt-laden run off during construction will be reinstated back to pre-development conditions.

Stockpiling of Materials

The following measures will be implemented for the stockpiling of materials. Stripped soil will be stockpiled more than 10 m away from the surface interceptor drain. Stockpiles will be in a dry zone that is not subject to flooding (i.e. outside 1:100 flood extent (1% Annual Exceedance Probability)). The following measures will be put in place by the Contractor for stockpiling of material:

- Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within 10 m of a watercourse;
- For watercourse crossings, stockpiles will not be located anywhere within the crossing working area;
- Stockpiles will be managed to prevent siltation of watercourse systems through run-off during rainstorms with the measures to be implemented by the Contractor. These will include the following measures:
  - No use of commercial seed to stabilise exposed soils;
  - Coir matting to be used where determined by the ECoW to be required to enable vegetation to establish on the exposed soil;
  - Providing silt fences or straw barriers at the toe of the stockpile to mitigate run-off during rain events;
  - Surrounding stockpiles with cut-off ditches to contain run-off;
  - Directing any run-off to the site drainage system or filter drains along the construction working width and to the settlement pond (or other) treatment systems; and
  - Providing bunds or another form of diversion to keep run-off from entering the stockpile area.

Storage of materials

The following measures will be implemented for storage of materials:

- All oil and diesel storage facilities will be at least 30 m from any watercourse, including surface water drains, and outside the 1:100 flood extent (1% Annual Exceedance Probability);
- Spill kits and drip trays will be provided for all equipment and at locations where any liquids are stored and dispensed;
- Storage areas for solid materials, including waste soils, will be designed and managed to prevent deterioration of the materials and their escape (via surface run-off or wind blow);
- Storage areas will be kept secure to prevent acts of vandalism that could result in leaks or spills; and
- All containers of any size will be correctly labelled, indicating their contents and any hazard warning signs.

Spills

The following measures will be implemented across the site to prevent spills:

- Fuel tanks, drums and mobile bowsers (and any other equipment that contains oil and other fuels) will have a secondary containment, for example double-skinned tanks;
- All tanks, drums and mobile bowsers will be located in a sealed impervious bund with sufficient capacity to contain at least 25% of the total volume of the containers or 110% of the largest container, whichever is the greatest;
- Storage areas will be covered, wherever possible, to prevent rainwater filling the bunded areas (long-term storage areas will be covered. Storage areas used for a short period of time e.g. a few hours and where no rain is predicted, will not be covered);
- Fuel fill pipes will not extend beyond the bund wall and will have a lockable cap secured with a chain;
- Where fuel is delivered through a pipe permanently attached to a tank or bowser:
    - The pipe will be fitted with a manually operated pump or a valve at the delivery end which closes automatically when not in use;
    - The pump or valve will be fitted with a lock;
    - The pipe will be fitted with a lockable valve at the end where it leaves the tank or bowser;
    - The pipework will pass over and not through bund walls;
    - Tanks and bunds will be protected from vehicle impact damage;
    - Tanks will be labelled with contents, capacity information and hazard warnings; and
    - All valves, pumps and trigger guns will be turned off and locked when not in use. All caps on fill pipes will be locked when not in use.
- Suitable precautions will be taken to prevent spillages from equipment containing small quantities of hazardous substances (for example, chainsaws and jerry cans) including:

  - Each container or piece of equipment will be stored in its own drip tray made of a material suitable for the substance being handled; and
  - Containers and equipment will be stored on a firm, level surface.
- For deliveries and dispensing activities, the Contractor will ensure that:
  - Site-specific procedures are in place for bulk deliveries; and
  - Delivery points and vehicle routes are clearly marked.
- Emergency procedures will be displayed, and suitably sized spill kits will be available at all delivery points, and staff will be trained in these procedures and the use of spill kits.

Fuel and oil leaks from vehicles and plant

The use of vehicles and plant poses similar risks to those posed by storage of liquids. Fuel and oil may leak from such equipment which may enter drains and/or watercourses, as well as contaminating the ground itself. The following measures will be implemented to reduce this risk:

- Vehicles and plant provided for use on the site will be in good working order to ensure optimum fuel efficiency, and will be regularly inspected to ensure they are free from leaks;
- Sufficient spill kits will be carried on all vehicles;
- Vehicles and plant will be regularly maintained to ensure that they are working at optimum efficiency and are promptly repaired when not in good working order;
- Vehicles and plant will not park near or over drains; and
- Refuelling of vehicles and plant will be carried out on hard standing, using drip trays to ensure no fuel can contaminate the ground outside of the bunded areas.

Concrete

The following measures will be implemented to reduce risks associated with concrete pouring:

- When working in or near the surface water and the use of introduced materials (e.g. oil) cannot be avoided, alternative materials such as biodegradable oils will be used;
- Placing of concrete in or near watercourses will only be carried out under the supervision of the ECoW;
- there will be no hosing of concrete, cement, grout or similar material spills into surface water drains. Such spills shall be contained immediately, and run-off prevented from entering the watercourse;
- Concrete waste and wash-down water will be contained and managed on-site to prevent pollution of all surface watercourses; and
- Washout from concrete lorries will not be permitted on-site and will only take place at the batching plant (or other appropriate facility designated by the manufacturer).

Breeding Birds

Unless suitable mitigation is adopted (see next paragraph), hedgerows, trees and scrub will not be removed within the bird breeding season, generally taken to be between 1 March and 31 August, to avoid impacts on nesting birds.

Where this seasonal restriction cannot be adhered to, habitats that need to be removed will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. The ecologist will demarcate a suitable buffer around an active nest and clearance within this area will be postponed until the chicks have fledged. A suitable exclusion zone will be established by the ECoW. Bird deterrents (e.g. flicker tape/compact discs will be tied to habitat confirmed without nests and the habitat will be cleared within three days of the inspection; otherwise, repeat inspections will be carried out to confirm the continued absence of nesting birds. If vegetation is to be cleared in the breeding season (under supervision of an ecologist), it will be chipped, removed or covered on the same day to prevent birds from nesting. Planting of woodland, hedgerow and grassland habitats within the PAB as detailed in the landscape drawings will provide suitable compensatory habitat for the breeding bird species recorded within the study area. Once established, this will provide nesting habitat for breeding birds displaced as a result of the Proposed Development

Bats

The baseline data gathered on surveys can allow the works to proceed within the legislation. Gathering this information before the works begins allows time for license applications if roosts are found and reduces the likelihood of the need to stop works, which may prove costly dependent on the licence application process. Despite the fact that no bat roosts are known to be present, to avoid the risk of killing and injuring bats during construction, all trees to be removed will be subject to pre-construction checks or soft felling.

Soft felling is where tree limbs are cut and left grounded overnight to allow bats to escape, prior to further cutting of the trunk. Soft felling should only be undertaken between midway through August – early November when juvenile bats are capable of flight. In the unlikely event that any roosts are confirmed, given that none were recorded during baseline surveys, the tree(s) would be felled under a derogation licence. The following will be provided such as:

- The provision of an alternative roost (bat box) in a suitable, undisturbed location, away from the construction works, either within the Planning Application Boundary where works have been carried out or on third-party lands, and with the agreement of landowners.
- The loss of trees with high potential for roosting bats will be mitigated for on a 3-to-1 ratio with bat boxes, and moderate potential trees will be mitigated on a 2-to-1 ratio with bat boxes.
- The ECoW will ensure that a range of suitable models will be used, suited to the species recorded within the study area, and for different seasons.
- The boxes will be erected in a suitable location. It may be necessary for temporary lighting to be provided at construction compounds for security purposes.
- Temporary lighting will be controlled and directed in order to mitigate any potential impacts to bats as advised by the appointed ECoW. Control measures will include cut-off cowls, suitable colours of lights are used, and ensuring lights are orientated in suitable directions.

Otter

Following the pre-construction surveys, the following general mitigation measures for otter will be implemented:

- Any excavations will be covered at night to prevent otter from falling in or becoming trapped;
- Should any otter be observed within the PAB or should any evidence of otter activity be found during the works, works must cease immediately and the ECoW contacted for advice;

- Should a non-breeding otter holt or rest site be unexpectedly identified, a buffer zone of 30 m will be implemented around the feature. Where a resting place is confirmed to be a natal site this would increase to 150 m; and

- NRA's Guidelines for the Treatment of Otters (NRA 2008b) will be followed at all times.

Although there are not predicted to be any impacts on otters, if confirmatory surveys identify likely disturbance of otters, further mitigation will be implemented to ensure no significant effects on otters arise.

Badger

The following general mitigation measures for badger will be implemented during the construction phase, after badger pre-construction surveys have been carried out:

- Ground excavations will be covered at night to prevent badger from falling in or becoming trapped;

- Any works within 30 m of an active sett will be supervised on-site and full-time by an ECoW (extended to 50 m during the breeding season for a main sett where there is breeding activity);

- Breeding setts will not be interfered with or disturbed during the badger breeding season (December to June inclusive);

- Only the use of hand tools will be permitted within 20 m of an active sett;

- No heavy machinery will be used within 30 m of a sett;

- During the breeding season, none of the construction works will be undertaken within 50 m of active setts nor blasting (if required) within 150 m of active setts. Should this not be possible, an experienced ecologist will be contacted for advice on how best to proceed; the ecologist will be able to advise on any mitigation options that may be available relative to the predicted scale and duration of impact (which is informed by the proposed works and sett specifics, i.e. sett type, level of sett activity, tunnel direction, type of substrate, vegetative cover, and topography)

- Night-time working will be restricted as far as possible within 100 m of a sett;

- The use of noisy plant and machinery with 30 m badger setts will cease before sunset; and

- Any spoil heaps will be sited at a minimum distance of 30m from setts.

Squirrels

Squirrels breed in winter (young born February to April) when trees are proposed to be felled (i.e. outside the bird nesting season). Even if adults vacate their dreys, if present, young could be killed. Dreys are often distinguishable from bird nests as dreys are constructed in the main upper tree trunk (not upper thinner terminal branches). Dreys are not usually in isolated trees, and typically have leaves attached to twigs. Grey squirrels are a scheduled invasive species widespread in the environs of the Proposed Development site. Red squirrels are a nationally protected species with a patchy distribution in the environs of the Proposed Development site.

Where pre-construction confirmatory surveys identify potential dreys at risk from felling, vantage point watches (for individual trees) or transects (for hedgerows/groups of trees) will be conducted to visualise squirrels and identify if the squirrel is grey (invasive) or red (protected). Surveys will be conducted in the early morning, during the summer months. Where visualisations are inconclusive, hair tube surveys may be required, following the method in NRA (2009). As grey squirrels are a scheduled invasive species, confirmed grey squirrel dreys can be felled without mitigation. In the event that confirmed or suspected red squirrel dreys require felling, felling will only be carried out from October to January, in consultation with the NPWS, who may require a licence, subject to survey findings.

Other Protected Mammals

Removal and clearance of vegetation may affect small mammal species if present in these habitats. The following measures will be adhered to in order to minimise impacts to small mammal species:

- Any excavations will be covered at night to prevent small mammals from falling in and / or becoming trapped;
- Working at night will be prohibited where specific tasks such as vegetation removal and clearance are to be carried out and will be informed by the ECoW;
- Any lights will be turned off after working hours, unless required for safety or security reasons;
- Noise mitigation level as outlined in Chapter 9 (Noise and Vibration) of this EIAR will be followed; and
- With the exception of permanent areas of hardstanding and cable easement, the site will be re-vegetated, post-construction.

Amphibians and reptiles

Removal and clearance of vegetation may affect amphibians or reptiles if present in these habitats. The following measures will be adhered to, to minimise impacts on amphibians or reptiles:

- Vegetation will be cleared in two stages, during the reptile and amphibian active season, following the completion of the toolbox talk: specific to amphibians and reptiles:
    - A hand-search by a licensed ECoW for any animals present within vegetation to be cleared, followed by a first cut of vegetation down to 210 mm above ground-level using hand tools;
    - A second hand-search of vegetation by an ECoW for any animals present, followed by the second cut of vegetation to ground-level (or as close as practicable).
- If any reptiles are found during pre-construction surveys or during works, they will be captured and translocated by a suitably qualified and experienced ecologist under licence to a previously identified receptor site.
- Where practicable in the context of construction, water levels will be maintained in any watercourses potentially used by amphibians; and
- Habitat reinstatement will re-create, except in areas of permanent hardstanding, the former habitats within the PAB.

Invasive Plant Species

A management plan for those Third Schedule invasive plant species recorded during the survey which have the potential to be impacted by the works will be prepared. The mitigation measures described below follow the recommendations set out in the Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2010):

- All staff will be informed of the presence of Himalayan balsam and any other invasive species through toolbox talks;
- Exclusion zones will be established where necessary to prevent the spread of invasive species;
- No machinery will be allowed within exclusion zones other than where necessary to undertake treatment measures;

- Any plant material and soil-containing plant material must be disposed of in accordance with the NRA (2010) guidelines; and

- Care will be taken near watercourses to ensure that material that contains flower heads, seeds or cuttings of any invasive species will be disposed of correctly and not enter watercourses.

10.6.4.2 Specific mitigation measures

European designated sites

The NIS for the Proposed Development (Jacobs 2024b) found that, in the absence of mitigation, likely significant effects on the Rye Water Valley/Carton SAC could not be excluded, because this SAC is hydrologically connected to the PAB by the following waterbodies: WB03 (Cullendragh); WB04 (Jenkinstown Stream); WB09 (un-named ditch, flows into Rye Water); WB10 (Bride Stream); WB12 (un-named ditch, flows into Rye Water); WB13 (Rye Water); WB26(un-named ditch, flows into River Lyreen); WB16 (River Lyreen); WB20 (un-named ditch, flows into River Lyreen); WB22 (Baltracey River, flows into River Lyreen).

Mitigation measures to protect the Rye Water Valley/Carton SAC from water pollution are described in the NIS (Jacobs 2024b) and in the site-wide mitigation measures above.

Nationally designated sites

In addition to the site-wide waterbody mitigation measures, the following mitigation relating to HDD will be put in place where it crosses the Grand Canal pNHA and the Royal Canal pNHA to prevent bentonite drilling fluid release entering these canals:

- When using HDD, the drilled cuttings will be flushed back by the drill fluid flowing via nozzles in the drill bit, to the surface, where they will be separated from the fluid fraction for disposal. A comprehensive closed-loop drilling fluid mixing and circulation system with recycling capability will be used to minimise the volume of fluids required on site;

- The shaft and borehole will be kept at least 50 m away from any watercourse where possible. However, given that the shaft will be kept as short as possible to reduce the risk of the drilling machine becoming stuck, it may not be possible to keep 50 m from a watercourse. In this case, a bunded area will be created around the temporary working space to prevent slurry washing into the waterbody in the case of accidental release;

- Use will be constantly monitored by the contractor through materials balance calculations, pressure monitoring in the lines and above ground visual assessment of the works. The pressure will be lowered, if necessary, to prevent a breakout. Bentonite pumping will stop immediately if any sudden drop in pressure is detected which could indicate a bentonite breakout;

- Biodegradable drilling mud formulation and management for the conditions and best practice drilling practices will be adhered to by the contractor at all times; and

- The contractor will further develop the emergency action plan, which is included in the CEMP which will include containment, control and clean-up measures in the event of drilling fluid release into the environment. Containment measures include installing interception devices (e.g., silt fence, staked straw bales, sediment curtains, collection sumps).

Otter

The mitigation measures described below follow the recommendations set out in the Guidelines for the Treatment of Otters during the Construction of National Road Schemes (NRA, 2008b)

One potential otter holt was identified within the PAB during the field surveys (see Figure 6, Appendix 10.7). Due to an apparent active Otter holt within 150 m of the Proposed Development, subject to further confirmatory surveys, a derogation licence will be required to undertake the proposed works. To confirm the holt status, the holt will be monitored under licence for a minimum of five days using remote cameras. Camera trap surveys will be undertaken prior to licence application. This will involve placement of static cameras at the holt for five consecutive nights.

Should the holt be determined to be inactive, works can proceed under the supervision of an ECoW. Should the holt be determined to be active, a buffer zone will be established as agreed with the ECoW – up to 150 m for a natal site. The NRA's Guidelines for the Treatment of Otters (NRA 2008b) will be followed at all times This Guidance states the following: when holts are present, no wheeled or tracked vehicles will be used within 20 m, and no light work will occur within 15 m. When a non-breeding otter holt or rest site is identified, a buffer zone of 30 m will be implemented around the feature, while when a breeding otter holt or resting site is identified, the buffer zone will be extended to 150 m – buffer zones will have to be fenced prior the beginning of the works. Moreover, should works occur in the vicinity of otters' holts with breeding females or cubs, screening will occur and working hours will be restricted. Disused and inactive holts can be destroyed, after being identified as inactive holts and after their entrances have been blocked and monitored for a five-days period. Exceptions can be adopted under licence; Guidelines for the Treatment of Otters Prior to Construction of National Road Schemes (NRA 2008b) states that a license will be required for any works likely to cause disturbance (e.g. piling and blasting) to active breeding holts when present with 150 m of a scheme.

Badger

Mitigation measures follow the recommendations set out in the NRA Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA 2006).

During the baseline surveys, it was identified that seven badger setts/potential badger setts could be impacted by the Proposed Development, including five within 50 m of the PAB and two between 61 m and 150 m (see Table 10.20 and on Figure 7, Appendix 10.8).

Of the seven setts, there are three active setts: one at 32 m, one at 40 m and one at 150 m from the PAB, and four are inactive (all within 61 m of the PAB).

To determine whether a sett is active or inactive, prior to commencement of construction, camera traps will be set up to monitor the entrance to the holes for a minimum of five days. If, after five days, there is no evidence that badgers are using the sett, it is presumed inactive and no further actions are required. However, this would only apply if the camera trap monitoring was carried out directly prior to the start of works, meaning there was no change to the baseline. The use of the sett may change over time, so if there is a delay of more than 12 months prior to the commencement of the works from the date of the final camera monitoring, then a further badger survey will be undertaken to determine the status of the hole.

No heavy machinery will be used within 30 m of active badger setts; lighter machinery (generally wheeled vehicles) will not be used within 20 m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10 m of sett entrances. During the breeding season (December to June inclusive), none of the above works will be undertaken within 50 m of active setts nor blasting or pile driving within 150 m of active setts.

Affected badger setts should be marked and the extent of bounds prohibited for vehicles clearly marked by fencing and signage. When there is the need of proceeding with works close to active setts during the breeding season, mitigation measures, such as sett screening and restricted working hours will be adopted, prior expert consultation. To determine whether a sett is active or inactive, camera traps will be set to monitor the entrance to the holes for a minimum of five days. If, after five days, there will be no evidence that badgers are using the sett, it will be considered inactive, and no further actions will be required. However, this will only apply if the monitoring was carried out directly prior to the start of works, meaning there was no change to the baseline. The use of the sett may change over time, so if delays occur (more than 12 months prior to the commencement of the works from the date of the final camera monitoring), further badger surveys will be undertaken to determine the status of the hole. Disused and inactive setts entrances can be blocked to prevent the reoccupation, and sett can be destroyed using a mechanical digger after 5 days of monitoring, under the supervision of the licensee. Construction activities within the vicinity of affected setts can begin after setts have been evacuated and destroyed under licence from the public authority. Alternatively, when affected setts do not require destruction, construction works will start after recommended alternative mitigation measures have been addressed (NRA 2006b).

Works close to badger setts will only be conducted under the supervision of a qualified expert under licence from the public authority.

Fish and aquatic invertebrates

The following control measures will be implemented during construction in or adjacent to a watercourse:

- In-stream works will not be carried out in watercourses frequented by salmon or trout during the Annual Close Season. The duration of the season varies regionally within the period from the beginning of October to the end of February, inclusive (IFI 2016). River and brook lamprey spawn during March to April/May. Translocation (fish rescue) and in-stream works will be undertaken outside of the spawning season for salmonids (salmon and trout) and lamprey (river and brook), generally taken to be summer to early autumn, which would also protect white-clawed crayfish. The timing of works will be considered on a site-specific basis and in agreement with the IFI;

- Operation of machinery in-stream will be kept to an absolute minimum. All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will be cleaned and checked prior to commencement of in-stream works;

- The design of temporary settlement ponds, the outfalls from these temporary ponds and the construction method statements for their installation will be agreed with IFI prior to construction;

- The area of disturbance of the watercourse bed and bank will be the absolute minimum required for the installation of outfalls/culverts;

- Any dewatering flows will be directed to the construction drainage system and to the settlement pond (or other) treatment system;

- Sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the ECoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI;

- Small check dams will be constructed in the cut-off watercourse to trap any sediment, and a sediment trap will be provided immediately downstream of the diversion to the existing watercourse; and

- Where in-stream bed material is to be removed, coarse aggregates, if present, will be stockpiled at least 10 m away from the watercourse for replacement following reinstatement of a watercourse channel.

Watercourse banks affected during construction in/near a watercourse will be reinstated back to pre-development conditions.

Where open trenching is proposed, site restoration works will be carried out following completion of the crossing, in agreement with IFI (see Table 10.25 for list of these watercourses). These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Open cut trenching works will not be carried out during extreme rainfall or high flow events. Met Éireann provides a five-day weather forecast via its website (www.met.ie) and works will not take place during orange and red weather warnings unless agreed with the ECoW. Unless otherwise agreed with IFI (for fish) and/or the NPWS (for white-clawed crayfish), any element of the works requiring in-stream works will be restricted to the fisheries open season (i.e. restricted to July to September inclusive). Where white-clawed crayfish were confirmed as present (WB46 and WB32), works will be carried out under licence.

Additional measures that will be undertaken to protect fish species and white-clawed crayfish are as follows:

- Where in-stream trenching is to be carried out, the area will be dewatered to provide a dry working area;
- Netting, sandbags and/or dumpy-bags filled with rock will be installed upstream to prevent fish travelling downstream into the working area. An impermeable barrier will be tailored to the watercourse in question, where technically feasible, fluming will be preferred to over pumping techniques to provide the dry working area;
- Fish will be removed from the working area through electrofishing and moved upstream of the dammed area;
- Hand searches, under licence, will be conducted at WB46 and WB32 where crayfish were confirmed to be present, and any crayfish found will be removed and moved upstream of the dammed area;
- Water will then be over-pumped continually to ensure a dry working area. This will be pumped through a silt buster to avoid sediment from becoming suspended within the watercourse; and
- Once construction is completed, the watercourse will be re-wetted under the direction of the ECoW. Water will be released slowly, and silt mats, sediment traps and haybales will be used to avoid a sudden influx of sediment to the system. A silt buster will be used where required.

Invasive species

Himalayan balsam was present along the route of the Proposed Development between ch 37000 and 37250 at N 87990 24456, 40 m from the HDD launch platform on the west bank of the River Liffey, and at the same location but 70 m south of the PAB at N 87999 24353. These areas will be fenced off and toolbox talks given to raise awareness. Where this is not possible, biosecurity measures will be carried out as presented in the site-wide mitigation section.

10.6.4.3 Reinstatement

General Requirements (All Hedgerows)

All planting will be native (only), taking account of the vegetation that has been removed and typical species of the Kildare/Meath landscape.

A post-consent baseline survey of all hedges to be removed will be carried out to characterise its canopy, understorey and field layer species, and associated features (ditches, earth banks, walls etc.) to inform reinstatement.

Unless otherwise agreed with the Developer (ESB) and the local authority, the Contractor will reinstate hedgerows and treelines to a species-rich condition (i.e., five woody species per 30 m), comprising only native species. All other sites will be returned as close as possible to their pre-existing condition, using the same woody species removed, under the supervision and direction of the Contractor’s ECoW.

Hedging/hedgerow plants will be planted as a staggered double row, six plants per metre with 330 mm between rows. Suitable individual protection from browsing animals will be provided by tube, spiral or similar held in place with a short cane. Group protection of new planting may be provided by suitable fencing, but individual plant protection of spirals will be provided to protect against browsing animals. Mulch mats or similar weed suppression materials (restricted to a biodegradable specification) will be used to promote successful establishment.

The appointed Contractor will make orders by the scientific name to ensure native plants are delivered and not a cultivated variety.

Nurseries prefer to grow trees to order, so the Contractor will make the order as soon as possible (up to a year in advance) to ensure the required species and stock specification can be secured.

Consideration will be given to the procurement of planting so that there are suitable lead-in times to ensure that plants are of the right age/height required for when they are planted.

The Contractor will manage the establishment phase of planting (1–2 years) in accordance with online Teagasc guidance (Teagasc, 2020), to include watering in, weed suppression (using biodegradable mulches), and (where required) protection from browsing animals.

Thereafter, the Developer (ESB) will manage plantings from years 3-5 in agreement with the landowner.

Specific Requirements (Hedgerows and Trees Within The Cable Easement)

At the time of writing, the latest specification (EirGrid 2021) stated:

"*The easement area shall be cleared, and kept clear, of trees and other vegetation with deep root systems as these may damage the cable*".

Since publishing this specification, EirGrid has identified precedence from Germany and the Netherlands; for safely planting certain shrubs over High Voltage underground cables EirGrid has engaged closely with ESB, and relevant Dutch and German Transmission System Operators across Europe, to understand feasibility of planting over HV underground cables in Ireland. A Draft Over Cable Planting Strategy is in advance development in consultation with ESB, for which the Design Risk Assessment DRA was ongoing at time of writing (including calculations to assess a possible cable de-rating). The draft strategy combines the requirement for a minimum cable burial depth of 1m (to top of Cement Bound Granular Mixture in the cable trench), use of a high performing Root Barrier Membrane, and a strictly defined shrub species list with known maximum root depths less than 1m. It is possible the DRA may conclude that over cable planting cannot be delivered while guaranteeing cable performance and security. There are also risks that the strictly defined shrub species list is not compatible with landowner farm boundary requirements and/or agricultural farm payments. As such, applying a precautionary principle, in this assessment offsite compensatory planting is assumed for all permanent losses within the easement.

Specific Requirements (Semi-Natural Grasslands)

The appointed Contractor's ECoW will develop site-specific reinstatement plans for all semi-natural habitats (including dry calcareous grassland, dry meadows and grassy verges, and reed and large sedge swamps). These plans will be provided to the Developer's Ecologist (ESB), and the Planning and Environmental Unit in EirGrid's Chief Infrastructure Office. In accordance with the All-Ireland Pollinator Plan, commercial seed mixes will not be sown with the objective of restoring biodiversity. Seeds of certain plant species, such as wildflowers and certain species included in multi-species mixtures, are not subject to the seed certification schemes as implemented by the EU Member States and OECD-designated authorities in respect of third countries (Department of Agriculture, Food, and the Marine, 2021). Furthermore, even where harmful weed species are not present, seeds of non-local origin — even if the species are native — introduce new genetic strains which may displace or compromise the local, naturally-occurring flora (Dublin Naturalists Field Club 2021).

As such, in the site-specific habitat reinstatement plans for semi-natural habitats, the Contractor's ECoW will adopt the following approach, subject to consultation with the NPWS:

- Where it is deemed appropriate to allow habitats to re-vegetate naturally (e.g. roadside verges, where similar habitat is contiguous either side of the construction area), there will be no active seeding of reinstated topsoil;
- In all other areas, the preferred approach to reinstatement shall be use of locally collected seed from similar habitats;
- Use of commercial seed in semi-natural habitats will only be permitted where local seed is not available, or where local seed establishment has failed, and if both:

  - Certified native by the Department of Agriculture, Food, and the Marine; and,
  - With the written agreement of the NPWS.

General Requirements (Roadside Verges and Agricultural Areas)

Measures for use of seed in grassland reinstatement are as follows:

- Commercial seed mixes can be used on agricultural lands. All other areas will be left to naturally revegetate from the seed bank within reinstated soils (EirGrid 2023);.
- All seed mixes will be certified native by the Department of Agriculture, Food, and the Marine; and
- In agricultural areas, the rate of seeding, time and method of sowing, including the application of fertiliser, will be agreed with an experienced agronomist and will follow the guidance on reseeding (Teagasc 2020).

Monitoring

To ensure that the proposed mitigation measures remain effective, particularly in regard to reinstatement and compensation, the Contractor and ESB will collectively deliver a five-year monitoring landscape aftercare regime.

Sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the independent ECoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI.

10.6.4.4 Reporting

All reinstated or indirectly impacted semi-natural vegetation will be inspected at the completion of construction, at which time the Contractor's ECoW will provide written reports on habitat condition to the Developer's Ecologist (ESB), and EirGrid Planning and Environmental Unit. At that time, the Developer's Ecologist (ESB) will determine what additional steps are required. Additional steps could include replacement tree planting, additional hedge mulch or protection from browsing animals, or sowing of locally harvested seed (using a green hay approach) for semi-natural grasslands).

10.6.5 Operational Phase

The off-site compensatory planting will be maintained throughout the operational phase, by a third party charity supplier.

No other mitigation is proposed during the operation phase. The effects of operation of the Proposed Development are expected to be minimal on the IER, with most of the impacts to them occurring during the construction stage. Along most of the proposed cable route, the road will be re-instated for public use, and vegetation previously removed will be re-instated, except along the permanent easement, at joint bays, along permanent access tracks, and where over-cable planting is not technically viable due to asset risk.

10.7 Residual Effects and Compensation (Unrelated to European Sites)

Residual significance is defined as the level of significance of a potential impact or effect following the implementation of mitigation. For the purpose of this assessment, significant residual effects are only considered for permanent habitat losses (as outlined in Table 10.23).

There will be short to medium term significant residual effects at Local-County scale from the loss of hedgerows and treelines (WD1, WL1 and WL2) until new species rich hedgerows and treelines are established. There will be a permanent Significant residual effect estimated at County significance from the loss of mature trees as trees cannot be compensated with replacement planting due to the time taken for trees to reach maturation. There will be short to medium term significant residual effects at Local level from the loss of dry meadow and grassy verge (GS2)) until new grassland and meadows can establish. There are no compensation options available for wet grasslands (GS4).

Through the implementation of well-established approaches to mitigation, which will be implemented in accordance with best practice guidance, it will be possible to reduce the impacts to local level for all IEFs, except mature trees. There will be permanent significant residual negative ecological effects on trees despite the mitigation proposed, therefore these will be offset by appropriate compensatory measures being proposed to deliver 130% of trees permanently lost. Net habitat loss areas after mitigation (measured simply by habitat area), and habitat loss or gains after off-site compensatory planting are summarised below in Table 10.26.

An off-site hedgerow compensation strategy has been developed, in light of the urgent biodiversity action required at European and national level, and the hedgerow / tree policy objectives of Meath County Council (particularly HER POL 37, HER POL 38, HER POL 40) (MCC 2021) and Meath County Development Plan 2021-2027 policies (particularly HER POL 37, HER POL 38 and HER POL 40) (MCC, 2021).

A draft Over Cable Planting Strategy is in advance development in consultation with ESB, for which the DRA was ongoing at time of writing. However, applying a precautionary principle, it is assumed the DRA will conclude planting cannot be carried while maintaining technical and safety standards. The off-site compensatory planting will be entirely outside the PAB. A minimum of 130% compensatory off-site planting will be delivered by the Developer (ESB), in consultation with EirGrid. The surplus will deliver an overall biodiversity net gain.

Subject to consent, the planting will commence in advance of, or in parallel with, the construction phase. EirGrid has identified candidate sites in Co. Meath and Dublin in consultation with a charity partner, who provides compensatory planting options on third-party lands. Whether these candidate sites or other sites are used for compensatory planting, there will be no planting in semi-natural habitats of significant ecological value, which will be verified by the Ecologist employed the compensation supplier.

10.8 Conclusion

Significant residual effects are predicted for: dry meadows and grassy verges; wet grassland; (mixed) broadleaved woodland; hedgerows; treelines and individual trees. There are no compensation options available at present to offset the significant residual effects upon dry meadows and grassy verges or wet grassland; as such losses are permanent Significant effects, estimated at Local (High) geographic scale. Compensatory measures are proposed for hedgerows, treelines and individual trees although there will be an inevitable loss of biodiversity until these habitats have established (approximately 5-10 years for hedgerows and 20-30 years for treelines and individual trees). The loss of mature trees is considered a permanent residual effect of county significance due to the time taken for replacement trees to reach maturation.

Following off-site compensation there will be a net gain in tree numbers and with EirGrid's commitment to monitor mitigation success and embed Nature Inclusive Design into all projects the Proposed Development will ultimately align with Kildare County Development Plan 2023-2029 policies (in particular BI P4, BI P5 and BI P6) (KCC 2021) and Meath County Development Plan 2021-2027 policies (particularly HER POL 37, HER POL 38 and HER POL 40) (MCC 2021).

Table 10.26: Net habitat loss areas and Gains of Important Ecological Features (IEF) after mitigation and after compensation

Habitat Description (Fossitt Code)	Permanent Net Habitat Loss after mitigation (km or ha)	Significant residual effect	Compensation Proposed	Net Habitat Loss or Gain after Compensation (km or ha)
FW4 (Undifferentiated ditches/watercourses)	0.19km	No	N/A	Loss of 0.19km
GS2 - Dry meadows and grassy verges	0.67ha	Yes	No – no compensation options available	Loss of 0.67ha
GS4 - Wet grassland	0.78ha	Yes	No – no compensation options available	Loss of 0.78ha
WD1 - (Mixed) broadleaved woodland	0.51ha	Yes	0.66ha (130% compensation)	no change
WL1 Hedgerows	0.7 km	Yes	0.9 km (130% compensation)	Net gain of +0.2km
WL2 Treeline	0.8 km	Yes	1.04 km (130% compensation)	Net gain of + 0.24km
WS1 - Scrub	0.44ha	No	N/A	Loss of 0.44ha
Individual trees	348	Yes	452 (130% compensation)	Net gain of 104 trees
	*A further 710 trees are considered within the Arboricultural Assessment (Appendix 5.6) as at risk. Furthermore, three significant trees as defined in the Arboricultural Assessment were identified as at risk from removal from the Proposed Development., however none were assessed as veteran or ancient. *Study area as defined in the Arboricultural Assessment (Appendix 5.6), as the planning application boundary plus a 30m buffer. Note, due to the data collection methodology for the arboricultural survey the individual tree data includes trees within treelines, hedgerows, and woodland. The respective permanent loss and compensation figures are therefore indicative only as double counting of these habitat types is unavoidable. Trees also take many years to reach maturity so there will be residual impact from trees felled before they reach maturity.			

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11. Soils, Geology, and Hydrogeology

11.1 Introduction

This chapter presents the assessment of the likely significant effects arising from the Proposed Development to land, soils and hydrogeology. This chapter also provides an assessment of the compliance of the Proposed Development with 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 (hereinafter referred to as the Water Framework Directive or WFD), in terms of groundwater.

This chapter considers the likely significant effects during construction and operation of the proposed development with regard to:

- Land cover;
- Soils and geology; and,
- Hydrogeology.

Environmental control measures and mitigation measures to avoid, reduce and/or offset the anticipated potential effects are presented as appropriate.

The assessment of surface water is presented in Chapter 12 (Hydrology), including Flood Risk. The assessment of effects on biodiversity is discussed in Chapter 10 (Biodiversity). The assessment of effects on agriculture is discussed in Chapter 15 (Agronomy and Equine).

11.2 Methodology

11.2.1 Relevant Guidelines, Policy and Legislation

This assessment has been carried out in compliance with the following guidance, and has been adapted to reflect the nature of the Proposed Development and attributes of the environmental receptors, based on professional judgement and experience:

- S.I. No. 538/2001 - European Communities (Environmental Impact Assessment) (as amended) Regulations, 2001;
- S.I. No. 722/2003 - European Communities (Water Policy) Regulations 2003;
- S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010;
- S.I. No. 366/2016 - European Union Environmental Objectives (Groundwater) (as amended) Regulations 2016;
- 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 (Water Framework Directive);
- Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (hereafter referred to as the Groundwater Directive);
- Land contamination: risk assessment (EA 2021);

- British Standards Institution (BSI) British Standard (BS) 10175:2011 + A2:2017 Investigation of potentially contaminated sites. Code of practice (BSI 2017);
- Construction Industry Research and Industry Association (CIRIA) C552 Contaminated Land Risk Assessment: A Guide to Good Practice (CIRIA 2001);
- CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings (CIRIA 2007);
- Ireland-Specific Good Practice Guidance for the Development of Ground Gas Conceptual Site Models – An IBN Position Statement (Ireland Brownfield Network 2023);
- EPA (2003). Towards Setting Guideline Values For The Protection of Groundwater In Ireland;
- Institute of Environmental Management and Assessment (IEMA) Guide: A New Perspective on Land and Soil in Environmental Impact Assessment (hereafter referred to as the IEMA Guide) (IEMA 2022);
- Institute of Geologists of Ireland (IGI) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI 2013);
- National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2009); and
- Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013).

11.2.2 Data Collection

The following data sources have been accessed in December 2023 during the collation of baseline information on the receiving environment with respect to land and land use, soils and geology, and hydrogeology.

- Geological Survey of Ireland (GSI) database (GSI, 2023);
- Environmental Protection Agency (EPA) database and mapping (EPA, 2023);
- Teagasc Agriculture and Food Development Authority soil maps (Teagasc, 2023);
- National Parks & Wildlife Service (NPWS) Public Map Viewer; and
- Map of Irish Wetlands.

The GSI database has known limitations. It is not required for private water supplies to be registered with GSI and so there is the possibility of additional supplies present without being registered. It is recommended by the GSI not to rely on this database, as it is not comprehensive with many wells and springs not included, and the GSI record may also include historical abstractions which are no longer active. Due to the uncertainty of location and existence of these private water supplies as a precaution unknown supplies that may not be included in the GSI dataset have also been assessed with mitigation measures proposed in this chapter that will ensure no significant effects.

A ground investigation (GI) was undertaken covering the proposed cable route of the Proposed Development to provide geotechnical information for input to the design and construction of the Proposed Development. The GI was undertaken by Causeway Geotech Ltd, and was led by Paul Dunlop BEng(Hons) PhD CEng MIEII and Ciaran Doherty BSc, Pg Dip (Environmental Engineering & Management Practice). Paul is a Director at Causeway and has over 20 years' experience in GI. He has led Causeway since 2012, undertaking many GI contract across Ireland. Ciaran has over 15 years' experience in GI and has been with Causeway since 2012.

The GI included boreholes, trial pits, slit trenches, geophysical surveys, soil and rock core sampling, environmental sampling, groundwater monitoring, in situ and laboratory testing and reporting of results. Further details regarding the findings of the GI are presented in Section 11.3.6 below.

Information on potential groundwater dependent terrestrial ecosystems (GWDTE) was provided by the ecology team, based on Fossitt habitat surveys conducted by the team between June and October 2022. These surveys were undertaken up to 250 m either side of the Proposed Development. Further information on the survey techniques and the study area are provided in Chapter 10 (Biodiversity) of this EIAR.

There were no significant limitations in the preparation of this chapter. Because of the limitations in GSI groundwater data, there is the possibility of undiscovered water supplies (wells, etc). An assessment has been made of such sources and mitigation measures proposed in this chapter will ensure no significant effects. A summary of interim GI data is provided in this chapter and there are acknowledged limitations in terms of duration of groundwater monitoring, seasonal variation, and a spread of GI locations. These limitations are typical of interim GI data and given the scale of the potential effects of this Proposed Development, these do not affect the outcome of the assessment.

11.2.3 Study Area

The study area is based on 250 m from the edge of the Planning Application Boundary with regard to soils and geology. This is referred to as the 250 m study area in this chapter. This is considered a suitable distance to enable description of baseline conditions and allow assessment of soils and geology. In the absence of Ireland specific or more recent guidance this 250 m study area has been based on professional judgment with reference to National House Building Council (NHBC) and Environmental Agency (EA) guidance; Guidance for the safe Development of Housing on Land Affected by Contamination R&D66 (NHBC and EA 2008).

With regard to hydrogeology, the study area for the Proposed Development has been defined as the surrounding 1 km from the edge of the Planning Application Boundary. This is referred to as the 1 km study area in this chapter. This buffer allows for the identification of receptors outside the location of the physical works, which could potentially be impacted by the works. From a hydrogeology perspective these could be impacted by activities such as change in groundwater levels caused by dewatering or disturbance (in flow and/or quality) of groundwater. These in turn may support receptors such as GWDTEs or provide baseflow to watercourses. Based on professional judgment. it is not expected that impacts to groundwater and its receptors will extend beyond 1 km the 1 km study area defined above. In addition to this, impacts to land use, soils and geology will be localised to the works area, and are not expected to extend beyond the 1 km buffer set out above.

11.2.4 Assessment of importance/ sensitivity of receptors

The criteria used for assessing the importance/sensitivity of the geological and hydrogeological environments within the both of the study areas are outlined out in Tables 11.1, 11.2 and 11.3.

The importance / sensitivity of the geological receptors was assessed following NRA (2009) Guidance and is displayed in Table 11.1.

Table 11.1: Criteria for Rating Site Importance of Geological Features (from NRA, 2009; IGI, 2013)

Sensitivity/ Significance	Criteria	Typical Examples
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale [1]. Volume of peat and / or soft organic soil underlying alignment is significant on a local or regional scale	Geological feature rare on a regional or national scale. Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high-quality significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale [1]. Volume of peat and / or soft organic soil underlying alignment is significant on a local scale.	Contaminated soil on-site with previous heavy industrial usage [1] Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site). Well drained and / or high fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale [1]. Volume of peat and / or soft organic soil underlying alignment is moderate on a local scale.	Contaminated soil on-site with previous light industrial usage [1]. Small recent landfill site for mixed wastes Moderately drained and / or moderate fertility soils. Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale [1]' Volume of peat and / or soft organic soil underlying alignment is small on a local scale.	Large historical and / or recent site for construction and demolition wastes Small historical and / or recent landfill site for construction and demolition wastes [1]. Poorly drained and / or low fertility soils Uneconomically extractable mineral resource.

Recently published IEMA guidance (IEMA, 2022) provides additional guidance on classifying receptor sensitivity for in situ soils based on soil resource and soil functions, which has also been taken into account and is provided. The IEMA guidance provides examples of UK classifications which differ to classifications in Ireland although there is some commonality and these sensitivity classifications have been used within the assessment where appropriate and applicable. Table 11.2 describes the criteria for which soils sensitivity is based.

Table 11.2: Guidance on Rating Soil Receptor Sensitivity and Typical Soil Resource / Function Descriptions (from IEMA, 2022)

Receptor Sensitivity	Soil Resource and Soil Functions
Very High	**Biomass production:** ALC Grades 1 & 2 or LCA Classes 1 & 2. **Ecological habitat, soil biodiversity and platform for landscapes:** Soils supporting protected features within a European site (e.g., SAC, SPA, Ramsar); peat soils; soils supporting a national park, or ancient woodland. **Soil carbon:** Peat soils Soils with potential for ecological / landscape restoration. **Soil hydrology:** very important catchment pathway** for water flows and flood risk management. **Archaeology, Cultural Heritage, Community benefits and Geodiversity:** SAMs and adjacent areas; World Heritage and European designated sites; soils with known archaeological interest; soils supporting community / recreational / educational access to land covered by national park designation. **Source of Materials:** Important surface mineral reserves that would be sterilised (i.e. without future access).
High	**Biomass production:** ALC Grade 3a, or LCA Grade 3.1. **Ecological habitat, soil biodiversity and platform for landscapes:** Soils supporting protected features within a nationally designated site; native Forest and woodland soils; Unaltered soils supporting semi-natural vegetation. **Soil carbon:** Organo-mineral soils (e.g., peaty soils) **Soil hydrology:** Important catchment pathway** for water flows and flood risk management. **Archaeology, Cultural Heritage, Community benefits and Geodiversity:** Soils with probable but as yet unproven (prior to being revealed by construction) archaeological interest: Historic parks and gardens; RIGS; Soils supporting community / recreational / educational access to RIGS and AONBs. **Source of Materials:** Surface mineral reserves that would be sterilised (i.e. without future access).
Medium	**Biomass production:** ALC Grade 3b or LCA Grade 3.2. **Ecological habitat, soil biodiversity and platform for landscapes:** Soils supporting protected or valued features within non-statutory designated sites **Soil carbon:** Mineral soils **Soil hydrology:** Important minor catchment pathway** for water flows and flood risk management. **Archaeology, Cultural Heritage, Community benefits and Geodiversity:** Soils with possible but as yet unproven (prior to being revealed by construction) archaeological interest; soils supporting community / recreational / educational access to land. **Source of Materials:** Surface mineral reserves that would remain accessible for extraction.
Low	Biomass production: ALC Grade 4 & 5 or LCA Grade 4.1 to 7 or Urban soils.

Receptor Sensitivity	Soil Resource and Soil Functions
	Ecological habitat, soil biodiversity and platform for landscapes: Soils supporting valued features within non-designated notable or priority habitats / landscapes. Agricultural soils. Soil carbon: Mineral soils Soil hydrology: Pathway** for water flows and flood risk management. Archaeology, Cultural Heritage, Community benefits and Geodiversity: Soils supporting no notable cultural heritage, geodiversity no community benefits; soils supporting limited community / recreational / educational access to land. Source of Materials: Surface mineral reserves that would remain accessible for extraction.
Negligible	As for low sensitivity, but with only indirect, tenuous, and unproven links between sources of impact and soil functions.
** As defined by the site and catchment characteristics according to the professional judgement of a catchment hydrologist.	

The criteria for determining sensitivity of hydrogeological receptors have been adapted from Transport Infrastructure Ireland (TII) NRA (2009). The criteria and examples for each importance status is set out in Table 11.3.

Table 11.3: Criteria for Assessing the Importance of Hydrogeological Features (adapted from NRA, 2009)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Water feeding GWDTEs with a high or moderate groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) Groundwater supports river or surface water body ecosystem protected by EU Legislation e.g. SAC or SPA status Public potable water supply groundwater abstractions
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river or surface water body ecosystem protected by national legislation – e.g. NHA status. Water feeding GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs and SPAs; or water feeding highly or moderately GWDTE with a national priority.

Importance	Criteria	Typical Example
		Regional potable water source supplying >100 homes or other high volume groundwater usage (such as for bottling plant, large industry or large agricultural farm) Inner source protection area for regionally important water source. Buildings of regional or national importance
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Water feeding GWDTEs of low groundwater dependence with a national priority. Locally important potable water source supplying >50 homes or used for local activities such as local medium scale industry or medium scale farming. Outer source protection area for regionally important water source. Inner source protection area for locally important water source. Residential and commercial properties
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Water feeding GWDTEs of feeding highly or moderately groundwater dependent GWDTE sites with no conservation designation. Potable water source supplying <50 homes or sustaining local small-scale activity such as small scale farming. Outer source protection area for locally important water source. Unoccupied residential and commercial properties and buildings.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Water feeding GWDTEs of low groundwater dependence with no designation. Back-up private water supply used on an ad-hoc basis or used for secondary activities such as gardening when the main potable supply is provided by another source. Industrial buildings that are currently not utilised, all derelict buildings and infrastructure that serves a single dwelling.

11.2.5 WFD Assessment Methodology

The design of the Proposed Development was screened against the various characteristics for groundwater bodies which can impact both the quantitative and qualitative status of the WFD groundwater body. This will determine whether the works require further assessments to be compliant with the WFD. The following quantitative and qualitative elements of the WFD groundwater bodies have been scoped in for this assessment:

- Impact of groundwater on surface water ecological/quantitative and chemical status test;
- Quantitative and qualitative GWDTE test;
- Quantitative Water Balance;
- Qualitative drinking water protected areas; and
- General chemical test.

Following the assessment, where mitigation can be incorporated to maximise opportunities for enhancement, the activity will be considered to have a very low residual risk and therefore will be compliant with the WFD.

11.2.6 Magnitude of impact

The scale or magnitude of potential impacts depends on both the degree and extent to which the Proposed Development may impact the geological and groundwater receptors during the construction and/or the operational phases.

Table 11.4 describes the assessment of the magnitude of impacts to geological receptors based on IGI guidance (IGI, 2013), which can be described as adverse or beneficial.

Table 11.4: Criteria for Assessing the Magnitude of Impact on Geology and Soils (IGI, 2013)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves; Irreversible loss of high proportion of local high fertility soils Removal of entirety of geological heritage feature Requirement to excavate / remediate entire waste site Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves Removal of part of geological heritage feature Irreversible loss of moderate proportion of local high fertility soils Requirement to excavate / remediate significant proportion of waste site Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves Removal of small part of geological heritage feature Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils Requirement to excavate / remediate small proportion of waste site Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Hydrogeological receptors use the TII Assessment Guidelines for determining the magnitude of impacts. The TII Assessment Guidelines do not define beneficial impacts in their categorisation of impacts on hydrogeological features, and therefore the magnitude of potential impacts is assessed on a scale of ‘Negligible’ to ‘Large Adverse’. The criteria for determining the magnitude of impacts for hydrogeological receptors are outlined in Table 11.5.

Table 11.5: Criteria for Assessing the Magnitude of Impact on Hydrogeology (TII, 2009)

Magnitude of Impact	Criteria	Typical Example
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems Potential high risk of pollution to groundwater from routine run-off* Calculated risk of serious pollution incident >2% annually† Dewatering effects create significant differential settlement effects on existing infrastructure and buildings leading to extensive repairs required.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off*. Calculated risk of serious pollution incident >1% annually† Dewatering effects create moderate differential settlement effects on existing infrastructure and buildings leading to consideration of undertaking minor repairs.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off*. Calculated risk of serious pollution incident >0.5% annually† Dewatering effects create minor differential settlement effects on existing infrastructure and buildings which may need to be monitored but where repairs may be avoidable.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually† Dewatering effects create no or no noticeable differential settlement effects on existing infrastructure and buildings
Note: * DMRB Volume 4, Section 2, Part 1 Road Drainage and the Water Environment, Appendix A, Method C (TII, 2015) † DMRB Volume 4, Section 2, Part 1 Road Drainage and the Water Environment, Appendix A, Method D (TII, 2015)		

11.3 Baseline Conditions

11.3.1 Overview

The following sections present a desk-based overview of the baseline conditions of all land use, geological and hydrogeological receptors which lie within both of the study areas. The assessment also includes any WFD groundwater bodies which lie within the 1 km study area. Consideration of the recently completed GI is presented in Section 11.3.6.

11.3.2 Land Cover

The land and land use baseline encountered across the 250 m study area. may be divided into several land use types for which potential contaminant profiles may be assigned. The baseline land use (from the CORINE 2018 land use dataset) is summarised below in Table 11.6 and displayed in Figure 11.6.

The land use that covers the majority of the Proposed Development is agricultural land used for pasture. Within the areas of pasture there are small patches of non-irrigated arable land. Areas of discontinuous urban fabric are associated with the towns/villages of Kilcock, Prosperous, Clane, Naas and Two Mile House.

Between the towns of Prosperous and Clane are small areas of complex cultivation patterns. Within the northern part of the 250 m study area there are also small areas of mixed forest and broad-leaved forests. To the south at Dunstown substation are areas of natural grassland and transitional woodland shrub.

A summary of the land use and approximate locations is provided in Table 11.6.

Table 11.6: Summary of land use types (Corine Landcover, 2018)

Land Use Type	Distribution
Agricultural (pastures)	Located along the majority of the Proposed Development and the surrounding area
Agricultural (non-irrigated arable land)	Located in small sections throughout the pastures, across the entire 250 m study area
Mixed Forest	In the northern part of the 250 m study area south of Woodland substation
Broad-leaved forest	In the northern part of the 250 m study area, west of the Proposed Development
Discontinuous urban fabric	At the towns/villages of Kilcock, Prosperous, Clane, Naas and Two Mile House
Road and rail networks and associated infrastructure	Along the M4 and M7, regional and local road networks. Dublin-Sligo and Dublin-Cork/Limerick railway lines.
Complex cultivation patterns	Between Clane and Prosperous, with a small area north of these towns to the east of the Proposed Development
Peat bogs	West of and within 450 m of the Proposed Development, to the north and northwest of Prosperous
Non-Agricultural vegetated (Sports and leisure facilities)	Small areas south of Clane, east of the Proposed Development
Industrial or commercial units	West of Naas and the Proposed Development
Semi-natural grassland	East of Dunstown substation
Transitional woodland-shrub	West of Dunstown substation

11.3.3 Soils and Geology

There are no Geological Heritage Site present within the 250 m study area.

Soils have been identified using Teagasc mapping (Teagasc, 2023). The majority of the 250 m study area is underlain by soil types comprised of fine loamy drift with limestone (reflecting the underlying limestone bedrock). These soils are typically >75 cm thick. However, some areas in the centre of the 250 m study area could have soils with a thickness of 60 to 120 cm. Soils described as river alluvium are found across the 250 m study area along the courses of the rivers and their floodplains, with the most extensive areas found along the River Liffey in the centre of the 250 m study area and the Royal Canal/ Rye Water in the north.

Bedrock and superficial (quaternary) deposits were identified using GIS datasets including 1:100 k bedrock and 1:50 k Quaternary datasets.

In general, till derived from limestone is the most common quaternary deposit, which is present across the centre and southern part of the Proposed Development. The cable route in the northern part of the Proposed Development (north of the M4) is mainly underlain by till derived from Namurian sandstones and shales. Areas of mapped alluvium and gravels derived from limestone correlate with mapped watercourses and their floodplains. A summary of quaternary deposits within the 250 m study area and crossed by the Proposed Development based on the published information is given in Table 11.7.

As the cable runs north to south from Woodland substation to Dunstown substation it crosses multiple bedrock types with some faulting present along the central section of the Proposed Development, mainly in a northwest to southeast orientation. The geology along the Proposed Development comprises multiple limestone formations, with some mudstone, sandstone and shale formations interbedded. There is an area of Namurian shale sandstones and shales in the northern part of the Proposed Development (north of the M4). A summary of the bedrock geology along with locations is given in Table 11.7.

Geohazards are identified as any karst features, areas of peat, areas susceptible to landslides/subsidence, or mining and quarrying areas. There is no area identified as prone to landslides in the 250 m study area. Given the nature of the bedrock there is the potential for the presence of karst features within the limestone. These include sinkholes, caves, some types of springs and turloughs of which some of these features are mapped within formations present beneath the 250 m study area. No karst landforms are shown on GSI mapping to be within the 250 m study area but there is potential for these features to be present sub-surface.

Areas of peat are not expected to directly underlie the Proposed Development; however, they are present within the 250 m study area near the centre of the Proposed Development between chainage 27500 to chainage 32000.

No operational quarries have been identified within the 250 m study area based on GSI mapping. However, on historic maps six gravel pits and one quarry were identified in the 250 m study area. An historical quarry is located at chainage 6600 and the gravel pits are located on the Proposed Development at chainage 14750, 26750, 30600, 33000, 42750, and 46876. The gravel pits are located on quaternary deposits of gravels, while the quarry is located over an area of exposed shale and sandstone bedrock, surrounded by till derived from Namurian sandstones and shales.

Within the 250 m study area and underlying parts of the Proposed Development are areas of sand and gravel of economic value associated mainly with alluvium (undifferentiated) and glaciofluvial sands and gravels (undifferentiated). There are also small areas of ridge or plateau probably with gravel, hummocky kames and kettles and marl, which are considered to be of economic value.

Bedrock deposit of economic value are located throughout the 250 m study area and underneath the Proposed Development. These include large areas of high/very high potential granular aggregate, which cover the south of the

250 m study area, with small patches in the centre and north. In addition, throughout the 250 m study area there are small areas of very high/high potential crushed rock, some of which directly underlie the Proposed Development.

No operational landfills have been identified within the 1 km study area based GIS mapping. However, on historical maps one historical landfill was identified, located rurally in close proximity to the Proposed Development.

The soils and geology baseline is summarised in Table 11.7. The bedrock and quaternary deposit are displayed in Figure 11.1.

Table 11.7: Summary of soils, quaternary deposits and bedrock within the 250 m study area

Unit name	Description	Sensitivity	Location
Soils			
Straffan	Fine loamy drift with limestones	Medium	Majority of 250 m study area, to the north and centre
Elton	Fine loamy drift with limestones	Medium	Centre of Proposed Development between Prosperous and Clane
River alluvium	Variable clay, silt, sand and gravel	Low	Along watercourses, extensive along River Liffey and Royal Canal/ rye waters
Faoldroim	Fine loamy drift with limestones	Medium	Southwest of Naas – surrounding the area of the R447 and R448, which the Proposed Development is located in part.
Mylerstown	Fine loamy drift with limestones	Medium	At Dunstown substation – the southern terminus of the Proposed Development
Urban	Made ground of unknown nature	Low	Located at towns/ villages across Proposed Development
Quaternary Deposits			
Till derived from Namurian sandstones and shales	Clay to sand matrix containing variable cobbles and boulders	Low	Covers majority of the Proposed Development from ch 0 to 13500
Gravels derived from limestones	Gravel, variable minor clay, silt or sand content	Medium	Ch 13500 to 15375; ch 35250 to 35750; 37250 to 37875; ch 39000 to 39250; ch 45350 to 49350; ch 49875 to 50000
Alluvium	Variable clay, silt, sand and gravel	Medium	Small sections within the gravels between Ch 14750 to 15375; 36750 to 37250; ch 37875 to 38000; ch 38625 to 39000; ch 41125 to 41375; ch 44500 to 44750; ch 45125 to 45350

Unit name	Description	Sensitivity	Location
Till derived from limestone	Clay to sand matrix containing variable cobbles and boulders, likely to be calcareous	Medium	Ch 15375 to 35250; ch 35750 to 36750; ch 38000 to 38625; ch 39250 to 41125; ch 41375 to 44500; ch 45000 to 45125; ch 49350 to 49875; ch 50000 to 52850
Urban	Made ground of unknown nature	Low	Ch 44750 to 45000
Bedrock			
Lucan Formation	Dark limestone and shale	Low	Northern part of Proposed Development (from Woodland substation) ch 0 to 6500; ch 10000 to 23125
Namurian (undifferentiated)	Shale and sandstone	Low	Ch 6500 to 10000
Tober Colleen Formation	Calcareous shale, limestone conglomerate	Low	Ch 23125 to 24000
Waulsortian Limestones	Massive unbedded lime-mudstone	Low	Ch 24000 to 25375; 34250 to 34875; 35000 to 35250; 36875 to 38700
Boston Hill Formation	Nodular and muddy limestone and shale	Medium	Ch 25375 to 34250
Rickardstown Formation	Cherty often dolomitised limestone	Low	Ch 34875 to 35000; 35250 to 36875; 38700 to 43300
Ballysteen Formation	Dark muddy limestone, shale	Medium	Ch 43300 to 44800
Feighcullen Formation	Skeletal, oolic and micritic limestone	Low	Ch 44800 to 45800
Quinagh Formation	Lenticular mudstone and coarse siltstone	Low	Ch 45800 to 46250
Carrighill Formation	Calcareous greywacke siltstone and shale	Medium	Ch 46250 to 52850 at Dunstown substation

11.3.3.1 Radon

Radon is a naturally occurring radioactive gas which originates from the decay of uranium in rocks and soils. It is colourless, odourless and tasteless. As radon decays, radiation is given off in the form of alpha particles. After inhalation, the alpha particles are absorbed by the lungs and cause localised damage, which can lead to lung cancer.

Radon can accumulate in enclosed or poorly ventilated spaces, such as buildings, houses and tunnels. The receptors to radon in relation to the Proposed Development are construction and maintenance workers, future site users and adjacent residents.

Radon concentration is measured in becquerels per cubic metre of air (Bq/m^3). The becquerel is a unit of radioactivity and corresponds to one radioactive disintegration per second.

The Radiological Protection Institute of Ireland (RPII) (part of the EPA) has issued information and guidance on radon (EPA 2019a). The reference level for long-term exposure to radon in a house, above which the need for remedial action should be considered, is 200 Bq.m^3 (determined in accordance with the RPII's standard protocol). Based on current guidance (EPA 2019a) it is estimated that in Ireland, for the population as a whole, a lifetime exposure (i.e. 70 years) to radon in the home at the Reference Level of 200 Bq/m^3 carried a risk of about 1 in 50 of contracting fatal lung cancer.

Radon risk is determined by the percentage of homes in a given area that are estimated to be above the 200 Bq/m^3 Reference level. The online Radon Map of Ireland (EPA 2023) has been used to provide an indication of the level of risk associated with the Proposed Development. According to this map, the majority of the Proposed Development is located within low or medium areas.

11.3.3.2 Ground Gas

'Ground gas' refers to gases, including carbon dioxide, methane, carbon monoxide and hydrogen sulphide, which can occur naturally and from anthropogenic sources within the ground. Volatile and Semi-Volatile Organic Compounds (VOC/SVOCs) within the ground can also produce potentially harmful vapours. Typical sources of ground gases and vapours include:

- Ground gases from the breakdown of organic materials in the sub-surface from natural sources such as wetlands, peat, alluvium and anthropogenic sources such as landfills; and
- Vapours and ground gases from anthropogenic sources such as landfills or spillages/improper disposal of volatile materials such as petrol, oils or solvents.

Potential ground gas sources have been identified within the 250 m study area including natural soils with high organic content (alluvium, as present locally around some watercourses which cross the route), and point sources comprising gravel pits, quarries and other types of former superficial extraction sites which may have been backfilled with decomposable infill. The point sources have been identified below as one historical quarry and six historical gravel pits. The soils are as described in Section 11.3.3. Overall, it is considered that the potential for ground gas sources is low with no specific reported issues from the Local Authorities. The 250 m study area is predominately agricultural land with natural soils, covering approximately 80% of the study aera, as outlined in Section 11.3.3. The point sources will largely be avoided by the Proposed Development, however further assessment and mitigation measures are outlined in the following section of this chapter.

11.3.3.3 Contaminated Land

Land affected by anthropogenic contamination can pose constraints to the Proposed Development in a number of ways, such as:

- Limitations to materials reuse and increased costs of handling and disposal;
- Impact to human health of construction workers, residents and adjacent land users;
- Mobilisation of contaminants impacting the surface water, groundwater and ecological sites; and
- Impact to the integrity of construction materials.

Land contamination can be caused by activities such as historical industrial land use, waste disposal, historical mining and quarrying and pollution from accidents and spills. Potential contaminants can include a variety of elements and chemical compounds including heavy metals, hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), VOCs, SVOCs, per- and polyfluoroalkyl (PFAS) and ground gas.

The desk study information review identified the following potential sources of contamination within the 250 m study area:

- An historical quarry at chainage 6600 and six historical gravel pits (located at chainages 14750, 26750, 30600, 33000, 42750, and 46876);
- An historical smithy immediately adjacent to the Proposed Development at chainage 48750;
- Two railway lines which cross the Proposed Development at chainages 15600 and 19750;
- Two graveyards immediately adjacent to the Proposed Development at chainages 15750 and 35400;
- Integrated Pollution Control/Integrated Pollution Prevention Control (IPC/1PPC) licensed sites;
- Two filling stations immediately adjacent to the Proposed Development at chainages 4250 and 25260;
- Auto repair facilities at chainage 11000, 19250, and 19525; and
- Concrete manufacturing facility at chainage 25500.

The specific land uses detailed above may have resulted in localised impacts on soil and groundwater, as well as made ground associated with the construction of infrastructure and farming waste and chemicals (e.g. fertilisers, sheep dip and pesticides). These potentially contaminative land uses are small scale and localised and therefore will not result in any significant effect to and from the Proposed Development. Based on the review of historical and current land use, there are no large scale polluting industrial land uses present within the 250 m study area.

11.3.4 Hydrogeology

Hydrological receptors include aquifers, abstractions (public and private), groundwater/surface water interactions (baseflow contributions, groundwater dependent terrestrial ecosystems etc.) and karst features. These have been identified using relevant datasets such as historical mapping, Geological Survey maps and observations from habitat surveys (see Chapter 10 of this EIAR for details on the habitat surveys).

Aquifer categories describe both resource potential (regionally or locally important; or poor) and groundwater flow type and attenuation potential (through fissures, karst conduits or intergranular). The aquifers are summarised as:

Regionally Important (R) Aquifers:

- Karstified bedrock (Rk);
- Fissured bedrock (Rf);
- Extensive sand & gravel (Rg);

Locally Important (L) Aquifers:

- Sand & gravel (Lg);
- Bedrock which is Generally Moderately Productive (Lm);
- Bedrock which is karstified to a limited degree or limited area (Lk);
- Bedrock which is Moderately Productive only in Local Zones (Ll);

Poor (P) Aquifers:

- Bedrock which is Generally Unproductive except for Local Zones (Pl); and
- Bedrock which is Generally Unproductive (Pu).

In the south of the 1 km study area the gravels derived from limestone have been classified as locally important gravel aquifers (Lg).

Bedrock aquifers underlying the majority of the 1 km study area are classified as locally important bedrock aquifer which is moderately productive in local zones (Ll). Within the centre of the 1 km study area there is a small area which is a locally important bedrock aquifer which is karstified to a limited degree or limited area (Lk). In the southern part of the 1 km study area there is an area classified as a regionally important bedrock aquifer (Rk) associated with the Rickardstown Formation.

The productivity of an aquifer was used, as outlined in Section 11.3.3, to assign receptor value. A summary of the aquifer types and their importance are displayed in Table 11.8. Figure 11.1 displays the locations of the aquifers.

Table 11.8: Summary of aquifer types within the 1 km study area

Unit name	Aquifer type	Receptor value	Location
Quaternary Deposits			
Till derived from Namurian sandstones and shales	Not classified	Low	Covers majority of the Proposed Development from ch 0 to 13500
Gravels derived from limestones	Locally important gravel aquifer (Lg) - Significant rejected recharge	Medium	Ch 13500 to 15375; ch 35250 to 35750; 37250 to 37875; ch 39000 to 39250; ch 45350 to 49350; ch 49875 to 50000
Alluvium	Not classified	Low	Small sections within the gravels between Ch 14750 to 15375; 36750 to 37250; ch 37875 to 38000; ch 38625 to 39000; ch 41125 to 41375; ch 44500 to 44750; ch 45125 to 45350
Till derived from limestone	Not classified	Low	Ch 15375 to 35250; ch 35750 to 36750; ch 38000 to 38625; ch 39250 to 41125; ch 41375 to 44500; ch 45000 to 45125; ch 49350 to 49875; ch 50000 to 52850
Urban	Not classified	Low	Ch 44750 to 45000
Lacustrine sediments	Not classified	Low	Do not directly underlie the Proposed Development, but are within 1 km study area
Bedrock			
Lucan Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Northern part of Proposed Development (from Woodland substation) ch 0 to 23125
Namurian (undifferentiated)	Poor Aquifer- bedrock which is	Low	Ch 6500 to 10000

Unit name	Aquifer type	Receptor value	Location
	generally unproductive except for local zones (Pl)		
Tober Colleen Formation	Poor Aquifer-bedrock which is generally unproductive except for local zones (Pl)	Low	Ch 23125 to 24000
Waulsortian Limestones	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 24000 to 25375; 34250 to 34875; 35000 to 35250; 36875 to 38700
Boston Hill Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 25375 to 34250
Rickardstown Formation	Regionally important aquifer – karstified (diffuse) (Rkd)	High	Ch 38700 to 43300
	Locally important aquifer – karstified (Lk)	Medium	Ch 35250 to 36875
Ballysteen Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 43300 to 44800
Feighcullen Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 44800 to 45800
Quinagh Formation	Poor aquifer-bedrock which is generally unproductive except for local zones (Pl)	Low	Ch 45800 to 46250
Carrighill Formation	Poor aquifer-bedrock which is generally unproductive (Pu)	Low	Ch 46250 to 52850 at Dunstown substation

Within the 1 km study area no group water schemes have been identified and there are no public and group supply source protection zones, with the nearest source protection area located over 3 km to the west from the Proposed Development (i.e. 2 km to the west from the 1 km study area).

The GSI database on Groundwater Wells and Springs (GSI 2023) indicates that there are114 private water supplies with yields over 20 m^3/day within the 1 km study area, 8 of which potentially lie close to or directly underneath the Proposed Development (Table 11.9). Seven of these are noted to be boreholes while one is noted to be a spring source. A closer review of the spring location indicated this is in fact St Brides Well (also called St. Brigid's or St. Bridget's Well.), which was initially a small natural spring turned into a shallow stone-walled well. St Brides Well is a Holy Well and therefore not categorised as a private water abstraction (i.e. not supplying surrounding properties for domestic or farming purpose). The well is assessed in Chapter 13 of this EIAR in terms of its archaeology and cultural effects. This chapter has assessed its hydrogeological effects only.

The GSI database has known limitations. It is not required for private supplies to be registered with GSI and so there is the possibility of additional supplies present without being registered. The GSI record may also include historical abstractions which are no longer active. Due to the uncertainty of location and existence of these wells, the presence of them close to the Proposed Development cannot be ruled out. Additionally, the exact location of these private water supplies displayed by GSI are not precise and there could be sources which lie closer to the Proposed Development than what is displayed on mapping.

Table 11.9: Summary of aquifer types within the 1 km study area

Private water supply type	Location	Potential Distance from Proposed Development	Yield (m^3/day)
Borehole	Ch. 2750	315 m	109
Borehole	Ch. 5000	190 m	38
Borehole	Ch. 6000	109 m	32.7
Spring	Ch. 12,000	57 m	20
Borehole	Ch. 19550	5 m	43.6
Borehole	Ch. 35500	30 m	27.3
Borehole	Ch.36500	26 m	32.7
Borehole	Ch. 47300	48 m	32.73

As outlined in Chapter 3 of this EIAR, extensive consultations have been undertaken with the public for the Proposed Development. In addition, EirGrid's Agricultural Liaison Officers have met with each affected landowner several times to discuss the Proposed Development. These consultations and meetings have not identified any private supplies thereby suggesting those identified in the GSI database may either be abandoned or located further away from the Proposed Development.

The potential for unknown private supplies has been assessed to be medium. This is because of the historical development in the area (See Chapter 13 for further details), the absence of group water supplies/public water supplies in the majority of the affected area, the agricultural nature of land, and the hydrogeological conditions that are generally suitable for productive wells, springs, and boreholes for domestic supplies and agricultural practices. The review of the GSI database, public consultations, and landowner meetings have reduced the possibility of finding additional private supplies but the possibility of additional supplies is included in this assessment (please see Sections 11.4 and 11.6 of this chapter). Mitigation measures are identified in Section 11.5 below.

No karstic features were identified on mapping within the 1 km study area, however, this does not mean that they are not present subsurface. In addition to this, no groundwater features such as springs, sinks, spreads, collects or wells have been identified on mapping.

Areas of groundwater vulnerability are mapped throughout the 1 km study area. Where present the groundwater vulnerability is mainly high, with localised areas of extreme vulnerability and where rock is at or near the surface/ is karstic. Areas of high groundwater vulnerability are more prevalent in the centre and southern part of the 1 km study area, with high groundwater vulnerability more sporadic in the north. However, there are two areas in the north where the Proposed Development directly crosses areas classified as either extremely vulnerable or rock is at or near the surface/ is karstic.

The Proposed Development crosses multiple watercourses, including the river Liffey at Sallins, which could have interactions with groundwater. Therefore, they can be classed as a groundwater receptor in terms of baseflow contributions. In addition to this the Proposed Development crosses two canals; the Royal Canal and the Grand Canal. However, there will be no groundwater interactions with the canals as the canals will be crossed underneath at approximately 10 m via trenchless crossings.

There are no statutory designated sites located within the 250 m study area. However, there are two proposed Natural Heritage Sites (pNHA) along the Royal Canal and Grand Canal which cross the Proposed Development.

Potential groundwater dependent terrestrial ecosystems (GWDTE) have been identified through Fossitt habitat surveys conducted by the ecology team. The survey buffer was up to 250 m from the Proposed Development in accordance with the extent of the survey buffers identified in Chapter 10 (Biodiversity) of this EIAR. It should be noted however, that this buffer is sufficient to identify potential GWDTE which could be impacted by the Proposed Development as the impacts are expected to be local.

Through the habitat surveys areas of GS4 Wet Grassland, WN6 wet willow-alder-ash woodland, PF1 Rich Fen and Flush and FS1 Reed and large sedge swamp have been identified, which have the potential to contain GWDTE. In total 13 areas of potential GWDTE have been identified from habitat mapping within the 250 m study area. These are summarised in Table 11.10 and displayed on Figure 11.5.

Table 11.10: Summary of potential GWDTE based on habitat mapping

GWDTE	GWDTE site number (See chapter 10 Biodiversity)	Habitat type	Receptor value	Distance from Planning Application Boundary (m)	Location
Cullendragh	4	GS4- wet grassland	Medium	0m (on route)	Ch. 2000 to 2400
Ballynare North	8	GS4- wet grassland	Medium	100 m east	Ch. 2750
Jenkinstown	13	GS4- wet grassland	Medium	150 m south	Ch. 6000
Kilcock Common West	6.4 to 6.7 and 7.2	GS4- wet grassland	Medium	20 m at its closest point (site split into 5 areas)	Ch. 16500 to 17375

GWDTE	GWDTE site number (See chapter 10 Biodiversity)	Habitat type	Receptor value	Distance from Planning Application Boundary (m)	Location
Painestown	6.1	GS4- wet grassland	Medium	0 m (Adjacent)	Ch. 25700
Moortown	7.1	GS4- wet grassland	Medium	100 m east of Proposed Development	Ch. 26000
Longtown North	10 and 11	GS4- wet grassland	Medium	O m (Adjacent)	Ch. 32000
Ballynagappagh South	1	WN6 wet willow-alder-ash woodland	Medium	236 m north	Ch.32125
Firmount West	6.2, 6.3 and 6.8	GS4- wet grassland	Medium	0 m (Adjacent)	Ch. 33000 to 33250
Sallins West	9	GS4- wet grassland	Medium	0 m (Adjacent)	Ch. 39000
Osberstown	5	GS4- wet grassland	Medium	0 m (Adjacent)	Ch. 41250
New Caragh Road	12	FS1 Reed and large sedge swamp	Medium	61 m west	Ch. 44600 to 44750
Jigginstown	2	WN6 wet willow-alder-ash woodland	Medium	30 m west	Ch. 44750
Harristown Common	3.1 and 3.2	Rich Fen and Flush (PF1)	Medium	233 m east	Ch. 51500 to 25500
Dunnstown East	14	GS4- wet grassland	Medium	56 m east	Ch. 52850

11.3.5 WFD Groundwater Bodies

There are eight WFD groundwater bodies within the 1 km study area. Details of these groundwater bodies are summarised in Table 11.11 and their status shown in Table 11.12. All the WFD groundwater bodies have a good overall status, with both good quantitative and qualitative status (EPA, 2023). Locations of the WFD groundwater bodies are displayed in Figure 11.4.

Table 11.11: Summary of WFD groundwater bodies within the 1 km study area

Unit name	Description	Location
Dunshaughlin (IE_EA_G_031)	Productive fissure bedrock	Woodland converter substation to Ch. 875
Dublin (EA_G_008)	Poorly productive bedrock	Ch. 875 to 7125, ch. 7400 to 30750, Ch. 30875 to 34750, ch. 25000 to 35250, ch. 36875 to 38625, Ch. 43250 to 45800
Moynalvy (IE_EA_G_019)	Poorly productive bedrock	Ch. 7125 to 7400
Trim (IE_EA_G_002)	Productive fissured bedrock	Ch. 30750 to 30875
Kildare (IE_SE_G_077)	Poorly productive bedrock	Ch. 31300 Within 1 km study area. 509 m west of cable at closest point.
Naas (IE_EA_G_027)	karstic	Ch. 34750 to 35000, Ch. 35250 to 36875, Ch. 38625 to 43250
Curragh Gravels East (IE_EA_G_017)	Gravel	Ch. 46500 to Dunstown substation
Kilcullen (IE_EA_G_003)	Poorly productive bedrock	Ch. 45800 to ch 46500

Table 11.12: Status of WFD groundwater bodies

WFD groundwater body	Overall status (2016-2021)	Quantitative status (2016-2021)	Chemical status (2016-2021)
Dunshaughlin (IE_EA_G_031)	Good	Good	Good
Dublin (EA_G_008)	Good	Good	Good
Moynalvy (IE_EA_G_019)	Good	Good	Good
Trim (IE_EA_G_002)	Good	Good	Good
Kildare (IE_SE_G_077)	Good	Good	Good
Naas (IE_EA_G_027)	Good	Good	Good
Curragh Gravels East (IE_EA_G_017)	Good	Good	Good
Kilcullen (IE_EA_G_003)	Good	Good	Good

11.3.6 Ground Investigation

A GI was undertaken along the Proposed Development from Dunstown 400 kV station in Kildare to the Woodland 400 kV station in County Meath. The GI was contracted to Causeway Geotech Ltd, with site works carried out between 15 August 2022 to 21 December 2022.

11.3.6.1 GI scope

In summary the GI comprised the following.

- Sixty-six boreholes including:
    - forty-one light cable percussion boreholes.
    - ten boreholes by light cable percussive extended by rotary follow-on drilling.
    - six boreholes by rotary drilling.
    - nine boreholes by dynamic (windowless) sampling.
- Standpipe groundwater monitoring installations in 22 boreholes;
- Ten machine dug trial pits.;
- Nine slit trenches; and
- A Geophysical survey consisting of Electro Magnetic conductivity and 2D resistivity.

Selected samples were submitted for a suite of geotechnical and chemical testing. The samples selected for chemical testing were variably submitted for the following analysis suite:

- Metals;
- Speciated total petroleum hydrocarbons (TPH);

- Speciated polycyclic aromatic hydrocarbons (PAH);
- BTEX compounds;
- Volatile Organic Compounds (VOCs);
- Polychlorinated biphenyls (PCBs);
- Phenols;
- Organic matter;
- Total Organic Carbon (TOC);
- Cyanides;
- Asbestos screen;
- Sulphate and sulphide;
- Sulphur;
- pH; and
- Waste acceptance criteria (WAC)

11.3.6.2 Encountered Geology

Based on review of the GI data in summary the geological strata encountered in stratigraphical order comprised the following:

Topsoil

Topsoil was encountered in the majority of exploratory hole locations ranging in thickness from 0.1 m to 0.7 m, with a typical thickness of 0.3 m. The topsoil typically comprised of brown sandy clay with frequent rootlets.

Made Ground

Made ground/possible made ground was encountered in isolated locations in 14 of the exploratory holes, ranging in thickness (including topsoil where present above the made ground) from 0.2 m to 1.6 m.

The made ground was generally described as consisting of gravelly clay or gravel. Gravelly sand was also less frequently encountered, with the gravels typically consisting of limestone. The majority of the made ground encountered is likely to comprise reworked natural ground given the limited presence of anthropogenic materials. However, four exploratory hole locations encountered made ground with inert anthropogenic materials, comprising either brick, wood or plastic.

Superficial Geology

Superficial quaternary deposits were identified in exploratory holes underlying the entire Proposed Development. The deepest confirmed depth of the superficial geology is 11.5 m below ground level (bgl), with the deepest unconfirmed depth being 12.7 m bgl (where the borehole terminated in quaternary deposits).

The superficial quaternary deposits primarily consist of sandy gravelly clay, with a low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth. In addition, gravel is also present, typically recorded as medium dense to dense silty sandy gravel with a low cobble content, primarily comprising limestone, typically beneath the clay and overlying bedrock. However, the gravel is absent over parts of the Proposed Development where clay directly overlies bedrock.

No peat was identified in exploratory holes along the Proposed Development.

It is has been assessed by the author of this chapter that given the above the superficial deposits identified by the GI are generally in accordance with the published geological information (GSI mapping – see Sections 11.2 and 11.3.3 of this chapter for further details).

Bedrock Geology

Bedrock confirmed by coring was encountered in 14 boreholes, while possible bedrock was identified in a further 36 exploratory holes.

The depth to the bedrock from the ground level confirmed by coring ranges from 2.6 m bgl to 11.5 m bgl and the depth to bedrock (unconfirmed), identified by cable percussion drilling, ranges from 1.2 m bgl to 8.0 m bgl.

Given the above, bedrock will be encountered at a variable depth along the entire Proposed Development.

The bedrock predominantly comprises dark grey to black limestone and no karstic features were identified. The bedrock encountered is generally in accordance with the published geological information presented previously. However, given the spacing of exploratory hole locations the presence of karstic features cannot be entirely ruled out.

11.3.6.3 Hydrogeology

During drilling/excavation 17 groundwater strikes were recorded in 15 locations, from boreholes, window sample holes and trial pits, ranging in depth from 1.5 m bgl to 5.2 m bgl. Of these, only four groundwater strikes were recorded at depths of 2 m bgl or less, representing approximately 5% of GI locations. Subsequent rises in groundwater were recorded in eight of the boreholes ranging in height from 0.1 m to 2.2 m with final resting levels (after 20 minutes) ranging from 1.0 m bgl to 3.9 m bgl. Review of the GI logs indicates that all but three of the groundwater strikes were recorded within granular deposits, beneath overlying less permeable clay within the superficial geology, but frequently overlying directly on bedrock.

The GI factual report indicates that 21 boreholes were monitored, with 12 boreholes monitored between 25/10/22 and 27/10/22 and all 21 dipped on 27 February 2023. These recorded groundwater ranging in depth from 0.2 m bgl to 2.33 m bgl, with one location being recorded as dry. Given the positioning of the borehole response zones, the data indicates that groundwater is present within bedrock, and superficial gravels. Subsequent monitoring of all 21 locations on 27 February 2023 recorded groundwater levels ranging between 0.45 m bgl and 2.70 m bgl, with one location being recorded as dry.

In summary, the water strike data indicates that groundwater where identified is typically encountered within granular deposits beneath overlying clays (glacial till or alluvium) and that due to some rises being observed after the initial strike, that the groundwater may in some locations be confined by the overlying less permeable strata. Furthermore, borehole monitoring indicates that where the gravel overlies the bedrock that the two groundwater units are likely to be in continuity. The data also corroborates broadly with the published information in identifying the presence of the potentially locally important aquifers within the superficial gravel deposits and the bedrock.

Given the lack of groundwater strikes and their depth, shallow excavations (<1.5 m bgl) proposed for the majority of the Proposed Development in unlikely to encounter groundwater. However, the data also shows that there may be localised areas of shallower groundwater in which shallower excavations may encounter groundwater.

It should, however, be noted that interpretation of the data presented here is a summary of interim GI data and also that there are limitations. These limitations are typical of interim GI data and given the scale of the potential effects of this Proposed Development, these do not affect the outcome of the assessment. The limitations are due to the following:

- A limited monitoring dataset means there may be potential for seasonal variations in groundwater depths not identified to date;
- The GI monitoring distribution network means that areas of shallower groundwater conditions may not be recorded;
- Limitations inherent in the exploratory hole construction techniques used, means full characterisation of the groundwater regime may not be possible, for example due to:
    - The use of casing in supporting the borehole walls during drilling may seal out groundwater strikes;
    - The use of water to aid drilling may mean groundwater is not always identified, especially the case with water flush as used in rotary; and
    - The placement of response zones within groundwater monitoring installations may not target all water bearing zones.

11.3.6.4 Chemical testing data

In order to provide an assessment of potential risks to human health and water environment receptors from the soils affected by the Proposed Development, an assessment of the soil chemical testing data has been undertaken as part of this chapter. The assessment has been done by comparison of the chemical testing with appropriate generic screening criteria, selected in accordance with EPA guidance as detailed below.

Human Health Assessment methodology

Total soils chemical testing data for relevant substances were directly compared to published Human Health Assessment Criteria (HHAC) derived in accordance with recommended guidance (EPA, 2013), based on a public open space (park) land use, which are considered to be protective of long-term risks to human health receptors (future site users). This also provides an indication (albeit conservative) of the potential risk posed to construction workers. Assessment of human health risks from asbestos within soils was undertaken via screening of all soil samples for the presence of asbestos.

Human Health Results Assessment

Based on the lack of made ground (indicative of potential contamination) identified by the GI, contamination representing a risk to human health is considered very unlikely. This is generally confirmed by the chemical testing whereby contaminants indicative of potential anthropogenic contamination (e.g. hydrocarbons, heavy metals, polychlorinated biphenyl compounds) have generally not been detected or if so at only very low concentrations, below the HHAC.

A single sample, taken at 0.2 m bgl around chainage 39000 near Sallins, exceeds the HHAC for a number of Polycyclic Aromatic Hydrocarbons (PAH). However, this sample was taken from an area of agricultural land use; the borehole log did not identify the presence of made ground, and the material comprised of topsoil above natural gravels. No other nearby location recorded made ground. As such, the test result is not considered to be representative of a viable risk to human health.

Water Environment Assessment Methodology

The assessment of potential risks from on-site soils to water receptors has been undertaken by comparing the results of the soil leachate testing, with Controlled Waters Screening Criteria (CWSC). The results are compared against two criteria selected in accordance with EPA guidance (2003) titled 'Towards Setting Guideline Values For The Protection of Groundwater In Ireland, which contain– the EPA's Guideline Values for the Protection of Groundwater in Ireland (IGV) and Groundwater Threshold Values (GTV). The adopted CWSC provide a conservative assessment of the potential risks to water receptors from the site soils.

Water Environment Results Assessment

A summary of the relevant determinants and samples which exceed either of the CWSC is presented in Table 11.13 below.

Table 11.13: Summary results for substances exceeding the CWSC

Analyte	Unit	Interim Guideline Values	Groundwater Threshold Values	Number of Results	Number Exceeding Interim Guideline Values	Number Exceeding Groundwater Threshold Values	Maximum Concentration	Location of Max Concentration
Ammonium	mg/l	0.15	0.065 - 0.175	28	4	17	0.48	2.0 m bgl chainage 26500 at Moortown
Arsenic	ug/l	10	7.5	33	0	1	9.4	0.5 m bgl chainage 15500 at Kilcock
Nickel	ug/l	20	15	33	0	1	17	0.2 m bgl chainage 2000 at Ballymaglassan

As shown on Table 11.13, with the exception of ammonium, only a single sample has been identified at a concentration greater than the CWSC for arsenic and nickel. However, given the following, the sampled soils are not considered to represent a risk to the water environment:

- The inherent conservatism in comparing leachate testing directly with the CWSC, especially given the marginal exceedance of the GTV threshold for both arsenic and nickel; and
- Reference to the borehole logs indicates that both locations are in agricultural land.

- The strata from which both samples were taken comprised of natural ground with no evidence of contamination in overlying strata.

With regard to the ammonium results, the widespread exceedance of the CWS in samples primarily of natural ground indicates that the ammonium concentrations are likely to be indicative of natural background concentrations. The ammonium results are therefore not indicative of the sampled soils representing a risk to the water environment.

Chemical Testing Results Assessment Summary

Assessment of potential risks to human health and the water environment by comparison of the chemical testing with HHAC and CWSC have generally confirmed that risks from site soils are likely to be low. Isolated exceedance of the HHAC and CWSC were identified. However, these results were discounted as indicative of site soils representing a viable risk, or warranting specific mitigation.

11.4 Potential Effects

Both the construction and operational phase activities have the potential to effect land and land use, soils, geology and hydrogeology. These potential impacts are discussed individually below, considering embedded mitigation. Any additional mitigation that may be required beyond embedded mitigation, including any additional monitoring requirements, are discussed in Section 11.6.

11.4.1 Construction Phase

11.4.1.1 Land cover

At the off-road locations the land required to install the cable will be unavailable to the landowner throughout from initial fencing-off to the reinstatement of the land and fence removal. As part of the off-road sections there will be small areas of land lost for agricultural use associated with permanent access tracks for off-road Joint Bays (see Chapter 15 of this EIAR for this loss of land assessment). These permanent tracks are located on agricultural land used for pasture, which covers the majority of the 250 m study area. In additional there will be disruption to land use from trenching for cable installation, temporary storage of excavated materials and change of land use at Construction Compounds. Restoration works will be carried out to restore the land back to pre-construction conditions, excluding permanent access tracks.

Such temporary and permanent losses of agricultural land are considered in the Agronomy and Equine chapter (Chapter 15) while effects on soils are considered below, in Section 11.4.1.2.

11.4.1.2 Geology and soils

Disruption to underground soils and subsoil layers during excavation could impact soils physical, chemical and biological characteristics. The majority of the construction phase will comprise cable laying along the existing road network with some temporary access roads which will limit the extent of adjacent agricultural land affected by trenching. An overall small adverse impact has been assigned on the basis that the effects on the soils will be primarily local, and that the majority of soils will be replaced post works. Given the medium baseline sensitivity of the soils, significance of effect will be slight.

Given the largely rural setting of the Proposed Development and the results of the sampling/analysis and risk assessments presented previously, contaminated soils are not anticipated to be encountered. The potential sources of contamination identified on or immediately adjacent to the Proposed Development included an historical quarry, historical gravel pits, and 2 petrol filling stations. In addition, within urban areas such as Kilcock, Prosperous, Clane and Naas there is the potential for soil contamination to be present. As such, while specific sources were targeted during ground investigation to date, given the spacing of exploratory hole locations and inherent uncertainty associated with environmental sampling of heterogeneous subsurface materials, there remains the potential for encountering unidentified/unforeseen contamination during construction.

Measures set out in the CEMP will reduce the likelihood of contaminant mobilisation, including inclusion of a discovery strategy which sets out how to identify and deal with unexpected ground contamination. However, the measures will not reduce the severity of historical contamination if present. Mobilisation of historical contamination, where present, could lead to small adverse effects locally, especially where deposits of economic value are present.

In addition to geological receptors, any migration of contaminants in soils has the potential to create a localised pollution risk to groundwater and its receptors. These risks are discussed more in Section 11.4.1.3 below.

The majority of the 250 m study area is underlain by limestone, with at least one karstic formation (Rickardstown Formation). The other limestone units also have the potential to contain karstic features. The mapping of karstic features shows none within the 250 m study area, however, this mapping may underestimate the extent of these features and will not show subsurface features which could be present. Data regarding the ground conditions across the Proposed Development are limited but bedrock or suspected bedrock was encountered at depths of between 1.2 and 11.5 m bgl and therefore there is potential to encounter bedrock during construction. The excavation of any bedrock may lead to potential instabilities that may be significant, especially if karstic features are encountered. However, due to the shallow depth of the trenching, bedrock geology is unlikely to be significantly impacted. In addition, any excavations which expose karstic features at the surface could provide a pathway for surface water to flow into the exposed bedrock, hence increasing pollution risks to groundwater. The bedrock geology within the 250 m study area does not have a heritage value. Based on the low sensitivity and the small adverse magnitude of impact, the significance of effect will be imperceptible.

Nowhere within the 250 m study area has been identified as being susceptible to landslides therefore impacts associated with landslides and slope stability are not anticipated. Furthermore, no large-scale dewatering is expected therefore the risks of subsidence are negligible, and if they were to occur would be local to the Proposed Development. Localised dewatering will only occur in areas of trenching where the groundwater table is found to be shallow and potentially at HDD compounds where some shallow excavation may need to be excavated to create the appropriate working space for the drill (See Section 11.4.1.3 for more details on dewatering). However, any dewatering will be temporary during construction and is not expected to have any significant impacts on geology and soils.

The Proposed Development crosses multiple economic deposits comprising very high/high potential aggregate and crushed rock and sands and gravels. However, the areas directly impacted by the construction activities (i.e. project footprint and planning application boundary) only represent 0.03% aggregate and crushed rock and sands and gravels resource in the two counties. It should also be noted that this area includes the road network, of which 82% of the Proposed Development, which have no realistic potential for aggregate extraction. There are no known plans for granular aggregate extraction within the planning application boundary based on reviews of the Meath and Kildare Planning systems (accessed December 2023). The proposed construction depths are small relative to the size of the economic deposits as a whole across the 250 m study area. The nature of the underground cable as a 1.5 m wide by 1.3 m - 1.7 m wide trench, its location, and the area affected means that the effect on economic deposits of sand and gravel within Counties Kildare and Meath will be imperceptible.

Construction will involve excavation for Joint Bays, installation of services such as road drainage, temporary access roads electrical cabling. Construction activities will therefore create voids within which ground gases and radon could potentially accumulate and present a human health risk as well as potentially creating pathways for gas to migrate to new receptors. Given the potential risk to human health, the severity of exposure to ground gases is considered to be medium. Taking into account the relatively limited ground gas sources present the likelihood of exposure is low. Therefore, the overall risk associated with ground gases is low to moderate. However it has been assessed that the width and length of the excavation versus their relative depth (maximum depth of excavation is 1.7 m) will not allow the buildup of any gases. It is considered that the trenches are not confined spaces. While standard health and safety measures will be taken during construction, it is considered that there will be no risk as a result of ground gases or radon.

11.4.1.3 Hydrogeology

Proposed cable route

Vegetation and topsoil stripping is required for the trench, temporary passing bays and site compounds (including construction and HDD compounds). For the off-road sections temporary working strips (including access roads) will also require vegetation removal and topsoil stripping.

Changes to groundwater quality from the removal of vegetation and disturbance of ground could lead to increased suspended solid concentrations in the groundwater. In addition to this, the open trench required for the majority of the Proposed Development could create new pathways from the surface into shallow aquifer units impacting groundwater quality. These direct impacts to groundwater could lead to secondary impacts and affect the quality of groundwater discharging to surface waters, including water discharging to GWDTE. However, due to the filtering effect of the unsaturated zone and aquifer material, suspended solids will not migrate to any substantial extent in poorly productive bedrock and will attenuate relatively quickly in the locally important aquifers and potential impacts will be negligible at an aquifer scale. The significance of effect will be Imperceptible.

For aquifers with fracture flow, and particularly for flow in aquifers with karstic features, suspended solids can move considerable distances and rapidly. However, only one aquifer unit has been described as karstified (the Rickardstown Formation, in the area between Clane and Naas) and the surface area above this aquifer which could be impacted (i.e project footprint and immediate vicinity between chainages 38,700 and 43,300) only represents 0.3% of the total aquifer surface area. Several watercourses run across this aquifer, including the River Liffey. Therefore, any impacts on the aquifer are likely to be negligible but could be small adverse on surface watercourses. This would result in significance of effect of Imperceptible on the aquifer and Slight to Imperceptible, depending on the watercourses sensitivity.

Contamination may also be introduced to groundwater through leaks and spillages at working areas along the Proposed Development, or from structures associated with the Proposed Development acting as a preferential pathway for contaminant transport. The implementation of the mitigation measures described in the CEMP will reduce the likelihood of accidental leaks and spills, however, will not reduce the severity if an incident does occur. This will result in Moderate adverse impacts within Quaternary Deposits which directly underlie the Proposed Development, with Negligible impacts to the bedrock aquifers, resulting in a significance of effect of Slight to Imperceptible, depending on aquifer sensitivities (see Table 11.14). Further from the Proposed Development elsewhere within the 1 km study area negligible impacts to groundwater quality are predicted, resulting in an Imperceptible significance of effect.

Due to the shallow depths of the trenching (1.3 m – 1.7 m) across the majority of the Proposed Development, working is not expected to occur below the water table. Therefore, no large-scale dewatering is predicted. However, there is the potential for localised dewatering if groundwater levels are shallow at any point along the Proposed Development. Any dewatering required will have a small adverse impact on the underlying aquifers locally. This will result in a negligible impact at the scale of the superficial deposit aquifer (further details in Table 11.14). Therefore, the significance of effect will be Imperceptible. No impact will be expected on bedrock groundwater flows.

Based on the private supply information available (please see Section 11.3 of this chapter), the Proposed Development overlaps the documented buffer zone of seven private water supplies with yields over 20 m^3/day which are understood to be used for domestic supply. As identified in Section 11.3, the locations identified the GSI database can vary from the actual locations and the affected landowners have not reported any supplies that would be directly impacted. On this basis, it is assessed that there will be a potential Slight effect. St Brides Well is also located 30 m away from the Proposed Development. As identified above the depth of the cable trench is not expected to occur below the water table across the majority of the Proposed Development, but there is the potential for localised dewatering, which could require mitigation. On this basis, it is assessed that there will be a potential temporary Slight significance of effect on the private water supplies for which their buffer zone potentially overlaps with the Proposed Development, and an Imperceptible significance of effect on St Brides Well (see Table 11.14).

In terms of unknown private supplies, as identified in Section 11.3, there has been assessed to be a medium likelihood of the discovery of additional supplies. As the location of the supplies is currently unknown, there has been assessed to be a potential Large Adverse magnitude of impact resulting in Significant effect (Table 11.14) that will require mitigation.

The Proposed Development is adjacent to (<10 m) or within the footprint of potential GWDTE sites Cullendragh, Longtown North, Sallins West, Firmount West, Osberstown and Painestown. In addition, potential GWDTE sites Jenkinstown, Kilcock Common West, Moortown, Ballynare North, New Caragh Road, Jigginstown and Dunnstown East are within 100 m of the Proposed Development. There is a risk of intercepting shallow and/or perched groundwater when the trenches are excavated. There is the potential for small scale, localised dewatering. There is also the potential for a localised impact on the groundwater quality supporting these potential GWDTEs. Given the medium importance of these potential GWDTEs with no conservation designation and a moderate adverse magnitude of impact (on both flow and quality), this would result in a potential Moderate significance of effect on flow and quality in the short term on these GWDTE.

Construction compounds

One construction compound at chainage 35750 lies upon a locally important aquifer (karstified). Whereas the other construction and HDD compounds are located on locally important aquifers (moderately productive in local zones). The compounds along with topsoil stripping for access roads and temporary passing bays could lead to a compaction effect on underlying shallow aquifer units and impact shallow groundwater levels, flows and quality locally. This could lead to small adverse impacts locally to the underlying aquifers, however, at an aquifer scale, impacts are likely to be negligible given the size of the aquifer compared to the working footprint. Therefore, the significance of effect will be imperceptible.

Contamination may also be introduced to groundwater through leaks and spillages, associated with construction compounds for the Proposed Development acting as a preferential pathway for contaminant transport. This would result in potential moderate adverse impact on superficial deposits directly underlying the compounds and small adverse impact on bedrock aquifers, taking into account the potential of superficial deposits to attenuate contamination. This would result in significance of effect of Slight to Imperceptible, depending on sensitivities (see Table 11.14).

No impact is expected on potential GWDTE as a result of Construction Compounds. Additionally, the uncertainty on groundwater private water supplies means that the assessment done for the cable is also applicable to the Construction Compounds.

11.4.2 Horizontal Directional Drilling

Horizontal directional drilling (HDD) may be required at six locations; at major watercourses (Rye Water, River Liffey and Lyreen tributary of the River Liffey), canals (Royal Canal and Grand Canal) and at the M4. No substantial dewatering is expected to result from HDD activities, except potentially at launch and reception sites, which may require excavation of pits to a depth equivalent to a trench. However, dewatering effects in such cases will be expected to be negligible. Therefore, the significance of effect will be imperceptible.

If excavations are required for the launch and reception sites there is the potential for contamination to reach the underlying aquifers. This could lead to small adverse impacts locally to the underlying aquifers, however at an aquifer scale, impacts are likely to be negligible given the size of the aquifer compared to the working footprint. Therefore, the significance of effect will be imperceptible.

Trenchless crossings also have the potential to release artesian pressures/ water and have the potential to connect two aquifers that are currently not connected which could create a new contaminant pathway and lead to cross contamination. However, information regarding aquifer depths and groundwater levels at the HDD locations are not available at this stage and therefore the above cannot be ruled out. In the unlikely event a HDD was to connect two aquifers this could create new contaminant pathways and allow the mixing of different groundwater bodies, leading to small adverse impacts locally but negligible impacts at an aquifer scale. Therefore, the significance of effect would be imperceptible.

11.4.2.1 Summary of Predicted Impacts to Groundwater Receptors During Construction

Taking into consideration the construction activities, pathways, and receptors identified, the significance of the effect to each receptor has been summarised in Table 11.14.

This is no measurable effect on receptors except for GWDTE and unknown private water supplies (Table 11.14). The potential GWDTEs may undergo alteration in its environment as a result of the construction activities, however this will be short term and reversible.

Table 11.14: Summary of Predicted Impacts to Groundwater Receptors During Construction

Receptor	Parameter	Importance	Magnitude of impact	Significance of Effect
Private Water Supplies identified by GSI as potentially overlapping with the Proposed Development but not to be adjacent to the proposed work based on EirGrid's Agricultural Liaison Officers initial consultation with private landowners.	Groundwater Flow	Medium	Small Adverse	Slight
	Groundwater Quality	Medium	Small Adverse	Slight
St Brides Well	Groundwater Flow	Medium	Negligible	Not significant
	Groundwater Quality	Medium	Negligible	Not significant
Other GSI Private Water Supplies	Groundwater Flow	Medium	None	N/A
	Groundwater Quality	Medium	None	N/a

Receptor	Parameter	Importance	Magnitude of impact	Significance of Effect
Unknown Private Water Supplies	Groundwater Flow	Medium	Large Adverse	Significant
	Groundwater Quality	Medium	Large Adverse	Significant
Potential GWDTEs	Groundwater Flow	Medium	Moderate Adverse	Moderate
	Groundwater Quality	Medium	Moderate Adverse	Moderate
Tober Colleen Formation	Groundwater Flow	Low	Negligible	Imperceptible
	Groundwater Quality	Low	Negligible	Imperceptible
Namurian (undifferentiated)	Groundwater Flow	Low	Negligible	Imperceptible
	Groundwater Quality	Low	Negligible	Imperceptible
Rickardstown Formation	Groundwater Flow	High/Medium	Negligible	Imperceptible
	Groundwater Quality	High/Medium	Negligible	Imperceptible
Waulsortian Limestone	Groundwater Flow	Medium	Negligible	Imperceptible
	Groundwater Quality	Medium	Negligible	Imperceptible
Lucan Formation	Groundwater Flow	Medium	Negligible	Imperceptible

Receptor	Parameter	Importance	Magnitude of impact	Significance of Effect
	Groundwater Quality	Medium	Negligible	Imperceptible
Ballysteen Formation	Groundwater Flow	Medium	Negligible	Imperceptible
	Groundwater Quality	Medium	Negligible	Imperceptible
Feighcullen Formation	Groundwater Flow	Medium	Negligible	Imperceptible
	Groundwater Quality	Medium	Negligible	Imperceptible
Quinagh Formation	Groundwater Flow	Low	Negligible	Imperceptible
	Groundwater Quality	Low	Negligible	Imperceptible
Carrighill Formation	Groundwater Flow	Low	Negligible	Imperceptible
	Groundwater Quality	Low	Negligible	Imperceptible
Boston Hill Formation	Groundwater Flow	Medium	Negligible	Imperceptible
	Groundwater Quality	Medium	Negligible	Imperceptible
Till derived from Naurian sandstones and shales	Groundwater Flow	Low	Small Adverse	Imperceptible
	Groundwater Quality	Low	Moderate Adverse	Slight

Receptor	Parameter	Importance	Magnitude of impact	Significance of Effect
Gravels derived from limestones	Groundwater Flow	Medium	Small Adverse	Slight
	Groundwater Quality	Medium	Moderate Adverse	Slight
Alluvium	Groundwater Flow	Low	Small Adverse	Imperceptible
	Groundwater Quality	Low	Moderate Adverse	Slight
Till derived from limestone	Groundwater Flow	Low	Small Adverse	Imperceptible
	Groundwater Quality	Low	Moderate Adverse	Slight
Lacustrine Sediments	Groundwater Flow	Low	Negligible	Imperceptible
	Groundwater Quality	Low	Negligible	Imperceptible

11.4.2.2 WFD Groundwater screening assessment

The groundwater WFD assessment is summarised in Table 11.15. Only elements scoped in (Section 11.2.1) have been assessed.

The scale of the Proposed Development relative to the size of the groundwater bodies as a whole is very small and the potential impacts during construction minor and localised. Therefore, no significant impacts are anticipated to the WFD groundwater bodies. As a result, the Proposed Development is not expected to cause deterioration in the WFD status of any groundwater body either quantitatively or qualitatively.

Table 11.15: Impact assessment for WFD groundwater bodies

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
Trenching and HDD	Dunshaughlin (IE_EA_G_031)	No large-scale dewatering is proposed for the Proposed Development, however minor dewatering may be required where groundwater is shallow (subject to confirmatory investigations). However, if minor dewatering is required any changes will be short-lived and negligible on a groundwater body scale,	No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.	Minor dewatering may be required for the Proposed Development where groundwater is shallow. Any dewatering could indirectly lower water levels in underlying aquifer if the watercourse is in hydraulic continuity with the aquifer, and vice versa. However, this impact is likely to be localised and minimal and	No private groundwater abstractions identified from the GSI wells and spring layers lie upon this aquifer. However, if any undocumente d sources are present impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional	There are several best-practice mitigation measures which will be incorporated for pollution prevention during construction. These measures will reduce the likelihood of contaminating groundwater. Adherence to industry good practice will significantly reduce changes to	No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	Adherence to industry good practice during construction, as outlined in the CEMP, will significantly reduce changes to groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
		therefore there is no potential for significant change to water balance.		at a groundwater body scale any impacts will be insignificant.	treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.	groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.		
	Dublin (EA_G_008)		During construction temporary dewatering along the Proposed Development may be required which could locally alter groundwater flows and		Five identified potential private groundwater abstractions from the GSI wells and spring layers lie upon this aquifer. Impacts on drinking water protected		There are several best-practice mitigation measures which will be incorporated for pollution prevention including managing silt pollution (for suspended	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
			levels to potential GWDTE. However, given that the potential GWDTE are not designated sites the quantitative status of the groundwater body will not change significantly as a result of any impacts to these GWDTE.		areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.		solids transport) during construction. These measures will reduce the likelihood of contaminating groundwater. Therefore, negligible impacts to groundwater quality are predicted as a result of the Proposed Development construction. The potential GWDTE are not designated therefore the qualitative status of the groundwater	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
							body will not change significantly as a result of any impacts to these GWDTE.	
	Moynalvy (IE_EA_G_019)		No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.	No watercourses located on this groundwater body lie in close proximity to the Proposed Development therefore no changes to the quantitative status are expected.	No private groundwater abstractions identified from the GSI wells and spring layers lie upon this aquifer. However, if any undocumented sources are present impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality		No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	
	Trim (IE_EA_G_002)			Minor dewatering may be required for the Proposed Development where groundwater is shallow.				

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
				Any dewatering could indirectly lower water levels in underlying aquifer if the watercourse is in hydraulic continuity with the aquifer, and vice versa. However, this impact is likely to be localised and minimal and at a groundwater body scale any impacts will be insignificant.	such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, would ensure no significant changes to groundwater quality and quantity.			
	Kildare (IE_SE_G_077)	Given the distance from the Proposed Development no changes to the quantitative and qualitative status of this groundwater body are predicted						

	Naas (IE_EA_G_027)	No large-scale dewatering is proposed for the Proposed Development, however minor dewatering may be required where groundwater is shallow (subject to confirmatory investigations). However, any changes will be short-lived and negligible on a groundwater body scale, therefore there is no potential for significant change to water balance.	During construction temporary dewatering along the Proposed Development may be required which could locally alter groundwater flows and levels to potential GWDTE. However, given that the potential GWDTE are not designated sites the quantitative status of the groundwater body will not change significantly as a result of any impacts to these GWDTE.	Minor dewatering may be required for the Proposed Development where groundwater is shallow. Any dewatering could indirectly lower water levels in underlying aquifer if the watercourse is in hydraulic continuity with the aquifer, and vice versa. However, this impact is likely to be localised and minimal and at a groundwater body scale any impacts will be insignificant.	Two identified potential private groundwater abstractions from the GSI wells and spring layers lie upon this aquifer. Impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater	There are several best-practice mitigation measures which will be incorporated for pollution prevention during construction. These measures will reduce the likelihood of contaminating groundwater. Adherence to industry good practice will significantly reduce changes to groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.	There are several best-practice mitigation measures which will be incorporated for pollution prevention including managing silt pollution (for suspended solids transport) during construction. These measures will reduce the likelihood of contaminating groundwater. Therefore, negligible impacts to groundwater quality are predicted as a result of the Proposed Development construction.	Adherence to industry good practice during construction, as outlined in the CEMP, will significantly reduce changes to groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					quality and quantity.		The potential GWDTE are not designated therefore the qualitative status of the groundwater body will not change significantly as a result of any impacts to these GWDTE.	
	Curragh Gravels East (IE_EA_G_017)				One identified potential private groundwater abstraction from the GSI wells and spring layers lie upon this aquifer. Impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good			

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.			
	Kilcullen (IE_EA_G_003)		No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.		No private groundwater abstractions identified from the GSI wells and spring layers lie upon this aquifer. However, if any undocumented sources are present impacts on drinking water protected areas from this activity is		No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.			
Access roads and compound areas	Dunshaughlin (IE_EA_G_031)	No significant excavations or dewatering is expected to be required for the site	No potential GWDTE were identified within this groundwater body therefore	No significant excavations or dewatering is expected to be required for the site compound,	No private groundwater abstractions identified from the GSI wells and spring	There are several best-practice mitigation measures which will be	No potential GWDTE were identified within this groundwater body therefore	Adherence to industry good practice during construction, as outlined in the CEMP, will

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
		compounds and access roads, therefore there is limited to no potential for significant change to water balance.	no change to quantitative status is expected.	therefore no impacts to baseflow to surface waters are predicted.	layers lie upon this aquifer. However, if any undocumented sources are present impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant	incorporated for pollution prevention during construction. These measures will reduce the likelihood of contaminating groundwater. Adherence to industry good practice will significantly reduce changes to groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.	no change to qualitative status is expected.	significantly reduce changes to groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					changes to groundwater quality and quantity.			
	Dublin (EA_G_008)		No significant excavations or dewatering is expected to be required for the site compounds and access roads, therefore there is limited potential for change to groundwater flows and levels to potential GWDTE. Additionally, given that the potential GWDTE are not		Five private groundwater abstractions identified from the GSI wells and spring layers lie upon this aquifer. Impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required.		There are several best-practice mitigation measures which will be incorporated for pollution prevention including managing silt pollution (for suspended solids transport) during construction. These measures will reduce the likelihood of	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
			designated sites the quantitative status of the groundwater body will not change as a result of any impacts to these GWDTE.		Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.		contaminating groundwater. Therefore, negligible impacts to groundwater quality are predicted as a result of the Proposed Development construction. The potential GWDTE are not designated therefore the qualitative status of the groundwater body will not change as a result of any impacts to these GWDTE.	
	Moynalvy (IE_EA_G_019)		No potential GWDTE were		No private groundwater		No potential GWDTE were	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
	Trim (IE_EA_G_002)		identified within this groundwater body therefore no change to quantitative status is expected.		abstractions identified from the GSI wells and spring layers lie upon this aquifer. However, if any undocumented sources are present impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction,		identified within this groundwater body therefore no change to qualitative status is expected.	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.			
	Kildare (IE_SE_G_077)	Given the distance from the Proposed Development no changes to the quantitative and qualitative status of this groundwater body are predicted						
	Naas (IE_EA_G_027)	No significant excavations or dewatering is expected to be required for the site compounds and access roads, therefore there is limited to no potential for significant change to water balance.	No significant excavations or dewatering is expected to be required for the site compounds and access roads, therefore there is limited potential for change to groundwater flows and levels to	No significant excavations or dewatering is expected to be required for the site compound, therefore no impacts to baseflow to surface waters are predicted.	Two private groundwater abstractions identified from the GSI wells and spring layers lie upon this aquifer. Impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality	There are several best-practice mitigation measures which will be incorporated for pollution prevention during construction. These measures will reduce the likelihood of contaminating groundwater.	There are several best-practice mitigation measures which will be incorporated for pollution prevention including managing silt pollution (for suspended solids transport) during construction.	Adherence to industry good practice during construction, as outlined in the CEMP, will significantly reduce changes to groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
			potential GWDTE. Additionally, given that the potential GWDTE are not designated sites the quantitative status of the groundwater body will not change as a result of any impacts to these GWDTE.		such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.	Adherence to industry good practice will significantly reduce changes to groundwater quality, therefore at a groundwater body scale there will be limited to no change in quality status.	These measures will reduce the likelihood of contaminating groundwater. Therefore, negligible impacts to groundwater quality are predicted as a result of the Proposed Development construction. The potential GWDTE are not designated therefore the qualitative status of the groundwater body will not change as a result of any	
	Curragh Gravels East (IE_EA_G_017)				One private groundwater abstractions identified from the GSI wells and spring layers lie upon this aquifer. Impacts on drinking water protected			

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, will ensure no significant changes to groundwater quality and quantity.		impacts to these GWDTE.	
	Kilcullen (IE_EA_G_003)	No access roads or site compounds are planned within the boundary of this WFD waterbody, therefore no changes to the quantitative or qualitative status are expected.						

11.4.3 Operational Phase

11.4.3.1 Land use

All areas where vegetation removal and topsoil stripping has occurred along the trenches and for compounds, temporary access roads and passing bays will be reinstated following installation of the cable. (see outlined in Chapter 5 of this EIAR).

However, the cable will require routine maintenance activities along its route, requiring permanent access tracks to off road joint bays. The permanent access tracks will be used during the operational phase to reach off-road sections of the cable for maintenance access. The area of land lost to the permanent access roads is minimal relative to the wider extent of the pasture land use within the 250 m study area. Additionally, as outlined in Chapter 5 of this EIAR, the access tracks have been designed along the edges of fields reducing the impact on current land use. Therefore, there will be negligible to small adverse impacts to land use as a result of the permanent access tracks.

11.4.3.2 Geology and soils

No long term significant changes to geology and soils are predicted as part of the Proposed Development. All topsoil removed during construction will be stockpiled and reinstated once the Proposed Development is constructed.

11.4.3.3 Hydrogeology

No discharge to ground is expected from the operational phase.

There may be some areas, where the water table is shallow, where small changes to flows are possible due to the presence of sub-surface structures containing the joint bays and cables. However, these impacts will be very localised and negligible at an aquifer scale. The significance of effect will be Imperceptible.

Permanent access tracks to off-road joint bays could lead to compaction effects which could impact shallow groundwater levels and flows. However, at an aquifer scale these impacts are likely to be negligible to small adverse. Additionally, there is the potential of accidental leaks and spills on the access tracks during the operational phase which could impact groundwater quality. These would be of limited extent but could result in small adverse impacts locally to the quaternary deposits, resulting in an Imperceptible significance of effect.

The creation of impermeable areas at joint bays and permeant access tracks could locally alter recharge mechanisms. However, the size of any new impermeable areas compared to the size of the aquifers as a whole are negligible resulting in negligible impacts, resulting in an Imperceptible significance of effect.

Following the construction phase, the backfilled trench has the potential to act as a preferential flow pathway, thereby disturbing shallow groundwater flow pattern, where shallow groundwater is present. This could in places drain an area, and in other places it could facilitate accumulation of shallow groundwater and create localised ponding/flooding. At the scale of the superficial aquifers, this is of no significance and would be of negligible magnitude of impact, in turn resulting in an assessed imperceptible significance of impact. However, this could become significant at local level if sensitive receptors are present in the vicinity or from the perspective of increase localised flooding in some area. Impacts to GWDTE could result from the presence of permanent access tracks and joint bay chambers present within the sites. At Cullendragh (GWDTE site number 4) (see Figure 11.5), a joint bay is present within the GWDTE boundary along with an access track which could create localised adverse impacts to groundwater levels and flows which feed potential GWDTE habitats. This could result in a Slight Adverse significance on the hydrology functioning. The resulting effect on habitats is assessed in Chapter 10 (Biodiversity) of this EIAR, which has concluded that there will be no significant effects. No designated habitats will be affected and the GWDTE habitats identified largely found on agricultural land.

Table 11.16: Summary of Predicted Impacts to Groundwater Receptors During Operation

Receptor	Parameter	Importance	Magnitude of impact	Significance of Effect
St Brides Well	Groundwater Flow	Medium	Negligible	Not Significant
	Groundwater Quality	Medium	Negligible	Not Significant
GSI Private Water Supplies	Groundwater Flow	Medium	None	N/A
	Groundwater Quality	Medium	None	N/a
Unknown Private Water Supplies	Groundwater Flow	Medium	Large Adverse	Significant
	Groundwater Quality	Medium	Large Adverse	Significant
Potential GWDTEs	Groundwater Flow	Medium	Negligible to Small Adverse	Imperceptible to Slight
	Groundwater Quality	Medium	Negligible	Imperceptible
Tober Colleen Formation	Groundwater Flow	Low	None	N/A
	Groundwater Quality	Low	None	N/A
Namurian (undifferentiated)	Groundwater Flow	Low	None	N/A
	Groundwater Quality	Low	None	N/A
Rickardstown Formation	Groundwater Flow	High/Medium	None	N/A
	Groundwater Quality	High/Medium	None	N/A
Waulsortian Limestone	Groundwater Flow	Medium	None	N/A
	Groundwater Quality	Medium	None	N/A
Lucan Formation	Groundwater Flow	Medium	None	N/A
	Groundwater Quality	Medium	None	N/A
Ballysteen Formation	Groundwater Flow	Medium	None	N/A
	Groundwater Quality	Medium	None	N/A

Receptor	Parameter	Importance	Magnitude of impact	Significance of Effect
Feighcullen Formation	Groundwater Flow	Medium	None	N/A
	Groundwater Quality	Medium	None	N/A
Quinagh Formation	Groundwater Flow	Low	None	N/A
	Groundwater Quality	Low	None	N/A
Carrighill Formation	Groundwater Flow	Low	None	N/A
	Groundwater Quality	Low	None	N/A
Boston Hill Formation	Groundwater Flow	Medium	None	N/A
	Groundwater Quality	Medium	None	N/A
Till derived from Naurian sandstones and shales	Groundwater Flow	Low	Small Adverse	Imperceptible
	Groundwater Quality	Low	Small Adverse	Imperceptible
Gravels derived from limestones	Groundwater Flow	Medium	Small Adverse	Imperceptible
	Groundwater Quality	Medium	Small Adverse	Imperceptible
Alluvium	Groundwater Flow	Low	Small Adverse	Imperceptible
	Groundwater Quality	Low	Small Adverse	Imperceptible
Till derived from limestone	Groundwater Flow	Low	Small Adverse	Imperceptible
	Groundwater Quality	Low	Small Adverse	Imperceptible
Lacustrine Sediments	Groundwater Flow	Low	Small Adverse	Imperceptible
	Groundwater Quality	Low	Small Adverse	Imperceptible

11.5 Mitigation Measures

11.5.1 Construction Phase

Measures set out in the CEMP will also reduce any risks to soils and geology.

The following mitigation measures will be implemented prior to the commencement and throughout the duration of the works to limit these impacts:

- Prior to the construction phase starting, appropriate health and safety and waste management procedures for working with potentially contaminated soils (including asbestos) and water will be established, such as development and adoption of safe systems of work, including the use of PPE as a last resort. These procedures will be in-line with the requirements of the CEMP (Appendix 5.4 of this EIAR);

- A watching brief will be implemented to identify the potential presence of previously unidentified contamination. Personnel appointed by the appointed Contractor(s) will be appropriately trained in ground contamination identification (including Asbestos Awareness Training) if involved in earthworks activities. Any such instances of previously unidentified contamination will be recorded, the associated risks assessed and a remedial strategy developed by the contractor to manage the identified risks as appropriate;

- Any such instances of previously unidentified contamination will be recorded, the associated risks assessed and a remedial strategy developed by the appointed contractor(s) to manage the identified risks as appropriate;

- Potential risks to workers from ground gas when working within confined spaces will be mitigated through the development and adoption of an appropriate safe system of work, including the use of personal protective equipment (PPE) and Respiratory Protective Equipment (RPE) as a last resort; and

- To mitigate potential risks from radon migration into excavations and other enclosed spaces during the construction phase, an occupational monitoring programme should be implemented to identify whether radon migration and build up is occurring in areas where the risk is considered to be present. The monitoring will be undertaken in accordance with the EPA Protocol for the Measurement of Radon in Homes & Workplaces (EPA 2019b). If the workplace reference level of 300 Bq/m^3 is exceeded (EPA 2019a) mitigation measures will be required during the construction phase, such as development of safe systems of work to ensure protection of personnel, potentially including measures such as use of PPE, RPE and working time restrictions.

Specifically relating to individual receptors such as GWDTEs and groundwater abstractions, the following mitigation measures will be implemented prior to the commencement and throughout the duration of the works to limit these impacts:

- For known private supplies, the mitigation measures in the CEMP and Chapter 12 (Hydrology) of the EIAR will ensure no effect to groundwater quality from the Proposed Development. Based on the known locations, there is no requirement for groundwater monitoring;

- Should any unknown private supplies be identified in the vicinity of the Proposed Development, the supply will be monitored and, if required, an alternative supply will be provided;

- Trenching in areas of potential GWDTEs will be kept to a minimum, with trenches backfilled as rapidly as possible and dewatering volumes kept to a minimum; and

- Where trenching is carried out outside of existing roads, the methodology to backfill trenches will ensure that the backfill is not creating preferential subsurface flow pathway. Soil compaction will be undertaken and where needed on off road sections, additional clay bunds will be installed within the trench in areas that are adjacent to/ in proximity of potential GWDTEs.

11.5.2 Operational Phase

The following mitigation measures will be implemented during the operational phase:

- Risks to maintenance workers from ground gas when working within confined spaces will be mitigated by the development and adoption of safe system of work, including the use of personal protective equipment (PPE) and Respiratory Protective Equipment (RPE) as a last resort; and

- During the operational phase it is assumed that no further ground works will be undertaken. However, in the event that ground works are required, prior to such works commencing, appropriate health and safety and waste management procedures for working with potentially contaminated soils (including asbestos) and water will be established by the relevant contractor, such as development and adoption of safe systems of work, including the use of personal protective equipment (PPE) as a last resort. These will be in-line with standard health and safety practice and ESB requirements.

11.6 Residual Effects

11.6.1 Construction Phase

Residual effects are expected to range from Imperceptible to Slight after implementation of the mitigation measures. In particular, the construction of the Proposed Development within potential GWDTE areas will result in Slight residual effect, with trenches backfilled as rapidly as possible and dewatering volumes kept to a minimum.

11.6.2 Operational Phase

Potential residual effects are expected to range from Imperceptible to Slight during the operational phase after implementation of the mitigation measures.

11.7 Conclusion

After the embedded and proposed mitigation is implemented, no significant effects to land use, geology and hydrogeology are predicted as a result of the Proposed Development. There will be temporary adverse effects to the surface and land use due to the disruption associated with trenching for the cable installation, temporary storage of excavated materials and change of land use at construction compounds. However, given the minimal extent of the land use areas directly impacted compared to the wider extent of land use within the 250 m study area these effects are likely to be negligible.

The trench crosses multiple economic deposits along the Proposed Development comprising very high/high potential aggregate and crushed rock and sands and gravels. However, the areas directly impacted by the construction activities and proposed construction depths are small relative to the size of the economic deposits as a whole across the 250 m study area. Therefore potential losses in economic deposits across the 250 m study area are deemed to be low, resulting in negligible impacts. In addition, following the installation of the cable along the Proposed Development restoration works will be carried out to restore the land back to pre-construction condition, excluding the permanent access tracks. Therefore any impacts will be temporary for the duration of the construction period.

The nature and scale of the Proposed Development relative to the size of the groundwater bodies as a whole is very small. Therefore no significant impacts are anticipated to the WFD groundwater bodies. As a result, the Proposed Development is not expected to cause deterioration in the WFD status of any groundwater body either quantitatively or qualitatively.

Risks to groundwater quality and associated receptors will be mitigated with the adoption of a CEMP. Long term shallow groundwater flow disruptions in the backfilled trench will be mitigated by soil compaction and where needed on off road sections with the use of additional clay bunds, in particular in areas where potential GWDTEs are intercepted.

A review of GSI records on private abstractions has been undertaken and the known supplies have been assessed. There is the also possibility of currently unknown abstractions and supplies that could be affected by the Proposed Development. Albeit the risks being low, as proposed trenching will be 1.5 m deep by 1.7 m and short-lived. With the implementation of the mitigation measures for private supplies, there will be no significant effects - Imperceptible to Slight.

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European Commission, 2011. Consolidated EIA Directive 2011/92/EU;

European Commission, 2014. Directive 2014/52/EU;

European Communities (Environmental Impact Assessment) (Amendment) Regulations, 2001 [Statutory Instrument (S.I.) No. 538/2001];

European Communities, 2003. European Communities (Water Policy) Regulations 2003, [Statutory Instrument (S.I.) No. 722/2003];

European Communities Environmental Objectives (Groundwater) Regulations 2010, [Statutory Instrument (S.I.) No. 9/2010];

European Union (EU) Environmental Objectives (Groundwater) (Amendment) Regulations 2016;

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 (Water Framework Directive);

European Communities Environmental Objectives (Surface Waters) Regulations 2009;

EU Environmental Objectives (Surface Waters) (Amendment) Regulations 2019;

Local Government (Water Pollution) Act, 1977;

Waste Management (Licensing) Regulations, 2014, [Statutory Instrument (S.I.) No. 395/2004]

12. Hydrology

12.1 Introduction

This chapter presents the assessment of the likely significant effects of the Proposed Development on the surface water environment during the construction and operational phases, based on the project description presented in Chapter 5 of this EIAR.

The assessment of effects on biodiversity is discussed in Chapter 10 (Biodiversity). The assessment of the effects from the Proposed Development on groundwater resources is presented in Chapter 11 (Soils, Geology, and Hydrogeology). A Natura Impact Statement (NIS) also supports this application.

This chapter considers the construction and operational phases of the Proposed Development in relation to:

- Surface water drainage;
- Water supply and wastewater discharge;
- Water Framework Directive (WFD) surface water objectives; and
- Flood risk.

Proposed environmental control measures and mitigation measures are presented as appropriate.

12.2 Methodology

12.2.1 Legislation Context

This chapter has been prepared in accordance with the following legislation:

- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended) which gives effect to Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy as amended by Directive 2008/105/EC of 16 December 2008; and
- European Communities (Water Policy) Regulations 2003 (as amended) which gives legal effect to the WFD in Ireland.

The WFD commits EU member states to meet targets for the ecological and chemical status of waterbodies over a given period. The WFD classification scheme for surface water quality includes five status classes: High, Good, Moderate, Poor and Bad based on the biological and supporting physicochemical (nutrients, oxygen condition, temperature, transparency, salinity and river basin specific pollutants (RBSPs)) and hydromorphological quality elements. The biological quality elements are phytoplankton, macrophytes, phytobenthos, benthic invertebrate fauna and fish.

The overall ecological status relates to the biological and physicochemical parameters. Overall ecological status classification for a waterbody is determined, according to the 'one out, all out' principle, by the element with the worst status out of all the biological and supporting quality elements.

Good status means achieving satisfactory quality water, suitable for local communities' drinking, bathing, agricultural, industrial and recreational needs, while maintaining ecosystems that can support all the species of plants, birds, fish and animals that live in these aquatic habitats.

While the overall objective of the WFD is to achieve good status, some waterbodies require extra protection by virtue of their location in a protected area or their function as a drinking water or bathing water. In accordance with the requirements of the WFD and the associated national regulations, a register of protected areas has been set out for each River Basin District in Ireland. The protected areas are identified as those requiring special protection under existing National or European legislation, either to protect the surface water resource or to conserve habitats or species that directly depend on those waters.

The different protected areas included in this register are European drinking water protected areas, designated waters such as fish protected areas and shellfish protected areas, nitrates vulnerable zones, urban wastewater sensitive areas and bathing water protected areas.

The current objective is that all waters (rivers, lakes, groundwater, estuaries, coastal waters, canals and reservoirs) are protected and that measures are put in place to ensure quality of these waters is restored to at least 'good' status or good potential (with some narrow exceptions) by 2027 at the latest. The draft River Basin Management Plan for Ireland 2022-2027 was published in July 2022.

12.2.2 Guidance

This assessment has been prepared in accordance with guidelines established by Transport Infrastructure Ireland (TII) in its Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009), hereafter referred to as the NRA Guidelines, in terms of the criteria for ranking significance of potential impacts. Although these guidelines were developed for road schemes, they are applicable to this assessment given that the Proposed Development is associated with new linear infrastructure projects.

The following guidelines have been adhered to, all of which are considered to be current best practice for this type of Proposed Development within Ireland:

- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland (IFI), 2016);
- Planning for Watercourses in the Urban Environment: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (Inland Fisheries Ireland, 2020);
- EirGrid's Ecology Guidelines for Electricity Transmission Projects (EirGrid, 2020); and
- The Department of the Environment, Heritage and Local Government (DEHLG) and the Office of Public Works (OPW) Planning System and Flood Risk Management, Guidelines for Planning Authorities (hereafter referred to as the Flood Risk Guidelines) (DEHLG and OPW 2009).

The Flood Risk Guidelines aim to integrate flood risk management into the planning process to assist the delivery of sustainable development. They aim to encourage a transparent and consistent consideration of flood risk in the planning process.

The objectives of the Flood Risk Guidelines are given as:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;

- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

The Flood Risk Guidelines categorise flood risk in the form of three flood zones. These flood zones each relate to geographical areas at high, moderate or low flood risk and are therefore assigned as being in flood zone A, B or C, respectively. Table 12.1 provides a definition of each flood zone.

Flood risk is the chance of a flood occurring in any year, expressed as a percentage, for example, a flood event may be described as having a probability of flooding of 1%, which represents a 1 in 100-year event.

The vulnerability of development to flooding depends on the nature of the development, its location and the construction methods used. The classification of different land uses and types of development as highly vulnerable, less vulnerable and water-compatible is influenced primarily by the ability to manage the safety of people in flood events and the long-term implications for recovery of the function and structure of buildings.

Table 12.1: Definition of Flood Zones

Flood Zone	Description
A	Where the probability of flooding from rivers and the sea is highest (greater than 1% for river flooding or 0.5% for coastal flooding).
B	Where the probability of flooding from rivers and the sea is moderate (between 0.1% and 1% for river flooding or between 0.1% and 0.5% for coastal flooding).
C	Where the probability of flooding from rivers and the sea is low (less than 0.1% for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in Zone A or B.

Source: The Planning System and Flood Risk Management, Guidelines for Planning Authorities (OPW 2009)

The Proposed Development is assessed as "*essential infrastructure such as electricity generating power stations and substations*" and therefore, classed as a "*highly vulnerable development*". The Flood Risk Guidelines require that a Justification Test be completed for any highly vulnerable developments which are located within Flood Zone A or Flood Zone B. The planning guidelines describe the two-part test:

- Part 1) the plan making justification test – this is to incorporate flooding into the planning process: identifying the flood risk areas, considering flooding with the overall environmental assessment, and justifying the need for development within Flood Zones A and B, and
- Part 2) development management justification test – where flood risk is present, this part is to present how the development will manage flood risk including consideration that:

1. the development will not increase flood risk elsewhere and, if feasible, will reduce overall flood risk; and

2. the development proposal includes measures to reduce flood risk to people, property and the economy and the environment as far as reasonably practicable and to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures.

12.2.3 Methodology

12.2.3.1 Study Area

The baseline study area for this assessment is 250 m from the centreline of the Proposed Development route, the upgrade works to both Dunstown and Woodland substations, construction compounds and vegetation clearance area as shown in Figure 12.1 in Volume 2 of this EIAR. Given the nature and extent of the Proposed Development it is anticipated that any likely significant effects from the Proposed Development would occur at a local water body scale and therefore a 250 m study area, based on professional judgment, is considered appropriate to encompass all water bodies that may be susceptible to significant effects. Therefore, any identified surface water bodies within that area have been considered as receptors which include WFD designated and non-designated water bodies.

12.2.3.2 Data Collection and Collation

Information on the baseline environment, including hydrology, hydromorphology and water quality of the surface water receptors within the study area has been collated through desk study and field surveys.

12.2.3.3 Data Sources

The key resources used for the purpose of this appraisal were as follows:

- EPA – WFD Ireland online map viewer (EPA 2024);
- GeoHive (Ireland) – National Geospatial Data Hub (Government of Ireland and Tailte Éireann 2024);
- National Parks and Wildlife Service (NPWS) – Designated Sites (NPWS 2024);
- Office for Public Works (OPW) Flood Mapping (OPW 2024); and
- Summary Report – Water Quality in Ireland 2016-2021 (EPA 2022a).

There are potential limitations in using desktop data to identify surface water features/waterbodies such as rivers and ponds, and the use of desktop data has therefore been supplemented by ecology surveys undertaken across areas of interest (Appendix 10.4). Using various sources such as OS mapping and Google Earth imagery, visual observations such as planform, anthropogenic modifications, riparian vegetation, outfalls and discharges and land use have been recorded where possible.

No water quality sampling was carried out as water quality is not a constant parameter and varies significantly depending on weather, flows and seasons. Based on professional judgment, EPA data on water quality was deemed sufficient to establish a representative baseline. Information relating to the quality of the water bodies was drawn from the EPA's online mapping and information portals.

It is possible that some minor drainage ditches located in proximity to the works may not be identified in this chapter. However, the mitigation measures detailed in Section 12.5 of this chapter and within the Construction Environmental Management Plan (CEMP) included as Appendix 5.4 in Volume 3 of this EIAR will be implemented when dealing with any such features to avoid, reduce or offset any potential negative effects.

12.2.3.4 Flood Risk Assessment

A flood risk assessment (FRA) has been completed for the Proposed Development (see Volume 3 Appendix 12.1) in accordance with the Department of the Environmental, Heritage and Local Government (DEHLG) and the OPW Flood Risk Guidelines (DEHLG and OPW 2009).

The FRA considers the potential flood risk to the Proposed Development during construction and operation. This assessment has been undertaken through reviewing the OPW flood risk maps (OPW 2023) and assessing waterbody locations with respect to the Proposed Development.

12.2.4 Impact Assessment

12.2.4.1 General Approach

The following method for the assessment of effects has been adapted from the NRA Guidelines (NRA 2009). The surface water environment is intrinsically linked to ecological receptors and groundwater, considered in Chapter 10 (Biodiversity) and Chapter 11 (Soils, Geology and Hydrogeology).

The NRA Guidelines outline how impact type, magnitude, and duration should be considered relative to the importance of the hydrological receptors and their sensitivity to change in order to determine significance of effects.

The overall effect on surface water receptors (i.e. rivers, canals, transitional water bodies, coastal water bodies and lakes) as a result of the Proposed Development will be determined based on two parameters:

1. The sensitivity of the water body attributes (hydrology, surface water quality, hydromorphology and surface water supply) to change; and

2. The magnitude of the impacts on water body attributes.

12.2.4.2 Importance of Receptors

The importance of surface water receptors to changes as a result of the Proposed Development are determined by a set of criteria including their relative importance or 'value' (e.g. whether features are of national, regional or local value). Table 12.2 outlines the criteria for estimating the sensitivity of receptors, and their attributes were assessed following NRA Guidelines.

Table 12.2: Criteria Used to Evaluate the Sensitivity of Surface Water Receptors

Importance	Criteria	Typical Example
Extremely High	Receptor (or receptor attribute) has a very high quality or value on an international scale	Any WFD water body which is protected by EU legislation e.g. a Designated European Sites (Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)) or 'Salmonid Waters'; and A water body that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence.

Importance	Criteria	Typical Example
Very High	Receptor (or receptor attribute) has a high quality or value on an international scale or very high quality or value at a national scale	Any WFD water body (specific EPA segment) which has a direct hydrological connection of <2 km to European sites or protected ecosystems of international status (SAC / SPA or Salmonid Waters); WFD water body ecosystem protected by national legislation (Natural Heritage Area (NHA) status); A water body that appears to be largely in natural equilibrium and exhibits a diverse range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited modifications; and Nutrient Sensitive Areas.
High	Receptor (or receptor attribute) has a moderate value at an international scale or high quality or value on a national scale	A WFD water body with High or Good Status; A Moderate WFD Status (2013 – 2018) water body with some hydrological connection (<2 km) to European sites or protected ecosystems of international status (SAC / SPA or Salmonid Waters) further downstream WFD water body which has direct hydrological connection to sites/ecosystems protected by national legislation (NHA status); A water body that appears to be in some natural equilibrium and exhibits some morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences; and Direct hydrological connectivity to Nutrient Sensitive Areas.
Medium	Receptor (or receptor attribute) has some limited value at a national scale	WFD water body with Moderate WFD Status (2013 – 2018); WFD water body with limited (>2 km <5 km) hydrological importance for sensitive or protected ecosystems (much further downstream);

Importance	Criteria	Typical Example
		A water body showing signs of modification or culverting, recovering to a natural equilibrium and exhibiting a limited range of morphological features (such as pools and riffles). The waterbody is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences; Evidence of historical channel change through artificial channel straightening and re-profiling; and Some hydrological connection downstream Nutrient Sensitive Areas
Low	Receptor (or receptor attribute) has a low quality or value on a local scale	Water body with Bad to Poor WFD Status (2013 – 2018); and A WFD water body with >5 km (or no) hydrological connection to European sites or national designated sites. Or A non-WFD water feature with minimal hydrological importance to sensitive or protected ecosystems; and/or economic and social uses; A highly modified waterbody that has been changed by channel modification, culverting or other anthropogenic pressures. The waterbody exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification. Highly likely to be affected by anthropogenic factors. Heavily engineered or artificially modified and could dry up during summer months; and Many existing pressures which are adversely affecting biodiversity.

12.2.4.3 Magnitude of Effect

The magnitude of effects on receptors (or attributes) is determined in accordance with the NRA Guidelines (NRA 2009). The scale or magnitude of potential effects (both beneficial and adverse) depends on both the degree and extent of which the Proposed Development may impact the surface water receptors during the construction and operational phases.

Factors considered to determine the magnitude of potential effects include the following:

- Nature of effects;
- Intensity and complexity of the effects;
- Expected onset, duration, frequency and reversibility of the effects;
- Cumulation of the effects with other existing and / or approved project effects; and
- Possibility of effectively reducing the effects.

Table 12.3 illustrates the criteria used for determining the magnitude of effect on surface water receptors.

Table 12.3: Criteria for Determining the Magnitude of Effect on Surface Water Receptors (NRA 2009)

Nature of Effect	Description	Scale and Nature of Effects
Large Adverse	Results in loss of attribute and/or quality and integrity of the attribute	Loss or extensive change to a fishery; Loss of regionally important public water supply; Loss or extensive change to a designated nature conservation site; Reduction in water body WFD classification or quality elements; Results in loss of receptor and/or quality and integrity of receptor; and An impact, which has a high likelihood of occurrence and that has the potential to alter the character of a small part or element of the receptor in the medium to long-term. This could be frequent or consistent in occurrence, and result impact which may alter the existing or emerging trends.
Moderate Adverse	Results in effect on attribute and/or quality and integrity of the attribute	Partial loss in productivity of a fishery; Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies; Contribution to reduction in water body WFD classification; Results in impact on integrity of receptor or loss of part of receptor; and An impact, which has reasonable likelihood of occurrence and that has the potential to alter the character of a small part or element of the receptor in the medium-term. This could be intermittently or occasionally, and result impact which may be consistent with existing or emerging trends

Nature of Effect	Description	Scale and Nature of Effects
Small Adverse	Results in some measurable change in attributes, quality or vulnerability	Measurable impact but with no change in overall WFD classification or the status of supporting quality elements; Minor impacts on water supplies; Results in minor impact on integrity of receptor or loss of small part of receptor; and An impact, which has low likelihood of occurrence and that has some potential to alter the character of a small part or element of the receptor in the short-term. This could be on a once off occasion or rare occurrence, and result impact which may be consistent with existing or emerging trends.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	No measurable impact on integrity of the attribute; and Results in an impact on receptor but of insufficient magnitude to affect either use or integrity.
Small Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	No measurable impact on integrity of the attribute. Results in an impact on receptor but of insufficient magnitude to affect either use or integrity.
Moderate Beneficial	Results in moderate improvement of attribute quality	Has some potential to result in minor improvement WFD quality element(s)
Large Beneficial	Results in major improvement of attribute quality	Improvement in water body WFD Classification

12.2.4.4 Significance of Effects

The significance of an effect is determined by combining the sensitivity of the receptor with the predicted magnitude of effect. Any residual effects are reported after the assessment of the effectiveness of essential mitigation measures required to avoid, reduce or offset likely significant adverse environmental effects. The matrix used for the determination of significance is shown in Table 12.4.

Table 12.4: Categories of Environmental Effects (NRA 2009)

Importance of Attribute	Magnitude of Effect			
	Negligible	Small	Moderate	Large
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

12.3 Baseline Conditions

12.3.1 WFD Catchment Overview

The Proposed Development and the study area are located within the Hydrometric Area (HA) 09 (Liffey and Dublin Bay) water catchment area. The Liffey and Dublin Bay catchment includes the area drained by the River Liffey and by all streams entering tidal water between Sea Mount and Sorrento Point, Co. Dublin, draining a total area of 1,616 km^2. The Liffey catchment contains the largest population of any catchment in Ireland and is characterised by a sparsely populated, upland southeastern area and a densely populated, flat, low-lying area over the rest of the catchment basin.

12.3.2 Surface Water WFD Status

The EPA river dataset is designed as a geometric river network for monitoring management and reporting purposes. The EPA has split up rivers and streams into smaller sections to allow areas to be easily distinguished which are assigned segment codes. The WFD status of the rivers and streams within the study area of the Proposed Development are detailed in Table 12.5. Other watercourses without WFD status are shown in Table 12.6.

Table 12.5: Current classification status for identified WFD water bodies within the study area (Environmental Protection Agency, 2022b).

Waterbody Reference	Chainage	WFD Waterbody Name	WFD Sub-Catchment	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Proposed Crossing by Proposed Development
WB01	800	Trib of Tolka_020	Tolka_SC_010	IE_EA_09T010600	Moderate	Agriculture	Open Cut Trenching
WB02	1900	Dunboyne stream_010	Tolka_SC_010	IE_EA_09D040500	Poor	Agriculture, Domestic Waste Water	Open Cut Trenching
WB03	3615	Rye Water_030	Liffey_SC_080	IE_EA_09R010400	Poor	Agriculture, Domestic Waste Water, Hydromorphology	Open Cut Trenching
WB04	6000	Jenkinstown stream_010	RyeWater_SC_010	IE_EA_09J010950	Moderate	Agriculture, Domestic Waste Water	Open Cut Trenching
WB07	10700	Jenkinstown stream_010	RyeWater_SC_010	IE_EA_09J010950	Moderate	Agriculture, Domestic Waste Water	Open Cut Trenching
WB08	11180	Jenkinstown stream_010	RyeWater_SC_010	IE_EA_09J010950	Moderate	Agriculture, Domestic Waste Water	Open Cut Trenching
WB10	12370	Rye Water_020 (Brides Stream)	RyeWater_SC_010	IE_EA_09R010300	Good	N/A	Open Cut Trenching

Waterbody Reference	Chainage	WFD Waterbody Name	WFD Sub-Catchment	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Proposed Crossing by Proposed Development
WB12	14400	Rye Water_020 (Padistown)	RyeWater_SC_010	IE_EA_09R010300	Good	N/A	Open Cut Trenching
WB13	15050	Rye Water_010	RyeWater_SC_010	IE_EA_09R010100	Moderate	Agriculture, Domestic Waste Water	Horizontal Directional Drilling (HDD)
WB14	15400	Royal Canal	RyeWater_SC_010	IE_EA_AWB_RCMILE	Good	N/A	HDD
WB15	19920	Lyreen_010	Lyreen_SC_010	IE_EA_09L020035	Poor	Agriculture, Domestic Waste Water	N/A
WB19	21650	Lyreen_010 (Baltracey Trib Lyreen)	Lyreen_SC_010	IE_EA_09L020035	Poor	Agriculture, Domestic Waste Water, Hydromorphology, Industry	Open Cut Trenching
WB22	23620	Clonshanbo_010	Lyreen_SC_010	IE_EA_09C030300	Poor	Agriculture, Domestic Waste Water, Hydromorphology	Open Cut Trenching
WB24	25800	Clonshanbo_010	Lyreen_SC_010	IE_EA_09C030300	Poor	Agriculture, Domestic Waste Water, Hydromorphology	Open Cut Trenching
WB25	27300	Kilmurry_010	Liffey_SC_050	IE_EA_09K260890	Poor	Agriculture	Open Cut Trenching

Waterbody Reference	Chainage	WFD Waterbody Name	WFD Sub-Catchment	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Proposed Crossing by Proposed Development
WB27	30000	Liffey_130	Liffey_SC_050	IE_EA_09L011600	Good	N/A	N/A
WB29	30400	Liffey_130	Liffey_SC_050	IE_EA_09L011600	Good	N/A	N/A
WB30	31360	Trib of Slate_010	Slate_SC_010	IE_SE_14S010000	Poor	Extractive Industry, Hydromorphology, Urban Run-off	Open Cut Trenching
WB31	31360	Liffey_130	Liffey_SC_050	IE_EA_09L011600	Good	N/A	N/A
WB32	36150	Longton_Demesne_Trib of Liffey_120	Liffey_SC_050 / Liffey_SC_060	IE_EA_09L011500	Good	N/A	Open Cut Trenching
WB35	37200	Liffey_120	Liffey_SC_050 / Liffey_SC_060	IE_EA_09L011500	Good	N/A	HDD
WB36	37900	Liffey_120	Liffey_SC_050 / Liffey_SC_060	IE_EA_09L011500	Good	N/A	N/A
WB37	39000	Liffey_120	Liffey_SC_050 / Liffey_SC_060	IE_EA_09L011500	Good	N/A	N/A

Waterbody Reference	Chainage	WFD Waterbody Name	WFD Sub-Catchment	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Proposed Crossing by Proposed Development
WB38	39400	Grand Canal	Liffey_SC_060	IE_09_AWB_GCMLE	Good	Anthropogenic Pressures	N/A
WB39	41510	Liffey_110	Liffey_SC_060	IE_EA_09L011300	Good	N/A	N/A
WB41	42900	Liffey_110	Liffey_SC_060	IE_EA_09L011300	Good	N/A	N/A
WB42	44600	Grand Canal	Liffey_SC_060	IE_09_AWB_GCMLE	Good	Anthropogenic Pressures	HDD
WB43	45330	Liffey_100	Liffey_SC_060	IE_EA_09L011200	Good	N/A	N/A

12.3.3 Non-WFD Classified Surface Water Features

A review of OS mapping has identified 18 minor water features within the study area. These features, including the approximate chainage where interaction is likely, are listed in Table 12.6 below.

Table 12.6: Non-WFD Classified Surface Water Features identified within Study Area

Waterbody Reference	Chainage	WFD Sub-Catchment	Watercourse type / WFD Waterbody Name (where applicable)	Proposed Crossing by Proposed Development
WB05	7385	RyeWater_SC_010	Pond/ watercourse	Open Cut Trenching
WB06	8080	RyeWater_SC_010	Jenkinstown stream The Stream is supplemented by ditches	Open Cut Trenching
WB09	11400	RyeWater_SC_010	Jenkinstown stream The Stream is supplemented by ditches	Open Cut Trenching
WB11	13650	RyeWater_SC_010	Newtownmoy Aghy Stream Trib of RYE WATER_020	N/A
WB16	20870	Lyreen_SC_010	Drainage ditches	N/A
WB17	21250	Lyreen_SC_010	Drainage ditches	Open Cut Trenching
WB18	21300	Lyreen_SC_010	Drainage ditches	Open Cut Trenching
WB20	22000	Lyreen_SC_010	Trib of Liffey_010	HDD
WB21	22300	Lyreen_SC_010	Drainage ditches	Open Cut Trenching
WB23	24150	Lyreen_SC_010	Drainage ditches	N/A
WB26	27600	Liffey_SC_050	Trib of Kilmurry_010	Open Cut Trenching
WB28	30250	Liffey_SC_050	Trib of Liffey_130	Open Cut Trenching
WB33	36650	Liffey_SC_050 / Liffey_SC_060	Drainage ditches	N/A
WB34	36900	Liffey_SC_050 / Liffey_SC_060	Drainage ditches	Open Cut Trenching

Waterbody Reference	Chainage	WFD Sub-Catchment	Watercourse type / WFD Waterbody Name (where applicable)	Proposed Crossing by Proposed Development
WB40	42300	Liffey_SC_060	Liffey_110	N/A
WB44	49000	Liffey_SC_050	Drainage ditches	Open Cut Trenching
WB45	52700	Liffey_SC_050	Dunstown	Open Cut Trenching

12.3.4 Designated Sites

Designated sites are considered within each waterbody within the Liffey and Dublin Bay catchment. The sites described comprise Nutrient Sensitive Areas, Shellfish Areas, Coastal Bathing Waters, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), proposed Natural Heritage Areas (pNHAs), salmonid rivers and marine bathing waters. A summary is provided in Table 12.7.

Table 12.7: Designated Sites within Study Area

WFD Register of Protected Areas Category	Present in Study Area?	Comments
Nutrient Sensitive Areas	Yes	The River Liffey is designated under the Urban Waste Water Treatment (UWWT) Directive.
Shellfish Areas	No	N/A
Coastal Bathing Waters	No	N/A
SAC	No	Ballynafagh Bog SAC not within study area but rivers associated with SAC are: Slate_010 (approximately 1.5 km to the west of the Proposed Development)
SPA	No	N/A
Proposed Natural Heritage Areas	Yes	Royal Canal (Site Code: 002103) Grand Canal (Site Code: 002104)
Salmonid Rivers	No	N/A
Drinking Water Protected Rivers	No	N/A

12.3.5 Flood Risk

This section should be read with the detailed Flood Risk Assessment in Appendix 12.1. There are a number of potential sources or categories of flood risk to be assessed based on a source-pathway-receptor model. The potential categories of flood risk to a development are described in Table 12.8 and the risk to the development assessed.

Table 12.8: Sources of Flood Risk

Category	Mechanism	Potential risk to Proposed Development from category of flooding
Fluvial flooding	Exceedance of the flow capacity of the channel of a river, stream or other natural watercourse (which may be culverted in some areas). Fluvial flooding is typically associated with heavy rainfall events, and excess water spills onto the river floodplain.	Proposed Development potentially at risk from a number of local watercourses where there is an interface with proposed works.
Coastal and tidal flooding	Caused by high astronomical tide, storm surge, wave action, and local bathymetric effects, often in combination. In estuaries and watercourses affected by tide-locking, flooding can occur as a result of high tidal levels and high fluvial flows in combination.	The Proposed Development is outside OPW tidal flood risk areas so is not at risk.
Surface water / overland flow	Water flowing over the ground surface that has not reached a natural or artificial drainage channel. This can occur when intense rainfall exceeds the infiltration capacity of the ground, or when the ground is so highly saturated that it cannot accept any more water.	Rainfall could potentially affect the Proposed Development.
Groundwater flooding	Raised groundwater levels, typically following prolonged rain (that may be slow to recede). High groundwater levels may result in increased overland flow flooding. Normally associated with catchments where porous substrate and/or aquifers exist.	OPW Groundwater flood risk maps indicate no risk of groundwater flooding along the development route. There may be potential for groundwater seepage in areas of high soil permeability, as well as close to the proposed river crossings and riverbanks.
Human/mechanical error	Blockage or overloading of pipes, sewers, canals, and drainage channels or failure of pumping systems. Typically occurs following heavy rainfall or as a result of high water levels in a receiving watercourse.	Blockage could be a potential source of flood risk.

As per the findings from the FRA (Appendix 12.1), the Proposed Development could potentially be at low risk of flooding from fluvial and surface water in certain locations where there are interfaces between the proposed works and floodplains. There is no known risk from coastal and groundwater flooding. These flood risk sources have been assessed for the Proposed Development during construction and operation and mitigation measures provided where required.

12.3.6 Summary of Receptor Importance

Table 12.9 provides an indication of importance for the identified receptors based on criteria set out in Table 12.2.

Table 12.9: Summary of Scoped in Baseline Receptor Importance

Waterbody ID	Waterbody Name	Indicator/Feature	Importance
WB01	Trib of Tolka_020	Water body has moderate WFD status and is >5 km from European or national designated sites. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	Medium
WB02	Dunboyne stream_010	Water body has a poor WFD status and is >5 km from European or national designated sites. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	Low
WB03	Rye Water_030	Water body has a poor WFD status and is >5 km from European or national designated sites. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	Low
WB04, WB07, WB08	Jenkinstown stream_010	Water body has a moderate WFD status and is >5 km from European or national designated sites. Water body appears to generally be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	Medium
WB10, WB12	Rye Water_020 (Brides Stream & Padistown)	Water body has good WFD status and is >5 km from European or national designated sites. Water body appears to generally be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	High
WB13	Rye Water_010	Water body has moderate WFD status and is >5 km from European or national designated sites. Water body appears to generally be in natural equilibrium with evidence of a	Medium

Waterbody ID	Waterbody Name	Indicator/Feature	Importance
		limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	
WB14	Royal Canal	The Royal Canal is an artificial water body (AWB). The water body has good Ecological Potential and is designated a potential Natural Heritage Area (pNHA). No surface water abstractions have been identified within the study area.	High
WB15, WB19	Lyreen_010	Water body has poor WFD status and is >5 km from European or national designated sites. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	Low
WB22, WB24	Clonshanbo_010	Water body has poor WFD status and is >5 km from European or national designated sites. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	Low
WB25	Kilmurry_010	Water body has poor WFD status and is >5 km from European or national designated sites. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	Low
WB27, WB29, WB31	Liffey_130	Water body has good WFD status and is connected to the Liffey Nutrient Sensitive Area. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	High
WB30	Trib of Slate_010	Water body has poor WFD status but is hydrologically connected to Slate_10 and <2 km from Ballynafagh Bog SAC. Water body is modified and is engineered. However, displays some evidence of natural features indicating an attempt to recover to a natural equilibrium. No surface water abstractions have been identified within the study area.	High
WB32	Longton_Demesne_Trib of Liffey_120	Water body has good WFD status and is connected to the Liffey Nutrient Sensitive Area. Water body appears to be in	High

Waterbody ID	Waterbody Name	Indicator/Feature	Importance
		natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	
WB35, WB36, WB37	Liffey_120	Water body has good WFD status and is connected to the Liffey Nutrient Sensitive Area. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	High
WB38, WB 42	Grand Canal	The Grand Canal is an artificial water body (AWB). The water body has good Ecological Potential and is protected by national legislation and is designated a potential Natural Heritage Area (pNHA). No surface water abstractions have been identified within the study area.	High
WB39, WB41	Liffey_110	Water body has good WFD status. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	High
WB43	Liffey_100	Water body has good WFD status. Water body appears to be in natural equilibrium with evidence of a limited range of fluvial processes. Water body is subject to some anthropogenic modification. No surface water abstractions have been identified within the study area.	High
WB05 WB06 WB09 WB11 WB16 WB17 WB18 WB20 WB21 WB23 WB26 WB28 WB33 WB34 WB40 WB44 WB45	Unnamed watercourses	Water body is not designated under WFD and is >5 km from European or national designated sites. Water bodies are straightened and channelised with potential to be largely constrained by hard engineering. No surface water abstractions have been identified within the study area.	Low

12.4 Potential Effects

The following sections discuss the potential effects which could arise as result of the Proposed Development in the absence of mitigation.

12.4.1 Construction Phase

Given the nature of the Proposed Development, the potential for effects on the water environment is primarily associated with the construction phase, and construction activities are typical for civil engineering projects. These include potential effects on:

- Surface water quality from sediment run-off, spillages, discharges or physical modification;
- Drainage patterns from formation of impermeable surfaces and working in or near watercourses;
- Water supply and drainage infrastructure; and
- Flood risk.

12.4.1.1 Surface Water Quality

Excavation works and works associated with the creation of passing-bays, the storage of excavated material, vegetation clearance, crossing of watercourses and infilling of trenches can pose a risk to surface water quality through surface water run-off and the release of sediment to watercourses. In addition, surface water quality can be impacted by open-cut trenching either by the direct crossing or crossings close to watercourses. Elevated levels of sediment affect water quality by affecting dissolved oxygen, pH, clarity, nutrient levels, and temperature which can all have negative impacts on aquatic species. The construction of below ground structures, such as joint bays, may require dewatering (depending on ground conditions and water table elevations at the time of excavation) and any associated discharges from groundwater to a surface waterbody may have the potential to affect water quality.

Exposed surfaces of construction vehicles and machinery can erode, and when it rains this eroded material can enter surface water features and potentially have a negative impact on water quality. Access tracks used to facilitate construction may affect surface run-off patterns, creating alternative flow paths and promoting erosion of previously unaffected areas. Also, accidental release of potentially polluting substances such as cement and oils (hydrocarbons) can result in significant effects on the surface water environment and associated aquatic environment.

The release of hydrocarbons from accidental spillages, vehicles and/or machinery are likely to result in a deterioration to water quality including a reduction in dissolved oxygen. This can have a negative impact on any water dependent species present. Hydrocarbons do not dissolve, and so will not dilute into the water until they break down.

Concrete and cement are highly alkaline and fresh concrete has corrosive properties. Concrete wash water is a particularly severe pollutant, as it typically has a high pH (11-12) coupled with extremely high suspended sediment content. In the freshwater environment, pH levels which are elevated beyond natural conditions can have significant effects upon water bodies. There is also the potential for bentonite break out (or slurry run-off from launch pits) to contaminate watercourses where HDD activities are taking place.

In the absence of mitigation measures, it is predicted that the Proposed Development will have adverse effects on water quality locally due to activities detailed above. Depending on the importance of the receptor, potential effects vary from a magnitude of small to moderate leading to an Imperceptible, Slight or Significant significance of effect. Table 12.10 details the impact assessment outcomes during the construction phase in the absence of mitigation measures.

12.4.1.2 Hydromorphology

There are 41 watercourse crossings associated with the Proposed Development. The drainage patterns associated with watercourses confined to existing culverts will not be impacted significantly as a result of the Proposed Development.

Open cut trenching will be carried out in a dry works area. To do this, an impermeable barrier will be installed, the type of which will be tailored to the specific watercourse and determined during detailed design and following consultation with IFI. Section 12.5.4 details the types of diversions that can be considered. The existence of a temporary impermeable barrier to facilitate open cut trenching will have a direct impact on the cross section of the channel. This is likely to give rise to localised but temporary changes in water depth, velocities and sediment erosion and deposition while the barrier remains in situ and in the short-term following removal while sediment erosion and deposition processes return to normal.

Vegetation clearance/topsoil stripping and tracking of plant and machinery within water body floodplain and along banks has the potential to increase fine sediment delivery to water bodies through accelerated fluvial activity causing an increase in the rate of bank erosion. In channel construction associated with open cut trenching can lead to the removal of natural bed substrate and natural morphological features and disruption to lengths of natural bank.

The changes to water body hydromorphology may potentially lead to changes in river processes and habitats upstream and downstream. Any effects would be localised and temporary in nature.

The proposed activities may result in localised changes to surface water drainage patterns and restrictions to infiltration of rainfall in soils. Given the largely rural locations of the Proposed Development, existing drainage networks are available and any disturbance will be localised and temporary in duration. Surface water contributions will remain unchanged and will likely discharge to the same catchment.

In the absence of mitigation measures, there is potential for the Proposed Development to have adverse effects on hydromorphology locally. Depending on the importance of the receptor, potential impacts vary from a magnitude of small to moderate leading to an Imperceptible, Slight or Significant significance of effect.

12.4.1.3 Water Supply and Drainage infrastructure

As identified within Section 12.3, there are no known surface water abstractions within the study area. Additionally, none of the WFD designated water bodies are designated as drinking water protected river, nor are they hydrologically connected to such within 5 km of the Proposed Development.

However, during the construction phase, there is potential for disruption to services not currently identified through inadvertent damage caused by works activities. This could lead to water supply issues in terms of quantity and quality losses or complete severance of supply.

During the construction phase, temporary construction compounds will be constructed within the planning application boundary along the route, as noted in Chapter 5 (Proposed Development Description). There will be water usage demands within these compounds, as well as the generation of wastewater. Any wastewater will be tankered off-site to a suitability licensed facility.

12.4.1.4 Flood Risk

Sections of the Proposed Development are partially located within floodplains associated with a number of watercourses located throughout the route corridor. Where the Proposed Development interacts with watercourses, a crossing will be required by either open trench crossing or by HDD. Refer to Chapter 5 (Proposed Development Description) for details on which method will be implemented at each crossing location. The larger main watercourses will be traversed by HDD. Most minor watercourses are located outside the OPW flood risk maps for defining Flood Zone B. For minor watercourses and ditches, a trench will be excavated through the watercourse.

Construction activities have the potential to cause blockages and damage within watercourses, which may in turn impact floodplains and reduce their storage capacity, or increase the risk of flooding from a blocked or damaged watercourse.

During the construction of the Proposed Development, in the absence of mitigation measures, there is the potential for surface water flow paths to be altered locally. This could increase the risk of surface water flooding to the local area and result in a significant adverse effect on flood risk.

12.4.2 Operational Phase

12.4.2.1 Surface Water Quality

There is the possibility of some effects on surface water quality during the operational phase of the Proposed Development, primarily during future maintenance. Maintenance of a buried cable will typically involve extraction and replacement of the section of faulty cable. At the above ground locations (along permanent access tracks to off-road joint bays), potential impacts would include:

- Pollution entering surface water systems from spillages of fuels, lubricants and hydraulic oils that may be used during ongoing maintenance or along the permanent access tracks to off-road joint bays; and
- Alterations to the hydrological regime by altering or preventing the natural movement of surface and subsurface flows or by acting as a conduit for new flows that may carry contaminants to the receiving surface water environment.

All maintenance works will be infrequent. As the cables are solid insulation type, there are no sources of pollution, and as they are buried, they will not offer a pathway to any surface water receptors.

Given the nature of the Proposed Development, significant adverse effects on surface water quality during operation are not anticipated.

12.4.2.2 Hydromorphology

During the operational phase of the Proposed Development all new cable infrastructure will be located below ground and will not interface with surface water receptors. Where permanent access tracks to off-road joint bays remain that include culverts, there is the potential for natural processes to be affected upstream and downstream. As part of embedded design mitigation measures, the installation of any culverts shall be to best practice to ensure no impacts.

Given the above, no potential effects to hydromorphology are anticipated during the operational phase.

12.4.2.3 Water Supply and Drainage infrastructure

As the land will continue to drain as per the existing situation no potential effects to water supply and drainage infrastructure are anticipated during the operational phase.

12.4.2.4 Flood Risk

The Proposed Development is designed to not be vulnerable to flooding; this includes avoidance of Flood Zones A and B where feasible. The cable is underground and is designed to be floodable without affecting its operation. During operation, the key vulnerability to the cable is its joints. All joint bays are designed with watertight connections as standard. The cable route is buried and so will not affect flood flows. The cable route therefore passes the development management justification test. For further detail, please see the Flood Risk Assessment (Appendix 12.1).

12.5 Mitigation Measures

12.5.1 Construction Phase

12.5.1.1 General

The following mitigation measures will be implemented prior to commencement and throughout the duration of the construction phase:

- Implementation of the CEMP (Appendix 5.4 of this EIAR) and the Construction Resource Waste Management Plan (Appendix 5.5 of this EIAR) which set out measures to control and manage activities at the surface to prevent issues such as accidental spillage;

- A full-time on-site Environmental Clerk of Works (EnCoW) will be appointed prior to commencement of works. The role of the EnCoW is to monitor and ensure compliance with planning consents, environmental permits, legislation and mitigation;

- Works will be carried out in accordance with the guidelines set out by IFI in Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016);

- The IFI Biosecurity Protocol for Field Survey Works (IFI, 2011) will be complied with;

- Works method statements will be agreed with, and subject to any requirements specified by IFI for all watercourse crossings. The works method statement will include details on silt fencing, pH monitoring requirements for in-stream concrete pouring works, and handheld turbidity monitoring for in-stream and HDD works; and

- An adverse weather stop work plan will be developed to ensure that activities with the potential to cause pollution are stopped under certain weather conditions. Certain activities (such as open cut trenching, HDD works) will not be carried out during extreme rainfall or high flow events. Met Eireann (Red, Amber, Yellow) warnings and flood warnings will be monitored daily by the EnCoW.

12.5.1.2 Surface Water Quality Protection Measures

The following surface water quality mitigation measures will be implemented prior to commencement and throughout the duration of the works, which will be carried outside of any known seasonal restrictions, including instream working restrictions which are generally confined to summer/early autumn season (June/July/Aug/Sept):

- Activities will be planned in advance and machinery will be managed to ensure that the number of trips is limited to the minimum required at each location. This is because the more times a piece of ground is tracked, the more likely it is that vegetative cover will be removed and ruts will be created that will act as miniature rivers where dirty water will flow;

- Tracking beside streams and tracks will be kept to a minimum to reduce damage to the bankside;

- Geotextile or timber matting will be used on soft ground, and in all protected areas;

- A buffer zone of 20 m will be maintained between storage/working areas and sensitive watercourses, such as the River Liffey, taking account of the minimum working area required to facilitate the works;

- Oil or fuel stored in or adjacent to the works area will be kept in a bunded area (providing 110% capacity of the largest storage unit), 10 m from any watercourse which appears on a 6" OS map of the site. Vehicle maintenance will not occur within 10 m of any watercourse and all machinery will be in good working order, free from any leakage of fuel, oil or hydraulic fluid;

- Reinstatement method statements will be subject to approval by the EnCoW and in agreement with IFI;
- Concrete will be brought to site by covered truck. Wet concrete operations adjacent to watercourses will be minimised, with a minimum separation distance of 10 m. Where unavoidable, for example in-channel works requiring the use of concrete, these operations will be carried out under supervision of the EnCoW and with suitable mitigation measures in place, such as controlling the leakage of any cement;
- The Contractor will ensure that all concrete truck rinsings/cleaning is undertaken within construction compounds and at least 10 m away from watercourses;
- In order to reduce the risk of contamination arising as a result of spills or leakages, measures including, but not limited to, the following will be employed:
    - All collected waste will be managed in accordance with the Waste Management Act 1996, and associated Regulations;
    - Fuels, chemicals, liquid and solid waste will be stored on impermeable surfaces;
    - Refuelling of plant, equipment and vehicles will be carried out on impermeable surfaces;
    - All tanks and drums will be bunded; and
    - Spill kits will be provided at all compound locations and carried by all crews during underground cable installation works.
- Silt fences (to Hy-Tex Premium specification or similar) and silt traps will be installed prior to commencement of works and will be inspected daily so that they can be adjusted as necessary. The EnCoW will consider the locations for these measures based on the potential for sediment-laden run-off to reach a receiving watercourse.
- Site restoration post works will be carried out, in agreement with IFI. These site restoration works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation;
- The Emergency Incident Response Plan and environmental control and mitigation measures described in the CEMP will be agreed prior to construction with IFI; and
- Water pumped from dry works areas and any dewatering will be treated using settlement tanks to remove sediment prior to discharge onto grass and allowed to filter back to the watercourse.

12.5.1.3 Silt Control Measures

The following silt control mitigation measures will be implemented prior to commencement and throughout the duration of the works:

- Silt control measures will be used to control silt generated from activities on site and prevent it gaining access to surface drainage which could convey silt to larger streams and watercourses;
- Silt control measures will include silt traps which can be located in small drains where flow is small and silt fences where run-off from large areas needs to be controlled;
- Silt fences will be installed downgradient of the works and not at the watercourse;
- Access routes will be delineated such that an appropriate set back distance from watercourses is maintained. Where works are to be undertaken adjacent to watercourses the setback distance will be delineated by the EnCoW on site;

- Where distances between the works and watercourse allow (with the exception of open trench cutting), a minimum setback distance of 20 m from the watercourse will be maintained; and
- Where the site is constrained, the best available set back distance will be determined by the EnCoW, taking account of the minimum working area required to facilitate the works.

Silt Fences

- Silt fences will be installed downslope of the area where silt is being generated on disturbed ground;
- To be effective, the silt fence will contain the area where silt is generated and will terminate on high ground (i.e. an elevated area not in the watercourse);
- Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh;
- The base of the silt fence will be bedded at least 15–30 cm into the ground at 2 m intervals. The manufacturer’s installation instructions should be consulted prior to installation to ensure the silt fence is appropriately installed to avoid a reduction on performance efficacy,
- Once installed the silt fence will be inspected regularly by the EnCoW, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains;
- The integrity of the silt fencing will be checked daily by the EnCoW and after poor weather conditions (rain or wind) and any failures rectified immediately;
- Two lines of silt curtain/fence will be installed, where considered necessary, by the EnCoW;
- Any build-up of sediment along the fence boundary will be removed daily;
- Silt fences will be maintained until vegetation on the disturbed ground has re-established;
- The silt fencing will be left in place until the works are completed in the respective work areas or downstream of these (which includes removal of any temporary ground treatment);
- Silt fences will not be removed during heavy rainfall;
- The silt fence will not be pulled from the ground but cutaway at ground level and posts removed; and
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

Silt Traps

The purpose of the trap is to reduce the level of solids in the slowly flowing water. The silt trap works by allowing a build-up of water behind it, slowing flow and allowing solids to settle out. The following requirements will apply:

- Silt traps will only be placed in drains downstream of working areas where the volume of water flow is expected to be low;
- Silt traps will be made of Terram or similar material, not mesh;
- The trap will be staked into the banks of the drain/watercourse such that no water can flow around the sides;
- The material will be bedded into the drain bed/watercourse to prevent water flowing beneath it;

- The height of the trap will be lower than the bank heights. The upper edge will be fixed to a timber cross piece. This will allow water to overtop the silt trap and not burst through or around it;
- Inspections will be carried out daily by the EnCoW during the proposed works, weekly on completion of the works for at least one month, and after heavy rains, and monthly thereafter until bare areas have developed new growth;
- Any build-up of solids will be carefully removed without removing any vegetation growing on the bottom;
- The silt trap will not be pulled from the ground but cutaway at ground level and posts removed; and
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

12.5.2 Construction Compounds/Laydown areas

All temporary construction compounds will be secured with hoarding/fencing around the compound perimeters as appropriate. Where temporary construction areas are required and existing hardstanding is not available, engineering stone fill will be laid and compacted and maintained as required for the duration of the works. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition or for specific locations with biodiversity value in-line with reinstatement measures outlined in Chapter 10 (Biodiversity) of this EIAR.

Temporary facilities will be provided at the construction compounds including construction phase car parking and welfare facilities and temporary material storage areas as necessary.

Any discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licensed contractor to an approved licensed facility.

Storage of fuel and refuelling will be undertaken within bunded hardstanding areas. Water will be brought to site via tankers as required.

12.5.3 Service Diversions/Interactions

All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works. This will include thorough investigations to identify and reconfirm the location of all utility infrastructure within the works areas and implementing procedures to be agreed with utility providers when undertaking works around known infrastructure services.

Service disruptions impacting the surrounding residential, social and commercial properties will be kept to a minimum, only occurring where unavoidable. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Relevant neighbouring parties will be consulted prior to any proposed disruptions.

12.5.4 Open Trench Water Crossings

As with all construction works proposed, no works on watercourses will be allowed to commence until the relevant Risk Assessment Method Statements (RAMS) and pertinent Health and Safety documents are received from the Contractor and are reviewed and agreed by the EnCoW. These Contractor documents will include method statements, open trenching risk assessments and environmental management plans specific to the area where the trenching is to take place. These plans will be submitted by the Contractor to the EnCoW for review and comment prior to commencing open trench operations. Relevant documentation relating to the proposed works will also be provided to IFI for approval.

All open trench watercourse crossings in salmonid watercourses will take place during the July to September period in order to avoid the period of salmon and trout spawning.

The ground preparation works (such as soil stripping, hardstand formation) adjacent to the watercourse crossing will be carried out in the same manner as that for other works activities. All clean coarse surface material (gravel, cobbles and boulders) on the riverbed or stream will be removed to a depth of 30 cm. Where a depth of 30 cm is not present, the full depth of the layer will be removed to where the substrate is mainly clay or sand. These excavated materials will be set back at least 10 m from the watercourse and placed on a geotextile base for use in the reinstatement process following the cable installation.

Temporary diversions of the watercourse will be used for open trenching activities. Where sites require to be flumed, the diameter chosen for the flume pipe will accommodate flows at the time with spare capacity to cover that predicted over the period that the works would be expected to last. A clay material will be used around the flume pipe to create a seal. Over-pumping methods will be prohibited unless otherwise agreed with IFI. If over pumping methods are to be used for open trenching, sandbags will be used with an impermeable barrier. This method requires pumping of water from the upstream end of the barrier to an area downstream of the works area, maintaining normal flow in the watercourse either side of the isolated reach. The proposed solutions will be determined during detailed design and in consultation with IFI.

Material excavated from the watercourse (and an upstream pump sump if required) will be placed on terram on level ground as far back from the watercourse edge as is practicable and surrounded on its downslope side by a silt fence to prevent material re-entering the watercourse. This material, if deemed suitable by the EnCoW, can be used to partially backfill the trench. However, a significant amount will be in excess and will be removed from site under licence. Dewatering of the excavation will be treated on site using settlement tanks before the settled water is returned to the watercourse. A second tank in series with the first will be used if the first is not sufficient to remove enough solids. Pumped over water will be directed to a splash plate to prevent erosion of the riverbed at the downstream side.

The surface coarse substrate which was set aside will be used to reinstate the stream bed after the ducts have been installed and the flume pipe has been removed as well as all the damming materials. All surfaces will be reinstated to the satisfaction of the landowner and re-seeded to assist soil stabilisation. A silt fence will be placed along the riverbank where the works were undertaken in order to prevent solids washed off the works area during heavy rainfall from entering the stream while the surface adequately re-vegetates.

Site restoration works will be carried out following completion of any water crossings, in agreement with IFI. These works will include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Significant adverse effects in terms of water depth, velocities and sediment erosion/deposition are therefore not anticipated.

12.5.5 HDD Water Crossings

As with all construction works proposed, no drilling works will be allowed to commence until the relevant RAMS and pertinent Health and Safety documents are received from the specialist Contractor and are reviewed and agreed by the Client's Representative. These Contractor documents will include method statements, drilling risk assessments and environmental management plans specific to the area where the drilling is to take place. These plans will be submitted by the Contractor to the Client's Representative on site for review and comment prior to commencing drilling operations. The specialist drilling team will constantly monitor fluid volume pressure, pH, weight and viscosity during the proposed works. The volume of cuttings produced will also be monitored to ensure that no over cutting takes place and that hole cleaning is maintained. The mud returns will be pumped to the circulation system trailer by a bunded centrifugal pump. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses. After the initial pilot hole is completed, it will be reused in a number of passes to reach the required bore size to enable the duct lining to be pulled. To ensure that the prevailing geological conditions have suitable cohesion that can maintain the bore during the drilling and reaming process, the specialist drilling team will pay close attention to modelled drag forces during pullback and constantly monitor load stress to ensure that modelled tensile stress, collapse pressures, hoop stress and buckling stress are not exceeded. In addition to the above measures, the rate of drilling progress will be monitored to help identify any voids or changes in strata.

In addition, the Contractor and EnCoW will monitor river/stream flows upstream and downstream of any HDD watercourse crossings by regular visual inspection. The flow monitoring will be undertaken on a daily basis for five working days prior to the HDD, during the directional drilling and for five working days following completion of the HDD. If a noticeable change in flow conditions is observed in the reach where the HDD took place, such as losses from the watercourse to ground, discolouration or collection of debris, investigations will take place to determine the source of issue and this may require consultation with IFI.

12.5.6 Operational Phase

There are no recommended mitigation and monitoring measures during operation of the Proposed Development to reduce the potential effect with respect to hydrology.

12.5.7 Monitoring

The appointed Contractor will ensure that all personnel and visitors to site are directed to report visual indications of changes in water quality in any watercourses on site. Ongoing monitoring will be carried out throughout the construction phase of the Proposed Development to ensure that the mitigation measures deployed remain effective.

The EnCoW will undertake regular visual inspection of the watercourses on site. The monitoring records will include the following minimum information:

- Antecedent and current weather conditions;
- Current construction activities near and in particular up-stream or up-gradient of the observation point;
- Visual assessment of water colour, turbidity and flow rate; and
- Details on any communication, corrective action and/or mitigation undertaken as a result of water quality issues observed.

Certain construction activities (including HDD, open trench crossings, or wet concrete near watercourses) will be constantly supervised by the EnCoW. Visual monitoring supported by turbidity monitoring of receiving waters will be conducted by the Contractor's EnCoW for the duration of works.

12.6 Residual Effects

12.6.1 Construction Phase

Table 12.10 details the residual effects during the construction phase for surface water features following the implementation of the mitigation and monitoring measures outlined in Section 12.5.

Table 12.10: Residual effects on specific water features post mitigation

Waterbody Reference	WFD Waterbody Name	Crossing Type	Impact summary	Pre Mitigation Significance			Post Mitigation (Residual Effects) (See Section 12.5 for mitigation)	
				Importance	Magnitude	Significance	Magnitude of Effect	Significance
WB01	Trib of Tolka_020	Open Cut Trenching	Hydrology • Disruption to local drainage systems due to diversions required to accommodate the construction works, construction compounds and open cut crossing, where required. • Increases in surface water run-off and thus discharge to the waterbody due to increased impermeable area from construction access tracks. Surface water quality • Increased silty water run-off and disturbance during in and near channel works to construct the open trench crossings; also increased risk of sediment pollution from disturbed riverbed and bank material during construction of the open cut trenching and dry working area;	Medium	Moderate	Moderate	Small	Slight
WB02	Dunboyne stream_010			Low		Slight		Imperceptible
WB03	Rye Water_030			Low		Slight		Imperceptible
WB04	Jenkinstown stream_010			Medium		Moderate		Slight
WB07								
WB08								
WB10	Rye Water_020 (Brides Stream & Padistown)			High		Significant		Slight
WB12								
WB13	Rye Water_010	HDD		Medium	Small	Slight	Negligible	Imperceptible

<table>
<tr><th rowspan="2">Waterbody Reference</th><th rowspan="2">WFD Waterbody Name</th><th rowspan="2">Crossing Type</th><th rowspan="2">Impact summary</th><th colspan="3">Pre Mitigation Significance</th><th colspan="2">Post Mitigation (Residual Effects) (See Section 12.5 for mitigation)</th></tr>
<tr><th>Importance</th><th>Magnitude</th><th>Significance</th><th>Magnitude of Effect</th><th>Significance</th></tr>
<tr><td>WB14</td><td>Royal Canal</td><td></td><td rowspan="9">Increased risk of sediment pollution from disturbed riverbed and bank material during construction.
Risk of chemical pollution resulting from accidental releases of fuel, oils, cementitious material (or other polluting substances) while working adjacent to and within the waterbody.
Hydromorphology
Potential fine sediment input from construction activities as described above for surface water quality. This could lead to changes to morphological features and processes (if present), including smothering of bed substrate and depositional features;
In-channel works to construct the proposed open cut crossing. Provision of a dry working area and excavations required for the cable trench will temporarily remove flow from a section of</td><td>High</td><td></td><td>Slight</td><td></td><td>Imperceptible</td></tr>
<tr><td>WB15</td><td rowspan="2">Lyreen_010</td><td>N/A</td><td rowspan="2">Low</td><td>Small</td><td>Imperceptible</td><td>Negligible</td><td>Imperceptible</td></tr>
<tr><td>WB19</td><td rowspan="4">Open Cut Trenching</td><td rowspan="3">Moderate</td><td>Slight</td><td rowspan="3">Small</td><td>Imperceptible</td></tr>
<tr><td>WB22</td><td rowspan="2">Clonshanbo_010</td><td rowspan="2">Low</td><td rowspan="2">Slight</td><td rowspan="2">Imperceptible</td></tr>
<tr><td>WB24</td></tr>
<tr><td>WB25</td><td>Kilmurry_010</td><td>Low</td><td>Moderate</td><td>Slight</td><td>Small</td><td>Imperceptible</td></tr>
<tr><td>WB27</td><td rowspan="3">Liffey_130</td><td rowspan="3">N/A</td><td rowspan="3">High</td><td rowspan="3">Small</td><td rowspan="3">Slight</td><td rowspan="3">Negligible</td><td rowspan="3">Imperceptible</td></tr>
<tr><td>WB29</td></tr>
<tr><td>WB31</td></tr>
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<table>
<tr><th rowspan="2">Waterbody Reference</th><th rowspan="2">WFD Waterbody Name</th><th rowspan="2">Crossing Type</th><th rowspan="2">Impact summary</th><th colspan="3">Pre Mitigation Significance</th><th colspan="2">Post Mitigation (Residual Effects)
(See Section 12.5 for mitigation)</th></tr>
<tr><th>Importance</th><th>Magnitude</th><th>Significance</th><th>Magnitude of Effect</th><th>Significance</th></tr>
<tr><td>WB30</td><td>Trib of Slate_010</td><td rowspan="2">Open Cut Trenching</td><td rowspan="9">channel and would also remove natural bed substrate;

• Works within the vicinity of watercourses and along the banks, could remove riparian vegetation, altering and destabilising channel banks. These impacts could lead to increased erosion and sediment input into the waterbody; and

• Where open cut trenching is required, in-channel works to construct the proposed open cut crossing. Provision of a dry working area and excavations required for the cable trench would temporarily remove flow from a section of channel and would also remove natural bed substrate.</td><td>High</td><td rowspan="2">Moderate</td><td>Significant</td><td rowspan="2">Small</td><td>Slight</td></tr>
<tr><td>WB32</td><td>Longton_Demesne_Trib of Liffey_120</td><td>High</td><td>Significant</td><td>Slight</td></tr>
<tr><td>WB35</td><td rowspan="3">Liffey_120</td><td>HDD</td><td rowspan="3">High</td><td>Small</td><td rowspan="3">Slight</td><td>Negligible</td><td rowspan="3">Imperceptible</td></tr>
<tr><td>WB36</td><td rowspan="2">N/A</td><td rowspan="2">Small</td><td rowspan="2">Negligible</td></tr>
<tr><td>WB37</td></tr>
<tr><td>WB38</td><td rowspan="2">Grand Canal</td><td>N/A</td><td rowspan="2">High</td><td rowspan="2">Small</td><td rowspan="2">Slight</td><td rowspan="2">Negligible</td><td rowspan="2">Imperceptible</td></tr>
<tr><td>WB42</td><td>HDD</td></tr>
<tr><td>WB39</td><td rowspan="2">Liffey_110</td><td rowspan="2">N/A</td><td rowspan="2">High</td><td rowspan="2">Small</td><td rowspan="2">Slight</td><td rowspan="2">Negligible</td><td rowspan="2">Imperceptible</td></tr>
<tr><td>WB41</td></tr>
</table>

Waterbody Reference	WFD Waterbody Name	Crossing Type	Impact summary	Pre Mitigation Significance			Post Mitigation (Residual Effects) (See Section 12.5 for mitigation)	
				Importance	Magnitude	Significance	Magnitude of Effect	Significance
WB43	Liffey_100			High		Slight		Imperceptible
Non-designated Waterbodies								
WB05	Pond/ watercourse	Open Cut Trenching	Hydrology • Disruption to local drainage systems due to diversions required to accommodate the construction works, HDD compound and open cut crossing, where required. • Increases in surface water run-off and thus discharge to the waterbody due to increased impermeable area from construction access tracks. Surface water quality • Increased silty water run-off and disturbance during in and near channel works to construct the open trench crossings; also increased risk of sediment pollution from disturbed riverbed and	Low	Moderate	Slight	Small	Imperceptible
WB06	Jenkinstown stream							
WB09								
WB11	Newtownmoy Aghy Stream Trib of RYE WATER_020	N/A			Small	Imperceptibl e	Negligible	
WB16	Drainage ditches	N/A			Small	Imperceptibl e	Negligible	
WB17	Drainage ditches	Open Cut Trenching			Moderate	Slight	Small	

Waterbody Reference	WFD Waterbody Name	Crossing Type	Impact summary	Pre Mitigation Significance			Post Mitigation (Residual Effects) (See Section 12.5 for mitigation)	
				Importance	Magnitude	Significance	Magnitude of Effect	Significance
WB18	Drainage ditches		bank material during construction of the open cut trenching and dry working area; • Increased risk of sediment pollution from disturbed riverbed and bank material during construction. • Risk of chemical pollution resulting from accidental releases of fuel, oils, cementitious material (or other polluting substances) while working adjacent to and within the waterbody. Hydromorphology • Potential fine sediment input from construction activities as described above for surface water quality. This could lead to changes to morphological features and processes (if present), including smothering of bed substrate and depositional features; • In-channel works to construct the proposed open cut crossing. Provision of a dry working area and excavations required for the cable trench will					
WB20	Trib of Liffey_010	HDD			Small	Imperceptible	Negligible	
WB21	Drainage ditches	Open Cut Trenching			Moderate	Slight	Small	
WB23	Drainage ditches	N/A			Small	Imperceptible	Negligible	
WB26	Trib of Kilmurry_010	Open Cut Trenching			Moderate	Slight	Small	
WB28	Trib of Liffey_130							
WB33	Drainage ditches	N/A			Small	Imperceptible	Negligible	

Waterbody Reference	WFD Waterbody Name	Crossing Type	Impact summary	Pre Mitigation Significance			Post Mitigation (Residual Effects) (See Section 12.5 for mitigation)	
				Importance	Magnitude	Significance	Magnitude of Effect	Significance
WB34	Drainage ditches	Open Cut Trenching	temporarily remove flow from a section of channel and would also remove natural bed substrate; • Works within the vicinity of and along the banks, could remove riparian vegetation, altering and destabilising channel banks. These impacts could lead to increased erosion and sediment input into the waterbody; and • Where open cut trenching is required, in-channel works to construct the proposed open cut crossing. Provision of a dry working area and excavations required for the cable trench will temporarily remove flow from a section of channel and will also remove natural bed substrate.		Moderate	Slight	Small	
WB40	Liffey_110	N/A			Small	Imperceptibl e	Negligible	
WB44	Drainage ditches	Open Cut Trenching			Moderate	Slight	Small	
WB45	Dunstown							

12.6.2 Operational Phase

No residual effects on water bodies for surface water elements have been identified during the operational phase.

12.7 Conclusion

The Proposed Development and the study area is located within the Liffey and Dublin Bay water catchment area. The Proposed Development crosses 27 watercourses that have been mapped by the EPA, as part of its requirements under the Water Framework Directive. Fourteen of these watercourses have been assessed to have Good Ecological Status; five have Moderate Status; and eight are Poor. An additional 14 watercourses that have not been mapped by the EPA will be crossed by the Proposed Development. These watercourses are considered to be of Good potential status and mitigation measures will be applied to ensure that the Proposed Development does not affect that potential status.

The Proposed Development crosses several floodplains including those associated with the River Liffey. It is located in Flood Zone C, apart from minor local areas close to watercourses. While flooding was considered in the routing of the Proposed Development, it will not be feasible to entirely avoid floodplains. The nature of the underground cable means that there will be no effects on floodplains post-construction. The cable and critical components will be designed so there will be no impact from flooding on the Proposed Development. The proposed works at the substations are within existing substation sites and will not affect nor be affected by flooding. Mitigation measures will ensure no significant effects during construction. Works will take account of forecasted high rainfall and any storage of material will be setback from watercourses. As the nature of the works will result in relatively minimal changes to the existing ground surfacing (i.e. impermeable or permeable surfaces), it is not expected that there will be any discernible increases in generated runoff volumes which could contribute to increased flooding as a result of the Proposed Development.

In conclusion, once mitigation has been applied, any residual effects upon water bodies for surface water elements has been assessed to be Small or Negligible Adverse during the construction phase, these are localised and temporary in duration. Disturbed ground will be reinstated post-construction. No residual effects on water bodies for surface water elements have been identified during the operational phase.

Irrespective of the condition of the surface waterbody if it was categorised, with the implementation of the mitigation measures proposed the Proposed Development will not prevent it meeting any objectives under the WFD or prevent any surface waterbodies from reaching good status in the future.

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13. Archaeology, Architectural Heritage and Cultural Heritage

13.1 Introduction

This chapter of the EIAR presents the results of an assessment of the archaeological, architectural heritage and cultural heritage impacts resulting from construction and operation of the Proposed Development. A full description of the Proposed Development is provided in Chapter 5 of this EIAR.

In line with guidance in *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); and
- 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).

Cultural heritage assets are *"…places and objects of aesthetic, cultural, historic, scientific, social or spiritual value. They include recorded archaeological monuments (RMP), national monuments, UNESCO world heritage sites (WHS), tentative WHS known and unknown surface and subsurface archaeological remains, protected structures, designed landscapes, architectural conservation areas (ACAs), NIAH building and garden survey sites, structures of architectural heritage merit (vernacular, urban and rural), cultural heritage features, placenames, language and inherited traditions*" (EirGrid, 2015, page 4). Cultural heritage assets can be designated or non-designated.

Section 13.2 provides the methodology used for the assessment. Section 13.3 presents information on the baseline conditions, and Section 13.4 presents the assessment of the Proposed Development. Proposed mitigation is presented in Section 13.5, and Section 13.6 presents residual effects. An inventory of archaeology, architectural heritage and cultural heritage is also provided in Appendix 13.1.

13.2 Methodology

13.2.1 Relevant Guidelines, Policy and Legislation

This assessment was undertaken in accordance with the following legislation and best practice guidance:

- National Monuments Acts 1930 to 2014 (as amended):
  - National Monuments Act 1930;
  - National Monuments (Amendment) Act 1954;
  - National Monuments (Amendment) Act 1987;
  - National Monuments (Amendment) Act 1994;

  - National Monuments (Amendment) Act 2004;
  - EIA of Proposed Demolition of National Monuments Regulations 2012;
  - S.I. 229/2005 - National Monuments Act 1930 (Section 14B) Regulations 2005; and
  - S.I. 114/2013 (EIA re Approved Road Developments).
- European Cultural Convention 1954 (European Treaty Series No. 018) (Council of Europe 1954);
- International Council on Monuments and Sites (ICOMOS) International Charter for the Conservation and Restoration of Monuments and Sites 1964 (The Venice Charter 1964) (ICOMOS 1965);
- United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention Concerning the Protection of the World Cultural and Natural Heritage 1972 (UNESCO 1972);
- Convention for the Protection of the Architectural Heritage of Europe (The Granada Convention) (European Treaty Series No. 121) (Council of Europe 1985);
- Convention for the Protection of the Archaeological Heritage of Europe (revised) (The Valetta Convention) (European Treaty Series No. 143) (Council of Europe 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 2023 (as amended):
- Convention on the Value of Cultural Heritage for Society (The Faro Convention) (European Treaty Series No. 199) (Council of Europe 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 (now Department of Culture, Heritage and Gaeltacht), 2011);
- National Planning Framework (Government of Ireland 2018);
- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022); and
- Cultural Heritage Guidelines for Electricity Transmission Projects (EirGrid, 2015).

Archaeological sites and monuments are protected under the National Monument Acts 1930–2014 (as amended), primarily through inclusion in the RMP, the Register of Historic Monuments (RHM) and/or by being declared a National Monument. Section 2 of the National Monument Act 1930 (as amended) 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 National Monument Act 1930 (as amended) states that the Minister may also place a Preservation Order on a monument "*which in his* [the minister's] *opinion is a national monument 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).

Section 5 of the National Monuments (Amendment) Act 1987 requires an RHM 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.

While the Historic and Archaeological Heritage and Miscellaneous Provisions was enacted in October 2023 it has not fully entered into force and therefore the relevant sections of the National Monuments Acts 1930 to 2014 (as amended) identified above remain in force and continue to do so until their repeal[72]. While the Planning and Development Bill 2023 has completed the second stage of debate in Dáil Éireann, it has not fully entered into force and therefore the Planning and Development Acts 2000 to 2023 (as amended) remains in force.

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. Inclusion on the SMR does not, in itself, confer legal protection.

The Planning and Development Act 2000 (as amended) 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 ACA as "*a place, area, group of structures or townscape, taking account of building lines and heights, that:*

- *is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or value, or*
- *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 to permit development within an ACA, the effect of a development 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 Kildare County Development Plan 2023 – 2029 (Kildare County Council, 2023) include a list of ACAs protected under the Act. In addition, the Meath County Development Plan 2021 – 2027 and the Kildare County Development Plan 2023 – 2029 include objectives for the protection of archaeology, architectural and cultural heritage (see below).

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 designed 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 (NIAH, 2022). 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.

[72] https://www.archaeology.ie/news/enactment-of-historic-and-archaeological-heritage-and-miscellaneous-provisions-act-2023-and.

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.

While not ratified by Ireland, the 2005 Framework Convention on the Value of Cultural Heritage for Society (the Faro Convention) provides the following useful definition of cultural heritage: *"a group of resources inherited from the past which people identify, independently of ownership, as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. It includes all aspects of the environment resulting from the interaction between people and places through time*".

Ireland ratified the Convention for the Safeguarding of the Intangible Cultural Heritage (the Paris Convention; UNESCO, 2003) in 2015. Ireland's obligations under the Paris Convention include establishing National Inventory of Intangible Cultural Heritage to protect, promote and celebrate Irish living cultural heritage practices, customs, crafts and traditions. Currently, the Inventory includes entries under the following categories:

- oral traditions and expressions, including language;
- social practices, rituals, and festive events;
- traditional craftsmanship;
- performing arts; and
- knowledge and practices concerning nature and the universe.

Successful applicants to the National Inventory may also consider seeking nomination by the State for inscription on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity, to which the State is entitled to make one nomination every year. Ireland has successfully inscribed three elements of Irish Intangible Cultural Heritage on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity: Irish Harping was inscribed in 2019, Hurling was inscribed in 2018 and Uilleann Piping was inscribed in 2017.

Meath County Development Plan 2021 – 2027 (MCC 2021)

The Cultural and Natural Heritage Strategy of the Meath County Development Plan 2021 – 2027 identifies Meath's wealth of architectural heritage making it exceptional in Ireland. The identity of the county is linked to its unique heritage, which forms an intrinsic part of the character and attractiveness of the county. The Meath County Development Plan 2021 – 2027 sets out specific policies for the management of: archaeological heritage (HER POL 1 – HER POL 5), architectural heritage (HER POL 14 – HER POL 23), industrial heritage (HER POL 24 and HER POL 25), and designed landscapes, gardens and demesnes (HER POL 26).

Policies of relevance to the Proposed Development include:

- HER POL 1: which aims to protect sites, monuments, places, areas or objects including sites recorded on the SMR, Recorded Monuments, sites on the RHM, National Monuments, and sites with Preservation Orders placed on them. In addition, HER POL 2 aims to protect sites of archaeological interest discovered after the publication of the RMP, in situ (or at a minimum preservation by record);
- HER POL 14: which aims to protect and conserve the architectural heritage of the county; and
- HER POL 26: which encourages the protection and enhancement of GDLs.

13.2.1.1 Kildare County Development Plan 2023 – 2029 (Kildare County Council, 2023)

The Built & Cultural Heritage chapter of the Kildare County Development Plan 2023 – 2029 identifies the aim to protect, conserve and sensitively manage the built and cultural heritage of County Kildare. Policies of relevance to the Proposed Development include:

- AH P1 which aims to recognise the value and opportunity of Kildare's unique heritage resource and to manage, conserve, promote and protect it, for present and future generations and AH P6 which seeks to protect, conserve and manage the archaeological and architectural heritage of the county and to encourage sensitive sustainable development in order to ensure its survival, protection and maintenance for future generations;

- AH P2 which aims to protect and enhance archaeological sites, monuments and their setting, including those that are listed in the RMP or newly discovered archaeological sites and/or subsurface and underwater archaeological remains;

- AH P5 which seeks to identify, protect and conserve historic items and features of interest throughout the county including street furniture, surface finishes, roadside installations, items of industrial heritage, riverine heritage, and other stand-alone features of interest (items not listed on the RMP or RPS) and AH P9 which promotes the protection, retention, appreciation and appropriate revitalisation of the built vernacular heritage of the county;

- AH P7 and P8 which seek to promote appreciation of the landscape and historical importance of traditional and historic gardens, demesnes and parks within the county and preserve and protect the historic gardens and designed landscapes identified in the NIAH Survey of Historic Gardens and Designed Landscapes.

13.2.2 Study Area

The study area for archaeology, architectural heritage and cultural heritage was defined using professional judgement as the Planning Application Boundary for the Proposed Development plus a 50 m buffer. This study area is large enough to establish a robust baseline as it allows archaeological, architectural heritage and cultural heritage assets within and immediately adjacent to the Planning Application Boundary (and which could potentially extend into it) to be identified, provides a wider context for these and enables an informed assessment of the possible presence of unknown archaeological remains to be made. As works (the excavation for the cable trench, joint bays, and launch and reception pits for HDD, construction of the passing bays and off-road access tracks, and establishment of construction compounds) could have a direct impact on archaeology, architectural heritage and cultural heritage assets within the Planning Application Boundary, the study area allows direct impacts on sites within the Planning Application Boundary, or that potentially extend into it, to be identified and assessed.

Indirect impacts could result from changes to the setting of archaeology, architectural heritage and cultural heritage assets during construction and operation. During construction, the activities that could result in indirect impacts would be restricted to the Planning Application Boundary. In addition, areas disturbed during construction will be reinstated and, apart from joint bay covers and permanent access tracks (in off-road sections), the Proposed Development will be underground during operation (excluding the Woodland Substation and Dunstown Substation upgrade works, where new infrastructure will largely be within the footprint of the existing substations and seen in the context of the existing substations). Therefore, indirect impacts are not anticipated beyond 50 m, and the study area as defined allows them to be identified and assessed both during construction and operation.

13.2.3 Data Collection

The following sources of information were consulted to establish the archaeology, architectural heritage and cultural heritage baseline for the study area:

- the results of the archaeology, architectural heritage and cultural inputs into previous project stages of work (Jacobs, 2021; Jacobs, 2022);

- the lists of National Monuments in State Care: Ownership and Guardianship for County Meath[73] and County Kildare[74];
- the list of Preservation Orders held by the National Monuments Service[75];
- the RMP for County Meath (1996) and County Kildare (1996)[76];
- the SMR for County Meath and County Kildare[77];
- the NIAH survey of County Meath and County Kildare[78];
- National Inventory of Intangible Cultural Heritage[79];
- the Meath County Development Plan 2021 – 2027 (Meath County Council, 2021), Kildare County Development Plan 2017 – 2023 (Kildare County Council, 2017) and Kildare County Development Plan 2023 – 2029 (Kildare County Council, 2023) for Protected Structures, ACAs and sites on the RHM;
- the Survey of Historic Gardens and Designed Landscapes[80];
- aerial imagery (aerial photographs and satellite imagery; see Section 13.8 for details of the sources consulted). A range of aerial imagery from different dates was used which maximised the potential to identify archaeological, architectural heritage and cultural heritage assets. Overall ground conditions within the study area were considered to be suitable for the identification of previously unknown assets;
- historic mapping available online (see Section 13.8);
- placename information and information from the National Folklore Collection, including information from the Schools' Collection (1937–38), via the UCD digital library[81,82];
- Topographical files of the National Museum of Ireland through the online National Museum of Ireland: Finds Database (up to 2010)[83];
- Excavations Bulletin[84] and Transport Infrastructure Ireland (TII) Archaeological Excavation Reports[85];
- Archaeological Inventory of County Meath (Moore, 1987) (an Archaeological Inventory of Kildare has not been published);
- information from public consultation (Traverse, 2022);
- sources held by the National Archives of Ireland and National Library of Ireland (see Section 13.8);
- site inspection and walkover survey (undertaken 24 to 27 January 2023; see Section 13.2.5); and

[73] https://www.archaeology.ie/sites/default/files/media/pdf/monuments-in-state-care-meath.pdf [accessed 09 January 2023].
[74] https://www.archaeology.ie/sites/default/files/media/pdf/monuments-in-state-care-kildare.pdf [accessed 09 January 2023].
[75] https://www.archaeology.ie/sites/default/files/media/publications/po19v1-all-counties.pdf [accessed 09 January 2023].
[76] https://www.archaeology.ie/publications-forms-legislation/record-of-monuments-and-places [accessed 09 January 2023].
[77] https://maps.archaeology.ie/HistoricEnvironment/ [downloaded 10 January 2023].
[78] https://maps.archaeology.ie/HistoricEnvironment/ [downloaded 10 January 2023].
[79] https://nationalinventoryich.tcagsm.gov.ie/national-inventory/.
[80] https://www.buildingsofireland.ie/resources/ [accessed 10 January 2023].
[81] www.loganim.ie.
[82] https://digital.ucd.ie/.
[83] http://heritagemaps.ie/.
[84] https://excavations.ie/.
[85] https://repository.dri.ie/catalog.

- bibliographic sources (see Section 13.8).

Some archaeological, architectural heritage and cultural heritage assets are entered separately on one or more datasets. Where assets appear on more than one dataset, duplicates have been removed to avoid double counting. These assets have been included under their designation (or more significant designation) as it affords the asset legal protection. Where an asset does appear on more than one dataset, this has been identified in Section 13.3 below and in Appendix 13.1.

A unique reference number was assigned to each asset identified from the sources listed above. Archaeological assets are prefixed with ‘AY’ and architectural heritage assets are prefixed with ‘AH’. Demesne lands are prefixed with ‘DL’ and undesignated cultural heritage sites are prefixed with 'CH'. Assets identified from a review of LiDAR data acquired for the Proposed Development are prefixed with ‘LI’, and townland boundaries are prefixed with ‘TB’. Please note, to provide consistency with previous stages of assessment, unique reference numbering has been retained with new assets added following subsequent data gathering to inform this EIAR, so numbering does not start at ‘01’ or run sequentially.

13.2.4 LiDAR

Jacobs was commissioned by EirGrid to undertake a review of Light Detection and Ranging (LiDAR) data (0.25 m resolution) captured for the Planning Application Boundary in March 2022. The aim of the review was to inform the archaeology, architectural heritage and cultural heritage baseline by identifying previously unrecorded potential assets and gathering additional information on known assets.

LiDAR data were processed, and Digital Elevation Models (DEMs) were produced which were then used to create a number of complementary visualisations. These visualisations were then reviewed, and potential archaeological features were identified, and the locations of known assets were reviewed to gather additional information about them. In addition, a range of sources were consulted to verify interpretations of the results.

The review of the LiDAR data identified 158 potential assets, including six previously unrecorded potential assets that may comprise sites of some significance, providing further information about the archaeology, architectural heritage and cultural heritage baseline and the potential for the presence of unknown archaeological remains. The report on the results of the LiDAR analysis (Jacobs, 2022) is included in Appendix 13.3.

13.2.5 Site Inspection and Walkover Survey

The baseline for archaeology, architectural heritage and cultural heritage was also informed by a walkover survey and site inspection of the Planning Application Boundary undertaken between 24 and 27 January 2023.

This involved a drive-through, as well as walkover survey of off-road sections where land access was granted, to note topography and current land use, the presence and condition of known assets and their setting, and to identify previously unrecorded sites and their setting.

13.2.6 Consultation

A meeting was held with the NMS on 19 December 2022 to discuss the Proposed Development, including presenting an overview of the Proposed Development, outcomes of the previous stages of assessment and the preferred route, and the approach to the EIAR. The NMS identified the potential for the presence of previously unrecorded archaeological remains in the off-road sections and the archaeological potential of rivers as concerns that should be considered as part of the assessment.

13.2.7 Limitations

Not all areas were accessible during the walkover survey and site inspection; however, baseline data from desk-based sources, including a review of LiDAR data acquired for the Planning Application Boundary (Appendix 13.3), was available and sufficient to inform the assessment for assets in these locations.

It was not possible to obtain a copy of the aerial photograph (GSI N 337-6) from the Geological Survey of Ireland which shows the locations of the enclosures recorded on the RMP and SMR at Dunstown (AY_46 – 48; AY_53 – 58). However, a sketch from the aerial photograph showing the locations of these is provided in Deery (2022) and is reproduced as Plate 13.1. This was used to locate these enclosures.

These limitations did not reduce the efficacy of the assessment.

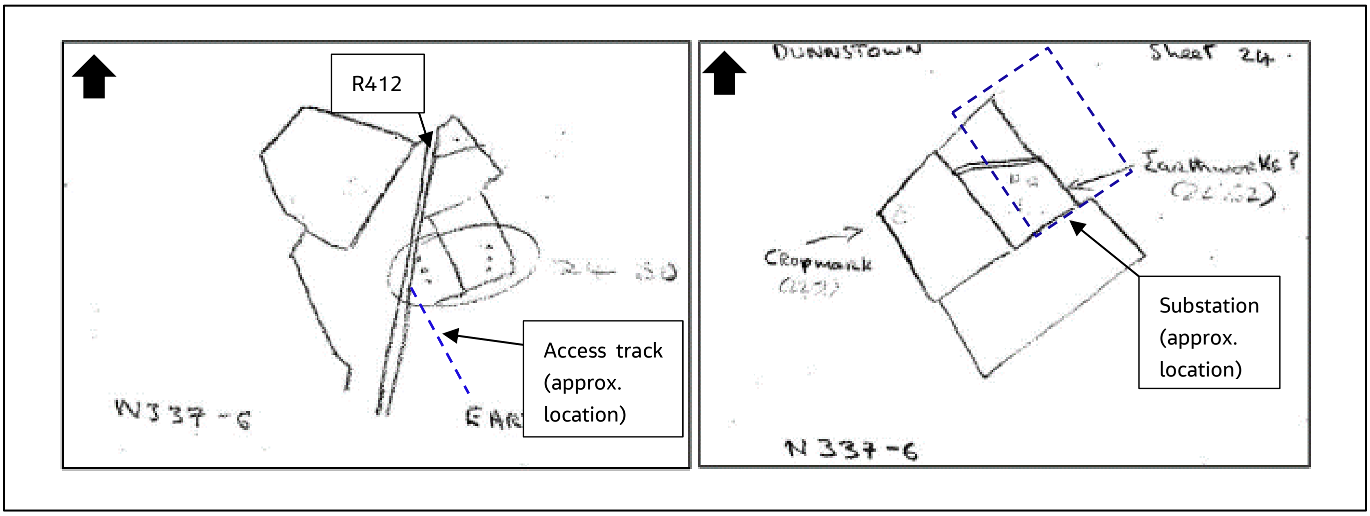

Plate 13.1: Sketch showing the locations of enclosures at Dunstown substation (right) and access track (left) (from Deery, 2022)

13.2.8 Assessment Methodology

13.2.8.1 Assessment of Significance

For archaeology, architectural and cultural heritage, an assessment of significance of each asset was undertaken on a six-point scale of Very High, High, Medium, Low, Very Low / Negligible, and Unknown, based on professional judgement and guided by the criteria provided in the draft Cultural Heritage Impact Assessment (CHIA) of TII Projects – Overarching Technical Document (TII, forthcoming) as presented in Table 13.1. This approach was used as while the TII guidance is in draft it has been widely consulted on and provides a method for the assessment of significance of impacts of linear infrastructure projects on archaeological, architectural heritage and cultural heritage assets aligned with the EPA Guidelines (EPA, 2022).

Table 13.1: Criteria to Assess the Significance of Archaeology, Architectural and Cultural Heritage Assets

Significance	Criteria
Very High	World Heritage Properties and properties on the World Heritage Tentative List; Architectural Heritage assets rated as being of International importance by the NIAH; Historic landscapes of international value (designated or undesignated), including those identified by the NIAH. Such landscapes will be extremely well-preserved with exceptional coherence, time-depth, or other critical factors; Places or features of international intangible heritage value; and Other designated and undesignated assets of demonstrable international Cultural Heritage importance.
High	National Monuments; Undesignated sites and monuments that might reasonably be considered a national monument by the Minister because of their historical, architectural, traditional, artistic, or archaeological interest; Recorded Monuments (or sites and monuments scheduled for inclusion on the RMP) of high quality and importance;

Significance	Criteria
	Sites and monuments subject to Preservation Order or a Temporary Preservation Order; Protected Structures; Undesignated assets of comparable quality and importance as Recorded Monuments and Protected Structures; Architectural Conservation Areas containing important buildings / groupings of buildings that contribute either individually or collectively to the streetscape and the character and appearance of the ACA; Architectural Heritage assets rated as being of National importance by the NIAH; Historic landscapes (designated or undesignated) of outstanding interest and of demonstrable national value, including those identified by the NIAH. These will be well-preserved historic landscapes exhibiting considerable coherence, time-depth or other critical factors; Places or features of national heritage value; and Other designated or undesignated assets of national Cultural Heritage importance.
Medium	Recorded Monuments (or sites and monuments scheduled for inclusion on the RMP) of good quality / preservation; Architectural Heritage assets rated as being of Regional importance by the NIAH; Historic townscapes or built-up areas with importance historic integrity in their buildings or built settings (e.g. including street furniture and other structures); Historic landscapes or regional value (designated or undesignated), including those identified by the NIAH; Places or features of regional intangible heritage value; and Other designated or undesignated assets of regional Cultural Heritage importance.
Low	Assets compromised by poor preservation and / or poor survival of contextual associations; Architectural Heritage assets rated as being of Local importance by the NIAH; Undesignated historic buildings of modest quality in their fabric or historical association; Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures); Historic landscapes whose value is limited by poor preservation and / or poor survival of contextual associations, including those identified by the NIAH; Places or features of local intangible heritage value; and Other designated or undesignated assets of local importance.
Very Low / Negligible	Assets / landscapes with very little or no surviving Cultural Heritage interest; and Buildings of no architectural, historical, archaeological, artistic, cultural, scientific, social, traditional or technical interest; buildings of an intrusive character.
Unknown	The importance of the asset has not yet been ascertained (e.g. a LiDAR feature that may or may not be archaeological). In such cases, the significance of effect will be 'Indeterminable'.

13.2.8.2 Impact Magnitude

Magnitude considers the size and scale of the impact, the extent of the area over which it occurs, whether it is reversible or irreversible, and whether it is short or long-term in duration. Magnitude of impact is assessed without reference to the significance of the asset, and may include direct and indirect impacts, and can either be 'Positive' (i.e. beneficial) or 'Negative' (i.e. adverse).

Assessment of magnitude was based on professional judgement informed by the criteria presented in Table 13.2.

Table 13.2: Magnitude of Impact on Archaeology, Architectural Heritage, and Cultural Heritage Assets

Magnitude of Impact	Criteria / Typical Descriptions
Very High	Major alteration to, or complete loss of, archaeological, architectural heritage and cultural heritage interests. Effects likely to be experienced at a very large scale, considered permanent and irreversible.
High	Notable or long-term change to archaeological, architectural heritage and cultural heritage interests.
Medium	Moderate or long-term change over a restricted area or a moderate change to archaeological, architectural heritage and cultural heritage interests
Low	Minor short- or medium-term change over a restricted area or a minor change to archaeological, architectural heritage and cultural heritage interests.
Very Low / Negligible	Imperceptible change to archaeological, architectural heritage and cultural heritage interests

13.2.8.3 Significance of Impacts

For archaeology, architectural heritage and cultural heritage, the significance of impacts with and without mitigation was assessed as a combination of the significance and the magnitude.

In accordance with the guidance provided in the EPA Guidelines (EPA, 2022), significance of impacts was assessed on a seven-point scale of Profound, Very Significant, Significant, Moderate, Slight, Not Significant and Imperceptible. The seven levels of significance apply equally to positive and negative impacts. Unless otherwise stated, impacts assessed are negative.

The significance of impacts was assessed using professional judgement informed by the matrix presented in Image 13.1.

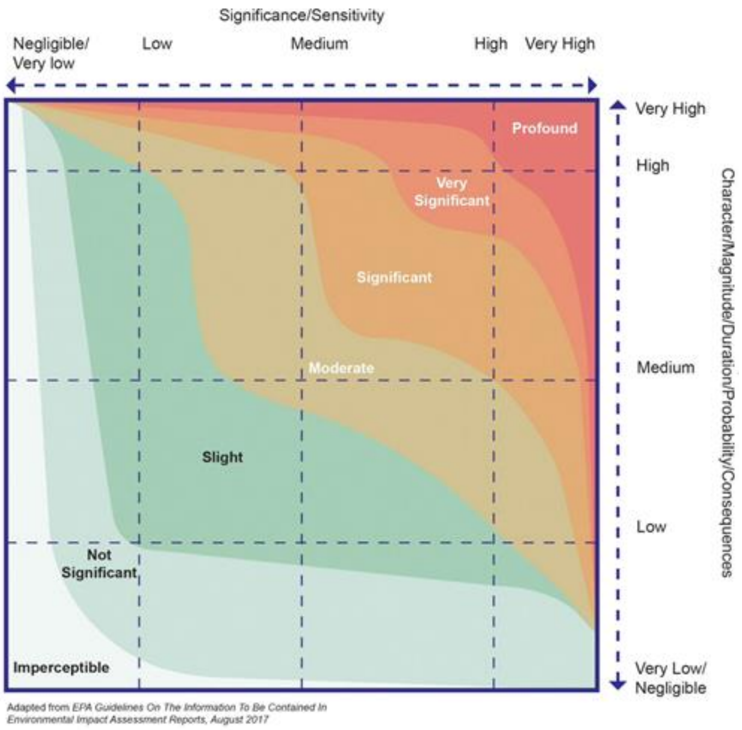

Image 13.1: Matrix for Determination of Significance of Impacts (TII, 2020)

A summary of the assessment of significant effects (i.e. impacts of Moderate or higher significance of effect) is presented in Section 13.4 below. Appendix 13.2 presents the complete assessment of significant and non-significant effects and proposed mitigation measures (where applicable) for archaeology, architectural heritage, cultural heritage. Unless otherwise stated, impacts described are negative.

13.3 Baseline Conditions

This section presents baseline conditions for the archaeology, architectural heritage and cultural heritage of the study area. Further details on individual archaeology, architectural heritage and cultural heritage assets identified within the study area are provided in Appendix 13.1.

13.3.1 Archaeological and Historical Background

Archaeological evidence dating to the Mesolithic period (c. 8000 – 4000 BC) often comprises lithic (stone) artefacts, middens, and ephemeral sites, often located close to rivers or on higher ground. While no known Mesolithic sites have been identified within the study area, a wooden trackway dating to the Mesolithic was identified approximately 14.5 km to the west of the study area at Lullymore Bog (Driscoll, 2006). Evidence of the Neolithic period (c. 4000 – 2500 BC) within the study area is similarly absent; however, concentrations of activity dating to this period have been identified in the wider area including in the townland of Corbally (KD023-114001-3; KD023-116001-3), approximately 8 km to the east of the study area, and in Maynooth (KD005-015001), approximately 6 km to the south-east of the study area. Typically dating to the Bronze Age (c. 2500 – 600 BC) or Iron Age (c. 600 BC – AD 500), barrows and ring ditches, comprising circular ditches with earthen mounds at the centre and typically containing individual burials, have been identified within the study area with examples in the townlands of Woodland (CH_60 and CH_61), Castlesize (AY_59), Calgath (CH_78), Firmount East (CH_97) and Warrenstown (LI_033).

The early medieval period (AD 500 – 1169) is evidenced by domestic activity, including a rath (AY_24; a Recorded Monument). These common features comprise enclosures defined by one or more ditches and banks. Raths and ringforts characterise rural settlement dating to this period, with a farmstead comprising one or more house located within the enclosure. The late medieval period (c.1171 – 1550) saw the construction of prominent defensive structures. Examples within the study area include a possible motte or Anglo-Norman defended homestead in the townland of Firmount East (such as AY_26; a Recorded Monument and Protected Structure) and a tower house in Jigginstown (AY_44; Preservation Order; located outside the study area) and the linear earthwork (AY_13; included on the RHM and a Recorded Monument) in the townlands of Ballybrack, Ballyloughan, Clonduff, Clonfert North, Clonfert South and Graiguepottle interpreted as part of The Pale, a boundary constructed by the Anglo-Normans to divide their lands from those held by the Irish (see Section 13.3.2 below).

The land within the study area remained largely agricultural into the post-medieval period (1550 – present; Down Survey of Ireland, 1650; Griffith Valuation, 1851), and the current pattern of fields reflects those depicted on historic Ordnance Survey mapping (1837-1842) both through extant field boundaries and the remains of former field boundaries visible as cropmarks on aerial imagery. Settlement has remained focused on established centres, such as Clane and Naas (all located outside the study area) which developed from religious houses established during the early medieval period with the introduction of Christianity to Ireland. Rural settlement characterised by dispersed linear settlements and scattered farms. Large eminent country estates, including high-status principal houses, gardens and grounds, and ancillary, functional, and decorative structures were established from the 17th century onwards (Costello, 2014). Examples within the study area include Jigginstown House (AY_39; National Monument and a Protected Structure), Larchill House (DL_04) and Millicent House (DL_17).

More recent development within the study area comprises the network of 19th century canals and railways (such as the Royal Canal and the Midland Great Western Railway), roads, motorways and associated infrastructure (such as the Sallins Bypass and M4 junction 8 in Kilcock), and areas of residential and commercial infill development (such as the urban expansion of Naas and the commercial complex in Osberstown).

13.3.2 Archaeology

Archaeological assets included as part of the archaeological baseline include:

- one National Monument (AY_39) and three sites with Preservation Orders placed on them (AY_40, AY_42 and AY_43);
- six RHM comprising AY_13, AY_38, AY_39 (also a National Monument), AY_42, AY_43 (both sites with Preservation Orders placed on them) and AY_44.
- six Recorded Monuments (AY_02, AY_03, AY_24, AY_26, AY_51 and AY_58); and
- 17 sites recorded on the SMR (AY_01, AY_07, AY_27, AY_41, AY_46 - AY_50, AY_52 – AY_57, AY_59, and AY_60).

National Monuments and Preservation Orders

There is one National Monument (AY_39; also a Protected Structure) and three sites with Preservation Orders placed on them (AY_40, AY_42, and AY_43) located within the study area (see Figure 13.1). These form part of the Jigginstown Castle complex. Two further sites with Preservation Orders placed on them (AY_38, AY_44; also a Protected Structure), approximately 146 m and 190 m to the west of the Proposed Development respectively, located outside the study area, also form part of the complex.

Built by the Lord Lieutenant of Ireland, Thomas Wentworth, as a summer residence and to accommodate Charles I on royal visits to Ireland[86], the complex includes the 17th century house (AY_39; Plate 13.2) and gardens (AY_43), enclosed within a large oval enclosure (AY_42). Far from coherent in style, the asymmetrical rubble stone and red and yellow brick buildings include a variety of notable architectural features including mismatched windows, 12 chimneys, and rib and barrel vaulting in the basement (Quirke, 2007). The use of brick was the first in Ireland on such a scale, and employed different types in its construction (Quirke, 2007), with local legend stating men formed a chain from Dublin to Naas and passed the bricks along the line to build the house[87]. The '*Great House*' was likely situated within extensive grounds and gardens, with approaches from the north and west (indicated by grand staired entranceways). A survey of 1728 details the '*Demesne to the Great House*' with the '*ruins of the Earl of Stafford's Great House*' as well as areas of arable, meadow and pasture to the north; an orchard, gardens and yards to the west; and a walled paddock to the south and south-west; with a small number of buildings, including the later farmhouse to the west (Moland, 1728). However, an engraving from the early 19th century shows the house in ruinous conditions[88] and a later survey (Hodges and Smith, 1842) shows the surroundings to the house much altered with the Grand Canal (built in the 1780s; CH_113) to the north; the house, identified as '*The Buildings*', to the north-east of '*Jigginstown House*' (the farmhouse); and '*Castle Rag*' (AY_44; Preservation Order; located outside the study area) to the south-west.

[86] https://kildare.ie/Heritage/historic-sites/jigginstown-castle.asp [accessed 06 February 2023].
[87] https://digital.ucd.ie/view-media/duchas:4819384/canvas?manifest=https://data.ucd.ie/api/img/manifests/duchas:4819384 [accessed 06 February 2023].
[88] https://catalogue.nli.ie/Record/vtls000544208 [accessed 02 February 2023].

Plate 13.2: Jigginstown Castle (AY_39; National Monument) to the south of the R445

While some original landscape features remain, including the sunken garden (AY_43) to the south of the main house, modern development, including the expansion of Naas, road network and installation of utilities, has also likely removed features associated with the grounds, such as the old fishpond[89], and there is limited potential for the remains of landscape features to be present in land to the east to the complex given the likely disturbance from a water main and sewer in this location. Nevertheless, archaeological excavations (Licence Number 02E1603) within the complex identified debris associated with the construction of the house[90] and a contemporary midden (AY_41), and archaeological testing to the north-east recovered brick and mortar, and sherds from a 17th–18th century roof tile and a medieval glazed potsherd (1979:13)[91] were also found nearby.

While still a prominent feature of the streetscape, recent modern development, including the junction with the R447, residential development to the south and industrial complexes to the east, have much altered the surroundings of the Jigginstown Castle complex. Traffic noise and movement forms a part of the setting of the complex and views, while limited by mature trees and hedges along the eastern boundary, as well as modern fencing and buildings, are predominantly of the R447 and R445.

Given these assets hold historical, architectural and archaeological interest because of their potential to contribute to the understanding of high-status houses during the 17th century through their surviving historic fabric/physical

[89] https://kildare.ie/Heritage/historic-sites/jigginstown-castle.asp [accessed 02 February 2023].
[90] https://excavations.ie/report/2002/Kildare/0008231/ [accessed 02 February 2023].
[91] http://excavations.ie/report/2007/Kildare/0017795/ [accessed 02 February 2023].

remains, group value as a coherent complex of associated contemporary assets, and in consideration of their designations, AY_38, AY_39, AY_40, AY_42, AY_43 and AY_44 have been assessed to be of High significance.

Register of Historic Monuments

A total of six sites on the RHM have been included within the baseline.

AY_39, AY_42, and AY_43 form part of the Jigginstown Castle complex and have been described above. Two other sites on the RHM associated with the Jigginstown complex (AY_38 and AY_44) are located outside the study area.

In addition to being recorded on the RHM, AY_13 (a linear earthwork) is also a Recorded Monument (KD010-001001) and forms the townland boundary between Ballyloughan and Graiguepottle (TB_68). It consists of a bank and ditch, approximately 680 m in length, and is orientated north–south. The ditch is located to the west of an established field boundary, in a flat area of pasture, with a low earth bank along its length likely deposited following ditch clearance. Aerial photographs and LiDAR show an ephemeral ditch feature aligned north–south, east of the R407, alongside the current field boundary (Plate 13.3).

Identified as ‘The Pale’ on the Ordnance Survey 25” map of 1888–1913, and depicted as a narrow trackway, this monument may be part of a boundary constructed by the Anglo-Normans to divide their lands from those held by the Irish. Legislated by parliament in 1460 and 1494–95, a defensive ditch was constructed to protect areas of Meath, Louth, Dublin and Kildare (Clare, 2006; Ellis, 2011). While it is reported local households adjacent to the boundary were required to provide men and tools to construct a double ditch six feet high as part of the defence of English interests (Clare, 2006; Ellis, 2011), it has been suggested that AY_13 was by and large conceptual and may only have been fortified in parts (Lyndon, 1973).

Given this asset holds archaeological and historical interest because of its potential to contribute to the understanding of the political and social landscape of the post-medieval period through its physical remains and documentary evidence, and in consideration of its inclusion on the RHM and designation as a Recorded Monument, AY_13 has been assessed to be of Medium significance.

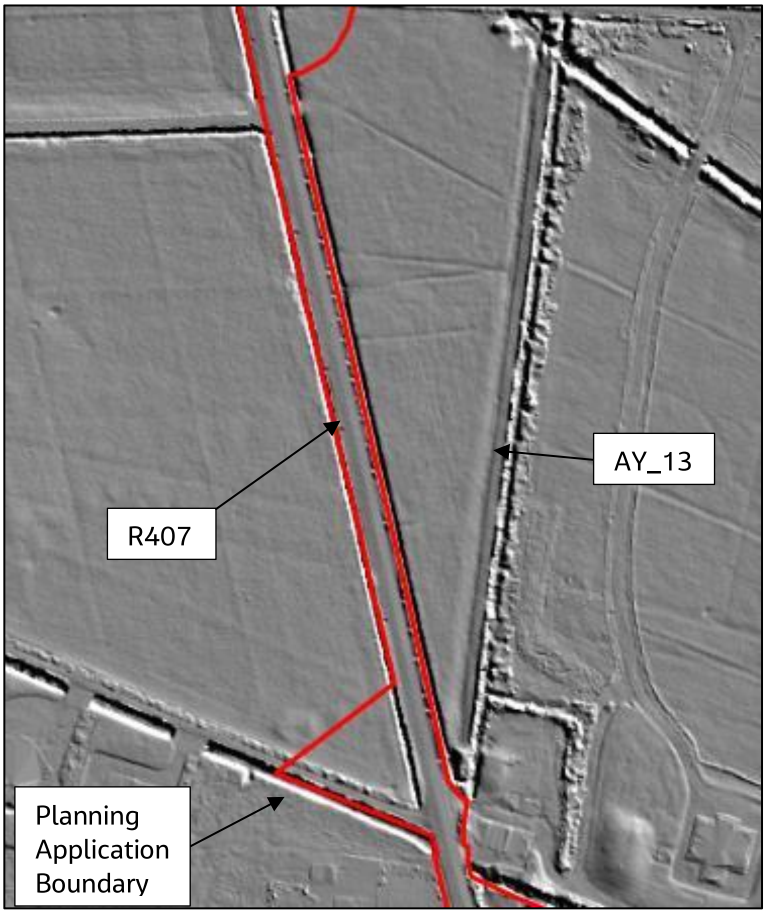

Plate 13.3: Section of the linear earthwork (AY_13; RHM and Recorded Monument) between Ballyloughan and Graiguepottle to the east of the R407 (DTM) (approximately ch. 21,750)

Recorded Monuments

Six[92] Recorded Monuments are located within the study area (see Figure 13.1).

AY_26 (also a Protected Structure) is located 18 m to the north-east of the Planning Application Boundary in Firmount East, within the demesne lands of Moatfield House (DL_15). Depicted on historic mapping (Ordnance Survey 25", 1888–1913), AY_26 measures approximately 28 m in diameter and approximately 4 m in height, and comprises a circular, round-topped, earthwork, located approximately 18 m to the north-east of the Planning Application Boundary. The site may be the remains of a motte or Anglo-Norman defended homestead dating to the 12th and 13th centuries (Department of the Environment, Heritage and Local Government, 2004; National Monuments Service, 2012). Topped with palisaded towers, these sites often had an associated enclosure (a bailey), which contained other buildings, attached. Cultivation patterns were visible on the mound from a review of LiDAR data acquired for the Proposed Development (Plate 13.4; Appendix 13.3) and is partially covered in mature trees. The site is visible from the L2002; however, views towards the site are filtered by an established private garden within which the mound is located. While there is the potential for associated features in the area surrounding the mound, for example associated field systems evidencing agricultural activities contemporary with the settlement, no features were identified from aerial imagery or LiDAR data (Appendix 13.3). Given this asset holds archaeological interest because of its level of preservation and potential to contribute to the understanding of platform ringforts, and in consideration of its designation as a Recorded Monument and a Protected Structure, AY_26 has been assessed to be of High significance.

[92] A further Recorded Monument, a linear earthwork (AY_13) is also on the RHM and, to avoid double counting assets, is described under 'Register of Historic Monuments' above.

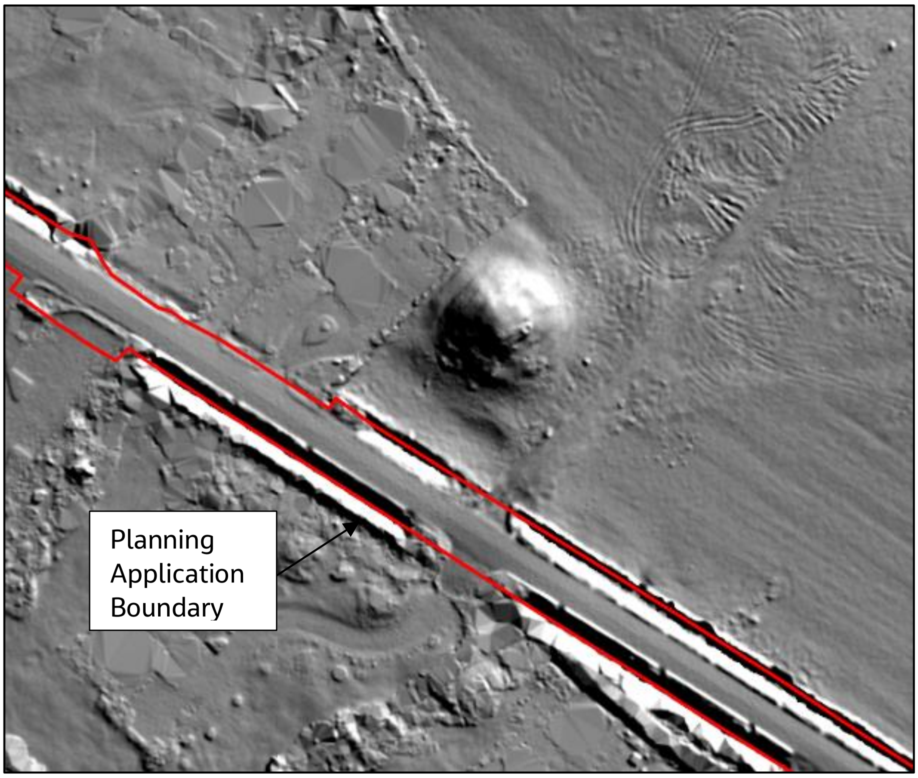

Plate 13.4: The mound in Firmount East (AY_26; Recorded Monument and Protected Structure) to the north-east of the L2002 (DTM) (approximately ch.34,250)

A mound (AY_02), comprising a low (approximately 1.6 m in height; ASI 1987) circular earth mound, is located approximately 26 m to the west of the Planning Application Boundary in Calgath. The mound is depicted on historic mapping as a '*Mound*' associated with '*Brides Well*' (Ordnance Survey 6", 1837–1842) and was topped by a single ash tree[93](important in pre-Christian tradition (O'Sullivan and Downey, 2006)), until recent restoration to the well (AY_01; a site recorded on the SMR; see 'Sites and Monuments Record' below) removed it. While holy wells are often located near church sites (The Heritage Council, 2023), no known early churches were identified nearby. The mound is located along the boundary of a small pasture field, identified as '*The Well Field*'[94], on a gentle east-facing slope. A modern post-and-rail fence surrounding the well is positioned around the top of the mound and a footpath leads from the R125 to the well from the north-east corner of the field; however, the mound itself is not visible from the road due to a high established hedgerow. This asset is of archaeological, traditional and social interest because of its potential to contribute to the understanding of this site type through its physical remains and group value given its relationship with the well (AY_01). Based on this and its designation as a Recorded Monument AY_02 been assessed to be Medium significance.

A field system (AY_03) of unknown date is located in fields to the east of the Planning Application Boundary in Calgath comprising the earthwork remains of a series of irregular fields, some of which are not depicted on historic mapping (Ordnance Survey 6", 1837–1842). These features, identified from aerial photographs, are formed by banks and ditches. Aerial imagery shows the field system extending into the large field to the north and includes a circular feature, measuring approximately 34 m in diameter, which could indicate the location of a denuded rath within an associated field system (Plate 13.5). Test trenching in advance of residential development to the south of the field system identified raised field systems.[95] The field system is located within a large irregular arable field to the east of the R125. While three residential properties have been built within the southern boundary of the site, the extensive field system remains legible as cropmarks and ephemeral positive earthworks (also identified from a review of LiDAR

[93] https://digital.ucd.ie/view/duchas:49398 [accessed 06 February 2023].
[94] https://meathfieldnames.com/meath-fieldnames-fullscreen.html [accessed 06 February 2023].
[95] http://excavations.ie/report/2004/Meath/0012315/ [accessed 06 February 2023].

data; Appendix 13.3). This assets archaeological interest results from its potential to contribute to the understanding of historic landscape through its physical remains. Based on this and its designation as a Recorded Monument AY_03 been assessed to be Medium significance.

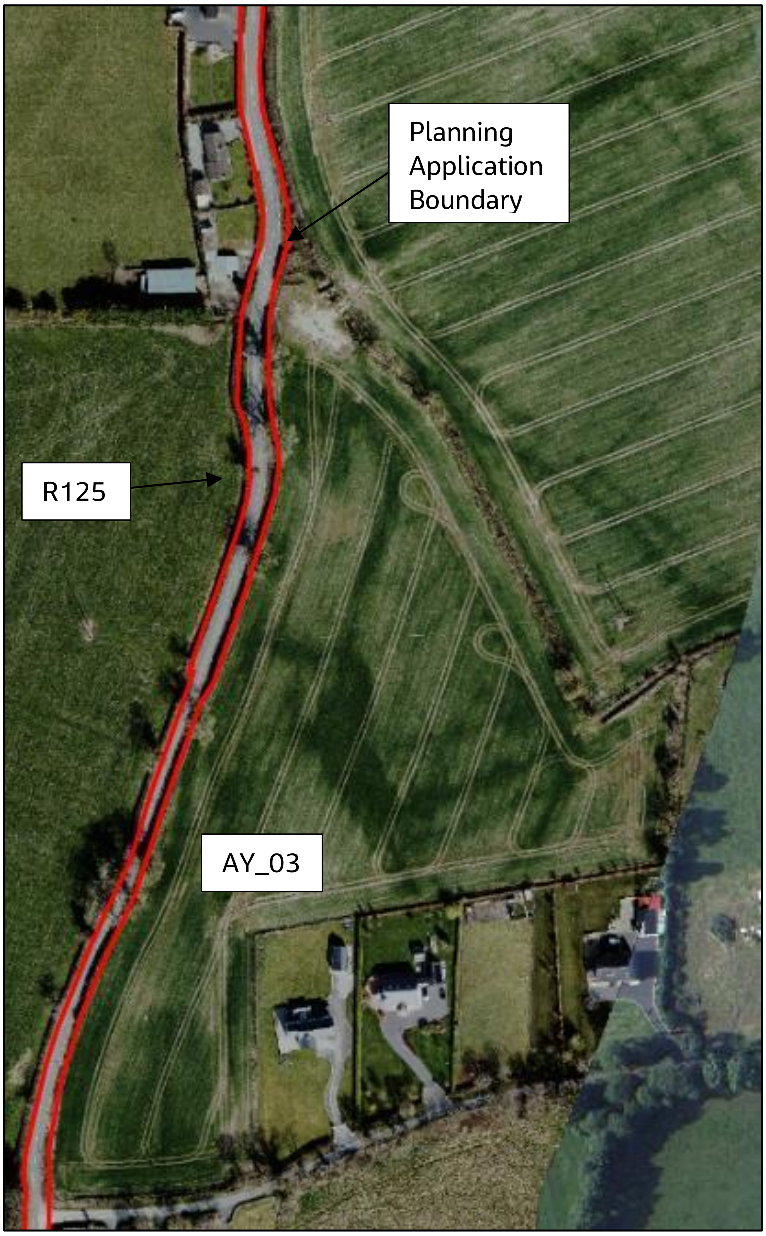

Plate 13.5: Aerial imagery showing field system (AY_03), including circular feature towards the centre and linear features extending into the field to the north (BlueSky, 2022) (approximately ch.12,750)

AY_24 is a poorly preserved rath in Ballynagappagh located approximately 36 m to the south-east of the Planning Application Boundary. Raths are farmsteads of early medieval date enclosed by one or more banks and ditches, and AY_24 comprises a low, sub-circular earth mound (measuring approximately 37 m by 24 m) surrounded by a fragmentary earth bank, approximately 3.8 m in width, with a possible entrance to the north-west. This monument is depicted on the Ordnance Survey 6" map of 1837–1842 as an oval earthwork. The rath is located within a private garden, to the east of a house, in an area of outcropping bedrock or subcrop[96]. It is covered in dense trees, with an established field boundary abutting the eastern edge, which limit views to and from the rath. This asset is of

[96] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [accessed 01 February 2023]

archaeological interest because of its potential to contribute to the understanding of ringforts through its physical remains. Based on this and its designation as a Recorded Monument AY_24 been assessed to be Medium significance.

A small circular enclosure (AY_51) is located approximately 20 m to the east of the Planning Application Boundary. The enclosure, identified from an aerial photograph from the 1970s (GSI N 337-6; not available), forms part of a small group in Stephenstown South. The group is not depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) and more recent aerial imagery shows the southern portion of this field subject to extensive disturbance, so any associated archaeological remains in this location may have been removed. No above ground remains were visible during the walkover survey or in LiDAR data acquired for the Proposed Development. The group of enclosures in Stephenstown South is near (within 1 km) of two further clusters of enclosures in Dunstown (see 'Sites and Monuments Record' below), also identified from aerial imagery, and may comprise part of a larger area of possible prehistoric settlement or funerary activity.

A small rectangular enclosure (AY_58) also identified from an aerial photograph (GSI N 337-6; not available) forms part of a group of six roughly rectangular earthworks in Dunstown (AY_53 – 57; see below). The earthworks were arranged in two roughly parallel rows of three within a rectangular field bisected by a field drain (Deery, 2022). However, this area was developed in the mid-1980s for the Dunstown substation, and these assets have been removed.

While there are no above ground traces, and the locations have been developed, there is the potential for archaeological remains below ground to survive and contribute to the understanding of these sites. While these assets are designated as Recorded Monuments, given their condition AY_51 and AY_58 have been assessed to be of Low significance.

Sites and Monuments Record

A total of 17 sites recorded on the SMR have been identified within the study area. Of these, four, comprising the site of two small pits identified during archaeological monitoring (AY_07), the present location of an ex-situ medieval font (AY_27), the site of a midden (AY_41) identified at Jigginstown Castle complex, and the site of an enclosure that has since been developed (AY_50) have been removed or are no longer in situ. While these provide evidence for archaeological activity within the study area, as they have been removed or are no longer in situ they not been included in the archaeological baseline.

The total number of sites recorded on the SMR and included in the archaeological baseline is therefore 13. These are shown on Figure 13.1 and information on these assets is provided in Table 13.3.

Table 13.3: Sites recorded on the SMR within the study area and included in the archaeological baseline.

Reference Number	SMR Reference	Description and Assessment of Significance	Townland	Location (Easting / Northing)
AY_01	ME049-014001	A holy well (AY_01) depicted on historic mapping as 'Brides Well' (Ordnance Survey 6", 1837–1842) comprising a small natural spring at the centre of a low earth mound (AY_02; a Recorded Monument, see above). The well is described as one of the hot wells in Meath which sprung up when St Brigid rested in the location and is said to cure deafness.[97]	Calgath	689223 / 742511

[97] 'St. Brigid's Well', *Ireland's Holy Wells County-by-County*. Available online: https://ihwcbc.omeka.net/items/show/416 [Accessed 12.11.21].

Reference Number	SMR Reference	Description and Assessment of Significance	Townland	Location (Easting / Northing)
		The well has more recently been conserved and is now stone lined. The well is located within a small pasture field, identified as 'The Well Field', on a gentle east-facing slope. A modern post-and-rail fence surrounds the well and a footpath leads from the R125 to the well from the north-east corner of the field. The well is not visible from the road due to a high established hedgerow. While this asset has archaeological, historical and social interest due to its potential to contribute to the understanding of the tradition of holy wells through its physical remains and group value (with AY_02; a Recorded Monument), it has been restored and subject to more recent alteration. In consideration of this, this asset has been assessed to be of Low significance.		
AY_463	KD024-050004	A group of small rectangular cropmarks, interpreted as enclosures, identified from aerial photographs. These features are not depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) and no above ground remains are still extant. While it was not possible to obtain the original image, ASI records indicate AY_46 to AY_48 are located within a level pasture field east of the R412 and positioned parallel to a field boundary (since removed; CH_103; Deery, 2022). No above ground remains were identified, and it is likely any associated archaeological remains that may have been present within the boundary of the Dunstown access track may have removed or truncated during its construction in the 1980s (Plate 13.6). While these assets have some limited archaeological interest, as well as group value, given their condition, these assets have been assessed to be of Low significance.	Dunstown	687302 / 712740
AY_47	KD024-050005		Dunstown	687328 / 712725
AY_48	KD024-050006		Dunstown	687335 / 712719
AY_49	KD014-061	A cropmark identified from aerial imagery and interpreted as an enclosure, measuring approximately 20 m in diameter (Plate 13.7). These features are not depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) and no above ground remains are still extant. A second circular feature (AY_59) of similar size is visible as a cropmark on aerial imagery in a field approximately 160 m to the east. While established field boundaries limit the intervisibility between these sites, it is possible they were contemporary and could form part of a larger complex of activity uncovered during recent archaeological investigations in advance of construction of	Castlesize	688231 / 724261

Reference Number	SMR Reference	Description and Assessment of Significance	Townland	Location (Easting / Northing)
		the Sallins Bypass approximately 130 m to the south of this asset (Licence number: E004777). AY_49 is of archaeological interest due to its potential to contribute to the understanding of enclosure sites, including their construction, function, date and duration of occupation through its physical remains. Therefore, AY_49 has been assessed to be of Medium significance.		
AY_52	KD024-048003	A group of small circular cropmarks (AY_51; a Recorded Monument; see above, AY_52 and AY_60) identified from aerial imagery from the 1970s in a flat wedge-shaped field between the R448 and R412; however, the features are not visible on later imagery which shows the southern portion of this field subject to extensive disturbance. No visible above ground remains were identified. Located in a large pasture field, bounded by established hedgerows as well as modern concrete and post-and-wire fencing. Located to the north of an operational farmyard/construction site (substantial ground disturbance visible). While AY_52 and AY_60 may have some limited archaeological interest, as well as group value, given their condition, these assets have been assessed to be of Low significance.	Stephenstown South	687262 / 713171
AY_60	KD024-048002		Stephenstown South	687252 / 713191
AY_53	KD024-052005	A cluster of small, roughly rectangular earthworks identified from aerial imagery and interpreted as enclosures. It is likely the group has been removed as a result of the construction of the Dunstown substation in the mid-1980s. While AY_53 – AY_57 may have some limited archaeological interest, as well as group value, given they have likely been removed, these assets have been assessed to be of Very Low / Negligible significance.	Dunstown	687688 / 712279
AY_54	KD024-052003		Dunstown	687744 / 712275
AY_55	KD024-052006		Dunstown	687688 / 712235
AY_56	KD024-052002		Dunstown	687740 / 712199
AY_57	KD024-052004		Dunstown	687682 / 712182

Reference Number	SMR Reference	Description and Assessment of Significance	Townland	Location (Easting / Northing)
AY_59	KD014-062	A circular feature (approximately 30 m in diameter) identified from aerial imagery (Plate 13.7). It has been interpreted as a barrow, which are artificial mounds constructed over burials and typically date to the Bronze or Iron Ages (c. 2400 BC to AD 400). This asset is located within arable land on the relatively flat, low-lying eastern floodplain of the River Liffey in Castlesize. A second circular feature (AY_49) of similar size is visible as a cropmark on aerial imagery in a field approximately 160 m to the west. While established field boundaries limit the intervisibility between these sites, it is possible they were contemporary and could form part of a larger complex of activity uncovered during recent archaeological investigations (Licence number: E004777) in advance of construction of the Sallins Bypass approximately 20 m to the south of this asset. AY_59 is of archaeological interest due to its potential to contribute to the understanding of Bronze Age funerary and ritual sites through its physical remains. Therefore, AY_59 has been assessed to be of Medium significance.	Castlesize	688409 / 724218

Plate 13.6: Approximate former location of enclosures (AY_47 and AY_48), to the north of the Dunstown access track in an area of disturbance (approximately ch.52,500)

Plate 13.7: Aerial imagery showing possible barrow (AY_59) and enclosure to the west (AY_49) (BlueSky, 2022) (approximately ch.37,500)

Potential for the Presence of Unknown Archaeological Remains

The sources identified in Section 13.2.3 and in Section 13.8, provide a thorough understanding of the potential for the presence of unknown archaeological remains within the study area.

The off-road section south of Woodland substation (between ch.0 and ch.3,500) has been assessed to have a very high potential for unknown archaeological remains due to the presence of the cropmark remains of ring ditches, possibly funerary monuments (CH_60; see Plate 13.8, CH_61, CH_63 and CH_66), and field systems (LI_006, LI_013, LI_017, LI_021, and LI_026) identified from LiDAR and aerial imagery, which may date from the prehistoric period onwards.

The off-road section at Castlesize (between ch.36,800 and ch.37,800) has also been assessed to have a very high potential of unknown archaeological remains due to the presence of possible barrows (AY_49 and AY_59; both sites recorded on the SMR; see Plate 13.7) and recent archaeological investigations in advance of the construction of the M7 Osberstown Interchange and R407 Sallins Bypass (Licence Number: E004777)[98,99]. These excavations identified a multi-period complex of activity on the floodplain of the River Liffey, including early medieval settlement activity and post-medieval industrial activity in the 'Kiln Field'.

[98] http://excavations.ie/report/2017/Kildare/0026981/ [accessed 08 February 2023].
[99] https://www.archaeology.org/news/5862-170822-ireland-kildare-early-medieval-complex [accessed 08 February 2023].

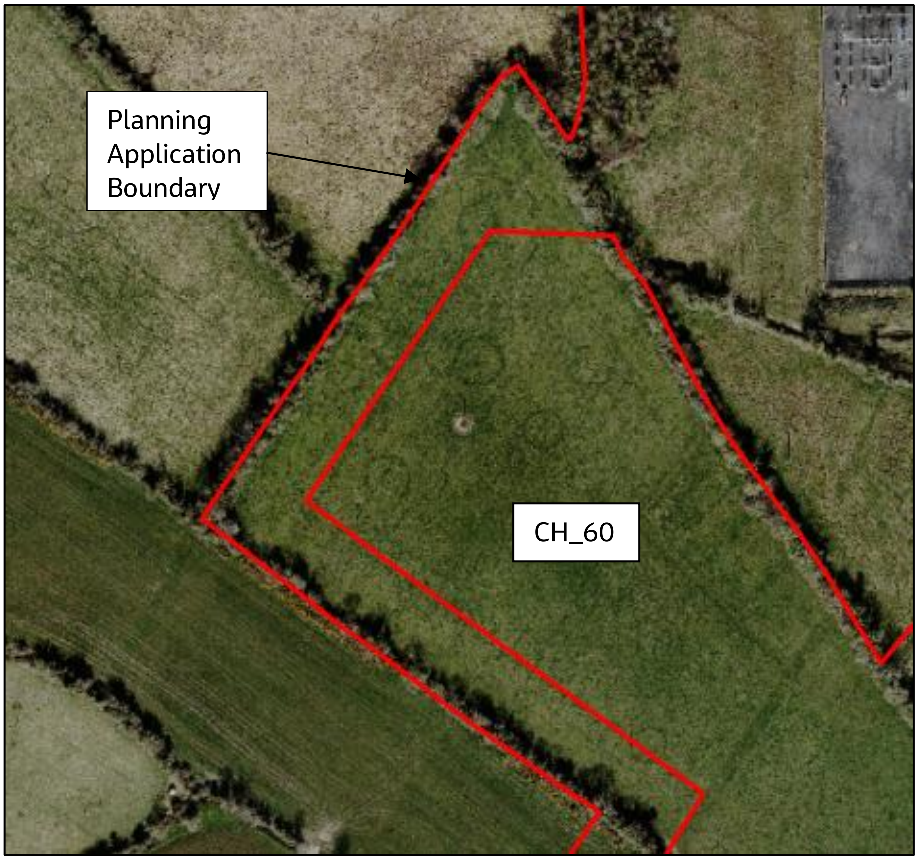

Plate 13.8: Aerial imagery showing cropmarks interpreted as possible ring-ditches (CH_60) south of Woodland substation (BlueSky, 2022) (Approximate Chainage 250)

The potential for the presence of unknown archaeological remains has been reduced in the off-road sections that have been subject to disturbance:

- in Kilcock between ch.16,250 and ch.16,800, where disturbance from the construction of the M4 motorway junction 8 (OSi Ortho 2005) and the wayleave of the Kilcock Ringmain PH 1 watermain (to the west of CH_81; Plate 13.9) is visible on aerial photographs (BlueSky, 2022).

- in Osberstown between ch.39,680 and ch.39,800, where disturbance from the construction of the Sallins Bypass (GoogleEarth, 2018–2020) is visible on aerial photographs.

- in Jigginstown between ch.44,500 and ch.44,900, where disturbance is visible on aerial photographs (GoogleEarth imagery; 4/2003, OSi Ortho 2000) from the construction of residential development, between the Grand Canal (Herbertstown Branch) and R445, and the installation of utilities (including a sewer and trunk water pipe) to the east of Jigginstown Castle (AY_39, a National Monument).

- in Stephenstown South between ch.51,900 and ch.52,200, where extensive ground disturbance is visible on aerial photographs (GoogleEarth imagery; 4/2003, OSi Ortho) associated with an agricultural complex.

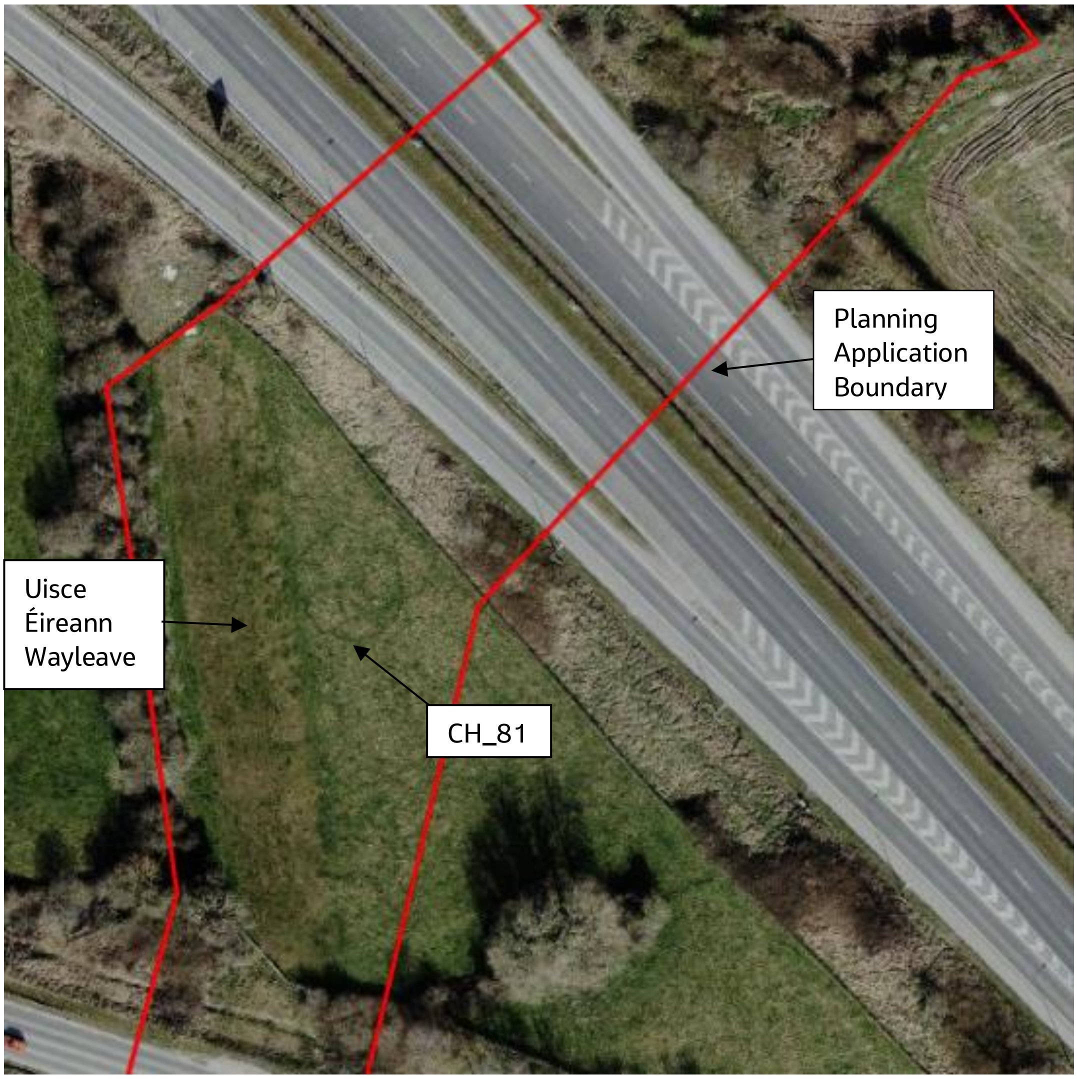

Plate 13.9: Cropmark interpreted as a possible enclosure (CH_81) to the south the M4 motorway (Junction 8) with wayleave for the Kilcock Ringmain PH 1 watermain visible to the west (BlueSky, 2022) (approximately ch.16,750)

However, given the number of known archaeological assets within the study area, the results of previous archaeological investigations (see Section 13.3.3), as well as extensive cropmarks identified from aerial photographs and sites identified from LiDAR (Appendix 13.3), the potential for the presence of unknown archaeological remains within the remaining off-road sections of the Proposed Development has been assessed to be high.

Ireland's extensive river network and post-glacial loughs are known to have been foci for human activity from the Mesolithic period onwards (FitzGerald, 2007; Mossop and Mossop, 2009; Aalen, Whelan and Stout, 2011; Woodman, 2015). In addition, votive offerings, objects deposited for religious reasons, were deposited in rivers, loughs and bogs, with a floruit in the Iron Age. Rivers were later used as a source of power, with evidence surviving from the early medieval period onwards. There is therefore potential for unknown archaeological remains in and around watercourses.

The Proposed Development crosses 41 watercourses (some are crossed multiple times) and details of these are provided in Table 13.4. As can be seen from Table 13.4: 15 are drainage ditches; 19 are streams (up to 3 m in width); four are rivers (over 3 m in width); and three are canals.

Table 13.4: Watercourses crossed by the Proposed Development

Reference	Watercourse Type	Notes	Chainage
WB01	Stream	Tributary of the River Tolka. Depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) following the same course.	Ch. 800
WB02	Stream	Dunboyne Stream. Depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) following the same course.	Ch. 1,900
WB03	Stream	Tributary of the Rye Water. Depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). A section of this stream has been straightened and is culverted under the Barstown Industrial Estate (south of the R156).	Ch. 3,615
WB04	Stream	Jenkinstown Stream, spanned by Jenkinstown Bridge (CH_04). Depicted as a stream on historic mapping (Ordnance Survey 6", 1837–1842). However, later mapping (Ordnance Survey 25", 1888–1913) shows the course of this stream was straightened to the south. This stream forms part of the Kilcock Drainage District of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[100]	Ch. 6,000
WB05	Drainage Ditch	A straight roadside drainage ditch, which angles to the east at its southern end. Not depicted on the Ordnance Survey 6" map of 1837–1842; however, appears on later editions (Ordnance Survey 25", 1888–1913).	Ch. 7,385
WB06	Stream	Jenkinstown Stream. Crossed by the R125. Depicted as a stream on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) following the same course.	Ch. 8,080
WB07	Stream	Jenkinstown Stream, crossed by the R125 by a stone road bridge (CH_06). Depicted on historic mapping (Ordnance Survey 6", 1837–1842); however, later mapping (Ordnance Survey 25", 1888–1913) shows the course of this stream was	Ch. 10,700

[100] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
		straightened. The old alignment of the stream is visible on LiDAR. This stream forms part of the Kilcock Drainage District of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[101]	
WB08	Stream	Jenkinstown Stream, crossed by the R125. Depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) as a stream; however, appears to have been straightened on modern mapping with the original course visible on aerial imagery (BlueSky, 2022).	Ch. 11,180
WB09	Stream	An unnamed stream, crossed by the R125 by a stone road bridge (CH_07). Depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) following the same course.	Ch. 11,400
WB10	Stream	Bride's Stream crossed by the R125. Depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913), crossed by 'Bride's Well Bridge' (no longer extant). Follows similar course; however, modern mapping shows the stream turning sharply to the west, to the west of the road.	Ch. 12,370
WB12	Stream	Tributary of the Rye Water, crossed by the R125. A watercourse is depicted on the Ordnance Survey 6" map of 1837–1842; however, later editions (Ordnance Survey 25", 1888–1913) show this watercourse straightened and in a new location. The old alignment of the stream to the north of the R125 is visible on aerial imagery (BlueSky, 2022).	Ch. 14,400
WB13	River	Rye Water, crossed by the R158 over Balfeaghan Bridge (CH_12). Depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) following the same course. A possible ford was noted to the west of the bridge (CH_108 during the walkover survey); however, no ford is depicted on historic mapping, and this could equally be a modern deposit. This river forms part of an Arterial Drainage Scheme of the Office of Public Works which strongly suggests this river may have been subject to modification.[102]	Ch. 15,050

[101] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].
[102] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
WB14	Canal	Section of the Royal Canal. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Remains extant and operational.	Ch. 15,400
WB15	Stream	Lyreen_010 – crossed by passing bay	Ch. 19,920
WB17	Drainage Ditch	A ditch depicted on Ordnance Survey 25” map of 1888–1913. Not shown on earlier edition (Ordnance Survey 6”, 1837–1842).	Ch. 21,250
WB18	Drainage Ditch	A drainage ditch, not depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913).	Ch. 21,300
WB19	Drainage Ditch	Not depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913); however, Loughtown River shown further north (ch.21,550) (possibly course changed, or a later ditch). Crossed by the R407.	Ch. 21,650
WB20	Drainage Ditch	Ditch depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Crossed by the R407.	Ch. 22,000
WB21	Drainage Ditch	A ditch depicted as a field boundary on Ordnance Survey 6” map of 1837–1842 and a ditch on later editions (Ordnance Survey 25”, 1888–1913). Crossed by the R407. This ditch forms part of the Baltracey Drainage District of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[103]	Ch. 22,300

[103] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
WB22	Stream	Clonshanbo River, crossed by the R407 via the Baltracey Bridge (CH_24). Depicted on historic mapping as 'Baltracey River' and 'Belgard or Baltracey River' (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) following the same course.	Ch. 23,620
WB24	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) crossed by the R407. This stream forms part of the Baltracey Drainage District of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[104]	Ch. 25,800
WB25	Stream	Gollymochy River. Shown as a field boundary on Ordnance Survey 6" map of 1837–1842 with later editions depicting the stream as a named watercourse (Ordnance Survey 25", 1888–1913). Crossed by the R408.	Ch. 27,300
WB26	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Crossed by the R408.	Ch. 27,600
WB27	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Crossed by the R408.	Ch. 30,000
WB28	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Could be associated with the drainage of Clane Bog.[105.]	Ch. 30,250
WB29	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Could be associated with the drainage of Clane Bog.[106.]	Ch. 30,400

[104] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].
[105] https://www.bordnamonalivinghistory.ie/wp-content/themes/living-history/assets/maps/index.htm?start_scene=scene_Map_-_Kildare_-_Part_of_the_Bog_of_Allen [accessed 16 February 2023].
[106] https://www.bordnamonalivinghistory.ie/wp-content/themes/living-history/assets/maps/index.htm?start_scene=scene_Map_-_Kildare_-_Part_of_the_Bog_of_Allen [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
WB30	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 25”, 1888–1913).	Ch.31,360
WB32	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 25”, 1888–1913), possible extension of a stream orientated east-west.	Ch. 36,150
WB33	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 25”, 1888–1913), possible extension of a stream orientated east–west.	Ch. 36,650
WB34	Drainage Ditch	No depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913).	Ch. 36,900
WB35	River	River Liffey. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 37,200
WB36	River	River Liffey. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 37,900
WB37	River	River Liffey. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 39,000
WB38	Canal	Section of the Grand Canal. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Remains extant and operational.	Ch. 39,400
WB39	Stream	A tributary of the River Liffey. Crossed by the Osberstown Millennium Parkway. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course; however, modern mapping shows the stream running into a drainage pond south of the M7 motorway.	Ch. 41,510

Reference	Watercourse Type	Notes	Chainage
WB40	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913), forming part of an extant field boundary.	Ch. 42,300
WB41	Drainage Ditch	A ditch depicted in historic mapping (Ordnance Survey 25”, 1888–1913). Crossed by the Osberstown Millennium Parkway.	Ch. 42,900
WB42	Canal	Section of the Grand Canal (Herbertstown Branch). Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Remains extant and operational.	Ch. 44,600
WB43	Stream	A watercourse depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Identified on the latter as ‘canal supply’. Follows the same course (although residential development to the north). Crossed by the R448.	Ch. 45,330
WB44	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course. Crossed by the R448.	Ch. 49,000
WB45	Drainage Ditch	No depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913).	Ch. 52,700

The potential for in situ archaeological remains within smaller watercourses and field drains, likely established in the 18th and 19th century as part of agricultural improvement (O'Sullivan and Downey, 2010), is considered to be lower than within unaltered streams and rivers, especially the large rivers. In addition, this potential is reduced where watercourses have been modified such as through canalisation or dredging. For example, recent assessment of dredged riverine deposits from the Rye Water in advance of road and flood mitigation works in Dolanstown did not identify any archaeologically significant remains (Licence Numbers: 11E239 and11R87)[107].

Where the evidence indicates that watercourses within the study area have been modified, this is presented in Table 13.3.

There is also the potential for the presence of unknown archaeological remains, including paleoenvironmental remains and preserved organics adjacent to watercourses. Ground investigation was undertaken for the Proposed Development (Causeway Geotech, 2023), including next to the following watercourses:

- Rye Water;
- Baltracey River; and
- River Liffey.

At ch.15,070 to the south of the Rye Water, deposits of clay, gravel and boulders approximately 5.35 m deep were identified in BHC054, while at ch.23,700 south of the Baltracey River, clay and gravel deposits approximately 1.8 m thick were identified in BHA042. A similar sequence of deposits was identified at ch.39,000 on the north bank of the River Liffey where gravels approximately 6.7 m deep overlain by thin (0.4 m) topsoil were identified in BHC024. No organic deposits were identified. Given the type of deposits identified (boulders and gravels) and their depth, they are likely to be Pleistocene in date, and therefore geological rather than archaeological in origin, reducing the potential for the presence of unknown archaeological remains in these areas. In addition, while the River Liffey meanders within the study area, it does not appear to have deviated much from its current course. This also suggests that it is unlikely that gravels were deposited during the Holocene.

While not confirmed by the ground investigation, alluvium and lacustrine deposits were identified from the GSI online mapper[108] along watercourses and adjacent to former loughs in the townlands of in Culcommon, Cullendragh, Phepotstown, Millicent South and Dunstown, and these are considered to have a higher potential for the presence of palaeoenvironmental remains and preserved organic materials.

13.3.3 Architectural Heritage

Architectural heritage assets within the study area comprise:

- six Protected Structures (AH_06, AH_11, AH_12, AH_15, AH_18 and AH_19; see Figure 13.2);
- two structures included on the NIAH (AH_01 and AH_20; see Figure 13.2), assessed by the NIAH to be of Regional importance; and
- ten GDLs (DL_02, DL_03, DL_04, DL_06, DL_07, DL_10, DL_14, DL_15, DL_17, and DL_20; see Figure 13.3).

No ACAs have been identified within the study area.

107 http://excavations.ie/report/2011/Meath/0022718/ [accessed 07 February 2023].
108 https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [accessed 31 January 2023]

Protected Structures

Six Protected Structures, comprising post-medieval houses and churches, have been identified within the study area (see Figure 13.2). Three additional Protected Structures are also a National Monument (AY_39), a site with a Preservation Order placed on it (AY_44) and a Recorded Monument (AY_26). These are described in Section 13.3.1.

Millicent Estate Houses (AH_15) is located within Millicent Demesne (DL_17; see below), approximately 3 m to the north-east of the Planning Application Boundary. The building comprises a square plan, two-storey house with a conservatory and outbuilding, both possibly of later date. While AH_15 is shown as a 'lodge' on historic mapping (Ordnance Survey 25”, 1888–1913), the plan of the current building differs from that depicted on the historic mapping and the building therefore may have been altered at a later date. The principal elevation of the house is to the south-east, with views across a private access track towards an area of trees. Views in all directions are largely screened by trees and an established boundary hedge. This asset is of architectural and historical interest as part of Millicent Demesne (DL_17), and aesthetic interest given its contribution to the local streetscape.

Vernacular architecture within the study area includes two thatched dwellings (AH_06 and AH_11) both dating to the 18th to 19th centuries and assessed by the NIAH to be of Regional importance. The house in Moortown (AY_06)[109] comprises an ‘L’-shape plan building on Mooretown Drive, off the R407, on Painestown Crossroads. Formerly O’Neill’s pub, this building has been substantially increased in size from the original single storey, three bay roadside dwelling, to include a two-storey building set perpendicular to the road and a modern (2002) single-storey thatched range (Kildare County Council, 2005). Not visible from the R407 due to established vegetation, mature trees and intervening buildings, views across Moortown Drive are limited by the hedgerow beyond. The building forms part of the local Sylvian streetscape character, and its location near a crossroads contributes to the understanding of the historic public function of the building. A five-bay, single-storey thatched house in Ballynagappagh (AH_11)[110] has also been extended and continues in use as a farmhouse forming part of the yard of an operational farm. The building is positioned perpendicular to the R408, behind a low roadside boundary wall which is approximately 0.6 km in length, with a large farmyard to the north. Views from the house are largely across the farmyard and an open area to the south, to the R408 and established fields and hedgerows beyond. These assets are of historical, architectural, aesthetic and social interest as good examples of vernacular architecture forming part of the local streetscape and given their contribution to the architectural heritage of the region.

Bluebell Farm House (AH_18) is located approximately 6 m to the west of the Planning Application Boundary and comprises a roadside three bay, two-storey Victorian farmhouse. Historic mapping (Ordnance Survey 25”, 1888–1913) depicts the house, and associated ranges forming a yard, enclosed by a boundary wall which surrounds the farm complex. Located on the former road alignment to the west of Kilcullen Road, the farm complex is screened from the road by the high stone boundary wall and established roadside hedges with views focused internally across the yard. This asset is of architectural interest as a modest example of a post-medieval farmhouse and its contribution to the architectural heritage of the study area.

Millicent Church and Lych Gate (AH_12), is located within Millicent House Demesne (DL_17). Consecrated in 1883, the church comprises a Hiberno-Romanesque building, located on a rise towards the centre of the parish of Clane, with a square tower that is visible for some distance[111]. The lych gate comprises a covered gateway at the entrance of the graveyard where a coffin could be set down during a funeral until the celebrant arrived (Plate 13.10). The structure has a slate pitched roof with decorative ridge pieces[112] and is the only entrance leading directly from the L2002 into a quiet treelined graveyard. While partially screened by an established boundary of mature trees and hedges, the church is visible from the road and intermittent traffic noise is audible from the churchyard. A later example, St Patrick’s Church (AH_19), comprises a Gothic-style, former Church of Ireland church that retains much of its original character despite a change in use. While now a residential property, the church is set back from the R148, within an enclosed former churchyard, east of the associated cemetery. Traffic noise and movement forms part of the setting

[109] https://www.buildingsofireland.ie/buildings-search/building/11901001/moortown-celbridge-ed-kildare [accessed 06 February 2023].
[110] https://www.buildingsofireland.ie/buildings-search/building/11901401/ballynagappagh-clane-ed-kildare [accessed 06 February 2023].
[111] https://www.kildare.ie/ehistory/index.php/church-of-st-michael-and-all-angels-millicent-clane/ [accessed 06 February 2023].
[112] https://catalogue.nli.ie/Record/vtls000303403 [accessed 08 February 2023].

of the church and views, while filtered by trees along the roadside boundary, are towards the road to the north. These assets have historical, architectural and aesthetic interest as modest examples of 19th century churches, in roadside locations, set within churchyards with associated structures and memorials, and social interest as the focus of Church of Ireland worship (and continued use for AH_12).

In consideration of their designations as Protected Structures, these assets have been assessed to be of High significance.

Plate 13.10: Millicent Church and Lych Gate (AH_12; Protected Structure) north-east of the L2002

National Inventory of Architectural Heritage

Larchill House (AH_01; assessed by the NIAH to be of Regional importance) in Phepotstown comprises a detached 18th century country house and associated structures. While house itself (RPS MH049-107) is located outside the study area, the former gate lodge and rendered entrance piers with limestone wheel guards and cast-iron double gates are located within the study area to the west of the R125. Originally the home farm to the Phepotstown House estate (DL_03), Larch Hill was developed into an ornamental farm by Robert Prentice (Gatehouse, 2017). The farm became a separate property when the Prentice family's fortunes declined and while the farm continued to be developed in the latter half of the century by the Watson family, it fell into neglect until the 1990s (Gatehouse, 2017). The house is set back from the R125 to the more elevated north of the demesne, with ornamental farm buildings to the west. The boundaries of the demesne, which comprise belts of mature trees, limit views to and from the house, with views from the house focused across the designed landscape and the distant views of the surrounding countryside incorporated into the original design (Gatehouse, 2017). This asset has historical, architectural and aesthetic interest as part of the Phepotstown House estate (DL_03) and due to its contribution to the local streetscape.

AH_20 (assessed by the NIAH to be of Regional importance) comprises a single arch stone railway bridge, carrying the Great South and Western Railway across a local road. While the bridge has been subject to some later additions, the structure remains largely as built in c. 1870, including original rock-faced granite voussoirs and dressed stone copes. The bridge is shown on historic mapping (Ordnance Survey 25", 1888–1913), as the route of the railway crosses fields to the south of the Grand Canal. Despite some development to the west and east of the structure, including the Sallins Bypass and residential properties, it continues to be a prominent feature of the local streetscape and forms part of a group of similar bridges on this section of the railway. This asset is of historical, architectural and technical interest as an example of a railway bridge exhibiting quality craftsmanship, and social interest as part of the Great South and Western Railway.

These assets have been assessed to be of Medium significance.

Gardens and Designed Landscapes

A total of 10 GDLs have been identified within the study area. The GDLs were recorded by the Survey of Historic Gardens and Designed Landscapes or from historic mapping (Ordnance Survey 6", 1837–1842). Information on these GDLs and an assessment of their significance is provided in Table 13.5 and they are shown on Figure 13.3.

Table 13.5: GDLs identified within the study area

Reference Number	Name	Description and Assessment of Significance	Townland	NIAH Reference
DL_02	Jenkinstown House	Demesne identified from historic mapping (Ordnance Survey 6", 1837–1842). The principal house remains extant (CH_02) and the footprint of the demesne remains legible as cropmarks and extant features including ancillary buildings and boundaries to the south-east. However, some of the boundaries, including the row of trees to the north-west depicted on historic mapping (Ordnance Survey 6", 1837–1842), have been removed. A modern barn has also been constructed to the north of the house. A curved roughcast boundary wall with alternate horizontal and vertical roughly squared copes, squared, rubble stone gate piers with tapered copes form the entrance with R156, and driveway leading to the house. Mature trees largely screen the house and form the roadside boundary along with an overgrown boundary along the R156. This asset is of limited architectural interest given the poor preservation of demesne features and its limited legibility. In consideration of this, this asset has been assessed to be of Low significance.	Jenkinstown	N/A
DL_03	Phepotstown House	The GDL to Phepotstown House (CH_05), including principal house and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837–1842). Retains elements of parkland and formal gardens, as well as original driveways and entrances with curved rendered entrance walls, gate piers and cast-iron gates. The boundary to the demesne is formed of an earth bank, hedgerows and mature trees, as well as high roughcast wall with buttressing (in poor condition). This asset is of architectural interest given its historic fabric, continued legibility and extant demesne features. In consideration of this, DL_03 has been assessed to be of Medium significance.	Phepotstown	NIAH 5151

Reference Number	Name	Description and Assessment of Significance	Townland	NIAH Reference
DL_04	Larchill House	The GDL to Larchill House (AH_01; see above) comprises an ornamental farm, which includes extant water features and woodland. While some features have been removed, for example the second lake to the south of the demesne (Gatehouse, 2017), these are legible as cropmarks. Established belt of trees with external roadside ditch and hedgerows bound the R125. A gated entrance with a single-storey lodge behind the boundary wall with a crenellated two-storey building behind. A low rubble stone wall runs from entrance to the carriageway, as well as rendered and painted entrance walls, with wheel guards. The southern boundary to the demesne comprises an established woodland belt. This asset is of architectural interest given its historic fabric, continued legibility and extant demesne features. In consideration of this, DL_04 has been assessed to be of Medium significance.	Phepotstown	NIAH 5104
DL_06	Calgath House	The GDL to Calgath House. A significant number of modern agricultural buildings have been constructed within this site; however, the boundary remains perceptible. Mature trees, low hedges, roadside ditch and large roughly coursed rubblestone entrance wall and gate piers are located along the R125. The entrance comprises splayed rubble stone entrance walls with square piers. A modern fence formed the roadside boundary further south. This asset is of limited architectural interest given the poor preservation of demesne features and its limited legibility. In consideration of this, this asset has been assessed to be of Low significance.	Calgath	NIAH 5697
DL_07	Brides Stream House	The GDL to Bridestream House with legible features including areas of parkland and belts of trees. A lodge (CH_09) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) remains extant to the south; however, the driveway appears to be overgrown and disused. The boundary along the R125 comprises a low stone wall and ditch, with a mature hedgerow and tree line. A low stone wall lining the roadside ditch was also identified, gradually increasing in height, leading to the entrance to the south. This asset is of architectural interest given its historic fabric, continued legibility and extant demesne features. In consideration of this, DL_07 has been assessed to be of Medium significance.	Calgath	NIAH 4983

Reference Number	Name	Description and Assessment of Significance	Townland	NIAH Reference
DL_10	Painestown House	The GDL to Painestown House. The principal building appears to be ruinous, and a large amount of woodland depicted on historic mapping (Ordnance Survey 6", 1837–1842) is no longer present. The R407 is bounded by established hedgerows and mature trees along an earth bank, with the entrances recessed from the carriageway. Sections of modern post-and-rail fences were identified, along with modern housing within boundary. This asset is of limited architectural interest given the poor preservation of demesne features and its limited legibility. In consideration of this, this asset has been assessed to be of Low significance.	Painestown	NIAH 1884
DL_14	Firmount House	The GDL to Firmount House, includes the principal building and other estate features such as the walled garden, parkland and some estate trees. The walled garden bounds the L2002 with high rendered stone wall and includes a small pedestrian doorway directly onto the carriageway. Splayed entrance walls are located to the north of garden, and a second entrance comprises a rubble stone construction further south. Modern post-and-rail fence were identified further south, as well as entrances to later houses. This asset is of architectural interest given its historic fabric, continued legibility and extant demesne features. In consideration of this, DL_14 has been assessed to be of Medium significance.	Firmount Demesne	NIAH 1882
DL_15	Moatfield House	The GDL to Moatfield House, includes principal building (RPS B14-18), agricultural range, and a wide tree-lined avenue. A ditch and established hedgerow bound the L2002; however, modern entrances and boundary features, including post-and-rail fencing, are also present. The entrance to the demesne is recessed with rubble stone walls and a set of simple square gate piers. This asset is of architectural interest given its historic fabric, continued legibility and extant demesne features. In consideration of this, DL_15 has been assessed to be of Medium significance.	Firmount East	NIAH 1883
DL_17	Millicent House	The GDL to Millicent House. The extensive riverside demesne lands surrounding the principal house (RPS B14-26) include extant estate features such as lodges (including AH_15), a walled garden, drives, and areas of woodland and parkland depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Rubble stone walls and a set of grand entrance gates delimit the demesne to the south and line the road from the entrance to Millicent Bridge. A later	Millicent Demesne	NIAH 1889

Reference Number	Name	Description and Assessment of Significance	Townland	NIAH Reference
		farmstead has been built within the boundary of the demesne, and modern replacement boundaries was identified at various points, including later private gardens (hedges). This asset is of architectural interest given its historic fabric, continued legibility and extant demesne features. In consideration of this, DL_17 has been assessed to be of Medium significance.		
DL_20	Killashee House	The GDL to Killashee House. Largely developed include Killashee National School, and the majority of demesne features have been removed. The R448 is located within the western boundary of the demesne. Extant boundary features include established hedgerows and a ditch, and modern post-and-rail fencing. A section of roughly coursed rubble stone wall is extant to the south of the demesne, along with a later recessed entrance. This asset is of very limited architectural interest given its very limited legibility and very few remaining demesne features. Given its condition, this asset has been assessed to be of Very Low / Negligible significance.	Killashee	NIAH 1980

13.3.4 Cultural Heritage

A total of 304 cultural heritage assets were identified within the study area (see Appendix 13.1 and Figures 13.4 – 13.6) comprising:

- 82 cultural heritage sites identified from historic mapping, aerial imagery, and during the walkover survey and site inspections;
- 135 features identified from LiDAR data acquired for the Proposed Development (Appendix 13.3); and
- 87 townland boundaries.

The cultural heritage assets are characterised by domestic, industrial, and funerary activity dating from the prehistoric to the post-medieval periods. The locations of these assets are shown on Figures 13.4 to 13.6 and further details are provided in Appendix 13.1.

A total of 22 cropmarks were identified. Fifteen of these were interpreted as evidence of activity dating from the prehistoric period onwards including ring-ditches (circular or near circular ditched features comprising the possible remains of barrows or round houses) in Woodland, Cullendragh Warrenstown, Jenkinstown, Phepotstown, Calgath and Boherhole (CH_60; Plate 13.4, CH_61, CH_63, CH_66, CH_69, CH_70, CH_77, CH_78 and CH_89), a possible barrow in Firmount East (CH_97), and enclosures in Portan, Culcommon, Jenkinstown, Kilcock, Duncreevan, Painestown, Betaghstown and Firmount West (CH_65, CH_71, CH_81; Plate 13.9, CH_82, CH_84, CH_91, CH_95 and CH_116). The remaining five cropmarks (CH_73, CH_75, CH_79, CH_86, and CH_96) have been interpreted as being of unknown date and function and could equally be non-archaeological in nature. A further group of possible ring ditches (LI_033) was also identified in Warrenstown from LiDAR data acquired for the Proposed Development and features interpreted as groups of possible pits (CH_87 and LI_073) of unknown date were identified in Boherhole and Balfeaghan respectively. These assets hold archaeological interest due to their physical remains having the potential to contribute to the understanding of the prehistoric period, including funerary practices (CH_60, CH_61, CH_63, CH_66, CH_69, CH_70, CH_77, CH_78, CH_89, CH_97 and LI_033). These cultural heritage assets have been assessed to be of Medium significance.

In addition, three enclosures (LI_058, LI_066, and LI_090) were identified from LiDAR data acquired for the Proposed Development in Phepotstown, Calgath and Ballybrack. LI_058 and LI_090 comprise negative linear features interpreted as ditches, which form part of larger square enclosures, and LI_066 comprises a sub-circular feature (approximately 58 m by 33 m across) interpreted as a possible enclosure of unknown date and function. These cultural heritage assets hold archaeological interest due to their physical remains having the potential to contribute to the understanding of enclosure sites, including their construction, function, date and duration of occupation. Therefore, these assets have been assessed to be of Medium significance.

A total of six mounds (LI_027, LI_105, LI_107, LI_109, LI_146 and LI_147) were identified from LiDAR data acquired for the Proposed Development. These comprise positive earthen features including two (LI_146 and LI_147) associated with a group of prehistoric pit burials identified in Plooplück (KD019-017; NS19-093; a Recorded Monument and Protected Structure) removed by gravel extraction in the 1930s (Mount, Buckley and Lynch, 1998). The remaining mounds have been interpreted as being of unknown date and function. Three negative circular features (LI_121, LI_127 and LI_129) between approximately 12 m and 28 m in diameter were also identified from LiDAR data acquired for the Proposed Development. These could be the sites of small circular enclosures or denuded mounds; however, they are equally likely to be the result of mineral extraction or non-archaeological in origin. These cultural heritage assets hold archaeological interest due to their physical remains having the potential to contribute to the understanding of this site type. Therefore, these assets have been assessed to be of Medium significance.

A total of 30 post-medieval structures were identified within the study area, comprising:

- five stone road bridges (CH_04, CH_06, CH_07, CH_12, and CH_24), which continue to form part of the road network, and a foot bridge within agricultural land (CH_104) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913);

- seven extant farms (CH_10, CH_39, CH_56, and CH_105) and agricultural buildings (CH_17, CH_41, and CH_42) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). The farms remain operational and include more recent agricultural buildings;

- a roadside public house (CH_03) depicted on historic mapping (Ordnance Survey 25", 1888–1913) comprising a one and a half storey, roughcast building with ancillary structures, located on the R156. The roadside position of the building, and connection to the historic road through Jenkinstown, contributes to its significance as a rural pub. Traffic noise and movement form a permanent feature with views across the road towards a modern petrol station forecourt;

- eight houses and cottages (CH_02, CH_15, CH_37, CH_43, CH_46, CH_55, CH_57, CH_58 and CH_107) depicted on historic mapping (Ordnance Survey 6", 1837–1842), including 'the Vicarage' (CH_46) associated with Millicent Church and Lych Gate (AH_12), as well as a former thatched dwelling (CH_107; Plate 13.11) on the R148 within the cemetery boundary of St Patrick's Church (AH_19) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913);

- four sections of the 19th century canal network comprising branches of the Royal and Grand canals through Kilcock, Sallins and Naas (CH_110, CH_111, CH_112 and CH_113);

- two estate buildings and structures comprising a single-storey roadside lodge (CH_16) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) at the entrance to Courtown House and a set of rubble stone entrance walls with a pair of square stone gate piers and cast iron gates (CH_109) identified during the walkover survey and site inspection. The entrance, located to the north of the R125 at the former entrance to 'Balfeighan House', is depicted on historic mapping (Ordnance Survey 6" Last Edition, 1942) but is no longer in use; and

- a roadside boundary stone or roadside marker (CH_106; Plate 13.12) identified during the walkover survey and site inspection, comprising a square granite monolith approximately 1 m in height, with '1798' inscribed on the north-easternmost face. The stone could be related to the 19th century road network (Meath County Council and Heritage Council, 2010) and may be the guidepost ('G.P.') identified on historic mapping (Ordnance Survey 6" Last Edition, 1957); however, the inscription and floral tributes left at the roadside (various online mapping) indicate it may commemorate the 1798 Irish Rebellion.

These cultural heritage assets are of architectural, archaeological, technical, or historical interest due to their physical remains and / or remaining historic fabric, which has the potential to contribute the understanding of post-medieval settlement and architectural heritage of the study area. However, they are not rare types and/or are in poor condition, and therefore have been assessed to be of Low significance.

Plate 13.11: Former thatched dwelling (CH_107) within the cemetery located to the south of the R148

Plate 13.12: Roadside boundary stone or marker (CH_106) identified on the junction between a local road and the R156

Two previously unrecorded buildings were identified from historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) comprising the site of a roadside farm in Jenkinstown (CH_64) and the site of a small roofless building of unknown date and function depicted within an enclosed field in Cullendragh (CH_67). CH_64 is depicted as a linear range, with two small ancillary buildings, to the south-east of '*Jenkinstown Bridge*' and later mapping shows additional buildings in fields to the north. This area is current under pasture and no above ground remains associated with the farm buildings were identified. A further 17 previously unrecorded buildings were identified from LiDAR data acquired for the Proposed Development (LI_015, LI_016, LI_030, LI_032, LI_042, LI_055,

LI_061, LI_069, LI_082, LI_083, LI_084, LI_086, LI_087, LI_120, LI_130, LI_156 and LI_158). These are characterised by individual or small groups of rectangular features, often corresponding with buildings depicted on historic Ordnance Survey mapping. However, two of these buildings (LI_015 and LI_084) are not depicted on modern or historic mapping and therefore may pre-date these. These cultural heritage assets hold limited archaeological interest due to their limited potential to contribute to the understanding of post-medieval settlement through their surviving physical remains. Given their lack of rarity and poor condition, these assets have been assessed to be of Low (LI_015 and LI_084) and Very Low / Negligible (LI_016, LI_030, LI_032, LI_042, LI_055, LI_061, LI_069, LI_082, LI_083, LI_086, LI_087, LI_120, LI_130, LI_156 and LI_158) significance.

Sections of the alignment of a former road (LI_020), a roadside recess or bay (LI_045), and former tracks (LI_137, LI_139, and LI_161) were identified from LiDAR data acquired for the Proposed Development. LI_020 and LI_045 are both depicted on historic mapping, along with two trackways associated with brickworks on the flat plains of the River Liffey (LI_137 and LI_139) in Barretstown and Osberstown which were also identified. LI_161 comprises a track through plantation depicted on historic mapping (25" to 1 mile, 1888–1913). A possible ford (CH_108), comprising a shallow stony point in the Rye Water with gently sloping banks either side to the west of the road bridge (CH_12), was also identified during the walkover survey and site inspection; however, this could equally be material deposited during drainage works to river. These cultural heritage assets hold limited archaeological interest due to having limited potential to contribute to the understanding of local communication networks through their surviving physical remains. Given these assets are not rare types and have limited potential to contribute to the understanding of communication routes at a local level, they have been assessed to be of Very Low / Negligible significance.

Located within the demesne lands associated with post-medieval country houses, four designed landscape features were identified from LiDAR data acquired for the Proposed Development (LI_048, LI_122, LI_134 and LI_151). These features comprise a ha-ha within Larchill House demesne (DL_04), a rectangular feature within Firmount House demesne (DL_14), a drainage feature or pond within Millicent House demesne (DL_17), and a driveway along the eastern boundary of Jigginstown Castle (AY_39; a National Monument). These cultural heritage assets hold limited archaeological interest due to their limited potential to contribute to the understanding of local estates and the historic landscape through their surviving physical remains. Therefore, they have been assessed to be of Very Low / Negligible significance.

A total of 23 former field boundaries and field systems were also identified from aerial imagery (CH_68, CH_72, CH_74, CH_76, CH_80, CH_83, CH_85, CH_88, CH_90, CH_92, CH_93, CH_94, CH_98, CH_100, CH_101, CH_102, CH_103, CH_114, CH_115, CH_117, CH_119, CH_120, and CH_121) and 60 were identified from LiDAR data acquired for the Proposed Development (LI_002, LI_003, LI_005, LI_006, LI_007, LI_013, LI_017, LI_018, LI_021, LI_026, LI_028, LI_029, LI_031, LI_036, LI_038, LI_040, LI_041, LI_043, LI_052, LI_062, LI_067, LI_072, LI_074, LI_076, LI_078, LI_079, LI_080, LI_085, LI_092, LI_094, LI_095, LI_096, LI_098, LI_100, LI_102, LI_104, LI_106, LI_108, LI_110, LI_113, LI_115, LI_117, LI_118, LI_119, LI_123, LI_125, LI_126, LI_128, LI_135, LI_138, LI_140, LI_142, LI_143, LI_144, LI_145, LI_149, LI_152, LI_154, LI_162 and LI_064). While some of these field systems correspond with the field pattern depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) and are likely post-medieval in date, some (including CH_72, CH_76, and CH_98, and LI_017, LI_018, LI_021, LI_026, LI_029, LI_041, LI_052, LI_067, LI_079, LI_102, LI_119, LI_142, and LI_152) may be earlier examples given they do not match the pattern depicted on historic Ordnance Survey mapping. In addition, six areas of drainage within agricultural land (CH_122 and LI_037, LI_054, LI_056, LI_077 and LI_136) were identified from aerial imagery and LiDAR data acquired for the Proposed Development. These cultural heritage assets hold limited archaeological interest due to limited potential to contribute to the understanding of the historic landscape through their physical remains. Given these assets are not rare, and in some cases comprise isolated examples of former post-medieval field boundaries, these assets have been assessed to be of Low (CH_72, CH_76, CH_93, CH_94, CH_98, CH_101, CH_102, CH_115, CH_120, CH_121, LI_006, LI_013, LI_017, LI_021, LI_026, LI_029, LI_031, LI_038, LI_040, LI_041, LI_043, LI_052, LI_064, LI_067, LI_072, LI_079, LI_080, LI_085, LI_092, LI_094, LI_095, LI_096, LI_102, LI_108, LI_110, LI_115, LI_119, LI_123, LI_135, LI_138, LI_142, LI_143, LI_149, LI_152, LI_154 and LI_162) and Very Low / Negligible (CH_68, CH_74, CH_80, CH_83, CH_85, CH_88, CH_90, CH_92, CH_100, CH_103, CH_114, CH_116, CH_117, CH_119, CH_122, LI_002, LI_003, LI_005, LI_007, LI_018, LI_028, LI_036, LI_037, LI_054, LI_056, LI_060, LI_062, LI_074, LI_076, LI_077, LI_078, LI_098, LI_100, LI_104, LI_106, LI_113, LI_117. LI_118, LI_`15, LI_126, LI_128, LI_136, LI_140, LI_144 and LI_145) significance.

A further 20 linear features identified from LiDAR data acquired for the Proposed Development were interpreted as ditches (LI_001, LI_008, LI_009, LI_010, LI_011, LI_014, LI_025, LI_035, LI_044, LI_046, LI_047, LI_050, LI_057, LI_059, LI_081, LI_088, LI_112, LI_133, LI_148, and LI_155). While four of these (LI_046, LI_047, LI_050, and LI_57) are located within demesne lands and could be associated with these designed landscapes, there are no corresponding features depicted on historic mapping. The remaining ditches comprise individual linear features of unknown date. These cultural heritage assets hold limited archaeological interest due to their limited potential to contribute to the understanding of the historic landscape through their physical remains. Given these assets are not rare, and in some cases comprise isolated examples of former post-medieval field boundaries, these assets have been assessed to be of Very Low / Negligible significance.

A total of six former gravel pits and quarries (LI_024, LI_070, LI_075, LI_101, LI_111, and LI_159), the site of a post-medieval corn mill (LI_065), old mill race (CH_118), mound of quarry material (LI_022) and the site of a smithy (LI_157) were identified from aerial imagery and LiDAR data acquired for the Proposed Development and comprise irregular areas of disturbance that correspond with sites depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). These cultural heritage assets hold limited archaeological interest due to their limited potential to contribute to the understanding of local industrial activities and mineral extraction through their surviving physical remains. Given these assets are not rare types and have limited potential to contribute to the understanding of these site types at a local level, they have been assessed to be of Very Low / Negligible significance.

Previous Excavations

A review of Excavations Bulletin and TII's Archaeological Excavation Reports identified the following archaeological excavations within the study area: These are identified in Table 13.6.

Table 13.6: Previous excavations identified within the study area

Licence Number	Townland	Findings
10E0445	Portgloriam	Excavation during monitoring of the foundations and the internal layout of the dwelling, as well as an ash (post-medieval).[113]
05E1090	Maynooth	Excavation of a stone structure, possible outhouse or a coal-storage building, including the remnants of an interior mud wall, a brick-laid fireplace and a deposit of charcoal (post-medieval).[114]
99E0569	Curryhills	Excavation of a possible truncated fire-pit (undated).[115]
C000238; E3600	Jigginstown	Testing to the north-east of Jigginstown House recovered pieces of brick and mortar, and sherds from a roof tile (17th to 18th century).[116]

A further five archaeological excavations were also identified (under Licence numbers: 07E0964, 09E0147, 05E1334, 05E1334 ext. and14E0452); however, these did not identify any archaeological remains or deposits.

[113] http://excavations.ie/report/2010/Kildare/0021615/ [accessed 21 January 2023].
[114] http://excavations.ie/report/2005/Kildare/0013775/ [accessed 21 January 2023].
[115] http://excavations.ie/report/1999/Kildare/0004267/ [accessed 21 January 2023].
[116] http://excavations.ie/report/2007/Kildare/0017795/ [accessed 21 January 2023].

Topographical Files

Information from the National Museum of Ireland's finds database identified a Medieval Glazed Potsherd (1979:13) recovered in Jigginstown.

Townland Boundaries

Along with baronies and parishes, townlands comprise a geopolitical unit of land still in use today (Smith, 2003). They form the oldest and smallest territorial division in Ireland, and in rural areas are often characterised by historic hedgerows which follow more organic pre-18th century improvement boundaries (Aalen, Whelan and Stout, 2011). Many townland names are particularly old and provide invaluable information about the past at a local level, including information on natural features and past land use, local traditions and landmarks, and, in some cases, historic landownership.

Townland boundaries have been identified within the study area, which are detailed in Appendix 13.1 and shown on Figure 13.6. The townlands within the study area and information derived from their names from *Irish Place Names* (Flanagan and Flanagan, 2002) are presented in Table 13.7.

Table 13.7: Townlands within the study area

English Name	Irish Name	Possible Meaning
Balfeaghan	Baile Fhiacháin	*baile* townland / town [with family name]
Ballybrack	An Baile Breac	*Baile Breac* speckled homestead
Ballyloughan	Baile an Locháin	*baile* townland / town *Locháin* little lake
Ballynaboley	Baile na Buaile	*baile* townland / town *buaile* milking place
Ballynagappagh	Baile na gCeapach	*baile* townland / town *ceapach* plot of land, tillage plot
Baltracey	An Baile Trasna	*baile* townland / town
Barrettstown	Baile an Bhairéadaigh	*baile* townland / town [with family name]
Barstown		
Betaghstown	Baile na mBiatach	*baile* townland / town [with family name]
Bluebell	An Cloigín Gorm	Direct translation
Boherhole	Bóthar Chóil	bóthar road *coll* hazel
Boycetown	Baile an Bhúisigh	*baile* townland / town [with family name]

English Name	Irish Name	Possible Meaning
Broadfield	An Gort Leathan (translation)	Direct translation
Calgath		
Castlesize	Caisleán an tSaghasaigh	'fields or gardens' / 'path of light'[117]
Clane	Claonadh	*claonadh* slanted ford
Commons South	An Coimín Theas	*coimín* commonage, common land; little hollow, glen
Cott	An Bhoth	*bhoth* a cottage or a hut
Courtown Great	Baile na Cúirte Mór	*baile* townland / town *mór* great / big 'the Courteton of Kilcok'[118]
Creemore		
Culcommon		
Cullendragh		
Curryhills	An Chorrchoill[436]	*coill* wood
Dolanstown		
Duncreevan	Dún Craobháin	'a very ancient personal name'119
Dunstown	Baile Uí Dhuinn	*baile* townland / town [with family name]
Firmount Demesne	Diméin na Ceapóige	*ceapóige* plot of land
Firmount East	An Cheapóg Thoir	*ceapóige* plot of land
Firmount West	An Cheapóg Thiar	*ceapóige* plot of land
Gaulstown		Possibly from *Ballynagall* townland of the English (Joyce 1913, p 98)
Graiguepottle	Gráig Phoitéil	*gráig* settlement (hamlet) (introduced by the Anglo-Normans)
Harristown Common	Coimín Bhaile Hanraí	*coimín* common *baile* townland / town [with family name]
Hodgestown	Baile Hoiste	*baile* townland / town [with family name]
Hoganswood	Coill Úgáin[436]	*coill* wood [with family name]
Jenkinstown	Baile Sheinicín	*baile* townland / town

117 https://www.logainm.ie/en/25677 [accessed 21 December 2022].
118 https://www.logainm.ie/en/25386 [accessed 21 December 2022].
119 https://www.logainm.ie/en/25388 [accessed 21 December 2022].

English Name	Irish Name	Possible Meaning
		[with family name]
Jigginstown	Baile Shigín	*baile* townland / town [with family name]
Kemmins Mill		
Kilclone	Coill Chluana	*cluain* meadow / pasture437 *coill* wood
Kilcock	Cill Choca	*cill* church 'Church of Coca' (Flanagan and Flanagan, 2002)
Killashee	Cill Uasaille	*cill* church 'Church of St. Usaille' (Flanagan and Flanagan, 2002)[120]
Longtown North	Baile an Longaigh Thuaidh	*baile* townland / town [with family name]
Mainham	Maighneán	*Magh* plain
Martinstown		
Millicent Demesne	Diméin Millicent	
Millicent North	Millicent Thuaidh	
Millicent South	Millicent Theas	
Moortown	Baile na Móna	*baile* townland / town *móna* bog / peatbog
Mullagh	Mullach	*mullach* summit
Mylerstown	Baile Mhaoilir	*baile* townland / town [with family name]
Naas East	Nás; An Nás Thoir	*nás* assembly
Naas West	Nás; An Nás Thiar	*nás* assembly
Newland South	An Fearann Nua Theas	*fearann* land / unit of land *nua* new
Newland West	An Fearann Nua Thiar	*fearann* land / unit of land *nua* new
Oldtown	An Seanbhaile	*sean* old / ancient 'old homestead' (Flanagan and Flanagan, 2002)
Osberstown	Baile Osbeird	*baile* townland / town

[120] https://www.logainm.ie/en/25905 [accessed 12 December 2022].

English Name	Irish Name	Possible Meaning
		Osbert', 'Osborne', 'son of Osbert' - a common Anglo-Saxon personal name[121]
Painestown	Baile an Phaghanaigh	*baile* townland / town [with family name]
Phepotstown		
Pitchfordstown	Baile Phitsfeaird	*baile* townland / town [with family name]
Ploopluck	Ploopluck	Possible corruption of Cloyth-an-puka the tone or stone fortress of the pooka (Joyce 1913, pg. 191)
Portan		
Portgloriam	Port Gleoráin	*port* / bank / fort / platform 'Bank of stinking gladon'[122]
Rathasker	Ráth Oscair	*rath* settlement unit 'Oscar's rath or fort'[123]
Stephenstown South	Baile Stiofáin Theas	*baile* townland / town [with family name]
Walterstown	Baile Bhaltair	*baile* townland / town [with family name]
Warrenstown		
Waterstown	Baile Uaitéir	*baile* townland / town [with family name]
Woodland	Fearann na Coille	*fearann* land / unit of land[438] *coill* wood

The key characteristics of these assets comprise their physical remains and documentary (cartographic) evidence. Given their historical, cultural, traditional, and social interest, 21 townland boundaries have been assessed to be of Medium significance (TB_01, TB_03, TB_08, TB_09, TB_14, TB_16, TB_26, TB_27, TB_29, TB_32, TB_47, TB_48, TB_50, TB_53, TB_61, TB_68, TB_76, TB_81, TB_83, TB_85 and TB_86).

While the remaining townland boundaries retain some historical, cultural, traditional, and social interest given their poor condition, or having been removed by development, they have been assessed to be of Low (TB_02, TB_04, TB_05, TB_06, TB_07, TB_10, TB_11, TB_12, TB_13, TB_15, TB_18, TB_19, TB_21, TB_22, TB_23, TB_24, TB_25, TB_28, TB_30, TB_31, TB_33, TB_34, TB_35, TB_36, TB_37, TB_38, TB_39, TB_40, TB_41, TB_42, TB_43, TB_44, TB_45, TB_46, TB_49, TB_52, TB_54, TB_55, TB_56, TB_57, TB_58, TB_59, TB_60, TB_62, TB_63, TB_64, TB_65, TB_66, TB_67, TB_69, TB_70, TB_71, TB_72, TB_73, TB_74, TB_75, TB_77, TB_78, TB_79, TB_80, TB_82, TB_84, TB_87 and TB_88) and Very Low / Negligible (TB_17, TB_20 and TB_51) significance.

[121] https://www.logainm.ie/en/25979 [accessed 22 December 2022].
[122] https://www.logainm.ie/en/25395 [accessed 22 December 2022].
[123] https://www.logainm.ie/en/25973 [accessed 22 December 2022].

13.4 Potential Effects

A summary of the impact assessment is presented in Section 13.4. Appendix 13.2 presents the complete assessment of significant and non-significant impacts and proposed mitigation measures (where applicable) for archaeology, architectural heritage, cultural heritage assets. Unless otherwise stated, impacts assessed are negative.

13.4.1 Construction Phase

Direct

Archaeology

A summary of the assessment of direct impacts on archaeology is presented below while the complete assessment is presented in Appendix 13.2. Unless otherwise stated, impacts described are negative.

The Proposed Development is located within the Zones of Notification of the following six Recorded Monuments:

- a mound (AY_02) in Calgath assessed to be of Medium significance and located approximately 27 m to the west of the Planning Application Boundary
- a linear earthwork (AY_13; also an RHM site) assessed to be of Medium significance and located between Ballyloughan and Graiguepottle approximately 5m to the east of the Planning Application Boundary;
- a rath (AY_24) in Ballynagappagh assessed to be of Medium significance and located approximately 36 m to the south-east of the Planning Application Boundary;
- a mound (AY_26; also a Protected Structure) assessed to be of High significance and located in Firmount East approximately 18 m to the north-east of the Planning Application Boundary;
- an enclosure (AY_51) assessed to be of Low significance and located in Stephenstown South approximately 16 m to the east of the Planning Application Boundary; and
- a small rectangular enclosure (AY_58) assessed to be of Low significance and located in Dunstown (located within Dunstown substation).

While the Proposed Development would not directly impact the Recorded Monuments themselves, excavation of the cable trench would have a direct impact on any archaeological remains that may survive within their Zones of Notification. Where the Proposed Development is on-road, within Dunstown substation or areas of previous disturbance (AY_02, AY_24, AY_26, AY_51 and AY_58), the potential for any archaeological remains to survive has been reduced, as development in these areas is likely to have already removed or truncated any archaeological remains that may have been present. The magnitude of this permanent impact for AY_13 has been assessed to be Medium and the significance of impact has been assessed to be Moderate. For AY_02, AY_24, AY_26, AY_51 and AY_58, the magnitude of these permanent impacts has been assessed to be Low and the significance of impact has been assessed to be Slight.

Construction of the Proposed Development, including excavation of the cable trench and joint bays, temporary passing bays, and the excavation of temporary launch and reception pits for HDD, may also result in a direct impact on any previously unknown archaeological remains that may be present within the land required for the Proposed Development.

There is potential for impacts on archaeological remains and artefacts that may survive in watercourses and in the land adjacent to them. Ten watercourses will be crossed using existing road structures (WB27, WB29, WB33, River Liffey (WB36 and WB37), WB38, WB39, WB40, WB41 and WB43), therefore avoiding watercourses themselves and the land immediately adjacent to them. No potential impacts on archaeological remains and artefacts that may survive have been identified.

Five watercourse (including two canals) will be crossed using HDD (Rye Water WB13, Royal Canal WB14, Tributary of the River Lyreen WB20, River Liffey WB35, and Grand Canal WB42). There will therefore be no impact on these watercourses. In addition, ground disturbance at temporary launch and reception pits for HDD will also be reduced through the temporary installation of a level hardstanding area on a geotextile base for the drilling rig.

In-stream trenching will be required at 26 watercourses. Of these:

- Ten are drainage ditches (WB05, WB17, WB18, WB19, WB21, WB26, WB30, WB32, WB34 and WB45); and
- Sixteen are streams (WB01, WB02, WB03, WB04, WB06, WB07, WB08, WB09, WB10, WB12, WB15, WB22, WB24, WB25, WB28, and WB44).

As identified in Section 13.3.1, the potential for unknown archaeological remains to be present is considered lower in drainage ditches than within unmodified streams and rivers.

Of these streams, two have been dredged (WB04 and WB07) based on drainage scheme information from the Commissioners of Public Works in Ireland flood maps[124], and the potential for archaeological remains to be present within these watercourses is also considered to be lower than those that have not been dredged. In addition, four of these streams (WB03, WB08, WB10 and WB12) have been subject to modification, based on historic mapping, and therefore the potential for archaeological remains to be present within these watercourses is also considered to be lower.

The potential for structural damage to Jigginstown Castle (AY_39; a National Monument assessed to be of High significance) from vibration resulting from HDD has been assessed. Using British Standard (BS) 5228-2, the castle was assessed to be a potentially vulnerable building, and the vibration threshold for structural damage during construction was identified to be 3 mm/s peak particle velocity (PPV). PPV is the instantaneous maximum velocity reached by the vibrating element as it oscillates about its rest position and is measured in millimetres per second (mm/s). The vibration assessment (see Chapter 9) assessed a PPV of 6 mm/s within 24 m of HDD locations and at least 3 mm/s between 24 m and 42 m from HDD locations during construction. Given that Joint Bay 60, including HDD launch pit, at Jigginstown will be located approximately 50 m to the south of Jigginstown Castle, the PPV would be less than 3 mm/s. Based on this, the vibration level has been assessed to be below the threshold for structural damage and therefore no impact from vibration was assessed.

No other direct impacts on archaeological remains during construction have been identified.

Architectural Heritage

A summary of direct impacts on architectural heritage assets assessed to be Significant (i.e. of Moderate significance or above) before mitigation is presented below. The assessment of all impacts (both significant and non-significant) is presented in Appendix 13.2. Unless otherwise stated, impacts described are negative.

While the following three architectural heritage assets are located outside of the Planning Application Boundary and would be retained, there is the potential for accidental damage to these structures during construction given their proximity to the Proposed Development:

- the entrance walls to Larchill House (AH_01; assessed to be of Medium significance), which are partially located within the Planning Application Boundary;
- the boundary wall associated with the thatched dwelling in Ballynagappagh (AH_11; a Protected Structure assessed to be of High significance), which is located approximately 2 m to the south-east of the Planning Application Boundary; and

[124] https://www.floodinfo.ie/map/drainage_map/ [accessed 17 February 2023].

- the lych gate to Millicent Church (AH_12; a Protected Structure assessed to be of High significance), which is within the Planning Application Boundary.

In the absence of mitigation (see Section 13.5 below) the magnitude of these permanent impacts has been assessed to be High and, in the absence of mitigation (see Section 13.5 below), the significance of impact has been assessed to be Significant for AH_01 and Very Significant for AH_11 and AH_12.

In addition, three direct impacts of Slight significance on DL_14, DL_15 and DL_17 have been identified for architectural heritage during construction of the Proposed Development. These are presented in Appendix 13.2.

Cultural Heritage

A summary of direct impacts on cultural heritage assets assessed to be Significant (i.e. of Moderate significance or above) before mitigation is presented below. The assessment of all impacts (significant and non-significant impacts) is presented in Appendix 13.2. Unless otherwise stated, impacts described are negative.

Construction of the Proposed Development would:

- wholly remove three and partially remove two ring-ditches that form part of a group of 14 ring ditches identified from aerial imagery (CH_60) assessed to be of Medium significance and located in Woodland in the off-road section between ch.50 and ch.550;

- remove the footings of a small group of buildings (LI_015) assessed to be of Low significance and located in Cullendragh identified from a review of LiDAR data acquired for the Proposed Development in the off-road section between ch.2,375 and ch.2,425.

The magnitude of these permanent impacts has been assessed to be Very High and the significance of impact has been assessed to be Very Significant for LI_015 and CH_60.

Construction of the Proposed Development would:

- wholly remove curvi-linear features forming part of a group of cropmarks identified from aerial imagery (CH_66; assessed to be of Medium significance) in Cullendragh in the off-road section between ch.2,875 and ch.3,030, including Joint Bay 4;

- wholly remove curvi-linear features forming part of a group of cropmarks identified from aerial imagery (CH_69; assessed to be of Medium significance) in Warrenstown in the off-road section between ch.4,450 and ch.4,580;

- wholly remove an enclosure (CH_81; assessed to be of Medium significance) identified from aerial imagery in Kilcock as a result of the excavation of the reception pit required for the HDD under the M4 motorway; and

- remove a mound of unknown date and function (LI_027; assessed to be of Medium Significance) in Warrenstown identified from a review of LiDAR data acquired for the Proposed Development as a result of the construction of Passing Bay 7 between ch.5,150 and ch.5,250.

The magnitude of these permanent impacts on CH_66, CH_69, CH_81 and LI_27 has been assessed to be High and the significance of impact has been assessed to be Significant.

Construction of the Proposed Development would also:

- remove a boundary/marker stone (CH_106; assessed to be of Low significance) identified during the walkover survey and site section as a result of Watercourse Crossing WB04 (at ch.6,000); and

- former field boundaries and a possible rath (CH_121; assessed to be Low significance) in Curryhills as a result of the construction of the off-road section between ch.31,000 and ch.31,350.

The magnitude of these permanent impacts has been assessed to be High and the significance of impact has been assessed to be Moderate.

Construction of the Proposed Development would remove approximately 40 m of the Gaulstown – Woodland townland boundary (TB_01; assessed to be of Medium significance) at ch.800, and 30 m of the Gaulstown – Cullendragh townland boundary (TB_03; assessed to be of Medium significance) at ch.1,900. The magnitude of these permanent impacts has been assessed to be Medium and the significance of impact has been assessed to be Moderate.

No impact has been identified for the Balfeaghan – Boycetown townland boundary (TB_16) as the Proposed Development would cross under the townland boundary via HDD.

In addition, 25 direct impacts of Slight significance (CH_03, CH_04, CH_06, CH_07, CH_24, CH_76, CH_94, CH_109, CH_120, LI_006, LI_017, LI_026, LI_038, LI_092, LI_096, LI_119, LI_143, LI_156, TB_08, TB_09, TB_10, TB_12, TB_13, TB_25 and TB_61), eight of Not significant significance (CH_64, CH_68, LI_001, LI_009, LI_011, LI_032, LI_042 and LI_158) and 14 of Imperceptible significance (CH_74, CH_92, CH_100, CH_117, CH_118, CH_119, CH_122, LI_054, LI_056, LI_065, LI_113, LI_125, LI_134 and LI_145) have been identified for cultural heritage during construction of the Proposed Development. These are presented in Appendix 13.2.

<u>Indirect</u>

Archaeology

No significant indirect impacts (i.e. of Moderate significance or above) on archaeology as a result of construction of the Proposed Development were identified. One indirect impact of Slight significance on AY_39 and impacts of Imperceptible significance on five assets (AY_38, AY_40, AY_42, AY_43 and AY_44) have been assessed, and these are presented in Appendix 13.2.

Architectural Heritage

No significant indirect impacts (i.e. of Moderate significance or above) were identified on architectural heritage assets as a result of construction of the Proposed Development. Five indirect impacts of Slight significance on AH_11, AH_12, AH_15, AH_19, and AH_20 and two indirect impacts of Imperceptible significance on AH_06 and AH_18 have been identified. These impacts are presented in Appendix 13.2.

Cultural Heritage

No significant indirect impacts (i.e. of Moderate significance or above) were identified on cultural heritage assets as a result of construction of the Proposed Development. Impacts of Slight significance have been identified on 14 assets (CH_03, CH_37, CH_39, CH_41, CH_42, CH_43, CH_46, CH_55, CH_56, CH_57, CH_107, CH_110, CH_112 and CH_113) and these are presented in Appendix 13.2.

13.4.2 Operation

<u>Direct</u>

No direct impacts were identified on archaeology, architectural heritage and cultural heritage assets as a result of the operation of the Proposed Development.

<u>Indirect</u>

Indirect impacts on the setting of archaeological, architectural and cultural heritage assets resulting from noise and visual intrusion from construction plant during construction would not continue into operation. In addition, as on-road sections would be reinstated post-installation, the Proposed Development would not be visible in on-road sections during operation and therefore no indirect impacts on the setting of archaeological, architectural and cultural heritage assets in these locations have been identified. Similarly while the temporary passing bay and joint bays would require the removal of hedgerows during construction, these would be reinstated with native species, and the off-road sections would be largely reinstated to agricultural land, no indirect impacts on the setting of archaeological, architectural and cultural heritage assets in these locations have been identified. Some permanent private access tracks, off-road joint bays and watercourse crossings may be visible within off-road sections, and therefore have the potential to result in indirect impacts to the setting of archaeological, architectural and cultural heritage assets. These are identified below and an impact assessment presented in Appendix 13.2.

Archaeology

No significant indirect impacts (i.e. of Moderate significance or above) were identified on archaeological assets as a result of operation of the Proposed Development. During operation, the presence of new infrastructure in the form of the concrete cap for Joint Bay 60 and access track would result in visual intrusion into the setting of Jigginstown Castle (AY_39; a National Monument of High Significance). The magnitude of this permanent impact has been assessed to be Very Low / Negligible and the significance of impact has been assessed to be Imperceptible and is presented in Appendix 13.2. As the access track and Joint Bay 60 would be largely screened by intervening buildings or trees along the eastern boundary of the complex, no impact on AY_38, AY_40, AY_42, AY_43 and AY_44 have been identified.

Architectural Heritage

No significant indirect impacts (i.e. of Moderate significance or above) have been identified. One indirect impact has been assessed to be of Slight significance (DL_17; assessed to be of Medium significance) and is presented in Appendix 13.2. Due to distance, intervening vegetation, their location adjacent to on-road sections or the reinstatement of hedgerows, no indirect impacts on the setting of AH_06, AH_11, AH_12, AH_15, AH_18, AH_19, AH_20, DL_14 or DL_15 have been identified.

Cultural Heritage

Due their location adjacent to on-road sections which would be reinstated, HDD sections, or the reinstatement of hedgerows that form part of their settings, no indirect impacts on the setting of CH_03, CH_37, CH_39, CH_41, CH_42, CH_43, CH_46, CH_55, CH_56, CH_57, CH_107, CH_110, CH_112 and CH_113 have been identified.

13.5 Mitigation Measures

This section identifies measures to mitigate effects that result from construction of the Proposed Development on archaeological, architectural and cultural heritage assets.

Mitigation will be undertaken within the framework provided by with the *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).

All mitigation will be carried out by a suitably qualified archaeologist under Licence (where required) granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004 (as amended).

Written reports on the results of all mitigation undertaken will be prepared in accordance with the requirements of the Licence(s) granted by the National Monuments Service. The reports be submitted to the planning authority and National Monuments Service.

While the sources identified in Section 13.2, including the review of the LiDAR data acquired for the Proposed Development, provide a thorough understanding of known assets and the potential for the presence of unknown archaeological remains, archaeological investigations will be implemented post-consent and pre-construction in all off-road sections required for construction, including land required for access tracks, passing bays and joint bays, and HDD and construction compounds to inform the design of mitigation. This will comprise archaeological geophysical survey, archaeological test excavation, palaeoenvironmental assessment, and underwater assessment in areas within the Planning Application Boundary for the Proposed Development to inform the design of archaeological excavation and further underwater surveys, as listed below. Mitigation measures for known archaeology, architectural heritage and cultural heritage that will be undertaken post-consent but in advance of construction comprise the following:

- Topographical survey of upstanding remains of LI_015, LI_027, LI_032 and LI_042;
- A photographic and written record of the elements of GDLs DL_14, DL_15, and DL_17;
- Written, measured and photographic survey will be undertaken for CH_106 prior to its removal. Following construction in this location, the boundary stone will be reinstated in the same location;
- Townland boundary surveys comprising detailed written and photographic survey, and test trenching of TB_01, TB_03, TB_08, TB_09, TB_10, TB_12, TB_13, TB_25, and TB_61;
- Informed by archaeological geophysical survey and archaeological test excavation, archaeological excavation of AY_13, CH_60, CH_66, CH_69, CH_76, CH_81, CH_94, CH_120, CH_121, LI_006, LI_017, LI_026, LI_038, LI_092, LI_096, LI_119, LI_125, LI_143, and LI_156;
- Underwater assessments, comprising wade and metal detecting survey of:
    - WB01 (tributary of the River Tolka);
    - WB02 (Dunboyne Stream);
    - WB06 (Jenkinstown Stream);
    - WB09 (unnamed stream);
    - WB22 (Baltracey River);
    - WB25 (Gollymochy River).
- Archaeological metal detecting survey of the banks of WB03, WB04, WB05, WB07, WB08, WB10, WB12, WB17, WB18, WB19, WB21, WB24, WB26, WB28, WB30, WB32, WB34, WB44 and WB45.

In addition, archaeological geophysical survey and archaeological test excavation will be undertaken post consent but pre-construction in all off-road sections required for construction, including land required for access tracks, passing bays and joint bays, and HDD and construction compounds. This will inform the design of any archaeological excavation required to mitigate the impact on any unknown archaeological remains identified.

The Contractor will allow sufficient time in their programme to allow the mitigation to be completed in the areas in which such mitigation is required.

During construction, the following mitigation will be undertaken:

- archaeological monitoring of on-road work within the Zones of Notification of Recorded Monuments (AY_02, AY_24, AY_26, AY_51 and AY_58), works located to the east of Jigginstown Castle (AY_39, a National Monument), and for assets CH_64, CH_68, CH_74, CH_92, CH_100, CH_117, CH_118, CH_119, CH_122, LI_001, LI_009, LI_011, LI_032, LI_054, LI_056, LI_065, LI_113, LI_134, LI_145 and LI_158; and

- AH_01, AH_11, AH_12, CH_03, CH_04, CH_06, CH_07, CH_24 and CH_109 will clearly demarcated with temporary fencing within the Planning Application Boundary to avoid accidental damage.

If archaeological remains are identified during the archaeological monitoring, and it is confirmed with the National Monuments Service the preservation in situ is not feasible, archaeological excavation will be undertaken under an excavation licence granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004 (as amended).

13.6 Residual Effects

An assessment of the residual significance of effect for all affected archaeological, architectural heritage and cultural heritage assets during construction and operation is presented Appendix 13.2. Where a significant impact (i.e. an impact of Moderate significance or above) had previously been identified prior to mitigation (see Section 13.4.1 and 13.4.2) an assessment of the residual significance of effects is also presented in Table 13.8. All effects are negative unless otherwise stated.

After the mitigation identified in Section 13.5, no significant residual effects have been assessed for known archaeology, architectural heritage and cultural heritage assets during construction or operation.

Table 13.8: Assessment of residual effects for archaeological, architectural and cultural heritage assets where a significant impact has been assessed prior to mitigation

Asset Reference	Designation	Significance	Impact Magnitude	Impact Significance	Mitigation	Residual Magnitude of Impact	Residual Significance of Effect
Archaeology							
AY_13	Recorded Monument; RHM site	Medium	Medium	Moderate	Archaeological monitoring during construction	Low	Slight
Architectural Heritage							
AH_01	None	Medium	High	Significant	Protection during construction	Very Low / Negligible	Imperceptible
AH_11	Protected Structure	High	High	Very Significant	Protection during construction	Low	Slight
AH_12	Protected Structure	High	High	Very Significant	Protection during construction	Low	Slight
Cultural Heritage							
CH_60	None	Medium	Very High	Very Significant	Archaeological excavation. This would be informed by archaeological geophysical survey and archaeological test excavation	Medium	Slight
CH_66	None	Medium	High	Significant	Archaeological excavation. This would be informed by archaeological geophysical survey and archaeological test excavation	Medium	Slight
CH_69	None	Medium	High	Significant	Archaeological excavation. This would be informed by archaeological geophysical survey and archaeological test excavation	Medium	Slight

Asset Reference	Designation	Significance	Impact Magnitude	Impact Significance	Mitigation	Residual Magnitude of Impact	Residual Significance of Effect
CH_81	None	Medium	High	Significant	Archaeological excavation. This would be informed by archaeological geophysical survey and archaeological test excavation	Medium	Slight
CH_106	None	Low	High	Moderate	Written, measured and photographic survey Reinstatement following construction	Low	Slight
CH_121	None	Low	High	Moderate	Archaeological excavation. This would be informed by archaeological geophysical survey and archaeological test excavation	Low	Slight
LI_015	None	Low	Very High	Very Significant	Topographical survey (written, photographic and drawn survey) Archaeological excavation. This would be informed by archaeological geophysical survey and archaeological test excavation	Low	Slight
LI_027	None	Medium	High	Significant	Topographical survey (written, photographic and drawn survey). Archaeological excavation. This would be informed by archaeological geophysical survey and archaeological test excavation	Low	Slight
TB_01	None	Medium	Medium	Moderate	Townland boundary survey Underwater assessments, including wade and metal detecting survey.	Low	Slight
TB_03	None	Medium	Medium	Moderate	Townland boundary survey Underwater assessments, including wade and metal detecting survey.	Low	Slight

13.7 Conclusion

This chapter presented the results of the assessment for archaeology, architectural heritage and cultural heritage arising from the Proposed Development. During construction, there is the potential for significant effects; however, following the application of the mitigation measures identified in Section 13.5, no significant effects are anticipated.

13.8 References

Maps

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Aerial Imagery

Cambridge Air Photographs: https://www.cambridgeairphotos.com/

CUCAP Number	Date	Type
BDU041	1970-07-19	Oblique
ASW017	1967-07-17	Oblique
ASW018	1967-07-17	Oblique

BlueSky Aerial (March 2022)

GoogleEarth (2003 - 2022)

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14. Traffic and Transport

14.1 Introduction

This chapter presents the assessment of the potential impacts of the Proposed Development on traffic and transport as a result of the construction phase and operational phase of the Proposed Development. A full description of the Proposed Development is provided in Chapter 5 (Proposed Development Description) of this EIAR.

This chapter includes a review of the existing baseline conditions of the traffic and roads environment in proximity to the Proposed Development. For this purpose, the road network has been reviewed and traffic counts have been undertaken at a number of locations outlined later in this chapter. An analysis based on this information, and consideration of any mitigation measures to minimise impacts resulting from the Proposed Development is presented in this chapter.

Consistent with advice set out in the Institute of Environmental Management and Assessment (IEMA) Guidelines: Environmental Assessment of Traffic and Movement (hereafter referred to as the IEMA Guidelines) (IEMA 2023) and the Transport Infrastructure Ireland (TII) Traffic and Transport Assessment Guidelines (PE-PDV-02045) (hereafter referred to as the TII Guidelines) (TII 2014), this chapter assesses the impacts of the construction phase of the Proposed Development and details the levels of construction vehicles generated and their most likely construction access routes to the respective construction locations. This chapter is supported by the Traffic Management Plan (TMP) which is included as Appendix 5.1, Volume 3 of this EIAR.

14.2 Methodology

This following list outlines the relevant guidance which have been applied in the assessment of the traffic and transport effects of the proposed development. They are referenced where they are applied throughout the report.

- Guidelines on the Information to be Contained in Environmental Assessment Reports (Environmental Protection Agency, EPA, 2022), (hereafter referred to as the EPA Guidelines);
- Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017);
- Traffic and Transport Assessment Guidelines (TII, 2014);
- Department of Transport (2019) Temporary Traffic Measures and Signs for Roadworks;
- The UK Design Manual for Roads and Bridges (DMRB) (National Highways, 2023);
- The Institute of Environmental Management and Assessment Guidelines for the Environmental Assessment of Traffic and Movement (IEMA, 2023); and
- The National Transport Model (NTpM) Update, Travel Demand Forecasting Report (NTpM Volume 3) (hereafter referred to as the NTpM Volume 3 Demand Forecasting Report).
- The Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections (TII, 2021)

14.2.1 Study Area and Receiving Environment

The study area for traffic and transport is effectively the existing road network along the proposed underground cable route, as illustrated in Plate 14.1 with the locations of the various traffic surveys undertaken within the study area as part of this assessment illustrated later in Plate 14.2.

The cable is traversed by a number of regional and local roads which are predominantly rural in nature. Two motorways, the M4 and M7, cross through the study area but will not be directly impacted by the Proposed Development. There are some built up areas within the study area which, as satellites of Dublin, imply that an important role of the study area road network is to carry commuter traffic into the City. The largest of these satellite towns is Naas, which the cable route bypasses.

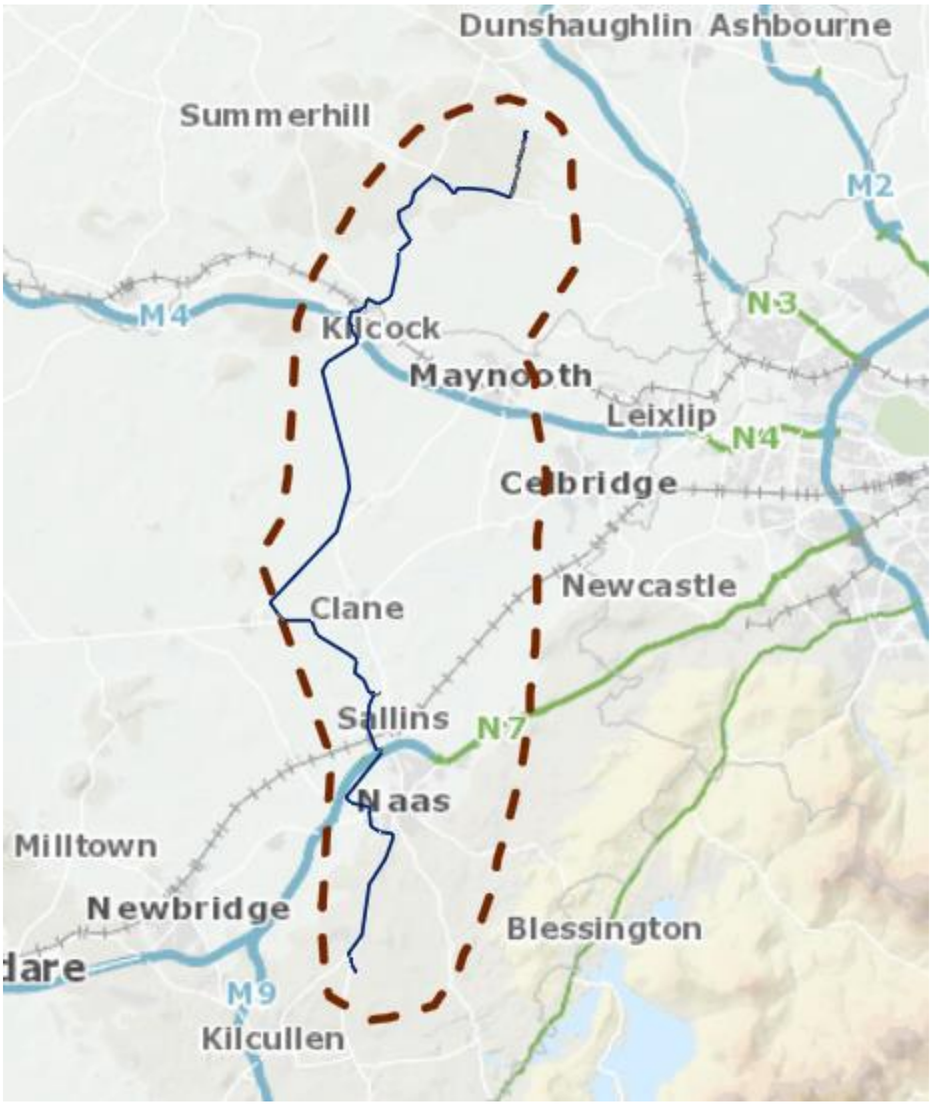

Plate 14.1: Study Area

For the purpose of the traffic and transport assessment, the cable route is split into 31 Temporary Traffic Management (TTM) sections. The locations of each of the TTM sections are outlined in more detail in the TMP contained in Appendix 5.1. For 19 of these, which comprise a length of 43.6 km, the cable will run in-road. These affected road sections, most of which are regional roads, are detailed in Table 14.1. The remaining 12 TTM sections, comprising 9.3 km of the cable route, are off-road and run predominantly through agricultural land.

Table 14.1: Road Sections along the Cable Route

TTM Sections	Length (m)	Road
2	3860	R156
4	3505	R125 North
5	3850	R125 South
6	200	R258
8	545	R148
10	460	R407 North
11	9370	R407
12	4145	R408
14	1170	R403
15	3190	L2002 North
17	300	L2002 South
19	2480	Sallins Bypass
21	100	Osberstown Road
23	2330	Millennium Parkway
24	1215	R409
26	1440	R447
27	5260	R448
28	400	R448 South
30	300	R412

In terms of public transport, these roads are used by 12 bus routes. Two railway lines – the Dublin-Sligo Railway Line and the Dublin-Cork/Limerick Railway Line – run through the study area. These services, and the likely impacts resulting from the construction of the Proposed Development, are outlined in more detail in Section 14.4.1.12.

14.2.2 Methodology and Approach

14.2.2.1 Traffic Impact

The assessment detailed in Section14.2.1 of this chapter has been undertaken using a combination of a desktop study and current policy advice with best practice in line with statutory agencies. The expected construction vehicle trips were generated from the programme for the Proposed Development, a summary of which is shown in Chapter 5. These have been compared to baseline traffic flows to identify if there are likely to be periods where the increase in traffic exceeds standard thresholds. This additional traffic may cause effects, for example, on driver delay, road safety or community and these have been identified and their significance assessed.

The EPA Guidelines do not provide specific guidance in relation to the threshold criteria for assessing vehicle impacts. However, IEMA Guidelines (IEMA, 2023) outline two rules which can be used to determine the scale and extent of the assessment of road traffic:

- Rule 1: Highway links where traffic flows (or the number of HGVs) are expected to increase by more than 30%
- Rule 2: Any other specifically sensitive areas where traffic flows would increase by 10% or more.

IEMA Guidelines also state that it should *"be assumed that projected changes in traffic of less than 10% create no discernible environmental impact"* (IEMA 2023).

In addition, the TII Traffic and Transport Assessment Guidelines provide thresholds for assessment as follows:

- Traffic to and from the development exceeds 10% of the existing two-way traffic flow on the adjoining highway; and

- Traffic to and from the development exceeds 5% of the existing two-way traffic flow on the adjoining highway, where traffic congestion exists or will exist within the assessment period or in other sensitive locations.

In the context of both sets of guidance and given that the impacts of any construction vehicles will be temporary in nature, it is considered that any changes in traffic volumes below 10% means no discernible environmental impact.

Where the predicted increase in traffic volumes falls short of this threshold, the significance of the impacts is termed as Not Significant. This means that further assessment is not warranted. Consequently, where the predicted traffic flow increase exceeds the 10% threshold, the impacts are considered to be potentially significant and, accordingly, are assessed in greater detail.

In the context of the above, and with cognisance of the EPA Guidelines (EPA, 2022) guidance on determining significance, an 'Impact Significance Matrix' has been developed based on professional judgement, to account for the potential of significant impacts. This is outlined in Table 14.2.

Table 14.2: Traffic Impact Significance Matrix

Significance of Impact	Percentage Increase in General Traffic
Major (Significant)	Greater than or equal to 60%
Moderate (Significant)	Greater than or equal to 10% and less than 60%
Minor (Not Significant)	Greater than or equal to 5% and less than 10%
Negligible (Not Significant)	Less than 5%

Where existing traffic levels are exceptionally low, on some unclassified roads for example, any increase in traffic flow may result in a predicted increase in traffic levels which equals or exceeds these thresholds. Where this situation is identified, it is important to consider any increase both in terms of its relative increase in respect of existing traffic flows, as well as the overall total flow in respect of the available capacity of the section of road being considered.

For example, a 30% increase in traffic flow on a road which currently only carries 1,000 vehicles AADT flow could potentially indicate a major significant impact if it was considered simply in terms of the IEMA Guidelines rules. However, a 7.3 m wide single carriageway road can accommodate an average of up to approximately 11,600 vehicles per day (AADT), as indicated by the thresholds contained in the TII Rural Road Link Design (DN-GEO-03031) (TII 2017), and as summarised in Table 14.3. Therefore, an element of professional judgement is also applied regarding the carrying capacity of the roads being considered, which is an acceptable and well utilised approach for this type of assessment, as such an increase in this example would be unlikely to have a significant impact, given the road's overall capacity.

Table 14.3: Road Types / Capacities (Two-Way AADT)

Type of Road	Edge Treatment	Capacity (AADT) for Level of Service D
Type 3 Single (6.0 m) Carriageway (National Secondary Roads Only)	0.5 m hard strip. Cycle Facilities/Footways	5,000
Type 2 Single (7.0 m) Carriageway	0.5 m hard strips. Cycle Facilities/Footways	8,600
Type 1 Single (7.3 m) Carriageway	2.5 m hard shoulders	11,600
Type 3 Dual Divided 2+1 Lanes (7.0 m + 3.5 m) Carriageways	0.5 m hard strips. Cycle Facilities/Footways where required.	14,000
Type 2 Dual Divided 2+2 Lanes (2x7.0 m) Carriageways	0.5 m hard strips Cycle Facilities/Footways	20,000

Type of Road	Edge Treatment	Capacity (AADT) for Level of Service D
Type 1 Dual Divided 2+2 Lanes (2x7.0 m) Carriageways	2.5 m hard shoulders	42,000
Motorway Divided 2+2 Lanes (2x7.0 m)	2.5 m hard shoulders	52,000
Wide Motorway Divided 2+2 Lanes (2x7.5 m)	3 m hard shoulders	55,500

The vehicle flows represent the approximate two-way flows corresponding to Level of Service (LoS) D in reasonably level terrain. At LoS D speeds begin to decline slightly with slight increase of flows and density begins to increase somewhat more quickly. Freedom to manoeuvre within the traffic stream is more noticeably limited, and the driver experiences reduced comfort levels.

The impact of traffic management, in particular full road closures, have been determined in conjunction with the duration of effects outlined in the EPA Guidelines, as outlined in Section 14.4.

With regards to construction traffic volumes, the Proposed Development's construction programme, a summary of which is included in Chapter 5, specifies the number of heavy goods vehicles that access each of the TTM sections on each day during the overall construction period.

Negligible traffic volumes are anticipated during the operational phase of the Proposed Development, so the assessment primarily focuses on construction phase traffic and transport impacts.

14.2.2.2 Severance

Severance is the perceived division that can occur within a community and access to the services and facilities therein, e.g. separation by impacts associated with construction and improvement projects resulting from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself.

Changes in journey times and amenity for pedestrians and cyclists may be such that they affect, adversely or beneficially, the degree to which a locality is subject to 'community severance'. In considering the impacts of the Proposed Development construction phase traffic, community severance is defined as the separation of residents from facilities and services they use within their community caused by changes in traffic flows. However, the correlation between the degree of severance and the physical barrier of the road and its traffic is not straightforward.

Factors that need to be considered in determining whether severance is likely to be an important issue include road width, traffic flow and composition, traffic speeds, the availability of crossing facilities and the number of movements that are likely to cross the affected route. Different groups may also be more impacted, specifically vulnerable groups such as older age, younger age, and health issues, as they may be more sensitive to traffic conditions than others.

The IEMA guidelines identify that *"changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and substantial' changes in severance respectively"* (IEMA 2023). In this context, professional judgement has been applied to develop Severance Impact Significance Matrix, as outlined in Table 14.4.

Table 14.4: Severance Impact Significance Matrix

Significance of Impact	Percentage Increase in General Traffic
Major (Significant)	Greater than or equal to 90%
Moderate (Significant)	Greater than or equal to 60% and less than 90%
Minor (Not Significant)	Greater than or equal to 30% and less than 60%
Negligible (Not Significant)	Less than 30%

Chapter 7 of this EIAR considers community impacts of the Proposed Development in a wider sense, while the community impacts examined here are exclusively those related to traffic effects.

14.2.2.3 Driver Delay

Driver delay impacts are likely to be significant when the traffic on the network surrounding the Proposed Development is already at, or close to, the capacity of the system. To inform the assessment of driver delay, the theoretical capacity of the roads has been considered by referencing the capacity information presented in Table 14.3.

Identifying the TTM measures along the relevant road sections is also an important part of this assessment. The effect of single lane closures and full lane closures are different, and their impact on traffic depends on the number of days these TTM measures are active:

- Single lane closures have a potential delay effect on traffic: a stop-and-go or traffic light system will be implemented at the single lane closures and queues may form at these locations if traffic levels are sufficiently high;
- Two-lane closures with Passing Bays have a potential delay effect on traffic: a stop-and-go or traffic light system will be implemented at the Passing Bays and queues may form at these locations if traffic levels are sufficiently high; and
- Full road closures will require traffic to temporarily follow a diversion route, increasing journey time.

The IEMA and EPA Guidelines do not give specific thresholds to determine significance associated with driver delay, so professional judgement has been applied and a 'Driver Delay Impact Significance Matrix' developed as outlined in Table 14.5.

Table 14.5: Driver Delay Impact Significance Matrix

Significance of Impact	Increase in Journey Time
Major (Significant)	31–40 minutes
Moderate (Significant)	21–30 minutes
Minor (Not Significant)	11–20 minutes
Negligible (Not Significant)	0–10 minutes

14.2.2.4 Pedestrian Delay

Pedestrian delay, as with any driver delay, is likely to be significant when the traffic on the network surrounding the Proposed Development is already at, or close to, the capacity of the system.

Pedestrian delay and severance are closely related effects. Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads. In general, increases in traffic levels are likely to lead to greater increases in delay. Delays will also depend on the general level of pedestrian activity, visibility and general physical conditions within the study area.

As part of this assessment, it has been noted where the construction of the Proposed Development has the potential to affect leisure routes, including hiking paths, cycle lanes and greenways.

For the purposes of this assessment, a Pedestrian Delay Impact Significance Matrix has been developed using the same threshold criteria as that for Severance, as outlined in Table 14.6.

Table 14.6: Pedestrian Delay Impact Significance Matrix

Significance of Impact	Percentage Increase in General Traffic
Major (Significant)	Greater than or equal to 90%
Moderate (Significant)	Greater than or equal to 60% and less than 90%
Minor (Not Significant)	Greater than or equal to 30% and less than 60%
Negligible (Not Significant)	Less than 30%

14.2.2.5 Pedestrian Amenity

Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic. The magnitude of the impact on pedestrian amenity is considered in terms of the 'threshold' described in the IEMA Guidelines, which suggests that a meaningful change in amenity would be where traffic flow (or its HGV component) is halved or doubled (IEMA 2023).

For the purposes of this assessment, we have developed a Pedestrian Amenity Impact Significance Matrix using the same threshold criteria as that for Severance and Pedestrian Delay, as outlined in Table 14.7.

Table 14.7: Pedestrian Delay Impact Significance Matrix

Significance of Impact	Percentage Increase in General Traffic
Major (Significant)	Greater than or equal to 90%
Moderate (Significant)	Greater than or equal to 60% and less than 90%
Minor (Not Significant)	Greater than or equal to 30% and less than 60%
Negligible (Not Significant)	Less than 30%

As part of this assessment, it has been noted where the construction of the Proposed Development has the potential to affect leisure routes, including hiking paths, cycle lanes, and greenways.

14.2.2.6 Fear and Intimidation

The magnitude of the impact on fear and intimidation has been considered in reference to the IEMA Guidelines, which advise that any impact is dependent on the total volume of traffic, the HGV composition, vehicle speeds, proximity of traffic to people or the lack of protection caused by such factors as narrow pavement widths and conclude that there are no commonly agreed thresholds for estimating levels of danger, or fear and intimidation from known traffic and physical conditions.

The perception of fear and intimidation as a result of the Proposed Development is likely to be impacted by the change in traffic volumes due to construction vehicles on relevant routes. In this context, it is considered appropriate to use the same threshold values as before when development a Fear and Intimidation Impact Significance Matrix, as illustrated in Table 14.8. Due consideration is given to areas such as high-speed sections of road, locations of turning points and accesses, areas exposed to higher-than-average levels of school children, the elderly or other vulnerable groups when considering each relevant receptor's sensitivity, as discussed in Section 14.2.3.1.

Table 14.8: Fear and Intimidation Impact Significance Matrix

Significance of Impact	Percentage Increase in General Traffic
Major (Significant)	Greater than or equal to 90%
Moderate (Significant)	Greater than or equal to 60% and less than 90%
Minor (Not Significant)	Greater than or equal to 30% and less than 60%
Negligible (Not Significant)	Less than 30%

14.2.2.7 Road Safety Impacts

The UK DMRB Volume 15, Section 1, Part 6[125], Chapter 4 states that, where traffic flow doubles, it can be expected that road traffic collisions will double (i.e. the increase in collisions is likely to be approximately proportional to the increase in traffic). It is acknowledged that the guidance source has been superseded, but based on professional judgement and experience the statement is considered to remain valid. As such, if the number of collisions were to increase proportionally with the increase in traffic, the impact of the construction traffic on road safety per route section can be forecast.

The revised DMRB GG 119 Road Safety Audit (Highways England, 2020) states, "*the analysis of road traffic collision data should include identification of changes in the collision trends in terms of number, rate (taking account of any traffic flow changes), types and other collision variables, and comparisons with control data*", suggesting that if traffic flow increases or decreases, causing collisions to increase or decrease, then the relative rate of collisions should remain constant.

At present, the Road Safety Authority is in the process of "*reviewing* [their] *road traffic collision (RTC) data sharing policies and procedures*", and as a result, "*record-level RTC data can't be shared until this review is complete*" (www.rsa.ie, 2022).

The Road Safety Authority has removed all accident data from its website while it reviews its data privacy guidelines, so relevant collision data will be reviewed, and the corresponding potential increases in collisions due to the construction phase of the Proposed Development analysed, once available.

Notwithstanding, it is considered appropriate to consider the potential increase in traffic as a result of the Proposed Development to ascertain the potential for increased Road Safety Impacts. A Road Safety Impact Significance Matrix with the same threshold factors as before has been developed, as illustrated in Table 14.9.

Table 14.9: Road Safety Impact Significance Matrix

Significance of Impact	Percentage Increase in General Traffic
Major (Significant)	Greater than or equal to 90%
Moderate (Significant)	Greater than or equal to 60% and less than 90%
Minor (Not Significant)	Greater than or equal to 30% and less than 60%
Negligible (Not Significant)	Less than 30%

14.2.2.8 Public Transport Impacts

Separately, the anticipated impact of the Proposed Development's construction on public transport routes has been estimated. The bus routes which run through the study area were identified along with the frequency of services and operator information, then any overlaps with the in-road portions of the cable route identified. Where there were overlaps, TTM measures along the relevant road section were identified. The effect of single lane closures and full lane closures are different, and their impact on bus routes depends on the number of days these TTM measures are active:

- Single lane closures could delay buses: a stop-and-go system will be implemented at the single lane closures, and queues may form at these locations if traffic levels are too high.

- Full road closures will require bus routes to be temporarily diverted, which may stop service to some bus stops and increase journey time. The diversion taken by the bus is assumed to be that identified in the TMP, which is also reproduced in Section 14.4.1.11 of this chapter.

[125] In the absence of equivalent Irish guidance, the UK DMRB has been used on a wide range of other infrastructure projects and is considered applicable to the Proposed Development.

The IEMA and EPA Guidelines do not give specific thresholds to determine significance associated with public transport impacts, so professional judgement has been applied and a 'Public Transport Impact Significance Matrix', with similar thresholds to that developed for 'Driver Delay' has been developed as outlined in Table 14.10.

Table 14.10: Public Transport Impact Significance Matrix

Significance of Impact	Increase in Journey Time
Major (Significant)	31–40 minutes
Moderate (Significant)	21–30 minutes
Minor (Not Significant)	11–20 minutes
Negligible (Not Significant)	0–10 minutes

The duration of impacts has also been considered for public transport based on the categorisation outlined in Section 14.2.3.3.

Train services were also reviewed by finding railway lines that traverse the cable route. The train services active on these were identified, and the impacts caused on them assessed on an individual basis. The construction methods used to create the cable crossing across the railway line determines how, if at all, train services will be affected.

14.2.3 Assessment of Impacts

The method for identifying the sensitivity or importance of receptors, the impact magnitude and the assessment of significant effects is set out below.

14.2.3.1 Sensitivity / Importance

The receptors that may be affected by traffic effects arising from the construction of the Proposed Development are likely to exist adjacent to the construction access routes. The sensitivity of these receptors is typically classified by size and function (in terms of settlements, the presence of school and community facilities, traffic calming or traffic management measures, vehicle speed limits and position on the roads hierarchy) using typical criteria such as those identified in Table 14.11. The classification is based upon professional judgement and relative sensitivity to the potential traffic effects of the Proposed Development.

Table 14.11: Receptor Sensitivity

Sensitivity	Description
High	Receptors of high importance at the international or national scale and with limited potential for substitution. Includes large rural settlements containing a high number of community and public services and facilities, areas with traffic control signals, waiting and loading restrictions, traffic calming measures and minor rural roads, not constructed to accommodate frequent use by HGVs.
Medium	Receptors with high or medium importance at the regional scale and with limited potential for substitution. To include intermediate sized rural settlements containing some community or public facilities and services, areas with some traffic calming or traffic management measures and local A or B class roads, capable of regular use by HGV traffic.
Low	Receptors with low or medium importance and rarity on a local scale (on-site or neighbouring the site). To include small rural settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.
Negligible	Receptors with little importance. To include roads with no adjacent settlements including new strategic trunk roads or motorways that would be hardly affected by additional traffic and are suitable for abnormal loads.

14.2.3.2 Significance of Effect

To determine the overall significance of the effects, the results from the receptor sensitivity and effect magnitude classifications are correlated and classified using the scale summarised in Table 14.12. The matrix provides a guide subject to professional judgement. The significance of the effects ascribed within the matrix are defined as follows:

- Negligible – impact is only very slightly detectable/noticeable or is undetectable and of no significance;
- Minor – impact is slightly detectable/noticeable; likely to be of temporary duration; local influence;
- Moderate – impact is easily detectable/noticeable; could have either a temporary or permanent duration; unlikely to exceed local influence; and
- Major – impact is easily detectable/noticeable; likely to be of a long-term or permanent duration; could have irreversible implications; influence exceeds the local area.

Table 14.12: Significance of Effects Matrix

		Sensitivity			
		Negligible	Low	Medium	High
Magnitude	Major	Minor	Moderate	Major	Major
	Moderate	Negligible	Minor	Moderate	Major
	Minor	Negligible	Negligible	Minor	Moderate
	Negligible	Negligible	Negligible	Negligible	Minor

14.2.3.3 Duration of Effect

It should be noted that the likely duration of an effect is also a relevant consideration. The EPA Guidelines (EPA, 2022) categorise duration of effects. The following categories are relevant to the Proposed Development:

- Brief Effects – effects lasting less than a day;
- Temporary Effects – effects lasting less than a year; and
- Short Term Effects – effects lasting one to seven years.

14.3 Baseline Conditions

Traffic surveys were commissioned to gain an understanding of baseline traffic conditions along the cable route and diversion routes. These were completed by Tracsis on behalf of Jacobs and cover a total of 30 Junction Turning Counts (JTCs) and 30 Automated Traffic counts (ATCs). The JTCs were collected on Tuesday 25 October 2022, while the ATCs were taken as weekday averages for the week from Monday 24 until Friday 28 October 2022. The traffic on these days is representative of normal traffic conditions since there were no public holidays, school holidays or special events in the area during this period. The data collected is considered to provide a robust dataset to assess the impacts of the Proposed Development. Plate 14.2 shows the location of the counters.

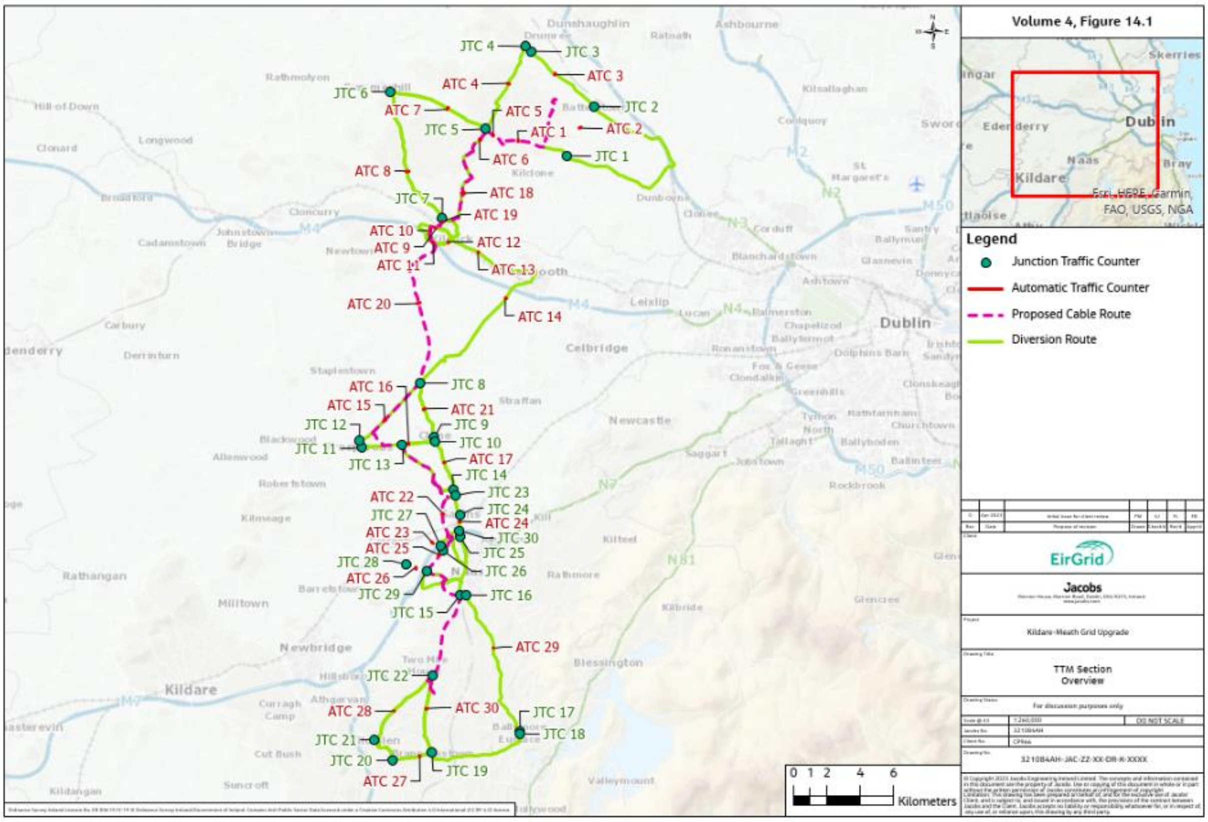

Plate 14.2: ATC and JTC Locations

14.3.1 Traffic Volume Forecasting

The ATCs and JTCs were forecast using growth rates from Table 7.4 of the NTpM Volume 3 Travel Demand Forecasting Report. These growth rates were applied to the traffic at each link, because the network is sufficiently small and significant changes in flow distribution are not expected. This is in line with Section 5 of PAG Unit 5.3.

PAG Unit 5.3 requires the application of the Central Growth Scenario for project appraisal, which is therefore taken as the correct scenario for this assessment as well. This is in line with professional judgement of the nature of traffic growth in the study area: albeit rural, the roads considered here are close enough to Dublin that somewhat elevated – but not high – traffic growth is a reasonable expectation.

The construction period is expected to last from 2025 until 2028, which gives four possible forecast years. Given the duration of the proposed construction phase, baseline traffic flows have not been projected beyond the anticipated commencement of the construction phase. To maintain the overall approach in this chapter to analysis, 2025 is chosen as the forecast year.

Since the forecast traffic during the construction phase will be lowest during 2025, the percentage impact of the construction traffic will be highest in this year and therefore showcase the largest relative impact that could occur. To maintain the overall approach in this chapter, 2025 is chosen as the forecast year. The growth rates from the Travel Demand Forecasting Report, used in this chapter, are reproduced in Table 14.13.

Table 14.13: Traffic Growth Rates vs 2022

Year	Growth vs 2022
2022	0.0%
2023	1.5%
2024	3.0%
2025	4.5%

The recorded and forecast values for each location are given in Table 14.14, where the JTCs are the aggregate of all turning movements at that location and the ATCs are the sum of traffic passing on an average weekday in both directions.

Table 14.14: Recorded and Projected Traffic counts (Weekday 24 hr Average)

Location	2022 Recorded	2025 Projected	Location	2022 Recorded	2025 Projected
ATC 1	4,146	4,333	JTC 1	4,670	4,881
ATC 2	1,484	1,551	JTC 2	6,020	6,292
ATC 3	6,084	6,359	JTC 3	9,491	9,920
ATC 4	1,537	1,607	JTC 4	8,277	8,651
ATC 5	4,777	4,993	JTC 5	4,560	4,766
ATC 6	917	9,58	JTC 6	9,167	9,582
ATC 7	3,831	4,004	JTC 7	7,728	8,077
ATC 8	7,399	7,734	JTC 8	10,005	10,457
ATC 9	13,479	14,088	JTC 9	15,249	15,939
ATC 10	10,489	10,963	JTC 10	14,260	14,905
ATC 11	11,550	12,072	JTC 11	11,902	12,440
ATC 12	9,630	10,065	JTC 12	5,940	6,209
ATC 13	7,089	7,410	JTC 13	8,861	9,262
ATC 14	4,302	4,497	JTC 14	17,360	18,145
ATC 15	4,242	4,434	JTC 15	21,935	22,927
ATC 16	7,210	7,536	JTC 16	12,785	13,363
ATC 17	16,684	17,438	JTC 17	4,442	4,643
ATC 18	1,343	1,404	JTC 18	3,103	3,243
ATC 19	8,515	8,900	JTC 19	2,359	2,466
ATC 20	7,680	8,027	JTC 20	3,364	3,516
ATC 21	8,618	9,008	JTC 21	12,577	13,146
ATC 22	12,207	12,759	JTC 22	4,651	4,861
ATC 23	1,338	1,399	JTC 23	14,092	14,729
ATC 24	14,349	14,998	JTC 24	11,307	11,818
ATC 25	16,156	16,887	JTC 25	22,893	23,928
ATC 26	7,839	8,193	JTC 26	13,274	13,874
ATC 27	1,884	1,969	JTC 27	14,304	14,951
ATC 28	5,901	6,168	JTC 28	7,157	7,481
ATC 29	3,284	3,432	JTC 29	14,035	14,670
ATC 30	1,613	1,686	JTC 30	13,600	14,215

14.4 Potential Effects

14.4.1 Construction Phase

14.4.1.1 Construction Traffic Impacts (Worker Movements)

Construction of the Proposed Development will require the movement of workers to and from various points along the cable route, throughout the entire construction period. Due to the rural nature of the study area, it is expected that all workers will use private vehicles to travel to and park at a construction compound. From here they will consolidate to a smaller number of light goods vehicles to travel to specific construction locations. The contractor will also be required to ensure that their staff do not park on public roads (except within the work areas).

The required personnel have been estimated for the entire construction phase of the Proposed Development, and the most needed at any one time would not exceed 171 as shown in Table 14.15. The central compound would require the largest workforce, with an estimated peak of 63 workers.

Table 14.15: Workforce Numbers

Site Compound	2025			2026				2027				2028		
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
North	43	23	23	23	23	23	23	23	23	23	23	19	10	31
Central	63	33	33	33	33	33	33	33	46	52	52	52	39	50
South	38	18	18	18	18	18	18	18	31	37	37	37	24	25
Woodland Substation	0	0	0	0	0	0	20	20	20	20	20	20	20	20
Dunstown Substation	0	0	0	0	0	0	20	20	20	20	20	20	20	20
Total	144	74	74	74	74	74	114	114	153	171	171	167	132	146

The movement of workers and HGVs will not overlap, since the workers need to arrive at their respective locations before goods vehicles can be of any use at the construction sites. It follows that HGVs are considered separately and in isolation from the worker movement traffic.

Due to the very low number of vehicles expected to be required for the movement of construction workers, and the dispersed locations of the worksites, the traffic resulting from worker movements is considered **Negligible** and of a **Short Term** effect.

14.4.1.2 Construction Traffic Impacts (HGVs)

The construction of the Proposed Development will require the delivery and removal of various construction materials and equipment including excavated material, asphalt, engineered fill, concrete and facility equipment. The vehicles used for this purpose will be HGVs and ready mixed trucks, and their volumes estimated based on the construction programme requirements to deliver and remove these various materials from construction sites.

At this stage, the exact origins and destinations of the vehicles accessing each site has not yet been determined. For the purpose of this assessment, it is assumed that the distribution of HGVs will be the same as the baseline distribution of traffic.

In order to undertake as robust an assessment of the traffic impacts as possible, a number of different scenarios were assessed. These are as follows:

- Scenario 1 – The maximum impact of construction traffic in the immediate vicinity of each TTM section when it assumed to be actively under construction;
- Scenario 2 – The cumulative impact of construction traffic on the local road network as a result of adjacent TTM sections being actively under construction at the same time; and
- Scenario 3 – The impact of construction traffic on the wider network during the period of the construction programme which generates the greatest overall volume of construction vehicles.

Scenario 1

In order to ensure that localised impacts associated with any single TTM section are considered, the percentage impact of construction vehicles in the immediate vicinity of each TTM section was assessed. Since the number of vehicles accessing each TTM section varies significantly across the construction period, the day(s) with the highest construction traffic volume was selected for each TTM section. Table 14.16 shows this information along with the duration and timing of the peak at each location.

It should be noted that, while the first peak day for the various TTM sections ranges between 2025 and 2027, the percentage peak impact assessment has been based on forecast 2025 volumes, as explained in Section 14.3.1.

Table 14.16: Impact Assessment of Peak Construction Traffic at each TTM Section – Scenario 1

TTM Section	Max Construction Vehicle Trips/Day	Background 2025 Traffic	% Peak Impact on background traffic	Estimated Number of Peak Days
1 Woodland	86	4095	2.1%	7
2 R156	86	8894	1.0%	7
3 Mullagh	22	3526	0.6%	1
4 R125 North	52	958	5.4%	2
5 R125 South	52	2892	1.8%	3
6 R158	34	7526	0.5%	1
7 Balfeaghan	42	11494	0.4%	1
8 R148	52	10963	0.5%	1
9 M4	22	17724	0.1%	6
10 R407 North	30	12072	0.2%	4
11 R407	132	9115	1.4%	2
12 R408	80	3996	2.0%	12
13 Curryhills	24	5715	0.4%	1
14 R403	30	7892	0.4%	10
15 L2002 North	30	3824	0.8%	28
16 Millicent Demesne	18	3780	0.5%	3
17 L2002 South	30	3780	0.8%	3
18 Castlesize	38	10983	0.3%	2
19 Sallins Bypass	42	10469	0.4%	4

TTM Section	Max Construction Vehicle Trips/Day	Background 2025 Traffic	% Peak Impact on background traffic	Estimated Number of Peak Days
20 Mills	38	11319	0.3%	1
21 Osberstown Road	24	10491	0.2%	1
22 M7	22	10491	0.2%	1
23 Millennium Parkway	86	11388	0.8%	14
24 R409	28	7141	0.4%	5
25 Grand Canal	22	10290	0.2%	11
26 R447	30	13439	0.2%	10
27 R448	86	8806	1.0%	14
28 R448 South	30	9663	0.3%	3
29 Stephenstown	18	2575	0.7%	2
30 R412	24	1670	1.4%	3
31 Dunstown	140	1670	8.4%	1

It can be seen that the percentage increase in traffic flows resulting from additional construction traffic is below the 10% threshold value at all of the TTM sections. The maximum number of construction trips at a TTM section is 140 vehicles at TTM Section 31 Dunstown, and this is only expected to be for a single day. Therefore, for Scenario 1 the impacts of the construction traffic near each TTM section are considered **Minor** and of **Temporary Effect**.

Scenario 2

Where adjacent TTM sections attract HGV movements at the same time, this can lead to cumulative impacts on sections of the local road network which will need to accommodate HGVs to and from more than one TTM section at the same time. Based on the construction programme, there are five examples where adjacent TTM sections will be active at the same time. These are illustrated in Table 14.17.

Table 14.17: Traffic Peaks when Considering Cumulative Effects of Adjacent TTM Sections – Scenario 2

Cumulative Impact Location	TTM Sections	Max Construction Vehicle Trips/Day	Estimated Duration of Cumulative Impacts
1	Section 1-Woodland Section 2-R156	1-Woodland: 86 2-R156: 86	7 days
2	Section 14-R403 Section 15-L2002 North	14-R403: 30 15-L2002 North: 4	1 day
3	Section 25-Grand Canal Section 26-R447	25-Grand Canal: 22 26-R447: 22	1 day
4	Section 29-Stephenstown Section 30-R412	29-Stephenstown: 18 30-R412: 22	1 day
5	Section-30 R412 Section-31 Dunstown	30-R412: 8 31-Dunstown: 140	1 day

The cumulative impacts at locations 2 to 5 are each expected to last for a single day. In addition, the cumulative daily construction vehicle trips at locations 2, 3 and 4 are relatively low, so the impacts at these sites are considered to be **Negligible** and of a **Brief Effect**.

The cumulative daily construction vehicle trips generated by adjacent TTM sections are greater at location 1 (172 trips) and location 5 (148 trips). These cases are taken forward for more detailed analysis where the construction is assigned onto road links in proximity of the relevant TTM sections to assess whether any impacts arise at road and junction level.

Location 1 (TTM Sections 1 and 2)

Plate 14.3 shows the peak construction traffic flows as a percentage of the baseline 2025 traffic on each link. The percentage impacts are below 10%, and so not significant, in all locations except for two: the left-turning movement from the R156 onto the R125 and the left-turning movement from the R156 onto the L2215, which carry 16 and 20 construction vehicle trips, respectively. From this information, it is clear that the impacts at these left turns are negligible and the percent impact is due to low background traffic levels.

The roads examined are located in a rural area and are not near any significant settlements. The R156 leads eastwards towards Dunboyne and goes near the M3 which is just over 7 km away.

When the peak flows shown in Plate 14.3 are expected, there will be nine passing bays along TTM Section 2. Since the construction traffic on this link is very low – it does not exceed 3% of baseline traffic – based on professional judgement, the combination of passing bays and additional construction traffic will not cause significant impacts. There will be no TTM measures active on nearby sections on this day.

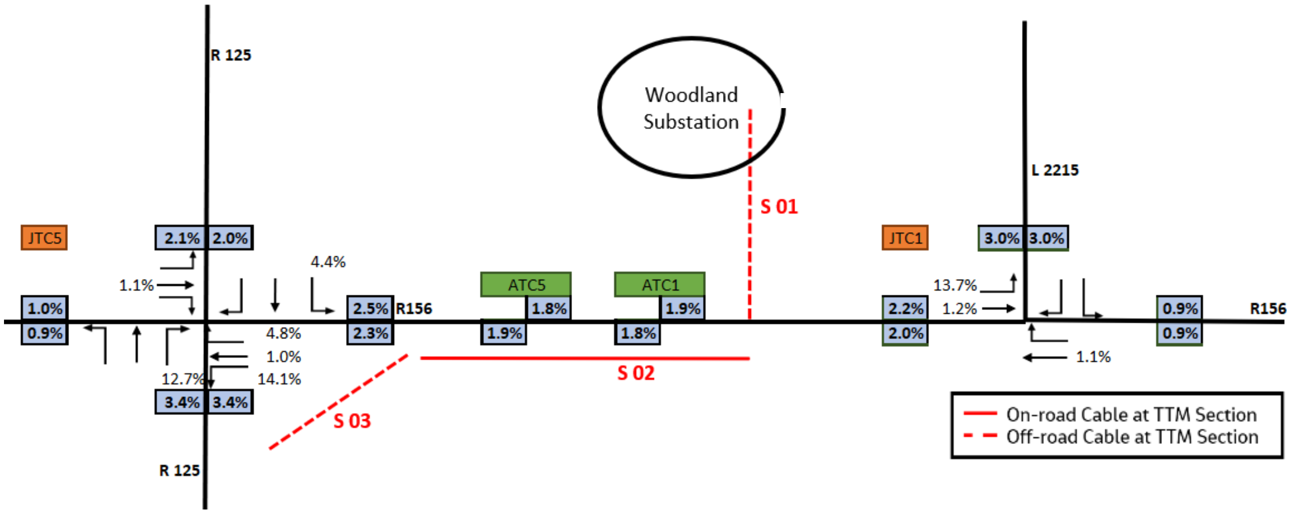

Plate 14.3: Traffic Flow Diagram for TTM Sections 1 and 2

It is therefore concluded that the impacts at location 1 (TTM Sections 1 and 2) would be **Minor** and of a **Temporary Effect**.

Location 5 (TTM Sections 30 & 31)

Plate 14.4 shows the peak construction traffic flows as a percentage of the baseline 2025 traffic on each link. The percentage impacts are all below 10%.

The roads examined are located in a predominantly rural area, the only settlement (Two Mile House) being located 900 m westwards of the junction marked as JTC 22 in Plate 14.4. Since there are no significant roads going through the settlement, and the regional roads that will be used to access TTM Sections 30 and 31 do not pass through it, no construction vehicles are expected to traverse Two Mile House.

When the peak flows shown in Plate 14.4 are expected, full road closures (with local access arrangements) will be active along TTM Section 30. Construction vehicles, which will be removing asphalt and excavated material and importing concrete to the site, are expected to access the site from either side of the road closure.

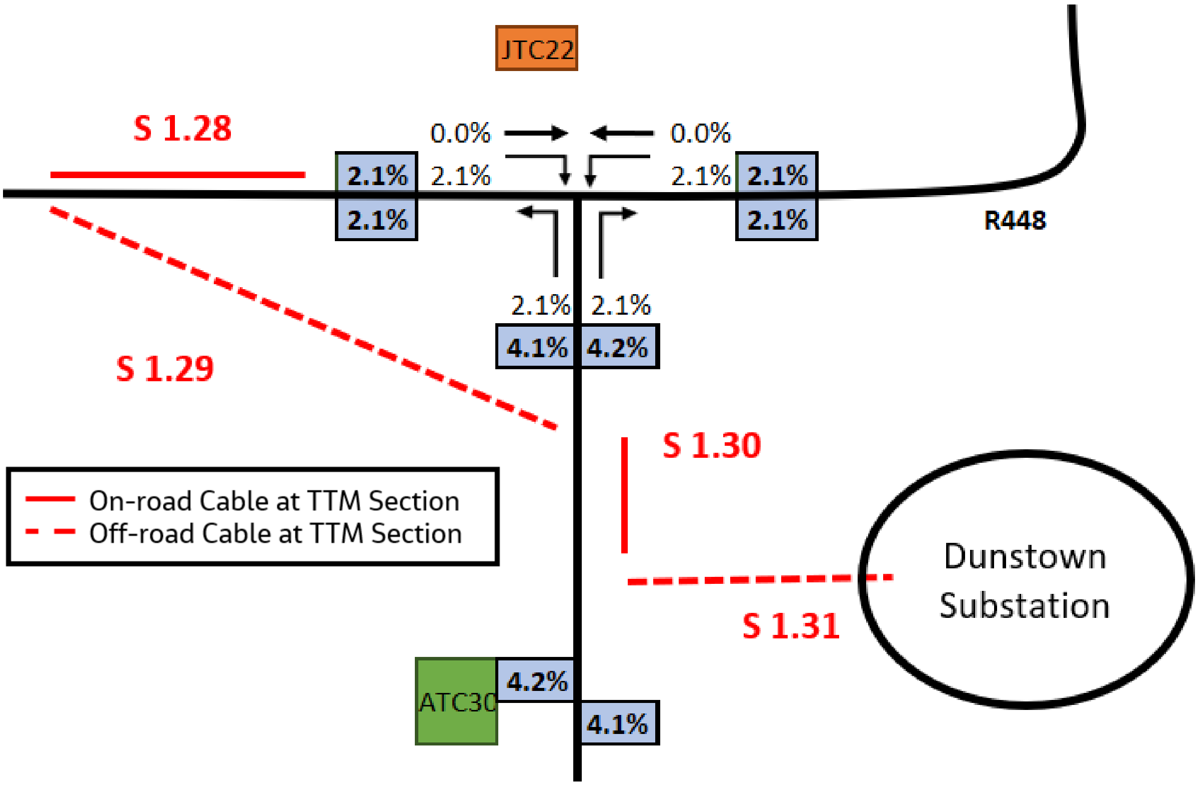

Plate 14.4: Traffic Flow Diagram for TTM Sections 30 and 31

Based on the assessment, it is concluded that the impacts at location 5 (TTM Sections 30 and 31) would be **Minor** and of a **Brief Effect**.

Scenario 3

During the peak period, it is forecast that a total of 430 construction vehicle trips will be made per day, and these will be associated with the following TTM sections:

- TTM Section 1 – Woodland;
- TTM Section 2 – R156;
- TTM Section 11 – R407;
- TTM Section 23 – Millennium Parkway; and
- TTM Section 27 – R448.

Construction vehicles associated with each of these sites have been collectively distributed across the study area network, and the percentage impact at each of the traffic survey locations in the study area is outlined in Table 14.18.

Table 14.18: Network Peak Construction Traffic at Counter Locations - Scenario 3

ATC	Construction HGV Trips per Day	2025 Background AADT	% Increase	JTC	Construction HGV Trips per Day	2025 Background AADT	% Increase
ATC 1	80	4,333	1.8%	JTC 1	80	4,881	1.6%
ATC 2	0	1,551	0%	JTC 2	0	6,292	0%
ATC 3	0	6,359	0%	JTC 3	0	9,920	0%
ATC 4	0	1,607	0%	JTC 4	0	8,651	0%
ATC 5	92	4,993	1.8%	JTC 5	92	4,766	1.9%
ATC 6	0	9,58	0%	JTC 6	0	9,582	0%
ATC 7	0	4,004	0%	JTC 7	0	8,077	0%
ATC 8	0	7,734	0%	JTC 8	39	10,457	0.4%
ATC 9	0	14,088	0%	JTC 9	0	15,939	0%
ATC 10	0	10,963	0%	JTC 10	0	14,905	0%
ATC 11	0	12,072	0%	JTC 11	0	12,440	0%
ATC 12	0	10,065	0%	JTC 12	0	6,209	0%
ATC 13	0	7,410	0%	JTC 13	0	9,262	0%
ATC 14	17	4,497	0.4%	JTC 14	0	18,145	0%
ATC 15	0	4,434	0%	JTC 15	64	22,927	0.3%
ATC 16	0	7,536	0%	JTC 16	0	13,363	0%
ATC 17	0	17,438	0%	JTC 17	0	4,643	0%
ATC 18	0	1,404	0%	JTC 18	0	3,243	0%
ATC 19	0	8,900	0%	JTC 19	0	2,466	0%
ATC 20	30	8,027	0.4%	JTC 20	0	3,516	0%
ATC 21	0	9,008	0%	JTC 21	0	13,146	0%
ATC 22	0	12,759	0%	JTC 22	23	4,861	0.5%
ATC 23	0	1,399	0%	JTC 23	0	14,729	0%
ATC 24	0	14,998	0%	JTC 24	0	11,818	0%
ATC 25	0	16,887	0%	JTC 25	0	23,928	0%
ATC 26	0	8,193	0%	JTC 26	43	13,874	0.3%
ATC 27	0	1,969	0%	JTC 27	0	14,951	0%
ATC 28	0	6,168	0%	JTC 28	0	7,481	0%
ATC 29	0	3,432	0%	JTC 29	34	14,670	0.2%
ATC 30	0	1,686	0%	JTC 30	0	14,215	0%

The percentage increase in traffic flows as a result of the additional construction traffic is below the 10% threshold value at all survey locations in the study area. It is acknowledged that there may be occasions when there are localised impacts during periods of construction which are linked to other TTM sections, and these have been assessed under Scenarios 1 and 2.

It should also be noted that the total number of construction vehicle trips made on the network during Scenario 3 (430 trips per day) is projected, under the construction programme, to only last for a period of two weeks. The total daily volume of construction vehicles on the network on any other day over the course of the construction programme is projected to be less than this volume. It is therefore considered that Scenario 3 represents a worst-case scenario in terms of the network-wide construction vehicle impacts. In addition, these impacts are considered to be Negligible and of a Temporary Effect.

14.4.1.3 Receptor Sensitivity

The roads identified from the geographic boundary assessment and summarised in Table 14.19 are part of the potential construction access route delivery network during the overall network peak period assessed previously as scenario 3 in Section 14.4.1.2. Consideration has been given to their existing condition and ability to accommodate HGV traffic, and characteristics identified as part of the baseline review.

Table 14.19: Receptor Sensitivity

Ref	Receptor Description	Receptor Sensitivity	Rationale
ATC 1	R156 Regional Road, between Warrenstown and L6205	Low	• Receptors with low or medium importance and rarity on a local scale. • Small settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.
ATC 5	R156 Regional Road, east of R125 Regional Road	Negligible	• Receptors with very low importance and rarity. • Roads with no adjacent settlements.
ATC 14	Newtown Road, south of Maynooth	Low	• Receptors with low or medium importance and rarity on a local scale. • Small settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.
ATC 20	R407 Regional Road, North of L1010	Negligible	• Receptors with very low importance and rarity. • Roads with no adjacent settlements.
JTC 1	R156/L2215	Negligible	• Receptors with very low importance and rarity. • Roads with no adjacent settlements.
JTC 5	R156/R125	Low	• Receptors with low or medium importance and rarity on a local scale. • Small settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.
JTC 8	R407/R408	Negligible	• Receptors with very low importance and rarity. • Roads with no adjacent settlements.
JTC 15	R448 / Ballycane Road south of Naas	Medium	• Receptors with high or medium importance at the regional scale and with limited potential for substitution. • Intermediate sized settlements containing some community or public facilities and services, areas with some traffic calming or traffic management measures and local A or B class roads, capable of regular use by HGV traffic.
JTC 22	R448 / R412	Negligible	• Receptors with very low importance and rarity. • Roads with no adjacent settlements.

Ref	Receptor Description	Receptor Sensitivity	Rationale
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	High	• Receptor of high importance at the international or national scale and with limited potential for substitution. • Motorway junction.
JTC 29	R445 Millennium Park / R409	Low	• Receptors with low or medium importance and rarity on a local scale. • Small settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.

14.4.1.4 Severance

The IEMA Guidelines note that 'severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery' (IEMA 2023). The assessed magnitude of the Severance impact is presented in Table 14.20, in the context of the Impact Matrix outlined previously in the methodology section of this chapter and the percentage impacts identified previously at Table 14.18. This considers that the temporary percentage increase in traffic due to construction trips, at relevant locations will have a Negligible impact on severance.

Table 14.20: Magnitude of Impact on Severance at Receptor Locations

Counter	Description	Construction Trips per Day	% Increase in traffic	Magnitude of Impact on Severance
ATC 1	R156 Regional Road, between Warrenstown and L6205	80	1.8%	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	92	1.8%	Negligible
ATC 14	Newtown Road, south of Maynooth	17	0.4%	Negligible
ATC 20	R407 Regional Road, North of L1010	30	0.4%	Negligible
JTC 1	R156/L2215	80	1.6%	Negligible
JTC 5	R156/R125	92	1.9%	Negligible
JTC 8	R407/R408	39	0.4%	Negligible
JTC 15	R448 / Ballycane Road south of Naas	64	0.3%	Negligible
JTC 22	R448 / R412	23	0.5%	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	43	0.3%	Negligible
JTC 29	R445 Millennium Park / R409	34	0.2%	Negligible

14.4.1.5 Driver Delay

Traffic delays caused by construction vehicles could occur along the chosen construction access routes. The IEMA Guidelines note that '*these delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system*' (IEMA 2023).

The road network surrounding the work sites / temporary construction compounds are operating comfortably within capacity, which is confirmed when comparing the baseline AADT flows in Table 14.14. As such the anticipated delay at the relevant receptor locations is considered to be minimal and well below the threshold value of 10 minutes identified previously in Table 14.5. The assessed magnitude of impact on driver delay at these locations is presented in Table 14.21. All locations have been assessed to have a Negligible magnitude of impact on driver delay.

Table 14.21: Magnitude of Impact on Driver Delay at Receptor Locations

Counter	Description	Increase in Journey Time	Magnitude of Impact on Driver Delay
ATC 1	R156 Regional Road, between Warrenstown and L6205	0-10 minutes	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	0-10 minutes	Negligible
ATC 14	Newtown Road, south of Maynooth	0-10 minutes	Negligible
ATC 20	R407 Regional Road, North of L1010	0-10 minutes	Negligible
JTC 1	R156/L2215	0-10 minutes	Negligible
JTC 5	R156/R125	0-10 minutes	Negligible
JTC 8	R407/R408	0-10 minutes	Negligible
JTC 15	R448 / Ballycane Road south of Naas	0-10 minutes	Negligible
JTC 22	R448 / R412	0-10 minutes	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	0-10 minutes	Negligible
JTC 29	R445 Millennium Park / R409	0-10 minutes	Negligible

14.4.1.6 Pedestrian Delay

The assessed magnitude of the Pedestrian Delay impact is presented in Table 14.22, in the context of the Impact Matrix outlined previously in the methodology section of this chapter and the percentage impacts identified previously Table 14.18. This considers that the temporary percentage increase in traffic due to construction trips, at relevant locations will have a Negligible impact on Pedestrian Delay for crossing roads at the receptor locations.

Table 14.22: Magnitude of Impact on Pedestrian Delay at Receptor Locations

Counter	Description	Construction Trips per Day	% Increase in traffic	Magnitude of Impact on Pedestrian Delay
ATC 1	R156 Regional Road, between Warrenstown and L6205	80	1.8%	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	92	1.8%	Negligible
ATC 14	Newtown Road, south of Maynooth	17	0.4%	Negligible
ATC 20	R407 Regional Road, North of L1010	30	0.4%	Negligible
JTC 1	R156/L2215	80	1.6%	Negligible
JTC 5	R156/R125	92	1.9%	Negligible
JTC 8	R407/R408	39	0.4%	Negligible
JTC 15	R448 / Ballycane Road south of Naas	64	0.3%	Negligible
JTC 22	R448 / R412	23	0.5%	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	43	0.3%	Negligible
JTC 29	R445 Millennium Park / R409	34	0.2%	Negligible

14.4.1.7 Pedestrian Amenity

Amenity is defined as the relative pleasantness of a journey. The volume and composition of traffic are very important determinants of amenity, as are other factors e.g., footpath width and distance from traffic; any barriers between pedestrians and cyclists and vehicle traffic; the quality of any street furniture, route signing and planting, and presences of crossings.

For this assessment, based on the available information, the magnitude of the impact on pedestrian amenity has been considered in terms of the threshold described in the IEMA Guidance, which suggests that *"a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or HGV component) is halved or doubled"* (IEMA 2023). Based on the estimated two-way average daily percentage increase in construction phase traffic, it is not anticipated that the Proposed Development construction phase traffic would lead to a halving or doubling of traffic at any of the assessed locations.

The assessed magnitude of Pedestrian Amenity impact in presented in Table 14.23, in the context of the Impact Matrix outlined previously in the methodology section of this chapter and the percentage impacts identified previously in Table 14.18. This considers that the temporary percentage increase in traffic due to construction trips, at relevant locations, will have a Negligible impact on Pedestrian Amenity.

Table 14.23: Magnitude of Impact on Pedestrian Amenity at Receptor Locations

Counter	Description	Construction Trips per Day	% Increase in traffic	Magnitude of Impact on Pedestrian Amenity
ATC 1	R156 Regional Road, between Warrenstown and L6205	80	1.8%	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	92	1.8%	Negligible
ATC 14	Newtown Road, south of Maynooth	17	0.4%	Negligible
ATC 20	R407 Regional Road, North of L1010	30	0.4%	Negligible
JTC 1	R156/L2215	80	1.6%	Negligible
JTC 5	R156/R125	92	1.9%	Negligible
JTC 8	R407/R408	39	0.4%	Negligible
JTC 15	R448 / Ballycane Road south of Naas	64	0.3%	Negligible
JTC 22	R448 / R412	23	0.5%	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	43	0.3%	Negligible
JTC 29	R445 Millennium Park / R409	34	0.2%	Negligible

14.4.1.8 Fear and Intimidation

The assessed magnitude of Fear and Intimidation impact is presented in Table 14.24, in the context of the Impact Matrix outlined previously in the methodology section of this chapter and the percentage impacts identified previously in Table 14.18. This considers that the temporary percentage increase in traffic due to construction trips, at relevant locations, will have a Negligible impact on Fear and Intimidation.

Table 14.24: Magnitude of Impact on Fear and Intimidation at Receptor Locations

Counter	Description	Construction Trips per Day	% Increase in traffic	Magnitude of Impact on Fear and Intimidation
ATC 1	R156 Regional Road, between Warrenstown and L6205	80	1.8%	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	92	1.8%	Negligible
ATC 14	Newtown Road, south of Maynooth	17	0.4%	Negligible
ATC 20	R407 Regional Road, North of L1010	30	0.4%	Negligible
JTC 1	R156/L2215	80	1.6%	Negligible
JTC 5	R156/R125	92	1.9%	Negligible
JTC 8	R407/R408	39	0.4%	Negligible
JTC 15	R448 / Ballycane Road south of Naas	64	0.3%	Negligible
JTC 22	R448 / R412	23	0.5%	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	43	0.3%	Negligible
JTC 29	R445 Millennium Park / R409	34	0.2%	Negligible

14.4.1.9 Road Safety Impacts

As mentioned in Section 14.2.2.7, all detailed road traffic collision data has been removed from public access, including historical road traffic collision data. Therefore, this data will be analysed once it is available again, in line with the methodology presented in Section 14.2.2.7.

Notwithstanding, professional judgement has used, in the context of the Road Safety Significance Matrix developed earlier in this chapter, to determine that the magnitude of the road safety impacts is considered Negligible at the receptor locations identified, as summarised in Table 14.25.

It is noted that, the roads forming the core of the construction access route network are either well-established haulage routes that can accommodate significant HGV composition or are routes capable of regular use by HGV traffic. Where construction access route links are minor roads in sensitive areas, mitigation measures identified in the TMP (contained in Appendix 5.1) will be implemented to minimise any impacts.

As required under the TMP, the contractor will carry out a Safety Audit of the Operational Traffic Management Plan prior to the commencement of works. This will ensure a high safety standard in relation to the traffic management measures implemented.

Table 14.25: Magnitude of Impact on Road Safety at Receptor Locations

Counter	Description	Construction Trips per Day	% Increase in traffic	Magnitude of Impact on Road Safety
ATC 1	R156 Regional Road, between Warrenstown and L6205	80	1.8%	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	92	1.8%	Negligible
ATC 14	Newtown Road, south of Maynooth	17	0.4%	Negligible

Counter	Description	Construction Trips per Day	% Increase in traffic	Magnitude of Impact on Road Safety
ATC 20	R407 Regional Road, North of L1010	30	0.4%	Negligible
JTC 1	R156/L2215	80	1.6%	Negligible
JTC 5	R156/R125	92	1.9%	Negligible
JTC 8	R407/R408	39	0.4%	Negligible
JTC 15	R448 / Ballycane Road south of Naas	64	0.3%	Negligible
JTC 22	R448 / R412	23	0.5%	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	43	0.3%	Negligible
JTC 29	R445 Millennium Park / R409	34	0.2%	Negligible

14.4.1.10 Significance of Effects Assessment

The magnitude of the impacts of the construction phase traffic on the identified sensitive receptors has been assessed based on the traffic volumes and professional judgement and is summarised in Table 14.26.

Table 14.26: Summary of Magnitude of Impacts

Counter	Description	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Road Safety Impacts
ATC 1	R156 Regional Road, between Warrenstown and L6205	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
ATC 14	Newtown Road, south of Maynooth	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
ATC 20	R407 Regional Road, North of L1010	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Counter	Description	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Road Safety Impacts
JTC 1	R156/L2215	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 5	R156/R125	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 8	R407/R408	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 15	R448 / Ballycane Road south of Naas	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 22	R448 / R412	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 29	R445 Millennium Park / R409	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Based on the sensitivity of the receptors (Table 14.19) and the summary of magnitude of impacts (Table 14.26), the significance of effects of the additional traffic movements during the construction phase are provided in Table 14.27.

Table 14.27: Significance of Construction Phase Traffic Effects

Counter	Description	Receptor Sensitivity	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Road Safety Impacts
ATC 1	R156 Regional Road, between Warrenstown and L6205	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
ATC 5	R156 Regional Road, east of R125 Regional Road	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
ATC 14	Newtown Road, south of Maynooth	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
ATC 20	R407 Regional Road, North of L1010	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 1	R156/L2215	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 5	R156/R125	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 8	R407/R408	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 15	R448 / Ballycane Road south of Naas	Medium	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 22	R448 / R412	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
JTC 26	R445 Millennium Park / M7 Motorway On/off slips	High	Minor	Minor	Minor	Minor	Minor	Minor

Counter	Description	Receptor Sensitivity	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Road Safety Impacts
JTC 29	R445 Millennium Park / R409	Low	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

The additional traffic caused by the activities for the Proposed Development during the construction phase would result in increases in traffic flows on the surrounding roads leading to the work sites and temporary construction compounds. Overall, on the basis that the predicted traffic increases are not deemed to be considerable (and with the predicted flows well within the practical operating capacity of these roads), it is assessed based on professional judgement that the estimated increases in traffic would have a Minor to Negligible significance effect on the identified sensitive receptors.

14.4.1.11 Diversion Routes

Around 44 km of the cable length will run in the road network. The TMP has identified a series of lane and full road closures during construction with the cable route split into a series of TTM sections. The closures planned for each TTM in-road section during the three construction phases are summarised in Table 14.28, in addition to the journey time impacts and assessment of impact for Driver Delay and Duration of Effect in the context of the thresholds defined for each in the methodology section.

Table 14.28: Summary of Lane and Road Closures Impacts Across the Construction Period

TTM Section	Cable Section Length	Location	Phase 1 and 3 Traffic Measures	Phase 2 Traffic Measures	Closure Total Duration	Diversion distance	Diversion journey time increase	Driver Delay significance	Duration of Effect
1.02	3.9 km	In-road	Single Lane Closure	Single Lane Closure with HGV Diversion	7 days	27.4 km	22 min	Moderate	Temporary
1.04	3.5 km	In-road	Single Lane Closure	Full Road Closure (with local access arrangements)	2 days	21.5 km	12 min	Minor	Temporary
1.05	3.9 km	In-road	Single Lane Closure	Full Road Closure (with local access arrangements)	3 days	18.7 km	11 min	Minor	Temporary
1.06	0.2 km	In-road	None	Single Lane Closure	1 day	3.6 km	7 min	Negligible	Brief
1.08	0.5 km	In-road	Temporary Construction Platform	Lane Closure	1 day	5.0 km	9 min	Negligible	Brief
1.10	0.5 km	In-road	Passing Bay – Single Lane Closure	Lane Closure	4 days	3.9 km	9 min	Negligible	Temporary
1.11	9.4 km	In-road	Single Lane Closure	Single Lane Closure	2 days	17.1 km	15 min	Minor	Temporary
1.12	4.2 km	In-road	Single Lane Closure	Full Road Closure	12 days	9.6 km	12 min	Minor	Temporary
1.14	1.2 km	In-road	Single lane closure	Full road closure	10 days	12.5 km	15 min	Minor	Temporary
1.15	3.2 km	In-road	Single lane closure	Full road closure	28 days	6.7 km	12 min	Minor	Temporary
1.17	0.3 km	In-road	None	Full road closure	3 days	9.5 km	14 min	Minor	Temporary
1.19	2.5 km	In-road	Single lane closure	Single lane closure	4 days	5.6 km	6 min	Negligible	Temporary
1.21	0.1 km	In-road	None	Full road closure	1 day	4.8 km	14 min	Minor	Brief
1.23	2.3 km	In-road	Lane closure	Lane closure	14 days	5.7 km	10 min	Negligible	Temporary
1.24	1.2 km	In-road	Lane closure	Lane closure	5 days	2.8 km	4 min	Negligible	Temporary
1.26	1.4 km	In-road	Lane closure	Lane closure	10 days	2.0 km	4 min	Negligible	Temporary
1.27	5.3 km	In-road	Single Lane Closure	Full Road Closure (with local access arrangements)	14 days	21.2 km	13 min	Minor	Temporary
1.28	0.4 km	In-road	None	Full road closure	3 days	14.1 km	17 min	Minor	Temporary
1.30	0.3 km	In-road	None	Full road closure	3 days	14.2 km	17 min	Minor	Temporary

Diversion Impact Summary

The in-road TTM sections will impact drivers' route choices and cause some delays to diverted traffic.

To avoid the stop-and-go system at lane closures, and to circumvent the full road closures where they are implemented, drivers can follow the diversions outlined above. These are routed in accordance with TII Guidelines, so they follow roads of an appropriate standard. The driver delay impact is considered Not Significant (7 Negligible and 11 Minor) in the vast majority of cases and all of these will be either Brief or Temporary Effect. Only in the case of TTM Section 2 is the impact categorised as Significant (Moderate). However, this impact is of Temporary Effect, (7 days) and the diversion will apply to HGVs only.

14.4.1.12 Public Transport Impacts

Several public transport routes have been identified near the proposed cable route through a desktop study. Many of the routes are local only, since the study area is predominantly rural. Table 14.29 outlines the public transport routes identified within or close to the study area.

The routes identified are mainly bus routes, but there are also two railway lines within or close to the construction works. The following services use these lines:

- Dublin–Sligo;
- Dublin–Maynooth;
- Dublin Heuston–Cork;
- Dublin Heuston–Galway;
- Dublin Heuston–Limerick and Ennis;
- Dublin Heuston–Waterford;
- Galway–Limerick; and
- Grand Canal Dock and Dublin Heuston–Portlaoise.

Just outside the Town of Kilcock, 1.2 km north-west of Kilcock Rail Station, the construction works will use HDD to cross beneath the tracks. These works are planned to take place during times when the trains are not in service, therefore causing no disruption to operational services.

At 1 km west of Sallins and Naas Rail Station, the construction works will use the rail bridge over the Sallins Bypass which has a redundant drainage tube. The cable will be inserted through the drainage tube, causing no disruption to railway services.

Table 14.29: Construction Impacts to Local Bus/Rail Routes

Service Number	Route Summary	Service Operator	Daily Services	TTM Section	Phase 1 & Phase 3 Impact	Phase 2 Impact
109	Busáras – Cavan Institute	Bus Éireann	Every 30-60 minutes	4; 5	Single lane closure – bus routing maintained, potential impact to journey times	Full road closure will require diversion of bus routing
109b	Busáras – Knightsbrook Hotel	Bus Éireann	Every 2 hours	4; 5	Single lane closure – bus routing maintained, potential impact to journey times	Full road closure will require diversion of bus routing
115	Mullingar-Enfield-Kilcock – Dublin	Bus Éireann	Every 30 minutes	6	Single lane closure – bus routing maintained, potential impact to journey times	Single lane closure – bus routing maintained, impact to journey times
115c	Mullingar – Killucan – Kilcock	Bus Éireann	Three times per day	6	Single lane closure – bus routing maintained, potential impact to journey times	Single lane closure – bus routing maintained, impact to journey times
(At Kilcock station)	Dublin – Sligo Rail Line	Irish Rail	Every 2 hours in AM and LT, every hour in SR and every 30 minutes in PM	7	No Impact	No Impact
(At Kilcock station)	Dublin – Maynooth Rail Line	Irish Rail	Every 2 hours in AM and LT, every hour in SR and every 30 minutes in PM	7	No Impact	No Impact
847a	Portumna-Maynooth	Kearns Coaches	One per day	8	Lane configuration maintained – service unaffected	Single lane closure – bus routing maintained, impact to journey times
847c	Portumna-Maynooth	Kearns Coaches	One per day	8	Lane configuration maintained – service unaffected	Single lane closure – bus routing maintained, impact to journey times

Service Number	Route Summary	Service Operator	Daily Services	TTM Section	Phase 1 & Phase 3 Impact	Phase 2 Impact
120/120x/ 120a/120e/ 120f	Dublin – Prosperous – Edenderry/ Newbridge	GoAhead	Every 30 minutes	14	Single lane closure – bus routing maintained, potential impact to journey times	Full road closure will require diversion of bus routing
125	University College Dublin - Newbridge	GoAhead	Two per day	26	No Impact	No Impact
126	Dublin-Rathangan	GoAhead	Every 30 minutes	26	No Impact	No Impact
130	Dublin-Athy	GoAhead	Peak hours only	27	Single lane closure – bus routing maintained, potential impact to journey times. Section of R448 will have full closure and will require diversion of bus routing	Full road closure will require diversion of bus routing
(At Sallins Station)	Dublin Heuston-Cork	Irish Rail	Every 60 minutes	19	No Impact	No Impact
(At Sallins Station)	Dublin Heuston-Galway	Irish Rail	Peak hours only	19	No Impact	No Impact
(At Sallins Station)	Dublin Heuston-Limerick and Ennis	Irish Rail	One per day	19	No Impact	No Impact
(At Sallins Station)	Dublin Heuston - Waterford	Irish Rail	Peak hours only	19	No Impact	No Impact
(At Sallins Station)	Galway – Limerick	Irish Rail		19	No Impact	No Impact
(At Sallins Station)	Grand Canal Dock and Dublin Heuston-Portlaoise	Irish Rail	Every 60 minutes	19	No Impact	No Impact

The majority of bus routes would be affected only by single lane closures. A stop-and-go system will be active at the single lane closures, which may cause delays depending on the traffic flows. Buses are expected to continue to serve the same stops, and single lane closures would only be temporary, so the impact of single lane closures on bus routes is deemed to be Negligible.

Table 14.29 shows that four bus routes – the 109, 109b, 120, and the 130 – will be impacted by full road closures and will need to follow the diversions identified in Section 14.4.1.11. The diversions identified are deemed to be **Minor**, with the following increases in journey time and closure durations:

- Bus routes 109 and 109b will be:
  - delayed for 12 minutes at the diversion for TTM Section 4, where a road closure will be active for an estimated 78 days[126], and
  - delayed for 11 minutes at the diversion for TTM Section 5, where a road closure will be active for an estimated 93 days;
- Bus route 120 will be delayed for 15 minutes at the diversion for TTM Section 14, where a road closure will be active for an estimated 36 days; and
- Bus route 130 will be delayed for 13 minutes at the diversion for TTM Section 27, where a road closure will be active for an estimated 110 days.

The closures in all cases will be temporary, and according to the EPA classification presented in Section 14.2.2, all are Temporary Effects since the duration would not exceed one year. In the case of bus routes 109 and 109b, which are affected by diversions on two different TTM sections, the road closures will not be active at the same time.

Train services would not be impacted by the construction of the Proposed Development, so impacts are deemed to be Negligible here as well.

As outlined in the TMP (Appendix 5.1), the Contractor will liaise with public bus operators in relation to lane and road closures and create a communication plan for this purpose which would outline any independent decisions made by the bus operators. Impacts to a bus stop on the R403 in Firmount West (approximate chainage 33000) are addressed in Chapter 16 of this EIAR.

14.4.1.13 Active Travel Assessment

Increased traffic can impact communities, especially where urban streets become busier, and increase severance. There may also be impacts on cycle and pedestrian routes caused by construction and diversion routes. To assess the impact on communities, pedestrian movements and cycle links, a desktop survey was carried out of such locations that are vulnerable to increases in heavy vehicle traffic using publicly available mapping. The potentially affected area is predominantly rural, with Naas being the most significant settlement near the cable route. The IEMA Guidelines define severance as *"the perceived division that can occur within a community when it becomes separated by a major traffic artery"* (IEMA 2023). Further, the IEMA Guidelines suggest *"a tentative threshold for judging the significance of changes in pedestrian amenity would be where traffic flows (or its HGV component) are halved or doubled"*.

Table 14.30 below highlights the main pedestrian crossings which will be impacted along the proposed route. The majority of crossings impacted are located in Naas; the final two in the table are located on the outskirts of Sallins.

[126] All construction durations in this chapter are an estimate and are subject to change at the detail design stage. The Contractor will seek to innovative and reduce the construction duration as far as possible. There could also be unexpected events that increase the duration. The durations are based on the current understanding of the Proposed Development and could increase or decrease in length.

Table 14.30: Pedestrian Crossings Affected

TTM Section	Location	Description
1.05 and 1.06	R158-L6228 Roundabout	Un-signalised pedestrian crossing at R158 Roundabout entrance and exit road. Cable will run through the crossing, and Joint Bay 20 is located at the roundabout
1.11	R407-Duncreevan Rd junction	Un-signalised pedestrian crossings across the Duncreevan Rd. The cable route runs through the junction.
1.23	Millennium Rd Apple Green Roundabout	Un-signalised pedestrian crossing at roundabouts in front of Millennium Rd Apple Green Roundabout entrance and exit road. Cable will run through the crossing.
1.23	Millennium Rd Kerry Group Roundabout	Un-signalised pedestrian crossing at Millennium Rd Kerry Group Roundabout entrance and exit road. Cable will run through the crossing.
1.23	Millennium Rd Millennium Park Roundabout	Un-signalised pedestrian crossing at Millennium Rd Millennium Park Roundabout entrance and exit road. Cable will run through the crossing.
1.24	Radharc An Chaislean Roundabout	Un-signalised pedestrian crossing at Radharc An Chaislean Roundabout entrance and exit road. Cable will run through the crossing.
1.24	New Caragh Rd Roundabout	Un-signalised pedestrian crossing at Caragh Rd Roundabout entrance and exit road. Cable will run through the crossing.
1.25	Naas Historic Trail	Greenway will be affected by site works as the cable runs along a 400 m stretch of the trail between the R409 and R445.
1.26	Elsmore Glen Roundabout	Un-signalised pedestrian crossing at Elsmore Glen Roundabout entrance and exit road. Cable will run through the crossing.
1.26	R445 junction	Signalised pedestrian crossing at R445 junction. Cable will run through the crossing.
1.27	Pipers Hill Junction	Two signalised pedestrian crossings affected. (Pipers hill junction). Cable will run through the two crossings.
1.27	White Well Estate	Pedestrian crossing at entrance into White Well Estate. Cable will run parallel to crossing.
1.27	White Well Estate	Signalised pedestrian crossing outside White Well Estate. Cable will run through the crossing.
1.27	Killashee View Estate	Pedestrian crossing at entrance into Killashee View Estate. Cable will run parallel to crossing.
1.27	Broadfield Estate	Signalised pedestrian crossing outside Broadfield Estate. Cable will run through the crossing.
1.27	Broadfield Estate	Pedestrian crossing at entrance into Broadfield Estate. Cable will run parallel to crossing.
1.27	Esmondale Estate	Signalised pedestrian crossing outside Esmondale Estate entrance. Cable will run through the crossing.
1.27	Kilcullen Rd Roundabout	Un-signalised pedestrian crossing at Kilcullen Rd Roundabout entrance road. Cable will run through the crossing.

TTM Section	Location	Description
1.27	Kilcullen Rd Roundabout	Signalised pedestrian crossing on Kilcullen Rd Roundabout exit onto South Ring Road. Cable will run through the crossing.

Table 14.31: Cycle Facilities Affected

TTM Section	Location	Description
1.07	Royal Canal Greenway north of R148 Bridge	Cable route crosses the Greenway.
1.23	Millennium Rd	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.24	New Caragh Rd Roundabout	Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.25	Naas Historic Trail	Greenway will be affected by site works as the cable runs along a 400 m stretch of the trail between the R409 and R445.
1.26	South Ring Road	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Killashee Primary School	Cycle lane begins at this location. Shared pedestrian/cycle facility. Cable layout runs parallel with facilities. Cycle facilities located on east side of road.
1.27	Pipers Hill Junction	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	White Well Estate	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Killashee View Estate	Cycle facilities continue up to this point. Shared pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Broadfield Estate	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Esmondale Estate	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.

Table 14.31 above highlights the current cycle facilities that may be temporarily affected by the installation of the cable. Along the Kilcullen Road and South Ring Road there is a combined cycle route length of 3.23 km. These facilities are a mixture of shared and segregated. Along the New Caragh Road and R445

Millennium Park Road there is a combined cycle route length of 3.63 km. These facilities are a mixture of shared and segregated.

In conclusion, while there are number of pedestrian and cycle routes which have been identified as being impacted along the route, due to the low construction volumes and the temporary nature of the impacts, the impact on active travel is concluded to be Negligible and of Temporary Effect. Notwithstanding, the TMP includes a commitment to provide advance warning of diversions and roadworks, as well as clear signage and physical barriers for walkers, cyclists and horse-riders, to reduce the risk of incursion within work zones or live traffic lanes.

14.4.1.14 Other Road Uses

The Drehid Landfill is located north-west of Prosperous and is served by heavy vehicles delivering waste to the facility. Some of the haulage routes designated for this purpose overlap with the cable or diversion routes:

- TTM Section 14 on the R403 between Clane and Prosperous;
- Diversion route for TTM Sections 15 and 17 on the R407 south of Clane, towards Naas;
- TTM Section 23 on the Sallins Road, northwest of Naas; and
- TTM Section 27 south of Naas on R448.

The abundance of haulage routes available to access the Drehid Landfill make it possible to circumvent the road closures that will be active along the road sections identified above. The disruption will be insignificant since the construction of the Proposed Development will result in only temporarily longer journey times for the landfill deliveries. The impact on driver delay for each of the TTM Sections above has been classified as either Minor or Negligible previously in Table 14.28 and all are classified as Temporary duration.

14.4.2 Operational Phase

The operational phase of the Proposed Development will not cause any discernible impacts on traffic since all roads will be restored to their original state after the construction is finished, and the presence of the Proposed Development along some portions of road in the study area will not affect traffic flows. Operational traffic and transport impacts will therefore be Negligible.

Where maintenance is needed along the cable, the traffic impacts will depend on the specific circumstances of the maintenance activity. The link box will require periodic inspection, for which localised, temporary traffic management will be devised by the contractor that carries out the inspection. Any maintenance-based traffic impacts would be temporary and would consist of a small number of non-HGV vehicles, therefore considered to be not significant.

14.5 Mitigation Measures

14.5.1 Traffic Management Plan (TMP)

The assessments outlined in this chapter have determined that the impacts of the Proposed Development on traffic and transport are negligible and of a temporary effect in the vast majority of cases and therefore do not require specific mitigation measures. The traffic management measures referred to in this chapter, which will be required to facilitate the construction of the proposed development, such as the proposed diversion routes, will be implemented through the adoption of a regulated and approved TMP.

The TMP is provided in Appendix 5.1. It should be noted that the TMP is included in the application and has been considered for the purposes of assessment, but is considered a 'live' document insofar as it is subject to ongoing future refinement by the appointed contractor in collaboration and agreement with the Roads Authorities. However, all such refinement will occur in the requirements of the TMP submitted as part of this application for approval, and therefore the subject of the assessment of the consenting authority.

The appointed contractor will agree temporary traffic measures, and will then adopt and monitor an appropriate way of working, in consultation with Kildare and Meath County Councils, TII and/or their agents, and An Garda Síochána as appropriate. Construction traffic will travel on predefined routes to and from the relevant sites to reduce the effects on local traffic.

The TMP will document measures to help efficiently transport components and materials to site, while reducing congestion and disruption which might impact negatively on local communities or general traffic and, in particular, emergency services.

Signed diversion routes, outlined in this chapter but with final agreement with the Roads Authorities, will be provided to mitigate journey disruption, and to minimise potential driver delay. Where practically achievable, diversion routes will not apply outside of the worksite hours of operation.

During the construction phase, signage will be installed to warn road and recreational route users to the presence of the works access and the associated likely presence of large or slow-moving construction traffic.

To minimise inconvenience to the local community in terms of obstructive parking, adequate car parking for permanent site personnel, visitors and deliveries will be provided within the site compounds. Car parking will not be permitted on any public road network adjacent to the site, to maintain sight lines and minimise the potential for obstruction and delay for other road users.

Furthermore, only vehicles needed for construction will be permitted to attend cable route worksites. Car sharing will be promoted to construction personnel by the contractor during the induction process.

The appointed contractor will nominate a person to be responsible for the coordination of all elements of traffic and transport during the construction process (liaison officer). This person will liaise with the local community and be a direct point of contact within the contractor organisation for the community to contact for information or to discuss the traffic management.

14.5.2 Construction Access Arrangements

Transportation, including deliveries to and from the construction areas, will be via the existing public road network. Given the nature of the cable route's construction, there will be multiple worksites along the route throughout the construction programme. The proposed programme of worksite locations will be confirmed by the appointed contractor as an integral part of their adopted TMP. All construction vehicle drivers will be instructed to access their destination worksite via an approved route.

14.6 Residual Effects

14.6.1 Construction Phase

The in-road TTM sections will impact drivers' route choices and cause some delays to diverted traffic. The driver delay impact is considered Not Significant (7 Negligible and 11 Minor) in the vast majority of cases and all of these will be either Brief or Temporary Effect. Along the approximately 53 km cable route, there will be one section (4 km in length) that will have a temporary but significant effect for HGVs. This section along the R156 in County Meath will have a significant effect as a result of the proposed Single Lane Closure with Heavy Goods

Vehicles Diversion, which will be required to use the diversion because of how narrow the road is at this location. There will be a large diversion of 27.4 km that will be signposted from the affected regional road to an alternative regional road. While the effect will be significant, the impacts will be limited to the construction of the cable trench, which will be a temporary impact – lasting approximately seven working days. TTM Section 2 is the impact categorised as Significant (Moderate). However, this impact is of Temporary Effect.

It is acknowledged that inconveniencies will be caused in some areas due to the diversion routes and construction of the cable route, however whilst the overall construction period is over several months, all construction access routes will only be affected during certain periods and therefore any impacts will be on a temporary basis. The traffic management measures referred to in this chapter, which will be required to facilitate the construction of the Proposed Development, such as the proposed diversion routes, will be implemented through the adoption of a regulated and approved TMP.

14.6.2 Operational Phase

There are no significant residual traffic and transport effects predicted during the operational phase. The operational phase of the Proposed Development will not exhibit any discernible impacts on traffic since all roads will be restored to their original state after the construction is finished and the presence of the Proposed Development along portions of roads in the study area will not impact or increase traffic flows.

14.7 Conclusion

This chapter has assessed the potential impacts of the Proposed Development on the traffic and transport networks in the study area as a result of both the construction and operational phases.

The assessment has been informed by traffic data from surveys undertaken in October 2022, as well as construction vehicles trips provided from the construction programme (outlined in Chapter 5). The impact of the construction traffic on the road network is predicted to have a Negligible impact and this is expected to be of Temporary duration.

With regards to traffic diversions as a result of road closures, the driver delay impact is considered Not Significant (7 Negligible and 11 Minor) in the vast majority of cases and all of these will be either Brief or Temporary Effect. Only in the case of TTM Section 2 (a 4 km section on the R156) is the impact categorised as Significant (Moderate). However, this impact is of Temporary Effect, (7 days) and will apply to HGVs only.

Other effect for public transport or active travel user have been assessed to range from Negligible to Minor and all are of a Temporary Effect.

The TMP (included in Appendix 5.1) outlines the cable route based on the TTM sections and identifies how the construction works will affect each section of road – whether it be a lane closure, diversions, and/or road closure with local access. The TMP also outlines the traffic management measures that will be required to facilitate the construction of the Proposed Development, such as the proposed diversion routes. The appointed contractor for the Proposed Development will refine the TMP in consultation with the relevant authorities and stakeholders, including agreement of appropriate traffic management measures etc.

15. Agronomy and Equine

15.1 Introduction

This chapter presents the assessment of potential impacts on Agronomy and Equine arising from the construction and operation of the Proposed Development.

15.2 Methodology

This chapter is prepared in accordance with the standard guidelines for environmental assessment published by the EPA in May 2022. The assessment of effects on agricultural and equine (horse) interests involves:

- Evaluation of the baseline environment, the types of farms and the sensitivity of farms and equine facilities within the study area. The study area is comprised of 68 agricultural land parcels along the Proposed Development where there will be temporary or permanent landtake;
- Evaluation of the nature and magnitude of the impacts on farms along the within the study area and the effects on agriculture within County Kildare and County Meath (i.e. regional effects); and
- Having considered the sensitivity of the baseline agricultural and equine environment and the magnitude of effects, the effect significance is predicted for:
  - Each land parcel assessed to be directly affected by the Proposed Development;
  - Agriculture including equine along the Proposed Development (i.e. locally); and
  - Agriculture including equine within County Kildare and County Meath (i.e. regionally).

These three elements of the methodology are described in Sections 15.2.2, 15.2.3 and 15.2.4. The agricultural and equine assessment assesses the changes that will occur to the agricultural and equine environment as a result of the Proposed Development.

15.2.1 Data Sources Used in the Assessment

The following data sources were used:

- Census of Agriculture 2020 (CSO.ie). The average size and type of farms in County Kildare and County Meath was determined from the 2020 Census of Agriculture;
- Your Grid, Your Views, Your Tomorrow – Responding to Equine Concerns (EirGrid, 2014);[127]
- Land Registry mapping available on PRAI.ie was used to determine land ownership boundaries of farms along the Proposed Development;
- Baseline information gathered from roadside surveys in March 2021 and February 2023. This information was used to assess impacts on individual farms;
- Consultation with EirGrid Agricultural Liaison Officers in February 2024 to gather information based on their professional experience and engagement and consultation with affected landowners;

[127] https://www.eirgridgroup.com/site-files/library/EirGrid/EirGridEquineReview.pdf

- Aerial Photography and mapping was used as an aid in examining farm layout and land quality;
- The baseline crops and grass yield data referred to in Section 15.2.3, based on:
    - Average cereal crop yields 2008 – 2022 which is available from the CSO.ie, Crops and Livestock June Final Results (data accessed in December 2023).
    - Baseline grass yields and trends derived from Teagasc Ballyhaise Agricultural College 2008 – 2021 and UCD from 2016 – 2022 (data accessed in December 2023). This information is used to determine baseline trends as outlined in Section 15.2.3 when assessing magnitude of impact;
- Meath County Development Plan 2021 – 2027 (Meath County Council, 2021) and Kildare County Development Plan 2023 – 2029 (Kildare County Council, 2023); and
- Information from public consultation (Traverse, 2022).

15.2.2 Evaluation of the Baseline Environment

Background information was gathered on all farm types and sizes within the study area from the 2020 Agricultural Census data, consultation with EirGrid Agricultural Liaison Officers (February 2024), roadside surveys conducted in March 2021 and February 2023 and examination of aerial photography.

The assessment of farm sensitivity is based on professional judgement. The main criterion used to determine the sensitivity is the farm enterprise. For example, equine farms are generally high or very high sensitivity because horses are sensitive to disturbance (e.g. construction noise) and where racehorses are being trained there is a risk to the jockey if horses are disturbed. Dairy farms are high sensitivity because it is critical that the movement of cows between the grazing plots and the milking parlour is not interrupted (this could be caused where there is severance of access). Table 15.1 shows the sensitivity of agricultural enterprises within the study area.

Table 15.1: Criteria for the Assessment of Sensitivity

Farm Enterprise	Sensitivity
Stud farm, equestrian centre, race horse training enterprise, horticultural / nursery enterprise, pig/poultry farm	High – Very High
Dairy farm, Intensive equine enterprise	High
Non-dairy livestock enterprises, including beef cattle and sheep, land used primarily for hay / silage, small non-intensive equine enterprise	Medium
Tillage and mixed tillage and livestock (beef, cattle and sheep)	Medium
Small livestock enterprises, rough grazing land, scrub plots and woodland / forestry	Low

Other criteria used on a case-by-case basis to infirm the assessment of sensitivity are the size of land parcels (small land parcels may be unviable and have a low sensitivity) and land quality (poor land quality indicates low sensitivity).

15.2.3 Evaluation of the Magnitude of Impact

The magnitude of the potential effects is assessed by predicting the degree of change in the physical nature of the affected land parcel or on agriculture within the study area. For example, if the Proposed Development takes 10% of an affected agricultural land parcel, and provided the farm enterprise can continue during the operational phase of the Proposed Development, it is reasonable to predict that the yield from the land parcel will be reduced by 10%.

To quantify the magnitude of the effect, typical baseline trends[128] in the agricultural environment are examined and interpreted using professional judgement. Effects which result in a 2.5% to 5% variation in yield of grass or crops are considered to create a low magnitude effect on the farm and are similar to natural baseline trends in yield. Between 5% and 10%, the magnitude of yield loss is starting to exceed the natural baseline trends and is considered medium magnitude. Yield effects which exceed 10% are considered to be high magnitude. There are other factors which may also affect the magnitude of effects such as severance or separation of land, the duration of effect, the quality of land affected and impact on farmyards and other farm facilities. For example, if land take from the Proposed Development takes 7% of an affected land parcel the magnitude is likely to be medium. However, if in addition there is severance or land separation of 20% of the farm the magnitude is likely to be high or very high.

Table 15.2 shows the magnitude criteria used in the assessment. These indicative criteria are based on analysis of baseline trends in grass and crop yields and professional judgment

Table 15.2: Criteria for the Assessment of Magnitude of Effects

Indicative Criteria	Magnitude of Effects
A high proportion of the land permanently taken (>10%) A high proportion of farm permanently separated (> 15%) Farm buildings or water sources may be affected permanently	High – Very High
A medium proportion of the farm permanently taken (5% -10%) A medium proportion of farm permanently separated (7% -15%) Farm buildings or water sources may be affected but can be replaced Temporary (construction) impacts which have long term effects	Medium

[128] According to CSO data (2008 – 2022) the yield of spring barley and winter wheat has varied by 7.9% and 9% respectively from the average mean yield. Teagasc data for grass production at Ballyhaise Agricultural College (2008 – 2021) shows the natural trend is for grass production to vary on average by 6.5% from year to year. UCD data for grass production at Lyons Estate (2016 – 2022) shows the natural trend is for grass production to vary on average by 6.2% from year to year.

Indicative Criteria	Magnitude of Effects
A small proportion of the farm permanently taken (2.5% - 5%) A small proportion of farm separated or no separation (2.5% - 7%) Farm buildings or water sources generally not affected but if affected can be replaced Temporary (construction) impacts which have short – medium term effects	Low
A very small proportion of the farm taken (<2.5%). A very small proportion of farm separated or no separation (<2.5% of the farm) Temporary (construction) impacts which do not have residual effects	Negligible – Very Low

The duration of the effect will affect the magnitude – the longer the effect the higher the magnitude. Effects that occur during the construction phase (e.g. construction noise and vibration) will generally result in low or very low magnitude because of thebe of shorter duration, and therefore lower magnitude, than residual effects which occur during the operational phase (e.g. permanent land take). Damage to land due to excavation and construction traffic is generally not permanent and is assumed to be medium term duration (7 – 15 years) except at the construction compounds where the damage to land is assumed to be medium to long term.

15.2.4 Evaluation of the Significance of Impact

Once sensitivity of the receptor and magnitude of potential effect has been determined, these are used together to define the overall significance of effect as per Section 3.7.3 of the May 2022 EPA guidelines. An effect on a farm with a low sensitivity will not be as significant as a similar magnitude of effect on a farm with a high sensitivity.

Table 15.3 is based on **Table 15.3**EPA guidelines (May 2022) for assessment of significance, adapted using professional judgement such that they are appropriate for agricultural impact assessment. In general, the effects from the Proposed Development on agriculture are adverse in nature.

Table 15.3: Comparison of Significance of Effect Criteria used in this Assessment with the EPA Guidance (May 2022)

Significance of Effects as per EPA 2022 Guidance	Significance of Effect used in this Assessment
Imperceptible An effect capable of measurement but without significant consequences	**Not Significant**

Significance of Effects as per EPA 2022 Guidance	Significance of Effect used in this Assessment
Not Significant An effect which causes noticeable changes in the character of the environment without significant consequences	An impact which may result in measurable effects and / or noticeable changes but the consequences are not significant.
Slight An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.	**Slight Adverse Effect** An effect which causes noticeable changes in the character and management of a farm in a minor way. The farm enterprise experiences inconvenience as a result of the proposed development.
Moderate An effect that alters the character of the environment in a manner that is consistent with existing emerging trends.	**Moderate Adverse Effect** An effect which alters the character of a farm in a manner that requires moderate changes in the management and operation of the farm. The farm enterprise can be continued as before but with increased management or operational difficulties.
Significant An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.	**Significant Adverse Effect** An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the farm. The farm enterprise can be continued but will require major changes in management and operation of the farm. This would typically occur where the farm was split in two due to separation but where access between the separated portions and the farm buildings could still be achieved effectively.
Very Significant An effect which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment.	**Very Significant Adverse Effect** An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the farm. The effect is similar to a Significant Adverse effect, however due to factors such as the sensitivity of the receptor or the magnitude of impact the effect is categorised as Very Significant Adverse.

Significance of Effects as per EPA 2022 Guidance	Significance of Effect used in this Assessment
Profound An effect which obliterates sensitive characteristics.	**Profound Adverse** An effect which obliterates sensitive characteristics of the farm. The farm enterprise cannot be continued because of the Proposed Development. This would occur where land-take was of such a scale that the remaining land would not form a viable unit or where separation was of such a nature to make the holding unworkable or where important farm buildings and facilities were removed and could not be replaced. In some situations, the farm enterprise may continue but will require dramatic changes in the future management and operation of the farm, such that the scale and operation of the enterprise is changed dramatically.

Source: Based on Table 3.4. EPA's 'Guidelines on the information to be contained in environmental impact assessment reports' (EPA, May 2022)

15.2.5 Technical Difficulties Encountered

No technical difficulties or limitations in the information obtained for the assessment were encountered.

15.3 Baseline Conditions

15.3.1 Land Quality and Soil Types

Digital soils data and maps sourced from the Irish Soils Information System, accessed in September 2023, (Teagasc, available from http://gis.teagasc.ie/soils/) along with roadside survey data was used to describe the soil types along the Proposed Development. The soils along the Proposed Development consist of mainly Surface Water Gleys in the area north of Clane and a combination of Luvisols, Brown Earths and Alluvial soil types to the south of Clane. In general, the land quality along the Proposed Development is good quality. The Surface Water Gleys are more suited to grass production while Luvisols and Brown Earths are more versatile and are also suited to tillage. However, in the east of the country Surface Water Gleys are often used for tillage due to the low rain fall. The land quality is suitable to support very high sensitivity enterprises such as stud farms and high sensitivity enterprises such as dairy enterprises. Farm types and their sensitivity are provided in Table 15.1, and further information specific to the Proposed Development is provided in Table 15.4 and Table 15.5.

15.3.2 Farm Types

Table 15.4: Comparison of Farm Types and Sensitivity within County Meath and County Dublin and within the Study Area

Enterprise Size & Type[129]	County Kildare	County Meath	Along Proposed Development[130]	National	Sensitivity
Average farm size (ha)	44.8	43.8	44[131]	33.4	-
Tillage / Beef / sheep / mixed / grass cropping (%)	92	88	85	85	Medium
Dairy (%)	6	11	1	11	High
Other (mainly equine) (%)	2	1	14	1	Medium – very high
[132]Number of horses / km^2	4.6	2.4	-	2.3	-

The average size of farms along the Proposed Development is likely to be reflective of the County averages and therefore is larger than the national average (44 ha versus 33.4 ha). The majority of the farm enterprises within the study area are medium sensitivity (i.e. beef / sheep / tillage / grass cropping). A comparison to the national statistics shows that within County Kildare the number of dairy farms is lower than the national average while the concentration of equines is significantly higher. Within County Meath (37% of the Proposed Development) the number of dairy farms and number of equines is similar to the national average.

Of the 68 land holdings where direct effects would arise from the Proposed Development there are ten farms with horses (15%) and one high sensitivity dairy farm (1%). Of the ten equine enterprises, three are very high sensitivity stud farms, three are high sensitivity equine enterprises and four are medium sensitivity equine enterprises.

[129] 2020 Agri Census - https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020-preliminaryresults/farmstructure/

[130] These figures relate to the 68 land holdings where there are direct effects from the Proposed Development i.e. either temporary or permanent land-take or wayleaves

[131] The average size of directly affected land parcels is 27.4ha. However, it can be assumed that the average size of directly affected farms is similar to the county average, i.e. 44ha, when outlying lands remote from the Proposed Development are included.

[132] 2010 Agri Census; area based on Table 1, number of equines based on Table 8D; equine data only available from 2010 data at time of publication

Table 15.5: Farm types and sensitivity within the study area

Enterprise Size & Type	Number along Proposed Development	Sensitivity
Beef / sheep / mixed / grass cropping	48 (71%)	Medium
Tillage	9 (13%)	Medium
Dairy	1 (1%)	High
Equine	3 (4.5%) 4 (6%)	High Medium
Stud Farms	3 (4.5%)	Very High

15.4 Potential Effects

15.4.1 Construction Phase

15.4.1.1 Potential construction effects where construction works are entirely in-road

The installation of the proposed underground cable in-road will have potential effects on farms adjoining these works for a period of two to three months; based on a rate of construction of 40-50 m per day. During the construction period the following potential effects are identified:

- Construction dust, noise and movement:
    - The potential noise and dust effects will arise from the movement of construction machinery and excavation and handling of soil materials. Deliveries of materials and construction machinery noises and movements have the potential to startle livestock in adjoining agricultural land; and
    - The likely effects resulting from dust from in-road construction sites will not have a significant effect on grazing livestock (including equines) and livestock (including equines) habituate to machinery and construction noises on farms without adverse effects. Therefore, before mitigation the potential effect from construction dust, noise and movement is assessed as not significant;
- Disturbance to land access in relation to farm machinery and livestock movements:
    - Disturbance and delays caused to local traffic during the construction phase has the potential to affect how farmers access their lands to carry out essential activities such as spreading of fertilisers and slurry and harvesting crops. It is important for agricultural operations that bulk deliveries of farm inputs such as fertiliser and feed are unrestricted and that milk lorries have access to dairy farms to collect milk. Similarly, it is important that access for tractors and HGVs to and from grain stores, and that equine transport is not significantly disrupted.

  - The movement of livestock along country roads to access outlying grazing land or housing is commonplace in Ireland and within the study area. It may arise more frequently on some dairy farms where a herd of cows may cross a public road to gain access to the milking parlour. While it is envisaged that there will be disturbance and inconvenience for several months due to traffic management on the public road network, the construction and traffic management plan commits to maintain effective access to agricultural land by farm machinery, transport lorries and livestock transport and movement. Therefore, before mitigation this potential effect is not significant;

- Disturbance to land drainage and water quality; and

  - The potential effect will result from construction activities interfering with surface water run-off from or to adjoining agricultural lands. There is the potential to cause flooding if drainage is impeded. Where there is sediment or construction material run-off from the construction site it has the potential to pollute water sources for livestock and potable water sources for farmyards and dwellings. Before mitigation this potential effect is assessed as not significant. The risk from construction effects on potable and livestock water sources is very low. Intersection of land drains from adjoining agricultural land is unlikely during in-road construction;

- Other potential disturbance issues:

  - Where soil has been stored in heaps there is the potential for weed propagation on the heaps and spread of theses weeds to adjoining agricultural land. This potential effect is short-medium term and not significant; and

  - The removal of trees and hedgerow, at passing bays and along working area, during the construction phase, will result in a reduction in available shelter. Removal of relatively short lengths of hedgerow across the 30m wide working area will not result in significant effects due to loss of shelter. There will be a 30m wide construction area for the cable trench in off-road sections. At passing bays, the width is generally 5.5m wide (see Chapter 5 of this EIAR for further details).

Where the cable is installed in the road there are no potential effects on agricultural land due to land take. Having assessed the effects of the works that are carried out entirely within the public road, there is no potential for significant pre mitigation impacts on agronomy and equine.

15.4.1.2 Potential construction effects where construction works are off-road in agricultural land

While the entire construction phase of an underground cable trench in agricultural land is expected to take 2.5 to 3.5 years, during this period it is expected that construction activity will occur for two to three months on any single land parcel. This is based on a rate of construction of 40-50 m per day with additional time required for construction of access tracks, cable jointing and energisation. During this period direct effects are predicted to arise at 68 farms within the study area (See Figure 15.1) where works will be carried out in agricultural land.

The particular elements of the Proposed Development which will be constructed on agricultural land include:

- Where constructed within agricultural land there will be a proposed 30 m wide construction working area. Within this area there will be a haul road along the cable trench. Where directional drilling is required (e.g. some water and road crossings) additional working areas will be required (anticipated to be 0.5ha or less). Temporary laydown areas will be required for the delivery of material to the construction site;

- An underground trench 1.5 m wide and 1.7 m deep containing the underground cables will be excavated and back-filled;

- Joint bays, communication chambers and link boxes are located on average in 745 m intervals. These elements will be contained in a precast concrete box measuring 10 m long x 2.5 m wide. The communication chamber and link boxes will be 2m long and 2m wide. Where located in agricultural land the surface of the concrete boxes will be visible at ground level and there will be a 3 m wide hard standing area around each joint bay;

- Temporary construction compounds (No. 5 in agricultural holdings Ref Nos 1200, 1139, 854, 608 and 465 as per Figure 15.1)) are required for storage of machinery and materials;

- Forty eight passing bays will be located on agricultural land (see Appendix 15.1). These are areas adjoining the public road network where the local traffic can travel over when the local road is partially or wholly blocked due to the construction of joint bays These areas will be used for the construction period after which they will be reinstated and returned to agricultural use; and

- Temporary access tracks (4m wide) will be constructed along the trench within the working area. Permanent access tracks (4m wide) will be constructed to access some joint bays.

During the construction period the following effects are expected to arise:

- Disturbance and damage to land:

    - Temporary land-take will occur along the working area and at the sites of the construction compounds, stream and river crossings and traffic passing bays. The 30 m wide construction working area and passing bays will be fenced off for a period of two to three years potentially affecting three cropping years and reducing land available for grazing, forage production and cropping. The construction compounds (located on land parcels 1200, 1139 & 1082, 854, 608 and 465) will be fenced off for a period of 42 months potentially affecting five cropping years. The excavation of a 1.5 m wide trench, stripping of topsoil and movement of heavy machinery will disturb the soil structure and natural drainage. It is likely that the trench will intersect with land drains from adjoining agricultural land and this will interfere with land drainage. Without mitigation the damage to land and soil will have a medium to long term effect (i.e. greater than 15 years) on areas that are directly affected. Based on the small areas of land parcels affected by the Proposed Development and the medium to long term duration of the effects, the potential effect before mitigation due to damage to land and soil range from not significant to slight adverse;

    - Where the working areas cross agricultural land severance of services such as pasture water pipes and power cables (electric fencing) may necessarily occur. Such severance of services would be temporary and the potential effects before mitigation are anticipated to range from not significant to slight adverse;

  - Before mitigation there is the potential for the spread of soil borne diseases and noxious weeds due to excavation, and movement and storage of topsoil. Where construction machinery cross farm boundaries there is the potential for the spread of farm diseases (e.g. Tuberculosis). These potential effects are assessed as not significant before mitigation;

- Construction dust, noise and movement;

- The potential noise and dust effects will arise from the movement of construction machinery and excavation and handling of soil materials. Deliveries of materials and construction machinery noises and movements have the potential to startle livestock in adjoining agricultural land. The likely effects resulting from dust from off-road construction sites will not have a significant effect on grazing livestock (including equines) and livestock (including equines) habituate to machinery and construction noises on farms without adverse effects. Therefore, before mitigation the potential effect from construction dust, noise and movement is assessed as not significant. Disturbance to land access (severance) in relation to farm machinery and livestock movements:

  - In addition to disturbance on the local road network the construction of the underground cable on agricultural land will interfere with access within farms. The working areas will be fenced off for a period of two to three and a half years. This will potentially sever access to land and affect how farmers move livestock and access their lands to transport farm produce and inputs and to carry out essential activities such as spreading of fertilisers and slurry and harvesting crops. Parts of fields adjoining the proposed working areas (e.g. corners of fields) may be too small to farm effectively with large farm machinery. Without mitigation this disturbance could have effects could be not significant to slight adverse depending on the degree of severance;

- A reduction in farmed areas during the construction phase may impact on farmer's ability to adhere to the terms and conditions of Department of Agriculture, Food and the Marine area-based schemes. For example, a reduction in area farmed is likely to increase the organic nitrogen stocking rate on a farm potential resulting in non-compliance with nitrates regulations and resulting financial penalties. A reduction in area in land assigned to environmental scheme options is likely to result in financial penalties;

- Disturbance to land drainage and water quality.

The potential effect will result from construction activities interfering with surface water run-off from or to adjoining agricultural lands and interference with land drainage. Severing land drains would impede drainage and possibly cause flooding in adjoining land. Where there is sediment or construction material run-off from the construction site it has the potential to pollute water sources for livestock and potable water sources for farmyards and dwellings. The presence of joint bays on agricultural land may potentially sever or block land drainage systems Before mitigation this potential effect is assessed as not significant – slight adverse because the Proposed Development directly impacts on relatively small proportions of affected land parcels. Before mitigation, construction phase impacts range from not significant to slight adverse. There are eight land parcels where slight adverse impacts arise before mitigation. Land parcels Ref No 608, 1139 & 1082, and 1200 (Refer to Figure 16.1) are medium sensitivity and will have temporary working areas and construction compounds which will reduce their size by 4.9%, 1.6% and 3.7% respectively for the duration of the construction period (42 months). The area reduction and the temporary duration of the effect will result in a low magnitude of effect and therefore a slight adverse effect on these land parcels. Land parcels Ref No 396, 413 and 580 are medium sensitivity land parcels and will have temporary working areas which will reduce their size by 11%, 20% and 6% respectively for several months during the construction period. Land parcel No 580 will be severed (before mitigation). The temporary duration of the effect will result in a low magnitude of effect and therefore a slight adverse effect on these land parcels. Land parcels Ref No 20 and 1223 & 1227 are low sensitivity land parcels and will have temporary working areas which will reduce their size by 42% and 23%

respectively for several months during the construction period. The low sensitivity combined with the temporary duration of the effect will result in a medium magnitude of effect and therefore a slight adverse effect on these land parcels.

15.4.2 Operational Phase

The following effects could arise during the operation phase:

- Permanent land-take:
    - Where the cables occur on agricultural land there will be a permanent 5 m wide easement. Permanent land-take of agricultural land will be required at the site of joint bays and the roads required to access these areas. There will be permanent access tracks located in 14 land parcels. Where joint bays are located in agricultural land there will be a hard standing area around the joint bay and the concrete roof of the joint bay will be located at the surface and is part of the permanent land take, The total permanent land-take area due to pipeline easement and joint bays on agricultural land for the Proposed Development is 11 hectares; and
    - Trees and hedgerow will be permanently removed along the 30m wide working area, at passing bays and adjoining in-road construction areas. Before mitigation, this will not have a significant effect on shelter;
- Permanent disturbance:
    - There will be 1,000 mm of soil material above the cables in agricultural land. This material will typically be 300 mm of topsoil and the remaining material will be suitable excavated material including subsoil. The 1,000 mm of soil will facilitate activities such as ploughing and there will be no significant restriction on normal agricultural activities. The underground cable will be housed in concrete structures and will potentially impact on the productivity of land above it. The areas of ground occupied by the joint bays, hard standing and the access tracks will not be available for agricultural use and will have to be avoided when farmers are mowing grass, ploughing or cultivating. While the Proposed Development does not cross existing commercial forestry, future land use such as commercial forestry and tree planting will be set back from the cable route. The set back distances will be agreed between EirGrid and ESB and affected landowners on a case-by-case basis depending on what tree species are planted. Please see Chapter 17 (Landscape and Visual) of this EIAR for further details on tree and hedgerow planting. Building agricultural buildings in close proximity to the cable will also be subject to restrictions and agreement from ESB. The cable will require routine maintenance along the entire length of the cable route. Inspection vehicles and personnel will access joint bays, link boxes and communications chambers on an annual basis for inspection and for any necessary maintenance. This has the potential to cause damage to field surfaces and disturbance to livestock;
    - There will be cable markers located in field boundaries crossed by the Proposed Development. This could potentially disturb hedgerow trimming / cutting operations;
- Before mitigation the effect from permanent land take and permanent disturbance is not significant in sixty land parcels and slight adverse in eight land parcels. In land parcels Ref Nos 20, 396, 580, 1200 and 1261 there will be permanent access tracks and the permanent land take (including the permanent easement) will be 4%, 5.5%, 4.5%, 4% and 2.6% respectively, and this, in combination with the areas with medium-term damage to land, results in slight adverse effects. Land parcels 413, 608

and 1223 have permanent easement land takes of 9%, 0.5% and 10% respectively and this, in combination with the areas with medium-term damage to land, results in slight adverse effects;

- Electric and Magnetic Fields (EMF):
  - The food quality standards written by Bord Bia for Beef, Lamb, Milk and Cereals and Farm Animal Welfare Advisory Council Guidelines for calf, dairy herds, cattle, sheep horses and pigs do not refer to electromagnetic fields and therefore, this assessment concludes there are no significant effects on animal welfare and food quality. EirGrid's design standards require all underground cables to operate to existing public (including farmers) exposure guidelines from ICNIRP and as such there will be no effects from EMFs related to underground cables. Before mitigation the effect from EMF is not significant.

15.5 Mitigation Measures

15.5.1 Construction Phase

The following mitigation measures will be implemented to address the impacts on agriculture (including equine):

- The appointed contractor will maintain close liaison with local community representatives and landowners to provide them with adequate progress information and advance notice of works. This will facilitate planning the maintenance of access to land to match the needs of the landowner. Scheduling of works will have to be agreed with each landowner to facilitate the operation of the farm and minimise disturbance. Where it is necessary to move livestock along public roads or across the working area this will be facilitated by the appointed contractor;

- Landowners with lands adjoining sites where rock breaking takes place will be notified in advance of these activities;

- Traffic management plans will ensure that farmers and agri-business have adequate access to farmyards and land so that the transport of farm inputs and produce is not significantly affected;

- Mitigation measures for the control of dust as set out in the mitigation measures section of Chapter 8 (Air Quality) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of water quality and as set out in the mitigation measures section of Chapter 12 (Hydrology) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of noise and vibration as set out in the mitigation measures section of Chapter 9 (Noise and Vibration) will be implemented by the appointed contractor;

- The appointed contractor will comply with any regulations pertaining to the control of farm diseases as specified by Department of Agriculture Food and the Marine and will employ reasonable precautions against spreading any such farm disease. The contractor will operate a biosecurity plan where machinery and personnel that are moving between farms will have adequate available disinfection facilities and equipment to ensure that disinfection can take place as required. ESB and/or its appointed contractor will also take due notice and consideration of reasonable concerns expressed by landowners or occupiers prior to entry; and

- Where field boundaries are affected, replanting and fencing will be used to ensure the boundaries are maintained between landowners and within existing field systems. Therefore no permanent restructuring occurs. Hedgerows will be replanted with species-rich varieties and with suitable fit for purpose fencing in-line with Teagasc and DAFM guidelines[133]. However technical considerations may limit planting above the underground cable. Where replanting is not feasible, suitable fit for purpose stockproof fencing will be provided with standard agricultural gates provided where required. Access between landowners will not be provided except where required on the joint bay access tracks (e.g. between Chainage 700 and 3400 – access track to Joint Bays 1-4). Double gates will be provided at field boundaries between landowners on these access tracks. The gates will be locked and maintained by ESB with no access provided to the landowners. Double fencing will be provided between separate landowners for biosecurity between adjoining farms;

- The appointed contractor will adhere to mitigation specified in this EIAR and the Construction Environmental Management Plan (Appendix 5.4). Following the mitigation measures employed for the re instatement of land (bullet points hereunder) the potential long-term (>15 years) damage to soil at the working areas will be reduced to medium-term (7-15 years) and the damage to land and soil at the construction compounds will remain long-term. The contractor will:
  - Maintain pre-entry records;
  - Erect fit for purpose livestock proof fencing to prevent straying livestock;
  - Maintain and repair existing field drainage systems to restore the drainage of land to the condition that prevailed before the proposed works;
  - Store soil separate from the works traffic ensuring minimum amount of damage and disturbance to excavated soil material;
  - Reinstate the land so that it is level and surface is free of stones and weeds; and
  - Treat soil compaction by ripping the soil to the required depth to address such compaction.

15.5.2 Operational Phase

The following measures will be applied during the operational phase:

- The drainage reinstatement will not impede the drainage of surrounding agricultural lands and where land drains have been intersected or blocked during construction these will be re connected or diverted to a suitable outflow;
- The loss of agricultural land due to the construction of the Proposed Development would be a permanent loss which cannot be mitigated except through compensation. Restriction of Common Agricultural Policy (CAP) payments, farmyard building, commercial forestry and commercial tree planting will be addressed by compensation where applicable; and
- Routine maintenance and inspection of cable infrastructure will where possible be notified in advance to minimise disturbance to livestock and farm enterprises. If faults occur excavation of soil may be required resulting in disturbance and crop loss. The risk of such faults is low and therefore the frequency of this type of disturbance is very low.

[133] https://www.teagasc.ie/media/website/crops/forestry/advice/stockproofhedge.establishment.factsheet_2.pdf

15.6 Residual Effects

The construction and operation of the Proposed Development which is located entirely in-road i.e. within the public road network, will not significantly affect agriculture (including equine). There are sixty-eight land parcels within the study area where direct effects will arise. Forty three of these land parcels will have permanent wayleaves.

The effects are confined to very small areas and mainly occur at the edge of the land parcels. In the affected land parcels, the effects are due to the presence of joint bays and surrounding hard standing areas, access tracks, passing bays and construction areas at watercourse crossing points. The construction works and traffic diversions at these sites is temporary (i.e. a low number of months) and the proposed area of passing bays is less than 0.25 hectares. The construction area at the smaller watercourse crossing sites is proposed to be less than 0.15 hectares. The construction area at directional drilling sites is proposed to be less than 0.5 hectares. The area around joint bays and the access tracks to the joint bays will be permanently lost to agricultural production and will cause disturbance to machinery operations such as cutting grass, ploughing and cultivation. The permanent easements will place an additional permanent disturbance effect on the affected land parcel because these easements will be inspected on a regular basis, for example, joint bays will be inspected once per annum. The agricultural land at these sites will be reinstated within two to three years.

Of the eight land parcels which have pre mitigation slight adverse effects arising from the construction period only land parcel 608 will have slight adverse residual effects after mitigation. This is due to the medium – long term damage to land at the site of the construction compound.

15.6.1 Residual Impacts on Individual Land Parcels

Table 15.6: Summary of Residual Impacts on land parcels along the Proposed Development

Impact Level	Number within the study area	Number within the study area with permanent easements or land-take
Not significant	60	35
Slight adverse	8	8
Moderate adverse	-	-
Significant adverse	-	-
Very significant adverse	-	-
Profound adverse	-	-
Total	**68**	**43**

Of these five land parcels there will be two slight adverse residual impact in land parcels 608 and 1200. In these land parcels there is medium to long term damage to land at the sites of the construction compounds and in land parcel 1200 there is a permanent access track. This combined with the area around joint bays and the access tracks to the joint bays will be permanently lost to agricultural production. The permanent easements will place an additional permanent disturbance effect on the affected land parcel because these easements will be inspected on a regular basis, for example, joint bays will be inspected once per annum.

Of the sixty eight land parcels where there are direct effects on agricultural land the residual impact is assessed as not significant in sixty land parcels. The individual land parcel assessments are shown in Appendix 15.1 and summarised in Table 15.6. The location of these land parcels is shown in Figure 15.1. Slight adverse residual impacts arise in eight land parcels. All the slight adverse residual impacts arise in land parcels where the underground cable is located on agricultural land and there is a permanent easement. None of the slight adverse residual impacts affect high or very high sensitivity enterprises. After mitigation the following residual slight adverse effects arise;

- Land parcel 20 (ch 52+000) is a small low sensitivity grassland plot where there will be an access track, joint bay No 70 and permanent easement at the edge of the land parcel. There will be medium term damage to soil on 23% of the land parcel;
- Land parcel 396 (ch 37+250) is a medium sensitivity tillage plot. There is an access track into joint bay No 37 and a directional drilling compound;
- Land parcel 413 (ch 37+000) is medium sensitivity grassland plot where 20% of the land parcel will have damage to land due to directional drilling site (Liffey Crossing) and there will be a permanent easement at the edge of the land parcel;
- Land parcel 580 (ch 31+250) is a medium sensitivity tillage plot with a permanent access track into joint bay No 42, easement across the middle of the land parcel and medium-term damage along the working area;
- Land parcel 608 (ch 30+750) is a medium sensitivity land parcel and will have slight adverse residual effects after mitigation. In addition to the presence of the concrete cable encasement structures in the ground there will be medium–long term damage to land at the site of the construction compound;
- Land parcel 1200 (ch 2+750) is a large medium sensitivity grassland plot. It will have a permanent access track to joint bays No 3 and 4 and there will be medium-long term damage at the construction site and along the working area which crosses the southern part of the farm;
- Land parcel 1223 & 1227 (ch 7 + 300) is a low sensitivity grassland plot. This will have a permanent access track into joint bay No 10. The working area and permanent easement will cross the land parcel; and
- Land parcel 1261 (ch 1+250) is a medium sensitivity grassland plot with a permanent access track into joint bay No 2 and an easement along the edge of the land parcel.

15.6.2 Residual Impacts on Agriculture along the Proposed Development and on Agriculture within the Region (i.e. County Kildare and County Meath)

Sixty-eight farms are directly affected. These farms have a combined area of 1,900 ha[134]. The total area required for the construction of the Proposed Development represents 2.5% of this area (41 ha of temporary

[134] This area is based on land parcels owned adjoining or in close proximity is not the entire area of these farms

land take and 11 ha of permanent easements and land-take). The majority of this directly affected area will be required on a temporary basis. Eighty-eight percent of the land parcel effects within the study area are in the not significant impact category and twelve percent are in the slight adverse impact category. Therefore, the overall impact on agriculture (including equine) within the study area is not significant.

The agricultural land-take required for the entire development is 41 ha. The total area (permanent and temporary) represents less than 0.02% of the entire agricultural area of County Kildare and County Meath[135]. Impacts on these small areas are not significant at a regional level.

A more detailed assessment of the individual farm impacts is provided in Appendix 15.1.

15.7 Conclusion

Significant impacts on agriculture and equine will not arise where the Proposed Development is constructed in-road. There are sixty eight land parcels where directs effect arise and forty three land parcels where there will be permanent easements or land-take required for the underground cable, access roads and joint bays. Where the construction works are off-road there will be eight locations where slight adverse residual impacts arise due to the Proposed Development and the remaining sixty directly affected farms will have not significant residual impacts. None of the slight adverse residual impacts affect high or very high sensitivity enterprises.

The overall residual impact on agriculture and equine within the study area is not significant due to 88% of all directly affected farms having a not significant residual impact and a slight adverse residual impact on 12% of these farms. The works will affect less than 2.5% of the area of these land parcels.

The Proposed Development will have direct effects on 0.02% of the area of County Kildare and County Meath. The residual impact on agriculture within this region is not significant because regional baseline trends in agricultural productivity continues to increase during the past 10 years despite widespread infrastructural developments.

[135] According to map 5.1 of the preliminary 2020 Agri Census the agricultural areas of County Kildare and County Meath is 113,449ha and 197,366ha respectively.

16. Material Assets

16.1 Introduction

The EPA Guidelines (EPA 2022) indicate that 'material assets' can be taken to mean built services and infrastructure. The EPA Guidelines specifically list built services, roads and traffic, and waste management as topics which fall into the category of material assets. This EIAR includes separate chapters for traffic and waste, as follows:

- Chapter 14 (Traffic and Transport); and
- Chapter 19 (Waste).

Built services are listed in the EPA Guidelines as electricity, telecommunications, gas, water supply infrastructure and sewerage. This chapter presents the assessment of the potential effects of the Proposed Development on material assets and, where appropriate, specifies mitigation measures.

The material assets addressed in this chapter are as follows:

- Utilities – electricity, telecommunications, gas, water supply and wastewater treatment infrastructure;
- Residential land and property;
- Commercial land and property;
- Community land and property – Public parks, open space or land that are used by the public for recreational amenity; and
- Development land – Land zoned for development (with or without planning permission) and sites with planning permission.

16.2 Methodology

16.2.1 Relevant Guidelines and Policy

This chapter has been prepared in accordance with the following guidance and policy documents:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA 2022); and
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017).

As described in Chapter 1 of this EIAR, the scope of the assessment in this chapter is based on a review of legislation, guidance documents, feedback from public consultation, consultation with prescribed bodies and on consideration of the likelihood of significant impacts arising, having regard to the nature of the baseline environment and the nature and extent of the Proposed Development.

As noted above, the chapter includes residential, commercial, community and development land. While the EPA Guidance (page 30, EPA 2022) groups land and soils together, these types of land are separate to the assessment undertaken in other chapters (such as Chapter 11 of this EIAR), as this chapter considers the socio-economic effects of any potential impact to the listed land types.

There were no limitations in the completion of this assessment.

16.2.2 Data collection

16.2.2.1 Utilities

Identification of utility services has been based on publicly available datasets and mapping, consultation with utility providers and targeted investigations. The collection of data was based on a study area of 300m either side of the planning application boundary (as shown in Figure 7.1). It is possible that some utility services located in proximity to the works may not have been identified. The potential for any undiscovered utilities is low but the possibility remains. Should any such utilities be discovered during construction, the mitigation detailed and proposed as part of this EIAR will be implemented. This will prevent any impacts to the utilities.

Major infrastructure and utilities which may be impacted by the Proposed Development are:

- Electricity;
- Water / Wastewater;
- Surface Water Drainage;
- Gas; and
- Telecommunications.

Existing utility information was requested from utility companies and service providers in 2023. The following service providers provided utility information for the study area (see Figure 7.1):

- Kildare County Council (KCC);
- Meath County Council (MCC);
- ESB Networks / EirGrid;
- Irish Water (for foul and water networks);
- Gas Networks Ireland (GNI); and
- Telecommunication providers.

Details and locations of the relevant utilities are described in Chapter 5 of this EIAR.

16.2.2.2 Land and Property

A review of all non-agricultural properties[136] in the study area as shown in Figure 7.1 was carried out to identify where there may potentially be impacts associated with the construction and operation of the Proposed Development. This was undertaken through the use of GIS and aerial imagery along the route of the Proposed Development in January 2024.

[136] Agricultural properties and holdings are assessed in Chapter 15 of this EIAR.

16.2.3 Assessment of Effects

The following criteria, which are based on professional experience, have been used in this assessment (see Table 16.1). **Table 16.1: Significance Criteria**

Significance Level	Criteria
Profound	Where there is a continuous utility interruption of more than a week; Where additional demand on a utility would consume all remaining capacity; or Where there is a permanent disruption* of a major piece of infrastructure, land or to a property.
Very Significant	Where there is a continuous utility interruption of more than 48 hours; Where additional demand on a utility would significantly reduce the available capacity of that utility; or Where there is long-term disruption* of a major piece of infrastructure, land or to a property.
Significant	Where there is a continuous utility interruption of more than 24 hours; Where there is significant additional demand on a utility; or Where there is a medium-term disruption* of a major piece of infrastructure, land or to a property.
Moderate	Where there are discrete utility interruptions of no more than eight hours for up to seven consecutive days; Where the additional demand on a utility is relatively large; or Where there is a short-term disruption* of a major piece of infrastructure, land or to a property.
Slight	Where there are discrete utility interruptions of no more than eight hours for up to three days; Where additional demand on a utility is relatively small; or Where there is a temporary disruption* of a major piece of infrastructure, land or to a property.
Not Significant	Where there is a utility interruption of no more than eight hours on a single day; Where additional demand on a utility is quantifiable but is too small to have any impact on capacity; or Where there is a brief disruption* of a major piece of infrastructure, land or to a property.
Imperceptible	Where there is no utility interruption during diversion works; Where additional demand on a utility has no material change; or Where there are minor changes on a major piece of infrastructure, land or to a property, which has no material impact on its usability.
*Disruption with respect to major infrastructure refers to the closure or significant reduction in usability of the infrastructure	

16.3 Baseline Conditions

16.3.1 Utilities

A total of 43.6 km of the 52.9 km 400 kV underground cable is proposed to be sited along existing roads, with the remainder to be located in private lands. The cable will be in a trench approximately 1.3m in depth in public roads and approximately 1.7 m depth in other areas (see Chapter 5 for details). Trenches will be approximately 1.5 m wide and will run the full length of the Proposed Development. There are a number of existing utility services of varying diameters and depths along and crossing the proposed cable route as described in Appendix 5.2. There are locations where the cable will need to cross existing utilities, and where existing utilities will need to be diverted as assessed in Section 16.4.1.1.

The following existing utilities are within the Planning Application Boundary for the Proposed Development:

- Overhead power lines;
- Underground power cables;
- Water distribution mains;
- Telecoms ducts;
- Gas mains; and
- Sewer pipes.

16.3.2 Land and Property

The land in the study area (see Figure 7.1) is a mixture of agricultural land (see Chapter 15 Agronomy and Equine) and non-agricultural lands which consist of residential clusters, single dwellings, community, industrial and commercial properties. Refer to Chapter 7 (Population and Human Health) for an overview of the baseline community information and receptors.

The majority of the Proposed Development will follow existing roads or, where deviating from the roads, will run through agricultural lands. The categories of non-residential properties located along the Proposed Development include (as shown in Figure 7.1):

- Schools;
- Medical facilities;
- Retail, commercial and industrial property;
- Sports and recreational facilities; and
- Churches and graveyards.

16.4 Potential Effects

16.4.1 Construction Phase

The following issues have been considered as part of the assessment of impacts:

- Potential for impacts on public utilities and the need to adequately protect them during the construction phase;
- Requirements for connections to public utilities by the Proposed Development during both the construction and operational phases;
- Land required; and
- Continued viability of the property or material asset in relation to any land-take or physical impacts to access that may be required.

16.4.1.1 Utilities

The main potential for impacts on utilities associated with the construction phase of the Proposed Development will be as a result of:

- Utility usage by construction compounds and construction equipment (i.e. powering site offices and equipment, water and wastewater services for construction activities and welfare facilities, and telecommunications connections for site offices and equipment); and
- Any requirements to divert any of the existing infrastructure to allow for the works on the Proposed Development.

The utility demands during construction will be minimal and therefore imperceptible and temporary effects on existing utility capacity are anticipated.

There will be a number of utility diversions required as a result of the Proposed Development. Such diversion works may result in some temporary local disruptions to the services. These will be temporary and will be communicated to the affected areas in advance which will result in only slight and temporary effects.

16.4.1.2 Land and Property

Potential impacts on non-agricultural property as a result of the Proposed Development during the construction phase include:

- Temporary impact[137] on the garden of a residential property on the R125 at approximate chainage 11200 to provide space for an off-road watercourse crossing is anticipated. The impact will result from a loss of part of the garden during construction, with a partial loss of amenity and general disruption as a result of construction. The construction area will not be accessed through the residential access. There is a gateway to the surrounding lands in the area affected that will be used for construction purposes, and the main access point to the house will be maintained during the construction period. The potential effect without mitigation is temporary and Significant;

[137] Temporary impacts are assessed in this chapter to be for the duration of the construction phase – this will be 45 months as identified in Chapter 5 of this EIAR. The duration of works at any one location will be less than this as the construction will be phases and work will progress along the Proposed Development. However, a reasonable worst case assessment has been included in this chapter as the duration of the construction phase.

- The proposed cable route runs through the western and southern edge an area (approximate chainage 16250) which has a planning application for a housing development on it (22314564). The Proposed Development has been designed to avoid interaction with any of the proposed houses, with the cable to go through a proposed linear park and partly follow a proposed pedestrian and cycle path along the western edge of the Proposed Development. The potential effect without mitigation is temporary and Significant;

- A bus stop located on the R403 in Firmount West (approximate chainage 33000) will need to be moved to accommodate a joint bay. A new temporary bus stop will be provided and the bus stop will be returned to its original location after construction. The potential effect without mitigation is temporary and Slight;

- The shared use footpath/cycleway along the Sallins Bypass will be temporarily unavailable for a short period of time during construction of the cable. The shared use footpath / cycleway extends from the northern start of the Sallins Bypass until approximately chainage 39600, approximately 100 m north of the railway bridge. At this point, the cycleway is temporarily diverted for the period of construction only to the east to the Osberstown Road, and the footpath continues along the Sallins Bypass. The footpath is then temporarily diverted to the Osberstown Road approximately 115 m south of the railway bridge – chainage 39850. In all the Proposed Development will temporarily affect 1.8 km of the shared use footpath/cycleway and an additional 240 m of the footpath. The construction sequencing has not been confirmed for works along the Sallins Bypass; however, it is unlikely that the entire length of the shared use footpath / cycleway would be closed at one time. If the entire section were closed, users would be required to divert through the village of Sallins – which would be a temporary diversion distance of 3.6 km from where the Proposed Development enters the Sallins Bypass to where the footpath departs the Sallins Bypass. This temporary diversion is an additional 1.6 km of cycling or walking compared to using the Sallins Bypass. The potential effect without mitigation is temporary and Moderate;

- The Proposed Development will follow the access road to Naas Sports Centre and then turn south through the grounds adjacent to the car park, with a Horizontal Directional Drilling (HDD) compound to be located within the grounds of the campus on the north side of the Grand Canal. The Proposed Development will not directly impact on the adjacent car park or recreational facilities (skatepark and playground) but will temporarily impact for the period of construction the access paths to those recreational facilities. However, given that there are two access paths, one path will always be available to the public during the construction in that area. Access in general to the complex will also be maintained throughout construction. The potential effect without mitigation is temporary and Slight;

- The HDD compound on the southern side of the Grand Canal will be located on scrub land adjacent to Jigginstown Castle, however, given that the area is currently unused and the use of land will be temporary, the significance of effect of acquiring that land for construction is anticipated to be temporary and Not Significant; and

- Properties which are not being directly impacted by land take, but which are lining the route of the Proposed Development may potentially experience impacts to their access while construction is being undertaken in front of the property. The effect is temporary, short-term in duration and as access will be maintained the significance of effect is anticipated to be temporary and Not Significant.

16.4.2 Operational Phase

Once operational, the impact of the Proposed Development will be overall beneficial as it will result in an improvement of the electricity infrastructure in the region. There will be no other likely significant effects during the operational phase of the Proposed Development.

16.5 Mitigation Measures

16.5.1 Construction Phase

16.5.1.1 Utilities

The Proposed Development has been designed to avoid or reduce impacts on major infrastructure. This includes the avoidance of interactions with major utility infrastructure as far as possible. Where there are interfaces with existing utility infrastructure, protection in place or diversion as necessary is proposed to prevent long-term interruption to the provision of the affected services (see Chapter 5 for further details). All interfaces will comply with minimum safety clearances and design standards.

All reasonable measures will be taken to avoid unplanned disruptions to any services during the construction phase. Prior to excavation works being commenced, localised confirmatory surveys will be undertaken by the Appointed Contractor to verify the results of pre-construction assessments undertaken. Where works are required in and around known utility infrastructure, precautions will be implemented by the appointed contractor to protect the infrastructure from damage, in accordance with the best practice methodologies and the requirements of the utility companies, where practicable (see Chapter 5 for further details).

Where diversions, or modifications, are required to utility infrastructure, service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. Where this is the case, it will be planned in advance by the appointed contractor. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Any required works will be carefully planned by the appointed contractor to ensure that the duration of interruptions is minimised as far as practicable. Consultation with relevant affected parties will be undertaken prior to any proposed disruptions.

16.5.1.2 Land and Property

Much of the mitigation for potential impacts on land and property has been embedded within the design, by selecting a route which follows public roads for the most part, minimising the requirement for additional lands to be affected. Where private lands will be directly affected, either temporarily during construction or permanently, this will be managed by ESB and their contractor and supported by EirGrid's Agricultural Liaison Officers.

Where there are potential access issues as a result of the Proposed Development, access arrangements to individual properties will be agreed with the affected property holders in advance to reduce the impact. Access arrangements along affected roadways and footpaths will be managed in accordance with applicable traffic management plans and measures outlined in Chapter 14 (Traffic and Transport) and in the CEMP.

Potential impacts to the garden of a residential property on the R125 at approximate chainage 11200 will be mitigated by the use of screens during construction to allow the owner to use their garden. The screens will be within the planning application boundary and be in place for the duration of construction at this location. The affected area will be reinstated to its original condition post-construction. The owner will be consulted on the species for planting. Selected tree species will need to be agreed with ESB to ensure no impacts to the cable (see Chapter 17 Landscape and Visual for further details). At the detailed design stage the cable route will be re-examined to determine if the garden can be fully avoided.

Potential impacts to the housing development planning application (22314564) (approximate chainage 16250) have been largely mitigated through routing. However, further consultation with the developer and Kildare County Council will be undertaken in so far as possible, to ensure there is no disruption during construction.

During the construction works at the bus stop located on the R403 in Firmount West (approximate chainage 33000), a new temporary bus stop will be provided. Consultations with Kildare County Council, and Bus Éireann, will be undertaken prior to construction to ensure no disruption to bus services.

Along the Sallins Bypass, early notification and signage to show diversions will be used by the Contractor. Local cycling/walking groups and community groups (as well as Cycling Ireland and Kildare County Council) will be directly contacted by the Contractor to inform them of the timing, extent, and duration of any closures and what signed diversion routes will be available. As far as possible the works along the Sallins Bypass will be phased so that the entire length of the cycleway and footpath will not be closed at any one time. The use of the Sallins Link Road at the roundabout on the Sallins Bypass will allow a shorter diversion and this is included in the traffic assessment (Chapter 14 of this EIAR).

Similarly, potential impacts to the Naas Sports Centre the adjacent car park or recreational facilities (skatepark and playground) have been largely mitigated through routing. Further mitigation will be provided through consultation, early notification of proposed works, and ensuring safe access to the facilities at all times. Daily cleaning of road surfaces in this area and good site management (as described in the CEMP (Appendix 5.4 of this EIAR)), will ensure that the construction activities do not cause unclean or muddy conditions. The affected areas will be reinstated to their current condition post-construction.

The HDD compound on the southern side of the Grand Canal will be located on scrub land. Affected vegetation will be replanted in-line with the planting specification outlined in Section 5.5.9 of Chapter 5 (Proposed Development Description).

Access to properties which are not being directly impacted by land take will be maintained. Chapter 14 (Traffic and Transport) and Appendix 5.1 (Traffic Management Plan) have further details on the measures to minimise disruption to traffic and access in the area.

16.5.2 Operational Phase

No mitigation measures are required for the operational phase as there are no likely significant effects.

16.6 Residual Effects

16.6.1 Construction Phase

There will be temporary disruption as a result of the construction works but consultation and mitigation measures will avoid or reduce these effects. Table 16.2 below provides a summary of the findings of this chapter.

16.6.1.1 Utilities

Potential for impacts to utilities will be further resolved pre-construction. Any disruption to services will be controlled through consultation with the utility owner and consumers would be fully informed. There will be a temporary effect on utilities, which is assessed to be Not Significant.

Future utility work (outside the scope of the Proposed Development) will ultimately be undertaken by the relevant utility company using their own statutory powers and will need to be done in consultation with ESB to ensure that any future development does not impact the Proposed Development. There are minimum safety clearances and design standards to be maintained but it will be possible for future utilities to co-exist with the Proposed Development (see Chapter 5 for further detail).

The utility demands during construction will be minimal and therefore imperceptible effects on existing utility capacity are anticipated.

Where diversions, or modifications, are required to utility infrastructure, service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. There will be a Slight temporary effect as a result.

16.6.1.2 Land and Properties

There will be a temporary Significant effect to the property owner on the R125 at approximate chainage 11200. The disruption to the garden cannot be mitigated during construction but the impact will be temporary for the duration of construction. If the cable route can avoid the garden, there will be no impact, however as this cannot be confirmed at this stage the assessment assumes that it will not be avoided.

With mitigation measures, effects will be Not Significant on the housing development planning application (22314564) (approximate chainage 16250).

Users of the bus stop located on the R403 in Firmount West (approximate chainage 33000), will be temporarily disrupted but a temporary bus stop will be provided in the area during construction. Consultations with Kildare County Council, and Bus Éireann, will be undertaken prior to construction to ensure no disruption to bus services. Therefore the effect will be Imperceptible.

Users of the Sallins Bypass footpath and cycleway will experience a temporary Moderate effect from construction along the facility. Mitigation measures will be in place to reduce the disruption; however, the closure of the footpath and cycleway will result in diversions through the village of Sallins and the temporary loss of this amenity. The footpath and cycleway will be restored post-construction and there will be no permanent effects to users.

There will be a temporary Slight effect on users of the Naas Sports Centre and associated facilities during construction. While all the facilities will remain open for use, there will be an impact to the amenity of the area from noise, etc. from the proximity of the construction area. Following the completion of the construction works, there will be no impact.

The HDD compound on the southern side of the Grand Canal will be located on scrub land adjacent to Jigginstown Castle, however, given that the area is currently unused, that affected vegetation will be replanted in-line with the technical specification in Chapter 5 of this EIAR, and the use of land will be temporary, the significance of effect of acquiring that land for construction is anticipated to be Imperceptible.

Impacts to access and traffic are assessed in Chapter 14 (Traffic and Transport) of this EIAR. Access to all properties will be maintained with mitigation measures. The significance of effect is anticipated to be Not Significant.

16.6.2 Operational Phase

Once operational, the impact of the Proposed Development will be overall beneficial as it will result in an improvement of the electricity infrastructure in the region. There will be no other likely significant effects during the operational phase of the Proposed Development. There will be no other likely significant Material Assets effects during the operational phase.

Table 16.2: Summary of Material Asset Effects

Receptor	Potential Impacts	Potential Effect	Mitigation	Residual Effect
Construction phase				
Utilities	Usage by Proposed Development during construction	Imperceptible, temporary	None required	Imperceptible
Utilities	Diversions to existing utilities - outages	Slight, temporary	• Prior notification of disruptions. • Duration of interruptions is minimised as far as possible. • Consultation with relevant affected parties.	Slight, temporary
Residential property on R125 – ch. 11200	Proposed cable routed through part of garden	Significant, temporary	• Screens during construction • Reinstated to its original condition post-construction in-line with planting specification.	Significant, temporary
Planned housing development - ch. 16250	Proposed cable routed through proposed proposed linear park and partly follow a proposed pedestrian and cycle path	Significant, temporary	• Further consultation with the developer and Kildare County Council.	Not Significant, temporary
Bus Stop – ch. 33000	To be moved during construction	Slight, temporary	• Temporary bus stop to be provided.	Imperceptible, temporary

Receptor	Potential Impacts	Potential Effect	Mitigation	Residual Effect
			• Consultations with Kildare County Council, and Bus Éireann.	
Footpath/cycleway along the Sallins Bypass	Temporary closure and diversion during construction	Moderate, temporary	• Consultations with Kildare County Council, and users. • Phasing of works to avoid closure of full length at one time (as far as possible).	Moderate, temporary
Naas Sports Centre	Disruption to access paths	Slight, temporary	• Consultations with Kildare County Council, and operators. • Access to be maintained and cleaned during construction.	Slight, temporary
Scrub land adjacent to Jigginstown Castle	Construction works located here, loss of vegetation	Not Significant, temporary	• Affected vegetation will be replanted in-line with the planting specification	Imperceptible, temporary
Other properties	No direct impacts, disruption to access	Not Significant, temporary	Traffic management plans and measures outlined in Chapter 14 (Traffic and Transport) and in the CEMP	Not Significant, temporary

Receptor	Potential Impacts	Potential Effect	Mitigation	Residual Effect
Operational Phase				
Utilities	Improvement of the electricity infrastructure in the region	Beneficial	None required	Beneficial
No other likely significant effects are assessed				

16.7 Conclusion

There is potential for impacts on material assets associated with the construction of the Proposed Development, however, with the implementation of the mitigation measures as outlined in this chapter, the permanent impacts on material assets will not be significant. However, there will be a temporary significant effect to the property at approximate chainage 11200 because of impacts to the garden. Additionally, users of the Sallins Bypass footpath and cycleway will experience a temporary moderate effect from construction along the facility.

There will be no significant operational phase impacts, except for the beneficial impact that the new electricity infrastructure will have on the power grid in the region.

17. Landscape and Visual

17.1 Introduction

This chapter presents the assessment of the potential landscape and visual impacts of the Proposed Development during the construction and operational phases. A full description of the Proposed Development is provided in Chapter 5 (Proposed Development Description) in this EIAR.

Although closely linked, landscape and visual impacts are assessed separately.

Landscape Impact Assessment relates to assessing effects of the Proposed Development on the landscape as a resource in its own right and is concerned with how the Proposed Development will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

Visual Impact Assessment relates to assessing effects of the Proposed Development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and / or the introduction of new elements. Visual impacts may occur from visual obstruction (blocking of a view, be it full, partial or intermittent) or visual intrusion (interruption of a view without blocking).

17.2 Methodology

Production of this chapter involved:

- A desktop study to establish an appropriate Study Area, relevant landscape and visual designations in the Kildare and Meath County Development Plans, as well as other sensitive visual receptors. This stage culminates in the selection of a set of potential viewpoints from which to study the effects of the Proposed Development;

- Fieldwork to establish the landscape character of the baseline environment and to confirm and refine the set of viewpoints to be used for the visual assessment stage;

- Assessment of the significance of the landscape impact of the Proposed Development as a function of landscape sensitivity weighed against the magnitude of the landscape impact;

- Assessment of the significance of the visual impact of the Proposed Development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact; and

- If mitigation measures are proposed to reduce potential impacts, these will be incorporated into the assessment and estimation of residual impacts.

17.2.1 Study Area

According to the Landscape Institute and the Institute of Environmental Management and Assessment (IEMA) Guidelines for Landscape and Visual Impact Assessment 3rd edition (hereafter referred to as the GLVIA) (Landscape Institute and IEMA 2013), the first step in the process of landscape and visual impact assessment (LVIA) is to determine a bespoke Study Area which is appropriate to the combination of the development type and the receiving landscape and visual context. Based on professional judgment, it is anticipated that the proposed works at Woodland and Dunstown substations are likely to be difficult to discern beyond 500 m thus are not likely to give rise to significant landscape or visual impacts beyond this distance. However, in the interests of a comprehensive appraisal, a 1 km radius Study Area was selected for each substation. A 500 m radius Study Area was applied to the underground cable because significant landscape or visual effects are highly unlikely beyond this 1 km wide swathe due to the subterranean nature of the proposed infrastructure and the transient nature of the proposed construction works.

17.2.2 Relevant Guidelines

This assessment was carried out in line with the GLVIA (Landscape Institute and IEMA 2013) and in compliance with the Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022).

17.2.3 Data Collection and Collation

17.2.3.1 Desk Study

The desk study (completed January 2023) element of data collection involved a review of project documents and Geographical Information System (GIS) datasets for the Proposed Development. These were read against a backdrop of aerial photography and topographical information. GIS datasets included highly sensitive landscape area scenic designations, and these were cross-checked against the relevant County Development Plans, in the interest of thoroughness.

Data to inform the assessment was extracted from the following data sources:

- Meath County Council (MCC) Meath County Development Plan 2021 - 2027 (MCC 2021);
- Kildare County Council (KCC) Kildare Development Plan 2023 – 2029 (KCC 2023);
- National Parks and Wildlife Service mapping (NPWS 2023);
- The Heritage Council – Heritage mapping (Heritage Council 2023);
- Ordnance Survey Ireland (OSI) maps (OSI 2023);
- Coillte Recreation map (Coillte 2023);
- Discover Ireland (Discover Ireland 2023);
- The National Inventory of Architectural Heritage (NIAH) survey data (NIAH 2023); and
- Sport Ireland Trails (Sport Ireland 2023).

17.2.3.2 Field Survey

Fieldwork was undertaken in January 2023 as part of the preparation of this assessment. This involved reviewing and recording aspects of landscape character along the route of the underground cable and at selected locations in relation to the visual baseline. The selected locations are identified in Section 17.3 below and were based on their sensitivity, importance, and the nature of the Proposed Development at each location.

17.2.4 Appraisal Method for the Assessment of Impacts

17.2.4.1 Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from the Proposed Development, the following criteria were considered:

- Landscape character, value and sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects.

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area or landscape element) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics. Landscape value and sensitivity are classified using the criteria set out in Table 17.1.

Table 17.1: Landscape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an International or National level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level, where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes which have a designation of protection at a County level, or at non-designated Local level, where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land, or are part of the urban fringe, where there would be a reasonable capacity to embrace change or the capacity to include the Proposed Development. Management objectives in such areas could be focused on change, creation of landscape improvements and / or restoration to realise a higher landscape value.

The magnitude of a potential landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the Proposed Development. The magnitude accounts for whether there is a direct physical impact resulting from the loss of landscape components and / or a change that extends beyond the Planning Application Boundary that may have an effect on the landscape character of the area (Table 17.2).

Table 17.2: Magnitude of Landscape Impacts

Magnitude	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix set out in Table 17.3.

Intermediate designations of sensitivity and magnitude are possible based on professional judgment. For example Tara Skryne Hills have been assessed later in this chapter to have High – Medium sensitivity and Medium-Low magnitude of effect (see Table 17.11). Where these intermediate designations have been used, they are defined in the relevant section of this chapter.

Table 17.3: Impact Significance Matrix

Sensitivity of Receptor					
Scale / Magnitude	**Very High**	**High**	**Medium**	**Low**	**Negligible**
Very High	Profound	Profound - Substantial	Substantial	Moderate	Slight
High	Profound-substantial	Substantial	Substantial - Moderate	Moderate – Slight	Slight - Imperceptible
Medium	Substantial	Substantial - Moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate – Slight	Slight	Slight - Imperceptible	Imperceptible
Negligible	Slight	Slight - Imperceptible	Imperceptible	Imperceptible	Imperceptible
Note: For the purposes of this chapter, judgements deemed 'substantial' and above are considered to be equivalent to or greater than 'significant impacts'.					

17.2.5 Visual Impact Criteria

As with the landscape impact, the visual impact of the Proposed Development will be assessed as a function of sensitivity versus magnitude. In this instance, the sensitivity of the visual receptor, weighed against the magnitude of the visual effect.

17.2.5.1 Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape. A list of the factors considered by the assessor in estimating the level of sensitivity for a particular visual receptor is outlined below:

- Susceptibility of Receptors: In accordance with the GLVIA (Landscape Institute and IEMA 2013), visual receptors most susceptible to changes in views and visual amenity are:
    - Residents at home;

  - People: whether residents or visitors, who are engaged in outdoor recreation, including the use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;

  - Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;

  - Communities where views contribute to the landscape setting enjoyed by residents in the area; and

  - People travelling on road, rail or other transport routes, where such travel involves recognised scenic routes and awareness of views, is likely to be heightened.

- Visual receptors that are less susceptible to changes in views and visual amenity include:

  - People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and

  - People at their place of work whose attention may be focused on their work or activity, not their surroundings, and where the setting is not important to the quality of working life.

- Recognised scenic value of the view (County Development Plan designations, guidebooks, touring maps, postcards etc.): These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, for example, a public consultation process is required;

- Views from within highly sensitive landscape areas: Again, highly sensitive landscape designations are usually part of a County's Landscape Character Assessment, which is then incorporated within the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;

- Primary views from dwellings: A proposed development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates has been influenced by the desire to take in a particular view. This might involve the use of a slope or the specific orientation of a house and / or its internal social rooms and exterior spaces;

- Intensity of use, popularity: This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at a County or Regional scale;

- Connection with the landscape: This considers whether or not receptors are likely to be highly attuned to views of the landscape (i.e. commuters hurriedly driving on a busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it);

- Provision of elevated panoramic views: This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas;

- Sense of remoteness and / or tranquillity: Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than, for example, those taking in the view of a busy street scene;

- Degree of perceived naturalness: Where a view is valued for the sense of naturalness of the surrounding landscape, it is likely to be highly sensitive to visual intrusion by distinctly manmade features;
- Presence of striking or noteworthy features: A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;
- Historical, cultural and / or spiritual significance: Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection, heightening the sense of their surroundings;
- Rarity or uniqueness of the view: This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;
- Integrity of the landscape character: This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;
- Sense of place: This considers whether there is a special sense of wholeness and harmony at the viewing location; and
- Sense of awe: This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be of high sensitivity. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular. The different sensitivity levels are then categorised with the same classification system (Very High down to Negligible) as for landscape sensitivity (see Table 17.1).

17.2.5.2 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence (relative visual dominance) of the Proposed Development and its effect on visual amenity. The magnitude of visual impacts is classified in Table 17.4.

Table 17.4: Magnitude of Visual Impact

Magnitude of Impact	Description
Very High	The Proposed Development obstructs or intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. An extensive degree of visual change will occur within the scene completely altering its character, composition and associated visual amenity
High	The Proposed Development obstructs or intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual change will occur within the scene substantially altering its character, composition and associated visual amenity

Magnitude of Impact	Description
Medium	The Proposed Development represents a moderate intrusion into the available vista and is a readily noticeable element. A noticeable degree of visual change will occur within the scene perceptibly altering its character, composition and associated visual amenity
Low	The Proposed Development intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the Proposed Development would not have a marked effect on the visual amenity of the scene
Negligible	The Proposed Development would be barely discernible within the available vista and/or it would not influence the visual amenity of the scene.

17.2.5.3 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix and applies the same EPA Guidelines' definitions (EPA 2022) of significance as used earlier in respect of landscape impacts (Table 17.3).

17.2.6 Quality and Timescale Impacts

In addition to assessing the significance of landscape impacts and visual impacts, the EPA Guidelines (EPA 2022) require that the quality of the impacts is also determined. This could be negative / adverse, neutral, or positive / beneficial.

Landscape and visual impacts are also categorised according to their duration:

- Temporary – Lasting for one year or less;
- Short Term – Lasting one to seven years;
- Medium Term – Lasting seven to 15 years;
- Long Term – Lasting 15 years to 60 years; and
- Permanent – Lasting over 60 years.

There were no limitations in the preparation of this chapter that affected the outcome of the assessment.

17.3 Baseline Conditions

17.3.1 Extent of Study Area

The landscape is the visible environment in its entirety, comprised of both natural and built elements including topography, water bodies, vegetation, wildlife habitats, open spaces, buildings and structures. Landscape and visual sensitivities considered include statutory and non-statutory landscape designations, natural features, Landscape Character Areas, notable deciduous trees of woodland, amenities and historic landscapes. The full routing detail for the Proposed Development is outlined in Chapter 5 (Proposed Development Description).

The start point of the proposed UGC route is Woodland Substation near Batterstown, County Meath. The end point of the proposed UGC route is Dunstown Substation, near Two Mile House, Co. Kildare. There are 15 km of the proposed cable route in County Meath and 38 km in County Kildare. The review of the Meath County Development Plan 2021 - 2027 (MCC 2021) and Kildare Development Plan 2023 – 2029 (KCC 2023) considered Landscape Character Areas, landscape elements and scenic designations.

17.3.2 Policy Context - Landscape

The Meath County Development Plan 2021 - 2027 (MCC 2021) and Kildare Development Plan 2023 – 2029 (KCC 2023) have identified Landscape Character Areas across each respective County. A map showing those that occur within the Study Area is presented in Figure 17.1.

17.3.2.1 County Meath

The Landscape Character Assessment for County Meath is contained in Appendix 7 of the Meath County Development Plan 2021 - 2027 (MCC 2021). There are five Landscape Character Areas within the Study Area: South East Lowlands; Tara Skryne Hills; Rathmoylan Lowlands; Royal Canal and The Ward Lowlands. Each Landscape Character Area within County Meath is assigned a rating in relation to 'value', 'importance', 'sensitivity' and potential capacity to accommodate various forms of development. These are noted in Table 17.5.

17.3.2.2 County Kildare

The Kildare Development Plan 2023 – 2029 (KCC 2023) divides the County into various Landscape Character Areas. There are 12 Landscape Character Areas within the Kildare portion of the Study Area: Chair of Kildare, Northern Lowlands; North-western Lowlands; Western Boglands; Northern Hills; Allen Bog; Pollardstown Fen; The Curragh; Central Undulating Lands; Eastern Transition; River Liffey; and Eastern Uplands.

In the Kildare Development Plan 2023 – 2029 (KCC 2023), each Landscape Character Area is assigned a rating in relation to 'value' and 'sensitivity'. These are noted in Table 17.5. Furthermore, several of the Landscape Character Areas within the Study Area are also designated as Areas of High Amenity: River Liffey; Pollardstown Fen; The Curragh; and Eastern Uplands.

Table 17.5: Landscape Character Areas within the Study Area

Landscape Character Area	Summary of Landscape Character Assessment in the County Development Plan
Meath: 12. Tara Skryne Hills	• *Landscape Character Type: Hills and Upland Areas*; • *Value: Exceptional*; • *Importance: National / International*; • *Sensitivity: High*; and • *Potential capacity to accommodate development - underground services: Low*. (The south-east portion of this Landscape Character Area, where the Proposed Project will be located, does not encompass the Hill of Tara or Skryne Hill.)
Meath: 11. South East Lowlands	• *Landscape Character Type: Lowland Landscape*; • *Value: Very High*; • *Importance: Regional*; • *Sensitivity: Medium*; and • *Potential capacity to accommodate development - underground services: Medium*
Meath: 14. Royal Canal	• *Landscape Character Type: River Corridor and Estuaries*; • *Value: High*; • *Importance: Regional*; • *Sensitivity: Medium*; and • *Potential capacity to accommodate development - underground services: Medium*
Kildare: Northern Lowlands	• Class 1 – Low Sensitivity
Kildare: River Liffey	• *Class 4 - Special Sensitivity*; and • *Areas of High Amenity*

Landscape Character Area	Summary of Landscape Character Assessment in the County Development Plan
Kildare: Eastern Transition	• *Class 2 – Medium Sensitivity*

17.3.2.3 Landscape elements

A total of ten Gardens and Designed Landscapes have been identified within the Study Area. Of these nine were recorded by the Survey of Historic Gardens and Designed Landscapes and two have been identified from historic mapping (Ordnance Survey 6", 1837 – 1842). Information on these Gardens and Designed Landscapes is summarised in Table 13.4, Chapter 13 of this EIAR and are assessed within that chapter.

The underground cable runs adjacent to Larch Hill Demesne in the townland of Phepotstown but no direct impacts are anticipated as the underground cable will be in road at this location.

There were no specific landscape elements in the Study Area contained within the County Meath County Development Plan.

Included in Table 14.4 of Chapter 14 (and indicated on Map 14.2) of the Kildare Development Plan 2023 – 2029 (KCC 2023) is 12 'principal landscape sensitivity factors': Major Rivers and Water bodies; Canals; Ridgelines; Green Urban Areas; Broad-Leaved Forestry; Mixed Forestry; Natural Grasslands; Moors and Heathlands; Agricultural Land with Natural Vegetation; Peat Bogs; Scenic View; and Scenic route.

The Kildare Development Plan 2023 – 2029 (KCC 2023), when describing the compatibility of different development types with the various 'principal landscape sensitivity factors', considers proximity within 300 m of the same as an area to also be considered. The proposed works at Dunstown substation are not within 300 m of any 'principal landscape sensitivity factor'. All 'principal landscape sensitivity factors' which occur within 300 m of the underground cable are listed in Table 17.6.

Table 17.6: Landscape Elements

Principal Landscape Sensitivity Factor
Major Rivers and Water bodies - River Liffey (approx. ch. 37100 centreline)
Canals - Royal Canal (approx. ch. 15350)
Canals - Grand Canal (approx. ch. 44500)
Mixed Forestry - Woodland near the R407 regional road (approx. ch. 17750)
Mixed Forestry - Woodland R412 regional road (approx. ch. 52250)
Scenic View - Allen Bridge RC11 (approx. ch. 15750) (N.B. Assessed as a key visual receptor not as a landscape element)
Scenic View - Millicent Bridge RL6 (townland of Castlesize) (approx. ch. 37100) (N.B. Assessed as a key visual receptor not as a landscape element)

17.3.3 Policy Context - Visual

The Landscape Appraisal of County Meath identifies ‘scenic routes’, ‘protected views’, ‘venerable features’ and ‘slopes and ridgelines’. Map 10.2 of the Meath County Development Plan 2021 - 2027 (MCC 2021) identifies ‘scenic routes’ and ‘scenic routes with designated views’. None of these designations are located close enough to the proposed UGC route or the Woodland Substation to be adversely impacted.

The Landscape Character Assessment in the Kildare Development Plan 2023 – 2029 (KCC 2023) contains a map and a corresponding table, which identifies ‘scenic routes’ and ‘scenic viewpoints’ within the County. The scenic designations within Kildare are included as ‘principal landscape sensitivity factors’ and are accounted for as such. These are noted in Table 17.7 and a map showing those that occur within the Study Area is presented in Figure 17.1.

In addition to the previously identified Scenic View ‘principal landscape sensitivity factors’ Allen Bridge RC11 and Millicent Bridge RL6 (townland of Castlesize), the following two additional visual receptors were identified for inclusion in visual impact assessment:

- Royal Canal National Waymarked Way (long-distance walking route); and
- Grand Canal National Waymarked Way (long-distance walking route).

Table 17.7: Key Visual Receptors in the Study Area

Key Visual Receptors
Scenic View - Allen Bridge RC11
Scenic View - Millicent Bridge RL6
Royal Canal National Waymarked Way
Grand Canal National Waymarked Way

17.4 Potential Effects

The following descriptions focus on those aspects of the Proposed Development that are most relevant to landscape and visual effects and should be read in conjunction with Chapter 5 (Proposed Development Description) of this EIAR. The greatest potential for significant impacts on landscape character and for visual impacts to occur in relation to the Proposed Development will be during the construction phase, as there will only be very minor surface expression of the development during the operational phase (i.e., permanent Joint Bays, permanent access tracks, limited locations of permanent vegetation loss, and works within the existing substations).

17.4.1 Sensitivity – Landscape

17.4.1.1 Landscape Character Sensitivity

The proposed underground high voltage cables will run underground within the existing road network and through private farmland on their route from Woodland Substation to Dunstown Substation. Open cut trenching will be required to lay the cables during the construction phase generating transient effects. The prevailing surface will be almost fully reinstated following construction.

There will be little material surface expression of the cable routes during the operational phase even at the sub-surface concrete Joint Bays, which will be covered in with dry fill and the prevailing surface reinstated. Stream crossings will be achieved using both open cut trenching and Horizontal Directional Drilling (HDD) options and neither will result in permanent surface expression during the operational phase. Above-ground infrastructure is proposed where the proposed underground cable will connect with the existing Woodland and Dunstown Substations. Furthermore, in terms of sensitivity, the road corridors sections of the route are not considered to be a particularly sensitive element within the landscape, as they are highly modified transport routes and works can be readily reinstated. For this reason, the underground cable is designed to be laid under existing road surfaces where possible, as the sensitivity of the immediate landscape is deemed to be low. However, there is a greater degree of landscape sensitivity where the underground cable is being laid off-road. For the off-road sections, the Joint Bays (surrounded by a maintenance hard standing composed of crushed rock/stone) will be visible at the surface level. Off-road Joint bays will also be connected to the public road by permanent access tracks. These tracks will be unbound, also made from crushed rock/stone. There will be some section of off-road underground cable within each Landscape Character Area. However, off-road sections may result in the removal of vegetation which contributes to the hedgerow patterns and character of the receiving landscape. Further details on the approach to trees, hedgerows, and treelines are provided in Chapter 5 of this EIAR (Section 5.5.9). That text outlines the approach to reducing the amount of trees, hedgerows, and treelines affected by the Proposed Development, and the mitigation that will be put into place to minimise the effects. The affected sections are proposed to be substantially replanted or reinstated post construction except within the permanent easement (5m or 15m wide) (see Section 5.5.9, Chapter 5 of this EIAR for clarification of the approach to losses and planting). Additionally, although industrial farm machinery is commonly present in these off-road sections, the intensity of construction activities would be only slightly greater than typical agricultural activities. Taking the above factors into account, it is not considered that Construction or operational phase effects are likely to be significant beyond 500m of the proposed underground cables.

With consideration of the nature and scale of the Proposed Development in respect of the Landscape Character Assessments for Meath and Kildare, sensitivity ratings have been assigned to each Landscape Character Areas and are indicated in Table 17.8. These judgements refer to material contained within the relevant County Development Plan but are independent judgements specifically in relation to the scale and context of the Proposed Development.

The sensitivity of each Landscape Character Area indicated in Table 17.8 specifically relate to a potential off-road portion occurring within the extents each Landscape Character area.

Table 17.8 uses the criteria set out in Section 17.2.4 to determine sensitivity at each of landscape character area.

Table 17.8: Summary of Landscape Character Area Sensitivity

Landscape Character Area	Sensitivity
Meath: 12. Tara Skryne Hills	High - Medium
Meath: 11. South East Lowlands	Medium - Low
Meath: 14. Royal Canal	Medium
Kildare: Northern Lowlands	Low
Kildare: River Liffey	High- Medium
Kildare: Eastern Transition	Medium-Low
Woodland substation	High- Medium
Dunstown Substation	Medium- Low

Note: although these sensitivity judgements involved referencing material contained within the relevant County Development Plans, they are independent judgements specifically in relation to the scale and context of the Proposed Development.

17.4.2 Landscape Element Sensitivity

The sensitivity judgements in this assessment are based on where there is the potential for a direct impact on the 'principal landscape sensitivity factors'. Each of these 'principal landscape sensitivity factors' are locations with strong associations with naturalistic and/or recreational values and contribute to the character of the wider landscape; therefore, vegetation removal and construction activity have the potential to alter the intrinsic qualities of the 'principal landscape sensitivity factors' in their own right and also the wider landscape setting. Thus, the judgements regarding the sensitivity of the 'principal landscape sensitivity factors' to the Proposed Development are noted in Table 17.9 (Note: Scenic View 'principal landscape sensitivity factors' will be assessed as visual receptors rather than landscape elements).

Table 17.9 uses the criteria set out in Section 17.2.4 to determine sensitivity at each of the landscape elements.

Table 17.9: Summary of Landscape Element Sensitivity

Principal Landscape Sensitivity Factor	Sensitivity
Major Rivers and Water bodies - River Liffey (approx. ch. 37100 centreline)	High-medium
Canals - Royal Canal (approx. ch. 15350)	Medium
Canals - Grand Canal (approx. ch. 44500)	Medium
Mixed Forestry - Woodland near the R407 regional road (approx. ch. 17750)	High
Mixed Forestry - Woodland R412 regional road (approx. ch. 52250)	High
Scenic View - Allen Bridge RC11 (approx. ch. 15750)	See Section 17.4.3 (Sensitivity - Visual)
Scenic View - Millicent Bridge RL6 (townland of Castlesize) (approx. ch. 37100)	See Section 17.4.3 (Sensitivity - Visual)

17.4.3 Sensitivity - Visual

There are 383 residential dwellings within 50 m of the cable route centreline, and 41 of these will be located within 50 m of a Joint Bay. The greatest potential for adverse effects due to the Proposed Development will be during the construction phase. Visual impacts may occur, but they generally occur within the road corridor where there is already a baseline level of activity. Most effects would relate to construction-related activities, which would be transitory and localised. Trenching works in relation to individual properties will be short-term, although a small number of dwellings will be adjacent to other works, such as joint bays, construction compounds or HDD sites, where effects may be temporary. During the operation phase, any noticeable, permanent change to the views will be highly localised and limited in scale.

In Woodland substation, the Proposed Development will 400 kV feeder bay and associated electrical shunt reactor (approximately 8 m in height) will be constructed. Insulators, instrument transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.6 m in height) will also be constructed. These works will be in the context of the existing Woodland substation and will not be significant change from the existing infrastructure – the heights will be similar to the existing equipment.

There will be nine new lattice tower lightning masts within the Dunstown substation. The lattice structure will be 40 m high with a 1 m high rod/conductor on top. These new masts will be the same height as the existing masts within the substation compound. Thus, the visual envelope of the substation, as viewed from the surrounding area, generally will remain unchanged, with only certain viewing angles where there will be a new mast identifiable protruding above the skyline. Still, the visual change will not be material in these limited instances. Dwellings in the vicinity of the substations at Woodland and Dunstown will be familiar with the presence of electrical infrastructure and related maintenance activity in the area; thus, the proposed changes within these substations are unlikely to result in any material visual impacts during construction or operation. Generally, the operational phase will see a return of conditions similar to the baseline for the residential dwellings located along the route of the underground cable, and at the substations; thus, the visual assessment focused on the proximity of the Proposed Development to specific key visual receptors such as scenic designations and public amenities.

17.4.3.1 Key Visual Receptors - Sensitivity

Table 17.10 uses the criteria set out in Section 17.2.4 to determine sensitivity at each of the key visual receptors.

Table 17.10: Visual Sensitivity at Key Visual Receptors

Key Visual Receptors	Sensitivity
Scenic View - Allen Bridge RC11	Medium
Scenic View - Millicent Bridge RL6	High-Medium
Royal Canal National Waymarked Way	Medium
Grand Canal National Waymarked Way	Medium
Residential properties	Medium

17.4.4 Construction Phase – Landscape

The following descriptions focus on those aspects of the Proposed Development that are most relevant to landscape effects and should be read in conjunction with Chapter 5 of this EIAR. The greatest potential for significant effects on landscape character to occur in relation to the Proposed Development is during the construction stage, because there will only be very minor surface expression of the development during the operational stage (permanent joint bay, permanent access tracks and limited locations of permanent vegetation loss).

17.4.4.1 Magnitude of Construction Phase Landscape Character Impacts – Underground Cable

The impacts on the physical terrain of the Proposed Development will be restricted mainly to the vicinity of the underground cable trench. These trenches will be excavated to allow for the conductors to be installed below the ground. There will be associated and ancillary development, including temporary Construction Compounds, permanent Joint Bays (including associated hardstanding), temporary Passing Bays, temporary access tracks, permanent access tracks, site development, landscaping works, fencing and vegetation removal. The physical impact of the trench on the landscape will be modest in scale and primarily contained within the already modified ground of the road network. There will be an increase in vehicle movements within the road network in the vicinity of the Proposed Development, which will be more noticeable along the smaller local roads within the Study Area.

Impacts on the land-cover for the off-road portions of the underground cable will be limited to the Planning Application Boundary, within which some grassland and hedgerow vegetation will need to be removed. The longest section of off-road track will be between Woodland substation and the public road to the south (ch. 0 to approx. ch. 3250), where there will be permanent vegetation removal to facilitate the 4 m wide access track. This will be in the 15 m wide permanent easement which will not be replanted at the time of writing (see Section 5.5.9, Chapter 5 of this EIAR for further details). As outlined Chapter 5, there will be 348 trees removed 4% of the trees in the tree study area (which is the Planning Application Boundary plus a 30m buffer), with a further 710 trees potentially at risk, 8% of the trees in the study area. The locations of the trees are shown on Figure 5.2, Volume 4 of this EIAR. There will be 3.2 km of hedgerow temporarily lost, and 0.7 km permanently lost (2.1% of the hedgerows within the Planning Application Boundary). There will be 1.1km of treelines temporarily lost, and 0.8km permanently lost (3.1% of the hedgerows within the Planning Application Boundary). Their locations are described in Chapter 10 (Biodiversity) of this EIAR and shown on Figure 10.2, Volume 4 of this EIAR.

During the construction phase, there may be a small degree of impact at specific locations along the route of the underground cable. However, it would not be at a scale that would have any material impact on the overall landscape fabric or on the broader landscape character along the route. Although construction activity may alter the landscape character near where the cable is being installed, it will be transitory and temporary. Impacts will predominantly occur in the road network where vehicular movements are already part of the existing character.

Open-cut trenching and joint bay construction will involve localised vegetation removal, but, where possible, the felling of healthy mature trees will be avoided. However, there may be some instances where vegetation removal may open up views previously screened. At most locations, any removed vegetation will be replanted, but there will be occasions where this is not practical such as within the proposed 4 m wide permanent access track to joint bays, above the permanent easement, or at the joint bays themselves, resulting in a permanent but very localised change.

At the time of writing, the latest specification (EirGrid, 2021) stated:

"The easement area shall be cleared, and kept clear, of trees and other vegetation with deep root systems as these may damage the cable".

Since publishing this specification, EirGrid has identified precedence from Germany and the Netherlands, for safely planting certain shrubs over High Voltage underground cables EirGrid has engaged closely with ESB, and relevant Dutch and German Transmission System Operators across Europe, to understand feasibility of planting over HV underground cables in Ireland. A Draft Over Cable Planting Strategy is in advance development in consultation with ESB, for which the Design Risk Assessment DRA was ongoing at time of writing (including calculations to assess a possible cable de-rating). The draft strategy combines the requirement for a minimum cable burial depth of 1 m (to top of Cement Bound Granular Mixture in the cable trench), use of a high performing Root Barrier Membrane, and a strictly defined shrub species list with known maximum root depths < 1 m. It is possible the DRA may conclude that over cable planting cannot be delivered while guaranteeing cable performance and security. There are also risks that the strictly defined shrub species list is not compatible with landowner farm boundary requirements and/or agricultural farm payments. As such, applying a precautionary principle, in this assessment offsite compensatory planting is assumed for all permanent losses within the easement.

The cable trench on off-road sections will be backfilled, then top soiled and re-vegetated, having regard for agricultural land use.

construction phase works will be transient, reversible and, in terms of the overall duration, short-term. Works at individual locations will be temporary. The cable trench Is anticipated to be completed at 40 m to 50 m per day so the construction area will pass receptors relatively quickly. Please see Chapter 5 (Proposed Development Description) of this EIAR for further details on the construction programme. During the construction phase, the underground cable will result in a low magnitude of impact along the sections of the route that follow the existing road network. The magnitude of impact will be medium-low along the off-road sections of the underground cable.

17.4.4.2 Magnitude of Construction Phase Landscape Character Impacts – Substations

Woodland and Dunstown Substations will require additional infrastructure and equipment to accommodate connections with the underground cable, thus with new structures and electrical apparatus to be installed within the existing substation compounds. As a result, there will be an increase in construction-related activity within the substations sites and an increase in vehicular movements within the surrounding road network. However, these works will occur within the footprint of the existing Woodland Substation and Dunstown Substation thus new permanent physical impact on the landscape will not occur. As a result, the magnitude of impact on the landscape due to the works at Woodland and Dunstown Substations is deemed to be low-negligible.

17.4.4.3 Significance of Construction Phase Landscape Character Impacts

The quality of the construction phase impacts will be Adverse. As the magnitude of landscape impacts during the construction phase (including Underground Cable and Substations) is assessed to be no greater than medium-low within the immediate surrounds of the proposed underground cable, and the sensitivity is medium-low, therefore, the significance of construction phase impacts is assessed to be Slight for both in-road and off-road sections.

The low-negligible landscape sensitivity at the two substations, in conjunction with the low-negligible magnitude of effects, will result in a construction phase impact significance of Imperceptible.

The duration of the landscape impacts are deemed to be Short-term for both the Underground Cable and the Substations.

Based on the impact significance matrix (Table 17.3), the significance of landscape effects are outlined in the Table 17.11.

Table 17.11: Significance of Construction Phase Landscape Character Impacts (both Underground Cable and Substations)

Landscape Character Area	Sensitivity	Magnitude of effect - Construction	Significance of effect - Construction
Meath: 12. Tara Skryne Hills	High - Medium	Medium-low	**Adverse** **Moderate-slight** **Short-term**
Meath: 11. South East Lowlands	Medium - Low	Medium-low	**Adverse** **Slight-imperceptible** **Short-term**
Meath: 14. Royal Canal	Medium	Medium-low	**Adverse** **Slight** **Short-term**
Kildare: Northern Lowlands	Low	Medium-low	**Adverse** **Slight-imperceptible** **Short-term**
Kildare: River Liffey	High- Medium	Medium-low	**Adverse** **Moderate-slight** **Short-term**
Kildare: Eastern Transition	Medium-Low	Medium-low	**Adverse** **Slight-imperceptible** **Short-term**
Woodland substation	High- Medium	Low-negligible	**Adverse** **Slight-imperceptible** **Short-term**
Dunstown Substation	Medium- Low	Low-negligible	**Adverse** **Slight-imperceptible** **Short-term**

17.4.5 Magnitude of Construction Phase Landscape Element Impacts

The Proposed Development will involve a combination of temporary and permanent tree and hedgerow loss which detailed in Section 5.5.9 of Chapter 5of this EIAR. It is predicted the construction of the cable route within roads with a width of 5 m or less would likely involve the consequent damage to the rooting system of roadside trees. Quantifications are detailed in Chapter 10 (Biodiversity). This would include a combination of temporary and permanent losses. There may be a degree of impact at particular locations along the route of the underground cable that relate most acutely to certain specific landscape and to visual receptors identified. It was determined, that this damage would be detrimental to one mature tree (greater than 15 years of growth) within Mixed Forestry - Woodland near the R407 regional road (approx. ch. 17750) and two mature trees within Mixed Forestry - Woodland R412 regional road (approx. ch. 52250) – 'principal landscape sensitivity factors' as identified in Table 17.6. Although this tree loss represents a direct permanent physical impact, it will be a limited loss affecting a very restricted area in the context of the immediate woodland context and the wider landscape fabric. All other construction activity in relation to these 'principal landscape sensitivity factors' will result in temporary effects. The underground cable will occur within 300 m of both plots of Mixed Forestry, but there will be no other direct impacts on either as the cable route, and other construction activity will occur within the road corridor. For these reasons, the magnitude of effect is deemed to be negligible.

An HDD technique will be undertaken so the underground cable can pass beneath the Canals and the River Liffey. HDD launch sites and the related facilities and activity will be new uncharacteristic features within 300 m of these watercourses but will be relatively discrete, involving a small number of workers.

The HDD launch sites for the canals will be located outside the canal corridors. Joint bays will be constructed within 300 m of the canals. At the Royal Canal, it will be in an agricultural field to the north, and at the Grand Canal, it will be in an existing road to the south, so in both instances, there will be no impact on any mature vegetation.

At the River Liffey, the HDD operation will not impact the riparian vegetation. The drilling area will be set back as far as possible from the riverbank to minimise impacts on tree roots (over 5m). There will be one permanent joint bay (JB49) within 300 m of the River Liffey. It will be in an agricultural field and will be positioned as far from the riverbank as possible (over 5m) within the Planning Application Boundary to minimise impacts on tree roots but it is determined that a minimum of three trees at ch. 36805 are required to be removed. The temporary construction area for the joint bay will occur within an area of 10 m x 2.5 m. The 3 m of permanent hardstanding associated with the joint bay will intentionally be positioned on the side of the bay furthest from the river. There will also be a section of permanent stoned access track within 300 m of the River Liffey. It will run parallel to an existing hedgerow but will be offset by a minimum of 3 m to minimise the potential for impacts on this hedgerow. At the western end of this permanent stoned track, the trench will have to pass through the adjacent hedgerow. A further four mature trees and four veteran trees (greater than 80 years of growth) elsewhere along the cable route within the 'principal landscape sensitivity factors' (River Liffey as set out in Table 17.6) are also anticipated to be removed during trenching works. All other construction activity concerning this 'principal landscape sensitivity factor' is anticipated to be temporary.

Open cut trenching and Joint Bay construction will involve localised vegetation removal and the felling of healthy mature trees will be unavoidable but no Tree Preservation Order or heritage trees mapped by the National Biodiversity Data Centre will be removed. There may be some instances where vegetation removal may open up views previously screened. At most locations, any removed vegetation will be replanted, but there will be occasions where this is not practical such as within the easement area, along proposed permanent access tracks to Joint Bays or at the Joint Bays themselves, resulting in a permanent but very localised change. The cable trench on off-road sections will be backfilled, then top soiled and re-seeded, having regard for current land use. Vegetation removal will not be at a scale that will have any material impact on the overall landscape fabric or on the broader landscape character along the route.

The quality of the construction phase impacts will be Adverse. For the reasons outlined above, it is determined the magnitude of impact on these landscape elements during construction will be no greater than medium-low. The duration of the landscape impacts is deemed to be Short-term for both the Underground Cable and the Substations.

Based on the impact significance matrix (Table 17.3), the significance of landscape effects are outlined in the Table 17.12.

Table 17.12: Significance of Construction Phase Landscape Element Impacts

Principal Landscape Sensitivity Factor	Sensitivity	Magnitude of effect - Construction	Significance of effect - Construction
Major Rivers and Water bodies - River Liffey	High-Medium	Medium-low	**Adverse** **Moderate-slight** **Short-term**
Canals - Royal Canal	Medium	Medium-low	**Adverse** **Slight** **Short-term**
Canals - Grand Canal	Medium	Medium-low	**Adverse** **Slight** **Short-term**
Mixed Forestry - Woodland near the R407 regional road	High	Negligible	**Adverse** **Imperceptible** **Short-term**
Mixed Forestry - Woodland R412 regional road	High	Negligible	**Adverse** **Imperceptible** **Short-term**

17.4.6 Construction Phase - Visual

17.4.6.1 Residential Receptors

Construction Phase visual impacts are an inevitable consequence of the Proposed Development being brought forward. The most notable influence will be as a result of the movement of construction related plant, and deliveries of materials within the Study Area resulting in Adverse impacts.

Given the degree of visibility, construction phase visual impacts will be localised to the immediate landscape of the Proposed Development, relating primarily to the movement on the local road network during the construction phase.

In relation to the assessment of residential receptors in the landscape to whom filtered views of construction activities may be possible, the magnitude of change is deemed to be no greater than low. When combined with the medium sensitivity of the visual receptors, the overall significance of impact during construction is assessed to be no greater than Slight. The duration of the impacts is deemed to be Short-term.

17.4.6.2 Key Visual Receptors

Based on the impact significance matrix (Table 17.3), the significance of landscape effects is outlined in the Table 17.13.

Table 17.13: Magnitude and Significance of Construction Phase at Key Visual Receptors

Key Visual Receptors	Construction Phase	Magnitude of visual effect - Construction	Significance of visual effect - Construction
Scenic View - Allen Bridge RC11 (approx. ch. 15750)	The view is focused on the canal corridor from the busy R148 regional road. The underground cable will pass under the Royal Canal 200 m to the northwest of this scenic view. Identifying construction works associated with the underground cable, a Joint Bay and the HDD launch site immediately to the north of the canal in the background are proposed. Intervening vegetation and terrain provide a good degree of screening of the Joint Bay and the HDD launch site. The magnitude of effect is deemed to be low.	Low	**Adverse** **Slight** **Short-term**
Scenic View - Millicent Bridge RL6 (townland of Castlesize) (approx. ch. 37100)	The view from this location is a heavily enclosed view within the River Liffey corridor. The underground cable will pass under the River Liffey 120 m to the southwest of this scenic view. It may be possible to identify construction works associated with the underground cable and the HDD sites on both banks of the river in the middle ground. Intervening vegetation is likely to provide a high degree of screening for the construction activities on the north side of the river, but on the south side, there will be a narrow-channelled view towards some of the works. Non-agricultural activities would be uncharacteristic in the view from this bridge, but they will be temporary in duration. Therefore, the magnitude of the visual effect is deemed to be low.	Low	**Adverse** **Moderate-slight** **Short-term**
Royal Canal National Waymarked Way (long-distance walking route)	The view from the canal is channelled along the canal corridor with vegetation on both sides, but it may be possible to glimpse the construction works. Still, these would be passed quickly in relation to the nature of the intermittent, sequential views afforded from the canal. Therefore the magnitude of the visual effect is deemed to be low.	Low	**Adverse** **Slight** **Short-term**

Key Visual Receptors	Construction Phase	Magnitude of visual effect - Construction	Significance of visual effect - Construction
Grand Canal National Waymarked Way (long-distance walking route)	The underground cable will be in-road as it spans the Grand Canal. Construction activity may be noticeable within a busy road corridor but will not be uncharacteristic at this location. Therefore the magnitude of the visual effect is deemed to be low-negligible	Low-negligible	**Adverse** **Slight-imperceptible** **Short-term**

17.4.7 Operational Phase - Landscape

17.4.7.1 Magnitude of Operational Phase Landscape Character Impacts – Underground Cable

Once the construction phase is complete, the road surface / agricultural grassland will be reinstated along the underground cable route but hedgerows/treelines within the permanent easement will not be replanted; thus, there will be a material surface expression of the underground features, however, it will be minimal. Further details on the approach to trees, hedgerows, and treelines are provided in Chapter 5 of this EIAR (Section 5.5.9). That text outlines the approach to reducing the amount of trees, hedgerows, and treelines affected by the Proposed Development, and the mitigation that will be put into place to minimise the effects. As outlined Chapter 5, there will be 348 trees removed 4% of the trees in the tree study area (which is the Planning Application Boundary plus a 30m buffer), with a further 710 trees potentially at risk, 8% of the trees in the study area. The locations of the trees are shown on Figure 5.2, Volume 4 of this EIAR. There will be 3.2km of hedgerow temporarily lost, and 0.7km permanently lost (2.1% of the hedgerows within the Planning Application Boundary). There will be 1.1km of treelines temporarily lost, and 0.8km permanently lost (3.1% of the hedgerows within the Planning Application Boundary). Their locations are described in Chapter 10 (Biodiversity) of this EIAR and shown on Figure 10.2, Volume 4 of this EIAR. Hedgerows removed for temporary works within the Planning Application Boundary which can be reinstated will be replanted with a new species-rich hedgerow which is proposed to be to be more ecologically diverse than what was removed. The species mix will be in accordance with the specification detailed in Section 5.5.9, Chapter 5 of this EIAR. In addition, vegetation removed during the construction phase at passing bays will be reinstated along the original alignment and will also be replanted with species-rich hedgerows.

The main identifiable features will be the joint bays and permanent access tracks, both of which would have minimal impact on the landform. Operational stage impacts mainly relate to the maintenance works for the underground cable, which will be infrequent and will be brief in nature (see Section 5.5 of this EIAR). Maintenance operations will be less intensive than the activity at the construction stage. For these reasons, the underground cable is deemed to have a negligible magnitude of impact on landscape character.

17.4.7.2 Magnitude of Operational Phase Landscape Character Impacts – Substations

The proposed changes to the Woodland and Dunstown Substations will occur within the existing substation footprints or immediately adjacent to existing equipment and, consequently, will be located where the landscape character is already influenced by electrical infrastructure. Thus, there will be no material change to the landscape character. For these reasons, the magnitude of operational phase effect on the landscape due to the upgrades at Woodland and Dunstown Substations is deemed to be negligible.

17.4.7.3 Significance of Operational Phase Landscape Character Impacts

The quality of the operational phase impacts will be Adverse for both the proposed underground cable and the substations. The proposed underground cable and the substations will both have a negligible magnitude of impact on the landscape during the operational phase. This combined with the landscape sensitivity along the route of the underground cable and at the substations, will result in an overall operational phase impact significance of Imperceptible for both. The duration of the impacts is deemed to be Permanent.

Based on the impact significance matrix (Table 17.3), the significance of landscape effects is outlined in the Table 17.14.

Table 17.14: Significance of Operational Phase Landscape Character Impacts (both Underground Cable and Substations)

Landscape Character Area	Sensitivity	Magnitude of effect - Operational	Significance of effect - Operational
Meath: 12. Tara Skryne Hills	High - Medium	Negligible	**Adverse** **Imperceptible** **Permanent**
Meath: 11. South East Lowlands	Medium - Low	Negligible	**Adverse** **Imperceptible** **Permanent**
Meath: 14. Royal Canal	Medium	Negligible	**Adverse** **Imperceptible** **Permanent**
Kildare: Northern Lowlands	Low	Negligible	**Adverse** **Imperceptible** **Permanent**
Kildare: River Liffey	High- Medium	Negligible	**Adverse** **Imperceptible**

Landscape Character Area	Sensitivity	Magnitude of effect - Operational	Significance of effect - Operational
			Permanent
Kildare: Eastern Transition	Medium-Low	Negligible	**Adverse** **Imperceptible** **Permanent**
Kildare: Eastern Transition	High - Medium	Negligible	**Adverse** **Imperceptible** **Permanent**
Kildare: Eastern Transition	Medium - Low	Negligible	**Adverse** **Imperceptible** **Permanent**

17.4.7.4 Magnitude of Operational Phase Landscape Element Impacts

Operational phase impacts will be lower than those anticipated to occur during the construction phase. All construction activity will have ceased, and there will be very little evidence of the Proposed Development. For the reasons outlined above, it is determined the magnitude of impact on landscape elements during the operational phase will be negligible in relation to the Mixed Forestry and the River Liffey; and no greater than low-negligible for the canals.

17.4.7.5 Significance of Operational Phase Landscape Element Impacts

Based on the impact significance matrix (Table 17.3), the significance of landscape effects is outlined in the Table 17.15.

Table 17.15: Significance of Operational Phase Landscape Elements

Principal Landscape Sensitivity Factor	Sensitivity	Magnitude of effect - Operational	Significance of effect - Operational
Major Rivers and Water bodies - River Liffey	High-Medium	Negligible	**Adverse** **Slight-imperceptible** **Permanent**
Canals - Royal Canal	Medium	Low-negligible	**Adverse Imperceptible Permanent**
Canals - Grand Canal	Medium	Low-negligible	**Adverse Imperceptible Permanent**
Mixed Forestry - Woodland near the R407 regional road	High	Negligible	**Adverse Imperceptible Permanent**
Mixed Forestry - Woodland R412 regional road	High	Negligible	**Adverse Imperceptible Permanent**

17.4.8 Operational Phase - Visual

17.4.8.1 Residential Receptors

Operational Phase visual impacts as a consequence of the Proposed Development is anticipated to be minimal, but any visual change within the Study Area will likely result in Adverse impacts.

The Proposed Development is anticipated to have a very limited consequence in relation to visual amenity for residential dwellings during the operational phase. Visual changes are likely to be highly localised and/or filtered. Therefore the magnitude of change is deemed to be Low. When combined with the sensitivity of the visual receptors, the overall significance of impact during operational phase is assessed to be Slight. The duration of the impacts is deemed to be Permanent.

17.4.8.2 Key Visual Receptors

Based on the impact significance matrix (Table 17.3), the significance of visual effects is outlined in the Table 17.16.

Table 17.16: Magnitude and Significance of Operational Phase at Key Visual Receptors

Key Visual Receptors	Operational Phase	Magnitude of visual effect - Operational	Significance of visual effect - Operational
Residential Receptors	Minimal, but any visual change within the Study Area will likely result in Adverse impacts.	Low	**Adverse** **Slight** **Permanent**
Scenic View - Allen Bridge RC11 (approx. ch. 15750)	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.	Negligible	**Adverse Imperceptible Permanent**
Scenic View - Millicent Bridge RL6 (townland of Castlesize) (approx. ch. 37100)	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.	Negligible	**Adverse Imperceptible Permanent**
Royal Canal National Waymarked Way (long-distance walking route)	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.	Negligible	**Adverse Imperceptible Permanent**
Grand Canal National Waymarked Way (long-distance walking route)	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.	Negligible	**Adverse Imperceptible Permanent**

17.5 Mitigation Measures

The primary measure employed in respect of landscape and visual impacts for the Proposed Development was avoidance of impacts through design. The key embedded design measure relevant to landscape and visual, as well as many of the other environmental factors, is to place the underground cable within the existing road bed in order to minimise the amount of vegetation loss (hedgerows and riparian). This has been applied in the design of the Proposed Development in so far as is feasible. Mitigation of effects on landscape and visual receptors is neither possible nor practicable, in some instances. For example, it is not possible to provide landscape mitigation for the loss of land from private properties, or to provide mitigation for the loss of mature trees in the short / medium-term until the proposed replacement planting becomes established.

17.5.1 Construction Phase

Once the construction phase is complete, the road surface / agricultural grassland will be reinstated along the underground cable route for all temporary works areas. Thus, any permanent material surface expression of the underground features will be minimal. In instances where it occurs outside the permanent easement, hedgerows removed for temporary works within the Planning Application Boundary will be replanted with a new species-rich hedgerow which is likely to be more ecologically diverse than what was removed. Where applicable, vegetation removed during the construction phase at Passing Bays will be reinstated along the original alignment and will also be replanted with species-rich hedgerows, albeit within the permanent wayleave no replacement planting will be possible – generally this will be a 5 metre wide gap, except it will be 15 metres wide between chainage 0 (at Woodland substation) and 3400 (where the underground cable meets the R156). Additional specific landscape and visual mitigation measures are not considered necessary during the construction phase as all impacts will be either temporary or short-term and not considered 'significant'.

17.5.2 Operational Phase

Specific additional landscape and visual mitigation and monitoring measures are not considered necessary in relation to the Proposed Development during the operational phase, as there is no potential for significant impacts.

17.6 Residual Effects

No residual landscape and visual impacts are predicted as a result of the construction and operational phases of the Proposed Development.

17.7 Conclusion

Landscape and visual effects have been considered in respect of the Proposed Development. The proposed changes to the Woodland and Dunstown Substations will occur within the existing substation footprints or immediately adjacent to existing equipment and, consequently, will be located where the landscape character is already influenced by electrical infrastructure. Thus, there will be no material change to the landscape character and no significant landscape or visual effects. For the remainder of the Proposed Development outside the substations, there is the potential for adverse construction phase effects (maximum of Moderate-slight in certain areas), but these will be localised and temporary / short-term in duration. There will be no significant operational phase impacts as the Proposed Development will be predominantly below ground with the land cover above largely reinstated.

For the reasons outlined within this chapter, it is considered that the Proposed Development will not give rise to any significant landscape or visual effects.

17.8 References

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18. Risk Of Major Accidents and/or Disasters

18.1 Introduction

This chapter of the EIAR assesses the potential significant adverse impacts of the Proposed Development, deriving from its vulnerability to risks of major accidents and/or disasters (MA&DS) during the construction and operational phase.

The underlying objective of considering the risk of MA&Ds is to ensure that appropriate precautionary measures are taken for those projects with a likelihood of creating 'significant environmental impacts' (Environmental Protection Agency (EPA) 2022) and with a focus on 'low likelihood but potentially high consequence events' in accordance with guidance provided by the Institute of Environmental Management and Assessment (IEMA 2020). A further objective is to ensure that the EIAR identifies measures to mitigate harm that could arise from those unlikely scenarios and ensure that it addresses preparedness and response planning.

This chapter outlines how the potential for MA&Ds relevant to the Proposed Development have been identified and how those risks will be managed and/or controlled. Based on the requirements of the EIA Directive, this chapter considers:

- The relevant MA&Ds, if any, that the Proposed Development could be vulnerable to;
- The potential for these MA&Ds to result in likely significant adverse environmental effects on people and local communities, and the natural, built and historic environments; and
- The existing and proposed mitigation and management measures to prevent and mitigate the likely significant adverse effects of such events on the environment.

This chapter should be read in conjunction with the following Chapters, and their Appendices, which expand upon aspects of the Proposed Development:

- Chapter 5 (Proposed Development Description);
- Chapter 8 (Air Quality);
- Chapter 9 (Noise and Vibration);
- Chapter 10 (Biodiversity);
- Chapter 11 (Soils, Geology and Hydrogeology);
- Chapter 12 (Hydrology); and
- Chapter 20 (Climate).

18.1.1 Relevant Guidelines, Policy and Legislation

The development of the risk assessment methodology has been prepared in accordance with the following guidelines and legislation:

- A Guide to Risk Assessment in Major Emergency Management (Department of Environment, Heritage and Local Government (DoEHLG 2010);
- A National Risk Assessment for Ireland 2020 (Government of Ireland 2020);
- Directive 2012/18/EU of the European Parliament and of the Council of July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC;
- EU Regulation 402/2013 (as amended) on the Common Safety Method on Risk Evaluation and Assessment (CSM-RA) (as amended by Regulation EU 2015/1136);
- Health and Safety Authority Guidance on Technical Land-use Planning Advice for Planning Authorities and Operators of Establishments under the COMAH establishments (HSE 2023);
- Major Accidents and Disasters in EIA: A Primer (IEMA 2020) (IEMA 2020);
- S.I. No. 291 of 2013 – Safety, Health and Welfare at Work (Construction) Regulations 2013 (hereafter referred to as the Safety, Health and Welfare (Construction) Regulations);
- S.I. No. 299/2007 - Safety, Health and Welfare at Work (General Application) Regulations 2007 (hereafter referred to as the Safety, Health and Welfare at Work (General Application) Regulations);
- S.I. No. 10 of 2005 – Safety, Health and Welfare at Work Act 2005 (as amended);
- Safe Evacuation for All: A Planning and Management Guide (National Disability Authority 2011);
- Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances (the Seveso III Directive);
- S.I. No. 209 of 2015 - A Guide to the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015; and
- International Organization for Standardization 31000:2018 Risk Management.

The following external plans and assessments have also informed the assessment:

- Major Emergency Plan of Kildare County Council (KCC) (KCC 2010); and
- Major Emergency Plan of Meath County Council (MCC) (MCC 2020).

The following project-specific documents have also informed the assessment:

- CEMP including topics addressed as follows:
  - Construction Resource and Waste Management;
  - Traffic Management Plan; and
  - Environmental Incident Response.

- Chapter 12 (Hydrology - Flood Risk Assessment).

18.1.2 Definitions

At the time of undertaking this assessment, no clear definition of the term 'major accident and / or disaster' has been outlined in the context of the EIA Directive. For the purposes of this assessment, the following definitions from the Institute of Environmental Management and Assessment (IEMA) Major Accidents and Disasters in EIA: A Primer (hereafter referred to as the IEMA Primer) (IEMA 2020) have been adopted:

- Accident – something that happens by chance or without expectation;

- Disaster – a natural hazard (e.g. earthquake) or a man-made / external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident;

- Major Accident – events that threaten immediate or delayed serious environmental effects to human health, welfare and / or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events;

- Risk – the likelihood of an impact occurring, combined with the effect or consequence(s) of the impact on a receptor if it does occur;

- Risk event – an identified, unplanned event, which is considered relevant to the Proposed Development and has the potential to result in a major accident and / or disaster, subject to assessment of its potential to result in a significant adverse effect on an environmental receptor;

- Vulnerability – the potential for harm as a result of an event, for example due to sensitivity or value of receptors. In the context of the EIA Directive, the term refers to 'exposure and resilience' of the Proposed Development to the risk of a major accident and / or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact; and

- Significant Environmental effect (in relation to a major accident and / or disaster assessment) – includes the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.

18.2 Baseline Environment

As described in detail throughout the technical environmental chapters of this EIAR (Chapters 7 to 17), there are a number of sensitive receptors located along or near the alignment of the Proposed Development that may be vulnerable to major risks and/or natural disasters. These include the following:

- The high-density population located along the alignment, as discussed and assessed under Chapter 7 (Population and Human Health). These not only include residential properties but also include education facilities, places of worship, recreational areas, sports grounds, hospitals and other buildings with sensitive activities;

- There are numerous historic buildings and structures of architectural heritage along the Proposed Development alignment. These have been detailed and assessed in Chapter 13 (Archaeology, Architectural Heritage and Cultural Heritage);

- Sensitive habitats and protected designated European sites are detailed and assessed in Chapter 10 (Biodiversity);
- Water resources are detailed in Chapter 12 (Hydrology) and Chapter 11 (Soils, Geology and Hydrogeology);
- Traffic and air quality are discussed in Chapter 8 (Air Quality) and Chapter 14 (Traffic and Transport);
- Land quality, agriculture, soil and geology have been detailed and assessed in Chapter 11 (Soils, Geology and Hydrogeology) and Chapter 15 (Material Assets); and
- Landscape and visual sensitive receptors have been assessed and detailed in Chapter 17 (Landscape and Visual).

18.2.1 Hazards

18.2.1.1 Natural Hazards

Ireland's geographic location means it is less vulnerable to natural disasters such as earthquakes or tsunamis, which might pose a risk to projects of this nature and scale in other locations around the world. However, in recent times there has been an increase in the number of severe weather events in the country, particularly those leading to flooding and flash flood incidents.

With regards natural disasters, severe weather conditions pose one of the most common risks to Ireland and to the Proposed Development. Furthermore, climate change may change the likelihood of a natural disaster occurring. Flood risk relating to the Proposed Development is further detailed in Chapter 12 (Hydrology).

18.2.1.2 Geo-stability Hazards

Ground conditions generally comprise limestone derived tills with areas underlain by till derived from sandstones and shales in the north and areas of mapped alluvium and gravels derived from limestone correlate with mapped watercourses and their floodplains. No quarries, landslides or geological heritage sites have been identified however given the nature of the bedrock there is potential for the presence of karst features within limestone. Soils, geology and hydrogeology are detailed and assessed in Chapter 11 (Soils, Geology and Hydrogeology).

18.2.1.3 Anthropogenic Hazards

Potential MA&DS can also result due to anthropogenic activity in the vicinity of the Proposed Development. These are discussed below in the context of Industrial sites including Seveso sites and adjacent major infrastructure.

18.2.1.4 Industrial Sites

There are three industrial sites within 1 km of the Proposed Development, which are subject to Industrial Emissions Directive (IED) licences from the EPA. A potential risk with industrial sites is the existence of a source-pathway-receptor linkage. A 1km distance is determined to ensure any potential risks do not have an opportunity to have an effect on the Proposed Development or for the Proposed Development to have an effect on them. These are:

- Enrich Environmental Limited (IEL), townland of Newtownrathganley, Co. Meath – 660 m from the Proposed Development;
- LPD (Ireland) Limited/Weathercreate Coatings Limited (IEL), Military Road, Naas, Kildare – 556 m from the Proposed Development; and
- Boran Plastic Packaging Limited (IPC), townland of Osberstown, Co. Kildare – 88 m from the Proposed Development.

18.2.1.5 Seveso Sites

A review of Upper Tier and Lower Tier Seveso Sites in County Kildare and County Meath and their respective distances from the Proposed Development was undertaken.

Seveso Sites are subject to the Seveso III Directive Volume 3 - Book 3: Material Assets, Waste and Materials Management, Cultural Heritage, Landscape and Risk Chapter 28: Risk of Major Accidents & Disasters Page 13 (2012/18/EU) and relate to the control of major accident hazards involving dangerous substances. The Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the "COMAH Regulations"), implements the Seveso III Directive (2012/18/EU) (refer to Figure 28.1). This classification as a Seveso site identifies the facilities as being industrial establishments where dangerous substances are used or stored in large quantities. The occurrence of a major emission, fire or explosion resulting from a Seveso site has the potential to give rise to a major accident or disaster, immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances.

Of the Seveso Sites listed on the Health and Safety Authority (HSA) website (https://www.hsa.ie), six are situated within 30 km of the centreline of the Proposed Development cable route (Table 18.1).

There are two tiers of establishment, which are related to the quantities of dangerous substances present, in this case, both facilities are lower tier establishments. The Health & Safety Authority is the Central Competent Authority that provides advice where appropriate in respect of planning applications within a certain distance of the perimeter of these sites. Seveso Site Consultation Distances are specified in the Planning & Development Regulations, 2001 (As amended) and vary depending on the nature of activity at the site.

Table 18.1: Seveso Sites within 30 km of the Proposed Development

Tier	Name	Address	Approx. Linear Distance from the Proposed Development
Upper	Irish Industrial Explosives	Clonagh, Enfield, Co. Kildare	7.1 km to the west
Upper	Intel Ireland Ltd.	Collistown Industrial Park, Co. Kildare	11.6 km to the south-east
Lower	Great Northern Distillery	Cloncowan, Kill, Trim, Co. Meath	19.9 km to the west
Upper	Boliden Tara Mines DAC	Knockumber Road, Navan, Co. Meath	22.5 km to the northwest
Lower	Xtratherm Limited	Liscarton Industrial Estate, Kells Road, Navan, Co. Meath	24.8 km to the north-west
Lower	Grassland Argo Slane	The Pound Road, Slane, Co. Meath	27.1 km to the north-east

The principal hazards associated with the Upper Tier Seveso Sites within 30 km of the Proposed Development are:

- Physical damage and / or adverse human health effects due to fire and / or explosion as a result of ignition of flammable liquids / vapours;
- Environmental pollution as a result of release of toxic substances; and
- Adverse human health effects as a result of release of toxic substances.

A review of the traffic impact assessment reported in Chapter 14 (Traffic and Transport) has also been undertaken to determine the potential for impacts on emergency response accesses to Seveso sites from their respective nearest hospital and fire stations. No significant impacts on emergency response times are anticipated and it has therefore been scoped out of this assessment.

Because of the distances of the Seveso Sites from the Proposed Development, only the Irish Industrial Explosives site has been screened into the assessment.

18.2.1.6 Utilities Infrastructure

The Proposed Development will cross and directly impact on existing utilities during the construction phase. Utilities including gas, power and water services are detailed in Chapter 5 (Proposed Development Description).

18.3 Methodology

18.3.1 Scope and Content

The scope and methodology presented in this chapter is based on the provisions of the EIA Directive, Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022), Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 Volume 3 - Book 3: Material Assets, Waste and Materials Management, Cultural Heritage, Landscape and Risk Chapter 28: Risk of Major Accidents & Disasters Page 5 (S.I. No. 209 of 2015) ((COMAH Regulations), European Commission (2017) guidance, IEMA (2020) guidance and other published risk assessment methodologies and professional judgement (referenced in Section 28.2.2.2).

The identification, control and management of risk is an integral part of the design and assessment process throughout all stages of a project lifecycle. The scope and methodology of this assessment is centred on the understanding that the Proposed Development will be designed, built and operated in line with best international current practices and guidelines. As a result, major accidents resulting from the Proposed Development will be very unlikely.

A risk analysis-based methodology that covers the identification of risks and considers their likelihood to occur and the potential consequences of MA&Ds has been used for this assessment. The criteria considered for this risk assessment seek to determine:

- The risk events that have the potential to result in a MA&D that the Proposed Development may be vulnerable to or which the Proposed Developmentcould contribute to; and

- The consequent impacts and significance of such incidents in relation to population, human health and the receiving natural, built and historic environments.

Such risks may be present at the construction phase and operational phase of the Proposed Development. It is anticipated that this Proposed Development will not have a decommissioning phase.

18.3.2 Risk Assessment Methodology

The impact assessment methodology is risk based and involves three stages;

- Identification and Screening of potential risk events;

- Risk classification; and

- Risk evaluation.

18.3.3 Identification and Screening

The first stage of the assessment was to identify potential unplanned risks that the Proposed Development may cause or may be vulnerable to. An initial list of relevant hazards which may make the Proposed Development vulnerable to major accidents and or disasters that could potentially result in significant effects were identified and sourced using the guidelines and reference documentation as listed above.

The list of potential risk events that could lead to major accidents and / or disasters was subjected to an initial screening assessment to identify the potential risks that the scoping criteria (i.e. that meets the definition of a MA&D). The following risks were screened out of the assessment according to the following criteria:

- MA&Ds that have already been assessed in other areas of this EIAR, for example flood risk.;
- MA&Ds with construction phase and operational phase activities that fall within the Regulations and Codes of Practice made under the Safety, Health and Welfare at Work Act and associated Regulations, for example risks associated with working at height and within confined spaces;
- MA&Ds where no 'source-pathway-receptor' linkage exists e.g. an oil spill occurring at an oil depot that is not located near to a watercourse and for which there is no pathway from source to receptor;
- MA&Ds where risk events are not applicable to that particular geographic location (e.g. volcanic activity, earthquakes in Meath and Kildare, and risk of nuclear accidents in Ireland); and
- Risk events that possess low likelihood / low consequence, as they do not meet the criteria of the assessment of being a MA&Ds, for example the risk of minor traffic accidents on the road network causing delays.

18.3.4 Risk Classification

Following the initial identification and screening process, remaining MA&Ds were evaluated with regard to the likelihood of occurrence and the potential impact. The rating criteria adopted for the assessment followed that used in A Guide to Risk Assessment in Major Emergency Management (DoEHLG 2010) combined with guidance from IEMA Primer (IEMA 2020) and guidelines provided in the EPA Guidelines (EPA 2022). The EPA Guidelines state that the risk assessment must be based on a 'worst case' approach. Therefore, the consequent rating assumes that all embedded design mitigation measures and safety procedures have failed to prevent the MA&Ds.

The classification and rating of likelihood and consequence, as taken from A Guide to Risk Assessment in Major Emergency Management are provided in Table 18.2 and Table 18.3. These apply to both the construction phase and operational phase.

Table 18.2: Classification of Likelihood (source DoEHLG 2010)

Rating	Classification	Impact Description
1	Extremely Unlikely	May occur only in exceptional circumstances; once every 500 or more years
2	Very Unlikely	Is not expected to occur; no recorded incidents or anecdotal evidence; and/or very few incidents in associated organisations, facilities or communicates; and/or little opportunity, reason or means to occur. May occur once every 100 to 500 years.
3	Unlikely	May occur at some time; and/or infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organization worldwide; some opportunity, reason or means to occur. May occur once every 10 to 100 years
4	Likely	Likely to or may occur; regular recorded incidents and strong anecdotal evidence. Will probably occur once every one year to 10 years.
5	Very Likely	Very likely to occur; high level of recorded incidents and/or strong anecdotal evidence. Will probable occur more than once a year.

Table 18.3: Classification of Consequence (source DoEHLG 2010)

Rating	Classification	Impact	Description
1	Minor	Life, Health, Welfare, Environment, Infrastructure, Social	• Small number of people affected; no fatalities and small number of minor injuries with first aid treatment • No contamination, localized effects • €<0.5 million * • Minor localised disruption to community services or infrastructure (<6 hours)
2	Limited	Life, Health, Welfare, Environment,	• Single fatality; limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small

Rating	Classification	Impact	Description
		Infrastructure, Social	number of people for 6-24 hours. Personal support satisfied through local arrangements • Simple contamination, localized effects of short duration • €0.5million to €3 million * • Normal community functioning with some inconvenience
3	Serious	Life, Health, Welfare, Environment, Infrastructure, Social	• Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation. Large number of people displaced for 6-24 hours or possibly beyond; up to 500 evacuated. External resources required for personal support. • Simple contamination, widespread effects or extended duration • €3 million to €10 million * • Community only partially functioning, some services available
4	Very Serious	Life, Health, Welfare, Environment, Infrastructure, Social	• 5 to 50 fatalities, up to 200 serious injuries, up to 2,000 evacuated • Heavy contamination, localized effects or extended duration • €10 million to €25 million * • Community functioning poorly, minimal service available
5	Catastrophic	Life, Health, Welfare, Environment, Infrastructure, Social	• Large numbers of people impacted with a significant number of fatalities (>50), injuries in the hundreds, more than 2000 evacuated • Very heavy contamination, widespread effects of extended duration • €>25 million *

Rating	Classification	Impact	Description
			• Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support

* economic impact in terms of costs of property/ infrastructure damage as well as recovery costs or loss of economic production.

18.3.4.1 Risk Evaluation

Using guidelines provided by the DoEHLG (2010) and the IEMA Primer (IEMA 2020), MA&Ds were evaluated against a risk matrix to determine the level of significance of each risk for each scenario. These have been grouped according to three categories below and presented visually in Table 18.4:

- High Risk – events that have an evaluation score of 15 to 25, as indicated by the Red Zones in Table 18.4
- Medium Risk – events that have an evaluation score of 8 to 12, as indicated by the Amber Zone in Table 18.4; and
- Low Risk – events that have an evaluation score of 1 to 6, as indicated by the Green Zone in Table 18.4.

Table 18.4: Levels of Significance (derived from DoEHLG (2010); EPA (2022) and IEMA (2020))

Likelihood	5 - V. Likely	5	10	15	20	25
	4 - Likely	4	8	12	16	20
	3 - Unlikely	3	6	9	12	15
	2- V. Unlikely	2	4	6	8	10
	1 - Ext. Likely	1	2	3	4	5
		1 - Minor	2 - Limited	3 - Serious	4 - V. Serious	5 - Catastrophic
	Consequence of Impact					

Significant impacts resulting from major accidents and / or disasters are adverse impacts that are described as ‘Significant’, ‘Very Significant’ or ‘Profound’ under the EPA Guidelines (EPA 2022). Therefore, significant adverse impacts that fall within the Amber Zone and Red Zone are brought forward for further consideration and assessment for further mitigation. The IEMA Primer (IEMA 2020) recommends that the MA&D assessment focuses on low likelihood but potentially high consequence events, therefore for the purposes of this assessment and to also bring this in line with DoEHLG's (2010) guidance, it can be assumed that the Red Zone is high likelihood/high consequence, and the Amber Zone is low likelihood/high consequence.

As per the IEMA Primer (IEMA 2020) low-consequence events have been scoped out as they are not considered to be a MA&Ds. Where relevant these risks to the environment are addressed under other topics in the EIAR.

18.4 Potential Effects

18.4.1 Risk Evaluation

The potential impacts in this section assume a worst-case scenario, which does not consider the implementation of mitigation measures or emergency plans which will be in place to reduce the likelihood and potential impact of any MA&Ds.

A MA&Ds risk register has been developed which contains precautionary scenarios identified as presenting a probabilistic risk during the construction phase and operational phase of the Proposed Development and has been evaluated using the criteria in above This is provided in Table 18.5.

Table 18.5: Potential Risk of Major Accidents and Disasters in the Absence of Mitigation

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
Construction Phase							
Engineering Accidents / Failures							
C1	Utilities – Risk of gas explosion due to the strike of a gas mains during excavation works	Throughout	Unlikely	3	Serious Potential fatalities and injuries. Hazards associated with the explosion to neighbouring residents, businesses and activities. Potential to discharge deleterious material to adjacent watercourses	2	Low
C2	Utilities – Risk of release of trapped gas under pavements that accumulates due to local gas leaks	Throughout	Unlikely	3	Minor Potential minor risk of poisoning. Simple contamination, localised effects of short duration	1	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
C3	Utilities – Risk of exposure to and release of untreated wastewater due to the strike of mains sewers and combined sewers during excavation	Throughout	Very Unlikely	2	Limited Potential injury Hazards associated with exposure to untreated wastewater (diseases etc.) Potential untreated wastewater to discharge to adjacent watercourses	2	Low
C4	Utilities – Risk of striking watermains supply	Throughout	Unlikely	3	Minor Potential minor injury for nearby personnel and potential displacement of local residences and business in the event of flooding. Clean mains water supply so no potential for contamination	1	Low
C5	Utilities – Risk of striking and damaging low voltage overhead lines (such as telecoms, fibre optics etc.)	Throughout	Unlikely	3	Limited Localised disruption / inconvenience to community	2	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
	that cross the Proposed Development						
C6	Utilities – Risk of striking and damaging high voltage underground cables during excavation	Throughout	Very Unlikely (Easiest cables to detect remotely and have warning marker tapes above them)	2	Serious Potential fatalities and injuries Potential to lead to fire and associated effects Potential to disrupt electricity / telecoms supply	3	Low
C7	Utilities – Risk of striking and damaging low voltage underground cables (telecoms, electricity cables, fibre optic etc.) during excavation	Throughout	Unlikely	3	Limited Localised disruption / inconvenience to community	2	Low
C8	Utilities – failure of brick or other sewers during connection by new works causing collapse	Locations where there are new connections	Unlikely	3	Limited Potential injury	3	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
		to existing system.			Hazards associated with exposure to untreated wastewater (diseases etc.) Potential untreated wastewater to discharge to adjacent watercourses		
C9	Structures – Risk of working above / collapse of structure during construction of the Proposed Project	Proposed works at bridges	Very Unlikely	2	Serious Potential fatalities and injuries Potential to cause environmental damage to the aquatic environment and associated species and to ecologically designated areas. Potential to cause disruption to local road network infrastructure	3	Low
C10	Structures – Risk of collapse of structures during the construction of the Proposed Project	Proposed works at bridges	Unlikely	3	Minor Potential injuries to a limited amount of people. Minor localised disruption to road network infrastructure.	1	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
C11	Tree Stability - Risk of trees with unstable roots falling during surface and excavation works / potential for contact with overhead lines, residents, properties, pedestrians and road users	Throughout	Unlikely	3	Limited Potential fatality and injuries Localised effects and short duration. Potential for some minor damage to local infrastructure	2	Low
C12	Deep excavations during roadworks adjacent to live traffic – risk of falling from a height	Throughout	Very Unlikely	2	Minor Shallow excavations only required	2	Low
Geological Disasters							
C14	Ground Collapse – Risk of excavation works leading to the subsidence of land/encountering unstable ground during construction	Throughout	Unlikely	3	Minor Shallow excavations only required	1	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
Transport Accidents							
C15	Transport Accident – Major road traffic accidents resulting from construction phase traffic and works taking place adjacent to live traffic	Throughout	Unlikely	3	Limited Potential fatality and injuries due to increased movements and collisions with construction traffic Disruption to local road network infrastructure	2	Low
C16	Transport Accident – Risk of accidents due to interface of construction works with other public transport infrastructure	Throughout	Very Unlikely	2	Serious Potential fatalities and injuries Disruption to local road network infrastructure	2	Low
Environmental Risks							
C17	Contamination Event - Risk of encountering unknown contaminated ground and mobilisation during construction / disturbance of tar bound material during excavations or full depth	Throughout	Unlikely	3	Limited Potential injury from exposure to hazardous substances Potential for a limited number of people to be affected and for short duration localised effects	2	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
	pavement replacement / hazardous pipe materials (i.e. asbestos pipes) and potential damage to brittle pipes during construction works				Potential to cause environmental damage		
C18	Contamination Event – Pollution event leading to environmental damage to watercourses or groundwater, particularly associated with the potential release of silt to the aquatic environment	Locations near watercourses	Unlikely	3	Serious Potential to cause environmental damage to the aquatic environment and associated species and to ecologically designated areas	3	Low
C19	Contamination Event – Risk of encountering and mobilising contaminants during construction / hazardous pipe materials (i.e. asbestos pipes) and potential damage to brittle pipes during construction works.	Throughout	Unlikely	3	Limited Potential injury from exposure to hazardous substances Potential for a limited number of people to be affected and for a short duration localised effects	2	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
C20	Biosecurity - Risk of spread of invasive species during construction works, particularly during site clearance works	Throughout	Unlikely	3	Serious Contamination with extended duration and potential to lead to more widespread effects	3	Low
Extreme Weather Event							
C21	Extreme Weather Event – Risk of extreme weather events such as prolonged flooding resulting in sediment load runoff during construction, storm damage, snowstorm, wildfire.	Throughout	Unlikely	3	Limited Localised displacement of a small number of people and short duration and localised effects	2	Low
Industrial Accidents							
C22	Industrial Incident – Explosion / fire occurring at adjacent facility containing flammable / hazardous	Throughout	Very Unlikely	2	Limited Potential for injury working near live traffic taking evasive action to avoid fire services	2	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
	substances (i.e. petrol station)				Localised disruption to road network		
Operational Phase							
O1	Cable Strike – risk of third party striking cable during excavation works in vicinity of new cable		Extremely Unlikely	1	Limited Potential fatality and injuries Potential for localised damage to infrastructure and disruption to road network	2	Low
Transport Accident							
O2	Transport Accident – Major road traffic accidents resulting from maintenance works taking place adjacent to live traffic	Throughout	Unlikely	3	Limited Potential fatality and injuries Disruption to local road network infrastructure	2	Low
O3	Transport Accident - Risk of accidents due to interface of operation with other public transport infrastructure.	Throughout	Very Unlikely	2	Serious Potential fatalities and injuries	3	Low

Risk ID	Risk Event	Proposed Development Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
					Disruption to local road network infrastructure		
Industrial Accidents							
04	Industrial Incident – Explosion / fire occurring at adjacent facility containing flammable / hazardous substances (i.e. petrol station)	Throughout	Very Unlikely	2	Limited Potential for localised damage to infrastructure	2	Low
Extreme Weather Events							
05	Extreme Weather Event – Risk of extreme weather events such as prolonged flooding resulting in sediment load runoff, prolonged periods of heavy rainfall at surface works including open and deep excavation, storm damage, snowstorm, wildfire.	Throughout	Unlikely	3	Limited Potential for localised damage to infrastructure	2	Low

The results from the evaluation have been applied to Table 18.6.

Table 18.6: Evaluation of Levels of Significance in the Absence of Mitigation

Likelihood	**5 - V. Likely**					
	4 - Likely					
	3 - Unlikely	C2,C4,C10,C14,C17	C5,C7,C8,C11,C13, C15, C19, C21, C23,O2,O5, C1,C18,C20			
	2- V. Unlikely	C12	C3,C22,O4	C6,C9,C16,O3		
	1 - Ext. Unlikely		O1			
		1 - Minor	**2 - Limited**	**3 - Serious**	**4 - V. Serious**	**5 - Catastrophic**
	Consequence of Impact					

From examining the plausible risks presented in Table 18.6 Risk IDs, no risks have been assessed to fall within the Red Zone ('High' risk scenario) and Risk IDs C1, C18, and C20 fall within the Amber Zone ('Medium' risk scenario) and are therefore brought forward for further consideration and assessment of mitigation measures. These three Risk IDs fall within the construction phase. No operational phase risks fell within the Amber or Red zones and the operational phase is therefore not considered further.

18.5 Proposed Mitigation

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on avoiding or reducing the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Development are attained.

Regulation 15 of the Safety, Health and Welfare at Work (Construction) Regulations places a duty on designers carrying out work related to the design of a project to take account of the 'General Principles of Prevention' as listed in Schedule 3 of the Safety, Health and Welfare at Work Act.

In addition to the duties imposed by Regulation 15 of the Safety, Health and Welfare at Work (Construction) Regulations, designers must comply with Section 17(2) of the Safety, Health and Welfare at Work Act which requires persons who design a project for construction work to ensure, so far as is reasonably practicable, that the project is designed and is capable of being constructed to be safe and without risk to health, can be maintained safely and without risk to health during use, and complies in all respects, as appropriate, with other relevant legislation. This includes S.I. No. 138/2012 - Building Regulations (Part A Amendment) Regulations 2012 and, if the works being designed are intended for use as a workplace, the relevant parts of the Safety, Health and Welfare at Work (General Application) Regulations.

The design of the Proposed Development incorporates mitigation measures that have been embedded into the design of the Proposed Development elements or which have been specified as part of this EIAR.

18.5.1 Construction Environmental Management Plan (CEMP)

A CEMP has been prepared to ensure that the proposed construction works can be undertaken in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to the construction works of this nature. The CEMP is included as Appendix 5.4 of this EIAR. The CEMP will be updated by the appointed contractor to set out how environmental protection will be achieved during the construction phase of the Proposed Development. As set out below, the CEMP is a key contract document and the appointed contractor will be legally/contractually obliged to implement it in full.

The CEMP summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of the Proposed Development and must be read in conjunction with the construction details outlined in Chapter 5 of this EIAR.

The CEMP will be a live document which will be updated post-consent as it will include method statements and work programmes that provide more detailed phasing of work based on the methodologies described in Chapter 5 (Proposed Development Description) and the mitigation measures set out in this EIAR, in addition to any relevant conditions contained in the planning consent. The Principal Contractor will develop a series of detailed plans for the construction of the Proposed Development in accordance with the parameters set out in the CEMP. This will include the following:

- Traffic Management Plan;
- Construction Resources Waste Management Plan; and
- Emergency Response Plan.

18.5.2 Construction Resources Waste Management Plan (CRWMP)

Construction Resource Waste Management Plan forms part of the CEMP, to ensure that waste arising during the construction phase of the Proposed Development will be managed and disposed of in a way that ensures compliance with the provisions of Number 10 of 1996 – Waste Management Act, 1996, as amended.

18.5.3 Traffic Management Plan (TMP)

The risk of Major Accidents and Natural Disasters resulting from a road traffic accident associated with the Proposed Development will be reduced by the development and implementation of a Traffic Management Plan (TMP) as described in Chapter 14 (Traffic and Transport). The Traffic Management Plan TMP has been prepared to demonstrate the manner in which the interface between the public and construction-related traffic will be managed and how vehicular movement will be controlled. It will be a condition of the employer's requirements that the successful contractor, prior to commencement of works, must detail in the TMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions in any grant of approval from An Bord Pleanála. The commitments included within the EIAR are the minimum commitments that the Principal Contractor will follow, and others may be developed during the construction phase in consultation with the various stakeholders, including the local authorities. Further details on the assessment of construction traffic, and traffic related mitigation measures are provided in Chapter 14 (Traffic and Transport) of this EIAR.

18.5.4 Environmental Incident Response Plan (EIRP)

An Environmental Incident Response Plan has been developed as part of the CEMP.

The Environmental Incident Response Plan demonstrates how, in the unlikely event of an incident, response efforts will take place promptly, efficiently, and suitably for the particular circumstances and includes the following:

- Environmental Emergency response procedures;
- List of emergency contact details;
- Records and sharing of records with prescribed bodies;
- Training; and
- Details (locations, number and type) of emergency response equipment maintained on site.

The CEMP details procedures that will be followed in the event of a significant release of sediment into a watercourse, or a significant spillage of chemical, fuel or other hazardous substances (e.g. concrete), a non-compliance incident with any permit or licence, or other such risks that could lead to a major pollution incident, including flooding.

This assessment has considered the reasonable worst-case consequences, and as such, risks are unlikely to be greater than those that have been assessed within this EIAR. The CEMP will ensure that all mitigation measures and monitoring requirements are carried out, ensuring that risk does not increase over time on the site.

18.6 Residual Effects

There are no identified incidents and / or major accidents and / or disasters risk events that present a sufficient combination of risk and consequence that would lead to significant residual environmental impacts.

No significant residual impacts have been identified either in the construction or operational phases of the Proposed Development.

18.7 Conclusion

The Proposed Development is a cable trench with construction works at two existing substations. The proposed construction works and technology used are designed and tested in accordance with national and international guidelines and will not result in major accidents and/or disasters. The assessment has concluded that there is nothing in the Proposed Development nor in the Study Area that will interact to result in any significant effects.

18.8 References

DECLG (2015). A Framework for Major Emergency Management. Guidance Document

DEHLG (2010). A Framework for Major Emergency Management. A Guide to Risk Assessment in Major Emergency Management

Department of Defence (2017). Strategic Emergency Management National Structures and Framework

Department of Transport and DEHLG (2005). Maximum Aircraft Movement Data and the Calculation of Risk and PSZs: Dublin Airport

EPA (2014). Guidance on Assessing and Costing Environmental Liabilities

EPA (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports

European Commission (2017). Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report

FCC (2011). Major Emergency Plan of Fingal County Council

Government of Ireland (2023). A National Risk Assessment for Ireland 2023

(HSA 2023). Health and Safety Authority Guidance on Technical Land-use Planning Advice for Planning Authorities and Operators of Establishments under the COMAH establishments.

IEMA (2020). Major Accidents and Disasters in EIA: A Primer

MCC (2019). Major Emergency Plan

<u>Directives and Legislation</u>

Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EU

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

Number 10 of 1996 – Waste Management Act, 1996, as amended

Number 10 of 2005 - Safety, Health and Welfare at Work Act 2005

S.I. No. 299/2007 - Safety, Health and Welfare at Work (General Application) Regulations 2007

S.I. No. 138/2012 - Building Regulations (Part A Amendment) Regulations 2012

S.I. No. 291 of 2013 - Safety, Health and Welfare at Work (Construction) Regulations 2013

S.I. No. 209/2015 – Chemical Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015

S.I. No. 229 of 2021 - Building Control (Amendment) Regulations 2021

S.I. No. 528/2021 - Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021

S.I. No. 619/2021 – Safety, Health and Welfare at Work (General Application) (Amendment) (No.2) Regulations 2021

19. Waste

19.1 Introduction

This chapter of the EIAR has considered the likely waste and resource effects associated with the construction and operational phases of the Proposed Development. A full description of the Proposed Development is presented in Chapter 5 (Proposed Development Description) of this EIAR.

Potential impacts associated with the Proposed Development during the construction and operational phases have been assessed. Site clearance, excavation and construction are activities which will take place during the construction phase which are likely to generate surplus materials. In recent years there has been a shift in focus on best practice waste management and waste minimisation in construction and an increase in the reuse of construction by-products in projects.

The following aspects of the Proposed Development are particularly relevant to the resource and waste assessment:

- Throughout the design of the Proposed Development, consideration has been given to the minimisation of resource usage and to the generation of waste through retention of material on site and re-use;

- During construction, material usage will be minimised, and material will be reused where possible. Waste will be generated from site clearance, and excavation; and

- During the operational phase, waste is likely to be generated from maintenance works associated with the Proposed Development.

The use of resources and the potential for waste and surplus material to be generated during site clearance, excavation, construction and operation of the Proposed Development are assessed in this chapter. The potential environmental effects of the use of resources and the generation and management of waste arising are examined in the context of the existing local and regional waste management environment. Mitigation measures are identified, where necessary, to reduce the likely impact of the use of resources and the generation of waste by the Proposed Development during the construction and operational phases.

This chapter also considers resource and waste management. A Construction Resource and Waste Management Plan (CRWMP) is included in Appendix 5.5 of this EIAR.

19.2 Methodology

19.2.1 Study Area

The study area with regards to waste and resource use, comprises of all areas and activities within the Planning Application Boundary, including both permanent and temporary land take boundaries.

Waste from the Proposed Development could be accepted at sites nationally and internationally (that are suitably licensed or permitted for the waste volume and type), for treatment, recovery and disposal. However, given that waste management planning in Ireland takes place on a regional basis, the study area for waste treatment, recovery and disposal comprises the Eastern-Midlands Waste Region (EMWR), and is broadened out to a national study area as required.

19.2.2 Relevant Guidelines, Policy and Legislation

The following guidelines and policy documents were complied with when undertaking the waste and resources assessment:

- Institute of Environmental Management and Assessment (IEMA) Guide to: Materials and Waste in Environmental Impact Assessment – Guidance for a Proportionate Approach (hereafter referred to as the IEMA Guidelines) (IEMA 2020);
- Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects (EPA 2021a);
- The Circular Economy Programme 2021-2027 (EPA 2021b);
- A Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020 -2025 (hereafter referred to as the National Waste Action Plan) (Department of Communications, Climate Action and Environment (DCCAE) 2020);
- Draft National Waste Management Plan for a Circular Economy 2023-2029 (Regional Waste Management Offices 2023);
- Eastern – Midlands Region Waste Management Plan 2015-2021 (EMWR 2015);
- Construction & Demolition Waste - Soil and Stone Recovery / Disposal Capacity – Update Report 2020 (Regional Waste Management Offices 2020);
- EU Construction & Demolition Waste Protocol and Guidelines (European Commission 2018);
- Transport Infrastructure Ireland (TII) The Management of Waste from National Road Construction Projects. GE-ENV-01101 (TII 2017);
- Guidance on Soil and Stone By-Products in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011 (EPA 2019);
- By-Product Guidance Note – A Guide to by-products and submitting a by-product notification under Article 27 of the European Communities (Waste Directive) Regulations 2011 (EPA, 2020).
- Guidance on waste acceptance criteria at authorised soil recovery facilities (EPA,2021).
- A New Circular Economy Action Plan for a Cleaner and More Competitive Europe (European Commissions 2020); and
- Waste Classification – List of Waste and Determining if Waste is Hazardous or non-Hazardous EPA (EPA 2018).

As part of the compilation of this chapter the following EU, national and local policy documents were reviewed and complied with respect to waste management policies:

- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (hereafter referred to as the Waste Framework Directive – as amended);
- National Hazardous Waste Management Plan 2021-2027 (EPA, 2021);

- S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2020 (hereafter referred to as the Waste Directive Regulations);
- S.I. No. 86/2008 - Waste Management (Facility Permit and Registration) Regulations 2008, as amended;
- S.I. No. 821/2007 - Waste Management (Facility Permit and Registration) Regulations 2007;
- S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007, as amended;
- S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007;
- The EU Waste Framework Directive (2018/851) (as amended);
- Waste Classification – List of Waste and Determining if Waste is Hazardous or Non-Hazardous (EPA 2015).
- Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (hereafter referred to as the Landfill Directive); and
- Number 10 of 1996 - Waste Management Act 1996 Revised (hereafter referred to as the Waste Management Act 1996 (as amended)).

19.2.3 Data collection

19.2.3.1 Waste

A desktop study (December 2023) was undertaken to review the existing waste management baseline locally, within the Eastern-Midlands Waste Region and across the country as appropriate. This desktop study was based on the data sources as listed in Section 19.2.2 above and the study included a review of:

- Relevant policy and legislation which creates the legal framework for waste and resource management in Ireland;
- The estimated surplus materials and by-product generated during the construction phase of the Proposed Development;
- the estimated imported material required for the construction of the Proposed Development;
- Types, quantities and management of construction and demolition (C&D) waste that arises and is generated in Ireland, the relevant local authority and EMWR jurisdictions;
- Types, quantities and management of commercial and industrial waste generated in Ireland and EMWR jurisdictions; and
- Availability (type and capacity) of waste infrastructure within the EMWR.

Consultations were also held with EirGrid and ESBN on the waste anticipated to be generated in the operational phase.

19.2.4 Appraisal Method for the Assessment of Effects

The potential impacts of waste and resource generation and management associated with the Proposed Development were assessed for both the construction and operational phases. These impacts may be neutral, positive or adverse and are dependent on the measures employed to prevent and / or manage the waste generated and materials used.

The following factors were considered when determining the significance of the impacts of the Proposed Development on the various aspects of the baseline environment:

- Desktop study of the current waste and by-product management practices in Ireland (December 2023);
- Estimates of the types and quantities of waste and by-products generation and management from the Proposed Development. This is compared with the established baseline set out in Section 19.3;
- An assessment of the likely environmental impacts that may arise from the use of imported material during the construction phase;
- The surplus materials arising and waste infrastructure capacity in the Eastern-Midlands Region in which the Proposed Development will be located; and
- A review of the Proposed Development in the context of the waste hierarchy and circular economy principles to determine the mitigation measures required.

The criteria used to categorise the significance of waste and resource impacts is based on and compliant with both the EPA Guidelines (EPA 2022) and the IEMA Guidelines (IEMA 2020). The EPA Guidelines are complemented by the more detailed approach set out in the IEMA Guidelines with respect to materials and waste.

With respect to waste generation and management, the IEMA Guidelines set out the criteria to assess the sensitivity of waste management capacity regionally or nationally (as relevant) for both inert / non-hazardous and hazardous waste, and sets out the magnitude of impact as a result of the consumption of that void space.

Table 19.1: Sensitivity Criteria for Waste (IEMA 2020)

Value	Description	
	Inert / Non-Hazardous	Hazardous
	Across the construction and / or operational phases, the baseline landfill void capacity is expected to…	
Negligible	…remain unchanged or is expected to increase through a committed change in capacity.	...remain unchanged or is expected to increase through a committed change in capacity.
Low	...reduce minimally: by <1% as a result of wastes forecast.	...reduce minimally: by <0.1% as a result of wastes forecast

Value	Description	
	Inert / Non-Hazardous	Hazardous
	Across the construction and / or operational phases, the baseline landfill void capacity is expected to…	
Medium	...reduce noticeably: by 1-5% as a result of wastes forecast.	...reduce noticeably: by 0.1- 0.5% as a result of wastes forecast.
High	...reduce considerably: by 6-10% as a result of wastes forecast.	...reduce considerably: by 0.5-1% as a result of wastes forecast.
Very High	... reduce very considerably (by >10%); end during construction or operation; is already known to be unavailable; or would require new capacity or infrastructure to be put in place to meet forecast demand.	... reduce very considerably (by >1%); end during construction or operation; is already known to be unavailable; or would require new capacity or infrastructure to be put in place to meet forecast demand.

Table 19.2: Assessing Magnitude of Impact for Waste (IEMA 2020)

Value	Description	
	Inert / Non-Hazardous	Hazardous
No Change	Zero waste generation and disposal from the Proposed Development.	Zero waste generation and disposal from Proposed Development.
Negligible	Waste generated by the Proposed Development will reduce regional* landfill void capacity baseline# by <1%.	Waste generated by the Proposed Development will reduce national landfill void capacity baseline # by <0.1%.
Minor	Waste generated by the Proposed Development will reduce regional* landfill void capacity baseline# by 1-5%.	Waste generated by the Proposed Development will reduce national landfill void capacity baseline # by <0.1-0.5%.
Moderate	Waste generated by the Proposed Development will reduce regional* landfill void capacity baseline# by 6-10%.	Waste generated by the Proposed Development will reduce national landfill void capacity baseline # by <0.5-1%.
Major	Waste generated by the Proposed Development will reduce regional* landfill void capacity baseline# by >10%.	Waste generated by the Proposed Development will reduce national landfill void capacity baseline # by >1%.

Value	Description	
	Inert / Non-Hazardous	Hazardous
* Or where justified, national. # Forecast as the worst-case scenario, during a defined construction and / or operational phase.		

With respect to imported materials for the construction of the Proposed Development, the IEMA Guidelines set out the criteria to assess the sensitivity of materials and sets out the magnitude of impact as a result of the use of materials.

Table 19.3: Sensitivity Criteria for Materials (IEMA 2020)

Value	Description
	On balance, the key materials required for construction of the Proposed Development …
Negligible	Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock; and/or Are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials. *
Low	Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock; and/or Are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials*.
Medium	Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock; and/or Are available comprising some sustainable features and benefits compared to industry-standard materials*
High	Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock; and/or Comprise little or no sustainable features and benefits compared to industry-standard materials*
Very High	Are known to be insufficient in terms of production, supply and/or stock; and/or Comprise no sustainable features and benefits compared to industry-standard materials*
*Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: comprise reused, secondary or recycled content (including excavated and other arisings); support the drive to a circular economy; or in some other way reduce lifetime environmental impacts.	

Table 19.4: Assessing Magnitude of Impact for Materials (IEMA 2020)

Value	Description
	The assessment is made by determining whether through the Proposed Development, the consumption of …
No change	...one or more materials is >10% by volume of the regional* baseline availability.
Negligible	...one or more materials is between 6-10% by volume of the regional* baseline availability.
Minor	...one or more materials is between 1-5% by volume of the regional* baseline availability.
Moderate	...one or more materials is between 6-10% by volume of the regional* baseline availability.
Major	...one or more materials is >10% by volume of the regional* baseline availability.
* or where justified, national.	

For both waste and material usage, the determination of significance of the impact follows the matrix within the IEMA Guidelines. As the significance levels differ from the EPA Guidelines, the IEMA Guidelines have been adapted to use the EPA significance rating names.

Table 19.5: Determining Significance (IEMA Guidelines adapted to reflect the EPA Guidelines Significance Ratings)

Sensitivity (or Value) of the Receptor	Magnitude of Impact					
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
	Very High	Neutral	Not Significant	Significant	Very Significant	Profound
	High	Neutral	Not Significant	Slight	Significant	Very Significant
	Medium	Neutral	Imperceptible	Not Significant	Moderate	Significant
	Low	Neutral	Imperceptible	Imperceptible	Not Significant	Slight
	Negligible	Neutral	Neutral	Imperceptible	Imperceptible	Not Significant

There were no limitations in the writing of this chapter that affected the assessment. At this stage, it is not possible to accurately estimate the volume of waste from the operational phase of the Proposed Development. Any operational waste would be generated from broken equipment. All equipment will be professionally manufactured and installed, and will be maintained in-line with the manufacturer's, EirGrid's, and ESB's guidelines. Based on professional judgment, the risk of broken equipment is assessed to be extremely low. An assessment has been made in Section 19.4 of this chapter.

19.3 Baseline Conditions

19.3.1 Waste Management

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (referred to as the Waste Framework Directive, as amended) defines waste as '*any substance or object that the holder discards or intends to or is required to discard*'.

The Waste Hierarchy as shown in Plate 19.1, prioritises prevention over re-use, recycling, recovery and disposal. It establishes the order of preference for the management of waste, with the most preferential management method be to prevent the creation of waste in the first place. The ultimate goal is to reduce, as far as is possible, the quantity of waste disposed of to a landfill, thus increasingly treating waste as a resource.

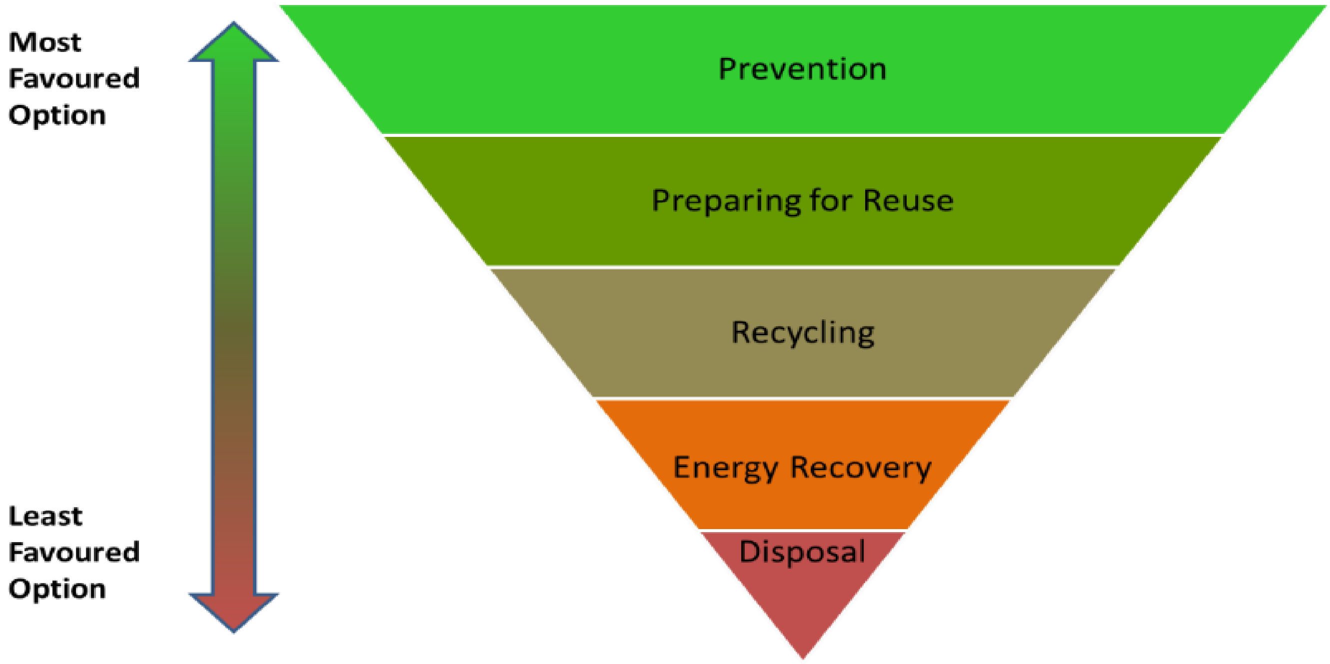

Plate 19.1: Waste Hierarchy (as per Waste Framework Directive)

The majority of the waste which will arise as a result of the Proposed Development will be created during the construction phase. According to the most recently released EPA data on the Construction & Demolition (C&D) Waste Statistics for Ireland (EPA 2022), the quantity of C&D waste generated in Ireland decreased from 8.8 million tonnes in 2019 to 8.2 million tonnes in 2020. The vast majority of this waste was composed of soil and stone (84.4%) while the rest comprised waste concrete, brick, tile and gypsum (6.4%); mixed C&D waste (4.6%); metal (2.4%); bituminous mixtures (1.6%); and segregated wood, glass and plastic (0.6%).

The vast majority (95%) of the C&D waste generated in 2020 underwent final treatment in Ireland. Approximately 5% was exported abroad for final treatment. Recovery through backfilling was the dominant final treatment of the C&D waste treated in Ireland (82%), with 10% being disposed of and 8% being recycled.

The Waste Framework Directive includes a target 70% of non-hazardous, non-soil and stone construction and demolition (C&D) waste to be recovered, reused, or recycled by 2020. According to the EPA statistics, Ireland achieved 78% material recovery of such waste in 2020, surpassing that target.

The Eastern Midlands Region Waste Management Plan 2015-2021 (the most recent available) provides a framework for the prevention and management of waste in a sustainable manner in County Kildare, Meath and other local authority areas. Managing waste in a 'sustainable and self-sufficient manner' is one of the key challenges for the Eastern Midlands Region.

There are a number of waste management facilities within counties Kildare and Meath and within the wider Eastern and Midlands Region which accept C&D waste. The most prominent C&D waste type likely to be generated by the construction of the Proposed Development will be uncontaminated soil and stone (List of Waste (LoW) Code 17 05 04). The potential waste management facilities available within the Eastern-Midlands Region which accept such C&D waste are summarised in Table 19.6.

Table 19.6: EPA Licensed Soil Recovery Facility Capacity Per Annum in the Eastern-Midlands Region[138] (January 2024)

Facility Name	Authorisation Number	Maximum Capacity per Annum (tonnes)
Blackhall Soil Recovery Facility, Naas, Co. Kildare	W0247	400,000
Clashford Recovery Facilities Ltd., Naul, Co. Meath	W0265	190,000
Milverton Waste Recovery Facility, Skerries, Co. Dublin	W0269	400,000
Huntstown Quarry, Finglas, Dublin 11	W0277	1,595,000
Mullaghrone Quarry, Donore, Co. Meath	W0278	100,000
N&C Enterprises Limited, The Pit, Naas, Co. Kildare	W0292	345,000
Calary Quarry, Kilmacanogue, Co. Wicklow	W0293	300,000
Kildare Sand & Gravel Limited, Rathangan, Co. Kildare	W0295	225,000
Total		**3,555,000**

[138] As taken from EPA Waste Infrastructure in Ireland [Online]. Available from: https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/infrastructure/

19.3.2 Construction Waste

Construction waste, including excavation waste, will be the main type of waste generated as a result of the Proposed Development. There will also be small quantities of municipal-type waste generated during construction and operation (i.e. associated with maintenance activities).

The EPA publishes statistics on waste generation and management for Ireland. The most recent statistics available were published in August 2023 and concern the year 2021. With respect to construction and demolition (C&D) waste, the EPA data states that there were 9 million tonnes of C&D waste generated in Ireland in 2021, an approximate 10% increase on 2020, with 96% undergoing final treatment in Ireland and only 4% being exported abroad for final treatment (EPA 2023a[139]). The majority of the C&D waste (85%) was backfilled with only 8% recycled and 7% sent for disposal in 2021. The EPA reported that Ireland achieved 85% material recovery in 2021, surpassing the 70% EU target.

Hazardous waste will be generated during the construction phase of the Proposed Development (e.g., oils, batteries, asphalt (bituminous mixtures containing coal tar) and contaminated soils and materials). According to the EPA statistics for 2021 (EPA 2023b[140]), there was a total of 466,941 tonnes of hazardous waste generated in Ireland in 2021, which was a decrease of approximately 16% on 2020. Of the hazardous waste generated in Ireland, 52% was treated in-country, with the other 48% exported to other countries (mainly the United Kingdom and within the EU) for treatment. Specifically with respect to C&D hazardous waste, there were 106,664 tonnes generated in 2021, of which approximately 33,000 tonnes were contaminated soils (99% of which were treated in Ireland). There are no plans for the export of waste from the Proposed Development outside of this jurisdiction.

Municipal waste will be generated in small quantities during the construction and operational phases of the Proposed Development (e.g., canteen, office and staff welfare waste). According to the EPA statistics for 2021 (EPA 2023c[141]) Ireland generated 3.17 million tonnes of municipal waste in 2021, which represents a decrease of one percent on the 2020 quantities. This breaks down as 57% from household sources and 43% from commercial and public service sources. Approximately 1.3 million tonnes were recycled in 2021, equating to a recycling rate of 41%. 42% of Ireland's municipal waste went for incineration for energy recovery, with 16% going to landfill. An estimated 38% of all municipal waste generated was exported.

19.3.3 By-Products

With respect to material generated as a by-product of the construction phase (e.g., surplus excavated soil and stone), Article 27 of the Waste Directive Regulations allows for this material to be treated as a by-product instead of a waste, as long as the material satisfies the following requirements:

a) *"further use of the substance or object is certain;*

b) *the substance or object can be used directly without further processing other than normal industrial practice;*

c) *the substance or object is produced as an integral part of a production process; and*

[139] EPA (2023a). Construction & Demolition Waste Statistics for Ireland [Online]. Available from: https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/construction--demolition/

[140] EPA (2023b). Hazardous Waste Statistics for Ireland [Online]. Available from: https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/hazardous/

[141] EPA (2023c). Municipal Waste Statistics for Ireland [Online]. Available from: https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/municipal/

d) *further use is lawful in that the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts. "*

The material producer must notify the EPA of their determination that the material is a by-product and not a waste. On receipt of an Article 27 notification, the EPA can determine that the material is a waste or a by-product. Where the EPA does not make a determination, the material has not been determined as a waste. Where the material has not been determined to be a waste, the material is available for reuse within the industry.

According to the EPA waste statistics (EPA 2023a), there were 123 by-product notifications assessed totalling 12,526,137 tonnes of material. Of this quantity, the EPA determined that 459,836 tonnes were a by-product, 600 tonnes were a waste, and the notifications for 152,400 tonnes of material were withdrawn. The EPA made no determination with respect to the remaining 11,913,301 tonnes.

19.3.4 Imported Material

The quantities of material which are currently imported to the area of the planning application boundary under baseline conditions are low. Currently material is only imported as part of maintenance activities which are undertaken on the existing infrastructure such as roadways, footpaths, utilities, substations and verges. These activities would largely involve repair of surfaces and general roadworks, drainage maintenance and repair, utility works, landscaping and winter maintenance.

A report entitled Essential Aggregates: Providing for Ireland's Needs to 2040 (Irish Concrete Federation 2019[142]) was published in 2019 which details and quantifies Ireland's natural aggregate reserves. At the time of publication of that report, Ireland had approximately 500 active large commercial quarries, approximately 220 ready mixed concrete plants, 20 large scale precast concrete plants and 40 plants producing bitumen bound road surfacing materials.

The Irish Concrete Federation quantifies the annual production of these materials in Ireland on their website, with the 2019 figures (the most recent available) being as follows:

- Five million cubic metres of ready-mixed concrete;
- 135 million concrete blocks;
- 38 million tonnes of aggregates;
- Two million tonnes of bituminous road surfacing materials; and
- Two million square metres of paving products.

19.4 Potential Effects

19.4.1 Construction Phase

The main waste streams likely to arise during the construction phase of the Proposed Development are typical for this type of project and are listed in Table 19.7 with their List of Waste (LoW) code (EPA 2018).

[142] Irish Concrete Federation (2019). Essential Aggregates Providing for Ireland's Needs to 2040

Table 19.7: Main Waste Types Likely to be Generated during Construction

Waste Type	LoW Code
Concrete	17 01 01
Wood, glass and plastic	17 02 01 – 17 02 04*
Bituminous mixtures	17 03 02
Mixed construction and demolition waste other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	17 09 04
Metals	17 04 01 – 17 04 11
Soil and Stones	17 05 04
Wastes of liquid fuels	13 07 01* – 13 07 03*
Absorbents, filter materials, wiping cloths and protective clothing	15 02 02* – 15 02 03
Batteries and accumulators	16 06 01* – 16 06 06*
Waste packaging	15 01 01 – 15 01 11*

The likely quantities of materials and waste which will require import and export during the construction phase have been estimated and are provided in Table 19.8. The estimate has been undertaken by the authors of Chapter 5 (Proposed Development Description) based on the Proposed Development dimensions, the construction techniques as described in Chapter 5, professional judgment, and consultation with EirGrid and ESB. As shown, soils and fill material will make up the majority of the construction phase surplus material requiring management (either as a waste or as a by-product). This material will be managed in accordance with best practice and with the implementation of the mitigation measures outlined in Section 19.5.

Table 19.8: Materials Balance Estimate

			Import (m^3)	Export (m^3)		Transported Material Compacted (m^3)	Transported Material (t)
By Location	**Cable Route**						
	In-road	**Asphalt**	6545	6545		13089	30105

			Import (m^3)	Export (m^3)		Transported Material Compacted (m^3)	Transported Material (t)
		Engineered Fill	*	-		52356	115183
		Subsoil	-	52356		52356	78534
		Concrete	37905	-		37905	-
	Off-road	**Topsoil**	-	-		-	-
		Subsoil	-	8691		8691	13036
		Concrete	8054	-		8054	-
	Permanent Access Tracks	**Topsoil**	-	4803		4803	6724
		Engineered Fill	7205	-		7205	15851
	Enabling Works						
	Passing Bays	**Topsoil**	-	-		-	-
		Asphalt	1421	1421		2843	6538
		Engineered Fill	5685	5685		11370	25014
		Subsoil	-	-		-	-
	Construction Platforms	**Topsoil**	-	-		-	-
		Engineered Fill	3314	3314		6629	14583
		Subsoil	-	-		-	-
	Compounds	**Topsoil**	-	-		-	-

			Import (m^3)	Export (m^3)		Transported Material Compacted (m^3)	Transported Material (t)
		Engineered Fill	37540	37540		75080	165176
By material		Asphalt	7966	7966		15932	36642
		Topsoil	-	4803		4803	6724
		Subsoil	-	61047		61047	91570
		Engineered Fill	53744	46539		152639	335807
		Concrete	45958	-		45958	-
		Total	**107,668**	**120,355**		**280,379**	**470,743**

*All engineered road fill will be reused but will require movement around the Proposed Development due to construction space constraints.

Without mitigation, there will be a Negative, Significant and Short-Term effect as a result of the generation of waste by the Proposed Development during the construction phase. Given the relatively small potential quantity of surplus material estimated to be generated, and that this quantity will be generated across the approximately 42 months construction phase, the effect of this quantity on the local and regional waste capacity will be Not Significant with the implementation of the mitigation measures outlined in Section 19.5.

19.4.2 Operational Phase

There are not anticipated to be any significant amounts of waste to be generated during the operational phase of the Proposed Development. The routine maintenance of the Proposed Development is described in Chapter 5 (Section 5.5) of this EIAR. Should equipment need to be replaced, this would be managed during the operational phase in-line with ESB waste management plans and procedures. As outlined in ESB's most recent Environmental Performance Report (ESB 2022): *"ESB Networks are committed to being at the forefront of the sustainable and circular economy, and the effective management of waste is a fundamental part of this environmental management goal."* This waste will be managed in accordance with all relevant waste management legislation.

At this stage, it is not possible to quantify the volume of waste that will be generated from maintenance, repair or replacement of equipment. All equipment will be professionally manufactured and installed, and will be maintained in-line with the manufacturer's and ESB guidelines. Based on professional judgment, the risk of broken equipment is assessed to be extremely low and so it is not anticipated to result in any significant environmental impacts.

19.5 Mitigation Measures

19.5.1 Construction Phase

A Construction Resource Waste Management Plan (CRWMP – Appendix 5.5) is included for the Proposed Development. The appointed contractor(s) will be responsible for reviewing and updating the CRWMP prior to commencement of construction and in periodically reviewing and updating as necessary throughout the construction phase.

The CRWMP outlines how waste arising during the construction phase of the Proposed Development will be managed in a way that ensures compliance with the provisions of the Waste Management Act 1996 (as amended) and in-line with EPA guidelines (please see section 21.2.2 of this chapter).

All operations will be managed and programmed in such a manner as to prevent / minimise waste production. All waste material will be managed in accordance with the waste hierarchy (Plate 19.1), with an emphasis on reuse, recycling and recovery of material over disposal where feasible.

To minimise the creation of waste, opportunities for reuse of excavated material within the Proposed Development (e.g. as fill) will be sought in agreement with the planning authorities. Where there is no reuse potential within the Proposed Development of such material, either due to the material being unsuitable or due to the quantity being in excess of requirements, the potential for reuse as a by-product in accordance with Article 27 will be investigated by the appointed contractor(s). Where this option is technically / economically feasible, the appointed contractor(s) will be responsible for generating the EPA Article 27 notification and the associated requirements. Any material which is to be managed as a by-product will be appropriately stored on-site and will be kept separate from any waste storage to avoid cross contamination.

Where waste is created it shall be managed on site in accordance with best practice and applicable waste legislation as follows:

- Waste excavated material will be appropriately stockpiled;
- Waste will be segregated at source to prevent cross contamination;
- Where relevant (e.g., excavated fill material), wastes will be sampled and tested to allow classification prior to disposal;
- Waste receptacles will be appropriate to the waste streams using them, and covered or netted including while in transit, where practicable to prevent wind-blown debris emanating from them;
- Any hazardous wastes will be stored in segregated waste containers which are appropriately labelled;
- All waste will be collected by a suitable contractor in possession of a valid and appropriate Waste Collection Permit, and will only be transported to suitably licensed or permitted waste facilities (i.e., facilities in possession of a valid EPA Licence, Waste Facility Permit or Certificate of Registration);
- Regular site inspections and cleaning will minimise the potential for litter in the surrounding area;
- Waste records will be maintained throughout the construction and operational phases of the Proposed Development; and

- Waste auditing against the CRWMP will be carried out.

The quantity and type of waste and materials leaving the Proposed Development site during the construction phase will be recorded by the appointed contractor(s). The name, address and authorisation details of all facilities and locations which waste, and materials will be delivered to will be recorded along with the quantity sent to each facility. Records will show which material is reused, which is recycled, and which is disposed of.

Any off-site interim storage or waste management facilities for excavated material will have the appropriate EPA Licence, Waste Facility Permit or Certificate of Registration, as appropriate, in place.

Excavated materials from within roadways (e.g. capping, subbase and bituminous materials) will be reused or recycled in line with TII specifications where reasonably practicable:

- Capping, subbase, bituminous and concrete materials could be reused or recycled in fill and capping materials providing they comply with the Specification for Road Works Series 600 – Earthworks (CC-SPW-00600) (TII 2013a);

- Subbase, bituminous and concrete materials could be reused or recycled in subbase or base materials providing they comply with the Specification for Road Works Series 800 – Unbound and Cement Bound Mixtures (CC-SPW-00800) (TII 2013b); and

- Subbase and bituminous materials could be recycled in base or binder materials providing they comply with Road Pavements – Bituminous Materials (CC-SPW-00900) (TII 2015).

With respect to the potential to encounter coal tar within road planings, the contractor will test road planings for the presence of coal tar to ensure accurate classification of all arisings prior to disposal, thus minimising the quantity being disposed of as hazardous waste. Furthermore, the contractor will seek recycling options for any coal tar to divert it from landfill. Any other hazardous waste generated during the construction or operational phase of the Proposed Development will be collected and managed by contractors in possession of a suitable Waste Collection Permit and will be disposed of at a suitably licensed hazardous waste facility, in-line with the procedures outlined in the CRWMP (Appendix 5.5 of this EIAR).

The Proposed Development has been designed to minimise the quantities of construction materials required as far as reasonably practicable. Consideration will be given by the appointed contractor(s) to the sustainability of material being sourced for the construction of the Proposed Development. As far as is reasonably practicable, materials required for the construction of the Proposed Development will be sourced locally to reduce the amount of travelling required to get the material to the site. Key issues to be considered when sourcing materials for the construction phase will include the source, the material specification, production and transport costs, and the availability of the material. For quarried material, only quarries which are included in local authority quarry registers will be used by the appointed contractor to source any quarried material.

Construction materials will be managed on-site by the appointed contractor(s) in such a way to prevent overordering and to reduce the quantity of potential waste. Materials will be stored in appropriate storage areas or receptacles to reduce the potential for damage requiring replacement. 'Just-In-Time' ordering principles will be implemented by the appointed contractor(s), where practicable, to reduce the potential for over-ordering.

19.5.2 Operational Phase

As there are no anticipated significant operational phase impacts, no additional mitigation or monitoring measures are considered necessary. Waste will be managed during the operational phase in line with ESB waste management plans and procedures.

19.6 Residual Effects

With the mitigation measures implemented, given the relatively small potential quantity of surplus material expected to be generated and the requirement for imported material, and that this quantity will be generated across the approximately 42 months construction phase, there are no significant residual impacts predicted as a result of the Proposed Development, either during the construction phase or the operational phase. There will be no significant effects as a result of the waste generated by the Proposed Development or the import of materials.

19.7 Conclusion

The likely key waste effects of the Proposed Development are anticipated to arise from the construction of the cable trench. The construction of the trench will result in road planings, surplus earth, and other waste material. Construction materials will also be required to be imported as part of the construction phase. A Construction Resource and Waste Management Plan (CRWMP) is included in Appendix 5.5 of this EIAR.

Waste material will be minimised as far as practical through best practice construction methods onsite, by minimising waste production in accordance with the waste hierarchy and managing material with an emphasis on reuse, recycling and recovery of material over disposal where feasible. Where waste must be disposed of offsite, it will be correctly managed and sent to an appropriate licenced facility. There will be a potential Negative, Significant and Short-Term impact as a result of the generation of waste by the Proposed Development during the construction phase, while there will be a potentially Negative, Imperceptible and Short-Term impact associated with the importation of materials for the construction of the Proposed Development. The significance of these impacts will be reduced by the implementation of mitigation measures, particularly with respect to construction waste which will reduce to Negative, Not Significant and Short-Term following the diversion of waste from landfill.

There is no potential for significant impacts anticipated as a result of the operational phase of the Proposed Development.

There are no significant residual impacts predicted as a result of the Proposed Development, either during the construction phase or the operational phase.

19.8 References

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Eastern Midlands Waste Region (EMWR) (2015). Eastern Midlands Region Waste Management Plan 2015 - 2021

Environmental Protections Agency (EPA) (2018). Waste Classification – List of Waste and Determining if Waste is Hazardous or Non-Hazardous

EPA (2019). Guidance on Soil and Stone By-Products in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011

EPA (2021a). Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects

EPA (2021b) Circular Economy Programme 2021-2027

EPA (2023a). Construction & Demolition Waste Statistics for Ireland [Online]. Available from: https://www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/construction--demolition/

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Regional Waste Management Offices (2020). Construction & Demolition Waste, Soil and Stone Recovery / Disposal Capacity - Updated report 2020

Regional Waste Management Offices (2023). Draft National Waste Management Plan for a Circular Economy 2023-2029

Transport Infrastructure Ireland (TII) (2013a). Specification for Road Works Series 600 Earthworks (including Erratum No. 1, dated June 2013). Standard CC-SPW-00600

TII (2103b) Specification for Road Works Series 800 – Road Pavements – Unbound and Cement Bound Mixtures. Standard CC-SPW-00800

TII (2015) Specification for Road Works Series 900 – Road Pavements – Bituminous Materials. Standard CCSPW-00900

Transport Infrastructure Ireland (TII) (2017). The Management of Waste from National Road Construction Projects. Standard GE-ENV-01101

UK Government Waste Statistics 2022 [Online]. Available from: https://www.data.gov.uk/dataset/aa53a313-f719-4e93-a98f-1b2572bd7189/2022-waste-data-interrogator

Directives and Legislation

Directive 1999/31/EC of 26 April 1999 on the landfill of waste

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

Directive 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC

Regulation (EC) No. 1013/2006 of the European Parliament and of the Council of 14 June 2006 on Shipments of Waste

Number 10 of 1996 - Waste Management Act 1996 (as amended)

Number 26 of 2022 – Circular Economy and Miscellaneous Provisions Act 2022

S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007

S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007 (as amended)

S.I. No. 821/2007 - Waste Management (Facility Permit and Registration) Regulations 2007

S.I. No. 86/2008 - Waste Management (Facility Permit and Registration) Regulations 2008 (as amended)

S.I. No. 126 of 2011 – European Communities (Waste Directive) Regulations 2011 (as amended)

S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2020

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20. Climate

20.1 Introduction

This chapter of the EIAR has considered the potential climate impacts associated with the construction and operational phases of the Proposed Development. It describes the relevant legislation, guidance and methodology applied, identifies the potential impacts on receptors, discusses the effects of the impacts and provides details of mitigation. Residual effects have also been described, where relevant. The assessment of cumulative Greenhouse Gas (GHG) emissions cannot be carried out in a process analogous to other environmental topics because there is no causal link between the location of GHG emissions and the impacts arising from the cumulative aggregation of GHGs in the atmosphere. The assessment includes consideration of the:

- Vulnerability of the Proposed Development to climate change; and
- Impacts of the Proposed Development on climate.

20.2 Methodology

20.2.1 Study Area

The Proposed Development will cover a 52.9 km route - please refer to Chapter 5 (Proposed Development Description). Unlike the majority of other environmental factors, the consideration of GHG emissions is not determined by a pre-defined geographical area. Different study areas are required to be defined for each aspect of a climate impact assessment.

20.2.2 Vulnerability to Changes in Climate

The study area for assessing the Proposed Development's vulnerability to changes in climate comprises the assets associated with the Proposed Development within the Planning Application Boundary. This area is 156 hectares.

20.2.3 GHG assessment

The study area for the GHG assessment, hereafter referred to as the GHG study area, primarily comprises the construction and operational areas within the Planning Application Boundary. However, the GHG study area also incorporates the transport distances of construction materials from the supplier within Ireland and the transport distances of materials off-site for waste processing within Ireland. The GHG study area is therefore defined by the largest extent of these activities i.e., including the transport distances of materials on a national scale, within Ireland.

20.2.4 Data Collection and Collation

As the climate impact assessment is desk-based, research data and relevant publications from the following sources have been reviewed:

- Open-source observed climate average datasets for Dublin Airport, available from Met Éireann (2023);
- Open-source climate projection datasets for County Kildare, available from the World Bank Group Climate Change Knowledge Portal (2023);

- Baseline county level GHG emissions datasets from the Kildare County Council (KCC) Climate Action Plan 2024 – 2029 and the Meath County Council (MCC) Draft Climate Action Plan 2024 – 2029;
- Baseline national level GHG emission totals and projections published by the Ireland's Environmental Protection Agency (EPA), including Ireland's Greenhouse Gas Emissions Projections 2022 – 2040 report (EPA, 2023a), Ireland's National Inventory Report (EPA, 2023b) and the EPA website;
- Material quantities associated with construction of the Proposed Development based on the calculations in Chapter 19 (Waste) and Chapter 5 (Proposed Development Description);
- Carbon emission factors from the Inventory of Carbon and Energy Version 3 database (Circular Ecology, 2019) and Harrison et al. (2010);
- Typical GHG emissions associated with the embodied carbon of a three-bedroom house using traditional construction methods, from Monahan et al. (2011); and
- Equivalent carbon dioxide emissions per capita from the Central Statistics Office (2023).

There have been no significant limitations in the preparation of this chapter. However, please note as stated in Section 20.2.8, details relating to the construction activities e.g. vehicle type and fuel mix, and construction material suppliers are not available. Default transport distances have therefore been applied in the GHG assessment as described in Section 20.2.8. Construction activities have been scoped out of the GHG assessment as described in Section 20.2.8.

20.2.5 Guidance

The assessment methodology has been derived with reference to the most appropriate guidance documents, as follows:

- Institute of Environmental Management and Assessment (IEMA) guide to climate change resilience and adaptation (2020);
- Royal Institution of Chartered Surveyors (RICS). Whole Life Carbon Assessment for the Built Environment, 2nd edition. November (2023);
- Institution of Civil Engineers (ICE). PAS 2080:2023 Carbon Management in Buildings and Infrastructure (2023);
- IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022); and
- Transport Infrastructure Ireland (TII) Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document. PE-ENV-01104 (2022).

All of the guidance applied is considered current best practice either in the UK or internationally, and is therefore appropriate for application in Ireland.

20.2.6 Relevant Legislation and Policy

20.2.6.1 European Policy Context

There is a range of key international and European Union (EU) level agreements and policy frameworks that have contributed towards shaping Ireland's approach to energy transmission, distribution and storage. These include:

- European Green Deal, 2019 - Proposes stricter EU emissions reduction targets for 2030 to at least 50% and towards 55% compared with 1990 levels;

- European Union 'Fit for 55' legislative package – Aims to make all sectors of the EU's economy fit to meet the 55% reduction target;

- The Paris Agreement – Agreement to strengthen climate change resilience efforts through increased financing, while curbing GHG emissions via an agreed 'Paris Agreement rulebook' setting out how countries are held accountable for delivering on their climate action promises;

- Recast Renewable Energy Directive (RED III) – established a binding target of at least 42.5% of renewable energy for the EU by 2030;

- Europe 2030 Climate and Energy Framework – established a binding domestic target to reduce greenhouse gas emissions by 40% below 1990 levels by 2030; and

- Energy Roadmap 2050 – Developed scenarios demonstrating that decarbonising the energy system is technically and economically feasible.

A detailed policy summary for all of the above is provided in Appendix 20.1.

National, Regional and Local Planning Policy Context

It is recognised at national and regional level that international, European, and national climate change commitments mean that power generation, transport and heat all increasingly have to derive power from sustainably produced electricity. Therefore, national and regional policy place a strong emphasis on the need for new energy systems and transmission grids.

National Policy Context

The following are those national-level plans, policies, and strategies relevant to the Proposed Development:

- Climate Action and Low Carbon Development (Amendment) Act 2021, hereafter referred to as the 2021 Climate Act, and the Climate Action Plan 2023 (CAP23) and the Climate Action Plan 2024 (CAP24) all commit Ireland to achieving a 51% reduction in overall greenhouse gas emissions by 2030, relative to 2018 levels, and setting Ireland on a path to reach net-zero by no later than 2050. The CAP also includes a commitment to increase renewable electricity – wind and solar up to 80% by 2030. These documents state that in order to do so there is a need for transformational policies, measures and actions, including strengthening the grid;

- Project Ireland 2040- National Planning Framework (NPF) – Sets out key policy principles via National Strategic Outcomes (NSOs), which include supporting and strengthening the economy and a transition to a low carbon, climate resilient society (NSO 3, 6 and 8), providing access to quality services (4, 7, and 10) and achieving sustainable growth and better environmental resource management (NSO 1 and 9). It states that Ireland's National Energy Policy is focused on three pillars, sustainability, security of supply, and competitiveness;

- The National Development Plan (NDP) 2021-2030 – represents the national capital investment strategy plan for delivering the NSOs of the NPF, achieved via Strategic Investment Priorities to the year 2030. A core strategic investment priority is a focus on decarbonising energy, in order to, 'create greater links between different energy carriers (such as electricity and hydrogen); infrastructures; and consumption sectors (such as transport and heating).'. Doing so requires a coordinated programme of investment in, among other things, 'an expanded and strengthened electricity transmission and distribution network', to support an increase in both renewable and conventional electricity generation;

- National Energy and Climate Plan (NECP) 2021-2030 – a 10-year plan mandated by the EU to each of its Member States, in order for the EU to meet its overall GHG emissions targets. The plan establishes key measures to address the five dimensions of the EU Energy Union: decarbonisation, energy efficiency, energy security, internal energy markets and research, innovation and competitiveness; and

- The White Paper – Ireland's Transition to a Low Carbon Energy Future 2015-2030 – sets out a framework to guide Ireland's energy policy development. The Proposed Development is considered to be an 'enhanced and extended energy infrastructure' development, which will be critical for economic development, regional development and the secure provision of energy and other services for the Irish society and economy.

Further details on these policies are provided in Appendix 20.1.

The purpose of the 2021 Climate Act is to provide for the approval of plans "for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050". The 2021 Climate Act will also "provide for carbon budgets and a sectoral emissions ceiling to apply to different sectors of the economy". It defines the carbon budget as "the total amount of greenhouse gas emissions that are permitted during the budget period".

The first carbon budget programme proposed by the Climate Change Advisory Council was approved by Government and adopted by both Houses of the Oireachtas in April 2022 (Government of Ireland). The carbon budgets[143] comprise of three successive 5-year budgets. The total emissions allowed under each budget is set out below in Table 20.1, as well as the average annual reduction for each five-year period.

Table 20.1: 2021-2035 Ireland Carbon Budgets

Period	Carbon Budgets (Mt CO_2e)	Emissions Reduction Target
2021-2025	295	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200	Reduction in emissions of 8.3% per annum for the second budget period.

[143] The Ccarbon budgets are expressed as carbon dioxide equivalent (abbreviated as CO_2e). This metric is used to compare the emissions of various greenhouse gases, based on their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of CO_2 with the same GWP.

Period	Carbon Budgets (Mt CO_2e)	Emissions Reduction Target
2031-2035	151	Reduction in emissions of 3.5% per annum for the third provisional budget.

CAP24, approved in December 2023, is the third annual update to Ireland's Climate Action Plan. The previous update, CAP23, provided that the economy-wide carbon budgets will be supplemented by sectoral emissions ceilings, setting the maximum amount of GHG emissions that are permitted in a given sector of the economy during each five-year carbon budget. CAP24 builds upon CAP23 to refine the measures and actions required to deliver the carbon budgets and sectoral emissions ceilings. The sectoral emissions ceilings for each sector are shown in Table 20.2, as reported in CAP24 and the Sectoral Emissions Ceilings Summary Report (Government of Ireland). The sectoral emissions ceilings for the Electricity sector requires a 75% abatement to emissions from the 2018 baseline (i.e. 3 $MtCO_2e$ per annum by 2030). Further details on CAP24 are provided in Appendix 20.1.

Table 20.2: Sectoral Emissions Ceilings

Sector	2018 Baseline Emissions ($MtCO_2e$)	Sectoral emissions ceilings for each 5-year carbon budget period ($MtCO_2e$) up to 2030		2030 Emissions Ceiling ($MtCO_2e$)	Reduction in emissions by 2030 compared to 2018
		2021-2025 Emissions Ceiling	2026-2030 Emissions Ceiling		
Electricity	10	40	20	3	~75%
Transport	12	54	37	6	~50%
Built Environment – Residential	7	29	23	4	~40%
Built Environment – Commercial	2	7	5	1	~45%
Industry	7	30	24	4	~35%
Agriculture	23	106	96	17.25	~25%
Other[1]	2	9	8	1	~50%
LULUCF	5				

Sector	2018 Baseline Emissions ($MtCO_2e$)	Sectoral emissions ceilings for each 5-year carbon budget period ($MtCO_2e$) up to 2030	2030 Emissions Ceiling ($MtCO_2e$)	Reduction in emissions by 2030 compared to 2018	
		2021-2025 Emissions Ceiling	2026-2030 Emissions Ceiling		
TOTAL	68	CAP24 puts activity targets in place for the LULUCF Sector reflecting an EU-type approach			
Annual unallocated Emission Savings in 2030[144]	-	-	5.25	5.25	-
Unallocated Savings 2026-2030	-	-	26		-
Legally binding carbon budgets and 2030 Emission Reduction Targets	-	295	200	34	51%
[1] F-gases, Petroleum Refining and Waste					

20.2.6.2 Regional Policy Context

In terms of the regional context, the Proposed Development is located in the Eastern and Midlands Region of Ireland and, therefore, the relevant regional policy is the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Regional Assembly (EMRA) 2019-2031 (Hereafter referred to as the RSES). The RSES locates the majority of the Proposed Development within the Dublin Metropolitan Area. Key points from the RSES are as follows:

- Climate action is one of three key principles underpinning the RSES vision to create a sustainable and competitive region, to be achieved by securing the transition to a low carbon economy. The RSES expresses support for NSO 8: of the NPF, seeking 'Alignment of growth with enabling infrastructure' to ensure quality infrastructure provision and capacity improvement is provided in tandem with new development;

[144] 5.25 $MtCO_2e$ of annual emissions reductions are currently unallocated on an economy-wide basis for the second carbon budget period (2026-2030). CAP24 sets out an approach to deal with unallocated savings no later than 2025 and proposes that this may be achieved by focussing on exploring emerging technologies and on the deployment of carbon removal technologies.

- The RSES states, in relation to the Dublin Metropolitan Area, that the 'Development of the energy distribution and transmission network in the region will enable distribution of more renewable sources of energy to facilitate future energy demand in strategic development areas'. The RSES specifically identifies the need for the 'expansion and upgrading of the grid with the aim of increasing the share of variable renewable electricity that the all-island system can accommodate'; and

- The RSES expresses support for EirGrid's Implementation Plan 2017 – 2022 and Transmission Development Plan (TDP) 2016 and any subsequent plans prepared during the lifetime of the RSES, while Objective RPO 10.23 specifically states to "Support reinforcement of the Greater Dublin Area between Dunnstown and Woodland 400 kV substations to increase the capacity of the often congested and highly loaded Dublin transmission network to enable the transmission system to safely accommodate more diverse power flows and also facilitate future load growth in the area".

20.2.6.3 Local Policy Context

The Proposed Development will be located within the administrative boundaries of Kildare County Council and Meath County Council. This sub-section provides a summary of relevant local policy and strategy on climate change.

Kildare County Council

The local plans and policies of Kildare County Council relevant to the Proposed Development are as follows:

- The KCC Climate Change Adaptation Strategy 2019 – 2024 – Adopted in August 2019. The strategy aims to ensure a proper comprehension of the key risks and vulnerability of climate change, bring forward the implementation of climate resilient adaptation actions and to ensure climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of the local authority;

- The Local Authority Climate Action Charter – This was signed by KCC in October 2019 and represents a commitment by local authorities to deliver effective climate action on the local and national scale. The Local Authority Climate Action Charter commits local authorities to several actions, including a requirement to deliver on a target of 30% reduction in carbon emissions by 2030 and to ensure that all suppliers provide information on their carbon footprint and steps they plan to reduce its impact;

- Delivering Effective Climate Action 2030, hereafter referred to as DECA2030 – This is the local government strategy on climate action published in April 2021. DECA2030 provides a stated roadmap at the sectoral level for local authorities to deliver the necessary decarbonisation and adaptation measures required by the Climate Action Charter and Climate Action Plan;

- Kildare County Development Plan 2023-2029[145] - Adopted in January 2023. This is the key strategy document for planning and sustainable development in County Kildare. The Kildare County Development Plan 2023 – 2029 contains several aims, policies and actions that are relevant to the Proposed Development, specifically CEC O71, which states that the Plan does: "Support and facilitate the Kildare-Meath Grid Upgrade (also known as Capital Project 966) to enable further renewable

[145] Kildare County Development Plan 2023 – 2029 (took effect on 28th Jan 2023). Available at: https://kildarecoco.ie/AllServices/Planning/DevelopmentPlans/KildareCountyDevelopmentPlan2023-2029/Volume1Chapters1-17/

energy generation in line with the Governments' target of 80% renewable energy generation by 2030.". Further details are provided in Appendix 20.1; and

- Kildare County Climate Action Plan 2024 – 2029 – This Plan sets the ambition for Kildare County Council towards achieving a climate neutral economy by 2050, in accordance with the 2021 Climate Act. The strategic goals within the Kildare County Climate Action Plan 2024 – 2029 that are relevant to the Proposed Development are listed in Appendix 20.1.

The Proposed Development is located within the boundaries of several local plans, including:

- Naas Local Area Plan (NLAP) 2021-2027 - The Proposed Development passes through the functional area of the NLAP. Policy I4 – Energy and Communications sets out a number of objectives in relation to the energy transmission infrastructure, including supporting the statutory providers of national grid infrastructure. It also seeks to ensure the undergrounding of all electricity, telephone and television cables in the town including the town centre and in residential and amenity areas;

- Sallins Local Area Plan (SLAP) 2016-2022 - The Proposed Development passes through the functional area of the SLAP. The SLAP states that a more sustainable energy sector incorporating power generation and energy efficiency in all sectors is vital for reducing greenhouse gas emissions, and that this may be achieved by focusing on renewable energy generation and improving energy efficiency. It also states, "The availability of appropriate energy and communications infrastructure is essential for the successful future development of the town".

Meath County Council

The local plans and policies of Meath County Council relevant to the Proposed Development are as follows:

- The Meath County Council Climate Action Strategy 2019-2024 – Published in September 2019, this strategy sets several actions on the subject on clean energy, with the primary action (C1) being to "Build on and support national renewable energy targets and strategy";

- Local Authority Climate Action Charter – Like KCC, MCC is also a signatory to the Local Authority Climate Action Charter and therefore committed to deliver on its commitments;

- DECA2030: Like KCC, MCC is also a signatory to the DECA2030 strategy for local authorities;

Meath County Development Plan 2021 – 2027 – Meath adopted this plan in November 2021 and issued a 2-year progress report in December 2023. The Meath County Development Plan includes several objectives relating to the promotion of renewable energy alternatives, as summarised in Appendix 20.1.

Meath County Draft Climate Action Plan 2024 – 2029 – This document is currently under consultation and sets out Meath County Council's proposed strategy on climate action, in fulfilment of its obligations under the 2021 Climate Act. The objectives identified within the Meath County Draft Climate Action Plan that are relevant to the Proposed Development are described in Appendix 20.1.

The Proposed Development is not located within any boundaries in Meath County that are subject to Local Plans.

20.2.7 Vulnerability to Changes in Climate

A qualitative methodology has been undertaken to identify the vulnerability of the Proposed Development to changes in climate. The methodology has followed the IEMA guide to climate change resilience and adaptation (2020).

Regarding the vulnerability of all assets associated with the Proposed Development to climate change during the construction phase, this has been scoped out of the assessment as there are likely to be negligible changes in climate prior to the end of the construction phase. The indicative preliminary construction programme for the Proposed Development runs from 2025 to 2028, as per Table 5.5 in Chapter 5 (Proposed Development Description). The future climate projections for 2020-2039 in Table 20.7 show a less than 5% change in seasonal accumulated precipitation and a less than 1°C change in seasonal maximum/minimum temperature from the 1995-2014 baseline. Any construction within this 20 year scenario (2020 – 2039) would be subject to the same projected changes in climate.

The vulnerability of the Proposed Development to climate change has been assessed for the operational phase. However, the substation extension works are located within the existing substation sites, which have been sited to be resilient to the main risks associated with climate change (mainly flooding). Substations have therefore not been considered further in this vulnerability assessment.

The IEMA (2020) guidance represents international best practice for undertaking climate change risk assessments. In compliance with IEMA (2020), risks[146] to the Proposed Development associated with the future climate baseline have been identified (see Section 20.4 Potential Effects) and a significance rating has been determined based on professional judgement. The significance rating considers both the perceived likelihood and severity of each risk. The risk assessment and the determination of significance take account of embedded mitigations that will be in place.

This assessment applies the likelihood[147] criteria defined in Table 4 of the IEMA (2020) guidance. The likelihood of each risk has been determined based on the projected future climate baseline and professional judgement with relevant subject experts, as defined in Table 20.3.

Table 20.3: Definitions of likelihood categories

Likelihood category	Description (probability and frequency of occurrence)
Very high	The event occurs multiple times during the lifetime of the project (e.g. approximately annually)
High	The event occurs several times during the lifetime of the project e.g. approximately once every five years)
Medium	The event occurs limited times during the lifetime of the project (e.g. approximately once every 15 years)
Low	The event occurs during the lifetime of the project
Very Low	The event may occur during the lifetime of the project

The magnitude of impact[148] ratings for each risk have been assigned in a similar manner, according to the categories in Table 20.4. The best practice IEMA (2020) guidance provides that *"definitions of likelihood and*

[146] Risk is defined as the risk that a weather or climate event occurs and results in an adverse impact.

[147] The likelihood of each risk occurring relates to the likelihood that a specified risk resulting from climate change should occur.
[148] The severity refers to the magnitude of a risk upon an asset.

magnitude will vary from scheme to scheme, and should be tailored to a specific project". The magnitude of impact ratings are therefore based on the example criteria provided in Table 4 of IEMA (2020), with tailoring of the likely impacts to the Proposed Development based on experience and professional judgement.

Table 20.4: Definitions for magnitude of impact categories

Magnitude of Effect	Definition
Very large adverse	Continuous disruption as a result of severe damage to the asset, lasting more than 1 week OR A severe reduction in asset lifespan.
Large adverse	Intermittent disruption as a result of moderate to severe damage to the asset, lasting more than 1 week OR A moderate reduction in asset lifespan
Moderate adverse	Intermittent disruption as a result of moderate damage to the asset, lasting less than 1 week. OR A measurable increase in necessary maintenance frequency and costs.
Minor adverse	A small reduction in asset performance or lifespan.
Negligible	Undetectable change in asset performance or lifespan.

The significance of each risk has subsequently been determined based on the likelihood and severity ratings according to the significance matrix in Table 20.5. The significance matrix is aligned with Table 4 of the IEMA (2020) best practice guidance.

Table 20.5: Significance Matrix

	Magnitude of Effect					
		Very large adverse	**Large adverse**	**Moderate adverse**	**Minor adverse**	**Negligible**
Likelihood	**Very high**	Significant	Significant	Significant	Significant	Not significant
	High	Significant	Significant	Significant	Significant	Not significant
	Medium	Significant	Significant	Significant	Not significant	Not significant
	Low	Significant	Significant	Not significant	Not significant	Not significant
	Very Low	Not significant	Not significant	Not significant	Not significant	Not significant

20.2.8 GHG Assessment

The main sources of GHG emissions during the construction phase will consist of the carbon embodied within the construction materials used; the transport and road haulage of materials from the supplier to the construction areas; and construction activities, including waste treatment and transport. For a full description of the construction phase activities, please refer to Chapter 5 (Proposed Development Description).

The embodied construction emissions for the construction phase materials (PAS 2080:2023 Whole Life Cycle (WLC) modules A1-A3) have been calculated using emission factors from the Inventory of Carbon and Energy Version 3 (Circular Ecology, 2019) and Harrison et al. (2010). The Inventory of Carbon and Energy is a leading embodied carbon database for building materials, that is applied in several best practice carbon calculators, including the TII carbon tool for road and light rail projects. The application of carbon factors from peer reviewed literature, such as Harrison et al. (2010), is also compliant with scientific best practice. The carbon emissions are calculated, in units of tonnes of CO_2e, by multiplying the emission factor by the quantity of the material that will be used over the entire construction phase.

The construction phase will require the import of materials for the Proposed Development works. Table 19.8 in Chapter 19 (Waste) of this EIAR provides estimated quantities of the major materials required to complete the construction phase of the Proposed Development. This GHG assessment has considered the major materials defined in Table 19.8 of Chapter 19 (Waste) and is therefore subject to the same assumptions and limitations as the Waste Assessment (Chapter 19 (Waste)). The major materials and their quantities are, as follows:

- Enabling Works: 1,421 m^3 of asphalt and 46,539 m^3 of engineered fill, associated with passing bays, construction platforms and compounds; and
- Permanent Works: 6,545 m^3 of asphalt, 7,205 m^3 of engineered fill and 45,958 m^3 of concrete, associated with the in-road cable route, off-road cable route and permanent access tracks.

Additionally, this GHG assessment has accounted for the materials associated with 70 pre-cast joint bays and the High Voltage 400 kV cables. This GHG assessment estimates 38 tonnes of high strength pre-cast concrete per joint bay. Based on the cable specifications, the total materials associated with the three 400 kV cables, for the Proposed Development length of 52.9km, are estimated to be:

- 4,540 tonnes of copper cables;
- 1,255 tonnes of Insulation XLPE;
- 433 tonnes of aluminium concentric wires;
- 37 tonnes of aluminium sheath; and
- 367 tonnes of polyethylene jackets.

The carbon emissions associated with the transport of the materials from the supplier to the site (PAS 2080:2023 WLC module A4 emissions) have been calculated applying 2023 GHG emission factors published by the UK Government (2023), for average laden and 0% laden HGVs (under Freighting Goods). The UK Government-published GHG factors are applied in several best practice tools, including the TII carbon tool for roads and light rail projects. An average vehicle load of 7.5t was applied to estimate the number of vehicle movements, where required.

The suppliers for the construction materials have not yet been confirmed. Therefore, in accordance with the Royal Institution of Chartered Surveyors' (RICS) Whole Life Carbon Assessment (WLCA) for the Built Environment standard (RICS, 2023), which represents international best practice guidance for GHG assessments, this GHG assessment has assumed a default one-way transport distance of 20km for cement, 50km for other locally sourced materials (asphalt, cement based granular material (CBGM)) and 120km for nationally sourced materials (precast concrete). The 400kV cables will be sourced from outside of Ireland. However, at this stage, the geographical origin of the cable components cannot be defined and, therefore, this GHG assessment accounts for the transport of the cables within Ireland, applying a one-way transport distance of 120km based on the RICS (2023) guidance. The transport emissions for each material includes a one-way transport by laden HGV from the supplier to the location of the Proposed Development and a return journey by unladen HGV.

The embodied carbon emissions associated with the construction materials, and the transport of the materials to the location of the Proposed Development, are likely to be the main contributors to the construction phase carbon for the Proposed Development. The construction of the Proposed Development is described in Chapter 5 (Proposed Development Description). At this stage, a contractor has not been appointed and therefore the details of construction and installation process, e.g. vehicle types and fuel mix, are not currently available. The GHG emissions associated with construction and installation processes (PAS 2080:2023 WLC module A5) have therefore been scoped out of this GHG assessment.

On the basis that waste material will be minimised as far as possible through best good practice construction methods (see Chapter 19 (Waste)), the estimation of GHG emissions associated with waste treatment and transport have not been considered further in this assessment.

The substation extension and upgrade works require minimal extension of the existing substation footprint and the associated material amounts are therefore considered to be a minor contributor to the total construction phase GHG emissions. These have therefore not been considered further in this assessment.

A 15% uplift has been applied to the total material amounts as a contingency to include for uncertainty, prior to calculating the embodied carbon and transport emissions.

The TII Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) states that *"the Climate Practitioner should use their professional judgement to determine how best to contextualise and assess the significance of a project's GHG impact. The assessment is not solely based on whether a project emits GHG emissions alone, but how it makes a relative contribution towards achieving a science based 1.5°C aligned transition towards net zero (IEMA, 2022). In the climate assessment, the Climate Practitioner must give regard to two major considerations when assessing the significance of a project's GHG emissions:*

- *Alignment to Ireland's trajectory towards net zero by 2050; and*
- *Mitigation of GHG emissions."*

In relation to determining significance, the IEMA guidance (Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance) (IEMA, 2022) states:

"*When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project ' s emissions should therefore be based on its net impact over its life time, which may be positive, negative or negligible.*

Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project ' s residual emissions at all stages.

Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project ' s remaining emissions should be considered".

The guidance acknowledges that there will be continuing GHG emissions over time but these should be reduced and compatible with national climate change commitments. The guidance also states:

The crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050 " .

In considering the emissions of GHGs, professional judgement, following a proportionate approach, has been used to provide a qualitative description of the nature of the impacts and determine the significance of the effect on climate. This is directly in compliance with the significance principles and examples of criteria set out in the IEMA (2022) guidance. The assessment included contextualising the predicted GHG emissions against the relevant legislated carbon budgets.

The significance criteria are set out in Table 20.6.

Table 20.6: Significance criteria for GHG emissions.

Significance	Magnitude	Magnitude Criteria
Significant	Major Adverse	The Proposed Development's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to Ireland's trajectory towards net zero.
	Moderate Adverse	The Proposed Development's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to Ireland's trajectory towards net zero.
Not Significant	Minor Adverse	The Proposed Development's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve Ireland's trajectory towards net zero.
	Negligible	The Proposed Development's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.

The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022) describe the quality of effects in terms of positive, neutral and negative, where neutral is defined as effects that are imperceptible, within normal bounds of variation.

As part of the assessment of significance outlined in Table 20.6**Table 20.6: Significance criteria for GHG emissions.**, comparison of the GHG emissions associated with the Proposed Development have been compared to the 2030 Electricity sectoral emissions ceiling (3 Mt CO_2e). For further context, the GHG emissions have also been compared to the typical GHG emissions associated with the embodied carbon of a three-bedroom house using traditional construction methods, which was found to be around 50t CO_2e by a study in 2011 (Monahan 2011). The GHG emissions have also been compared to the CO_2 equivalent per capita, where each person in

Ireland is currently responsible for a carbon footprint of 12.3t CO_2e per year, based on 2021 data (Central Statistics Office (CSO 2023)).

In the operational phase, GHGs associated with the maintenance of the Proposed Development[149] (embodied carbon of the raw materials required for routine operational maintenance) have been considered but scoped out on the basis that the cable is underground and GHG generating activities associated with maintenance would be very low even over the WLC period. Details of the maintenance activities in the operational phase are described in Section 5.5 of Chapter 5 (Proposed Development Description).

One of the primary objectives of the Proposed Development is to facilitate decarbonisation of the energy supply, by enabling the distribution of electricity obtained from renewable sources[150]. The extent of the renewable electricity distribution that will be facilitated by the Proposed Development is still to be determined. However, over time, this is expected to partially offset the greenhouse gases associated with transmission losses. On this basis, the GHG emissions associated with operational energy use[151] have been considered but scoped out of any further assessment.

20.3 Baseline Conditions

20.3.1 Current and Future Climate Baseline

The current climate baseline in Ireland is best described by the 1991-2020 climate averages[152], compiled by Met Éireann (2023) based on their observation network for several parameters, including air temperature, precipitation, sunshine and wind. The Met Éireann 1991-2020 climate averages for Dublin Airport, which is the nearest weather and climate monitoring station to the Proposed Development, are presented in Appendix 20.2. The climate averages show the region of the Proposed Development has a temperate climate, resulting in mild winters and cool summers. The majority of the Proposed Development is located within the administrative boundary of County Kildare, with the remainder of the Proposed Development being located in County Meath. Projected climate changes for County Kildare, in terms of temperature and precipitation, are therefore presented in Table 20.7 and, based on professional judgement, are deemed to be representative of the future baseline for both counties. These data utilise the 0.25° (25km) spatial resolution probabilistic dataset from the Sixth phase of the Coupled Model Inter-comparison Projects (CMIP6), accessed via the Word Bank Group Climate Change Knowledge Portal[153]. The current climate conditions (i.e. observed baseline) refer to the most recent historic climate dataset of 1995-2014. The future climate conditions refer to projections made under the high emissions scenario (i.e., SSP5-8.5, where SSP stands for Socio-Economic Pathway) with a 50% probability of occurrence for 2020–2039, 2040-2059, 2060-2079 and 2080 – 2099. These 20-year periods cover the lifespan of the Proposed Development. There is inherent uncertainty associated with all model-based projections. However, the IPCC AR6 multi-model ensemble, from which these projections derive, represent the latest global state of knowledge on climate change and are therefore appropriate for use in this assessment.

[149] PAS 2080:2023 Whole Life Cycle emissions: modules B2-B4
[150] KMGU-JAC-TN-0048-STEP-4B-Final.pdf (eirgrid.ie)
[151] PAS 2080:2023 Whole Life Cycle emissions: module B6
[152] Climate averages are defined as the mean values of a climate variable over a standard reference period.
[153] World Bank Group, Climate Change Knowledge Portal (2023). URL: https://climateknowledgeportal.worldbank.org/. Date Accessed:

Table 20.7: Range of SSP5-8.5 climate projections for County Kildare

Climate Metrics	Baseline 1995-2014 modelled climate averages	Projected anomaly change from the modelled 1995-2014 Baseline (SSP5-8.5, 50th percentile)			
		2020-2039	2040-2059	2060-2079	2080-2099
Annual mean accumulated precipitation (% change)	857.3 mm	0.8	-0.4	0.8	1.5
Winter mean accumulated precipitation (% change)	218.7 mm	4.4	5.8	14.3	21.4
Summer mean accumulated precipitation (% change)	209.0 mm	-3.4	-7.8	-16.2	-22.2
Annual mean temperature (°c change)	9.8 °c	0.6	1.1	2.0	3.0
Mean winter minimum temperature (°c change)	2.9 °c	0.4	0.9	1.7	2.3
Mean summer maximum temperature (°c change)	18.4 °c	0.7	1.5	2.3	4.1

The climate projections indicate that annual mean accumulated precipitation totals in Kildare (and therefore also in neighbouring County Meath) are likely to remain similar over the next century. However seasonal variability in rainfall will become larger, with wetter winters and drier summers. Local annual mean temperatures are projected to increase by as much as 3°C by 2100, with increases in temperature across all seasons. Mean summer maximum temperatures in the region are projected to increase by up to 4.1 °c by the end of the century.

20.3.2 Climate Pollutants

Climate is defined as the average weather over a period of time, whilst climate change is a significant change to the average weather. Climate change is a natural phenomenon but in recent years human activities, through the release of GHGs, have impacted on the climate (IPCC 2015). The release of anthropogenic GHGs is altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. This effect is causing an increase in the atmosphere's heat-trapping abilities resulting in increased average global temperatures over the past 40 years. The release of CO_2 as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'. The most significant GHGs are CO2, methane (CH_4) and nitrous oxide (N_2O).

For the purpose of this assessment, the definition outlined in Council Directive 2018/2001/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directive 2009/28/EC (hereafter referred to as the Renewable Energy Directive) for GHGs has been used. In Annex VI, B. Methodology Point 4 of the Renewable Energy Directive the relevant GHGs are defined as CO_2, CH_4 and N_2O.

CO_2 accounted for 60.4% of total GHG emissions in Ireland in 2022 while CH_4 and N_2O combined accounted for 38.4% (EPA 2023c). GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. To compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWP) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The IPCC AR5 Synthesis Report: Climate Change 2014 of the Fifth Assessment Report (AR5), sets out the global warming potential for a 100-year time period (GWP100) for CO_2 as the basic unit (GWP = 1), whereas CH_4 has a global warming potential equivalent to 28 units CO_2CO_2 and N_2O has a GWP100 of 265.

20.3.3 Existing GHG Emissions Baseline

Given the circumstances of Ireland's declaration of a climate and biodiversity emergency in May 2019 and the November 2019 European Parliament approval of a resolution declaring a climate and environment emergency in Europe, in conjunction with Ireland's current failure to meet its EU binding targets under the GHG Effort Sharing Regulation (ESR), changes in GHG emissions either beneficially or adversely are of more significance than previously viewed prior to these declarations. Thus, the baseline climatic environment should be considered a highly sensitive environment for the assessment of impacts.

The sectoral Baseline Emissions Inventories for County Kildare and County Meath have been quantified by their respective county councils for a baseline year of 2018, in support of their individual Climate Action Plans for 2024-2029. As shown in Table 20.8, the GHG emissions in 2018 for County Kildare and County Meath equated to 1,679 ktCO2e and 4,254 ktCO2e, respectively. These are equivalent to 2% and 6% of the national total in 2018 (~69,998 ktCO_2e; EPA 2023b[154]).

Table 20.8: Baseline GHG emissions inventory for Counties Kildare and Meath

Emissions Category	2018 County Kildare Emissions (ktCO_2e)	2018 County Meath Emissions (ktCO_2e)
Industrial	See foot note [a]	1,230 (28%)
Transport	641 (38%)	419 (10%)
Residential	391 (23%)	353 (8%)
Manufacturing and Commercial Services	322 (19%)	556 (13%)
Agriculture	232 (14%)	1,054 (25%)
Waste	5 (<1%)	378 (9%)
LULUCF	-	264 (6%)
Public Services [b]	87 (5%)	8 (<1%)

[154] EPA 2023 Ireland's National Inventory Report. Greenhouse Gas Emissions 1990-2021

Emissions Category	2018 County Kildare Emissions (ktCO_2e)	2018 County Meath Emissions (ktCO_2e)
F-gases	not available	0.0004 (<1%)
Total [c]	**1,679**	**4,254**

a. Industrial emissions for County Kildare are included within the commercial emissions.

b. E.g. municipal, social housing and wastewater

c. Apparent discrepancies may arise due to the rounding of totals, subtotals and percentages

Data published in 2023 (EPA 2023c) showed that Ireland's 2022 GHG emissions were estimated to be 60.8 MtCO_2e. Ireland's provisional 2022 GHG ESR emissions were 46.08 Mt CO_2eq and therefore exceeded its 2022 ESR Annual Emissions Allocation of 42.36 Mt CO2eq. This indicates that Ireland is not in compliance with its 2022 Effort Sharing Regulation annual limit. The sector with the highest emissions is agriculture at 38.4% of the total, followed by transport at 19.1%. Industrial Processes contribute 3.8% of the total. It is predicted that Ireland will exceed its new 2030 target under the EU's Effort Sharing Regulation (ESR) to limit its greenhouse gas emissions by at least 42% by 2030 (EPA 2023a).

20.4 Potential Effects

20.4.1 Construction Phase

20.4.1.1 GHG assessment

During the construction phase, the Proposed Development has the potential to affect Earth's climate by causing (either directly or indirectly) the emission of GHGs such as CO_2 into the atmosphere. Construction activities will include excavation of cable trenches and associated joint bays and crossings. Temporary activities, including the requirement for Passing Bays, site works and ancillary staff facilities and parking will also be required. All activities could impact on GHG emissions generation.

The total estimated embodied carbon and material transport emissions for the Proposed Development are equivalent to 43,014 tCO_2e. These emissions are presented for different aspects of the construction phase in Table 20.9. The majority of the emissions are associated with the embodied carbon in the 400kV cables, due to the relatively high embodied carbon associated with producing the copper conductor and aluminium sheath. However as aluminium and polyethylene associated with the cables are relatively lightweight, the transport emissions associated with the cables are lower than those for the enabling works and other permanent works.

Table 20.9: Full Construction Phase Embodied Carbon GHG Emissions

Emission type	GHG emission (tCO_2e)
Enabling Works	
Embodied Material Carbon	946
Materials Transport Carbon	965
Enabling Works: Total Carbon	1,910
Permanent Works	
Embodied Material Carbon	12,352
Materials Transport Carbon	745
Permanent Works: Total	13,096
Cables	
Embodied Material Carbon	22,251
Materials Transport Carbon	145
Cables: Total	22,396
Total	
Total emissions (PAS 2080:2023 WLC Modules A1-A4)	**37,403**
Total (with 15% uplift)	**43,014**

As shown in Table 20.9, the estimated total GHG emissions associated with the construction of the Proposed Development is 43,014 tCO_2e. These construction emissions would occur over the anticipated 42-month construction period (between 2025 to 2028, as per Table 5.5 in Chapter 5 (Proposed Development Description). This equates to an average annual emission of 12,290 tCO_2e per year. The associated construction emissions therefore represent a very small percentage (i.e., 0.4%) of the 2030 Electricity sectoral emissions Ceiling (i.e., the 2030 Electricity sectoral emissions ceiling is 3 $MtCO_2e$). The annual construction Phase GHG emissions associated with the Proposed Development are equivalent to the GHG emissions arising from the construction of 246 three-bedroom houses using traditional construction methods and to the annual carbon footprint for 999 people in Ireland. All construction phase emissions would occur within the 2026-2030 carbon budget period for Ireland, from which the 2030 Electricity sectoral emissions are derived.

With respect to the 2030 Electricity sectoral emissions ceiling, the relatively minor contribution to existing GHG emissions and that the fact that the Proposed Development is to support the transmission of energy from renewable sources, it is considered that the magnitude is classed as *Minor Adverse* and the effect would be *Not Significant*.

20.4.2 Operational and Maintenance Phase

20.4.2.1 Vulnerability to Changes in Climate

A full description of potential risks that may impact the Proposed Development and associated vulnerability rating are presented in Table 20.10. The assessment of risk likelihood, magnitude of impact and significance ratings are determined based on experience and professional judgement according to the criteria in Table 20.3, Table 20.4 and Table 20.5, respectively. The criteria are in compliance with the IEMA (2020) guidance.

Table 20.10: Projected Climate Change Risks[155]

Risk ID	Climate aspect	Potential Risk	Design Mitigations/Adaptations	Likelihood	Magnitude of Impact	Significance Rating
R1	High Temperatures	Inability to perform maintenance activities in high temperatures (>32°C) due to increased level of discomfort for staff.	The cable routes will not require specific or routine maintenance activities along the cable trench or joint bay locations. Routine maintenance will be required for link boxes and communication chambers. However, this will be at a frequency of once per annum and so is not likely to be affected by high temperatures.	Medium	Minor Adverse	Not Significant
R2	High Temperatures	Increase in temperature could result in increased risk of structural failure from thermal expansion of trenches. This may lead to increased maintenance costs and disruption to operations.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions.	Low	Moderate adverse	Not Significant

155 Adapted from Metrolink 110kV Underground Cables. Volume 2 EIA Report Chapter 12 Climate.

Risk ID	Climate aspect	Potential Risk	Design Mitigations/Adaptations	Likelihood	Magnitude of Impact	Significance Rating
R3	High Temperatures	Increase in temperature could result in increased risk of structural failure from thermal expansion of metallic features and on concrete structures, resulting in need for repair. This may lead to increased risk of damage to underground cables during road repair activities.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions.	Low	Moderate adverse	Not Significant
R4	High Temperatures	Increase in temperature could result in increased risk of surface failure from thermal expansion, melting and deformation of road crossing sections. This may lead to increased maintenance costs and disruption to operations.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions.	Low	Moderate adverse	Not Significant
R5	High temperatures, freeze-thaw	Rising temperatures will reduce risk of freeze-thaw events which lead to erosion, cracking and spalling of metallic features and concrete structures. However, the risk will still occur.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions.	Low	Moderate adverse	Not Significant
R6	Precipitation	Increases in winter precipitation could increase groundwater levels with the potential to cause ground movements. This may damage buried cables.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions.	Medium	Minor adverse	Not Significant

Risk ID	Climate aspect	Potential Risk	Design Mitigations/Adaptations	Likelihood	Magnitude of Impact	Significance Rating
R7	Precipitation	Increase in winter precipitation, in particular, extreme precipitation events, may increase the rate of soil erosion, exposing and damaging cables.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions. Cables are placed within a protective plastic ducting and buried underground within a cement bound granular material surround.	Low	Moderate adverse	Not Significant
R8	Precipitation	Increase in winter precipitation could result in flooding, reducing access to cable structures, communication equipment and link boxes for maintenance or emergency repair.	The cable routes will not require specific or routine maintenance activities along the cable trench or joint bay locations. Routine maintenance will be required for link boxes and communication chambers. However, this will be at a frequency of once per annum and so is not likely to be affected by flooding.	Low	Minor adverse	Not Significant

Risk ID	Climate aspect	Potential Risk	Design Mitigations/Adaptations	Likelihood	Magnitude of Impact	Significance Rating
R9	High temperatures and drought	Increase in temperature and drought may cause soil creep and instability of earthwork slopes (where cables are buried in sloped verge/sloped field edge) if soils dry out. This may damage buried cables.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions. Cables are placed within a protective plastic ducting and buried underground within a cement bound granular material surround.	Low	Moderate adverse	Not Significant
R10	Precipitation and temperature	Cyclic wetting and drying may result in soil shrink-swell action, increasing the risk of ground movement including landslip or subsidence. This may damage buried cables.	The Proposed Development is designed to ensure that infrastructure can operate in varying climatic conditions. Cables are placed within a protective plastic ducting and buried underground within a cement bound granular material surround.	Low	Moderate adverse	Not Significant

Based on the qualitative review of risks to the Proposed Development associated with a changing climate no further assessment of climate vulnerability in the operational phase is considered necessary.

20.4.2.2 GHG assessment

As stated in Section 20.2.8 the assessment of GHGs for the Operational (including maintenance) Phase has been scoped out, although it is acknowledged that this phase of the Proposed Development will facilitate processes that result in the emission of GHGs (e.g. transmission losses). The Proposed Development is essential to meeting the Government of Ireland's Climate Action Plan target of up to 80% renewable energy generation by 2030, which requires the transportation of electricity from renewable sources[156]. The expected growth in onshore wind generation across the Republic of Ireland and offshore wind generation in the Irish Sea results in a need for power transfer capacity. Increasing renewables on the system displaces conventional generation in the area, resulting in voltage support needs. Added capacity encourages the electrification of other sectors (enabling those sectors to reduce GHG emissions). The Proposed Development also increases the security of supply. The need for grid development offered by the Proposed Development is therefore a high priority to address climate concerns.

It is therefore concluded that the net impact of the Proposed Development over its life cycle will be consistent with national policy requirements and will support Ireland's national commitment to achieving net zero.

20.5 Mitigation Measures

20.5.1 Construction Phase

20.5.1.1 Vulnerability to Changes in Climate

The vulnerability of the Proposed Development to climate change during the construction phase has been scoped out of this assessment.

20.5.1.2 GHG Assessment

Given the sensitivity of the global atmosphere to GHG emissions and the importance of reducing GHG emissions to meet GHG reduction targets on a trajectory towards net zero, mitigation measures are proposed to reduce emissions as far as practicable.

EirGrid has developed the 'Shaping Our Electricity Future' Roadmap, which was updated in July 2023 to align with CAP23[157] and the carbon budget programme. EirGrid has committed to, and will, publicly report on their sustainability performance in relation to the following targets:

- Reduce absolute Scope 1 and 2[158] GHG emissions by 50%;
- Reduce Scope 3 GHG emissions[159] related to dispatch of electricity generation by 35% per megawatt hour within the same timeframe; and
- Reduce all other absolute Scope 3 GHG emissions by 30% by 2030, using 2019 as a base year.

The following good practice measures will be implemented to reduce GHG emissions during the construction phase of the Proposed Development:

[156] KMGU-JAC-TN-0048-STEP-4B-Final.pdf (eirgrid.ie)
[157] CAP24 has subsequently been published and shares the same key targets for renewable energy generation as CAP23.
[158] Scope 1 emissions refer to those from sources that an organisation owns or controls directly. Scope 2 emissions are those that are caused indirectly by an organisation based on the energy it uses.
[159] Scope 3 emissions are those emissions that a company is indirectly responsible for up and down its value chain. They exclude emissions produced by the organisation itself or resulting from activities or assets controlled by an organisation.

- Investigating and implementing sustainable reuse of any materials won from excavation;
- The reuse, where possible of materials and waste generated from construction works;
- Procuring locally sourced materials where reasonably practicable to reduce transportation emissions;
- Careful consideration of material quantity requirements to avoid over-ordering and generation of waste materials, while also reducing transportation-related emissions; and
- The appointed contractor to develop and implement a plan to reduce energy consumption and GHG emissions throughout construction, including, for example:
    - Monitoring of fuel and mains electricity use on site (site accommodation to have motion activated lighting and use lower power lighting techniques such as LEDs);
    - Training of plant operatives in fuel efficient driving techniques or use of appropriate technology on construction vehicles (e.g. stop – start); and
    - Consideration of renewable/ and or low carbon energy sources to power construction compounds.

20.5.2 Operational Phase

20.5.2.1 Vulnerability to Changes in Climate

The vulnerability of the Proposed Development to changes in climate is assessed in Section 20.4. It describes the embedded design measures included in the design of the Proposed Development which will assist in mitigating potential impacts, such that no significant risks were identified. Therefore, no further adaptations to improve the Proposed Development's resilience to climate change are required for the operational phase.

20.5.2.2 GHG Assessment

The following measures will be implemented to reduce GHG emissions during the operational phase of the Proposed Development:

- Use of locally sourced, low carbon materials where practicable for asset replacements; and
- Regular planned preventative maintenance checks to optimise operational efficiency.

As stated in Section 20.2.8, one of the primary objectives of the Proposed Development is to facilitate the transmission of energy derived from renewable sources. The extent of the renewable electricity distribution that will be facilitated by the Proposed Development is still to be determined. However, EirGrid are committed to increasing the distribution of energy from renewable sources, and through facilitating this, GHG emissions owing to the Proposed Development will be offset over time.

20.6 Residual Effects

Where GHG emissions cannot be avoided, the goal of the environmental impact assessment process should be to reduce a project's residual emissions at all stages. According to IEMA, in the Environmental Impact Assessment Guide to: Assessing Greenhouse Gas and Evaluating their Significance, GHG emissions from projects will contribute to climate change and may be considered significant. The IEMA Guidance suggests that the level of significance is not only based on GHG emissions of a project, but how this project contributes or not towards achieving science-based targets and net-zero[160].

20.6.1 Construction Phase

Opportunities for carbon reduction (mitigation) during the construction phase have been identified in Section 20.5. However, the effects of the mitigation are not quantifiable at this stage of the Proposed Development. Therefore, there will be residual GHG emissions owing to the construction of the Proposed Development, as calculated in Section 20.4.1, the magnitude of which have been deemed to be Minor Adverse.

20.6.2 Operational Phase

Estimating the net effects of the GHGs from the Proposed Development on system wide GHG emissions is beyond the scope of this assessment. However, the integration of renewable electricity generation from the South and South West regions of Ireland is a key driver underpinning the need for the Proposed Development, as stated in Chapter 2 (Need for the Proposed Development). Considering the need to transition to net zero by 2050, it follows that the Proposed Development can be considered as supportive of system wide decarbonisation.

With the application of mitigation, as outlined in Section 20.5, it is likely that the GHG emissions from the construction and operation of the Proposed Development will be reduced. However, the magnitude of emissions will remain as Minor Adverse, and the residual effects will be Not Significant.

20.7 Conclusion

An assessment of the effects of climate change on the Proposed Development and of the effect of the Proposed Development on the climate has been undertaken. The Proposed Development has been designed so that it will not be susceptible to the effects of climate change. Although, the Proposed Development is expected to result in some direct GHG emissions during the construction and operational phases, the magnitude of the direct GHG emissions have been estimated for the construction phase and are considered to be Minor Adverse and therefore Not Significant. As outlined in Chapter 2 of this EIAR, the Proposed Development will help to meet the Government of Ireland's Climate Action Plan target of up to 80% renewable energy generation by 2030. This includes the transmission of electricity from offshore and onshore renewable sources thus allowing for a sustainable growth in energy demand, while also supporting the uptake of renewably sourced electricity in other sectors. It is anticipated that the Proposed Development's role in providing a low-carbon electricity grid will, over time, partially offset the direct emissions resulting from the construction and operational phases.

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21. Cumulative Impacts & Environmental Interactions

21.1 Introduction

This chapter considers and assesses the potential for cumulative impacts arising from the Proposed Development in combination with approved projects and developments or other projects and developments which, at the time of assessment, were yet to be approved, but for which a decision on such project / development is reasonably foreseeable over the likely consenting and construction period anticipated for the Proposed Development (it should be noted that the terms project / development are used interchangeably when discussing the other projects / developments in this assessment).

In addition, this chapter addresses the potential for interactions between impacts on different environmental factors of the Proposed Development itself on the receiving environment.

This chapter should be read in conjunction with Chapter 7 to Chapter 20 of this EIAR, and their appendices, which present the assessment of the likely significant environmental impacts arising from the Proposed Development itself and proposed mitigation measures to ameliorate the predicted impacts. It should also be read in conjunction with Appendix 21.1 in Volume 3 of the EIAR, which contains the detailed assessment of other developments / projects.

21.2 Cumulative Impacts

Annex IV of Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the EIA Directive) requires that an EIAR provides a "*description of the likely significant effects of the project on the environment resulting from…the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.*" In addition, Schedule 6 of S.I. No. 600/2001 – Planning and Development Regulations, 2001 (as amended) states that the EIAR should include "*a description of the likely significant effects (including……cumulative……) of the proposed development*".

The Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999) provide the following definition of cumulative impacts:

"*Impacts that result from the incremental changes caused by other past, present or reasonably foreseeable actions together with the project.*"

The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as EPA Guidelines) (EPA 2022) define cumulative effects as:

"*The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects*."

It should be noted that the EPA Guidelines use the terms impacts and effects interchangeably. A relatively minor effect on a particular receptor caused by the Proposed Development could result in a significant effect if it is added to by impacts from another nearby development. This chapter identifies and provides an assessment of likely significant cumulative effects caused by the Proposed Development in combination with other planned developments / projects. Section 21.3 sets out the process for deciding which other planned developments / projects were included in the assessment.

21.2.1 Environmental Interactions

Environmental interactions are the reactions between impacts, whether between impacts of just one project / development (i.e., the Proposed Development), or between the impacts of multiple projects / developments. For each environmental topic there will be certain interactions or interdependencies with other environmental topics, whereby impacts may interact to create a greater effect or a different type of effect. An assessment of these interactions has been undertaken as required by Article 3 of the EIA Directive, which states the following:

"The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

(a) Population and human health;

(b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

(c) Land, soil, water, air and climate;

(d) Material assets, cultural heritage and the landscape;

(e) The interaction between the factors referred to in points (a) to (d)."

This is also reflected in Section 171A(b) of Number 30 of 2000 - Planning and Development Act 2000 (as amended by Section 53 of Number 30 of 2010 – Planning and Development (Amendment) Act 2010, which states:

" 'environmental impact assessment' means an assessment carried out by a planning authority or the Board, as the case may be, in accordance with this Part and regulations made thereunder, that shall identify, describe and assess in an appropriate manner, in light of each individual case and in accordance with Articles 4 to 11 of the Environmental Impact Assessment Directive, the direct and indirect effects of a proposed development on the following:

(a) human beings, flora and fauna;

(c) soil, water, air, climate and the landscape;

(d) material assets and cultural heritage; and

(e) the interaction between the factors mentioned in paragraphs (a), (b) and (c)."

Some of the topic assessments within this EIAR already address environmental interactions. For example, Chapter 7 (Population and Human Health) provides an assessment of effects on community amenity, which relates to the interaction of impacts on air quality; visual amenity; traffic and transport; and noise and vibration and describes and assesses how a combination of impacts on health determinants can interact and influence health outcomes.

Section 21.6 of this chapter sets out the main environmental interactions identified from the Proposed Development, sign-posting chapters which already address environmental interactions and providing a description and assessment of environmental interactions which are not addressed elsewhere in this EIAR.

21.2.2 Relevant Guidelines

This assessment has been completed with regard to the following guidance documents:

- EPA Guidelines (EPA 2022);

- Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017);
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999); and
- Advice Note 17: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects (The Planning Inspectorate 2019).

21.3 Methodology for Cumulative Impact Assessment

21.3.1 Introduction

It is necessary to consider the scale, nature and likely impacts of other projects which could combine with the Proposed Development to cause cumulative effects. It was therefore necessary to identify which other projects should be included for analysis as part of the cumulative impact assessment. A staged approach to identify such other developments / projects was applied, as illustrated in Plate 21.1, with each stage described in subsequent chapter sections.

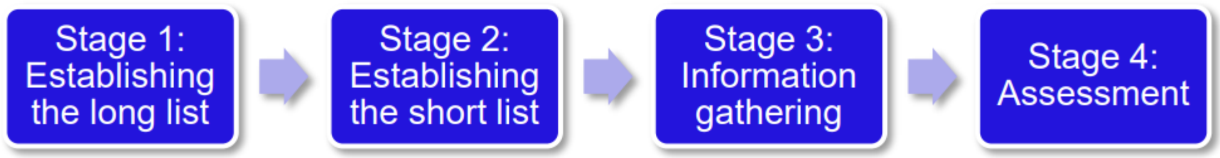

Plate 21.1: Staged Approach to Identifying Which Other Developments Should be Included for Analysis as Part of the Cumulative Impact Assessment

21.3.2 Identification of Other Developments

21.3.2.1 Stage 1: Establishing the Long List of Other Developments

The first stage of the cumulative assessment was to identify other projects deemed potentially relevant to be included in the long list. While the EIA Directive only requires the consideration of other existing and/or approved developments / projects, the assessment has gone further in that it has considered a number of other developments / projects with the potential to receive approval and be progressed, which may give rise to cumulative impacts, in combination with the Proposed Development.

Stage 1 involved a desk-based assessment, which is outlined in the following sections.

<u>Zone of Influence</u>

The long listing process involved establishing the topic Zones of Influence (ZoI). This was achieved by establishing whether each of the other projects identified would fall within the study areas for the topics considered for the Proposed Development in isolation, as assessed in the topic chapters of this EIAR. The ZoI provides a guide as to the likelihood that another development may contribute to potentially significant cumulative impacts with the Proposed Development. The largest ZoI identified in the assessment chapters of the EIAR was 1 kilometre (km). Therefore, a 1km buffer from the Planning Application Boundary was applied and considered appropriate to capture the potential cumulative impacts that could arise for all assessment topics.

<u>Sources for the Identification of Other Projects</u>

Potentially relevant other projects include those from various sectors, such as residential and commercial projects, utilities, and other transport projects. The identification of projects for the long list considered the following sources:

- The An Bord Pleanála (ABP) website (ABP 2024) – for details of Strategic Infrastructure Developments, Strategic Housing Developments and Large-Scale Residential developments;

- Local authority websites and the development plans for Meath and Kildare – for details of allocations for housing, areas for regeneration and other zoning objectives (Kildare County Council 2024; Meath County Council 2024);

- National Planning Application Database (Government of Ireland 2024) – for downloadable list of planning applications sent from Local Authorities;

- EirGrid-owned developments, as provided by EirGrid, and captured within the National Planning Application Database and the ABP website;

- Projects being planned by the National Transport Authority (NTA) on the NTA website (NTA 2024), as part of other major transport projects and programmes in accordance with the Greater Dublin Area Transport Strategy 2022 – 2042 (hereafter referred to as the GDA Transport Strategy) (NTA 2023);

- Project Ireland 2040, which combines the National Development Plan (Government of Ireland 2021) and National Planning Framework (Government of Ireland 2019);

- Transport Infrastructure Ireland (TII) website (TII 2024) – to identify major transport projects and programmes;

- The EIA Portal maintained by the Department of Housing, Planning and Local Government (DHPLG 2024) – for applications for development consent accompanied by an EIAR;

- Uisce Éireann's website, which includes a page on its projects (Uisce Éireann 2024); and

- Other infrastructure and utility providers and developers, as captured within the National Planning Application Database and the ABP website.

All planning application data provided by each local authority is fed into the National Planning Application Database. This dataset was used to identify planning applications within the ZoI of the Proposed Development. The dataset included all planning applications lodged to the relevant local authorities within 1km of the Planning Application Boundary. The dataset contained planning applications which had been granted, granted and appealed, refused, refused and appealed, withdrawn or invalidated. The application list was screened for potential cumulative impacts to contain any application that was conditional, or appealed and conditional. The exercise to identify relevant planning applications was undertaken in January 2024, with a cut-off date for assessment of other developments of 8 December 2023.

In addition to this process, and to capture other potentially relevant foreseeable projects and developments, major projects as part of transport and other infrastructure programmes were added to the preliminary long list, using the sources outlined above. This included other EirGrid proposed developments that had not been submitted for planning but which might reasonably (if approved) give rise to cumulative impacts.

The planning application datasets were searched to identify and exclude very minor applications from the long list on the basis that, given their minor nature, these were not likely to have a cumulative effect noticeable over the effects of the Proposed Development in isolation. Examples of planning applications which were excluded from the preliminary long list were applications for one off houses and residential housing extensions. Granted and pending applications older than five years were also excluded from the preliminary long list on the basis that they would likely already have been built (and so would form part of the existing baseline) or are now unlikely to be progressed. Applications which have been refused or invalidated were discounted from the preliminary long list on the basis that they are unlikely to progress, unless through successful appeal.

The types of projects that were identified for consideration on the long list have been classed as follows:

- Local Planning Applications – those projects for which planning permission is applied for through local planning authorities themselves and were identified from local authority planning applications lists;
- Strategic Housing Developments or Large-scale Residential Developments – housing developments of a certain type and scale (e.g., 100 or more houses or student accommodation units) for which applications are lodged directly with An Bord Pleanála;
- Strategic Infrastructure Developments - major developments by local authorities and others for which applications are lodged directly with An Bord Pleanála;
- Uisce Éireann Projects – projects under the programmes of work listed on Uisce Éireann's website; and
- Other Major Projects – projects which were at a pre-application stage at the time of identification, but which are anticipated to be developed over the estimated programme for the delivery of the Proposed Development. These include projects from various sectors including energy, utilities and transport, as identified from the sources listed in this Section.

<u>Assignment of Tiers</u>

A 'tier' (1 or 2) was assigned to each of the other projects / developments to indicate the level of certainty associated with its implementation, as detailed in Plate 21.2. While the tiers provide an indication of the level of information available on which to base an assessment, the status of planning applications changes through time.

Appendix 21.1 provides an indication of the tier of each other development at the time of assessment.

Tier 1	Under construction	Decreasing level of detail likely to be available
	Permitted application(s) but not yet implemented	
	Submitted application(s) but not yet determined	
Tier 2	Identified in the relevant Development Plan and Strategies (and emerging Development Plans, with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited	
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.	

Plate 21.2: Tier 1 and Tier 2 Classification for Other Projects (adapted from The Planning Inspectorate 2019)

21.3.2.2 Stage 2: Establishing the Shortlist of Other Projects

The aim of Stage 2 was to narrow down the Stage 1 long list to include only those other projects / developments where there was potential for significant cumulative effects arising in combination with the Proposed Development. To do this, the following were considered:

- Whether the development has been completed, or the planning applications have been refused (where not identified at Stage 1), invalidated or expired (if so, they were not shortlisted). If a development was identified as completed, it has been considered as part of the baseline as appropriate;

- Whether there is a likelihood of temporal overlap (including overlap for construction periods) between the Proposed Development and the other project; and
- Whether the scale and nature of the other project is likely to significantly contribute to the effects of the Proposed Development, taking account of the aspects of the environment for which the ZoI is relevant.

In considering the scale and nature of the other projects/ developments, regard was had for the screening thresholds set out in Schedule 5 of S.I. No. 600/2001 - Planning and Development Regulations, 2001 (as amended). The use of EIA screening thresholds was only a guide however, and some projects / developments which are below thresholds yet relatively close in proximity to the Proposed Development, and still of a scale to be noticeable in the local context, were shortlisted. Ultimately, the judgement as to whether a project / development should be shortlisted depended on whether the scale, location and/or nature could be sufficient to generate impacts which would be noticeable against typical baseline trends in the same ZoI as the Proposed Development.

The shortlisting was informed by input from the environmental topic specialists involved in the preparation of this EIAR, which allowed for consideration as to whether a particular type of development could result in impacts to receptors of interest for the Proposed Development assessment.

The rationale for whether a project / development should be scoped out or not is recorded, where relevant, in Appendix 21.1 in Volume 3 of the EIAR, which provides a record of key decisions made when shortlisting developments for Stages 3 and 4 of the cumulative impact assessment. This includes a note of the reasons where a specialist has scoped out a development that falls within the ZoI for their topic. The shortlisted developments are indicated on Figure 21.1 in Volume 4 of the EIAR.

21.3.2.3 Stage 3: Information Gathering for the Shortlist of Other Projects

The cumulative impact assessment has relied primarily on the gathering of environmental information from a range of sources published as part of planning application submissions or planning documentation for the shortlisted developments. In addition, where environmental assessments have not yet been undertaken or published, then any published Strategic Environmental Assessments (SEA) have been relied on for additional supporting information, where available. Specific information has been obtained from the following sources:

- Planning application documentation and supporting environmental assessments obtained via the National Planning Application Database and the EIA Portal;
- Local authority websites and the development plans for Meath and Kildare; and
- Developer websites (where available), for example for Uisce Éireann and other utilities companies.

The information sought focused on:

- Proposed design and location of the development;
- Proposed programme of construction, operation and decommissioning (if relevant); and
- Environmental assessments, if available, that set out baseline data and effects arising from the development.

In some cases, there is limited information on the above available with which to inform the cumulative impact assessment (i.e., for many of the developments in a pre-application stage or where environmental impact assessment is not required). Some information was also gathered through consultations with developers and Kildare and Meath County Councils (refer to Chapter 3: Stakeholder Engagement). EirGrid and ESB will continue to consult with Kildare County Council and Meath County Council so that future projects can be implemented without impacts to and from the Proposed Development.

21.3.2.4 Stage 4: Assessment of Other Projects

The potential cumulative impacts of the Proposed Development with each of the other projects / developments were assessed to a level of detail commensurate with the information that was available at the time of assessment. Where information regarding other projects / developments was limited, these gaps were acknowledged within the assessment and the associated uncertainty in these cases is documented.

There are no prescriptive techniques used in the evaluation of the significance of cumulative impacts. Professional judgement and consideration of standards, guidelines and environmental carrying capacities have been applied to determine whether in-combination impacts have the potential to give rise to additional levels of significance. The EPA Guidelines (EPA 2022) significance criteria were applied.

The significance criteria used to assess likely cumulative impacts considered the capacity of environmental resources and receptors to accommodate changes that are likely to occur. These include:

- The duration of the impact (i.e. would it be temporary or permanent);
- The extent of impact (e.g. its geographical area);
- The type of impact (e.g. whether additive (i.e. the loss of two pieces of woodland of one hectare (ha), resulting in 2ha cumulative woodland loss)) or synergistic (i.e. two discharges combine to have an effect on a species not affected by discharges in isolation);
- The frequency of the impact;
- The 'value' and resilience of the receptor affected; and
- The likely success of mitigation.

The potential cumulative impacts of other projects / developments with the Proposed Development are assessed against the significance criteria outlined in Table 21.1. These effects are based on their combination with the potential impacts identified in the individual topic assessments. Mitigation measures are identified if required, and where relevant, residual effects assessed.

Table 21.1: Description of Effects from the EPA Guidelines (EPA 2022)

Assessment Criteria	
Quality of Effects	
It is important to inform the non-specialist reader whether an effect is positive, negative or neutral.	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.

Assessment Criteria	
	Negative / Adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem, or damaging health or property or by causing nuisance).
Significance of Effects	
'Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	**Imperceptible** An effect capable of measurement but without significant consequences
	Not Significant An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
	Significant Effects An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment
	Very Significant Effects An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment
	Profound Effects An effect which obliterates sensitive characteristics

Assessment Criteria	
Extent and Context of Effects	
Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites and the proportion of a population affected by an effect
	Context Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Probability of Effects	
Descriptions of effects should establish how likely it is that the predicted effects will occur so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented
Describing the Duration and Frequency of Effects	
'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	**Momentary Effects** Effects lasting from seconds to minutes
	Brief Effects Effects lasting less than a day
	Temporary Effects Effects lasting less than a year
	Short-term Effects Effects lasting one to seven years
	Medium-term Effects

Assessment Criteria	
	Effects lasting seven to fifteen years
	Long-term Effects Effects lasting fifteen to sixty years
	Permanent Effects Effects lasting over sixty years
	Reversible Effects Effects that can be undone, for example through remediation or Restoration
	Frequency of Effects Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)

21.3.3 Potential Cumulative Effects

The long list of developments considered are presented in Table 1 in Appendix 21.1 in Volume 3 of this EIAR. Table 2 in Appendix 21.1 presents the assessment of potential cumulative impacts for each of the 'other projects' carried forward for Stage 4 assessment and provides a breakdown of the assessment per environmental topic.

It should be noted that the environmental topic of 'climate' was screened out of the cumulative impact assessment, as the assessment of cumulative greenhouse gas (GHG) emissions cannot be carried out in a process analogous to other environmental topics because there is no causal link between the location of GHG emissions and the impacts arising from the cumulative aggregation of GHGs in the atmosphere. This limitation has also been recognised in the recent update to the Institute of Environmental Management and Assessment (IEMA) Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance. (IEMA 2022).

Of the initial long list of 57 'other projects / developments' considered to have the potential to overlap (either spatially or temporally) with the Proposed Development at Stage 1 / Stage 2, 21 were assessed for potential cumulative impacts with the Proposed Development at Stage 3 / Stage 4. A summary of each of the 21 other projects / developments that were carried forward for Stage 3 / Stage 4 assessment, and their temporal and spatial relationship to the Proposed Development, is included in Table 21.2 (please refer to Appendix 21.1 in Volume 3 of the EIAR for further detail).

Table 21.2: Summary of Other Projects / Developments Assessed at Stage 4

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
PCI0001 / ABP	EirGrid - CP0466 North South Interconnector	• Planning permitted; • Overlaps with the Planning Application Boundary for the Proposed Development at Woodland Substation; • Construction is due to commence in Q1 2025 and be completed by 2027. There is therefore the potential for construction phases to overlap; and • Operational Phases will coincide.
N/A / ABP	EirGrid - CP1021 East Meath – North Dublin Grid Upgrade	• Planning application in preparation. Due to be submitted to ABP in Q1 2024; • Overlaps with the Proposed Development at Woodland Substation and along the 'Woodland Corridor' between Woodland Substation and the R156 Regional Road; • Construction Phase of CP1021 is estimated to commence in Q3 2026 and be completed by Q4 2029. There is therefore the potential for construction phases to overlap; and • Operational Phases will coincide.
221550 / MCC	EirGrid -	• Planning permitted; • Overlaps with the Planning Application Boundary for the Proposed Development at Woodland Substation;

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
	CP1194 Woodland Station 400kV – Station Redevelopment	• Construction anticipated to commence in Q2 2025 and be complete by Q4 2028. There is therefore potential for construction phases to overlap; and • Operational Phases will coincide.
211175 / Kildare County Council	EirGrid - Dunstown Substation Extension	• Planning permitted; • Overlaps with the Planning Application Boundary for the Proposed Development at Dunstown Substation; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
314232	TII – Dart+ West	• Lodged for planning. No determination as of yet; • Approximately 1km to the east of the proposed cable Planning Application Boundary in the vicinity of Kilcock; • Originally proposed to commence construction in the second half of 2023 (subject to planning approval) but planning is yet to be granted. A 47 month construction programme indicated and there is therefore potential for construction phases to overlap; and • Operational Phases will coincide.

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
313276 and 22313276 / ABP and Kildare County Council	The Land Development Agency - Strategic Housing Development at John Devoy Road, Naas, County Kildare	• Planning permitted; • Approximately 274m to the east of the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
312817 / ABP	Rathasker Homes Limited - Residential development at Rathasker Road, Naas, County Kildare	• Planning permitted; • Approximately 9m to the south-west of the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
310841 and 21608 / ABP and Kildare County Council	Strategic Power Projects Limited - Battery energy storage system compound at Dunnstown, County Kildare.	• Planning permitted; • Approximately 9m to the east of the Planning Application Boundary at Dunstown Substation; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
19784 / Kildare County Council	Electricity Supply Board - Alterations to the existing J125 - Blessington 38kV line at Bluebell, Kilcullen Road, Naas	• Planning permitted; • Approximately 21m to the west of the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
191288/ Kildare County Council	White Tide Developments Ltd - Mixed use development at Church Street, Kilcock, County Kildare	• Planning permitted; • Approximately 775m to the east of the proposed cable Planning Application Boundary in the vicinity of Kilcock; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
191296/ Kildare County Council	Alexander Georgakis – Residential development at Church Street and Bridge Street, Kilcock, County Kildare	• Planning permitted; • Approximately 882m to the east of the proposed cable Planning Application Boundary in the vicinity of Kilcock; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
21547/ Kildare County Council	Quattuor Developments Limited – Residential development at Limerick Road, Naas, County Kildare	• Planning permitted; • Approximately 749m to the east of the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
221016 / Kildare County Council	Island Stability Services Ltd. - Synchronous condenser grid support facility at Dunstown Substation	• Planning permitted; • Overlaps with the Planning Application Boundary for the Proposed Development at Dunstown Substation; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
22221502 and 23942 / Kildare County Council	Westar Homes Limited – Large-Scale Residential Development at 'Finlay Park', Naas, County Kildare	• Planning permitted; • Approximately 493m to the east of the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
23567 / Kildare County Council	Delamain Solar Farm Ltd. - Solar farm in County Kildare	• Planning permitted; • Approximately 376m to the south of the Planning Application Boundary for the Proposed Development at Dunstown Substation; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
21365 / Kildare County Council	Ken Fennell – Residential development at Oughteranny Village, Kilcock, County Kildare	• Planning permitted; • Approximately 900m to the east of the proposed cable Planning Application Boundary in the vicinity of Kilcock; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
20840 and 310016 / Kildare County Council and ABP	Boran Plastic Packaging Ltd. – Industrial development at Millennium Parkway, Boran Plastic Packaging Ltd., Naas, County Kildare	• Planning permitted; • Overlaps with the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
18303023 / Kildare County Council	Ardstone Homes Ltd. – Strategic Housing Development at Kilcullen Road, Naas, County Kildare.	• Planning permitted; • Approximately 169m to the west of the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and • Operational Phases will coincide.
22837 and 23136 / Meath County Council	GDA Energy 4 Ltd – Battery energy storage facility and synchronous condenser at Woodland, County Meath	• Planning permitted; • Approximately 297m to the north-west of the Woodland Substation Planning Application Boundary; • Construction timeline for other development unknown but estimated to take 10 years to complete. There is therefore the potential for construction phases to overlap; and • Operational Phases will coincide.
N/A	Microsoft – Jigginstown Data Centre at Jigginstown, Naas, County Kildare	• Concept design stage. Land zoned for data centre development by Kildare County Council in the Naas Local Area Plan 2021-2027; • Approximately 380m to the west of the proposed cable Planning Application Boundary in the vicinity of Naas; • Construction timeline currently unknown resulting in potential for construction phases to overlap; and

Planning Application Reference / Planning Body	Other Development Applicant / Name	Potential for Spatial or Temporal Overlap with the Proposed Development
		• Operational Phases will coincide.
N/A / ABP	Uisce Éireann – Water Supply Project	• Pre-planning stage. Planning application is due to be lodged in 2024 / 2025; • The Water Supply Project will cross under the proposed cable route in the vicinity of Joint Bay 30; • Construction of the Water Supply Project is currently scheduled to commence in mid-2026 and will take approximately 4.5 years to construct. There is therefore potential for construction phases to overlap; and • Operational Phases will coincide.

Each environmental topic was considered for potential cumulative impacts with the Proposed Development, in the absence of any mitigation for the Proposed Development. There is limited potential for cumulative impacts during the operational phase, on the basis that fewer impacts are anticipated during this phase for the Proposed Development.

Potential cumulative impacts that could arise in the absence of any mitigation for the Proposed Development are summarised in Table 21.3 (please refer to Appendix 21.1 in Volume 3 of the EIAR for further detail).

Table 21.3: Summary of Potential Cumulative Impacts

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
Population	211175 - EirGrid Dunnstown Substation Extension project, 221016 - Island Stability Services project	Neutral, Not Significant and Temporary population impact, if construction phases were to overlap.	Construction Phase
	PCI0001 – CP0466 North South Interconnector EirGrid project, 314232 – Dart+ West project, 313276 / 22313276 – Land Agency project, 310841 – Strategic Power Projects Limited project, 19784 – Electricity Supply Board J125 Line project, 191288 – White Tide project, 191296 – Alexander Georgakis project, 21547 – Quattuor Developments project, 22221502 / 23942 – Westar Homes project, 23567 – Delamain Solar Farm project, 21365 – Ken Fennell project, 20840 / 310016 – Boran Plastic project, 18303023 – Ardstone Homes project, 23136 – GDA Energy project, and Microsoft Jigginstown Data Centre project	Neutral, Imperceptible and Temporary population impact, if construction phases were to overlap.	Construction Phase
	312817 – Rathasker Home project	Negative, Imperceptible and Temporary population impact, if construction phases were to overlap.	Construction Phase
	Water Supply Project	Negative, Not Significant and Temporary population impact, if construction phases were to overlap.	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
Human Health	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project, 312817 - Rathasker Homes project	Negative, Imperceptible and Temporary cumulative impact on public health (transport modes, access and connections), if construction phases were to overlap.	Construction Phase
	211175 - EirGrid Dunnstown Substation Extension project, and the Water Supply Project	Negative, Not Significant and Temporary health impact, if construction phases were to overlap.	Construction Phase
	211175 - EirGrid Dunnstown Substation Extension project, 221016 - Island Stability Services project	Neutral, Not Significant and Long-Term health impact, due to operation of both developments at Dunstown substation.	Operational Phase
	314232 – Dart+ West project, 313276 / 22313276 – Land Agency project, 310841 – Strategic Power Projects Limited project, 19784 – Electricity Supply Board J125 Line project, 191288 – White Tide project, 191296 – Alexander Georgakis project, 21547 – Quattuor Developments project, 22221502 / 23942 – Westar Homes project, 23567 – Delamain Solar Farm project, 21365 – Ken Fennell project, 20840 / 310016 – Boran Plastic project, 18303023 – Ardstone Homes project, 22837 / 23136 – GDA Energy project, and the Microsoft Jigginstown Data Centre project	Neutral, Imperceptible and Temporary health impact, if construction phases were to overlap.	Construction Phase
	221016 - Island Stability Services project	Neutral, Not Significant and Temporary health impact, if construction phases were to overlap.	

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
Air Quality	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project, 221550 – CP1194 Woodland Substation Redevelopment Project, 211175 – EirGrid Dunnstown Substation Extension project, 312817 – Rathasker Homes project, 310841 – Strategic Power Projects Limited project, 19784 – Electricity Supply Board J125 Line project, 221016 – Island Stability Services Ltd. project, 20840 / 310016 – Boran Plastic Packaging project, 18303023 – Ardstone Homes project, Microsoft Jigginstown Data Centre project, and the Water Supply Project	Negative, Not Significant and Short-Term dust impact, if construction phases were to overlap.	Construction Phase
Noise and Vibration	CP1021 East Meath – North Dublin EirGrid project and 221550 – CP1194 Woodland Substation Redevelopment Project	Negative, Not Significant and Short-Term noise and vibration impact, if construction phases were to overlap.	Construction Phase
	20840 / 310016 – Boran Plastic Packaging Ltd. project	Neutral, Not Significant and Short-Term noise and vibration impact, if construction phases were to overlap.	Construction Phase
Biodiversity	PCI0001 – CP0466 North South Interconnector EirGrid project	Negative, Significant, and Short-Term impact on calcareous grassland due to the construction of both projects.	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	PCI0001 – CP0466 North South Interconnector EirGrid project	Negative, Moderate, and Short-Term impact on calcareous grassland due to the operational maintenance requirements for both projects.	Operational Phase
	CP1021 East Meath – North Dublin EirGrid project	Negative, Significant and Short-Term impact on Dunboyne_010, if construction phases were to overlap, due to the requirement of both projects to cross this water body.	Construction Phase
	CP1021 East Meath – North Dublin EirGrid project	Negative, Significant and Long-Term impact due to the loss of treelines / grassland between the entirety of both projects.	Construction Phase
	CP1021 East Meath – North Dublin EirGrid project	Negative, Significant and Long-Term impact on bats due to the loss of nesting and foraging habitat due to the removal of treelines / grassland between the entirety of both projects.	Construction Phase
	CP1021 East Meath – North Dublin EirGrid project	Negative, Significant and Medium-Term impact on breeding birds due to impacts to trees and hedgerows during the construction phases at a local level for construction phases.	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	211175 - EirGrid Dunnstown Substation Extension project, 310841 – Strategic Power Projects Limited project,	Negative, Not Significant and Short-Term on water quality and ecological features within the water body in the Liffey_SC_050 WFD sub-catchment, due to the potential for increases in sediment laden runoff, removal of bed material and changes to the bed and bank as a result of open cut trenching.	Construction Phase
	314232 – Dart+ West project	Negative, Significant and Short-Term cumulative impact on of Rye Water Valley/Carton Special Area of Conservation (SAC) due to the potential for accidental pollution from both projects.	Construction Phase
	191288 – White Tide project, 191296 - Alexander Georgakis	Negative, Significant and Long-Term cumulative impact on biodiversity from water pollution and from the removal of semi-natural vegetation on local bird and bat populations, due to both construction phases.	Construction Phase
	191288 – White Tide project,	Negative, Significant and Long-Term cumulative impact from the loss of the semi-natural vegetation until the replacement planting of both projects has matured.	Operational Phase
	191296 - Alexander Georgakis	Negative, Moderate and Long-Term cumulative impact from the loss of the semi-natural vegetation until the replacement planting of both projects has matured.	Operational Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	21547 - Quattuor Developments project	Negative, Significant and Medium-Term cumulative impact from water pollution and from the removal of semi-natural vegetation on local bird and bat populations, due to both construction phases.	Construction Phase
	22221502 / 23942 - Westar Homes project	Negative, Significant and Long-Term cumulative impact upon the Grand Canal pNHA from the potential for water pollution from both projects.	Construction Phase
	Jigginstown Data Centre project	Negative, Significant and Medium-Term cumulative impact upon the Grand Canal pNHA from the potential for water pollution from both projects.	Construction Phase
	Water Supply Project	Negative, Significant and Medium-Term cumulative impact from the potential for cumulative effects on water quality between both projects for water bodies which are hydrologically connected to Rye Water Valley/Carton SAC.	Construction Phase
Hydrogeology	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project, 211175 - EirGrid Dunnstown Substation Extension project, 312817 - Rathasker Homes project, 19784 – Electricity Supply Board J125 Line project, 221016 – Island Stability Services Ltd. project, 20840 / 310016 -	Negative, Slight and Short-Term cumulative impacts on groundwater quality, if construction phases were to overlap.	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	Boran Plastic Packaging project, Microsoft Jigginstown Data Centre project, Water Supply Project.		
	CP1021 East Meath – North Dublin EirGrid project	Negative, Negligible and Short-Term impact to the underlying aquifers, if construction phases were to overlap. Negative, Moderate and Short-Term impact on the hydrology of one groundwater dependent terrestrial ecosystem (GWDTEw2), if construction phases were to overlap.	Construction Phase
Hydrology	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project	Negative, Significant and Short-Term impact on the Dunboyne_10 water body from the potential for an increase in sediment laden runoff, removal of bed material and changes to the bed and bank as a result of open cut trenching, as both developments will cross this watercourse if construction phases were to overlap.	Construction Phase
	211175 - EirGrid Dunnstown Substation Extension project, 310841 - Strategic Power Projects Limited project, 221016 - Island Stability Services Ltd. project,	Negative, Significant and Short-Term impact on the unnamed watercourse within the Liffey_SC_050 WFD sub-catchment, from the potential for an increase in sediment laden runoff, removal of bed material and changes to the bed and bank as a result of open cut trenching, as both developments will cross this watercourse if construction phases were to overlap.	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	314232 – Dart+ West project, 191288 – White Tide project, 191296 – Alexander Georgakis project,	Negative, Slight and Short-Term cumulative impacts on hydrology for the Royal Canal, if construction phases were to overlap.	Construction Phase
	21547 – Quattuor Developments project, 22221502 / 23942 – Westar Homes project, Microsoft Jigginstown Data Centre project, and the Water Supply Project.	Negative, Slight and Short-Term cumulative impacts on hydrology for the Grand Canal, if construction phases were to overlap.	Construction Phase
	22837 / 23136 - GDA Energy 4 Ltd project	Negative, Significant and Short-Term impact on the Tolka_020 watercourse from the potential for an increase in sediment laden runoff from both developments, if construction phases were to overlap, as both are in close proximity to this water body.	Construction Phase
Archaeology, Architectural Heritage and Cultural Heritage	211175 - EirGrid Dunnstown Substation Extension project	Negative, Moderate and Permanent impact on AY_58 (Enclosure) as a result of the interaction between this project and the Proposed Development, as both will be located within the Zone of Notification of this Recorded Monument.	Construction Phase
Traffic and Transport	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project, 221550 – CP1194 Woodland Substation Redevelopment Project, 211175 - EirGrid Dunnstown Substation Extension project, 314232 – Dart+West project, 313276 /	Negative, Not Significant and Short-Term impact on traffic if construction phases were to overlap due to cumulative construction traffic on the following roads for the following other projects:	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	22313276 - The Land Development Agency project, 312817 - Rathasker Homes project, 310841 - Strategic Power Projects Limited project, 19784 – Electricity Supply Board J125 Line project, 191288 – White Tide Developments project, 191296 – Alexander Georgakis project, 21547 - Quattuor Developments Limited project, 221016 – Island Stability Services Ltd. project, 22221502 / 23942 - Westar Homes Limited project, 23567 - Delamain Solar Farm Ltd. project, 21365 – Ken Fennell project, 20840 / 310016 - Boran Plastic Packaging Ltd. project, 18303023 - Ardstone Homes Ltd. project, 22837 / 23136 - GDA Energy 4 Ltd. project, Microsoft Jigginstown Data Centre project, and The Water Supply Project.	• R125, R154, R156 and R158 Regional Roads (CP0466 North South Interconnector, 221550 – CP1194 Woodland Substation Redevelopment Project and GDA Energy 4 project); • R125, R147, R154, R156, R157 Regional Roads and The Red Road (CP1021 East Meath – North Dublin EirGrid project); • R412 and R448 Regional Roads (EirGrid Dunnstown Substation Extension, Strategic Power project, Island Stability project, Delamain Solar Farm project and Water Supply Project); • R148 Regional Road (Dart+ West); • R445, R447 and R448 Regional Roads (Land Agency project and Rathasker Homes project); • R407 and R148 Regional Roads (White Tide project, Alexander Georgakis project and the Ken Fennell project); • R447 and R448 Regional Roads (Electricity Supply Board J125 Line project and Ardstone Homes project);	

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
		• R409, R445, R447 and R448 Regional Roads (Quattuor Developments project and Westar Homes project); and • R409, R445 and R447 Regional Roads (Boran Plastic project and Jigginstown Data Centre project).	
Agronomy and Equine	CP1021 East Meath – North Dublin EirGrid project	There is the potential for cumulative impacts on the following land parcels, within the overlapping Woodland Corridor between the two developments: • Land parcel Ref No 1269 – Negative, Not Significant and Long-Term; • Land parcel Ref No 1271 – Negative, Not Significant and Long-Term; • Land parcel Ref No 1261 – Negative, Slight and Long-Term; and • Land parcel Ref No 1200 – Negative, Slight and Long-Term.	Construction and Operational Phase
	211175 - EirGrid Dunnstown Substation Extension project	Neutral, Not Significant and Long-Term impact on agricultural land due to the development of both the	Construction and

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
		Proposed Development and the other project on ESB-owned land.	Operational Phase
	312817 - Rathasker Homes project	Adverse, Significant and Long-Term cumulative impact due to the required land take from both the Proposed Development and the other project on land parcel 994.	Construction and Operational Phase
	Water Supply Project	Adverse, Slight Adverse and Short-Term cumulative impact on land parcel 801, if construction phases were to overlap, due to the requirement for open cut trenching for laying of cable and water pipeline on this land parcel.	Construction Phase
Material Assets	PCI0001 – CP0466 North South Interconnector EirGrid project	Negative, Moderate, and Short-Term cumulative impact due to interactions with utilities in the same general area during the construction phase.	Construction Phase
	PCI0001 – CP0466 North South Interconnector EirGrid project	Neutral, Imperceptible and Long-Term cumulative impact on material assets during the operational phases.	Operational Phase
	CP1021 East Meath – North Dublin EirGrid project	Neutral, Imperceptible and Temporary cumulative impact as there is limited potential for an overlap in interfaces with existing utilities requiring diversions during the construction phases of the Proposed Development and each of the other developments.	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	CP1021 East Meath – North Dublin EirGrid project and 221550 – CP1194 Woodland Substation Redevelopment Project	Positive, Significant and Long-Term cumulative impact on the regional electricity network when each other development and the Proposed Development are operational.	Operational Phase
	314232 – Dart+West project, 313276 / 22313276 - The Land Development Agency project, 312817 - Rathasker Homes project, 310841 - Strategic Power Projects Limited project, 19784 – Electricity Supply Board J125 Line project, 191288 – White Tide project, 191296 – Alexander Georgakis project, 21547 – Quattuor Developments project.22221502 / 23942 – Westar Homes project, 23567 - Delamain Solar Farm project, 21365 – Ken Fennell project, 20840 / 310016 - Boran Plastic Packaging Ltd. project, 18303023 - Ardstone Homes Ltd. project, 22837 / 23136 - GDA Energy 4 Ltd. project, Microsoft Jigginstown Data Centre project, and the Water Supply Project	Neutral, Imperceptible and Temporary cumulative impact on material assets, if construction phases were to overlap.	Construction Phase
	221016 - Island Stability Services project	Neutral, Not Significant and Temporary cumulative impact on material assets, if construction phases were to overlap.	Construction Phase
Landscape and Visual	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project	Negative (Adverse), Slight and Short-Term visual impact within the Woodland Corridor, and a Negative, Moderate-Slight and Short-Term landscape impact on the Tara	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	and 221550 – CP1194 Woodland Substation Redevelopment Project	Skryne Hills landscape character area, if construction phases were to overlap.	
	211175 - EirGrid Dunstown Substation Extension project, 221016 – Island Stability Services Ltd. project, and 22837 - GDA Energy 4 Ltd. Project	Negative (Adverse), Slight-Imperceptible and Short-Term landscape and visual impacts, if construction phases were to overlap.	Construction Phase
	313276 / 22313276 – The Land Development Agency project, 312817- Rathasker Homes Limited project, 310841 - Strategic Power Projects Limited project, 19784 – ESB J125 - Blessington 38kV line at Bluebell project, 22221502 - Westar Homes Limited project, 23567 - Delamain Solar Farm Ltd. project, 20840 – Boran Plastic Packaging Ltd. project, 18303023 – Ardstone Homes Ltd. project, Jigginstown Data Centre project, and the Water Supply Project.	Negative (Adverse), Slight-Imperceptible and Temporary landscape and visual impacts, if construction phases were to overlap.	Construction Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	CP1021 East Meath – North Dublin EirGrid project.	Negative (Adverse), Slight and Permanent visual impact during the operational phases, and a Negative (Adverse), Imperceptible and Permanent landscape impact on the Tara Skryne Hills landscape character area during the operational phases, due to the presence of both projects in the landscape.	Operational Phase
	211175 - EirGrid Dunstown Substation Extension project, 221016 – Island Stability Services Ltd. project.	Negative (Adverse), Imperceptible and Permanent landscape and visual impacts during the operational phases due to the presence of both projects in the landscape.	Operational Phase
	313276 / 22313276 - The Land Development Agency project, 312817- Rathasker Homes Limited project, 310841 - Strategic Power Limited project, 19784 – ESB J125 – Blessington 38kV line at Bluebell project, 22221502 - Westar Homes Limited project, 20840 – Boran Plastic Packaging Ltd. project, 18303023 - Ardstone Homes Ltd. project, 22837 – GDA Energy 4 Ltd. project, Jigginstown Data Centre project, and the Water Supply Project.	Neutral, Imperceptible and Permanent landscape and visual impacts during the operational phases due to the presence of both projects in the landscape.	Operational Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
Waste	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project, 221550 – CP1194 Woodland Substation Redevelopment Project, 211175 - EirGrid Dunstown Substation Extension project, 314232 – Dart+West project, 313276 / 22313276 - The Land Development Agency project, 312817 - Rathasker Homes project, 310841 - Strategic Power Projects Limited project, 19784 – Electricity Supply Board J125 Line project, 221016 – Island Stability Services Ltd. project, and the Water Supply Project.	Negative, Significant and Short-Term cumulative impact on the annual capacity of waste management facilities within the region during any overlapping construction phase years.	Construction Phase
	191288 – White Tide projects, 191296 – Alexander Georgakis project, 21547 – Quattuor Developments project, 22221502 / 23942 – Westar Homes project, 23567 - Delamain Solar Farm project, 21365 – Ken Fennell project, 20840 / 310016 - Boran Plastic Packaging Ltd. project, 18303023 – Ardstone Homes project, 22837 / 23136 - GDA Energy 4 Ltd. project, and the Microsoft Jigginstown Data Centre project	Neutral, Imperceptible and Temporary waste cumulative impact during overlapping construction phases.	Construction Phase
	PCI0001 – CP0466 North South Interconnector EirGrid project, CP1021 East Meath – North Dublin EirGrid project, 221550 – CP1194 Woodland Substation Redevelopment Project, 211175 - EirGrid Dunnstown Substation Extension project, 314232 – Dart+West project, 313276 / 22313276 - The Land Development Agency project,	Neutral, Imperceptible and Long-Term waste cumulative impact during operational phases.	Operational Phase

Environmental Topic	Other Project(s)	Description of Potential Cumulative Impact (Pre-Mitigation)	Phase
	312817 - Rathasker Homes project, 310841 - Strategic Power Projects Limited project, 19784 – Electricity Supply Board J125 Line project, 221016 – Island Stability Services Ltd. project, and the Water Supply Project.		

21.4 Mitigation Measures

The results of the assessment presented in Table 2 in Appendix 21.1 in Volume 3 of this EIAR indicate that for the majority of environmental topics, no additional mitigation measures other than those provided in this EIAR (as summarised in Chapter 22 (Summary of Mitigation Measures)), and in the Construction Environmental Management Plan (CEMP) (included as Appendix 5.4 in Volume 3 of the EIAR), are required to mitigate the identified cumulative impacts.

However, the following additional mitigation measures will be implemented in the event that construction phases for the Proposed Development and the CP1021 East Meath – North Dublin Grid Upgrade occur at the same time, due to the spatial overlap between the two developments in the 'Woodland Corridor', (refer to Figure 21.2 in Volume 3 of this EIAR), which extends from Woodland Substation southwards to the R156 Regional Road:

- Air Quality: Liaison meetings with the CP1021 construction management team / appointed contractor will be held to ensure plans in the Woodland Corridor are coordinated, in order to reduce cumulative dust and particulate matter emissions. As part of this liaison process, the appointed contractors will be required to determine the interactions of the offsite transport / deliveries which might be using the same strategic road network routes;

- Hydrology: Given the proximity of the two development crossings of the Dunboyne Stream_010 water body, coordination of the construction programmes for the two developments will be required between the respective appointed contractors to ensure that, where possible, works to cross the water body are undertaken at the same time, and as such, minimising disruption;

- Traffic: Coordination of the construction programmes for the two developments will be required to ensure that there are no conflicting road closures from either development at the same time;

- Traffic: Cumulative construction traffic will also be timed to avoid peaks in construction programmes, where possible; and

- Material Assets: Coordination / consultation between the appointed contractors for the two developments will be required in the event that there are overlapping works within the Woodland Corridor area. Any future utility work identified as being required during the construction phase will be undertaken in consultation with the relevant utility companies.

21.5 Residual Cumulative Effects

With the implementation of the mitigation measures included in this EIAR and the CEMP, in addition to the additional mitigation measures outlined in Section 21.4, there will be no negative significant residual cumulative impacts for the potential cumulative impacts identified in Section 21.3.3 (please refer to Appendix 21.1 in Volume 3 of the EIAR which sets out the full details for the basis for these conclusions).

Table 21.4 outlines the significant residual impacts (Significant rating or higher) that have been identified.

Table 21.4: Summary of Predicted Significant Residual Cumulative Impacts

Environmental Topic	Other Project	Pre-Mitigation Cumulative Impact	Post-Mitigation Cumulative Impact
Material Assets	CP1021 – East Meath – North Dublin Grid Upgrade and 221550 - **EirGrid** CP1194 Woodland Substation Redevelopment Project	Positive, Significant and Long-Term impact on the regional electricity network once both the Proposed Development and each of these other two projects are operational.	Positive, Significant and Long-Term impact on the regional electricity network once both the Proposed Development and each of these other two projects are operational.

21.6 Environmental Interactions

The interaction of impacts arises from the combined action of a number of different environmental topic-specific impacts upon a single receptor / resource. For example, the removal of trees can have landscape, visual and ecological impacts, or an individual residential receptor can be affected by noise and visual impacts. Cumulative impacts can also arise from different types of impact within a single topic on a receptor, such as the cumulative visual impact of vegetation removal and erection of an electricity tower on a single receptor.

The technical assessments in this EIAR (Chapter 7 to Chapter 20) contain assessments of the likely significant impacts arising from the Proposed Development singularly. During the assessment process, coordination took place between assessment specialists to ensure that interacting impacts arising from the Proposed Development singularly were identified, assessed and, where appropriate, mitigated. These impacts are reported in the individual chapters and are not repeated here. Table 21.5 sets out a matrix to indicate where interactions between different impacts on different environmental factors have been addressed. This is in line with the approach set out in the EPA Guidelines (EPA 2022).

Table 21.5: Environmental Interactions Matrix

Environmental Topic	Population and Human Health	Air Quality	Noise and Vibration	Biodiversity	Soils, Geology, and Hydrogeology	Hydrology	Archaeology, Architectural and Cultural Heritage	Traffic and Transport	Agronomy and Equine	Material Assets	Landscape and Visual	Risk of Major Accidents and / or Disasters	Waste	Climate
Population and Human Health														
Air Quality	X													
Noise and Vibration	X													
Biodiversity		X	X											
Soils, Geology, and Hydrogeology	X			X										
Hydrology	X			X	X									
Archaeology, Architectural and Cultural Heritage					X	X								
Traffic and Transport	X	X	X											
Agronomy and Equine	X	X	X		X	X								
Material Assets	X							X						
Landscape and Visual	X			X			X							
Risk of Major Accidents and / or Disasters	X			X	X	X		X		X				
Waste					X			X						
Climate	X			X					X			X		

Note: This matrix should be read down, starting with each topic identified across the top.

X = significant interaction between. Blank cells indicate no or weak interaction.

Key interactive effects are:

- Biodiversity and Hydrology – interactive impacts could potentially occur to the surface water environment. They could include potential impacts on aquatic species, requiring mitigation measures;

- Biodiversity and Landscape and Visual – interactive impacts could potentially occur as a result of loss of habitats (hedgerows, trees, grassland, etc.);
- Archaeology, Architectural Heritage, and Cultural Heritage and Landscape and Visual – interactive impacts could potentially occur in relation to the landscape character and setting of cultural heritage assets;
- Archaeology, Architectural Heritage, and Cultural Heritage and Soils, Geology and Hydrogeology – interactive impacts arising from dewatering could potentially impact on cultural heritage sites, such as historical wells; and,
- Material Assets, Agronomy and Equine, Air Quality, Noise and Vibration, Traffic and Transport, and Population and Human Health –interactions in the human environment are typically complex as there is the potential for receptors to be impacted in a number of ways.

The likely significance of these combined and interrelated impacts has been assessed, and mitigated where required, within the individual assessment chapters. For instance the Landscape and Visual chapter includes an assessment of the relevant interactive ecological impacts. The converse is found in the Biodiversity chapter.

21.7 References

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DHPLG (2024). EIA Portal. [Online] Available at https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal. Accessed February 2024.

EPA (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports

European Commission (1999). Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions

European Commission (2017). Guidance on the Preparation of the Environmental Impact Assessment Report

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(The Planning Inspectorate 2019). Advice Note 17: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects

TII (2024). Projects & Improvements. [Online] Available at https://www.tii.ie/public-transport/projects-and-improvements/. Accessed February 2024.

Uisce Éireann (2024). Our Projects. [Online] Available at https://www.water.ie/projects/. Accessed February 2024.

Directives and Legislation

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

Number 30 of 2000 - Planning and Development Act 2000 (as amended)

Number 30 of 2010 – Planning and Development (Amendment) Act 2010

S.I. No. 600/2001 - Planning and Development Regulations, 2001 (as amended)

22. Summary of Mitigation Measures

The following mitigation measures will be implemented as part of the Proposed Development. These measures have been set out in the preceding chapters of the EIAR. No other mitigation measures are assessed as being required during the construction or operational phases.

22.1 Trees, Hedgerows, and Treelines

Within the Planning Application Boundary, where hedgerows and treelines have not been identified for removal (see Figure 5.3), a 10m protection area either side of hedgerows or treelines will be established to protect the habitat. This protection area will be outside of the permanent easement area, but set out perpendicular to it, and will be only within the Planning Application Boundary. This protected area will exclude any storage of soil, temporary access tracks, movement of construction vehicles, and any other construction works. The protected area will be highlighted with a temporary orange mesh barrier fencing, which will be set up to mark the edges of protection area within the Planning Application Boundary area. The protection area will be highlighted in relevant toolbox talks to construction staff and will be monitored by the Environmental/Ecological Clerk of Works.

Where trees are felled, this will be done outside of the bird nesting season and will be inspected for bat roosts prior to felling where identified in Chapter 10 (Biodiversity) of the EIAR. Although no bat roosts were known to be present, to avoid the risk of killing and injuring bats during construction, all trees to be removed will be subject to pre-construction surveys. Any roosts recorded will be felled under a derogation licence. The provision of an alternative roost (bat box) will be confirmed in consultation with NPWS. It will be located in a suitable, undisturbed location, away from the construction works, either within the Planning Application Boundary where works have been carried out or on third-party lands, and with the agreement of landowners.

The felled trees will be removed off-site and taken to a suitable licensed facility as identified in Chapter 19 (Waste) of the EIAR, unless agreement can be reached with the landowner for their own personal use of the wood.

Hedgerows will be replanted with species-rich varieties and with suitable fit for purpose fencing in-line with Teagasc and DAFM guidelines[161]. All planting will be native (only), reflecting the vegetation that has been removed and typical species of the Kildare/Meath landscape (with the except of ash and non-native species).

A pre-construction confirmatory baseline survey of all hedges to be removed will be carried out to characterise its canopy, understorey and field layer species, and associated features (ditches, earth banks, walls etc.) to inform reinstatement.

Unless otherwise agreed with the Developer (ESBN) and the local authority, the Contractor will reinstate hedgerows and treelines to a species-rich condition (i.e., five woody species per 30 m), comprising only native species. All other sites will be returned as close as possible to their pre-existing condition, using the same woody species removed, under the supervision and direction of the Contractor's ECoW.

Hedging/hedgerow plants will be planted as a staggered double row, six plants per metre with 330 mm between rows. Suitable individual protection from browsing animals will be provided by tube, spiral or similar held in place with a short cane. Group protection of new planting may be provided by suitable fencing, but individual plant protection of spirals will be provided to protect against browsing animals. Mulch mats or similar weed suppression materials (restricted to a biodegradable specification) will be used to promote successful establishment.

[161] https://www.teagasc.ie/media/website/crops/forestry/advice/stockproofhedge.establishment.factsheet_2.pdf

The appointed Contractor will make orders by the scientific name to ensure native plants are delivered and not a cultivated variety. Nurseries prefer to grow trees to order, so the Contractor will make the order as soon as possible (up to a year in advance) to ensure the required species and stock specification can be secured.

Consideration will be given to the procurement of planting so that there are suitable lead-in times to ensure that plants are of the right age/height required for when they are planted. The Contractor will manage the establishment phase of planting (1–2 years) in accordance with online Teagasc guidance (Teagasc, 2020), to include watering in, weed suppression (using biodegradable mulches), and (where required) protection from browsing animals. Thereafter, the Developer (ESBN) will manage plantings from years 3-5 in agreement with the landowner.

In areas where excavation is required within the root protection zone of retained trees, the use of vacuum excavation will be considered. The feasibility of use and specific methodology will be advised by the project arboriculturist as appropriate. Where high pressure water is used to break up the soil prior to extraction, care shall be taken to avoid high pressure water damage to significant roots as they are exposed. Any machinery used to carry out the process of excavation will be sited outside of the root protection area, or be located on suitable loadbearing temporary ground protection specified to avoid excessive ground compaction. Works will be carried out under appropriate supervision.

When roots between 10-25 mm in diameter may be encountered, these will be retained undamaged wherever possible, and protected from desiccation/frost by damp hessian sacking or a similar protective material until the excavation is back filled. Roots below 10mm in diameter are proposed to be trimmed back neatly in line with the edge of the excavation trench using secateurs. Once construction work commences on the Proposed Development specific methodologies that may be required around trees will be implemented to protect retained trees. This information will be contained within an Arboricultural Method Statement (AMS) which will be compiled by a qualified arboriculturalist.

As noted above, EirGrid has identified precedence from Germany and the Netherlands; for safely planting certain shrubs over High Voltage underground cables. EirGrid has engaged closely with ESBN, and relevant Dutch and German Transmission System Operators across Europe, to understand feasibility of planting over HV underground cables in Ireland. A draft Over Cable Planting Strategy is in advance development in consultation with ESBN, for which the Design Risk Assessment was ongoing at time of writing (including calculations to assess a possible cable de-rating). The draft strategy combines the requirement for a minimum cable burial depth of 1m (to top of Cement Bound Granular Mixture in the cable trench), use of a high performing Root Barrier Membrane, and a strictly defined shrub species list with known maximum root depths less than 1m. It is possible the DRA may conclude that over cable planting cannot be delivered while guaranteeing cable performance and security. There are also risks that the strictly defined shrub species list is not compatible with landowner farm boundary requirements and/or agricultural farm payments. As such, applying a precautionary principle, the possibility of over cable planting in accordance with the draft Over Cable Planting Strategy has not been factored into the assessment, and instead in this assessment offsite compensatory planting is assumed for all permanent losses within the easement.

Subject to consent, the compensatory planting will commence in advance of, or in parallel with, the construction phase. EirGrid has identified candidate sites in Co. Meath and Dublin in consultation with a charity partner, who provides compensatory planting options on third-party lands. Whether these candidate sites or other sites are used for compensatory planting, there will be no planting in semi-natural habitats of significant ecological value, which will be verified by the Ecologist employed the compensation supplier. All planting will comply with planning requirements. The off-site compensatory planting will be entirely outside the Planning Application Boundary. A minimum of 130% compensatory off-site planting will be delivered by the Developer (ESBN), in consultation with EirGrid. The surplus will deliver an overall biodiversity net gain.

To ensure that the proposed mitigation measures remain effective, particularly in regard to reinstatement and compensation, the Contractor and ESBN will collectively deliver a five-year monitoring landscape aftercare regime.

22.2 Population and Human Health

22.2.1 Construction Phase

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable.

A CEMP is included in Appendix 5.4 of the EIAR. The CEMP will be updated by the appointed contractor(s) in consultation with Kildare County Council and Meath County Council to incorporate any mitigation measures that might be attached as conditions to the planning permissions for the Proposed Development, if granted. The CEMP will be a key contract document and the appointed contractor will be contractually obliged to implement it in full during the construction phase to safeguard the environment, site personnel, and nearby sensitive receptors, i.e. occupiers of residential and commercial properties, from site activities which may cause harm or nuisance. The appointed contractor(s) will liaise closely with local community representatives, landowners and statutory consultees throughout the construction period. This is likely to include circulating information about ongoing activities, particularly those that could cause disturbance, including due to traffic. The appointed contractor(s) will also implement the Traffic Management Plan included as Appendix 5.1 of the EIAR, which will be updated following detailed design (in accordance with the CEMP in Appendix 5.4 of the EIAR) and consultation with Kildare County Council and Meath County Council to mitigate construction traffic on the public road network. All construction activities, including construction traffic, will be managed through the CEMP.

To mitigate potential traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 for further details) between Chainage 7395 and 14750 will be subject to traffic management measures set out in Section 22.9 below to ensure access for visitors and tourists is maintained to the Larchill Arcadian Gardens. Phases 1 and 3 of the construction sequence are not affected by this restriction.

To mitigate potential traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 of the EIAR for further details) between Chainage 46190 and 51450 will be timed to minimise disruption to school traffic. This will include avoiding road and lane closures during the morning drop off and evening school pick up times and avoiding closures during school term times for those schools along the R448 (subject to programming). Phases 1 and 3 of the construction sequence are not affected by this restriction.

22.2.2 Operational Phase

The location and nature of the Proposed Development is not predicted to have a permanent effect on the population of the area and wider environs. Regular planned maintenance will be infrequent and at the joint bay locations only.

22.3 Air Quality

22.3.1 Construction Phase

Good practice dust mitigation measures to manage the generation of dust at source will be implemented. Required mitigation measures, as per the IAQM Guidance (IAQM, 2023), are presented below.

The mitigation measures are included in the CEMP (see Appendix 5.4 in Volume 3 of the EIAR). If the planning permission conditions any additional mitigation measures, these can be included in an updated CEMP with the agreement of the local authority:

- **Communication:**
    - Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;

   - Display the name and contact details of the person(s) accountable for air quality and dust issues on the temporary construction compound site boundary. This may be the environment manager / engineer or the site manager; and
   - Display the head or regional office contact information for the developer and contractor.

- **Site management:**
   - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
   - Make the complaints log available to the local authority when asked; and
   - Record any exceptional incidents that cause dust and / or air emissions, either on-site or off-site, and the action taken to resolve the situation in the log book.

- **Monitoring:**
   - Carry out regular site inspections to monitor compliance with the CEMP, record inspection results, and make an inspection log available to the local authority when asked; and
   - Increase the frequency of site inspections by the person accountable for air quality and dust issues on-site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Regular site inspections to monitor compliance with the CEMP will be carried out and inspection results will be recorded.

- **Preparing and maintaining the site:**
   - Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable;
   - Erect solid screens or barriers around dusty activities;
   - Fully enclose specific operations where there is a high potential for dust production and impacts on nearby receptors;
   - Avoid site runoff of water or mud; and
   - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.

- **Operating vehicles/machinery and sustainable travel:**
   - Ensure all vehicles switch off engines when stationary (i.e. no idling vehicles); and
   - Avoid the use of diesel, or petrol-powered generators and use mains electricity or battery powered equipment where practicable.

- **Operations:**
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction (e.g. suitable local exhaust ventilation systems);
  - Ensure an adequate water supply can be made available for dust / particulate matter suppression where required;
  - Use covered skips;
  - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment as far as practicable, and use fine water sprays on such equipment wherever appropriate; and
  - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- **Waste management**
  - Avoid bonfires and burning of waste materials.
- **Measures specific to trackout:**
  - Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site;
  - Avoid dry sweeping of large areas;
  - Ensure vehicles entering and leaving sites containing friable materials are covered to prevent escape of materials during transport;
  - Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
  - Record all inspections of haul routes and any subsequent action in a site log book;
  - Install a hard surfaced (gravel etc) haul route to the temporary construction compounds, which will be regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned, if required;
  - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
  - Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
  - Locate access gates at least 10m from receptors where feasible, to reduce effects from trackout.

22.3.2 Operational Phase

Based on the findings of the assessment, it is not considered necessary to implement additional mitigation measures for the operational phase, as impacts are assessed to be Negligible.

22.4 Noise and Vibration

22.4.1 Construction Phase

The construction works will comply with the recommendations of BS 5228-1, and the mitigation measures that will be implemented include the following:

- Noise barriers will be installed around the HDD compounds:
    - HDD4 Ch. 22000 – Crossing of the Lyreen tributary of the River Liffey along the R407. The closest sensitive receptor is located around 18 m away. Noise barriers will be placed on the perimeter of both the launch and reception HDD compounds to screen the receptors identified in Plate 9.1 in Chapter 9 of the EIAR;
    - HDD5 Ch. 37100 – Crossing of the River Liffey north of Sallins. The closest sensitive receptor is located around 68 m away. Noise barriers will be placed on the northern perimeter of the HDD compound on the western bank of the River Liffey to screen the receptors identified in Plate 9.2 in Chapter 9 of the EIAR;
    - HDD6 Ch. 44600 – Crossing of the Grand Canal in Naas. The closest sensitive receptor is located around 32 m away. Noise barriers will be placed on the northern perimeter of the southern HDD compound to screen the receptors identified in Plate 9.3 in Chapter 9 of the EIAR;
    - The noise barriers will be within the Planning Application Boundary. The exact location, height and type of noise barriers to be installed will be confirmed pre-construction and agreed with the local planning authority;
- BS 5228-1 states that a noise barrier which blocks the line of sight between the source and the receptor would result in an approximate attenuation of 10 dB which would reduce the exposure of the effects. Therefore the noise barriers will be designed in order to block the line of sight between the noise sources and the affected receptors;
- Noise barriers will comply with the standard EN 14388;
- The Contractor will be obliged to comply with Local Authority controls on noise and vibration during construction.
- The location of the noise barrier will be set out and agreed in advance of the works and designed to keep noise levels within the limits;
- The routing, depth, locations, and drilling types of the proposed HDD works will be carefully selected to avoid / mitigate effects. Confirmatory structural surveys will be completed pre-construction at all structures that will be crossed or that are within 50 m of the HDD locations. These locations will be monitored by the Contractor during the HDD works, and the surveys will be repeated post-construction. In the extremely unlikely event of repairs being required, these will be immediately undertaken in agreement with the structure owner;
- During the HDD works, constant monitoring by the specialist drilling team will be carried out. The volume of cuttings produced will also be monitored to ensure that no over-cutting takes place and that hole cleaning is maintained. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses. The CEMP will be updated pre-construction with further information about HDD monitoring when the Contractor is appointed and will be agreed with stakeholders including the Local Authorities, TII, Waterways Ireland, and Irish Rail;

- There is potential for some elements of the HDD works to extend into the evening and the night periods and advanced notice will be given to nearby residents when this is occurring;
- The Contractor will develop and implement a stakeholder communications plan prior to the commencement of construction to ensure residents understand the nature and duration of noise and vibration effects, and the measures that will be put in place to manage and reduce them.
- Only plant conforming with or exceeding relevant national or international standards (including BS 5228), directives or recommendations on noise or vibration emissions will be used. Construction plant will be maintained in good condition with regards to minimising noise and vibration emission;
- Plant will be operated and maintained appropriately, in compliance with manufacturer recommendations. All vehicles, plant and equipment will be switched off when not in use;
- Routes for the transport of construction materials, spoil and personnel will be carefully selected to reduce the risk of increased noise and vibration impacts during construction;
- Vehicle and mechanical plant / equipment used for the works will be fitted with effective exhaust silencers, to be maintained in good working order and operated in a way that minimises noise emissions;
- Construction plant and activities will be positioned to minimise noise at sensitive locations;
- Equipment that breaks concrete by pulverising or similar, rather than by percussion, will be used where practicable;
- Mufflers will be used on pneumatic tools;
- Works will be programmed to minimise the need for working outside normal working hours;
- Unnecessary revving of engines will be avoided and idling of engines will be kept to a minimum;
- Plant and vehicles will be started-up sequentially rather than all together;
- Drop height of materials will be minimised;
- Rubber linings will be used in, for example, chutes and dumpers to reduce impact noise;
- Any plant, such as generators, which are required to operate before 07:00 or after 19:00 will be surrounded by an acoustic enclosure or portable screen;

In terms of vibration levels giving rise to human discomfort, the following additional measures will be implemented during the construction phase:

- A clear communication programme will be established between the Contractor and the affected residents prior to works which may give rise to significant vibration effects. The nature and duration of works will be clearly set out in all communications;
- Activities capable of generating significant vibration effects in relation to human response will be restricted to daytime hours where practicable;
- Appropriate vibration isolation will be applied will be applied to plant where required and where feasible;
- Low vibratory or non-vibratory plant will be used when working close to a vibration sensitive receptor; and

- Vibratory equipment will be started up and turned off as far away from sensitive receptors as practicable.

22.4.2 Operational Phase

Based on the findings of the assessment, it is not considered necessary to implement mitigation measures for the operational phase.

22.5 Biodiversity

22.5.1 Ecological Clerk of Works

An on-site Ecological Clerk of Works (ECoW)[162] will be appointed by the Contractor to carry out pre-construction surveys (see below) to ensure that the baseline is current and, where required, will implement appropriate mitigation measures as needed. Where sensitive habitats or species have the potential to be impacted, the ECoW will be on site to implement all mitigation measures as described below. The ECoW will have sufficient experience and will be a member of a professional body such as CIEEM or similar.

22.5.2 Pre-Construction Surveys

In advance of enabling works, the Contractor's ECoW will complete pre-construction confirmatory surveys of selected ecological features whose distribution is dynamic over time, and which are known to have potential to occur within the ZoI of the PAB. Any of the small number of areas that could not be surveyed during baseline data collection will also be surveyed at this time. As noted above, an assessment of these non-accessed areas has been made, based on the available data (e.g. aerial photograph, desktop data, access from adjacent area, etc). This is in-line with the CIEEM guidelines. These surveys will confirm the findings of the surveys completed between October 2021 and October 2022, and will consist of the following:

- Bat trees previously identified as having roosting potential and within the ZoI;
- Otter breeding/resting sites within the ZoI of the PAB (minimum 50 m, up to150 m at HDD sites, where access allows; noting that guidance recommends 20 m for non-breeding sites);
- Badger setts within the ZoI of the PAB (minimum 50 m, up to 150 m at HDD locations where access allows);
- Squirrel (grey and red), where dreys are identified within trees to be felled within the PAB;
- Amphibians and reptiles: a pre-construction survey will be undertaken by the ECoW of previously identified area suitable to host these species: reptile habitat (dry calcareous grassland, dry meadows and grassy verges and recolonising bare ground) and of amphibian habitat (drainage ditches, wet grassland and reed and sedge swamps) within the PAB. A suitable safe receptor site will be pre-identified, and if amphibians or reptiles are found the ECoW will translocate animals if necessary to the suitable receptor habitat;
- Invasive species within the PAB; and
- A baseline survey of all hedges to be removed will be carried out to characterise its canopy, understorey and field layer species, and associated features (ditches, earth banks, walls etc.) to inform reinstatement.

Bat surveys will be carried out in accordance with guidance from Bat Mitigation Guidelines for Ireland – 2 (Marnell *et al.*, 2022) and Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA,

[162] An Environmental Clerk of Works (EnCoW) with sufficient experience and membership of a professional body may also be used.

2006a). Surveys will be carried out by a licenced bat worker, who will determine the locations where they are required, using best practice techniques such as tree climbing and night vision equipment.

All surveys will be undertaken by suitably qualified ecologists with demonstrable experience in the survey and assessment of the feature.

22.5.3 Reporting

The results of pre-construction confirmatory surveys will inform the refinement of mitigation measures and monitoring measures (if required) in the Contractor's method statements (in accordance with the commitments set out in this EIAR), and all results will be incorporated into the Contractor's constraint mapping.

Survey reporting and mapping will be provided to the Developer's Ecologist (ESB), EirGrid's Planning and Environmental Unit (PEU) within the Chief Infrastructure Office, and to any prescribed bodies as additionally required by any planning conditions.

22.5.4 Construction Phase

22.5.4.1 Site-Wide Mitigation

A number of site-wide mitigation measures will be applied across the Proposed Development to avoid the impacts associated with pollution of watercourses and impacts to small mammal species, amphibians and breeding bird species. In addition to this, there are mitigation measures specific to the various Proposed Development elements.

Ecological Clerk of Works (ECoW)

The appointed contractor's ECoW will be on site during the construction for any works deemed to be of sensitive nature due to the number of sensitive ecological receptors and the works taking place within watercourses connected to European sites. Where sensitive habitats or species could be impacted, the ECoW will be on site to oversee the implementation of all mitigation measures as described below. The ECoW will be at sensitive locations for example where there will be in-stream works and where a watercourse is hydrologically connected to European site and at locations where there is potential for disturbance to SCI birds and where hording will be erected, and in areas of vegetation reinstatement, including tree planting. Table 22.1 shows the indicative location of proposed silt fencing locations. To note, some of these locations are not yet determined. The final locations will be determined by the ECoW onsite to ensure that the locations are suitable and are in-line with the requirements of this EIAR.

Table 22.1: Indicative silt fencing locations where an Ecological Clerk of Work will be required.

Waterbody name	European Site with Hydrological Connection	Indicative Location of silt fencing (NGR)
Tributary of the Tolka 020	N/A	1 location: • N 95028 46797
Dunboyne stream_010	N/A	1 location: • N 94782 46269
Rye Water_030	Rye Water Valley/Carton SAC	1 location: • N 93930 45180
Jenkinstown stream_010	Rye Water Valley/Carton SAC	4 locations: • N 91730 45313 • N 90246 45483 • N 89775 43468 • N 89661 43153
Unassigned stream	Rye Water Valley/Carton SAC	1 location: • N 89419 43023

Waterbody name	European Site with Hydrological Connection	Indicative Location of silt fencing (NGR)
Rye Water_020	Rye Water Valley/Carton SAC	2 locations: • N 89243 42178 • N 88410 40767
Newtownmoyaghy Stream tributary of Rye Water_020	N/A	1 location • N 89076 40939
Rye Water_010	Rye Water Valley/Carton SAC	1 location: • N 88065 40613
Royal Canal	Rye Water Valley/Carton SAC	1 location: • N 87874 40210
Lyreen_010	N/A	2 locations • N 86262 37369 • N 86673 35787
Tributary of Lyreen_010	N/A	1 location: • N 86754 35459
Clonshambo_010	N/A	1 location: • N 87176 33938
Clonshambo_020	N/A	1 location: • N 86916 31840
Kilmurry_010	N/A	1 location: • N 86272 30537
Tributary of Kilmurray_010	N/A	1 location: • N 86151 30369
Liffey_130	N/A	3 locations: • N 84449 28586 • N 84425 28283 • N 84807 27542
Tributary of Liffey_130	N/A	1 location: • N 84283 28429
Tributary of Slate_010	N/A	1 location: • N 84237 27559
Liffey_120	N/A	4 locations: • N 87519 25081 • N 88001 24231 • N 88281 24006 • N 88110 23008
Grand Canal Main Line (Liffey and Dublin Bay)	N/A	1 location: • N 88152 22604
Liffey_110	N/A	3 locations: • N 88249 21068 • N 87711 20395 • N 87394 20021
Grand Canal Naas Line (Liffey and Dublin Bay)	N/A	1 location: • N 88288 19245
Liffey_100	N/A	1 location: • N 88310 18467
Tributary of Liffey_120	N/A	1 location: • N 88017 24231

The ECoW will give toolbox talk to all site personnel to highlight any environmental sensitivities and the boundaries of sensitive habitats. Toolbox talks will include findings of pre-construction surveys on baseline changes and any adaptive mitigation measures required. The ECoW will propose adaptive mitigation measures in response to, for instance, extreme weather events (amber and red Met Éireann weather warnings), or mitigation requirements arising from pre-construction surveys which identify unexpected receptors. Method statements in relation to trenched crossings prepared prior to the start of works and will be in accordance with particular IFI standards unless otherwise agreed with the IFI or planning authority. No sensitive works will be permitted without the prior approval of the ECoW.

Pollution Control

The measures set out below will be implemented to ensure that there will be no pollution of surface water during the construction phase of the Proposed Development. The measures have been incorporated into the CEMP (Appendix 5.4) which is key contract document and will be implemented in full by the appointed contractor. The CEMP will be updated to include any pollution control mitigation measures prescribed by the local authority as a condition to the planning permission (if granted). The CEMP has been developed in accordance with the following guidance documents and legislation:

- CIRIA C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams *et al*. 2001);
- CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane *et al*., 2006a);
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane *et al*. 2006b);
- CIRIA C741 Environmental Good Practice on Site (Charles and Edwards 2015); and Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA 2005);
- S.I. No. 113/2022, (European Union (Good Agricultural Practice for Protection of Waters) (Amended Regulations).

Mitigation measures with respect to accidental pollution are focused on prevention, safeguarding the approach to the storage and handling of materials, and managing vehicles during the temporary construction phase.

Control of Silt-Laden Runoff

Specific measures to control silt will be implemented at each of the Proposed Development infrastructure sites. Surface water run-off at the construction sites will be managed to prevent silt-laden surface water flowing into surface water receptors:

- The appointed contractor will ensure no deleterious discharges are released from construction sites to the nearby water bodies during construction. If a discharge to a watercourse is necessary, the water will pass through a suitable drainage system such as a swale and/or silt buster prior to discharge. Levels of suspended solids in any discharge will be no greater than 25 mg/l (milligrams per litre) as per Inland Fisheries Ireland (IFI) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI 2016), and flows will be controlled to levels appropriate to the receiving water. It is possible that such a discharge may require a licence under the Water Pollution Acts 1977 and 1990 (as amended), and the Arterial Drainage Act 1945 and 1995 (as amended). The appointed contractor will liaise with the regulatory authorities at an early stage to determine the need for licences and include the appropriate application time required in any construction programme;
- Silt fences will be erected along the boundary of water bodies to prevent any silt laden runoff from impermeable surfaces, temporary or permanent, as well as spoil heaps within the construction working width:

- Silt fencing will also be applied to areas that are within 30 m of a watercourse and hydrologically linked to a European site, where concrete pouring is to be undertaken and where there is a risk to European designated sites. Where required this may be double silt fencing;
- Silt fences will be installed downgradient of the potential source of the silt / sediment;
- The silt curtain will contain the area where silted waters are being generated and will terminate on high ground;
- They will be constructed using permeable filter fabric (Hy-Tex Terrastop silt fence or similar) rather than a mesh material and its base will be embedded at least 15 cm into the ground and staked at 2 m intervals;
- Vegetation will be retained where possible, however, where targeted vegetation removal is required, additional measures will be put in place including additional silt fencing in these areas.
- The vegetated turves will be peeled back and not detached from the ground, the materials inserted and the turves replaced to hold the base in place;
- The silt fence will be inspected regularly by the ECoW and appointed contractor, and in particular following heavy rainfall;
- Silt fences will remain in-situ until the vegetation on the disturbed ground is re-established, as determined by the ECoW;
- The fence will not be pulled from the ground, but cut at ground level and the stakes / posts removed;
- Should water build up behind the fences, the sediment will settle to the bottom. Water can be released, but sediments will remain;
- Two lines of silt fencing will be installed in sensitive areas, based on the ECoW's professional judgement;
- A record of its installation, inspection and removal will be maintained by the ECoW; and
- Reinstatement of any banks affected by silt-laden run off during construction will be reinstated back to pre-development conditions.

Stockpiling of Materials

The following measures will be implemented for the stockpiling of materials. Stripped soil will be stockpiled more than 10 m away from the surface interceptor drain. Stockpiles will be in a dry zone that is not subject to flooding (i.e. outside 1:100 flood extent (1% Annual Exceedance Probability)). The following measures will be put in place by the Contractor for stockpiling of material:

- Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within 10 m of a watercourse;
- For watercourse crossings, stockpiles will not be located anywhere within the crossing working area;

- Stockpiles will be managed to prevent siltation of watercourse systems through run-off during rainstorms with the measures to be implemented by the Contractor. These will include the following measures:
    - No use of commercial seed to stabilise exposed soils;
    - Coir matting to be used where determined by the ECoW to be required to enable vegetation to establish on the exposed soil;
    - Providing silt fences or straw barriers at the toe of the stockpile to mitigate run-off during rain events;
    - Surrounding stockpiles with cut-off ditches to contain run-off;
    - Directing any run-off to the site drainage system or filter drains along the construction working width and to the settlement pond (or other) treatment systems; and
    - Providing bunds or another form of diversion to keep run-off from entering the stockpile area.

Storage of materials

The following measures will be implemented for storage of materials:

- All oil and diesel storage facilities will be at least 30 m from any watercourse, including surface water drains, and outside the 1:100 flood extent (1% Annual Exceedance Probability);
- Spill kits and drip trays will be provided for all equipment and at locations where any liquids are stored and dispensed;
- Storage areas for solid materials, including waste soils, will be designed and managed to prevent deterioration of the materials and their escape (via surface run-off or wind blow);
- Storage areas will be kept secure to prevent acts of vandalism that could result in leaks or spills; and
- All containers of any size will be correctly labelled, indicating their contents and any hazard warning signs.

Spills

The following measures will be implemented across the site to prevent spills:

- Fuel tanks, drums and mobile bowsers (and any other equipment that contains oil and other fuels) will have a secondary containment, for example double-skinned tanks;
- All tanks, drums and mobile bowsers will be located in a sealed impervious bund with sufficient capacity to contain at least 25% of the total volume of the containers or 110% of the largest container, whichever is the greatest;
- Storage areas will be covered, wherever possible, to prevent rainwater filling the bunded areas (long-term storage areas will be covered. Storage areas used for a short period of time e.g. a few hours and where no rain is predicted, will not be covered);
- Fuel fill pipes will not extend beyond the bund wall and will have a lockable cap secured with a chain;
- Where fuel is delivered through a pipe permanently attached to a tank or bowser:

  - The pipe will be fitted with a manually operated pump or a valve at the delivery end which closes automatically when not in use;
  - The pump or valve will be fitted with a lock;
  - The pipe will be fitted with a lockable valve at the end where it leaves the tank or bowser;
  - The pipework will pass over and not through bund walls;
  - Tanks and bunds will be protected from vehicle impact damage;
  - Tanks will be labelled with contents, capacity information and hazard warnings; and
  - All valves, pumps and trigger guns will be turned off and locked when not in use. All caps on fill pipes will be locked when not in use.
- Suitable precautions will be taken to prevent spillages from equipment containing small quantities of hazardous substances (for example, chainsaws and jerry cans) including:
  - Each container or piece of equipment will be stored in its own drip tray made of a material suitable for the substance being handled; and
  - Containers and equipment will be stored on a firm, level surface.
- For deliveries and dispensing activities, the Contractor will ensure that:
  - Site-specific procedures are in place for bulk deliveries; and
  - Delivery points and vehicle routes are clearly marked.
- Emergency procedures will be displayed, and suitably sized spill kits will be available at all delivery points, and staff will be trained in these procedures and the use of spill kits.

Fuel and oil leaks from vehicles and plant

The use of vehicles and plant poses similar risks to those posed by storage of liquids. Fuel and oil may leak from such equipment which may enter drains and/or watercourses, as well as contaminating the ground itself. The following measures will be implemented to reduce this risk:

- Vehicles and plant provided for use on the site will be in good working order to ensure optimum fuel efficiency, and will be regularly inspected to ensure they are free from leaks;
- Sufficient spill kits will be carried on all vehicles;
- Vehicles and plant will be regularly maintained to ensure that they are working at optimum efficiency and are promptly repaired when not in good working order;
- Vehicles and plant will not park near or over drains; and
- Refuelling of vehicles and plant will be carried out on hard standing, using drip trays to ensure no fuel can contaminate the ground outside of the bunded areas.

Concrete

The following measures will be implemented to reduce risks associated with concrete pouring:

- When working in or near the surface water and the use of introduced materials (e.g. oil) cannot be avoided, alternative materials such as biodegradable oils will be used;
- Placing of concrete in or near watercourses will only be carried out under the supervision of the ECoW;
- there will be no hosing of concrete, cement, grout or similar material spills into surface water drains. Such spills shall be contained immediately, and run-off prevented from entering the watercourse;
- Concrete waste and wash-down water will be contained and managed on-site to prevent pollution of all surface watercourses; and
- Washout from concrete lorries will not be permitted on-site and will only take place at the batching plant (or other appropriate facility designated by the manufacturer).

Breeding Birds

Unless suitable mitigation is adopted (see next paragraph), hedgerows, trees and scrub will not be removed within the bird breeding season, generally taken to be between 1 March and 31 August, to avoid impacts on nesting birds.

Where this seasonal restriction cannot be adhered to, habitats that need to be removed will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. The ecologist will demarcate a suitable buffer around an active nest and clearance within this area will be postponed until the chicks have fledged. A suitable exclusion zone will be established by the ECoW. Bird deterrents (e.g. flicker tape/compact discs will be tied to habitat confirmed without nests and the habitat will be cleared within three days of the inspection; otherwise, repeat inspections will be carried out to confirm the continued absence of nesting birds. If vegetation is to be cleared in the breeding season (under supervision of an ecologist), it will be chipped, removed or covered on the same day to prevent birds from nesting. Planting of woodland, hedgerow and grassland habitats within the PAB as detailed in the landscape drawings will provide suitable compensatory habitat for the breeding bird species recorded within the study area. Once established, this will provide nesting habitat for breeding birds displaced as a result of the Proposed Development

Bats

The baseline data gathered on surveys can allow the works to proceed within the legislation. Gathering this information before the works begins allows time for license applications if roosts are found and reduces the likelihood of the need to stop works, which may prove costly dependent on the licence application process. Despite the fact that no bat roosts are known to be present, to avoid the risk of killing and injuring bats during construction, all trees to be removed will be subject to pre-construction checks or soft felling.

Soft felling is where tree limbs are cut and left grounded overnight to allow bats to escape, prior to further cutting of the trunk. Soft felling should only be undertaken between midway through August – early November when juvenile bats are capable of flight. In the unlikely event that any roosts are confirmed, given that none were recorded during baseline surveys, the tree(s) would be felled under a derogation licence. The following will be provided such as:

- The provision of an alternative roost (bat box) in a suitable, undisturbed location, away from the construction works, either within the Planning Application Boundary where works have been carried out or on third-party lands, and with the agreement of landowners.

- The loss of trees with high potential for roosting bats will be mitigated for on a 3-to-1 ratio with bat boxes, and moderate potential trees will be mitigated on a 2-to-1 ratio with bat boxes.
- The ECoW will ensure that a range of suitable models will be used, suited to the species recorded within the study area, and for different seasons.
- The boxes will be erected in a suitable location. It may be necessary for temporary lighting to be provided at construction compounds for security purposes.
- Temporary lighting will be controlled and directed in order to mitigate any potential impacts to bats as advised by the appointed ECoW. Control measures will include cut-off cowls, suitable colours of lights are used, and ensuring lights are orientated in suitable directions.

Otter

Following the pre-construction surveys, the following general mitigation measures for otter will be implemented:

- Any excavations will be covered at night to prevent otter from falling in or becoming trapped;
- Should any otter be observed within the PAB or should any evidence of otter activity be found during the works, works must cease immediately and the ECoW contacted for advice;
- Should a non-breeding otter holt or rest site be unexpectedly identified, a buffer zone of 30 m will be implemented around the feature. Where a resting place is confirmed to be a natal site this would increase to 150 m; and
- NRA's Guidelines for the Treatment of Otters (NRA 2008b) will be followed at all times.

Although there are not predicted to be any impacts on otters, if confirmatory surveys identify likely disturbance of otters, further mitigation will be implemented to ensure no significant effects on otters arise.

Badger

The following general mitigation measures for badger will be implemented during the construction phase, after badger pre-construction surveys have been carried out:

- Ground excavations will be covered at night to prevent badger from falling in or becoming trapped;
- Any works within 30 m of an active sett will be supervised on-site and full-time by an ECoW (extended to 50 m during the breeding season for a main sett where there is breeding activity);
- Breeding setts will not be interfered with or disturbed during the badger breeding season (December to June inclusive);
- Only the use of hand tools will be permitted within 20 m of an active sett;
- No heavy machinery will be used within 30 m of a sett;
- During the breeding season, none of the construction works will be undertaken within 50 m of active setts nor blasting (if required) within 150 m of active setts. Should this not be possible, an experienced ecologist will be contacted for advice on how best to proceed; the ecologist will be able to advise on any mitigation options that may be available relative to the predicted scale and duration of impact (which is informed by the

proposed works and sett specifics, i.e. sett type, level of sett activity, tunnel direction, type of substrate, vegetative cover, and topography)

- Night-time working will be restricted as far as possible within 100 m of a sett;
- The use of noisy plant and machinery with 30 m badger setts will cease before sunset; and
- Any spoil heaps will be sited at a minimum distance of 30m from setts.

Squirrels

Squirrels breed in winter (young born February to April) when trees are proposed to be felled (i.e. outside the bird nesting season). Even if adults vacate their dreys, if present, young could be killed. Dreys are often distinguishable from bird nests as dreys are constructed in the main upper tree trunk (not upper thinner terminal branches). Dreys are not usually in isolated trees, and typically have leaves attached to twigs. Grey squirrels are a scheduled invasive species widespread in the environs of the Proposed Development site. Red squirrels are a nationally protected species with a patchy distribution in the environs of the Proposed Development site.

Where pre-construction confirmatory surveys identify potential dreys at risk from felling, vantage point watches (for individual trees) or transects (for hedgerows/groups of trees) will be conducted to visualise squirrels and identify if the squirrel is grey (invasive) or red (protected). Surveys will be conducted in the early morning, during the summer months. Where visualisations are inconclusive, hair tube surveys may be required, following the method in NRA (2009). As grey squirrels are a scheduled invasive species, confirmed grey squirrel dreys can be felled without mitigation. In the event that confirmed or suspected red squirrel dreys require felling, felling will only be carried out from October to January, in consultation with the NPWS, who may require a licence, subject to survey findings.

Other Protected Mammals

Removal and clearance of vegetation may affect small mammal species if present in these habitats. The following measures will be adhered to in order to minimise impacts to small mammal species:

- Any excavations will be covered at night to prevent small mammals from falling in and / or becoming trapped;
- Working at night will be prohibited where specific tasks such as vegetation removal and clearance are to be carried out and will be informed by the ECoW;
- Any lights will be turned off after working hours, unless required for safety or security reasons;
- Noise mitigation level as outlined in Chapter 9 (Noise and Vibration) of this EIAR will be followed; and
- With the exception of permanent areas of hardstanding and cable easement, the site will be re-vegetated, post-construction.

Amphibians and reptiles

Removal and clearance of vegetation may affect amphibians or reptiles if present in these habitats. The following measures will be adhered to, to minimise impacts on amphibians or reptiles:

- Vegetation will be cleared in two stages, during the reptile and amphibian active season, following the completion of the toolbox talk: specific to amphibians and reptiles:
    - A hand-search by a licensed ECoW for any animals present within vegetation to be cleared, followed by a first cut of vegetation down to 210 mm above ground-level using hand tools;

    - A second hand-search of vegetation by an ECoW for any animals present, followed by the second cut of vegetation to ground-level (or as close as practicable).

- If any reptiles are found during pre-construction surveys or during works, they will be captured and translocated by a suitably qualified and experienced ecologist under licence to a previously identified receptor site.

- Where practicable in the context of construction, water levels will be maintained in any watercourses potentially used by amphibians; and

- Habitat reinstatement will re-create, except in areas of permanent hardstanding, the former habitats within the PAB.

Invasive Plant Species

A management plan for those Third Schedule invasive plant species recorded during the survey which have the potential to be impacted by the works will be prepared. The mitigation measures described below follow the recommendations set out in the Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2010):

- All staff will be informed of the presence of Himalayan balsam and any other invasive species through toolbox talks;

- Exclusion zones will be established where necessary to prevent the spread of invasive species;

- No machinery will be allowed within exclusion zones other than where necessary to undertake treatment measures;

- Any plant material and soil-containing plant material must be disposed of in accordance with the NRA (2010) guidelines; and

- Care will be taken near watercourses to ensure that material that contains flower heads, seeds or cuttings of any invasive species will be disposed of correctly and not enter watercourses.

22.5.4.2 Specific mitigation measures

European designated sites

The NIS for the Proposed Development (Jacobs 2024b) found that, in the absence of mitigation, likely significant effects on the Rye Water Valley/Carton SAC could not be excluded, because this SAC is hydrologically connected to the PAB by the following waterbodies: WB03 (Cullendragh); WB04 (Jenkinstown Stream); WB09 (un-named ditch, flows into Rye Water); WB10 (Bride Stream); WB12 (un-named ditch, flows into Rye Water); WB13 (Rye Water); WB26(un-named ditch, flows into River Lyreen); WB16 (River Lyreen); WB20 (un-named ditch, flows into River Lyreen); WB22 (Baltracey River, flows into River Lyreen).

Mitigation measures to protect the Rye Water Valley/Carton SAC from water pollution are described in the NIS (Jacobs 2024b) and in the site-wide mitigation measures above.

Nationally designated sites

In addition to the site-wide waterbody mitigation measures, the following mitigation relating to HDD will be put in place where it crosses the Grand Canal pNHA and the Royal Canal pNHA to prevent bentonite drilling fluid release entering these canals:

- When using HDD, the drilled cuttings will be flushed back by the drill fluid flowing via nozzles in the drill bit, to the surface, where they will be separated from the fluid fraction for disposal. A comprehensive closed-loop drilling fluid mixing and circulation system with recycling capability will be used to minimise the volume of fluids required on site;

- The shaft and borehole will be kept at least 50 m away from any watercourse where possible. However, given that the shaft will be kept as short as possible to reduce the risk of the drilling machine becoming stuck, it may not be possible to keep 50 m from a watercourse. In this case, a bunded area will be created around the temporary working space to prevent slurry washing into the waterbody in the case of accidental release;

- Use will be constantly monitored by the contractor through materials balance calculations, pressure monitoring in the lines and above ground visual assessment of the works. The pressure will be lowered, if necessary, to prevent a breakout. Bentonite pumping will stop immediately if any sudden drop in pressure is detected which could indicate a bentonite breakout;

- Biodegradable drilling mud formulation and management for the conditions and best practice drilling practices will be adhered to by the contractor at all times; and

- The contractor will further develop the emergency action plan, which is included in the CEMP which will include containment, control and clean-up measures in the event of drilling fluid release into the environment. Containment measures include installing interception devices (e.g., silt fence, staked straw bales, sediment curtains, collection sumps).

Otter

The mitigation measures described below follow the recommendations set out in the Guidelines for the Treatment of Otters during the Construction of National Road Schemes (NRA, 2008b)
One potential otter holt was identified within the PAB during the field surveys (see Figure 6, Appendix 10.7). Due to an apparent active Otter holt within 150 m of the Proposed Development, subject to further confirmatory surveys, a derogation licence may be required to undertake the proposed works. To confirm the holt status, the holt will be monitored under licence for a minimum of five days using remote cameras. Camera trap surveys will be undertaken prior to licence application. This will involve placement of static cameras at the holt for five consecutive nights.

Should the holt be determined to be inactive, works can proceed under the supervision of an ECoW. Should the holt be determined to be active, a buffer zone will be established as agreed with the ECoW – up to 150 m for a natal site. The NRA's Guidelines for the Treatment of Otters (NRA 2008b) will be followed at all times This Guidance states the following: when holts are present, no wheeled or tracked vehicles will be used within 20 m, and no light work will occur within 15 m. When a non-breeding otter holt or rest site is identified, a buffer zone of 30 m will be implemented around the feature, while when a breeding otter holt or resting site is identified, the buffer zone will be extended to 150 m – buffer zones will have to be fenced prior the beginning of the works. Moreover, should works occur in the vicinity of otters' holts with breeding females or cubs, screening will occur and working hours will be restricted. Disused and inactive holts can be destroyed, after being identified as inactive holts and after their entrances have been blocked and monitored for a five-days period. Exceptions can be adopted under licence; Guidelines for the Treatment of Otters Prior to Construction of National Road Schemes (NRA 2008b) states that a license will be required for any works likely to cause disturbance (e.g. piling and blasting) to active breeding holts when present with 150 m of a scheme.

Badger

Mitigation measures follow the recommendations set out in the NRA Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA 2006).

During the baseline surveys, it was identified that seven badger setts/potential badger setts could be impacted by the Proposed Development, including five within 50 m of the PAB and two between 61 m and 150 m (see Table 10.20 and on Figure 7, Appendix 10.8).

Of the seven setts, there are three active setts: one at 32 m, one at 40 m and one at 150 m from the PAB, and four are inactive (all within 61 m of the PAB).

To determine whether a sett is active or inactive, prior to commencement of construction, camera traps will be set up to monitor the entrance to the holes for a minimum of five days. If, after five days, there is no evidence that badgers are using the sett, it is presumed inactive and no further actions are required. However, this would only apply if the camera trap monitoring was carried out directly prior to the start of works, meaning there was no change to the baseline. The use of the sett may change over time, so if there is a delay of more than 12 months prior to the commencement of the works from the date of the final camera monitoring, then a further badger survey will be undertaken to determine the status of the hole.

No heavy machinery will be used within 30 m of active badger setts; lighter machinery (generally wheeled vehicles) will not be used within 20 m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10 m of sett entrances. During the breeding season (December to June inclusive), none of the above works will be undertaken within 50 m of active setts nor blasting or pile driving within 150 m of active setts.

Affected badger setts should be marked and the extent of bounds prohibited for vehicles clearly marked by fencing and signage. When there is the need of proceeding with works close to active setts during the breeding season, mitigation measures, such as sett screening and restricted working hours will be adopted, prior expert consultation. To determine whether a sett is active or inactive, camera traps will be set to monitor the entrance to the holes for a minimum of five days. If, after five days, there will be no evidence that badgers are using the sett, it will be considered inactive, and no further actions will be required. However, this will only apply if the monitoring was carried out directly prior to the start of works, meaning there was no change to the baseline. The use of the sett may change over time, so if delays occur (more than 12 months prior to the commencement of the works from the date of the final camera monitoring), further badger surveys will be undertaken to determine the status of the hole. Disused and inactive setts entrances can be blocked to prevent the reoccupation, and sett can be destroyed using a mechanical digger after 5 days of monitoring, under the supervision of the licensee. Construction activities within the vicinity of affected setts can begin after setts have been evacuated and destroyed under licence from the public authority. Alternatively, when affected setts do not require destruction, construction works will start after recommended alternative mitigation measures have been addressed (NRA 2006b).

Works close to badger setts will only be conducted under the supervision of a qualified expert under licence from the public authority.

Fish and aquatic invertebrates

The following control measures will be implemented during construction in or adjacent to a watercourse:

- In-stream works will not be carried out in watercourses frequented by salmon or trout during the Annual Close Season. The duration of the season varies regionally within the period from the beginning of October to the end of February, inclusive (IFI 2016). River and brook lamprey spawn during March to April/May. Translocation (fish rescue) and in-stream works will be undertaken outside of the spawning season for salmonids (salmon and trout) and lamprey (river and brook), generally taken to be summer to early autumn, which would also protect white-clawed crayfish. The timing of works will be considered on a site-specific basis and in agreement with the IFI;

- Operation of machinery in-stream will be kept to an absolute minimum. All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will be cleaned and checked prior to commencement of in-stream works;

- The design of temporary settlement ponds, the outfalls from these temporary ponds and the construction method statements for their installation will be agreed with IFI prior to construction;

- The area of disturbance of the watercourse bed and bank will be the absolute minimum required for the installation of outfalls/culverts;

- Any dewatering flows will be directed to the construction drainage system and to the settlement pond (or other) treatment system;

- Sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the ECoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI;

- Small check dams will be constructed in the cut-off watercourse to trap any sediment, and a sediment trap will be provided immediately downstream of the diversion to the existing watercourse; and

- Where in-stream bed material is to be removed, coarse aggregates, if present, will be stockpiled at least 10 m away from the watercourse for replacement following reinstatement of a watercourse channel.

Watercourse banks affected during construction in/near a watercourse will be reinstated back to pre-development conditions.

Where open trenching is proposed, site restoration works will be carried out following completion of the crossing, in agreement with IFI (see Table 10.25 for list of these watercourses). These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Open cut trenching works will not be carried out during extreme rainfall or high flow events. Met Éireann provides a five-day weather forecast via its website (www.met.ie) and works will not take place during orange and red weather warnings unless agreed with the ECoW. Unless otherwise agreed with IFI (for fish) and/or the NPWS (for white-clawed crayfish), any element of the works requiring in-stream works will be restricted to the fisheries open season (i.e. restricted to July to September inclusive). Where white-clawed crayfish were confirmed as present (WB46 and WB32), works will be carried out under licence.

Additional measures that will be undertaken to protect fish species and white-clawed crayfish are as follows:

- Where in-stream trenching is to be carried out, the area will be dewatered to provide a dry working area;

- Netting, sandbags and/or dumpy-bags filled with rock will be installed upstream to prevent fish travelling downstream into the working area. An impermeable barrier will be tailored to the watercourse in question, where technically feasible, fluming will be preferred to over pumping techniques to provide the dry working area;

- Fish will be removed from the working area through electrofishing and moved upstream of the dammed area;

- Hand searches, under licence, will be conducted at WB46 and WB32 where crayfish were confirmed to be present, and any crayfish found will be removed and moved upstream of the dammed area;

- Water will then be over-pumped continually to ensure a dry working area. This will be pumped through a silt buster to avoid sediment from becoming suspended within the watercourse; and

- Once construction is completed, the watercourse will be re-wetted under the direction of the ECoW. Water will be released slowly, and silt mats, sediment traps and haybales will be used to avoid a sudden influx of sediment to the system. A silt buster will be used where required.

Invasive species

Himalayan balsam was present along the route of the Proposed Development between ch 37000 and 37250 at N 87990 24456, 40 m from the HDD launch platform on the west bank of the River Liffey, and at the same location but 70 m south of the PAB at N 87999 24353. These areas will be fenced off and toolbox talks given to raise awareness. Where this is not possible, biosecurity measures will be carried out as presented in the site-wide mitigation section.

22.5.4.3 Reinstatement

General Requirements (All Hedgerows)

All planting will be native (only), taking account of the vegetation that has been removed and typical species of the Kildare/Meath landscape.

A post-consent baseline survey of all hedges to be removed will be carried out to characterise its canopy, understorey and field layer species, and associated features (ditches, earth banks, walls etc.) to inform reinstatement.

Unless otherwise agreed with the Developer (ESB) and the local authority, the Contractor will reinstate hedgerows and treelines to a species-rich condition (i.e., five woody species per 30 m), comprising only native species. All other sites will be returned as close as possible to their pre-existing condition, using the same woody species removed, under the supervision and direction of the Contractor's ECoW.

Hedging/hedgerow plants will be planted as a staggered double row, six plants per metre with 330 mm between rows. Suitable individual protection from browsing animals will be provided by tube, spiral or similar held in place with a short cane. Group protection of new planting may be provided by suitable fencing, but individual plant protection of spirals will be provided to protect against browsing animals. Mulch mats or similar weed suppression materials (restricted to a biodegradable specification) will be used to promote successful establishment.

The appointed Contractor will make orders by the scientific name to ensure native plants are delivered and not a cultivated variety.

Nurseries prefer to grow trees to order, so the Contractor will make the order as soon as possible (up to a year in advance) to ensure the required species and stock specification can be secured.

Consideration will be given to the procurement of planting so that there are suitable lead-in times to ensure that plants are of the right age/height required for when they are planted.

The Contractor will manage the establishment phase of planting (1–2 years) in accordance with online Teagasc guidance (Teagasc, 2020), to include watering in, weed suppression (using biodegradable mulches), and (where required) protection from browsing animals.

Thereafter, the Developer (ESB) will manage plantings from years 3-5 in agreement with the landowner.

Specific Requirements (Hedgerows and Trees Within The Cable Easement)

At the time of writing, the latest specification (EirGrid 2021) stated:

"*The easement area shall be cleared, and kept clear, of trees and other vegetation with deep root systems as these may damage the cable*".

Since publishing this specification, EirGrid has identified precedence from Germany and the Netherlands; for safely planting certain shrubs over High Voltage underground cables EirGrid has engaged closely with ESB, and relevant Dutch and German Transmission System Operators across Europe, to understand feasibility of planting over HV underground cables in Ireland. A Draft Over Cable Planting Strategy is in advance development in consultation with ESB, for which the Design Risk Assessment DRA was ongoing at time of writing (including calculations to assess a possible cable de-rating). The draft strategy combines the requirement for a minimum cable burial depth of 1m (to top of Cement Bound Granular Mixture in the cable trench), use of a high performing Root Barrier Membrane, and a strictly defined shrub species list with known maximum root depths less than 1m. It is possible the DRA may conclude that over cable planting cannot be delivered while guaranteeing cable performance and security. There are also risks that the strictly defined shrub species list is not compatible with landowner farm boundary requirements and/or agricultural farm payments. As such, applying a precautionary principle, in this assessment offsite compensatory planting is assumed for all permanent losses within the easement.

Specific Requirements (Semi-Natural Grasslands)

The appointed Contractor's ECoW will develop site-specific reinstatement plans for all semi-natural habitats (including dry calcareous grassland, dry meadows and grassy verges, and reed and large sedge swamps). These plans will be provided to the Developer's Ecologist (ESB), and the Planning and Environmental Unit in EirGrid's Chief Infrastructure Office. In accordance with the All-Ireland Pollinator Plan, commercial seed mixes will not be sown with the objective of restoring biodiversity. Seeds of certain plant species, such as wildflowers and certain species included in multi-species mixtures, are not subject to the seed certification schemes as implemented by the EU Member States and OECD-designated authorities in respect of third countries (Department of Agriculture, Food, and the Marine, 2021). Furthermore, even where harmful weed species are not present, seeds of non-local origin — even if the species are native — introduce new genetic strains which may displace or compromise the local, naturally-occurring flora (Dublin Naturalists Field Club 2021).

As such, in the site-specific habitat reinstatement plans for semi-natural habitats, the Contractor's ECoW will adopt the following approach, subject to consultation with the NPWS:

- Where it is deemed appropriate to allow habitats to re-vegetate naturally (e.g. roadside verges, where similar habitat is contiguous either side of the construction area), there will be no active seeding of reinstated topsoil;
- In all other areas, the preferred approach to reinstatement shall be use of locally collected seed from similar habitats;
- Use of commercial seed in semi-natural habitats will only be permitted where local seed is not available, or where local seed establishment has failed, and if both:
    - Certified native by the Department of Agriculture, Food, and the Marine; and,
    - With the written agreement of the NPWS.

General Requirements (Roadside Verges and Agricultural Areas)

Measures for use of seed in grassland reinstatement are as follows:

- Commercial seed mixes can be used on agricultural lands. All other areas will be left to naturally revegetate from the seed bank within reinstated soils (EirGrid 2023);.
- All seed mixes will be certified native by the Department of Agriculture, Food, and the Marine; and
- In agricultural areas, the rate of seeding, time and method of sowing, including the application of fertiliser, will be agreed with an experienced agronomist and will follow the guidance on reseeding (Teagasc 2020).

Monitoring

To ensure that the proposed mitigation measures remain effective, particularly in regard to reinstatement and compensation, the Contractor and ESB will collectively deliver a five-year monitoring landscape aftercare regime.

Sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the independent ECoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI.

22.5.4.4 Reporting

All reinstated or indirectly impacted semi-natural vegetation will be inspected at the completion of construction, at which time the Contractor's ECoW will provide written reports on habitat condition to the Developer's Ecologist (ESB), and EirGrid Planning and Environmental Unit. At that time, the Developer's Ecologist (ESB) will determine what additional steps are required. Additional steps could include replacement tree planting, additional hedge mulch or protection from browsing animals, or sowing of locally harvested seed (using a green hay approach) for semi-natural grasslands).

22.5.5 Operational Phase

The off-site compensatory planting will be maintained throughout the operational phase, by a third party charity supplier.

No other mitigation is proposed during the operation phase. The effects of operation of the Proposed Development are expected to be minimal on the IER, with most of the impacts to them occurring during the construction stage. Along most of the proposed cable route, the road will be re-instated for public use, and vegetation previously removed will be re-instated, except along the permanent easement, at joint bays, along permanent access tracks, and where over-cable planting is not technically viable due to asset risk.

22.6 Soils, Geology, and Hydrogeology

22.6.1 Construction Phase

The following mitigation measures will be implemented prior to the commencement and throughout the duration of the works:

- Prior to the construction phase starting, appropriate health and safety and waste management procedures for working with potentially contaminated soils (including asbestos) and water will be established, such as development and adoption of safe systems of work, including the use of PPE as a last resort. These procedures will be in-line with the requirements of the CEMP (Appendix 5.4 of this EIAR);

- A watching brief will be implemented to identify the potential presence of previously unidentified contamination. Personnel appointed by the appointed Contractor(s) will be appropriately trained in ground contamination identification (including Asbestos Awareness Training) if involved in earthworks activities. Any such instances of previously unidentified contamination will be recorded, the associated risks assessed and a remedial strategy developed by the contractor to manage the identified risks as appropriate;

- Any such instances of previously unidentified contamination will be recorded, the associated risks assessed and a remedial strategy developed by the appointed contractor(s) to manage the identified risks as appropriate;

- Potential risks to workers from ground gas when working within confined spaces will be mitigated through the development and adoption of an appropriate safe system of work, including the use of personal protective equipment (PPE) and Respiratory Protective Equipment (RPE) as a last resort; and

- To mitigate potential risks from radon migration into excavations and other enclosed spaces during the construction phase, an occupational monitoring programme should be implemented to identify whether radon migration and build up is occurring in areas where the risk is considered to be present. The monitoring will be undertaken in accordance with the EPA Protocol for the Measurement of Radon in Homes & Workplaces (EPA 2019b). If the workplace reference level of 300Bq/m^3 is exceeded (EPA 2019a) mitigation measures will be required during the construction phase, such as development of safe systems of work to ensure protection of personnel, potentially including measures such as use of PPE, RPE and working time restrictions.

Specifically relating to individual receptors such as GWDTEs and groundwater abstractions, the following mitigation measures will be implemented prior to the commencement and throughout the duration of the works:

- For known private supplies, the mitigation measures in the CEMP and Section 22.7 (Hydrology) will ensure no effect to groundwater quality from the Proposed Development. Based on the known locations, there is no requirement for groundwater monitoring;

- Should any unknown private supplies be identified in the vicinity of the Proposed Development, the supply will be monitored and, if required, an alternative supply will be provided;

- Trenching in areas of potential GWDTEs will be kept to a minimum, with trenches backfilled as rapidly as possible and dewatering volumes kept to a minimum; and

- Where trenching is carried out outside of existing roads, the methodology to backfill trenches will ensure that the backfill is not creating preferential subsurface flow pathway. Soil compaction will be undertaken and where needed on off road sections, additional clay bunds will be installed within the trench in areas that are adjacent to/ in proximity of potential GWDTEs.

22.6.2 Operational Phase

The following mitigation measures will be implemented during the operational phase:

- Risks to maintenance workers from ground gas when working within confined spaces will be mitigated by the development and adoption of safe system of work, including the use of personal protective equipment (PPE) and Respiratory Protective Equipment (RPE) as a last resort; and

- During the operational phase it is assumed that no further ground works will be undertaken. However, in the event that ground works are required, prior to such works commencing, appropriate health and safety and waste management procedures for working with potentially contaminated soils (including asbestos) and water will be established by the relevant contractor, such as development and adoption of safe systems of work, including the use of personal protective equipment (PPE) as a last resort. These will be in-line with standard health and safety practice and ESB requirements.

22.7 Hydrology

22.7.1 Construction Phase

22.7.1.1 General

The following mitigation measures will be implemented prior to commencement and throughout the duration of the construction phase:

- Implementation of the CEMP (Appendix 5.4 of the EIAR) and the Construction Resource Waste Management Plan (Appendix 5.5 of the EIAR) which set out measures to control and manage activities at the surface to prevent issues such as accidental spillage;
- A full-time on-site Environmental Clerk of Works (EnCoW) will be appointed prior to commencement of works. The role of the EnCoW is to monitor and ensure compliance with planning consents, environmental permits, legislation and mitigation;
- Works will be carried out in accordance with the guidelines set out by IFI in Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016);
- The IFI Biosecurity Protocol for Field Survey Works (IFI, 2011) will be complied with;
- Works method statements will be agreed with, and subject to any requirements specified by IFI for all watercourse crossings. The works method statement will include details on silt fencing, pH monitoring requirements for in-stream concrete pouring works, and handheld turbidity monitoring for in-stream and HDD works; and
- An adverse weather stop work plan will be developed to ensure that activities with the potential to cause pollution are stopped under certain weather conditions. Certain activities (such as open cut trenching, HDD works) will not be carried out during extreme rainfall or high flow events. Met Eireann (Red, Amber, Yellow) warnings and flood warnings will be monitored daily by the EnCoW.

22.7.1.2 Surface Water Quality Protection Measures

The following surface water quality mitigation measures will be implemented prior to commencement and throughout the duration of the works, which will be carried outside of any known seasonal restrictions, including instream working restrictions which are generally confined to summer/early autumn season (June/July/Aug/Sept):

- Activities will be planned in advance and machinery will be managed to ensure that the number of trips is limited to the minimum required at each location. This is because the more times a piece of ground is tracked, the more likely it is that vegetative cover will be removed and ruts will be created that will act as miniature rivers where dirty water will flow;
- Tracking beside streams and tracks will be kept to a minimum to reduce damage to the bankside;
- Geotextile or timber matting will be used on soft ground, and in all protected areas;
- A buffer zone of 20 m will be maintained between storage/working areas and sensitive watercourses, such as the River Liffey, taking account of the minimum working area required to facilitate the works;
- Oil or fuel stored in or adjacent to the works area will be kept in a bunded area (providing 110% capacity of the largest storage unit), 10 m from any watercourse which appears on a 6” OS map of the site. Vehicle

maintenance will not occur within 10 m of any watercourse and all machinery will be in good working order, free from any leakage of fuel, oil or hydraulic fluid;

- Reinstatement method statements will be subject to approval by the EnCoW and in agreement with IFI;
- Concrete will be brought to site by covered truck. Wet concrete operations adjacent to watercourses will be minimised, with a minimum separation distance of 10 m. Where unavoidable, for example in-channel works requiring the use of concrete, these operations will be carried out under supervision of the EnCoW and with suitable mitigation measures in place, such as controlling the leakage of any cement;
- The Contractor will ensure that all concrete truck rinsings/cleaning is undertaken within construction compounds and at least 10 m away from watercourses;
- In order to reduce the risk of contamination arising as a result of spills or leakages, measures including, but not limited to, the following will be employed:
  - All collected waste will be managed in accordance with the Waste Management Act 1996, and associated Regulations;
  - Fuels, chemicals, liquid and solid waste will be stored on impermeable surfaces;
  - Refuelling of plant, equipment and vehicles will be carried out on impermeable surfaces;
  - All tanks and drums will be bunded; and
  - Spill kits will be provided at all compound locations and carried by all crews during underground cable installation works.
- Silt fences (to Hy-Tex Premium specification or similar) and silt traps will be installed prior to commencement of works and will be inspected daily so that they can be adjusted as necessary. The EnCoW will consider the locations for these measures based on the potential for sediment-laden run-off to reach a receiving watercourse.
- Site restoration post works will be carried out, in agreement with IFI. These site restoration works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation;
- The Emergency Incident Response Plan and environmental control and mitigation measures described in the CEMP will be agreed prior to construction with IFI; and
- Water pumped from dry works areas and any dewatering will be treated using settlement tanks to remove sediment prior to discharge onto grass and allowed to filter back to the watercourse.

22.7.1.3 Silt Control Measures

The following silt control mitigation measures will be implemented prior to commencement and throughout the duration of the works:

- Silt control measures will be used to control silt generated from activities on site and prevent it gaining access to surface drainage which could convey silt to larger streams and watercourses;
- Silt control measures will include silt traps which can be located in small drains where flow is small and silt fences where run-off from large areas needs to be controlled;

- Silt fences will be installed downgradient of the works and not at the watercourse;
- Access routes will be delineated such that an appropriate set back distance from watercourses is maintained. Where works are to be undertaken adjacent to watercourses the setback distance will be delineated by the EnCoW on site;
- Where distances between the works and watercourse allow (with the exception of open trench cutting), a minimum setback distance of 20 m from the watercourse will be maintained; and
- Where the site is constrained, the best available set back distance will be determined by the EnCoW, taking account of the minimum working area required to facilitate the works.

Silt Fences

- Silt fences will be installed downslope of the area where silt is being generated on disturbed ground;
- To be effective, the silt fence will contain the area where silt is generated and will terminate on high ground (i.e. an elevated area not in the watercourse);
- Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh;
- The base of the silt fence will be bedded at least 15–30 cm into the ground at 2 m intervals. The manufacturer's installation instructions should be consulted prior to installation to ensure the silt fence is appropriately installed to avoid a reduction on performance efficacy,
- Once installed the silt fence will be inspected regularly by the EnCoW, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains;
- The integrity of the silt fencing will be checked daily by the EnCoW and after poor weather conditions (rain or wind) and any failures rectified immediately;
- Two lines of silt curtain/fence will be installed, where considered necessary, by the EnCoW;
- Any build-up of sediment along the fence boundary will be removed daily;
- Silt fences will be maintained until vegetation on the disturbed ground has re-established;
- The silt fencing will be left in place until the works are completed in the respective work areas or downstream of these (which includes removal of any temporary ground treatment);
- Silt fences will not be removed during heavy rainfall;
- The silt fence will not be pulled from the ground but cutaway at ground level and posts removed; and
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

Silt Traps

The purpose of the trap is to reduce the level of solids in the slowly flowing water. The silt trap works by allowing a build-up of water behind it, slowing flow and allowing solids to settle out. The following requirements will apply:

- Silt traps will only be placed in drains downstream of working areas where the volume of water flow is expected to be low;
- Silt traps will be made of Terram or similar material, not mesh;
- The trap will be staked into the banks of the drain/watercourse such that no water can flow around the sides;
- The material will be bedded into the drain bed/watercourse to prevent water flowing beneath it;
- The height of the trap will be lower than the bank heights. The upper edge will be fixed to a timber cross piece. This will allow water to overtop the silt trap and not burst through or around it;
- Inspections will be carried out daily by the EnCoW during the proposed works, weekly on completion of the works for at least one month, and after heavy rains, and monthly thereafter until bare areas have developed new growth;
- Any build-up of solids will be carefully removed without removing any vegetation growing on the bottom;
- The silt trap will not be pulled from the ground but cutaway at ground level and posts removed; and
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

22.7.1.4 Construction Compounds/Laydown areas

All temporary construction compounds will be secured with hoarding/fencing around the compound perimeters as appropriate. Where temporary construction areas are required and existing hardstanding is not available, engineering stone fill will be laid and compacted and maintained as required for the duration of the works. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition or for specific locations with biodiversity value in-line with reinstatement measures outlined in Section 22.5.

Temporary facilities will be provided at the construction compounds including construction phase car parking and welfare facilities and temporary material storage areas as necessary.

Any discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licensed contractor to an approved licensed facility.

Storage of fuel and refuelling will be undertaken within bunded hardstanding areas. Water will be brought to site via tankers as required.

22.7.1.5 Service Diversions/Interactions

All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works. This will include thorough investigations to identify and reconfirm the location of all utility infrastructure within the works areas and implementing procedures to be agreed with utility providers when undertaking works around known infrastructure services.

Service disruptions impacting the surrounding residential, social and commercial properties will be kept to a minimum, only occurring where unavoidable. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Relevant neighbouring parties will be consulted prior to any proposed disruptions.

22.7.1.6 Open Trench Water Crossings

As with all construction works proposed, no works on watercourses will be allowed to commence until the relevant Risk Assessment Method Statements (RAMS) and pertinent Health and Safety documents are received from the Contractor and are reviewed and agreed by the EnCoW. These Contractor documents will include method statements, open trenching risk assessments and environmental management plans specific to the area where the trenching is to take place. These plans will be submitted by the Contractor to the EnCoW for review and comment prior to commencing open trench operations. Relevant documentation relating to the proposed works will also be provided to IFI for approval.

All open trench watercourse crossings in salmonid watercourses will take place during the July to September period in order to avoid the period of salmon and trout spawning.

The ground preparation works (such as soil stripping, hardstand formation) adjacent to the watercourse crossing will be carried out in the same manner as that for other works activities. All clean coarse surface material (gravel, cobbles and boulders) on the riverbed or stream will be removed to a depth of 30cm. Where a depth of 30cm is not present, the full depth of the layer will be removed to where the substrate is mainly clay or sand. These excavated materials will be set back at least 10m from the watercourse and placed on a geotextile base for use in the reinstatement process following the cable installation.

Temporary diversions of the watercourse will be used for open trenching activities. Where sites require to be flumed, the diameter chosen for the flume pipe will accommodate flows at the time with spare capacity to cover that predicted over the period that the works would be expected to last. A clay material will be used around the flume pipe to create a seal. Over-pumping methods will be prohibited unless otherwise agreed with IFI. If over pumping methods are to be used for open trenching, sandbags will be used with an impermeable barrier. This method requires pumping of water from the upstream end of the barrier to an area downstream of the works area, maintaining normal flow in the watercourse either side of the isolated reach. The proposed solutions will be determined during detailed design and in consultation with IFI.

Material excavated from the watercourse (and an upstream pump sump if required) will be placed on terram on level ground as far back from the watercourse edge as is practicable and surrounded on its downslope side by a silt fence to prevent material re-entering the watercourse. This material, if deemed suitable by the EnCoW, can be used to partially backfill the trench. However, a significant amount will be in excess and will be removed from site under licence. Dewatering of the excavation will be treated on site using settlement tanks before the settled water is returned to the watercourse. A second tank in series with the first will be used if the first is not sufficient to remove enough solids. Pumped over water will be directed to a splash plate to prevent erosion of the riverbed at the downstream side.

The surface coarse substrate which was set aside will be used to reinstate the stream bed after the ducts have been installed and the flume pipe has been removed as well as all the damming materials. All surfaces will be reinstated to the satisfaction of the landowner and re-seeded to assist soil stabilisation. A silt fence will be placed along the riverbank where the works were undertaken in order to prevent solids washed off the works area during heavy rainfall from entering the stream while the surface adequately re-vegetates.

Site restoration works will be carried out following completion of any water crossings, in agreement with IFI. These works will include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Significant adverse effects in terms of water depth, velocities and sediment erosion/deposition are therefore not anticipated.

22.7.1.7 HDD Water Crossings

As with all construction works proposed, no drilling works will be allowed to commence until the relevant RAMS and pertinent Health and Safety documents are received from the specialist Contractor and are reviewed and agreed by the Client's Representative. These Contractor documents will include method statements, drilling risk assessments and environmental management plans specific to the area where the drilling is to take place. These plans will be submitted by the Contractor to the Client's Representative on site for review and comment prior to commencing drilling operations.

The specialist drilling team will constantly monitor fluid volume pressure, pH, weight and viscosity during the proposed works. The volume of cuttings produced will also be monitored to ensure that no over cutting takes place and that hole cleaning is maintained. The mud returns will be pumped to the circulation system trailer by a bunded centrifugal pump. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses.

After the initial pilot hole is completed, it will be reused in a number of passes to reach the required bore size to enable the duct lining to be pulled. To ensure that the prevailing geological conditions have suitable cohesion that can maintain the bore during the drilling and reaming process, the specialist drilling team will pay close attention to modelled drag forces during pullback and constantly monitor load stress to ensure that modelled tensile stress, collapse pressures, hoop stress and buckling stress are not exceeded. In addition to the above measures, the rate of drilling progress will be monitored to help identify any voids or changes in strata.

In addition, the Contractor and EnCoW will monitor river/stream flows upstream and downstream of any HDD watercourse crossings by regular visual inspection. The flow monitoring will be undertaken on a daily basis for five working days prior to the HDD, during the directional drilling and for five working days following completion of the HDD. If a noticeable change in flow conditions is observed in the reach where the HDD took place, such as losses from the watercourse to ground, discolouration or collection of debris, investigations will take place to determine the source of issue and this may require consultation with IFI.

22.7.1.8 Monitoring

The appointed Contractor will ensure that all personnel and visitors to site are directed to report visual indications of changes in water quality in any watercourses on site. Ongoing monitoring will be carried out throughout the construction phase of the Proposed Development to ensure that the mitigation measures deployed remain effective.

The EnCoW will undertake regular visual inspection of the watercourses on site. The monitoring records will include the following minimum information:

- Antecedent and current weather conditions;
- Current construction activities near and in particular up-stream or up-gradient of the observation point;
- Visual assessment of water colour, turbidity and flow rate;
- Details on any communication, corrective action and/or mitigation undertaken as a result of water quality issues observed.

Certain construction activities (including HDD, open trench crossings, or wet concrete near watercourses) will be constantly supervised by the EnCoW. Visual monitoring supported by turbidity monitoring of receiving waters will be conducted by the Contractor's EnCoW for the duration of works.

22.7.2 Operational Phase

There are no recommended mitigation and monitoring measures during operation of the Proposed Development to reduce the potential effect with respect to hydrology.

22.8 Archaeology, Architectural Heritage, and Cultural Heritage

22.8.1 Construction Phase

Mitigation will be undertaken within the framework provided by with the *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).

All mitigation will be carried out by a suitably qualified archaeologist under Licence (where required) granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004 (as amended).

Written reports on the results of all mitigation undertaken will be prepared in accordance with the requirements of the Licence(s) granted by the National Monuments Service. The reports be submitted to the planning authority and National Monuments Service.

While the sources identified in Chapter 13 of the EIAR, including the review of the LiDAR data acquired for the Proposed Development, provide a thorough understanding of known assets and the potential for the presence of unknown archaeological remains, archaeological investigations will be implemented post-consent and pre-construction in all off-road sections required for construction, including land required for access tracks, passing bays and joint bays, and HDD and construction compounds to inform the design of mitigation. This will comprise archaeological geophysical survey, archaeological test excavation, palaeoenvironmental assessment, and underwater assessment in areas within the Planning Application Boundary for the Proposed Development to inform the design of archaeological excavation and further underwater surveys, as listed below. Mitigation measures for known archaeology, architectural heritage and cultural heritage that will be undertaken post-consent but in advance of construction comprise the following:

- Topographical survey of upstanding remains of LI_015, LI_027, LI_032 and LI_042;
- A photographic and written record of the elements of GDLs DL_14, DL_15, and DL_17;
- Written, measured and photographic survey will be undertaken for CH_106 prior to its removal. Following construction in this location, the boundary stone will be reinstated in the same location;
- Townland boundary surveys comprising detailed written and photographic survey, and test trenching of TB_01, TB_03, TB_08, TB_09, TB_10, TB_12, TB_13, TB_25, and TB_61;
- Informed by archaeological geophysical survey and archaeological test excavation, archaeological excavation of AY_13, CH_60, CH_66, CH_69, CH_76, CH_81, CH_94, CH_120, CH_121, LI_006, LI_017, LI_026, LI_038, LI_092, LI_096, LI_119, LI_125, LI_143, and LI_156;
- Underwater assessments, comprising wade and metal detecting survey of:
  - WB01 (tributary of the River Tolka);
  - WB02 (Dunboyne Stream);
  - WB06 (Jenkinstown Stream);
  - WB09 (unnamed stream);
  - WB22 (Baltracey River);

  - WB25 (Gollymochy River).

- Archaeological metal detecting survey of the banks of WB03, WB04, WB05, WB07, WB08, WB10, WB12, WB17, WB18, WB19, WB21, WB24, WB26, WB28, WB30, WB32, WB34, WB44 and WB45.

In addition, archaeological geophysical survey and archaeological test excavation will be undertaken post consent but pre-construction in all off-road sections required for construction, including land required for access tracks, passing bays and joint bays, and HDD and construction compounds. This will inform the design of any archaeological excavation required to mitigate the impact on any unknown archaeological remains identified.

The Contractor will allow sufficient time in their programme to allow the mitigation to be completed in the areas in which such mitigation is required.

During construction, the following mitigation will be undertaken:

- Archaeological monitoring of on-road work within the Zones of Notification of Recorded Monuments (AY_02, AY_24, AY_26, AY_51 and AY_58), works located to the east of Jigginstown Castle (AY_39, a National Monument), and for assets CH_64, CH_68, CH_74, CH_92, CH_100, CH_117, CH_118, CH_119, CH_122, LI_001, LI_009, LI_011, LI_032, LI_054, LI_056, LI_065, LI_113, LI_134, LI_145 and LI_158; and

- AH_01, AH_11, AH_12, CH_03, CH_04, CH_06, CH_07, CH_24 and CH_109 will clearly demarcated with temporary fencing within the Planning Application Boundary to avoid accidental damage.

If archaeological remains are identified during the archaeological monitoring, and it is confirmed with the National Monuments Service the preservation in situ is not feasible, archaeological excavation will be undertaken under an excavation licence granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004 (as amended).

22.8.2 Operational Phase

No mitigation measures are required for the operational phase.

22.9 Traffic and Transport

22.9.1 Construction Phase

22.9.1.1 Traffic Management Plan (TMP)

The traffic management measures, which will be required to facilitate the construction phase of the Proposed Development, such as the proposed diversion routes, will be implemented through the adoption of a regulated and approved TMP.

The TMP is provided in Appendix 5.1. It should be noted that the TMP is included in the application and has been considered for the purposes of assessment, but is considered a 'live' document insofar as it is subject to ongoing future refinement by the appointed contractor in collaboration and agreement with the Roads Authorities. However, all such refinement will occur in the requirements of the TMP submitted as part of this application for approval, and therefore the subject of the assessment of the consenting authority.

The appointed contractor will agree temporary traffic measures, and will then adopt and monitor an appropriate way of working, in consultation with Kildare and Meath County Councils, TII and/or their agents, and An Garda Síochána as appropriate. Construction traffic will travel on predefined routes to and from the relevant sites to reduce the effects on local traffic.

The TMP will document measures to help efficiently transport components and materials to site, while reducing congestion and disruption which might impact negatively on local communities or general traffic and, in particular, emergency services.

Signed diversion routes, with final agreement with the Roads Authorities, will be provided to mitigate journey disruption, and to minimise potential driver delay. Where practically achievable, diversion routes will not apply outside of the worksite hours of operation.

During the construction phase, signage will be installed to warn road and recreational route users to the presence of the works access and the associated likely presence of large or slow-moving construction traffic.

To minimise inconvenience to the local community in terms of obstructive parking, adequate car parking for permanent site personnel, visitors and deliveries will be provided within the site compounds. Car parking will not be permitted on any public road network adjacent to the site, to maintain sight lines and minimise the potential for obstruction and delay for other road users.

Furthermore, only vehicles needed for construction will be permitted to attend cable route worksites. Car sharing will be promoted to construction personnel by the contractor during the induction process.

The appointed contractor will nominate a person to be responsible for the coordination of all elements of traffic and transport during the construction process (liaison officer). This person will liaise with the local community and be a direct point of contact within the contractor organisation for the community to contact for information or to discuss the traffic management.

22.9.1.2 Construction Access Arrangements

Transportation, including deliveries to and from the construction areas, will be via the existing public road network. Given the nature of the cable route's construction, there will be multiple worksites along the route throughout the construction programme. The proposed programme of worksite locations will be confirmed by the appointed contractor as an integral part of their adopted TMP. All construction vehicle drivers will be instructed to access their destination worksite via an approved route.

22.9.2 Operational Phase

No mitigation measures are required for the operational phase.

22.10 Agronomy and Equine

22.10.1 Construction Phase

The following mitigation measures will be implemented:

- The appointed contractor will maintain close liaison with local community representatives and landowners to provide them with adequate progress information and advance notice of works. This will facilitate planning the maintenance of access to land to match the needs of the landowner. Scheduling of works will have to be agreed with each landowner to facilitate the operation of the farm and minimise disturbance. Where it is necessary to move livestock along public roads or across the working area this will be facilitated by the appointed contractor;

- Landowners with lands adjoining sites where rock breaking takes place will be notified in advance of these activities;

- Traffic management plans will ensure that farmers and agri-business have adequate access to farmyards and land so that the transport of farm inputs and produce is not significantly affected;

- Mitigation measures for the control of dust as set out in the mitigation measures Section 22.3 (Air Quality) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of water quality and as set out in the mitigation measures Section 22.7 (Hydrology) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of noise and vibration as set out in the mitigation measures Section 22.4 (Noise and Vibration) will be implemented by the appointed contractor;

- The appointed contractor will comply with any regulations pertaining to the control of farm diseases as specified by Department of Agriculture Food and the Marine and will employ reasonable precautions against spreading any such farm disease. The contractor will operate a biosecurity plan where machinery and personnel that are moving between farms will have adequate available disinfection facilities and equipment to ensure that disinfection can take place as required. ESB and/or its appointed contractor will also take due notice and consideration of reasonable concerns expressed by landowners or occupiers prior to entry; and

- Where field boundaries are affected, replanting and fencing will be used to ensure the boundaries are maintained between landowners and within existing field systems. Therefore no permanent restructuring occurs. Hedgerows will be replanted with species-rich varieties and with suitable fit for purpose fencing in-line with Teagasc and DAFM guidelines[163]. However technical considerations may limit planting above the underground cable. Where replanting is not feasible, suitable fit for purpose stockproof fencing will be provided with standard agricultural gates provided where required. Access between landowners will not be provided except where required on the joint bay access tracks (e.g. between Chainage 700 and 3400 – access track to Joint Bays 1-4). Double gates will be provided at field boundaries between landowners on these access tracks. The gates will be locked and maintained by ESB with no access provided to the landowners. Double fencing will be provided between separate landowners for biosecurity between adjoining farms;

- Following the mitigation measures employed for the re instatement of land (bullet points hereunder) the potential long-term (>15 years) damage to soil at the working areas will be reduced to medium-term (7-15 years) and the damage to land and soil at the construction compounds will remain long-term. The contractor will:

    - Maintain pre-entry records;

    - Erect fit for purpose livestock proof fencing to prevent straying livestock;

    - Maintain and repair existing field drainage systems to restore the drainage of land to the condition that prevailed before the proposed works;

    - Store soil separate from the works traffic ensuring minimum amount of damage and disturbance to excavated soil material;

    - Reinstate the land so that it is level and surface is free of stones and weeds; and

    - Treat soil compaction by ripping the soil to the required depth to address such compaction.

[163] https://www.teagasc.ie/media/website/crops/forestry/advice/stockproofhedge.establishment.factsheet_2.pdf

22.10.2 Operational Phase

The following measures will be applied during the operational phase:

- The drainage reinstatement will not impede the drainage of surrounding agricultural lands and where land drains have been intersected or blocked during construction these will be re connected or diverted to a suitable outflow;

- The loss of agricultural land due to the construction of the Proposed Development would be a permanent loss which cannot be mitigated except through compensation. Restriction of Common Agricultural Policy (CAP) payments, farmyard building, commercial forestry and commercial tree planting will be addressed by compensation where applicable; and

- Routine maintenance and inspection of cable infrastructure will where possible be notified in advance to minimise disturbance to livestock and farm enterprises. If faults occur excavation of soil may be required resulting in disturbance and crop loss. The risk of such faults is low and therefore the frequency of this type of disturbance is very low.

22.11 Material Assets

22.11.1 Construction Phase

22.11.1.1 Utilities

The Proposed Development has been designed to avoid or reduce impacts on major infrastructure. This includes the avoidance of interactions with major utility infrastructure as far as possible. Where there are interfaces with existing utility infrastructure, protection in place or diversion as necessary is proposed to prevent long-term interruption to the provision of the affected services (see Chapter 5 for further details). All interfaces will comply with minimum safety clearances and design standards.

All reasonable measures will be taken to avoid unplanned disruptions to any services during the construction phase. Prior to excavation works being commenced, localised confirmatory surveys will be undertaken by the Appointed Contractor to verify the results of pre-construction assessments undertaken. Where works are required in and around known utility infrastructure, precautions will be implemented by the appointed contractor to protect the infrastructure from damage, in accordance with the best practice methodologies and the requirements of the utility companies, where practicable (see Chapter 5 for further details).

Where diversions, or modifications, are required to utility infrastructure, service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. Where this is the case, it will be planned in advance by the appointed contractor. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Any required works will be carefully planned by the appointed contractor to ensure that the duration of interruptions is minimised as far as practicable. Consultation with relevant affected parties will be undertaken prior to any proposed disruptions.

22.11.1.2 Land and Property

Much of the mitigation for potential impacts on land and property has been embedded within the design, by selecting a route which follows public roads for the most part, minimising the requirement for additional lands to be affected. Where private lands will be directly affected, either temporarily during construction or permanently, this will be managed by ESB and their contractor and supported by EirGrid's Agricultural Liaison Officers.

Where there are potential access issues as a result of the Proposed Development, access arrangements to individual properties will be agreed with the affected property holders in advance to reduce the impact. Access arrangements along affected roadways and footpaths will be managed in accordance with applicable traffic management plans and measures outlined in Section 22.9 (Traffic and Transport) and in the CEMP.

Potential impacts to the garden of a residential property on the R125 at approximate chainage 11200 will be mitigated by the use of screens during construction to allow the owner to use their garden. The screens will be within the planning application boundary and be in place for the duration of construction at this location. The affected area will be reinstated to its original condition post-construction. The owner will be consulted on the species for planting. Selected tree species will need to be agreed with ESB to ensure no impacts to the cable. At the detailed design stage the cable route will be re-examined to determine if the garden can be fully avoided.

Potential impacts to the housing development planning application (22314564) (approximate chainage 16250) have been largely mitigated through routing. However, further consultation with the developer and Kildare County Council will be undertaken in so far as possible, to ensure there is no disruption during construction.

During the construction works at the bus stop located on the R403 in Firmount West (approximate chainage 33000), a new temporary bus stop will be provided. Consultations with Kildare County Council, and Bus Éireann, will be undertaken prior to construction to ensure no disruption to bus services.

Along the Sallins Bypass, early notification and signage to show diversions will be used by the Contractor. Local cycling/walking groups and community groups (as well as Cycling Ireland and Kildare County Council) will be directly contacted by the Contractor to inform them of the timing, extent, and duration of any closures and what signed diversion routes will be available. As far as possible the works along the Sallins Bypass will be phased so that the entire length of the cycleway and footpath will not be closed at any one time. The use of the Sallins Link Road at the roundabout on the Sallins Bypass will allow a shorter diversion.

Similarly, potential impacts to the Naas Sports Centre the adjacent car park or recreational facilities (skatepark and playground) have been largely mitigated through routing. Further mitigation will be provided through consultation, early notification of proposed works, and ensuring safe access to the facilities at all times. Daily cleaning of road surfaces in this area and good site management (as described in the CEMP (Appendix 5.4 of the EIAR)), will ensure that the construction activities do not cause unclean or muddy conditions. The affected areas will be reinstated to their current condition post-construction.

The HDD compound on the southern side of the Grand Canal will be located on scrub land. Affected vegetation will be replanted in-line with the planting specification outlined in Section 22.1 above.

Access to properties which are not being directly impacted by land take will be maintained.

22.11.2 Operational Phase

No mitigation measures are required for the operational phase as there are no likely significant effects.

22.12 Landscape and Visual

The primary measure employed in respect of landscape and visual impacts for the Proposed Development was avoidance of impacts through design. The key embedded design measure relevant to landscape and visual, as well as many of the other environmental factors, is to place the underground cable within the existing road bed in order to minimise the amount of vegetation loss (hedgerows and riparian). This has been applied in the design of the Proposed Development in so far as is feasible. Mitigation of effects on landscape and visual receptors is neither possible nor practicable, in some instances. For example, it is not possible to provide landscape mitigation for the loss of land from private properties, or to provide mitigation for the loss of mature trees in the short / medium-term until the proposed replacement planting becomes established.

22.12.1 Construction Phase

Once the construction phase is complete, the road surface / agricultural grassland will be reinstated along the underground cable route for all temporary works areas. Thus, any permanent material surface expression of the underground features will be minimal. In instances where it occurs outside the permanent easement, hedgerows removed for temporary works within the Planning Application Boundary will be replanted with a new species-rich hedgerow which is likely to be more ecologically diverse than what was removed. Where applicable, vegetation removed during the construction phase at Passing Bays will be reinstated along the original alignment and will also be replanted with species-rich hedgerows, albeit within the permanent wayleave no replacement planting will be possible – generally this will be a 5 metre wide gap, except it will be 15 metres wide between chainage 0 (at Woodland substation) and 3400 (where the underground cable meets the R156). Additional specific landscape and visual mitigation measures are not considered necessary during the construction phase as all impacts will be either temporary or short-term and not considered 'significant'.

22.12.2 Operational Phase

Specific additional landscape and visual mitigation and monitoring measures are not considered necessary in relation to the Proposed Development during the operational phase, as there is no potential for significant impacts.

22.13 Risk of Major Accidents and Disasters

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on avoiding or reducing the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Development are attained.

Regulation 15 of the Safety, Health and Welfare at Work (Construction) Regulations places a duty on designers carrying out work related to the design of a project to take account of the 'General Principles of Prevention' as listed in Schedule 3 of the Safety, Health and Welfare at Work Act.

In addition to the duties imposed by Regulation 15 of the Safety, Health and Welfare at Work (Construction) Regulations, designers must comply with Section 17(2) of the Safety, Health and Welfare at Work Act which requires persons who design a project for construction work to ensure, so far as is reasonably practicable, that the project is designed and is capable of being constructed to be safe and without risk to health, can be maintained safely and without risk to health during use, and complies in all respects, as appropriate, with other relevant legislation. This includes S.I. No. 138/2012 - Building Regulations (Part A Amendment) Regulations 2012 and, if the works being designed are intended for use as a workplace, the relevant parts of the Safety, Health and Welfare at Work (General Application) Regulations.

The design of the Proposed Development incorporates mitigation measures that have been embedded into the design of the Proposed Development elements or which have been specified as part of the EIAR.

22.13.1 Construction Environmental Management Plan (CEMP)

A CEMP has been prepared to ensure that the proposed construction works can be undertaken in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to the construction works of this nature. The CEMP is included as Appendix 5.4 of the EIAR. The CEMP will be updated by the appointed contractor to set out how environmental protection will be achieved during the construction phase of the Proposed Development. As set out below, the CEMP is a key contract document and the appointed contractor will be legally/contractually obliged to implement it in full.

The CEMP summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of the Proposed Development and must be read in conjunction with the construction details outlined in Chapter 5 of the EIAR.

The CEMP will be a live document which will be updated post-consent as it will include method statements and work programmes that provide more detailed phasing of work based on the methodologies described in Chapter 5 (Proposed Development Description) and the mitigation measures set out in the EIAR, in addition to any relevant conditions contained in the planning consent. The Principal Contractor will develop a series of detailed plans for the construction of the Proposed Development in accordance with the parameters set out in the CEMP. This will include the following:

- Traffic Management Plan;
- Construction Resources Waste Management Plan; and
- Emergency Response Plan.

22.13.2 Construction Resources Waste Management Plan (CRWMP)

Construction Resource Waste Management Plan forms part of the CEMP, to ensure that waste arising during the construction phase of the Proposed Development will be managed and disposed of in a way that ensures compliance with the provisions of Number 10 of 1996 – Waste Management Act, 1996, as amended.

22.13.3 Traffic Management Plan (TMP)

The risk of Major Accidents and Natural Disasters resulting from a road traffic accident associated with the Proposed Development will be reduced by the development and implementation of a Traffic Management Plan (TMP) as described in Section 22.9 (Traffic and Transport). The Traffic Management Plan TMP has been prepared to demonstrate the manner in which the interface between the public and construction-related traffic will be managed and how vehicular movement will be controlled. It will be a condition of the employer's requirements that the successful contractor, prior to commencement of works, must detail in the TMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in the EIAR and any additional measures required pursuant to conditions in any grant of approval from An Bord Pleanála. The commitments included within the EIAR are the minimum commitments that the Principal Contractor will follow, and others may be developed during the construction phase in consultation with the various stakeholders, including the local authorities. Further details on the assessment of construction traffic, and traffic related mitigation measures are provided in 22.9 (Traffic and Transport)

22.13.4 Environmental Incident Response Plan (EIRP)

An Environmental Incident Response Plan has been developed as part of the CEMP.

The Environmental Incident Response Plan demonstrates how, in the unlikely event of an incident, response efforts will take place promptly, efficiently, and suitably for the particular circumstances and includes the following:

- Environmental Emergency response procedures;
- List of emergency contact details;
- Records and sharing of records with prescribed bodies;
- Training; and

- Details (locations, number and type) of emergency response equipment maintained on site.

The CEMP details procedures that will be followed in the event of a significant release of sediment into a watercourse, or a significant spillage of chemical, fuel or other hazardous substances (e.g. concrete), a non-compliance incident with any permit or licence, or other such risks that could lead to a major pollution incident, including flooding.

The CEMP will ensure that all mitigation measures and monitoring requirements are carried out, ensuring that risk does not increase over time on the site.

22.14 Waste

22.14.1 Construction Phase

A Construction Resource Waste Management Plan (CRWMP – Appendix 5.5) is included for the Proposed Development. The appointed contractor(s) will be responsible for reviewing and updating the CRWMP prior to commencement of construction and in periodically reviewing and updating as necessary throughout the construction phase.

The CRWMP outlines how waste arising during the construction phase of the Proposed Development will be managed in a way that ensures compliance with the provisions of the Waste Management Act 1996 (as amended) and in-line with EPA guidelines.

All operations will be managed and programmed in such a manner as to prevent / minimise waste production. All waste material will be managed in accordance with the waste hierarchy, with an emphasis on reuse, recycling and recovery of material over disposal where feasible.

To minimise the creation of waste, opportunities for reuse of excavated material within the Proposed Development (e.g. as fill) will be sought in agreement with the planning authorities. Where there is no reuse potential within the Proposed Development of such material, either due to the material being unsuitable or due to the quantity being in excess of requirements, the potential for reuse as a by-product in accordance with Article 27 will be investigated by the appointed contractor(s). Where this option is technically / economically feasible, the appointed contractor(s) will be responsible for generating the EPA Article 27 notification and the associated requirements. Any material which is to be managed as a by-product will be appropriately stored on-site and will be kept separate from any waste storage to avoid cross contamination.

Where waste is created it shall be managed on site in accordance with best practice and applicable waste legislation as follows:

- Waste excavated material will be appropriately stockpiled;
- Waste will be segregated at source to prevent cross contamination;
- Where relevant (e.g., excavated fill material), wastes will be sampled and tested to allow classification prior to disposal;
- Waste receptacles will be appropriate to the waste streams using them, and covered or netted including while in transit, where practicable to prevent wind-blown debris emanating from them;
- Any hazardous wastes will be stored in segregated waste containers which are appropriately labelled;
- All waste will be collected by a suitable contractor in possession of a valid and appropriate Waste Collection Permit, and will only be transported to suitably licensed or permitted waste facilities (i.e., facilities in possession of a valid EPA Licence, Waste Facility Permit or Certificate of Registration);

- Regular site inspections and cleaning will minimise the potential for litter in the surrounding area;
- Waste records will be maintained throughout the construction and operational phases of the Proposed Development; and
- Waste auditing against the CRWMP will be carried out.

The quantity and type of waste and materials leaving the Proposed Development site during the construction phase will be recorded by the appointed contractor(s). The name, address and authorisation details of all facilities and locations which waste, and materials will be delivered to will be recorded along with the quantity sent to each facility. Records will show which material is reused, which is recycled, and which is disposed of.

Any off-site interim storage or waste management facilities for excavated material will have the appropriate EPA Licence, Waste Facility Permit or Certificate of Registration, as appropriate, in place.

Excavated materials from within roadways (e.g. capping, subbase and bituminous materials) will be reused or recycled in line with TII specifications where reasonably practicable:

- Capping, subbase, bituminous and concrete materials could be reused or recycled in fill and capping materials providing they comply with the Specification for Road Works Series 600 – Earthworks (CC-SPW-00600) (TII 2013a);
- Subbase, bituminous and concrete materials could be reused or recycled in subbase or base materials providing they comply with the Specification for Road Works Series 800 – Unbound and Cement Bound Mixtures (CC-SPW-00800) (TII 2013b); and
- Subbase and bituminous materials could be recycled in base or binder materials providing they comply with Road Pavements – Bituminous Materials (CC-SPW-00900) (TII 2015).

With respect to the potential to encounter coal tar within road planings, the contractor will test road planings for the presence of coal tar to ensure accurate classification of all arisings prior to disposal, thus minimising the quantity being disposed of as hazardous waste. Furthermore, the contractor will seek recycling options for any coal tar to divert it from landfill. Any other hazardous waste generated during the construction or operational phase of the Proposed Development will be collected and managed by contractors in possession of a suitable Waste Collection Permit and will be disposed of at a suitably licensed hazardous waste facility, in-line with the procedures outlined in the CRWMP (Appendix 5.5 of the EIAR).

The Proposed Development has been designed to minimise the quantities of construction materials required as far as reasonably practicable. Consideration will be given by the appointed contractor(s) to the sustainability of material being sourced for the construction of the Proposed Development. As far as is reasonably practicable, materials required for the construction of the Proposed Development will be sourced locally to reduce the amount of travelling required to get the material to the site. Key issues to be considered when sourcing materials for the construction phase will include the source, the material specification, production and transport costs, and the availability of the material. For quarried material, only quarries which are included in local authority quarry registers will be used by the appointed contractor to source any quarried material.

Construction materials will be managed on-site by the appointed contractor(s) in such a way to prevent overordering and to reduce the quantity of potential waste. Materials will be stored in appropriate storage areas or receptacles to reduce the potential for damage requiring replacement. 'Just-In-Time' ordering principles will be implemented by the appointed contractor(s), where practicable, to reduce the potential for over-ordering.

22.14.2 Operational Phase

As there are no anticipated significant operational phase impacts, no additional mitigation or monitoring measures are considered necessary. Waste will be managed during the operational phase in line with ESB waste management plans and procedures.

22.15 Climate

22.15.1 Construction Phase

Given the sensitivity of the global atmosphere to GHG emissions and the importance of reducing GHG emissions to meet GHG reduction targets on a trajectory towards net zero, mitigation measures are proposed to reduce emissions as far as practicable.

EirGrid has developed the 'Shaping Our Electricity Future' Roadmap, which was updated in July 2023 to align with CAP23[15] and the carbon budget programme. EirGrid has committed to, and will, publicly report on their sustainability performance in relation to the following targets:

- Reduce absolute Scope 1 and 2 GHG emissions by 50%;
- Reduce Scope 3 GHG emissions related to dispatch of electricity generation by 35% per megawatt hour within the same timeframe; and
- Reduce all other absolute Scope 3 GHG emissions by 30% by 2030, using 2019 as a base year.

The following good practice measures will be implemented to reduce GHG emissions during the construction phase of the Proposed Development:

- Investigating and implementing sustainable reuse of any materials won from excavation;
- The reuse, where possible of materials and waste generated from construction works;
- Procuring locally sourced materials where reasonably practicable to reduce transportation emissions;
- Careful consideration of material quantity requirements to avoid over-ordering and generation of waste materials, while also reducing transportation-related emissions; and
- The appointed contractor to develop and implement a plan to reduce energy consumption and GHG emissions throughout construction, including, for example:
    - Monitoring of fuel and mains electricity use on site (site accommodation to have motion activated lighting and use lower power lighting techniques such as LEDs);
    - Training of plant operatives in fuel efficient driving techniques or use of appropriate technology on construction vehicles (e.g. stop – start); and
    - Consideration of renewable/ and or low carbon energy sources to power construction compounds.

22.15.2 Operational Phase

The following measures will be implemented to reduce GHG emissions during the operational phase of the Proposed Development:

- Use of locally sourced, low carbon materials where practicable for asset replacements; and

- Regular planned preventative maintenance checks to optimise operational efficiency.

One of the primary objectives of the Proposed Development is to facilitate the transmission of energy derived from renewable sources. The extent of the renewable electricity distribution that will be facilitated by the Proposed Development is still to be determined. However, EirGrid are committed to increasing the distribution of energy from renewable sources, and through facilitating this, GHG emissions owing to the Proposed Development will be offset over time.

22.16 Cumulative Impacts and Environmental Interactions

The following mitigation measures will be implemented in the event that construction phases for the Proposed Development and the CP1021 East Meath – North Dublin Grid Upgrade occur at the same time, due to the spatial overlap between the two developments in the 'Woodland Corridor', (refer to Figure 21.2 in Volume 3 of this EIAR), which extends from Woodland Substation southwards to the R156 Regional Road:

- Air Quality: Liaison meetings with the CP1021 construction management team / appointed contractor will be held to ensure plans in the Woodland Corridor are coordinated, in order to reduce cumulative dust and particulate matter emissions. As part of this liaison process, the appointed contractors will be required to determine the interactions of the offsite transport / deliveries which might be using the same strategic road network routes;

- Hydrology: Given the proximity of the two development crossings of the Dunboyne Stream_010 water body, coordination of the construction programmes for the two developments will be required between the respective appointed contractors to ensure that, where possible, works to cross the water body are undertaken at the same time, and as such, minimising disruption;

- Traffic: Coordination of the construction programmes for the two developments will be required to ensure that there are no conflicting road closures from either development at the same time;

- Traffic: Cumulative construction traffic will also be timed to avoid peaks in construction programmes, where possible; and

- Material Assets: Coordination / consultation between the appointed contractors for the two developments will be required in the event that there are overlapping works within the Woodland Corridor area. Any future utility work identified as being required during the construction phase will be undertaken in consultation with the relevant utility companies.

23. Summary of Significant Residual Effects

23.1 Introduction

This chapter summarises the significant residual effects, which will result from the construction and operational phases of the Proposed Development). Please refer to Chapter 7 to Chapter 21 of this Environmental Impact Assessment Report (EIAR) for the full impact assessments.

Residual effects are the effects which occur after the proposed mitigation measures have been implemented. They refer to the degree of change that will occur after the proposed mitigation measures have taken effect.

Table 23.1 presents the residual impact significance, following the implementation of mitigation as set out in Chapter 7 to Chapter 21 of the EIAR, and as summarised in Chapter 22 (Summary of Mitigation Measures).

The terminology used in this chapter to describe the residual impact significance reflects the assessment terminology and guidelines used within Chapter 7 to Chapter 21 of the EIAR. While the terminology in the Environmental Protection Agency's (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022) is predominantly used, some chapters use discipline specific guidelines, and this terminology is presented within this summary chapter to maintain consistency with the assessments undertaken in Chapter 7 to Chapter 21.

Table 23.1: Summary of Significant Residual Effects from the Construction and Operational Phases of the Proposed Development

Environmental Aspect / Chapter	Significant Residual Effects Post-Mitigation (Yes/No)	Residual Effect Significance
Population and Human Health	No	With mitigation, there will be no significant adverse residual effects .
Air Quality	No	With mitigation, there will be no significant adverse residual effects.
Noise and Vibration	No	With mitigation, there will be no significant adverse residual effects.
Biodiversity	Yes	The loss of trees, hedgerows and treelines will be significant at Local and County level. While trees, hedgerows and treelines will be planted, they will take time to establish and reach maturation.
Soils, Geology and Hydrogeology	No	With mitigation, there will be no significant adverse residual effects.
Hydrology	No	With mitigation, there will be no significant adverse residual effects.
Archaeology, Architectural Heritage, and Cultural Heritage	No	With mitigation, there will be no significant adverse residual effects.
Traffic and Transport	Yes	During construction, a diversion on a 4km section of the 53km cable route will result in a long diversion for HGVs for seven working days (cars and vans will not be diverted). The effects will be Moderate, Adverse, Temporary. There will be no significant permanent adverse residual effects.
Agronomy and Equine	No	With mitigation, there will be no significant adverse residual effects.
Material Assets	Yes	There will be a temporary significant effect to one residential garden because of the cable route. There will also be a moderate effect because of temporary diversion required on the Sallins Bypass footpath and cycleway. With mitigation, there will be no significant permanent adverse residual effects.
Landscape and Visual	No	With mitigation, there will be no significant adverse residual effects.
Risk of Major Accidents and Disasters	No	With mitigation, there will be no significant adverse residual effects.
Waste	No	With mitigation, there will be no significant adverse effects residual.
Climate	No	With mitigation, there will be no significant adverse residual effects.
Cumulative Impacts and Environmental Interactions	No	With mitigation, there will be no significant adverse residual effects.

23.2 Conclusions

The need for the Kildare-Meath Grid Upgrade Project was established first at Step 1 in 2017 by EirGrid and it has been reconfirmed at each step of the project. The Kildare-Meath Grid Upgrade Project is required because:

1. Increased demand on East coast – An increase in electricity demand as part of natural growth is expected. In addition, there is a demand increase in the order of 1200 MW due to the planned connection of high energy users. This is based on executed and offered connection agreements mostly in the counties Kildare, Meath and Dublin. Part of this demand started to connect to the system in 2017 and is ramping up to the total demand figure in 2030. The interest is high and it is expected that this trend will continue with further requests for connection.

2. Integration of generation from the South and South West regions – Significant levels of new renewable generation have connected or are in the process of connecting to the transmission and distribution system in the south and south west of Ireland. This is also where the newer and more cost effective existing conventional generation units are located. This results in a scenario whereby a significant portion of the generation sources are located in the south and south west of Ireland away from the main demand centres within the Dublin and Greater Dublin Area, and East region in general. The power produced will hence have to be transported to get to where it is needed (known as demand centres).

EirGrid has identified that the Proposed Development will have the following benefits:

- Community – Deliver community benefit in the areas that facilitate the project infrastructure;
- Competition – Apply downward pressure on the cost of electricity;
- Sustainability – Help facilitate Ireland's transition to a low carbon energy future;
- Security of Supply – Improve electricity supply for Ireland's electricity consumers; and
- Economic – Contribute to the regional economy and support foreign direct investment.

The Proposed Development will create a new circuit in the electricity transmission network and will enhance the network in the area and provide capacity to connect new demand for electricity to support economic growth in the area and to connect new renewable generation to help with meeting national Climate Action Plan targets.

The Proposed Development facilitates the delivery of national energy policy outlined in the National Planning Framework; sustainability, security of supply, and competitiveness, and aids in moving Ireland towards a low carbon, climate resilient society. It also delivers on the National Development Plan through the delivery of an expanded and strengthened electricity network. In terms of the Climate Action and Low Carbon Development (Amendment) Act 2021 and Climate Action Plan 2023 and 2024, the Proposed Development helps climate action via strengthening of the electricity grid and allowing the supply of more renewable energy.

The Proposed Development complies with the polices within the Meath and Kildare County Development Plans and Local Area Plans. Both County Development Plans identify the clear need for improved energy grid infrastructure alongside new development, and outline policies that facilitate grid infrastructure improvements.

The Proposed Development is considered to be entirely in compliance with national, regional and local planning policy, and with the principles of proper planning and sustainable development for the areas.

The selection of Proposed Development as an underground cable and the routing of the cable route has been informed by ongoing discussions with the affected landowners, months of public consultations, and multiple meetings with Meath and Kildare County Councils, TII, Irish Rail, Waterways Ireland, and other stakeholders. The location of the Proposed Development has been informed by the Routing Principles, set out at Step 4 of the EirGrid's Grid Development Framework, and, the Project Team has accommodated feedback into the routing the cable route and other aspects of the project, as far as possible.

With mitigation measures, the majority of potential of environmental impacts will be avoided or will be not significant. After mitigation measures there will be four significant effects from the Proposed Development:

- Traffic – temporary significant effect because of a diversion during construction. Traffic disruption on a 4 km section (out of a total cable length of 52.9 km) on the R156 in County Meath has been assessed to be significant. A 27.4 km diversion will be in place for seven working days for HGVs. It will be signposted from the affected regional road to an alternative regional road. Smaller vehicles such as cars will be able to pass the works in this section and would not be required to use the diversion;

- Material Assets – temporary significant effect because the cable construction in a garden. There will be a temporary significant effect to one residential garden because of the cable route. There will be no significant permanent adverse effects;

- Material Assets – temporary significant effect because of a footpath and cycleway diversion during construction. There will be a temporary significant effect because of the temporary diversion required on the Sallins Bypass footpath and cycleway. There will be no significant permanent adverse effects; and

- Biodiversity – loss of trees, hedgerows and treelines. The loss of mature trees will be significant because of the time it will take for these trees to be replaced. Additionally, because of the nature of some of the works, replacement planting will not be possible at all areas directly affected. For instance, on permanent access tracks or joint bays and their associated hardstanding areas. EirGrid has committed to planting more trees than are cut down for the Proposed Development.