CLIENT:	COOLPOWRA FLEX GEN LIMITED
PROJECT NAME:	COOLPOWRA
PROJECT DETAILS:	PROPOSED DEVELOPMENT OF A RESERVE GAS-FIRED GENERATOR, ENERGY STORAGE SYSTEM FACILITY AND GIS SUBSTATION IN THE TOWNLANDS OF COOLPOWRA, COOLDORRAGHA, COOLNAGEERAGH BALLYNAHESKERAGH, GORTLUSKY, AND SHEEAUNRUSH, CO GALWAY
DOCUMENT:	ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) (VOLUME 2)

DATE	JUNE 2024
PROJECT REF.	SEP-0398

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1 INTRODUCTION

This Environmental Impact Assessment Report (EIAR) has been prepared by Halston Environmental & Planning Limited (Halston) on behalf of Coolpowra Flex Gen Limited. (CPFL) to support applications for planning permission for the development of grid-connected energy support projects on lands with an area (redline boundary) of 42.3 hectares (ha) (105 acres) in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway.

The overall development is comprised of three individual projects. These are:

- Project 1: Reserve Gas-Fired Generator,
- Project 2: Energy Storage System (ESS), and
- Project 3: Gas Insulated Switchgear (GIS) Electricity Substation.

The projects have been determined by the planning authorities (An Bord Pleanála and Galway County Council) as being distinct in the context of applying for, and obtaining, valid planning consents under the Planning and Development Act 2000, as amended, (*"the Act").*

The initial EIA Directive of 1985 and its three amendments were codified by Directive 2011/92/EU of 13 December 2011. Directive 2011/92/EU was amended in 2014 by Directive 2014/52/EU. Together these comprise the EIA Directive. The EIA Directive aims to ensure a high level of protection for the environment and human health. It requires that an assessment of the likely significant effects a project will have on the environment is carried out, where relevant, before development consent is given. The EIA Directive is transposed into Irish legislation by the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001 (as amended). Both the EIA Directive and Irish legislation set out in detail the entire EIA process.

This Environmental Impact Assessment Report (EIAR) is prepared in compliance with the EU Environmental Impact Assessment (EIA) Directive 2011/92/EU, as amended by EIA Directive 2014/52/EU, and the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018. This report is intended to inform the evaluation of the Application and to provide the planning authority with the necessary environmental information that must be considered when making a decision on the Application.

Whilst EIAR is mandatory only in the case of the Project 1, given the scale nature and the proximity of the projects to each other, a single Environmental Impact Assessment Report

(EIAR) has been prepared for all projects proposed as part of the development. The potential environmental impacts from each project are assessed individually and cumulatively (with each other and with any other identified projects) within this EIAR. The planning and development regulatory framework is presented in Section 1.3 of the EIAR

1.1 APPLICANT COMPANY

The Applicant Company, Coolpowra Flex Gen Limited, is part of the Lumcloon Energy Limited (LEL) group of companies which was established in November 2008 as a project development company focused on flexible power and energy assets. The company is based in Tullamore, Co. Offaly. At an early stage, LEL identified flexibility as a key component to address the changing needs of the evolving power systems which are transitioning from fossil-based generation to renewable-based generation. Since its inception, LEL has focused on the development of flexible generation and energy storage systems in Ireland plant to compliment the integration of renewable energy sources and assist to assist the transition to a decarbonised power source. LEL has developed a large portfolio of flexible generation and energy storage system facilities and is a founding member of the Irish Energy Storage Association (IESA), which was established to promote the benefits of energy storage in Ireland.

1.2 SUMMARY DESCRIPTION OF THE PROPOSED DEVELOPMENT

In the recent Ten-Year Generation Capacity Statement 2023-2032 published in January 2024, EirGrid and Soni predicts a challenging outlook for Ireland with capacity deficits identified during the 10 years to 2032. The deficits will increase up to 2025 due to the deteriorating availability of power plants, resulting in their unavailability ahead of intended retirement dates as well as increasing electricity demand. The analysis for Ireland shows that further new electricity generation will be required to secure the transition to high levels of renewable electricity over the coming decades. Furthermore, by 2030, there will be a significant increase in electricity demand due to the electrification of the heat and transport sectors. This is in line with government targets set out in the Climate Action Plan 2024. The transition towards electrification in these sectors is a critical component of Ireland's strategy to reduce carbon emissions and achieve its climate goals.

In February 2022 the European Commission included gas under the transitional activity category of the Taxonomy Regulation to *"allow us to accelerate the shift from more polluting activities, such as coal generation, towards a climate-neutral future, mostly based on renewable energy sources."* To achieve a balanced portfolio of new capacity, it is essential to include cleaner conventional gas-fired generation plant that are renewable gas-ready along with energy storage technologies which can provide balancing services.

As storage technologies continue to mature, and their costs continue to fall, they will be increasingly deployed as a flexible asset to support national decarbonisation goals. In June 2021, Baringa published *'Endgame – A zero-carbon electricity plan for Ireland'*[1], which projects up to 1,700 MW of large-scale battery storage will be needed on an all-island basis to meet 2030 RES-E targets and deliver a zero-carbon power system. According to Energy Storage Ireland, there is currently 700MW of battery storage now operational on the island of Ireland.

The proposed development is crucial in managing the impact on the power grid and handling the hourly and seasonal variations when wind and solar generation are insufficient whilst keeping the grid stable and reliable in the face of growing demand. It not only supports the immediate energy needs but also plays a vital role in ensuring Ireland meets its carbon budgets from now until 2040. This approach positions the electricity sector to progress towards achieving the zero net carbon target and climate neutrality by 2050.

Owing to the technologies proposed and operating profiles, the carbon footprint of the development proposal is minimal when compared with existing diesel-fired generators (temporary emergency generators (TEG)[2] and peaking stations), the recently retired peat-fired power stations and the Moneypoint coal-fired power station. The proposed development is designed to operate during peak demand periods, and rather than serving the system as a baseload conventional combined cycle power turbine (CCGT) plant, the proposed development will support the generation network which is increasingly centred on renewable energy.

A summary description of the projects within the proposed development and considered within this EIAR is outlined below.

1.2.1 PROJECT 1: RESERVE GAS-FIRED GENERATOR

The Reserve Gas Fired Generator comprises three open cycle gas-fired generator (OCGT) units positioned within a building (OCGT Hall) along with auxiliary equipment. An OCGT unit consists of a turbine connected to an electric power generator and the three turbines are designed to operate independently of each other. The OCGT units will receive natural gas from the gas network via an underground pipeline to an Above Ground Installation (AGI) compound within the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI.

[1] https://windenergyireland.com/images/files/20210629-baringa-endgame-final-version.pdf
[2] Development (Emergency Electricity Generation) Act, 2022.

The proposed OCGT units are dual fuel units as required by system requirements required by the Grid Code published by Eirgrid. Natural gas will be the primary and combustion fuel to each of the OCGT units when operating. Secondary fuel (gas oil) will be stored in a bunded structure outside the OCGT building along with ancillary items of electrical plant and machinery such as coolers and transformers.

The Reserve Gas-Fired Generator is designed to operate intermittently and provide generation capacity during periods of high demand or when renewable energy generators cannot meet system demand. OCGT units are advantageous due to their operational flexibility and can be turned on quickly to match system demand. The selected OCGT units are capable of being converted to allow for the combustion of biomethane and /or a blend of natural gas with green hydrogen (>30%), which will further assist in meeting climate-neutral targets.

1.2.2 PROJECT 2: ENERGY STORAGE SYSTEM (ESS)

The Energy Storage System (ESS) facility comprises (a) a Long Duration Energy Storage (LDES) static battery positioned within a secure outdoor compound, and (b) a Synchronous Condenser which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid. The project is designed to complement and support the reserve gas fired generator by providing zero carbon, instantaneous and balancing power to the grid.

1.2.2.1 Long Duration Energy Storage (LDES)

Battery storage is a technology that enables power system operators and utilities to store energy for later use. A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed. A BESS facility is made up of batteries, a battery management system, a power conditioning system, and an energy management system.

The plant will absorb and inject energy as demanded by the power system. Therefore, it should be distinguished that grid-connected BESS plants do not operate continuously like conventional power fossil fuel power plants. BESS plants are designed to economically and rapidly provide arbitrage and system support services when needed, allowing immediate system recovery.

1.2.2.2 Synchronous Condenser

Synchronous condenser technology has been around since the mid 1900's and is demonstrated and mature technology having been formerly used by utilities worldwide. The rotating generator is connected to the transmission system via a step-up transformer. The synchronous condenser is started up and stopped by a frequency controlled electric motor (pony motor). An inverter (static start device / startup frequency converter) is used to drive the generator to reach the operating speed and synchronises it with the system frequency. Once synchronised it acts as a motor providing reactive and short circuit power to the electricity network. There is no combustion or emissions from a synchronous condenser. The synchronous condenser will provide short-circuit power, inertia, and reactive power for dynamic loads and stabilise the network through voltage recovery during faults.

1.2.3 PROJECT 3: GAS INSULATED SWITCHGEAR (GIS) ELECTRICITY SUBSTATION

The Gas Insulated Switchgear (GIS) Electricity Substation comprises a two-storey building positioned and secured within a palisade fenced compound. This component of the overall development will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of Project 1 and Project 2 to the electricity transmission network. The High Volage (HV) lines and electric plant associated with Reserve Gas Fired Generator and ESS facility, and which will connect the projects to the GIS substation, are included with the planning application for Project 3.

1.3 PLANNING AND DEVELOPMENT REGULATORY FRAMEWORK

Each of the three projects proposed as part of development at the subject site require separate planning applications.

The Reserve Gas-Fired Generator (Project 1) falls within the remit of Section 37A of the Act. Following consultations with An Bord Pleanála ("the Board" or "ABP") under Section 37B of the Act, the Board determined that the project falls with the scope of paragraphs 37(A)(2)(a) and (b) of the Act. Accordingly, the Board decided that the proposed development would be strategic infrastructure within the meaning of Section 37A of the Act and any application for permission for the project must be made directly to the Board under Section 37E of the Act.

The applicant was advised that the Energy Storage System (ESS) facility (Project 2) does not fall within the scope of Section 37A of the Act and that planning consent be sought from Galway County Council under Section 34 of the Act. A preplanning meeting was also held with Galway County Council and the proposed approach was also discussed and agreed (Galway County Council Ref. 24PP51).

Preapplication SID consultation was undertaken with ABP regarding the GIS Electricity Substation (Project 3) proposal. The Board decided that Project 3 falls within the remit of Section 182A of the Act and would be strategic infrastructure within the meaning of Section 182A of the Act and any application for permission for the project must be made directly to the Board under Section 37E of the Act. The HV lines and electric plant associated with Reserve Gas Fired Generator and ESS facility, and which will connect these projects to the GIS substation, are included with the planning application for Project 3.

Therefore, two separate planning applications are being lodged with Board (as SID development) and one planning application is being lodged with Galway County Council. The redline boundary for the three projects is the same so that common infrastructure (such as roads) and cumulative design aspects can be appropriately considered. The proposed site layout drawing (Halston Ref. CPA-HAL-MP-XX-DR-PL-1000) showing all three projects as part of the proposed development is presented in Figure 1.1 and Figure 1.2. This information was used to inform the Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) processes.

The underground gas connection is not being applied for in the planning applications for the Proposed Development (as it will be applied for by Gas Networks Ireland (GNI) under separate consenting processes). However, the proposed underground natural gas pipeline, which will serve Project 1 is assessed with this EIAR. It is proposed that a gas transmission network will be extended by up to 25km south-west from its extant location to the north to the townland of Ballynaheskeragh at the proposed development site. GNI, as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI. The work by GNI is ongoing and includes selection of the preferred route. Therefore, for the purposes of the assessment of all aspects of the project, three indicative gas pipeline routes were selected and assessed as part of EIA works and these are shown in Figure 1.3, but may be subject to change as part of the detailed design process to be carried out.

Figure 1.1 Masterplan Layout (Halston Drawing Ref CPA-HAL-MP-XX-DR-PL-1000)

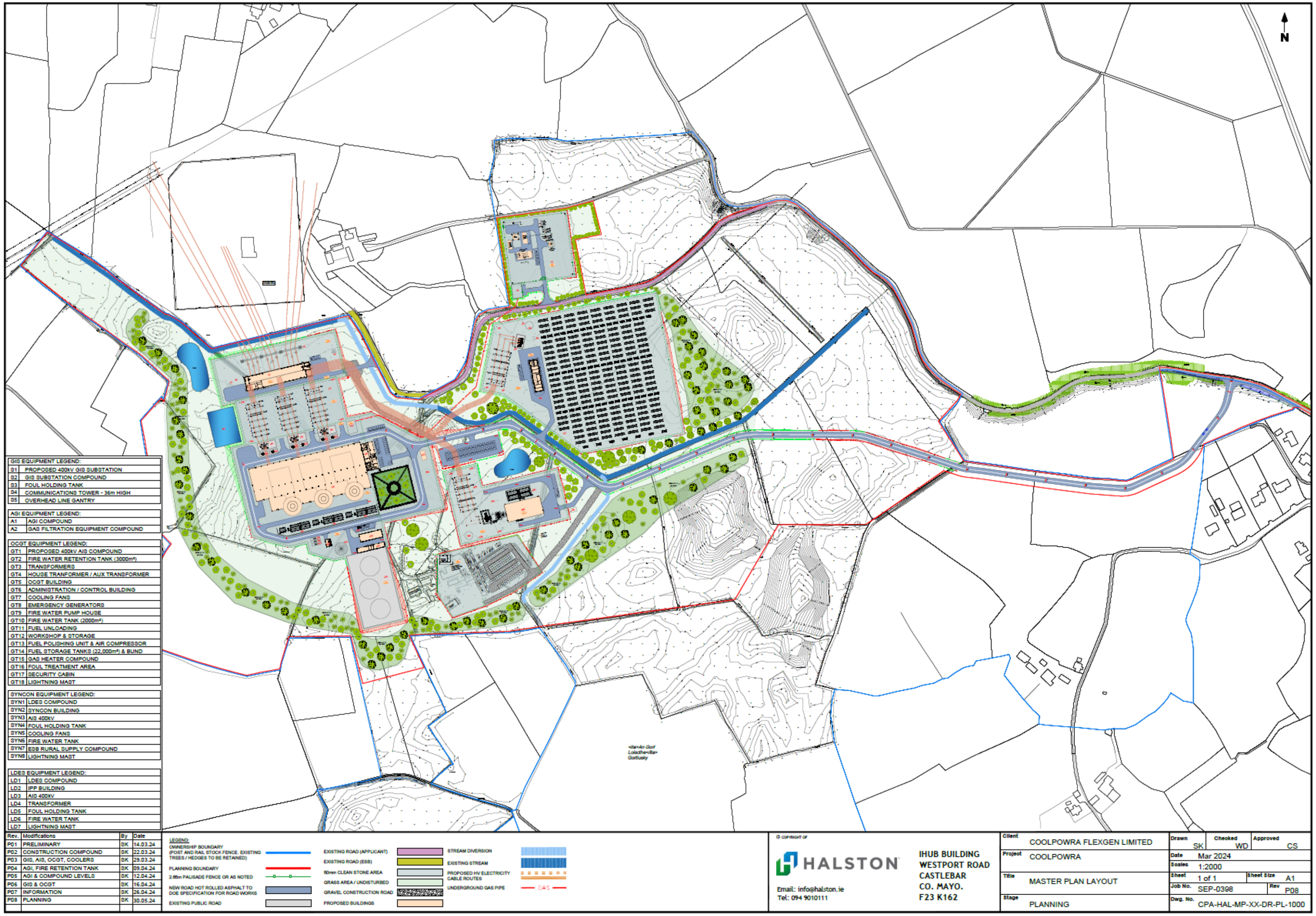


Figure 1.2 Masterplan Layout with Landscape Plan

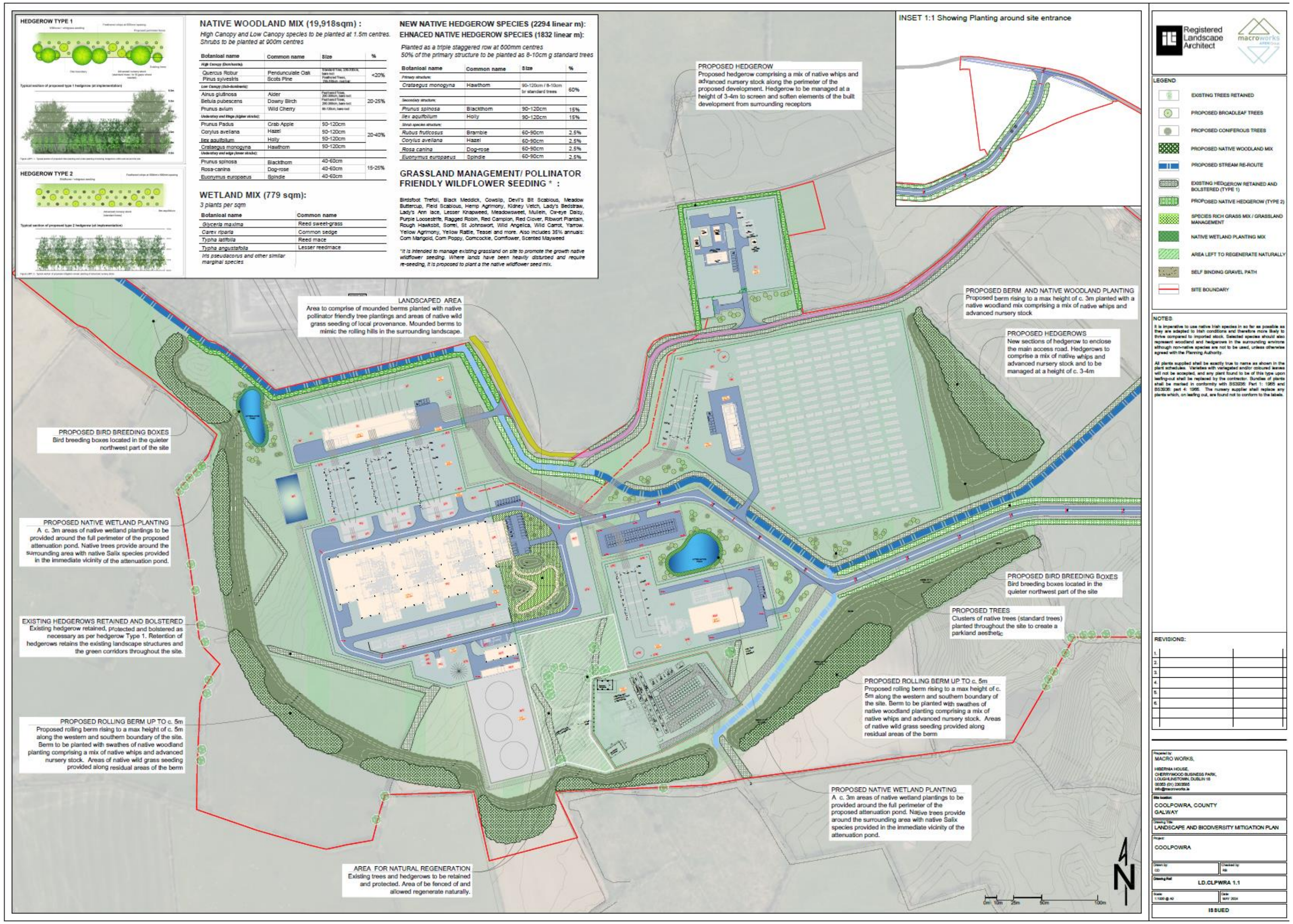
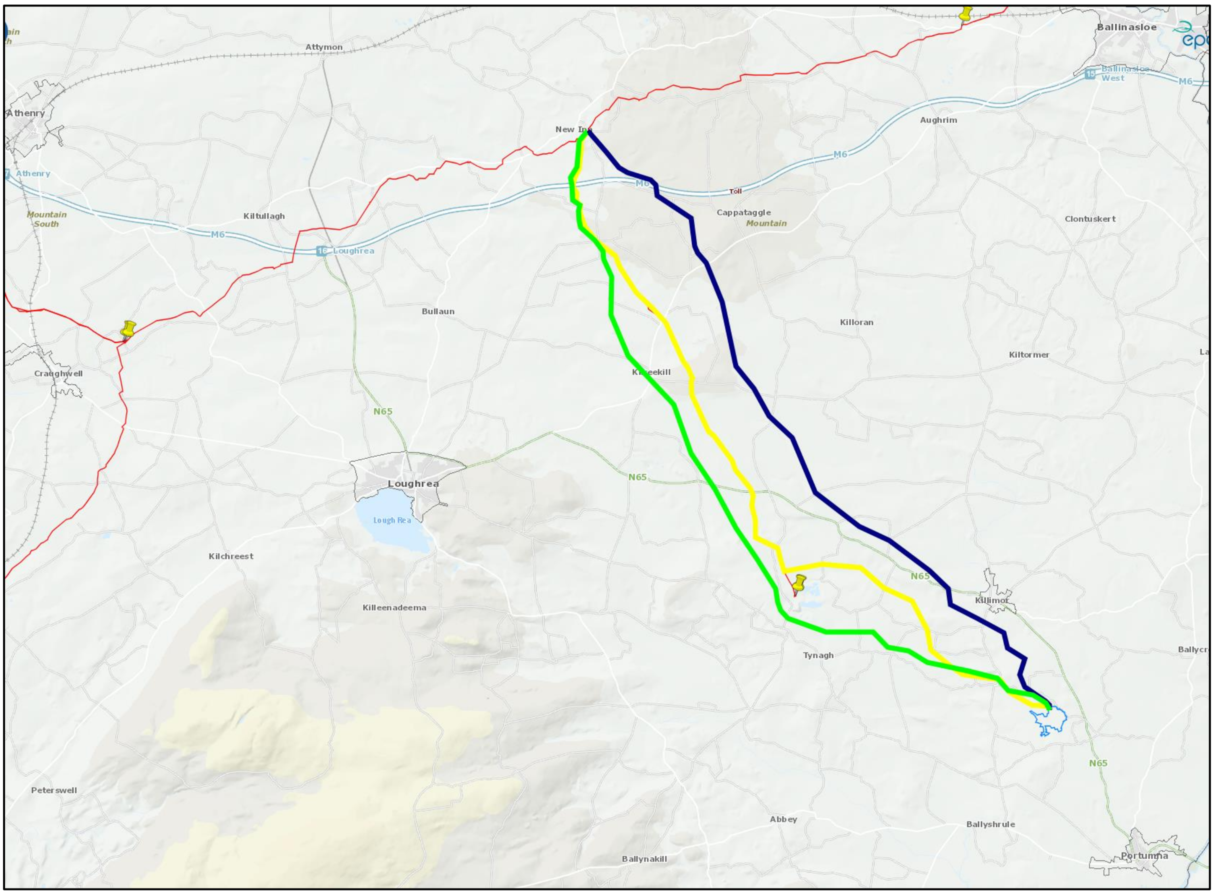


Figure 1.3 Indicative Gas Pipelines Routes



1.3.1 REQUIREMENT FOR ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

In Irish legislation, Section 172 of the Act establishes the requirement for an Environmental Impact Assessment (EIA), stating that:

"An environmental impact assessment shall be carried out by the planning authority or the Board, as the case may be, in respect of an application for consent for proposed development where either—

(a) the proposed development would be of a class specified in—

(i) Part 1 of Schedule 5 of the Planning and Development Regulations 2001, and either—

(I) such development would equal or exceed, as the case may be, any relevant quantity, area or other limit specified in that Part, or

(II) no quantity, area or other limit is specified in that Part in respect of the development concerned,

or

(ii) Part 2 of Schedule 5 of the Planning and Development Regulations 2001 and either—

(I) such development would equal or exceed, as the case may be, any relevant quantity, area or other limit specified in that Part, or

(II) no quantity, area or other limit is specified in that Part in respect of the development concerned,

or

(b) (i) the proposed development would be of a class specified in Part 2 of Schedule 5 of the Planning and Development Regulations 2001 but does not equal or exceed, as the case may be, the relevant quantity, area or other limit specified in that Part, and

(ii) it is concluded, determined or decided, as the case may be by a planning authority that the proposed development is likely to have a significant effect on the environment."

The classes of development where an EIA is mandatory are specified in the Planning and Development Regulations 2001, as amended ("the Regulations") pursuant to Section 176 of the Act. The Regulations outline the regulatory framework for planning and development activities in Ireland and provide detailed procedures and requirements for various aspects of planning and development, including the need for Environmental Impact Assessments (EIAs). Specifically, Schedule 5 of these regulations sets out specific thresholds for various types of projects. If a project exceeds these thresholds, an EIA must be carried out as a mandatory requirement. Where a project is of a type listed in the regulations but does not meet or exceed the applicable threshold then the likelihood of the project having significant effects on the environment should be assessment. Criteria to evaluate whether significant effects on the receiving environment will arise from a proposed development are listed under Schedule 7 of the Regulations.

The Proposed Development includes a Reserve Gas-Fired Generator (Project 1) with a nominal electrical output of 1,155MW. This exceeds the following threshold in Part 1 of Schedule 5 of the Regulation and therefore an EIA is mandatory.

2. (a) A thermal power station or other combustion installation with a heat output of 300 megawatts or more.

As an EIAR for Project 1 (Reserve Gas-Fired Generator) is mandatory, a single EIAR has been prepared for the entirety of proposed development. Whilst EIAR is mandatory only in the case of Project 1, the EIAR includes all three project components of the proposed development. This was done following preplanning consultation with the relevant planning authorities and consideration of the scale, nature and location of Project 1 by itself and in combination with the two other adjoining projects proposed by the applicant[3]; i.e., an energy storage system project (Project 2) and a HV GIS electricity substation (Project 3). This single EIAR accompanies each of the three planning applications and the potential environmental impacts and effects from each project are assessed individually and cumulatively within the EIAR.

1.4 SCOPING AND CONSULTATION

Pre-application planning consultation meetings in relation to development proposals were undertaken with the Board on 07 March 2024 (Case No. Ref. ABP-319073-24) and 18 April 2024 (Case No. Ref. ABP-319385-24) and with Galway County Council on 11 April 2024 (Ref No. 24PP51). Consultation, where appropriate, with relevant private and public agencies was undertaken by the various EIA specialists preparing each Chapter of the EIAR. Details of this consultation is provided within each Chapter of the EIAR.

In addition to the pre-application consultations with the planning authorities, consultation and notification of the application to prescribed bodies (by letter and email) has been undertaken prior to the lodgement of the planning applications.

1.5 THE ASSESSMENT APPROACH AND METHODOLOGY

Environmental Impact Assessment (EIA) is the process of assessment of the effects of a project or development proposal on the environment. In the planning area, it is undertaken by a Planning Authority or An Bord Pleanála during the consideration of applications for planning permission, taking account of an Environmental Impact Assessment Report (EIAR).

The main objective of an EIA, as set out in Article 3(1) of the 2014 EIA Directive, is to identify, describe and assess the direct and indirect significant impacts of a proposed project in relation to the following environmental factors:

a) population and human health,
b) biodiversity, with particular emphasis on species and habitats protected under EU Directives,
c) land, soil, water, air and climate,
d) material assets, cultural heritage and the landscape, and
e) the interaction between the factors mentioned in (a - d).

[3] Refer to Section 1.1 (Overview) and 1.4 (Planning Framework) of the EIAR for further information.

This EIAR has been completed fully in accordance with Article 5(1) and the Directive 2014/52/EU and this is set out as follows in the 2022 EPA Guidelines *"Guidelines on the information to be contained in Environmental Impact Assessment Reports"*,

a) description of the project comprising information on the site, design, size and other relevant features of the project;
b) a description of the likely significant effects of the project on the environment;
c) a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
d) a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;
e) a non-technical summary of the information referred to in points (a) to (d); and
f) any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

Accordingly, this EIAR is a report or statement of the effects, if any, which the proposed project, if carried out, would have on the environment. The EIAR reports on the findings of the EIA process and informs the Planning Authority, statutory consultees, other interested parties and the public in general about the likely effects of the project on the environment.

As required by the EIA Directive, electronic notification was provided to the Department of Housing, Local Government and Heritage about the applications for inclusion on the EIA portal. A copy of the EIA notification receipts is provided in support of each of the planning applications.

1.6 FORMAT AND STRUCTURE OF THE EIAR

The EIAR has been prepared to satisfy the requirements of Schedule 6 of the EIA regulations – *"Information to be contained in EIAR"*. This EIAR is presented as three volumes:

- Volume I EIAR Non-Technical Summary (NTS)
- Volume II EIAR (Main Text)
- Volume III Appendices

Further details of this set out below:

1) **Volume 1 Non-Technical Summary**
2) **Volume 2 Environmental Impact Assessment Report (EIAR)**
   - Chapter 1 Introduction
   - Chapter 2 Description of the Proposed Development
   - Chapter 3 Need for the Development and Alternatives
   - Chapter 4 Planning and Policy
   - Chapter 5 Population and Human Health
   - Chapter 6 Biodiversity
   - Chapter 7 Soils and Geology
   - Chapter 8 Water Environment
   - Chapter 9 Air Quality
   - Chapter 10 Material Assets
   - Chapter 11 Noise and Vibration
   - Chapter 12 Landscape and Visual
   - Chapter 13 Traffic and Transport
   - Chapter 14 Archaeology and Cultural Heritage
   - Chapter 15 Climate
   - Chapter 16 Interactions
   - Chapter 17 Schedule of Environmental Commitments

3) **Volume 3 Environmental Impact Assessment Report (EIAR) Appendices**

- Appendix 1.1 Landowner Consent Letters
- Appendix 1.2 An Bord Pleanála SID Pre-application Consultation Letters
- Appendix 1.3 SID Consultation Letters to Prescribed Bodies (Refer to SID Planning Form, Appendix E)
- Appendix 1.4 Applicant Consent Letters to Agent (Applications to Galway Co. Co and An Bord Pleanála)
- Appendix 2.1 Proposed Development Layout
- Appendix 2.2 Construction Environmental Management Plan (CEMP)
- Appendix 3.1 Architectural Design Statement ((Reserve Gas-Fired Generator)
- Appendix 4.1 Environmental Risk Assessment (ERA)
- Appendix 4.2 Consequence Study Report
- Appendix 4.3 Lighting Study
- Appendix 6.1 Bat Survey Report
- Appendix 6.2 Bird Survey Report
- Appendix 8.1 Stage 3 Flood Risk Assessment Report

- Appendix 9.1 Ambient Air Quality Survey Data – Passive
- Appendix 9.2 Ambient Air Quality Survey Data - Active
- Appendix 9.3 Air Quality Dispersion Modelling Report
- Appendix 11.1 Noise Impact Assessment – Plates
- Appendix 11.2 Noise Monitoring Data
- Appendix 12.1 Landscape Mitigation Plan (provided in separate booklet)
- Appendix 12.2 Photomontages (provided in separate booklet)
- Appendix 13.1 Traffic Counts
- Appendix 13.2 Trip Generation
- Appendix 13.3 Traffic Calculations
- Appendix 13.4 PICADY Analysis
- Appendix 13.5 Road Safety Audit Report
- Appendix 14.1 Archaeological & Cultural Heritage - Figures
- Appendix 14.2 Archaeological & Cultural Heritage - Plates
- Appendix 14.3 Archaeological & Cultural Heritage - Geophysical Report

1.7 EIAR PREPARATION AND CONTRIBUTORS

This EIAR has been prepared by Halston Environmental & Planning Limited (Halston), IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162, on behalf of the applicant. The Planning Application Stage Works were managed and coordinated by Mr Colm Staunton (Halston) and Peer Review was provided by Mr Iain Douglas (Dunedin Consultants Limited). Table 1.1 provides details of the author of each EIAR Chapter, and a statement of authority is provided below.

Table 1.1 List of EIAR Contributors

Chapter No.	EIAR Chapter	Contributor
1.	Introduction	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
2	Description of the Proposed Development[Note 1]	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
3	Need for the Development and Alternatives	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
4	Planning and Policy	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
5	Population and Human Health[Note 1]	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
6	Biodiversity[Note 1]	Moore Group and Eire Ecology

Chapter No.	EIAR Chapter	Contributor
		3 Gort na Rí, Athenry, Co. Galway
7	Soils and Geology	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
8	Water Environment[Note 1]	Halston Environmental & Planning Ltd. IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
9	Air Quality	TMS Environment Ltd 53 Broomhill Drive, Tallaght, Dublin 24
10	Material Assets[Note 1]	Halston Environmental & Planning Ltd IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
11	Noise and Vibration	Redkite Environmental Huntersmoon, Ballykeane Road, Redcross Co. Wicklow
12	Landscape and Visual	Macroworks Hibernia House, Cherrywood Business Park, Loughlinstown, Dublin 18
13	Traffic and Transport	Traffic Transport and Road Safety Associates Barran, Blacklion, Co. Cavan
14	Archaeology and Cultural Heritage	Archaeological Consultancy Services Unit (ACSU) 21 Boyne Business Park, Greenhills, Drogheda, Co. Louth, A92 DH99
15	Climate	TMS Environment Ltd 53 Broomhill Drive, Tallaght, Dublin 24
16	Interactions	All Contributors inputted and coordinated by Halston.

Note 1 Further information provided in Table 1.2

Other supporting specialist reports have been prepared in addition to, and in support of, certain Chapters of the EIAR.

Table 1.2 Supporting Specialist Reports

Chapter No.	EIAR Chapter	Assessment Report	Author
2	Description of the Proposed Development	Preliminary Construction Environmental Management Plan (CEMP)	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
5	Population and Human Health	Control of Major Accident Hazards	DNV Services UK Limited Exchange Street SK3 0EY Stockport United Kingdom
5	Population and Human Health	Outdoor Lighting Report	Daramack Exterior Lighting Design 21 Burandell Manor, Lisburn, Co. Antrim, BT28 3AX
6	Biodiversity	Bat and Bird Surveys	Eire Ecology Moyglass, Loughrea, Co. Galway

Chapter No.	EIAR Chapter	Assessment Report	Author
8	Waters	Stage 3 Flood Risk Assessment	Envirologic Unit 49 Baldoyle Industrial Estate, Baldoyle, Dublin 13
10	Material Assets	Control of Major Accident Hazards	DNV Services UK Limited Exchange Street SK3 0EY Stockport United Kingdom

Article 5(3)(a) of amended Directive requires that the developer (applicant) shall ensure that the environmental impact assessment report (EIAR) is prepared by competent experts and that sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality.

This EIAR was prepared by Halston on behalf of CPFL. In accordance with EIA Regulations, Halston confirms that experts involved in the preparation of this EIAR are fully qualified and competent in their respective fields. Each expert has extensive proven expertise in the relevant field concerned, thus ensuring that the information provided herein is complete and of high quality. Details of the assessment team (including a short biography for each team member) and relevant company, as well as their respective inputs to the EIAR is presented below.

The EIA team was led and managed by Mr Colm Staunton, BSc., is the owner and founder of Halston Environmental & Planning Limited. Colm is a member and Certified Project Management Associate with the International Project Management Association (IPMA®), a qualified Practitioner Member of the Institute of Environmental Management & Assessment (PIEMA) and a member of the Occupational Hygiene Society of Ireland (OHSI). Colm's experience predominantly relates to Environmental Planning, Project Management of Environmental Impact Assessments (EIA) and Environmental Due Diligence (EDD). Colm has a long track record of ensuring projects are delivered to a high quality and he has worked as an environmental consultant in Ireland for over 22 years of professional experience. Through his professional career, Colm has gained the required expertise and project specific technical knowledge from working as lead consultant and a specialist within multidisciplinary teams, dealing with high profile planning applications and providing expert witness testimony at public enquiries, oral hearings, planning appeals and under oath in courts of law.

Colm has prepared and project managed environmental planning and licensing components for various types of related energy developments, including, Powergen projects, Solar Farms, Power-to-Gas (P2G) projects, Biogas and Anaerobic Digestion (AD) projects, Biomass fuelled power plants, and grid connected Energy Storage System (ESS) projects. His academic and professional qualifications and ongoing academic studies in Spatial Planning coupled with his experience gained of delivering planning and licensing consents for small and large-scale complex projects ensures that he has sufficient; (a) knowledge of the specific tasks to be undertaken, (b) understanding of the project type and impacts which may arise, and (c) the experience and ability to fulfil the role and responsibilities required in carrying out duties and actions under the EIA Directive.

1.7.1.1 Biodiversity

This Chapter of the EIAR was undertaken by Ger O'Donohoe M.Sc. of Moore Group providing information on habitats in the study area. Ger is the principal ecologist with Moore Group and has 30 years' experience in ecological impact assessment. He graduated from ATU Galway in 1993 with a B.Sc. in Applied Freshwater & Marine Biology and subsequently worked in environmental consultancy while completing an M.Sc. in Environmental Sciences, graduating from Trinity College, Dublin in 1999. (He also has over 15 years' experience of carrying out bat surveys and has completed the Bat Conservation Ireland, Bat Detector Workshop which is the standard training for the carrying out of bat surveys in Ireland and follows the Bat Conservation Ireland 'Bat Survey Guidelines' - Aughney *et al*., 2008'. In addition, Ger is an active member of the Galway Bat Group and Bat Conservation Ireland, which monitors bat populations in Ireland, and facilitates the education of bat communities to the public.

Éire Ecology was commissioned to carry out Bat and Bird Surveys. The work was undertaken by John Curtin of Éire Ecology. John Curtin B.Sc. is the principal ecologist with Éire Ecology and has over 10 years of experience in ecological impact assessment having conducted plant, habitats, birds, bats and mammal surveys since 2010 including at windfarm and solar sites. John conducted bird, bat and badger surveys. Shane O'Neill is an experienced ornithologist (Co-author Hen Harrier Survey, NPWS 2015) with a broad knowledge of breeding birds, waders and all aspects of ornithology. Shane has previously conducted I-WeBS surveys and taken part in the Shannon estuary wintering wader surveys. Laura Hynes has a degree in Wildlife Biology from MTU Kerry and has worked as an ecologist since 2022. Laura has worked as a Curlew officer for the NPWS.

1.7.1.2 Soils & Geology, Water Environment and Material Assets

This Chapter of the EIAR was undertaken by Colm Staunton (Details are provided above). The Flood Risk Assessment report was undertaken by Dr Colin O' Reilly, who is the founder and owner of Envirologic. Colin has over ten years of professional experience as a hydrogeologist, coupled with a doctorate degree (awarded by the Centre for Water

Resources Research, School of Architecture, Landscape and Civil Engineering, University College Dublin) and academic research at postdoctoral level. Colin is an active member of the International Association of Hydrogeologists (Irish Group), having sat on the conference sub-committee between 2009-2012 and served as Conference Secretary in 2013 and 2014. Envirologic has key competencies in hydrogeology (groundwater) hydrology (surface water) and Flood Risk Assessments.

1.7.1.3 Air Quality and Climate

This Chapter of the EIAR was undertaken by Dr Imelda Shanahan, BSc. (Chemistry), PhD (Physical Chemistry) who is the owner and Managing Director of TMS Environment Ltd and has over 30 years' experience in environmental monitoring and consultancy. She is a Chartered Chemist and a Fellow of the Institute of Chemistry of Ireland and a Fellow of the Royal Society of Chemistry. Imelda specialises in Air Quality Impact Assessment and works in Compliance Assessment, Environmental Risk Assessment and Waste Management. Imelda provides consultancy services to both public and private sector clients and has provided expert witness evidence at oral hearings and court hearings.

1.7.1.4 Noise and Vibration

This Chapter of the EIAR was undertaken by Ms. Siobhán Maher whose qualifications include a B.Sc. in Analytical Science, M.Tech. in Environmental Management and a post graduate Diploma in Acoustics and Noise Control Engineering. Siobhán is a full Member of the Institute of Acoustics (MIOA) since 2002, is a committee member since 2020 and is also a Member of the Association of Acoustic Consultants Ireland (AACI). Siobhán is the Managing Director of Redkite Environmental with over 20 years of experience providing environmental consultancy and environmental assessment services to business, industry and public sectors. In acoustics, she has experience in a range of areas, but primarily specialising in noise and vibration impact assessment for new and proposed developments, environmental noise monitoring and prediction modelling and development of mitigation measures for noise abatement and control.

1.7.1.5 Landscape and Visual

This Chapter of the EIAR was undertaken by prepared by Cian Doughan (BSLA, MILI) and Mr Richard Barker (MLA, PG Dip, BA.) of Macroworks. Cian is an Associate Director at Macro Works Ltd a consultancy firm specialising in Landscape and Visual Assessment and associated maps and graphics. Macro Works' relevant experience includes a broad range of infrastructural, renewable energy, industrial and commercial projects since 1999, including numerous urban, residential, and mixed-use development projects. Richard has worked as a Town Planner in New Zealand, London and Dublin before moving into the field of Landscape Architecture. He has spent the last 14 years working as a Landscape Architect in Ireland and has considerable experience in the fields of both Landscape and Visual Impact Assessment (LVIA) and landscape design, covering all stages from project feasibility through to construction. This cross-over of expertise is invaluable in determining and designing the most appropriate and effective form of landscape and visual mitigation for infrastructural development projects. Richard manages the LVIA department in Macro Works undertaking assessment work on a broad spectrum of projects in areas such as renewable energy, roads and large scale industrial and infrastructural development. Richard has also delivered guest lectures to the University College Dublin professional course in EIA Management in relation to LVIA.

1.7.1.6 Traffic and Transport

This Chapter of the EIAR was undertaken by Mr Matthew Steele, company director of Traffic Transport and Road Safety Associates Ltd (TTRSA) and an established specialist traffic and transportation consultant based in Ireland. Matthew: graduated from the University of Westminster in 1998, with a master's degree in Transport Planning and Management; is a Chartered Fellow of the Chartered Institute of Logistics and Transport; a fellow of the Royal Geographical Society; and a member of the Chartered Institution of Highways and Transportation. Matthew has extensive national and international experience, working on numerous traffic, transport and development related projects in the public and private sectors, including access studies; specialist input into Strategic Environmental Assessments; and preparation of traffic and transportation related sections of Environmental Impact Assessments for specific schemes including extractive industries and energy related developments.

1.7.1.7 Cultural Heritage and Archaeology

This Chapter of the EIAR was undertaken by Mr Donald Murphyand Kerri Cleary of Archaeological Consultancy Services Unit (ACSU). Donald Murphy (BA(Hons), MA, MIAI) is the founder and Managing Director of Archaeological Consultancy Services Unit Ltd and he has over 30 years of experience as an archaeological consultant. Donald has completed EIARs for a variety of projects across Ireland and has managed the archaeological work in advance of several large infrastructural schemes, such as the M3 and M4 motorways. Dr Kerri Cleary (BA(Hons), MA, PhD, MIAI) is an Archaeologist with over 15 years of experience. She specialises in research and report production, with extensive experience in preparing cultural heritage impact assessment chapters for EIARs. She has completed assessments for several projects across Ireland, including housing, infrastructure developments and public realm projects.

1.8 APPROPRIATE ASSESSMENT

Appropriate Assessment (AA) is an assessment carried out under Article 6(3) of the Habitats Directive. Article 6(3) of the Habitats Directive states:

> *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

A Stage 1 AA screening of the proposed development was completed which concluded that there was a need for Stage 2 AA and preparation of a Natura Impact Statement (NIS). A single NIS has been completed for the proposed development and is provided under separate cover in support of each planning application.

1.9 CONTROL OF MAJOR ACCIDENT HAZARDS

The Health and Safety Authority (HSA) is the competent authority responsible for administration and enforcement of the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the COMAH Regulations).

The aim of the Regulations is to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious harm to people and/or the environment, with the overall objective of providing a high level of protection in a consistent and effective manner. The Reserve Gas-Fired Generator qualifies as a *"lower tier"* site under the COMAH Regulations 2015 as it holds quantities of dangerous substances above threshold quantities specified in Schedule 1 of the COMAH Regulations 2015. An Environmental Risk Assessment (ERA) Study and Consequence Assessment Report for the proposed development was carried out by DNV Services UK Limited. The report is provided under separate cover in support of the planning applications.

1.10 PLANNING STAGE DESIGN AND ENGINEERING DRAWINGS

Design of the proposed development has been undertaken by Halston in association with the applicant company (CPFL) and with inputs from, but not limited to, all EIA specialists Taylor McCarney Architects, Lally Engineering and various technology manufacturers and suppliers.

1.11 AUTHORISATIONS AND LICENSES

1.11.1 CRU AUTHORISATIONS AND LICENCES

The Electricity Regulation Act, 1999 as amended (the Act) gives the Commission for Regulation of Utilities (CRU) the necessary powers to licence and regulate the generation, distribution, transmission, and supply of electricity in Ireland. One of the functions of CRU under the Act is to grant or refuse Authorisations to Construct or Reconstruct generating stations and issue generation licences. Therefore, CPFL will, will in due course, apply to the CRU for the necessary authorisations and licences for the Reserve Gas-Fired Generator and ESS Projects.

1.11.2 EPA INDUSTRIAL EMISSIONS LICENSING

In accordance paragraph 2.1[4] of the First Schedule to the EPA Act 1992 as amended, the Reserve Gas-Fired Generator will require an Industrial Emissions Licence. When applying to the Environmental Protection Agency (EPA) for an Industrial Emissions licence a number of legislative requirements must be fulfilled. These are largely set out in:

- EPA (Industrial Emissions) (Licensing) Regulations, 2013 (S.I. No. 137 of 2013),
- European Union (Industrial Emissions) Regulations 2013 (S.I. 138 of 2013),
- The EPA Act 1992, as amended.

CPFL will apply to the EPA for an Industrial Emissions (IE) licence for the Reserve Gas-Fired Generator should the planning application for consent be successful.

1.12 GREENHOUSE GAS PERMIT

The EU emissions trading system applies to certain types of activity which produce greenhouse gases. The EPA has been given the responsibility for implementing the Emissions Trading Directive in Ireland. The Directive establishes an allowance-trading scheme for emission to promote reductions of greenhouse gases, in particular carbon

[4] Combustion of fuels in installations with a total rated thermal input of 50 MW or more.

dioxide. These activities are listed in Annex 1 of the EU ETS Directive. Annex 1 includes activities which involve combustion of fuels in installations with a total rated thermal input exceeding 20MW. Therefore, CPFL will apply to the EPA for a greenhouse gas permit for the Reserve Gas-Fired Generator Project should the planning application for consent be successful.

1.13 AVAILABILITY OF INFORMATION & DIFFICULTIES ENCOUNTERED

There were no significant difficulties encountered in the preparation of the EIAR.

2 PROPOSED DEVELOPMENT

2.1 INTRODUCTION

Coolpowra Flex Gen Limited (CPFL) propose to develop a Reserve Gas-Fired Generator (Project 1), a grid-connected Energy Storage System (ESS) facility (Project 2) and a Gas Insulated Switchgear (GIS) Electricity Substation (Project 3) in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway.

The development is considered of significant economic importance at both state and regional levels due to its strategic positioning on the 400kV transmission network. The proposed GIS substation (Project 3) will upgrade and enhance the existing AIS intermediate substation on the 400kV line at the Oldstreet node and will facilitate and provide for connection of the Reserve Gas-Fired Generator and Energy Storage System projects to the 400kV electricity network.

The location and scale of the development will enable, strengthen and reinforce the grid and encourage the advancement of onshore and offshore renewable energy sources. Ireland has 0.025GW of fixed offshore wind capacity installed to date in one small project of seven turbines installed in 2004. A further 3.1GW has been awarded an offtake agreement in the Offshore Renewable Energy Support Scheme (ORESS) Round 1 Auction of 2023 and is expected to be constructed in the coming years. The Government has stated its ambition to deliver 5GW of offshore wind by 2030, and 20GW by 2040, with a view to delivering on a long-term target of 37GW by 2050. The proposed development incorporates grid flexibility and enabling technologies and consequently, its impact extends well beyond the immediate local planning authority area.

The proposed development includes different flexible technologies which were chosen to provide a comprehensive range of electricity grid products and assist with the transition to a low carbon economy and climate neutrality by 2050.

The projects within the proposed development can be constructed, commissioned, and operated in isolation. The contract to supply and construct the development will be by open international competition. The final and precise plant outputs and scheme layouts cannot be specified at this stage without bias to a particular manufacturer or supplier. It is envisaged at this stage that the Project 3 (GIS substation) will be constructed as a contestable substation.

As part of detailed design, CPFL (or their appointed representative) will engage and issue the planning stage drawings to Eirgrid's technical teams for review to incorporate further technical detail. Once detailed design is complete the project can proceed to the construction stage. Upon completion, the substation will be transferred to ESB Network in their role as Transmission Asset Owner (TAO) and Eirgrid will operate it in their role as Transmission System Operator (TSO).

Owing to the technologies proposed and operating profile, the carbon footprint of the development proposal is minimal when compared with existing diesel-fired generators (temporary emergency generators (TEG)[5] and peaking stations), the recently retired peat-fired power stations and the Moneypoint coal-fired power station. The development is appropriately sized to support any generation capacity deficit, which is likely to arise when the above and diesel fired *temporary generators,* sanctioned under the Government's emergency generation legislation, are decommissioned (expected lifespan of five years from activity commencement). In an information note entitled *"Electricity Security of Supply Programme of Work Update"*, April 2024[6], the CRU state the following:

> *"The Retention of Existing Units (REU) also falls under the Delivery workstream, <u>targeting extension of the availability for operation of a number of older generation units, on a temporary basis, until new enduring capacity has been delivered to replace them through the Capacity Remuneration Mechanism (CRM)</u>. In August 2023, following Direction from the CRU, EirGrid entered into a Services Agreement with ESB for the continued availability of the three (3) units at Moneypoint after their planned closure date for the provision of Security of Supply services on an out of market and temporary basis. ESB has submitted planning and environmental permitting requests to convert the station from coal to run solely on lower carbon Heavy Fuel Oil (HFO) for the retention period."*

The proposed development proposal will deliver a nationally significant quantum of low carbon flexible, fast start-up generation capacity to the grid via the existing node (Oldstreet) on one of the two 400kV transmission lines which traverse the country from the west delivering power to the east coast of Ireland.

The proposed development is designed to ensure power supply continuity and assist with transition towards 80% renewable sources by 2030[7] and achieving climate neutrality by

[5] Development (Emergency Electricity Generation) Act, 2022.
[6] https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/Electricity_Security_of_Supply_Programme_of_Work_Update_April_2024_.pdf
[7] Climate Action Plan 2024

2050[8]. Achieving net zero carbon dioxide emissions by 2050 requires significant and unprecedented changes to Ireland's energy system. Infrastructure such as the electricity grid must be built, offshore wind needs to progress, large-scale investment must be sought, renewable fuels found, and homes and businesses transformed. To overcome the intermittency issue arising from the variable nature of wind energy, and to maintain the reliability and continuous operation of the power system in times of low resource availabilities, renewable generators need to be combined with low carbon emitters and storage technologies such as the technologies proposed (i.e. a reserve gas-fired generator which can be adapted and reconfigured in the future to use hydrogen and storage technologies).

The ESS Project will provide a full range of carbon free system services and it will replace the functions of a conventional power plant including black start services. The ESS Project will trade electricity at times of high demand aiming to shift and smoothen the demand curve by charging at night and discharging during peak hours (daytime) and during the occurrence of power system event such as a frequency drop, voltage deviation, faults in the lines, tripping generator, insufficient renewables supply, etc.

2.2 EXISTING SITE LOCATION

The proposed development is located on a 42.3 hectares (ha) (105 acres) site in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway (see Figure 2.2 and Figure 2.3). The site is located approximately 5km north of the town of Portumna and 3.7km south of Killimor.

Lands within the development site boundary are in agricultural use and include a farmhouse and outbuildings which will be demolished as part of development works. The proposed lands are situated at an elevation of c. 51-54m AOD and are accessed by public road via the N65 (National Road) and the L8763 (local road). The three project compounds within the site are positioned c.500 m west of the N65, with an internal site access road providing connection to the public road (L8763). The proposed development is located adjacent to, and south of, the existing operational 400kV AIS electricity substation (Oldstreet). The proposed site was chosen as the preferred site following analysis of alternative sites along the two 400kV transmission lines, which traverse the country from

[8] There are different interpretations of the term climate neutrality. The EU Climate Law aligns it with achieving net zero greenhouse gas emissions by 2050. The Climate Action and Low Carbon Amendment Act 2021 interprets a "climate neutral economy" as a "sustainable economy and society where greenhouse gas emissions are balanced or exceeded by the removal of greenhouse gases"

west to east. The proposed site adjoins the Moneypoint to Woodland[9] 400kV line and the Oldstreet intermediate 400kV AIS substation (the only one) along this line.

The area in which the proposed development site is located is typical productive rural landscape that is not rare or distinctive at a national or regional level. The are a limited number of residential properties within the surrounding rural area and these are described as one-off housing with a total of 40 recorded within 1km offset from the main development with the proposed development lands. The closest residential dwelling to the proposed development boundary is approximately 300m to the west of the development site. The proposed development includes for construction of a new private entrance to the site from the L8763 with associated signage. Car parking serving Projects 1 and 2 is incorporated as part of infrastructure serving the overall development.

The proposed development includes for the demolition and removal of a residential property (see Figure 2.1) within the site which contains a single storey house, associated outhouses and farm sheds.

Figure 2.1 Aerial view of Existing Residential Property

[9] The Woodlawn substation incorporates a connection to the East West Interconnector (EWIC). The East West Interconnector (EWIC) is a high-voltage direct current submarine and underground power cable which links the electricity transmission grids of Ireland and Great Britain and facilitates growth in renewable energy.

The construction and laydown area, as shown on the overall site layout plan, will be provided for all projects described as part of the proposed development. The principal contractor will secure the area with temporary fencing, set up initial site accommodation and welfare facilities, and temporary services. It is envisaged that existing services serving the residential property on site will be altered to serve the contractors construction compound.

Figure 2.2 Site Location (1:50,000)

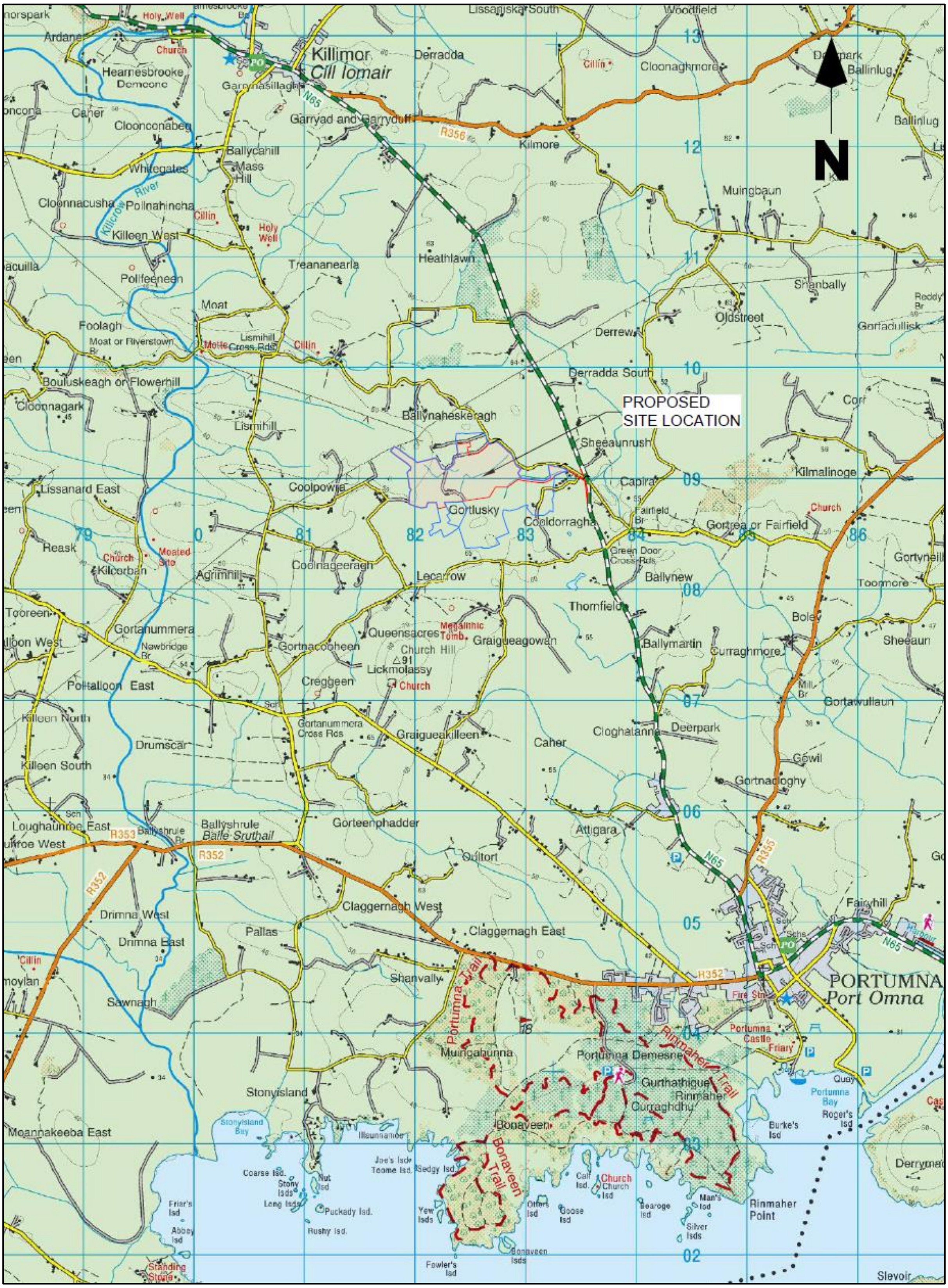
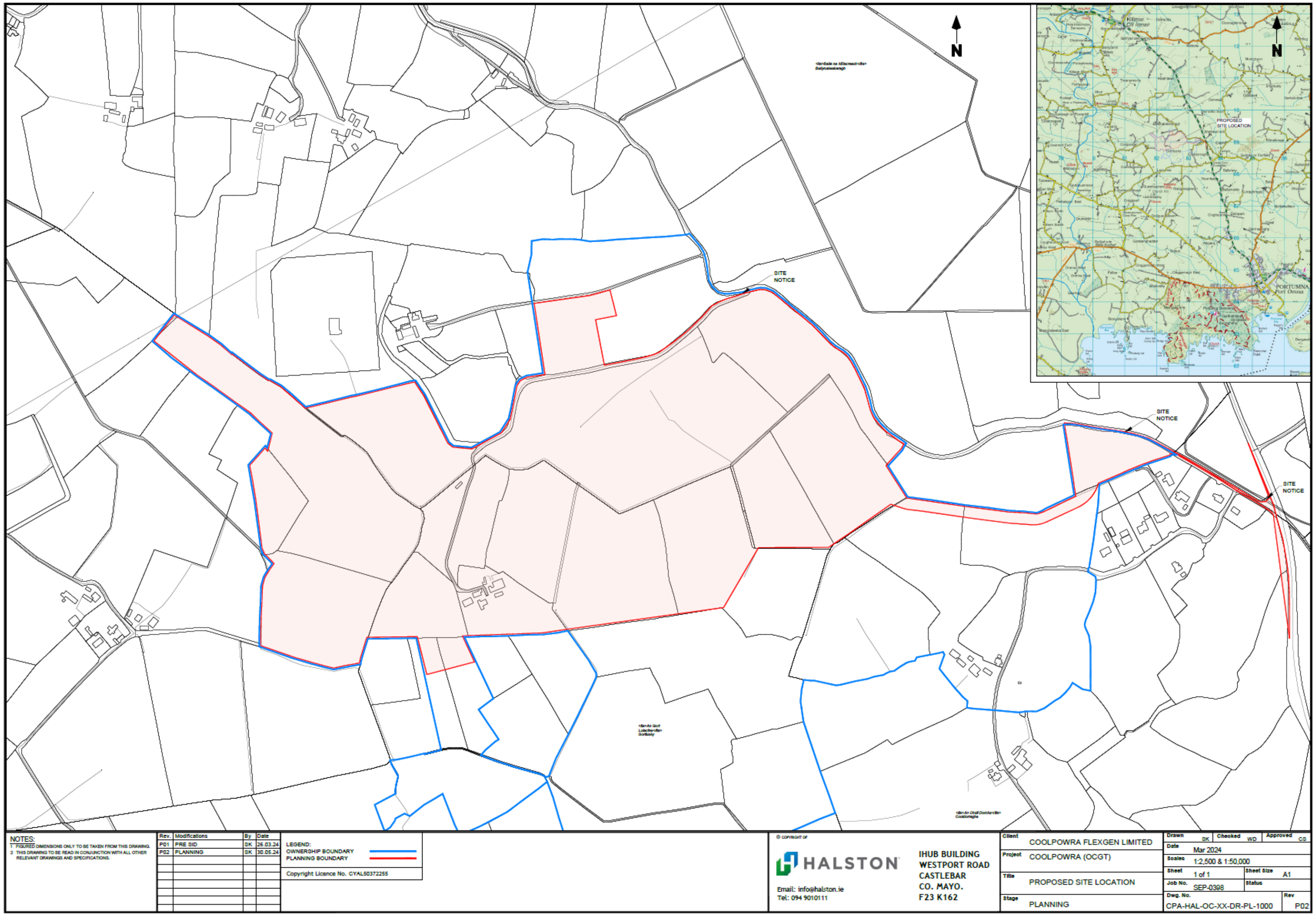


Figure 2.3 Site Location Map (1:2,500)



2.3 PROPOSED DEVELOPMENT

2.3.1 PROJECT 1: RESERVE GAS FIRED GENERATOR

OCGT units, by the nature of their design, capability and efficiency are designed to operate intermittently and provide generation capacity during periods of high demand or when renewable energy generators cannot meet system demand. OCGT units are advantageous due to their operational flexibility and can be turned on quickly to match system demand. The selected turbines are capable of being converted to allow for inclusion of green hydrogen in the fuel mix in the future, which will further assist with climate-neutral targets.

The proposed Reserve Gas Fired Generator will have the ability to operate 24 hours a day, seven days a week. However, while the plant has the potential to operate in this manner, it is expected that it will only operate during peak periods for a limited number of hours per year, i.e. it will be 100% available, but will only run, as and, when the system operator requires. This typically means when demand is high and or when renewable energy generators cannot meet system demand.

The Reserve Gas Fired Generator comprises three open cycle gas-fired generator (OCGT) units positioned within a building (turbine hall) along with auxiliary equipment (including hydraulic oil skid, instrument air skid, cable racks, air enclosures for combustion turbines, fire-fighting system, power control centre, ventilation systems, etc.). An OCGT unit consists of a turbine connected to an electric power generator and the three turbines are designed to operate independently of each other. The OCGT units will receive natural gas from the gas network via an underground pipeline to an Above Ground Installation (AGI) compound within the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI.

The proposed OCGT units are dual fuel units as required by system requirements specified by the Commission for Regulation of Utilities (CRU). Natural gas will be the primary combustion fuel to each of the OCGT units when operating. Secondary fuel (gas oil) will be stored in a bunded structure outside the turbine hall along with ancillary items of electrical plant and machinery such as coolers and transformers. To ensure compliance with the Grid Code, the Reserve Gas-Fired Generator must be capable of running continuously on secondary fuel equivalent to 72 hours of operating on the primary fuel. This preparedness is crucial for scenarios involving an outage or interruption to the natural gas supply.

2.3.2 PROJECT 2: ENERGY STORAGE SYSTEM (ESS)

The ESS technology is designed to complement and support the reserve gas-fired generator by providing zero carbon, instantaneous power and balancing power to the grid.

The Energy Storage System (ESS) facility comprises (a) a Long Duration Energy Storage (LDES) static battery (400MW) positioned within a secure outdoor compound, and (b) a Synchronous Condenser (400MVA electrical rating) which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid. The synchronous condenser will provide short-circuit power, inertia, and reactive power for dynamic loads and stabilise the network through voltage recovery during faults.

The LDES battery will comprise a total of 224 modular single storey battery enclosures and medium voltage power stations (MVPS) and IPP building. The LDES will connect to the 400kV electricity network via the proposed GIS substation using electric plant and HV electrical lines.

The horizontal synchronous generator will be positioned within a building and ancillary equipment including proprietary air-cooling units and electrical plant (including transformer) will be positioned adjacent to the synchronous generator hall. The synchronous condenser will connect to the 400kV electricity network via the proposed GIS substation using electric plant and HV electrical lines.

2.3.3 PROJECT 3: GAS INSULATED SWITCHGEAR (GIS) ELECTRICITY SUBSTATION

The Gas Insulated Switchgear (GIS) Electricity Substation comprises a two-storey building positioned and secured within a palisade fenced compound. The GIS building will contain a battery room, generator room, stairs, cable pits, switchgear rooms, workshop, messroom and stores. The proposed GIS will upgrade the existing air insulated switchgear (AIS) substation with a new gas GIS substation at Oldstreet. The GIS substation will serve the existing function of the AIS substation and facilitate connection of a proposed Reserve Gas-Fired Generator and ESS facility to the node on the 400kV transmission network. High Voltage lines and associated electric plant which will connect the Reserve Gas-Fired Generator and ESS facility to the substation are included as part of the proposed development. Associated internal roads, fencing, lighting, civils and drainage works will be appropriately developed for the subject development.

2.4 PROJECT PROCESS DESCRIPTIONS

2.4.1 RESERVE GAS-FIRED GENERATOR (PROJECT 1)

The Reserve- Gas-Fired Generator comprises three OCGT units fuelled by natural gas with a nominal electrical output of 1,155MW. The plant will operate as a 'peaking plant', spending most of its time on standby, and will be run by 100% available to run as and when required by the electricity system operator to support and compliment renewable power generation technology. It is envisaged that the project will have a design life of at least 25 years (this is based on design life of the chosen technology). The OCGT units will be capable of being modified to adapt to the future introduction of hydrogen blended fuel in the Irish network,

The main components of the Reserve Gas-Fired Generator Project are as follows:

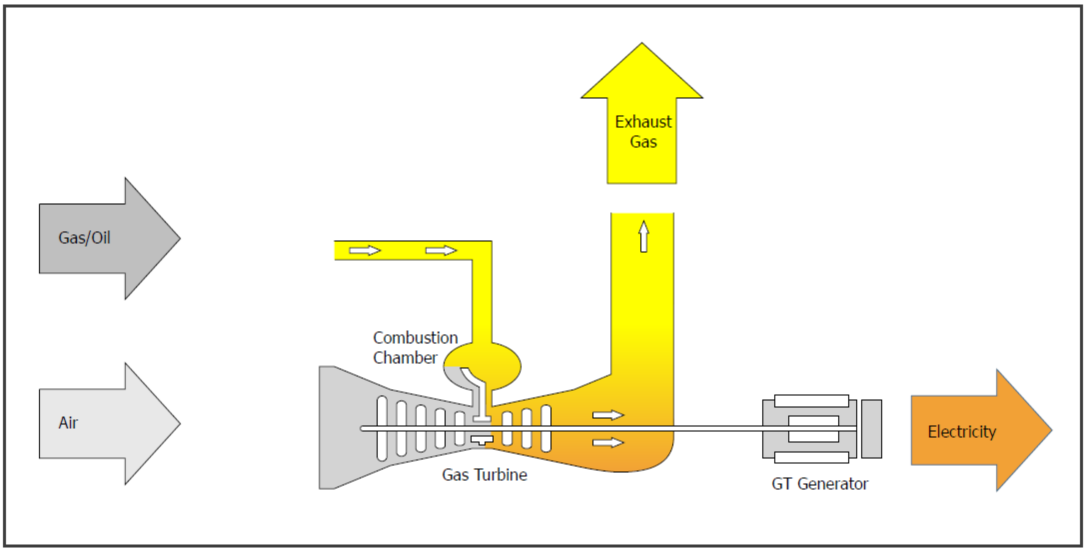
- OCGT building and adjoining administration block. The OCGT building will contain
    - 3no. open cycle gas turbine (OCGT) modules (each having a nominal electrical output of 385MW),
    - 3no. 45m high stacks positioned within outer enclosures designed to minimise heat transfer, discolouration of structures and abate noise,
    - Fire suppression skid and distribution system– inert gas
    - 3no. recessed, and roof mounted, air intake filter houses and ducts to intake air before filtering it to remove suspended particles and delivering it to the gas turbines,
    - CEMS mounted on the stacks to monitor and control stack emissions,
    - Power control centre and balance of plant (BoP),
- Administration block adjoining the OCGT building and containing control room, administration and welfare facilities,
- AIS compound north of the OCGT building containing electrical wires and associated plant,
- Fin fan coolers to provide cooling (air cooling of water contained within a closed loop) to the gas turbine lube oil, generators and transformers,
- Secondary fuel (gas oil /distillate) storage tanks (3no. containing 19,000 tonnes) positioned within a secondary concrete storage bund, fuel unloading area, fuel polishing unit and air compressor,
- Containerised emergency generators (3no.),
- AGI compound – gas receiving station,
- Main and auxiliary transformers,
- Workshop and stores,
- Firewater tank fire suppression skid,

- Site drainage which includes firewater storage tank, oil interceptors, stormwater, attenuation pond, culverting, crossings and proprietary foul pack treatment plant,
- Underground cabling and pipework,
- Ancillary components including cark parking, internal roads, lighting, fencing and gates, utilities, lightning protection masts, and associated works.

2.4.1.1 OCGT units

Combustion turbines in open cycle (or simple cycle) configuration utilise a single thermodynamic cycle called the Brayton cycle. In the Brayton cycle, the working fluid (e.g., air) is compressed, heated, expanded through a turbine to turn the shaft (rotor) and is then discharged. The shaft drives the generator to produce electricity and the compressor to provide a continuous source of compressed air to the combustor. The combustion turbine exhaust gas, at slightly above atmospheric pressure, flows through a diffuser before discharging through a vertical stack into the atmosphere.

Figure 2.4 Open Cycle Process



OCGT units are advantageous due to their operational flexibility and can be turned on quickly to provide peak load. The reserve gas-fired generator is designed to get to full load in less than 20 minutes and can synchronise within five minutes. OCGTs exhaust residual heat to atmosphere at a temperature of approximately 544°C, unlike combined cycle gas turbines (CCGTs) where exhausted heat is recycled to generate steam and ultimately additional electricity. The OCGT units have a typical energy efficiency of 38-41%.

The main emissions from the combustion of natural gas in the OCGT units are oxides of nitrogen (NO and NO_2, collectively referred to as NOx), carbon monoxide (CO), and particulate matter (PM). The proposed OCGT units are fitted with Dry Low NOx combustion (DLN), a technology that uses staged combustion and lean-premixed fuel-air mixtures practices and the use of natural gas fuel as its primary fuel[10] (in this instance DLN is also referred to as Dry Low Emissions (DLE) technology). Particulate emissions (PM_{10} and $PM_{2.5}$) is controlled through the use of best available control techniques (BAT) and using natural gas as the primary fuel source. BAT was introduced as a key principle in the IPPC Directive, 96/61/EC and in the identification of BAT, emphasis is placed on pollution prevention techniques rather than end-of-pipe treatment. The Reserve-Gas Fired Generator units will be equipped with DLE technology for low NOx emissions with gaseous and liquid fuels. DLE satisfies BAT requirements as required by the industrial emissions licensing process. In addition, particulate emissions would be further limited by the use of a high-efficiency inlet air filtration system, which would remove particulates in the ambient air prior to entering the combustion turbine generator processes. The exhaust stacks will be fitted with continuous emissions monitoring systems which continuously sample the stack concentrations of controlled emissions to ensure that the exhaust parameters remain within permitted parameters (EPA licence).

Following air dispersion modelling it has been determined that these should be c.45m in height to optimise dispersion of the emissions and prevent any downwash in the local environment.

2.4.1.2 Secondary Fuel (gas oil)

The proposed OCGT units are dual fuel units which, in accordance with CRU requirements, are capable of also operating on gas oil (diesel). In the highly unlikely event of an outage to the natural gas supply and its availability on site, the OCGT units need to be able to run for 72 hours continuously on secondary fuel (back-up fuel). Therefore, the project design includes for storage of secondary fuel as required by the grid code in two above ground tanks (capacity of 19,000 tonnes) within a bunded structure enabling the plant to run on at least 90% of rated capacity for three days. The secondary fuel <u>will only be used in the unlikely event that both the gas connection is unavailable and other generation sources on the transmission grid cannot meet demand</u>. A fuel polishing plant is required to remove any contaminates (water and particulates) using filtration from the secondary fuel that may accumulate during storage, the contaminants will be collected in a separate tank contained within the bunded area prior to its safe disposal.

[10] Best available control techniques for particulate emissions from combustion sources is the use of natural gas.

The secondary fuel will be received via road tanker at a new offloading station located to the north of the bunded tank and transferred to the tank via offloading pumps. A fuel forwarding pump skid will forward the secondary fuel from the storage area to the plant when required. The pumps and fuel treatment plant are in a building adjacent to secondary fuel bund and offloading area.

An Environmental Risk Assessment (ERA) and Consequence Modelling Assessment for the proposed development (which includes the use of natural gas and the storage and use of gas oil) was undertaken by DNV Services UK Limited (DNV) to support the planning application.

2.4.1.3 Emergency Generators

The secondary fuel store will also be used to serve three emergency generators. The function of the emergency generators is to provide power to the plant during emergency situation to safely shut down the plant in a scenario where power from the electricity grid is lost. Accordingly, the use of emergency diesel generators at power stations is very limited.

The plant itself will consume approximately 8-10MW of the total output (house load) depending on operating configuration. Power is required to for auxiliary equipment such as gas compressors, pumps and fans, cooling units, control systems, and general facility loads including lighting, heating, and air conditioning.

2.4.1.4 Above Ground Installation (AGI)

Natural gas will be supplied from the Gas Network Ireland transmission system at a minimum guaranteed pressure of 19 bar gauge (bar(g)) and 15°C via an Above Ground Installation (AGI). The design maximum pressure of the BGN gas pipeline is 85 bar(g). The pressure of the gas will be conditioned and regulated to approximately 35 bar(g) in the proposed on-site AGI.

2.4.1.5 Transformers

Transformers will be located outdoors and will be the oil immersed design type. All transformers will be bunded and the high voltage (HV) transformers include fire walls. It is proposed to install medium voltage (MV) step-up transformers, one for each turbine generator, as part of the proposed development.

2.4.1.6 Administration /Control Room /Welfare Facilities

Administration, control room and welfare facilities will be located in a building adjoining the eastern side of the OCGT hall. From the control room, the plant operator monitors and operate the facility, via the plant's 'Distributed Control System' (DCS). The system gives operators both audible and visual signals to keep them informed of plant conditions at all times and to determine when preventative maintenance is required.

2.4.1.7 Foul Wastewater

Foul wastewater, which comprises wastewater other than process wastewater and surface water, will be treated in a proprietary package treatment system and infiltrated to ground using percolation trenches.

Based on the findings of the site suitability assessment undertaken and using SR66 and the EPA Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses (population equivalent ≤ 10), the appropriate solution for treating wastewater the site is a proprietary package plant and gravity soil polishing filter.

2.4.1.8 Process Wastewater

No significant process wastewater will be generated during the operational stage of the Project. Any process effluent arising will be minimal (e.g. waste oils during maintenance activities) and will therefore be contained locally prior to be disposed of at an appropriately licensed facility.

2.4.1.9 Chemicals Storage

Small volumes of chemicals (e.g. lubricants, coolant oils for transformers, etc) will be stored on site during the operational stage of the project. These chemicals (stored in volumes of less than 1,000 litres) will be secured and stored in a designated bunded area at the workshop building.

2.4.1.10 Fire Fighting Water

In case of fire, water will be supplied to the system (ring main) for use as part of suppression via the above-ground fire water storage tank (2,000m^3 capacity) and fire pump (secondary supply). A fire deluge (sprinkler) system will be provided for certain areas within the site including fuel unloading and the secondary fuel storage area[11]. The

[11] The fire control and detection system will be further specified as part of detailed design works and will provide for quick and efficient suppression of fires and protection of structures from heat generated by nearby fires.

firewater storage volume is more than normally required based on 60 litres per sec (4 bar pressure) over 120 minutes. The additional capacity provides for automatic refill and reduces instantaneous pressure on water supplies (i.e. the reserve can be refilled over a longer time period than 8 hours as the stored water volume will be greater than the required water volume).

In the event of a fire, any fire wastewater generated will drain through the system and be held in a below ground tank (fire wastewater holding tank), which be in accordance with EPA requirements[12]. An actuated penstock valve will be positioned on the outlet of the below ground tank which will be activated to close upon the initiation of the fire alarm within the development. The contaminated water will be subsequently tested and appropriately disposed of. Gaseous extinguishing systems will also be provided for use on electrical systems.

2.4.1.11 Process Effluent

The reserve gas-fired generator project itself will not generate any significant volumes of process effluent. No process related effluents will be disposed of into the internal drainage system. A limited volume of wash water will arise during annual maintenance. This will arise as wastewater from washing the gas turbine compressors and will contain some detergent. The volume of wastewater generated will be approximately 5m^3 per event (i.e., 1m^3 per GT). The requirement for washing will be very low and it is anticipated that this will occur on average once per year generating 5m^3 of effluent (maximum twice per annum – 10m^3). The water wash will be performed using a dilute detergent *"soap"* such as Turbotech 950 (SDS attached) or similar manufacturer approved product. The effluent arising from the process will be contained and drained to an Intermediate Bulk Container (IBC). The wastewater will be transported off site by a was permitted contractor and will be disposed of at a licensed facility.

2.4.1.12 Surface Water Drainage and Treatment

The surface water drainage system incorporates below-ground oil interceptors, a firewater retention tank, stormwater attenuation pond, silt sumps (at gully positions) and infiltration trenches. Large external areas/compounds at the site will be surfaced with stone /grassed areas to allow rainwater to percolate to the underlying soils (e.g., AIS compound, AGI and areas beyond the main compound areas but within the development site boundary).

[12] 2019 EPA Guidance on Retention Requirements for Firewater Run-off

The access roads to the site will be drained utilising filter drains. These will run longitudinally along the road and allow the stormwater to filter directly to ground /soils via infiltration trenches.

Surface water collected from impermeable areas will be delivered to the site stormwater drainage system. Surface water will be routed via the fire wastewater retention tank and an oil/water interceptor prior to entering an attenuation pond. The outfall from the attenuation pond will be controlled using a hydrobrake which will limit the discharge of stormwater to the receiving watercourse to 9.4l/s (4l/s per hectare). During those times when chemicals are handled, isolation valves in the drainage system will be closed. This is to ensure that accidently spilled chemicals do not enter the storm water drain. The isolation valves will only be opened again once it has been assured that contamination of the downstream system has been excluded.

Transformer bunds have been designed utilising a water displacement system which negates the requirement for a pump to remove stormwater from within the bund. This system will be connected directly to the piped underground gravity drainage system upstream of the SUDS management train elements. This bund design can accommodate a pumped solution if required.

Stormwater collected within the secondary fuel bund will be pumped to the gravity drainage system upstream of SUDS management train elements. The secondary fuel bund is design to contain 150% capacity of a single tank in the event of tank failure /loss. Pumping of water from bunds can only be manually initiated by an operator following inspection of the water within the bund. In the event of a spillage from an unloading fuel tanker the liquid will runoff into a central gully. The spill will be detected by a below ground forecourt oil separator which will contain and store the liquid for removal off site. The retention separator will be capable of retaining the maximum spillage likely to occur for road tanker delivery. The below ground separator is designed to accommodate 150% of this volume.

The drainage system on site will be further developed as part of detailed design stage works.

2.4.2 PROJECT 2: ENERGY STORAGE SYSTEM (ESS)

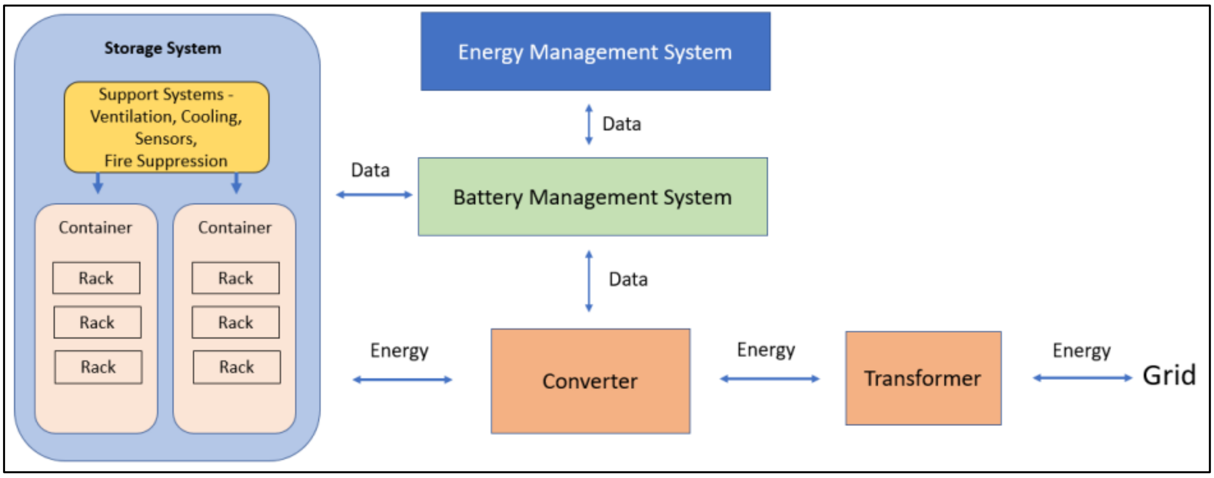
The Energy Storage System (ESS) facility comprises (a) a Long Duration Energy Storage (LDES) static battery (400MW) positioned within a secure outdoor compound, and (b) a Synchronous Condenser (400MVA electrical rating) which will operate within a building in a separately secured compound.

2.4.2.1 LDES

The LDES facility comprises a total of 224 modular single storey battery enclosures and medium voltage power stations (MVPS) and an IPP building. Both LDES facility will connect to the proposed GIS substation using electric plant (including step-up transformer) and HV cables. The proposed 168no. battery enclosures (12.2m long x 2.3m wide) and 56no. MVPS enclosures (6.1m long x 2.4m wide) will be positioned on concrete plinth foundations. Once positioned the top of the battery enclosures will be a height of 4.42m above the finished ground level (FGL) of the BESS compound and the top of the MVPS enclosures will be a height of 3.29m above the compound FGL. The enclosures will be connected by underground ducts and cables.

The battery enclosures will house the modular array of lithium-ion (Li-ion) battery units. Li-ion battery units will be assembled to form modules and will be self-contained and certified for intrinsic safety. The battery cell is the smallest subpart of the BESS system, and the cells store the energy. The cells are aggregated into modules which has a positive and negative terminal and are contained in hard casing with a battery management system (BMS - analyser that continuously checks module parameters such as voltage, current, temperature and State of Charge (SoC)). The modules are then aggregated into a pack (or string), again with one positive and one negative terminal. MVPS (or Power Control System (PCS)) units and small transformers will also be positioned in self-contained weather-proof enclosures. The plant will absorb and inject energy as demanded by the power system numerous times over an annual period over short-duration events. The MVPS units on each pack deliver information on the state of the pack to the superior control system for the battery ESS. A high-level diagram of a BESS is illustrated in Figure 2.5 below.

Figure 2.5 High-Level Diagram of a BESS



Source: https://www.energystorageireland.com/

Battery energy storage systems are designed to prevent a problem in one battery cell from spreading to others in the system. The safety systems for a battery storage project operate on multiple layers from the individual battery cell right up to the whole storage system and this is managed by the battery management system (BMS). As soon as the BMS detects that a specific battery cell, or group of cells, is acting in a way that it should not it can instantly reduce the flow of electricity through the cell, switch it off or disconnect it from the power supply completely depending on the severity of the problem. This minimises the risk of a problem escalating in a cell or group of cells and spreading to others. These techniques help to dissipate heat in the event of a cell failure, and subsequent overheating, and prevent adjacent cells or modules from being affected.

The batteries for energy storage are housed in separate enclosures (containers) to prevent the risk of a problem in one container spreading. Sufficient clearance between enclosures is included within the design to provide for this and it also allows for safe access and replacement of modules. Each module includes control equipment, to provide for ventilation, air conditioning and fire suppression equipment (inert gas and detectors). A firewater tank (1,000m^3) is also provided within the LDES compound as an additional safeguard and in the event of a fire within an enclosure the water can be applied to nearby enclosures as a cooling agent to prevent escalation.

Surface finishes within the BESS compound will comprise clean permeable stone fill. Stormwater collected from impervious areas such as the IPP building and limited bitumen macadam roads will be directed to a below ground oil interceptor and attenuation /infiltration structure (volume of c.90m^3) before being discharged via a hydrobrake (which will limit flow to 1l/s (4l/s per hectare)) to the open drain /stream which runs to the south of the compound. Foul wastewater generated from welfare facilities within the BESS compound will be discharged to a sealed foul holding tank. The holding tank will be emptied and suitably disposed of periodically by a local waste permitted contractor. A foul holding tank is recommended due to low occupancy of the facility once operational. There is no requirement for the use of water in the process.

2.4.2.2 Synchronous Condenser

The Synchronous Condenser uses a generator to provide the necessary inertia with its rotating mass while also providing or absorbing reactive power. The generator is connected to the transmission network by a transformer and is started by either an electric motor or a static frequency converter. Once operating speed is achieved, the generator is synchronized with the network and behaves like a synchronous motor with no load, providing reactive power and short-circuit power to the transmission network.

The synchronous condenser compound includes a building (46m (l) x 22.7m (w) x 14.42m (h)), which will contain the horizontal synchronous generator unit along with control modules. It is expected that this building will be a portal steel frame structure. Associated externally located equipment includes an air-cooling unit for the generator, electrical plant (such as transformers), a fire water storage tank and a below ground foul wastewater holding tank. The site layout design includes much permeable clean stone around the various compounds that will be sourced from existing local quarries in the area. A limited amount of impervious internal roads will be installed on site using tarmac which provides suitable vehicular access to and within the compound. It is proposed to use, in so far as possible, raw materials for construction from local sources to support the local economy and minimise environmental impact associated with vehicle emissions. A firewater tank (1,000m^3) is also provided within the LDES compound.

Stormwater collected from impervious areas such as the building and limited bitumen macadam roads will be directed to a below ground oil interceptor and attenuation pond before being discharged via a hydrobrake, which will limit flow to 2.3l/s (4l/s per hectare) to the open drain which runs to the north of the compound. Foul wastewater generated from welfare facilities within the synchronous condenser compound will be discharged to a sealed foul holding tank. The holding tank will be emptied and suitably disposed of periodically by a local waste permitted contractor. A foul holding tank is recommended due to low occupancy of the facility once operational. There is no requirement for the use of water in the process.

2.4.3 PROJECT 3: GAS INSULATED SWITCHGEAR (GIS) ELECTRICITY SUBSTATION

The GIS Electricity Substation comprises a two-storey building positioned and secured within a palisade fenced compound. This component of the overall development will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of Project 1 and Project 2 to the electricity transmission network.

The GIS building (height of 17m) will contain a battery room, generator room, stairs, cable pits, switchgear rooms, workshop, messroom and stores. The proposed GIS will upgrade the existing air insulated switchgear (AIS) substation with a new gas GIS substation at Oldstreet. A lattice steel gantry will be built on the northern side of the GIS building, which will connect the proposed GIS substation to the existing 400kV network and 220kV circuit. A 36m high communications tower will be constructed on the eastern side of the GIS building. The GIS substation will serve the existing function of the AIS substation and facilitate connection of a proposed Reserve Gas-Fired Generator and ESS facility to the node on the 400kV transmission network. High Voltage lines and associated electric plant which will connect the Reserve Gas-Fired Generator and ESS facility are included as part of the proposed development. Associated internal roads, fencing, lighting, civils and drainage works will be appropriately developed for the subject development.

Access to the site during construction and operation will be from the newly constructed internal roads as shown on the site layout plan. The site access and internal roads allow access for construction. A new dedicated entrance from the existing road serving the existing AIS substation compound will also be constructed for the project. This will provide access to the GIS substation during the operational stage, i.e. all stages of the project post construction.

Stormwater collected from impervious areas such as the building and limited bitumen macadam roads will be directed to a below ground oil interceptor before entering a below ground geocellullar attenuation /infiltration system (volume of c. 177m^3). The attenuation /infiltration structure will also outfall to the drain further north via a hydro-brake which will limit the discharge to 1.35l/s (4l/s per hectare). Foul wastewater generated from welfare facilities within the GIS building will be discharged to a sealed foul holding tank. The holding tank will be emptied and suitably disposed of periodically by a local permitted contractor. A foul holding tank is proposed due to low occupancy of the facility once operational. There is no requirement for the use of process water.

2.4.4 UNDERGROUND GAS PIPELINE (ASSOCIATED WITH PROJECT 1)

Following selection of the preferred route, construction will follow standard pipeline construction methods. The main stages associated with this are follows:

- Setting out the route
- Surface stripping
- Excavation
- Pipelaying
- Reinstatement of the working width

The construction phase of the project will incorporate all necessary precautions to secure the efficient protection of all land, streams, waterways, watersheds and reservoirs, against pollution which may have a detrimental impact to persons, flora or fauna. The water flow in all open drains, streams and other watercourses which may be affected by the works shall be fully maintained throughout the construciton period. Banks of open drains, streams, rivers and canals disturbed by the works will be reinforced and stabilised as required and to the satisfaction of the project engineer. Where the pipeline crosses below an open drain, ditch or stream, it will be protected, and the pipeline will be placed at such a depth as will provide a cover of 1.6 metres from the true clean bottom of the drain, ditch or stream to the top of the pipe. In areas of high-water table, marsh or bog it may be deemed necessary to employ anti-buoyancy means to prevent flotation of the pipeline after backfilling.

The works will be designed to ensure that all catchment areas, springs, wells, streams etc. which provide a water supply to local habitations and animal water supplies, etc. are safeguarded and protected from pollution or obstruction during all pipeline construction works and operations.

Depending on the design and particular requirements associated with location, GNI will employ either open cut and /or trenchless techniques for the pipeline project. Should selected pipeline route encounter rock-like material, the construction project will remove the material using pneumatic or hydraulic hand tools or ripping /wedging techniques.

In terms of the pipeline, it is expected that construction of the underground gas pipeline from the existing transmissions system to the development lands will take approximately 18 months. Depending on the exact route, the pipeline construction route will be approximately 30m in width (subject to final route selection localised constraints), which will provide for installation of a 250mm nominal diameter steel pipe in a trench width of 1.5m and approximate depth of 2.0 (soil cover above the pipe being a minimum of 1.2m). The overall width of the construction route allows for safe the passage of two construction vehicles and material storage sites. The working width may be increased at river or stream crossing and may be reduced at tree lines. Mature trees will be preserved and protected and will only be removed where absolutely necessitated and approved by the scheme engineer. The route of the pipeline will be fenced for the construction phase to prevent straying livestock onto or along or across the construction site.

The type of construction machinery which will be used for the pipeline project will include.

- Excavators
- Grading plant /equipment
- Tractor /tipping trailers
- Dump trucks
- Cranage
- Steel cutting tools
- Welding equipment and apparatus
- Non-destructive testing equipment -for the testing of welds in accordance with EN 12732

2.5 DESCRIPTION OF CONSTRUCTION AND COMMISSION STAGES

This section details the construction works associated with the proposed development and outlines general construction methods and associated mitigation measures to be implemented to ensure that potential environmental impacts are minimised. The design and undertaking of construction work associated with the connection of the proposed development to the gas network will be managed by Gas Networks Ireland (GNI).

It is envisaged that the proposed development (three projects) will be constructed over an estimated 20–28-month period. After the estimated 28 month-month construction period, it is expected that all projects will be fully constructed, commissioned and capable of operating as designed. The specific details of the construction programme are not currently known as such this programme will be developed under Engineering Procurement and Construction (EPC) contract as part of the detailed design phase. The EPC contractor will prepare a detailed Construction Environmental Management Plan (CEMP) which will be submitted for agreement with the planning authority. It is expected that the EPC contractor will appoint subcontractors to undertake all the specific construction and civil works.

It is therefore difficult to assess the staffing and delivery levels for the development. However, it is considered that the design and proposed layout of projects has developed sufficiently to discuss the potential environmental effects of proposed construction methods. An estimate of construction traffic volumes has been made for a site of this size and is described in Chapter 13 (Traffic and Transport).

The timing of the commencement of construction is subject to planning, design, tendering and ecological constraints. Any works associated with site clearance and removal of soils and internal hedging would be seasonally limited to mitigate against any adverse ecological affects. The impact of construction activities on Biodiversity and Roads and Traffic are assessed separately in this EIAR. The CEMP will provide a framework under which construction activities, which have potential for environmental impact (e.g., generation of dust, ecological impacts, surface water discharge, etc.), will be managed. Mitigation measures as outlined in the EIAR shall be included within this plan. An indicative construction schedule for each project relative to each other is outlined below (Figure 2.6). It should be noted that the timing and phasing of projects and activities are approximate and are indicative rather than a definitive programme of works.

Figure 2.6 Indicative Construction Programme

<table>
<tr><th>Year</th><th colspan="3">Year 1</th><th colspan="12">Year 2</th><th colspan="12">Year 3</th><th colspan="2">Year 4</th></tr>
<tr><td>Month</td><td>10</td><td>11</td><td>12</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>1</td><td>2</td></tr>
<tr><td>GIS Substation</td><td colspan="5">E&P</td><td colspan="6">C&S</td><td colspan="6">M&E</td><td colspan="3">C&T</td><td colspan="9"></td></tr>
<tr><td>Reserve Gas-Fired Generator</td><td colspan="4">E&P</td><td colspan="9">C&S</td><td colspan="7">M&E</td><td colspan="4">C&T</td><td colspan="5"></td></tr>
<tr><td>ESS Facility</td><td colspan="4"></td><td colspan="4">E&P</td><td colspan="9">C&S</td><td colspan="7">M&E</td><td colspan="4">C&T</td><td></td></tr>
</table>

Notes:

1. The construction timelines are for each project are indicative and will be finalised at detailed design stage of the projects.
2. In relation to GIS Project, timings of certain tasks /works will be subject to system outage planning by Eirgrid and EBS Networks.
3. Construction of the gas pipeline is non-contestable works and will be carried out by GNI.
4. E&P = Site Evaluation and Preparation (Works)

   C&S = Civil & Structural (Works)

   M&E = Mechanical & Electrical (Works)

   C&T = Commissioning and Testing (Works)

Equipment to be used during the construction of the facility will be typical for a project of this scale. In general, the following machinery will be used:

- Tracked excavators,
- Wheeled Excavators,
- Bulldozer,
- Vibrator Rollers,
- Trucks, Dump trucks /Dumpers,
- Mobile Crane,
- Backhoe,
- Grader,
- Breakers,
- Generators /pumps,
- Hoists,
- Concrete pump – Lorry Mounted,
- Loaders,
- Compressors /compactors,
- Rollers,
- Road surfacing plant,
- Delivery vehicles for concrete, steel and other construction materials,

Heavy vehicle movements to the site will consist predominantly of plant and material deliveries. The extent of HGV movements will vary at different stages of the construction works in response to the activities taking place at any given time. The majority of machinery associated with the construction phase is likely to remain onsite for the duration of the construction process. Therefore, the traffic associated with heavy plant will be limited to their delivery and removal, with the intervening period comprising internal movements within the site.

The intensity of traffic will vary over the course of the construction programme. The values referenced are only anticipated during peak periods and therefore representative of the worse-case scenario.

It has been estimated that during the course of an average day during construction, approximately 32 trucks will access the site to deliver materials. These will be spread over the course of the working day.

2.5.1 DURATION AND PHASING

2.5.1.1 Phase 1: Site Evaluation and Preparation

Prior to commencement of construction, geotechnical investigations such as trial pits and boreholes will be conducted to verify foundation designs and road construction. All investigations required prior to enabling works will be carried out in accordance with BS 5930 (Code of Practice for Site Investigations).

No land acquisition is required prior to construction, as the applicant has put in place agreements with the relevant landowners with respect to the entire development lands. Phase 1 of construction will not commence until the main construction contract is awarded and will initially comprise, fencing, excavation, re-grading and berming /soil deposition. The site clearance works will be undertaken in accordance with best practice. Removal of any bird habitats will be undertaken outside the bird breeding season to mitigate disturbance to birds. Mitigation measures to avoid and limit impact to biodiversity include implementation of an environmental management plan which will address water run-off, noise and dust generation, implementation of a suitable landscaping strategy to compensate for habitat loss and to benefit the wildlife of the local area, retention of hedgerows and treelines along the boundary of the site, etc. Also, site clearance will proceed only after cognisance is made to the ecological mitigation measures as detailed in this EIAR.

Where cutting or excavation is carried out, this material will then be reused in areas of the site where fill is needed or in areas requiring landscaping. If any additional material is required this will be imported into the site in a safe and controlled manner, so as to minimise the potential for nuisance and disturbance.

The applicant is committed to ensuring that all the mitigation measures are implemented in full. Haul roads, internal construction site roads, construction compound, main drainage runs, temporary car-parking and staff facilities will also be constructed during this phase. Such site preparation works are expected to be carried out within the first 6 months of the projects commencing.

Site preparation and enabling works will also involve the site set up by the building contractor, which will include provision of a site construction compound which will include the following:

- Site Office,
- Site Facilities (canteen, toilets etc.),
- Office for Resident Engineer,

- Secure compound for the storage of all on site machinery and materials,
- Carparking,
- Permanent/temporary fencing,
- Site Security.

Construction traffic will enter the site via the proposed access road which will be constructed at the outset of the project. This road will run from the L8763 to the project development compounds and serve the contractor's compound. A contractor's compound will be installed in the south area of the site close to the existing residential property which is to be demolished. At the outset of the project, it is proposed that the existing stream on site will be realigned in accordance with statutory obligations. It is proposed that the new channel is constructed initially and once complete the watercourse will be diverted.

2.5.1.2 Phase 2: Civil and Structural Works

This phase will comprise the construction of the foundations and buildings (e.g., OCGT Building, GIS Building, Synchronous Condenser Building, LDES IPP Building, Workshop Building, etc), below ground pipework and conduits for services, bunds, internal roads, drainage works, and infrastructural works completion. Large items of plant /equipment will be installed during this phase.

2.5.1.3 Phase 3: Mechanical and Electrical Works

Mechanical and electrical works include placement of plant and machinery, transformers, tanks, skid mounted structures and enclosures, above ground pipework, wring and cabling, etc. The individual project plant components will be delivered to the site by the preferred supplier and will be installed in accordance with manufacturer requirements. All pipework and ducting will be assembled on site.

2.5.1.4 Phase 4 Installations and Commissioning

This phase will comprise the installation and testing of mechanical and electrical equipment. During this phase final completion and finishing works will be carried out in anticipation of handover of the projects to the project owner /client. It should be noted that the above phasing is indicative only and may be subject to variation by the planning authority and also to final schedule agreement with the main contractor.

2.5.2 EMPLOYMENT

Employment levels during the development will vary depending on the construction programme and the extent of activities occurring on the site. It is expected that during peak activities there will be up to 140-150 construction workers at the site.

It is anticipated that during peak construction periods, approximately 200 vehicles will enter the site in the morning and leave the site in the evening. This is based on vehicle occupancy of two. An assessment of the likely traffic volumes which may arise during the construction and operational phase is discussed in the Traffic and Transport Chapter of this EIAR.

2.5.3 ACCOMMODATION/FACILITIES

The relevant statutory requirements will be provided for all workers on the construction site including:

- Canteen facilities and drinking water supply
- Toilet, wash up and locker facilities and hot water
- Drying room
- Car parking for workers
- First Aid Office
- Site Engineers & Resident Engineers offices
- Site offices for Contractors
- Secure site compounds

2.5.4 CONSTRUCTION OPERATION HOURS

Subject to agreement with the planning authority, it is anticipated that the following times will constitute the standard working hours[13] on the construction site.

- Monday to Friday 07:00 to 19:00
- Saturdays 07:00 to 13:00
- Site closed on Sundays and Bank Holidays,

Working hours may vary slightly depending on weather conditions and daylight hours during winter months. Heavy construction activities will be avoided where possible outside

[13] Typical Construction hours will apply with the exception of commissioning and specific engineering works (e.g., concrete pours) which could take place outside these hours, as and when agreed with the planning authority. It is likely that some construction activities will be required to continue for 24 hours for limited durations. The facility may be operational at any point during a 24-hour period during commissioning (and operation).

the normal working hours outlined above. Lighting for night-time working will be downward facing and directed towards the centre of the site so as to minimise any nuisance outside of the site in relation to residential receptors or light disturbance to ecological receptors.

2.5.5 CONSTRUCTION TECHNIQUES

The construction techniques used will be standard and similar to those that would normally be associated with large industrial projects of this nature with both building and technology installation elements and a large civil engineering element.

2.5.6 MATERIALS

In so far as possible, construction materials will be from local sources to support the local economy and minimise environmental impact associated with vehicle emissions. All imported material that will be used on site will be retrieved from approved sources.

The construction of surface water systems are an important element of the project. Temporary localised settlement ponds and interceptors (where necessary) will be constructed during the initial stages of the contract mitigating against adverse impacts on existing receiving water receptors.

2.5.7 EXTENSION OF INFRASTRUCTURE

Services such as ESB and Telecoms will be brought to the dedicated construction compound from the nearest available point. Potable water for the development will be supplied from the on-site well which is currently serving the residential property which is to be demolished. Temporary sanitary accommodation will be provided on site until proposed foul effluent management packages are installed. All domestic effluent generated on site will be discharged to temporary sewage containment facilities prior to transport and treatment off site.

2.5.8 WASTE MANAGEMENT

During the construction phase both solid and liquid waste will be produced at the facility. Waste oils, solvents and paints will be stored in a temporary bunded area prior to transport off site by a licensed contractor. All wastes arising from construction of the proposed development will be managed in accordance with the Waste Management Acts 1996, as amended.

The existing residential property within the development lands will be demolished and removed from site in accordance with best practice. Works will involve careful decommission and removal of all farm structures at the site. Anticipated wastes which will be generated include soils, bricks and blocks; concrete and reinforced concrete; timber; metal sheeting and steel. Materials arising from this process will be recycled /disposed of at authorised waste management facilities.

Designated skips and receptacles will be provided on site for all recyclable wastes. The appointed waste contractor will collect and transfer the recyclable wastes as skips are filled. Non-recyclable waste (e.g. canteen waste, general waste) will be transferred by an authorised waste collector to licensed facilities (e.g., canteen waste, general waste). Numerous licensed waste contractors are available in the area and will be obtained from the waste management authority listing.

It is not envisaged that there will be any excess spoil materials arising from construction, as all the excavated soil will be re-used as part of the construction process (formation of berms and landscaping). All other solid waste generated during the construction phase will be adequately segregated and stored prior to transfer to an authorised facility for recovery/recycling/disposal.

2.5.9 FENCING AND SECURITY

Secure fencing will be erected around individual development sites and temporary fencing will be erected around the construction compound. All on site machinery and materials will also be stored within the fenced compound.

2.5.10 NOISE, VIBRATION AND DUST

Dust emissions during the construction period have been detailed under temporary environmental protection measures. The CEMP will incorporate all mitigation measures detailed in the EIAR and any conditions specified in the interests of proper planning, sustainable development and environmental protection. This will include measures and trigger values to mitigate any potential impacts to nearby receptors.

2.5.11 TEMPORARY ENVIRONMENTAL PROTECTION MEASURES

During the construction stage site construction roads will be sprayed with water during dry periods to mitigate against the formation of dry dust particles. Excavated materials stored or moved on site could lead to the formation of airborne dust particles during dry weather periods. Water suppressants will be used during these dry weather conditions.

The landscaping areas proposed for the facility will be constructed and planted at the earliest opportunity thus limiting the potential for off-site migration of airborne dust.

Where temporary stockpiles are required, the material will be stored in designated areas and will be covered with tarpaulins and/ or regularly dampened during dry weather periods.

All potentially polluting substances such as oils, chemicals and paints used during construction will be stored in designated storage areas. These will be bunded to a volume of 110% capacity of the largest tank/container within the bunded area with all filling and draw-off points fully located within the bunded area. Drainage for the bunded area will be diverted for dedicated collection and safe disposal.

As stated above all domestic effluent generated on site will be discharged to temporary sewage containment facilities prior to transport and treatment off site.

Temporary settlement ponds and interceptors will be constructed as necessary during the early stages of construction mitigating against silt laden run-off to the existing drainage network.

Prior to commencement of development a construction quality assurance plan (CQA) will be jointly prepared by the contractor and developer. Written approval of the CQA will be sought from the planning authority prior to commencement of construction activities on-site if required.

Good housekeeping and facility management during the construction period will ensure that there will be no negative environmental impacts from the construction of the proposed facility.

As stated previously in this section, the majority of machinery associated with the construction phase is likely to be onsite for extended periods of time. The traffic associated with these will therefore be limited to their delivery and removal, with the intervening period involving internal movements within the site. The impact of these on the surrounding road network is therefore expected to be minimal and infrequent.

2.6 DESCRIPTION OF OPERATIONAL STAGE

The Reserve Gas-Fired Generator will only run during periods of high demand or system instability and in accordance with the needs of the system operator. The project will employ approximately 15-20 full-time personnel who will work across three daily shifts. Periodic engineering and maintenance inspection visits to the plant will also be carried out. When called upon, it is expected that the plant will respond and reach full load within 20 minutes and generate electricity for export to the grid. The Reserve-Gas Fired Generator will require an industrial emissions licence from the EPA (i.e., it falls under a class of activity (*"Combustion of fuels in installations with a total rated thermal input of 50 MW or more*") as outlined in the first schedule of the EPA Act 1992, as amended.

The ESS facility (LDES and Synchronous Generator) will operate unmanned and will be controlled remotely. The storage systems will respond to system demand and provide a wide range of balancing and system support services. The Project is not a class of activity under the First Schedule of the EPA Act 1992, as amended.

Upon handover after the Commissioning and Testing Phase, the plant operators will provide suitably qualified and technically competent staff who will be responsible for maintenance of the plant. Employees will cover a broad range of services including safety, engineering, technical, security, maintenance and administrative support staff. Subcontracted maintenance staff will also be required at critical times such as an annual shutdown period. The plant will be operated in accordance with procedures which will be prescribed in management systems associated with the site operations, i.e., quality, health and safety, energy and environmental.

2.7 DECOMMISSIONING

The proposed projects are expected to be operational for at least 25 years or as long as is required by grid infrastructure. Given that the GIS Project and the AGI will become grid assets, these elements are not considered in this section as the utility operator will take ownership when constructed and will be responsible for decommissioning.

In terms of the Reserve Gas-Fired Generator, once operational the Project will be subject to the requirements of an EPA Industrial Emissions (IE) Licence. At the end of the useful life of the facility, the IE Licence will require that the site be returned to its pre-development status. In line with implementing the Environmental Liability Directive (2004/35/EC), which provides a framework of environmental liability based on the *"polluter pays"* principle, the proposed development will include a condition under a *"Statement of Measures"* condition as outlined below:

> *"The licensee shall as part of the AER provide an annual statement as to the measures taken or adopted at the site in relation to the prevention of environmental damage, and the measures in place in relation to the underwriting of costs for remedial actions following anticipated events (including closure) or accidents/incidents, as may be associated with the carrying on of the activity."*

Given the modular nature of the ESS Projects which will not be licensed by the EPA, it is expected that decommissioning will occur in accordance with the following main steps:

- An audit will be conducted to assess and provide for preparation of a decommissioning management plan. This will include the assessment and evaluation of plant and equipment which may have resale value or that which should be scrapped or recycled.
- All services connected to the site will be terminated. These will include electricity water, storm and foul, communications, and gas.
- All waste will be removed by a permitted contractors to suitably licensed facility.
- All plant and equipment will be dismantled.
- All electrical cabling and pipework will be removed and recycled.
- Battery modules will be decommissioned.
- Foundations will be broken down to ground levels and any surplus material will be removed from site.
- Depending on the future use of the sites, the internal hardstands and roadways may or may not be demolished. If required, all internal hardstanding and roadways will be broken up with concrete and hardcore material recovered for onsite crushing and recover for further use as filling material elsewhere. Any steel within these areas will be recovered for recycling.
- Depending on the future use of the site, the site fencing and gates may or may not be removed. If they are removed, they will be removed carefully and depending on condition will be reused elsewhere.
- Ground levels will be graded and left level.
- On completion of full demolition, the site will be re-profiled and contoured to match the surround areas. Grass will be sown to return the area back to grassland as per its original use.

3 NEED FOR THE DEVELOPMENT AND ALTERNATIVES

This chapter of the EIAR sets out the need for the development and the consideration of reasonable alternatives in terms of locations, designs and processes. The impact of not proceeding with the proposed development at all, often referred to as the "do nothing" option, is also considered.

3.1 NEED AND RATIONALE FOR THE PROPOSD DEVELOPMENT

The Irish Government has committed that up to 80% of electricity consumption will come from renewable sources by 2030[14] and that the country will be on a pathway to achieving a climate neutral net zero target by 2050. The use of electricity will also contribute to the decarbonisation of the transport sector, through the uptake of electric vehicles, and the heat sector, through the use of heat pumps. Ensuring continued security of electricity supply is considered a priority at national level and within the overarching EU policy framework in which the electricity market operates.

On the 30 November 2021, the Department of the Environment, Climate and Communications (DECC) issued a Policy Statement on Security of Electricity Supply. The Statement sets out a number of updates to national policy in the context of the Programme for Government commitments relevant to the electricity sector, planning authorities and developers. The policy statement includes explicit Government approval that the development of new conventional generation (including gas-fired and gasoil/distillate-fired generation) is a national priority and should be permitted and supported in order to ensure security of electricity supply and support the growth of renewable electricity generation. Conventional generation should be flexible and low emitting (i.e., powered by natural gas). The policy statement acknowledges that such gas-fired generation should also be able to operate on gasoil/distillate as a backup fuel.

The CRU has statutory responsibility to ensure security of supply, the duty of monitoring electricity supplies and taking measures as it considers necessary to protect the security of supply. It is assisted in its role by EirGrid, the electricity transmission system operator, and the Department of Energy Climate and Communications (DECC). In May 2024[15] the CRU issued a direction to stakeholders including Eirgrid and ESB Networks DAC to provide a pathway to grid connection for onshore units in the T-4 Capacity Auction for 2028/29 with the objective of mitigating the risk of capacity shortfall.

[14] Climate Action Plan 2024
[15] https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU202437_CRU_Direction_to_EirGrid_T-4_2028-29_393003.PDF

The CRU's Information Paper on Security of Electricity Supply – Programme of Actions (CRU/21/115) highlights the need to secure 2GW of enduring capacity in the form of new gas-fired generation and is aligned with the Government's Policy Statement on Security of Electricity Supply16 and the Climate Action Plan 2024.[17] The CRU notes the Government's Policy Statement on Security of Electricity Supply, which states the following:

> *"The Government has approved that:*
> *the development of new conventional generation (including gas-fired and gasoil/distillate-fired generation) is a national priority and should be permitted and supported in order to ensure security of electricity supply and support the growth of renewable electricity generation;*
>
> *it is appropriate for additional electricity transmission and distribution grid infrastructure, electricity interconnection and electricity storage to be permitted and developed in order to support the growth of renewable energy and to support security of electricity supply".*

Similarly, the CRU notes the General Policy Directive[18], pursuant to Section 79 of the Environmental Protection Act, from January 2023, which calls for the prioritisation of *"the consideration of applications which impact on the State's energy security of supply."*

The location of this proposed development was guided by a number of factors not least being the existence of the adjoining 400kV AIS substation and the availability of sufficient and suitable lands within a location with low environmental sensitivities. In terms of rationale applied in respect of the scale and design of the proposed development which includes the reserve gas-fired generator project (1,155MW), the LDES (400MW) and Synchronous Generator (400MVA electrical rating) project, the electricity system requires flexible gas-fired generation capacity and ESS facilities to assist the system with inertia, voltage stability, reserve and other technical elements. The requirement for the technologies proposed as part of this development is because the majority of renewable energy generated by 2030 and beyond will be from wind and solar. These sources of renewable energy are variable in nature will require other technologies to both support their operation and provide the supply of electricity when they are not generating. In addition, the significant growth in electricity demand projected over the coming years from

[16] https://www.gov.ie/en/publication/a4757-policy-statement-on-security-of-electricity-supply/
[17] https://www.gov.ie/en/publication/79659-climate-action-plan-2024/
[18] https://www.gov.ie/pdf/?file=https://assets.gov.ie/245631/487f19aa-446a-4cea-8592-409bd7224b50.pdf#page=null

large energy users, electrification of heating and transport and because of growing population underpin the need for development such as that proposed.

In terms of the proposed 400kV GIS which will facilitate connection of Projects 1 and 2 to the 400kV system, the CRU recognises the vital importance of the physical delivery of grid infrastructure to both decarbonisation and security of supply, and that this is also a key tenet of the REPowerEU plan. In this context, the CRU considers it appropriate to expedite connection works associated with connection offers issued under its May 2024 Direction and it accepts that the benefits to customers of this approach outweigh the potential risks.

3.2 CONSIDERATION OF ALTERNATIVES

This Section of the EIAR sets out the reasonable alternatives considered and iterations of the design of the development which have evolved in terms of layout and processes.

Schedule 6 to the Planning and Development Regulations, as substituted by Article 97 of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, states that the EIAR should contain *"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".* It should be noted that the assessment does not include an assessment of potential alternatives, rather it evaluates and considers "reasonable alternatives" that have been "*studied by the person or persons who prepared the EIAR".*

In Section 4.2(d) of the *"Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment August 2018"* it states that the information provided must include

> *"A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;"*

Reasonable alternatives are defined under Section 4.13 in the 2018 guidelines as the following:

> *The Directive requires that information provided by the developer in an EIAR shall include a description of the reasonable alternatives studied by Reasonable alternatives may relate to matters such as project design, technology, location, size and scale . The*

type of alternatives will depend on the nature of the project proposed and the characteristics of the receiving environment. For example, some projects may be site specific so the consideration of alternative sites may not be relevant. It is generally sufficient for the developer to provide a broad description of each main alternative studied and the key environmental issues associated with each. A 'mini- EIA' is not required for each alternative studied.

The above statement is also reiterated in the 2022 EPA EIA Guidelines (Section 3.4.1).

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.

3.2.1 DO NOTHING

The CRU and Eirgrid have issued warnings to Government about the risk of blackouts. Ongoing system analysis shows that the all-Ireland capacity margin is insufficient, particularly when renewable generation is at a low output and support is not available. This has been exacerbated in recent times due to closure (and pending closure) of older conventional thermal generators and increases in system demand. In the event of system emergency conditions or imminent shortfall of MW capacity, the Single Electricity Market Operator (SEMO) issues colour-coded alerts. Depending on seriousness of events, alerts are issued to informing stakeholders of the possibilities of failure in meeting the power system demand, frequency or voltage departing significantly from normal, shutdown of users, or shutdown of the power system (partial or full). As of early May 2024, SEMO has issued 22 system alerts since May 2021 (three years) to warn of capacity shortages on the electricity grid, compared with just 11 alerts over the previous 10 years[19].

The proposed development provides a mix of technological solutions designed to provide a wide range of grid support services and to assist with the transition to a low carbon economy. In the absence of the proposed development, integration of renewable energy generators will be constrained, security of supply will continue to be threatened and decarbonisation of the generation portfolio will be inhibited, thereby impeding Ireland's

[19] https://www.businesspost.ie/energy/electricity-system-amber-alert-issued-this-morning-f772c7e6

commitment to meet its EU and national emissions targets. In the absence of the proposed GIS substation (Project 3), the option and provision of connecting Project 1 and Project 2 directly connect to the electricity transmission system and export power to the grid would not have been considered and assessed.

3.2.2 ALTERNATIVE LOCATIONS

The proposed development incorporates grid flexibility and enabling technologies. It is designed and configured to address capacity deficiencies and support further integration of renewable generators, particularly the offshore wind industry. Analysis of system needs by the applicant identified the opportunity and *"best fit"* to provide this support via the 400kV transmission line, thereby locating the proposed development at a suitable location along its route from Moneypoint to Woodland was determined as being a key driver in terms of the consideration of location and this factor significantly reduced the feasible options regarding site location.

The site was chosen as the proposed development location due to:

a) the existence of the adjoining 400kV Oldstreet AIS substation (the only intermediate substation along the route of this 400kV line) at the proposed development lands,
b) the availability of sufficient and suitable lands (under the control of the applicant) with low environmental sensitivities,
c) sufficiency of buffer distances to residential properties,
d) suitable ground conditions,
e) lands are accessible from the public road, no material conflicts with zoning objectives, and
f) being able to demonstrate conformance with planning policy.

The government guidance regarding alternative sites in this instance is clear and supports the decision to locate the development at the proposed site, i.e. *"….some projects may be site specific so the consideration of alternative sites may not be relevant…."* Developing the proposal at this location avoids and reduces adverse environmental effects (following the mitigation hierarchy of avoid, reduce and, if possible, remedy) such as routing HV overhead lines to a development site removed or distant from the existing HV corridor. It ensures that the above ground development[20] is consolidated and substantially improves cost benefit analysis of the proposed development.

[20] It is noted that an underground gas transmission line will be extended to serve the proposed development. However extension of the gas transmission network in the region conforms with development policy as outlined in Chapter 3 of this EIAR

3.2.3 ALTERNATIVE TECHNOLOGIES AND PROCESSES

A mix of technologies were chosen for the proposed development to provide a comprehensive range of grid products and to assist with the transition to a low carbon economy. This EIAR assesses the proposed development and the three projects contained within. An assessment of the alternative technologies considered to satisfy system requirement is provided below.

3.2.3.1 Reserve Gas-Fired Generator (Project 1)

Open cycle gas turbine (OCGT) technology, also referred to as simple cycle gas turbine technology, was chosen to address the emergent needs for support generation capacity and the closure of peat and coal plants in Ireland. The chosen technology type will be capable of providing predicable dispatchable power and a range of *"on-state"* and *"off-state"* electricity system services which will support and complement the growing mix and integration of renewable (non-dispatchable) generators (e.g., solar and wind).

In Ireland, electricity system reserve generators (or peaking plants) are run only when there is a high demand for electricity. Unlike baseload power plants (such as combined cycle gas turbines (CCGT)), peaking plants operate in standby mode when not in use and are called to run by the grid operator when there is a high demand to supply electricity. CCGT can deliver greater efficiency, however in the context of an energy market where some traditional power plants will need to be kept online to augment renewable sources, open cycle gas turbines can be a cleaner and/or cheaper technology to install and operate depending on whether they are being compared to other types of gas turbines and other fossil-fuel-based plants.

Historically the portfolio of peaking plants which exist in Ireland are fuelled on diesel (gasoil) only. However, due to the shift and transition to a low carbon and sustainable economy, the technology is not considered suitable as emissions from diesel only engines do not comply with the Clean Energy Package limits.

Therefore, in terms of designing a suitable peaking plant to serve the capacity market, the assessment of technology options recommended open cycle gas turbine as the preferred technology solution. The OCGT option also needed to be commercially proven, capable of operating on distillate oil as a secondary fuel, comply with environmental requirements and ramp up to full load from cold start in less than 10 minutes. Therefore, OCGT technology represent a pragmatic option for delivering back-up electricity into the grid.

3.2.3.2 ESS (Project 2)

In the context of the All-Ireland system, energy storage system technologies are becoming increasing important as they have no air emissions and are considered carbon neutral. The ESS technologies considered were again evaluated in terms of the market requirements, i.e., the scope was to design a carbon free solution to provide a full range of products in the system services market replacing the functions historically served by conventional power plants.

In terms of the energy storage element of the ESS project, a number of battery types were considered. This included lead acid, flow battery (iron, vanadium) and NaS batteries. Criteria which informed selection of the preferred technology included, proven and demonstrated technology, long life cycling requirements and positive environmental and safety attributes.

The technologies chosen for the ESS Project comprises a lithium-ion static battery storage system (to provide circa 4 hours storage capacity) and a horizontal synchronous condenser. Both technologies will trade electricity at high demand aiming to shift and smoothen the demand curve by charging at night and discharging during peak demand hours and during grid events such as frequency and voltage drop. The LDES is capable of providing a wide range of system services[21] which support the integration and further growth of nonsynchronous renewable generation. The synchronous condenser provides reactive power consumption and generation resulting in voltage control, short circuit power capacity and inertia response.

3.2.3.3 GIS (Project 3)

As part of the assessment of the electricity substation option, a gas insulated switchgear (GIS) substation and an air insulated switchgear (AIS) substation (an expansion to the existing AIS substation) were considered. In general GIS substations are positioned indoor and AIS substations are installed outdoors. The main advantage of the GIS substation is that the phase to phase spacing is reduced significantly resulting in a substation with a much smaller compound footprint and visual impact than its AIS counterpart. The selection of a GIS substation over an AIS substation offered more scope in the site selection process due to the smaller size of compound (approximately 4-5 times less than the minimum take for an AIS) and it resulting in a lesser impact on the receiving environment in terms of noise and landscape and visual impact.

[21] SIR, FFR, POR, SOR, TOR1, TOR2, SSRP, RRS, RRD, RM1, RM3, and RM8

3.2.4 ALTERNATIVE LAYOUT AND DESIGNS

Once the preferred site was selected, the design team focused on suitably positioning a proposal within the site that is sympathetic and one which integrates into the landscape and surrounding environment. The final design concept was, as far as practicable, to minimise visual intrusion and accordingly the proposed finished compound levels were determined following careful consideration of cut and fill requirements and existing local topographical conditions. The Project compound finished levels were set to reduce the overall height of the development within its setting whilst carefully considering other potential knock-on effects, such as cut and fill imbalance, waters, etc.

During the EIA process baseline surveys were carried out and design mitigation measures were incorporated into the overall scheme. Various design layout options were developed to minimise potential impact on sensitive receptors) and accord with the natural features of the site (e.g., topography). Extensive consideration was also given in relation to devising suitable access to the proposed development and mitigating potential impacts.

These included the following:

- positioning the development with the subject site whilst allowing maximum and sufficient distance to recptors,
- rerouting part of the Treananearla stream (also known as Ballynaheskeragh stream) running though the site and incorporation of SuDS principles within the proposed stormwater drainage scheme,
- relocating the proposed entrance point to development lands (moved to point further south along L8763), thereby reducing potential impacts (e.g. construction stage traffic) associated with using the L8763 (local road),
- positioning the AGI compound repositioned further south within the development lands to consolidate development,
- Increasing separation distances between enclosures within the LDES compound,
- improving sight lines along the junction of the N65 (National Road) and the L8763 (local road) proposed in accordance with TII guidelines,
- Localising main HV transformers for Project 1 and Project 2 within associated compounds, rather than in single HV transformer compound close to the Project 3,
- Creating an undulating berm (4-5m high) along the western and southern areas of the development lands (approximately 1.4km long) proposed with soils arising from excavation works on site to minimise potential landscape and visual and noise impacts at sensitive receivers.

- Providing new (2,294 linear metres) and enhanced (1,832 linear metres) planting of hedgerows proposed along with planting of new woodland (4.9 acres) with native broadleaved species to create and support biodiversity on site. This provides significant additional commuting and foraging for habitats for birds, small mammals and bats. Attenuation ponds (SuDS feature) designed to increase biodiversity value.

Examples of early iterations of development layouts are presented in Figure 3.1 to Figure 3.3. Given the rural setting and following consideration of baseline findings in conjunction with processes and chosen technologies was considered appropriate to position the OCGT units within a building, rather than configure and assemble the generator within outdoor enclosures. This process resulted in the following changes evolving in the design of the Reserve Gas-Fired Generator Project (Project 1):

- The location of the OCGT units within a building, rather than as outdoor units (within enclosures),
- The OCGT stacks positioned within outer structures and partially incorporated into building,
- The air intake filter housings recessed into the roof of OCGT building,
- The architecture of the OCGT building structure being designed to reflect the receiving environment and landscape,

This final and proposed layout and configuration for Project 1 provides the applicant with more options in terms of design and mitigation of potential effects during operation. Examples of early iterations of development site layouts and the design of the OCGT building are presented in Figure 3.4 to Figure 3.10. An Architectural Design Statement is provided in Appendix 3.1.

Figure 3.1 Site Layout Iteration (example 1)

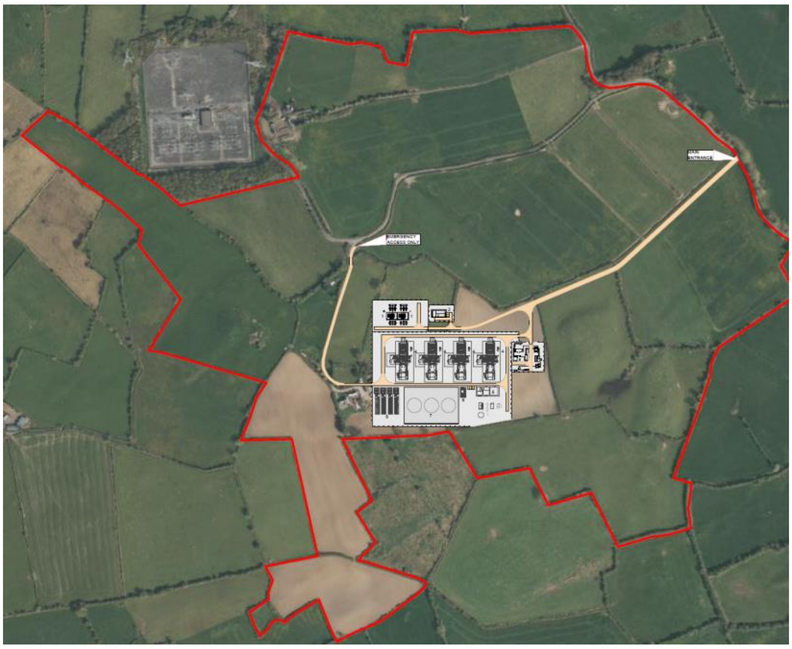


Figure 3.2 Site Layout Iteration (example 2)

Figure 3.3 Site Layout Iteration (example 3)

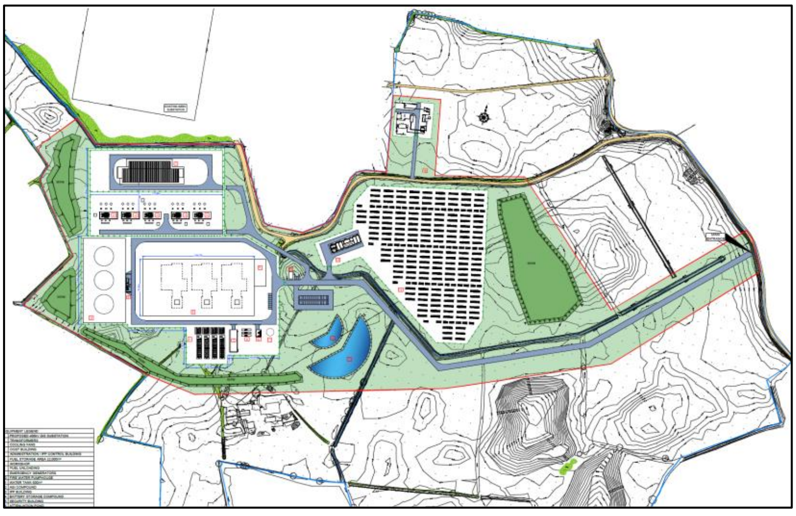


Figure 3.4 OCT Building Design Iteration (example #1)

Figure 3.5 Example of Section to inform OCT Building Design (example #1)

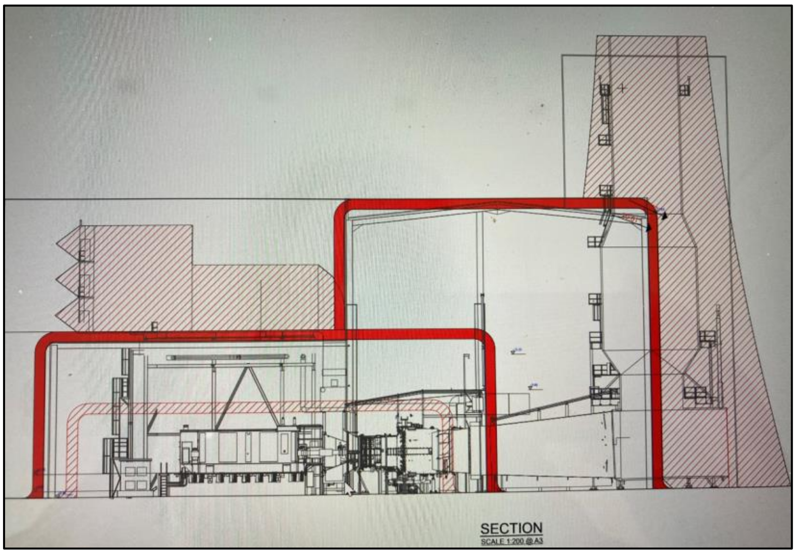


Figure 3.6 OCT Building Design Iteration (example #2)

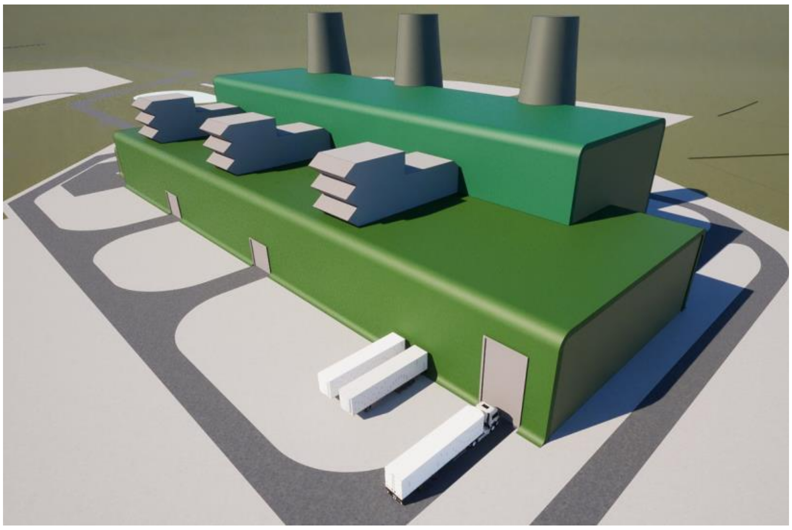


Figure 3.7 Example of Section to inform OCT Building Design (example #2)

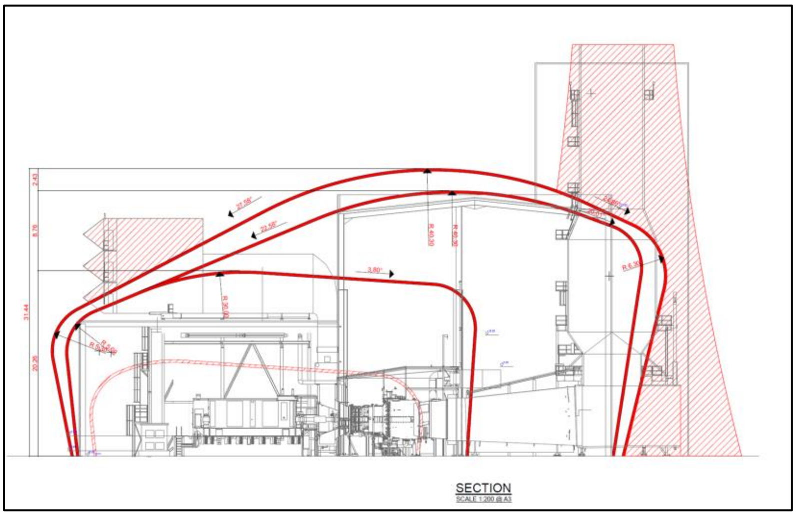


Figure 3.8 OCT Building Design Iteration (example #3)

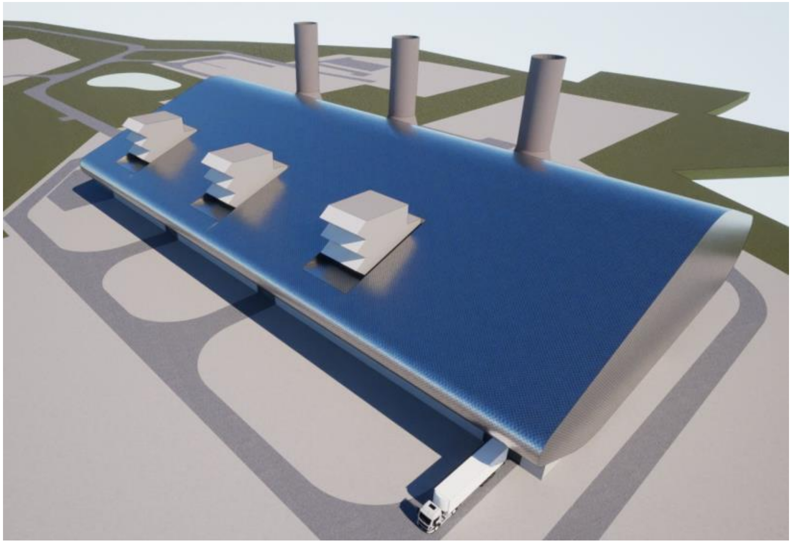


Figure 3.9 OCT Building Design Iteration (example #4)

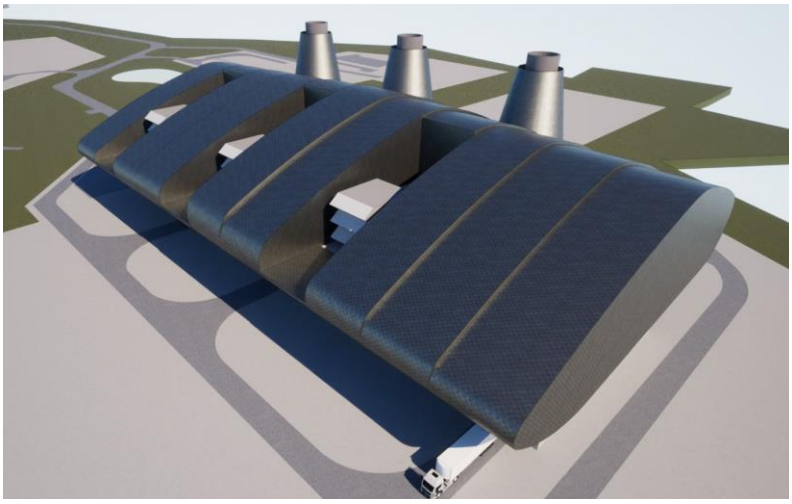


Figure 3.10 OCT Building Design Iteration (example #5)

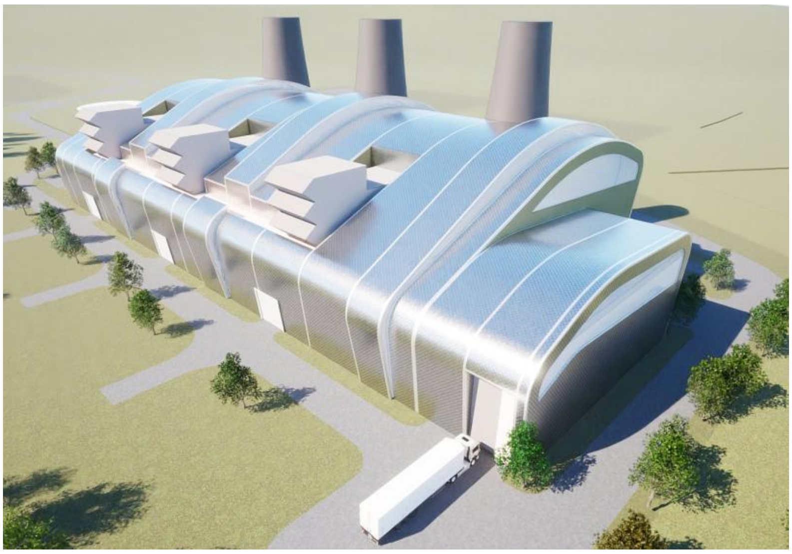


Figure 3.11 OCT Building Design Iteration (Proposed)

Development and connection of the GIS Project to the existing transmission system involved consideration of numerous layout options and consultation with Eirgrid. Changes which resulted from this process included, (i) moving the GIS north and closer to the existing Oldstreet AIS substation, (ii) inclusion of lattice steel gantry to provide for connection of the existing three circuits and (iii) changes to lengths of underground cables to match rating for existing overhead line conductors. Ultimately the GIS building and compound when built will be owned by the ESB in their role as Transmission Asset Owner (TAO) and Eirgrid will operate it in their role as Transmission System Operator (TSO). The proposed layout and process is considered less onerous than earlier iterations and the most effective and efficient solution in terms an outage to support connection and reduces project risks.

4 PLANNING & POLICY

4.1 INTRODUCTION

This Chapter provides an overview of international, national, regional, and local policy associated with the proposed development at Coolpowra, Ballynaheskeragh, Coolnageeragh and Gortlusky, County Galway. The proposed projects are examined in the context of the policies and objectives set out within each of these plans.

4.2 INTERNATIONAL AND EUROPEAN

The United Nations Framework Convention on Climate Change (UNFCCC), agreed in 1992, is the main international treaty on fighting climate change. Its objective is to prevent dangerous man-made interference with the global climate system. The Paris Agreement (COP 21[22]) adopted by all UNFCCC Parties in December 2015 is the first-ever universal, legally binding global climate agreement. Before 2020, the world's only legally binding instrument for cutting greenhouse gas emissions is the 1997 Kyoto Protocol. The Protocol has been ratified by 192 of the UNFCCC Parties, including the EU and its member countries.

The development of EU climate policy was first discussed by the European Council in 1990. At this time, EU leaders agreed to implement the first European climate target, namely to stabilise greenhouse gas (GHG) emissions of the European Community (EC) at 1990 levels by 2000. At the climate summit in Kyoto in 1997, the EC committed to 8% reductions of six GHGs during the first commitment period 2008-2012 (compared to 1990 levels). Specific internal arrangements were agreed in 1998 and the approved burden sharing agreement became binding on Member States in 2004.

This was followed by the second commitment period (2013-2020) and introduction of the EU's first package of Climate and Energy measures, which were adopted in 2008. The Climate and Energy Package 2020 includes a set of three binding targets for Member States including the requirement to reduce greenhouse gas (GHG) emissions by 20% by 2020 (compared with 1990 levels). One of the four constituent parts[23] of the package was the Renewable Energy Directive (RED I)[24]. RED I is a central element in EU policy and a key driver for meeting renewable energy targets; 20% consumption to come from

[22] "Conference of the Parties" – referring to the countries that signed up to the 1992 UNFCCC. The COP in Paris is the 21st such conference. COP 24 was held in Katowice (Poland) in December 2018.
[23] The other three parts being a reviewed Directive on Emissions Trading (ETS Directive), the Effort Sharing Decision (ESD) and a Directive on Carbon Capture and Storage
[24] European Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

renewable sources by 2020. Under RED I (2009/28/EC) Ireland is committed to producing from renewable sources at least 16% of all energy consumed by 2020. Ireland has committed to meeting this national target through 40% renewable electricity, 12% renewable heat and 10% renewable transport.

The 2012 Energy Efficiency Directive (EED) (2012/27/EU) establishes a set of binding measures to help the EU reach its 20% energy efficiency target by 2020. Under the 2012 EED, all EU countries are required to use energy more efficiently at all stages of the energy chain, including energy generation, transmission, distribution and end-use consumption. Article 7 of the EED obliges Members to deliver savings of 1.5% of annual energy sales to final customers. In Ireland, the Energy Efficiency Obligation Scheme (EEOS) is projected to deliver half of the required 1.5% target.

In October 2014 the European Council agreed on a new target framework for 2030 that continues the triple target approach of 2020 (the 2030 Climate and Energy Framework). The 2030 Climate and Energy Framework includes targets and policy objectives for the period 2021-2030. The targets for renewables and energy efficiency were revised upwards in 2018 following agreement on a recast of RED I. The recast directive, RED II (Directive 2018/2001), provides a framework towards meeting the binding Union target of at least 32% renewable energy in gross final energy consumption by 2030 and a cut in GHG emissions by at least 40%[25].

Under the new 2030 Climate and Energy Framework, which is also part of the *Clean Energy for all Europeans Package*[26], EU countries are required to draft 10-year National Climate and Energy Plans (NECPs) for 2021-2030, outlining how they will meet the new 2030 targets for renewable energy and for energy efficiency.

In 2018, the Directive on Energy Efficiency (2018/2002/EC) was agreed (amending 2012/27/EU) to update the policy framework to 2030 and beyond. Article 7 of the amending EDD sets a binding target for Member States to make new annual energy savings equivalent to 0.8% of their final energy consumption each year to meet a cumulative target by 2030. To meet these requirements Government has to put policies and measures in place that will result in energy savings.

In light of the Intergovernmental Panel on Climate Change (IPCC) Special Report in 2018 on the "*Impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways*", the EC presented its strategic long-term vision for a

[25] Requirement for the ETS sector to cut emissions by 43% and the non-ETS sector by 30% (compared to 2005).
[26]This addresses the 5 dimensions of the Energy Union (1) energy security; 2) the internal energy market; 3) energy efficiency; 4) decarbonisation of the economy; and 5) research, innovation and competitiveness.

climate-neutral (net zero target) economy by 2050 in November 2018. The purpose of the Strategy (*A Clean Planet for all),* isn't to set targets. Rather it creates a vision and plan and provides a portfolio of pathways to stakeholders in line with the Sustainable Development Goals[27] to help achieve a climate neutral net zero target by 2050.

4.3 NATIONAL POLICY

4.3.1 NATIONAL PLANNING FRAMEWORK 2018-2040 – PROJECT IRELAND 2040

The National Planning Framework 2018-2040 (NPF) is the comprehensive strategic plan designed to guide the development of Ireland over the next 20-year period. This framework aims to achieve balanced regional development, promote sustainable growth, and improve quality of life across the country. Key objectives include:

1. Regional Development: Promoting balanced growth across all regions to ensure that economic and social benefits are distributed more evenly throughout the country.
2. Sustainable Development: Encouraging the use of renewable energy, enhancing public transportation, and implementing environmentally friendly policies to ensure sustainable development.
3. Economic Growth: Supporting economic expansion by improving infrastructure, fostering innovation, and creating a conducive environment for business investment.
4. Housing and Community: Addressing housing shortages by facilitating the construction of new homes and ensuring the availability of affordable housing options, while also improving community amenities and services.
5. Infrastructure: Investing in critical infrastructure projects, including transportation networks, healthcare facilities, and educational institutions to support future growth and development.
6. Urban and Rural Balance: Ensuring that both urban and rural areas benefit from growth and development initiatives, thereby avoiding over-concentration in major cities and neglect of rural areas.
7. Quality of Life: Enhancing the quality of life for all citizens by improving public services, protecting the environment, and fostering vibrant and inclusive communities.

[27] https://www.un.org/sustainabledevelopment/sustainable-development-goals/

The NPF seeks to harness the country's renewable energy potential, achieve a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050, and promote new energy systems and transmission grids based on renewables-focused energy generation system, including solar energy. Key national policy objectives which are relevant to the proposed development are as follows:

- **National Policy Objective 52**: The planning system will be responsive to our national environmental challenges and ensure that development occurs within environmental limits, having regard to the requirements of all relevant environmental legislation and the sustainable management of our natural capital;
- **National Policy Objective 54**: Reduce our carbon footprint by integrating climate action into the planning system in support of national targets for climate policy mitigation and adaptation objectives, as well as targets for greenhouse gas emission reduction; and
- **National Policy Objective 55:** – promote renewable energy use and generation at appropriate locations within the built and natural environment to meet national objectives towards achieving a low carbon economy by 2050.

4.3.2 NATIONAL DEVELOPMENT PLAN 2021-2030

The National Development Plan (NDP) underpins the NPF, and it sets a framework for investment priorities which includes expenditure commitments to secure a wider range of Strategic Investment Priorities which include support for a Transition to a Low Carbon and Climate Resilient Society. The plan was prepared to guide national, regional and local planning and investment decisions in Ireland over the next two decades, to cater for an expected population increase of over 1 million people. The NDP is designed to be flexible and responsive to changing circumstances, ensuring that Ireland can adapt to new challenges and opportunities over the decade. Chapter 3 of the NDP details the climate and environmental assessment of the NDP Review in 2021).

The NDP recognises that reliable supply of energy is essential for the functioning of society and the economy. With over two million customers reliant on the electricity grid, maintaining a stable energy system is paramount. In the short-to-medium term, conventional electricity generation, primarily gas-fired, plays a crucial role in supporting grid operations and ensuring security of supply during periods when variable renewable generation, like wind and solar, may not meet demand.

Overall, the NDP 2021-2030 recognises the urgent need to transition to a low-carbon, climate-resilient economy and society. It sets out a comprehensive strategy to drive forward Ireland's energy transition, reduce greenhouse gas emissions, and build resilience to the impacts of climate change, while also fostering sustainable economic growth and social development.

The NDP prescribes 10 National Strategic Outcomes and Public Investment Priorities. Of particular relevance to development of the proposed plant is:

- ***National Strategic Outcome (NSO)*** *8 - Transition to a Climate-Neutral and Climate-Resilient Society*.

NSO8 details the need to change the existing power generation assets to lower carbon fuel sources and details relating to decarbonising energy. The NDP states that Ireland's energy system requires a radical transformation in order to achieve its 2030 and 2050 energy and climate objectives. This means that how we generate energy, and how we use it, must fundamentally change. It states that Ireland has the opportunity to comprehensively decarbonise energy generation and that by 2030, peat and coal will no longer have a role in electricity generation in Ireland.

The NDP states that approximately 2 gigawatts (GW) of new conventional electricity generation capacity will need to be developed over the next decade to meet demand. This additional capacity will primarily serve as backup, remaining on standby to balance the system during times of high demand and low renewable generation.

In addition to new generation capacity, ensuring security of electricity supply requires investment in grid infrastructure, interconnection, and energy storage solutions such as batteries. These investments are essential for maintaining grid stability, managing fluctuations in supply and demand, and enhancing overall reliability of the electricity system.

4.3.3 NATIONAL ENERGY AND CLIMATE PLAN 2021-2030

Under the new 2030 Climate and Energy Framework, which is also part of the Clean Energy for all Europeans Package, EU countries are required to draft 10-year National Climate and Energy Plans (NECPs) for 2021-2030, outlining how they will meet the new 2030 targets for renewable energy and for energy efficiency. In June 2019, the government agreed to support the adoption of a net zero target by 2050 at EU level, and to pursue a trajectory of emissions reduction nationally which is in line with reaching net zero in Ireland by 2050.

The national plan released in 2019 centres around the five dimensions of the Energy Union:

1. Decarbonisation – GHG Emissions and Removals & Renewable Energy
2. Energy Efficiency

3. Energy Security
4. Internal Energy Market
5. Research, Innovation & Competitiveness

These plans are designed to ensure that the EU remains on track to meet its long-term energy and climate goals, including the transition to a low-carbon economy and the fulfilment of commitments under the Paris Agreement. Each NECP also includes specific policies, measures, and trajectories for achieving these targets, reflecting national circumstances and priorities.

4.3.4 CLIMATE ACTION PLAN 2024

The Irish Government published its latest Climate Action Plan on 20 December 2023 (CAP24). The Plan sets out a roadmap to achieve a net zero carbon energy system by 2050. CAP24 seeks to build on the progress made under Climate Action Plan 2023 (CAP23) by delivering policies, measures and actions that will support the achievement of our carbon budgets, sectoral emissions ceilings, and 2030 and 2050 climate targets.

To achieve Ireland’s targets under the Plan, a detailed sectoral roadmap setting out a range of measures and actions for each sector of the economy is included. For the electricity sector, the need for additional gas-fired generation capacity is clear. The Plan states that ‘rapid delivery of flexible gas generation is needed at scale and in a timeframe to replace emissions from coal and oil generation as soon as possible to reduce impacts on the carbon budgets.

Key measures identified for the energy sector under CAP24 include ‘the delivery of at least 2GWs of new flexible gas-fired generation’ and 80% Renewable Electricity Share by 2030.In 2022, renewable generation accounted for 38.6% of electricity, an increase from 35% in 2021. Electricity emissions decreased by 2% in 2022 which is attributable to an increase in renewable generation, coupled with reductions in coal, fuel oil, and peat use for electricity generation. The electricity sector continues to face an immense challenge in meeting its requirements under the sectoral emissions ceiling, as the decarbonisation of other sectors, including transport, heating, and industry, relies to a significant degree on electrification. The deployment rates of renewable energy and grid infrastructure required to meet the carbon budget programme for electricity is unprecedented and requires urgent action across all actors to align with the national targets.

4.3.5 CLIMATE ACTION AND LOW CARBON DEVELOPMENT (AMENDMENT) ACT 2021

The 2021 Act sets Ireland on a legally binding path to net-Zero emissions no later than 2050, and to a 51% reduction in emissions by the end of this decade. The Act provides the framework for Ireland to meet its international and EU climate commitments and to become a leader in addressing climate change. This Act (2021) amends the 2015 Act and establishes a 2050 net zero emissions target, compared to 1990 levels, and introduces a system of successive five-year carbon budgets starting in 2021.

4.3.6 POLICY STATEMENT IN THE SECURITY OF ELECTRICITY SUPPLY, NOVEMBER 2021

Circular Letter PL12.2021 seeks to ensure security of electricity supply which is at short to medium term risk due to lower-than-expected availability of some existing power stations, expected growth in electricity and the expected closure of some power stations. It states that the development of new conventional generation (incl. gas-fired & gasoil/distillate-fired generation) is a national priority and should be permitted and supported, which will ensure security of electricity supply and facilitate the target of up to 80% renewable electricity generation by 2030. The Policy Statement builds on policies set out in the NDP and the Climate Action Plan 2023, which target the development of c.2GW of flexible gas-fired generation capacity.

4.3.7 NATIONAL ENERGY SECURITY FRAMEWORK, APRIL 2022

Sets out the Government's response to the impacts of the war in Ukraine on the energy system in Ireland. Paragraph 2.3.3 (Electricity) states *that "The level of dispatchable electricity generation capacity (i.e. capacity that does not rely on wind or solar energy) needs to increase significantly over the coming years due to the reduced reliability of existing plants, anticipated new power stations not being developed as planned, expected strong growth in demand for electricity, and the closure of existing generation*."

4.3.8 IRELAND'S TRANSITION TO A LOW CARBON ENERGY FUTURE 2015-2030

This White paper on Energy policy (Department of Communications, Energy and Natural Resources) – December 2015 sets out a vision to reduce greenhouse gas (GHG) emissions by between 80% and 95% compared to 1990 levels, by 2050, falling to zero or below by 2100. It states that new energy solutions such as bioenergy, solar photovoltaic (PV) and offshore energy mature and become more cost effective they will be included in the renewable energy mix.

4.4 REGIONAL POLICY

4.4.1 NWRA: REGIONAL SPATIAL AND ECONOMIC STRATEGY 2020-2032

The RSES (2020-2032) for the Northern and Western Region provides a high-level development framework for the region that supports the implementation of the NPF. The RSES identifies *"Five Growth Ambitions"* which aim to link strategic and operational challenges with prioritised capital interventions. One of these growth ambitions is *"Infrastructure Ambition"* noting that the *"provision and maintenance of economic infrastructure, such as energy, water, and wastewater, are key to delivering compact growth and a connected, vibrant, inclusive, resilient and smart region."*

The Infrastructure Ambition outlined in the RSES reflects a comprehensive vision for fostering a dynamic and sustainable North-West region, where well-planned infrastructure serves as a catalyst for economic progress and enhances the quality of life for its residents.

The following *"Regional Policy Objectives"* (RPOs) aim to ensure that the development of the electricity and gas networks is undertaken in a safe and secure way which meets projected demand levels, Government Policy and the need to achieve a long-term, sustainable and competitive energy future for Ireland.

- ***RPO 8.1*** *- The Assembly support the development of a safe, secure and reliable electricity network and the transition towards a low carbon economy centred on energy efficiency and the growth projects outlined and described in this strategy. (emphasis added)*
- ***RPO 8.2*** *- Support the reinforcement and strengthening of the electricity transmission network with particular reference to the regionally important projects contained within Table 11.*
- ***RPO 8.3*** *- The Assembly support the necessary integration of the transmission network requirements to allow linkages with renewable energy proposals at all levels to the electricity transmission grid in a sustainable and timely manner.*
- ***RPO 8.4*** *- That reinforcements and new electricity transmission infrastructure are put in place and their provision is supported, to ensure the energy needs of future population and economic expansion within designated growth areas and across the region can be delivered in a sustainable and timely manner and that capacity is available at local and regional scale to meet future needs. Ensure that development minimises impacts on designated areas.*
- ***RPO 8.6*** *– Facilitate the delivery and expansion of natural gas infrastructure throughout the region and have regard to the location of existing gas infrastructure in assessing potential developments.*

4.5 LOCAL POLICY

4.5.1 GALWAY COUNTY DEVELOPMENT PLAN (CDP) 2022-2028

The Galway County Development Plan (CDP) 2022-2028 sets out the Council's policy objectives (CPO's) for the development of the County over the Plan period. Overall, the Development Plan seeks to develop and improve, in a sustainable manner, the social, economic, environmental and cultural assets of the County. The following provides a summary of the relevant objectives relevant to the proposed development.

Chapter 7 of the CDP deals with Infrastructure, Utilities and Environmental Protection and Electricity infrastructure is detailed under Section 7.7.

The CDP states that "*a strong electricity infrastructure and transmission grid is essential for the county in order to attract and retain high-tech industrial investment, to ensure competitive energy supplies, to achieve balanced development, to reduce dependency on fossil fuels, and to achieve climate change targets. Moreover, to attract renewable energy development, it is important for County Galway that the existing grid infrastructure is reinforced where necessary and expanded to areas not adequately serviced.*"

With regard to electricity transmission, the CDP highlights that EirGrid is responsible for the delivery of "*safe, secure and reliable transmission of electricity*" and that the Council commit to working with EirGrid to protect existing infrastructure and facilitate the delivery of new infrastructure. In this regard, the following policy objectives are noted which are considered to support this:

- **EG 1 - Enhancement of Electricity Infrastructure:** Support and promote the sustainable improvement and expansion of the electricity transmission and distribution network that supply the County, while taking into consideration landscape, residential, amenity and environmental considerations.
- **EG 2 Delivery of Electricity and Gas Infrastructure:** Support the provision and extension of electricity and gas transmission networks within the county which are critical to the economic development of the County subject to environmental quality, landscape, wildlife, habitats or residential amenity.
- **EG 3 Power Capacity:** - To support and liaise with statutory and other energy providers in relation to power generation, in order to ensure adequate power capacity for the existing and future needs of the County.
- **EG 4 Ireland's Grid Development Strategy:** Support the implementation of Ireland's Grid Development Strategy, while taking into account landscape, residential, amenity and environmental considerations

Chapter 14 of the CDP deals with Climate Change, Energy and Renewable Resource. The CDP acknowledges that Climate Action is central to all objectives of the development plan, and that it is important to ensure that development happens with *'regard to sustainable infrastructure networks which build resilience to climate change.'*

- **CC 1 Climate Change:** Support and facilitate the implementation of European, National and Regional objectives for climate adaptation and mitigation taking into account other provisions of the Plan (including those relating to land use planning, energy, sustainable mobility, flood risk management and drainage) and having regard to the Climate mitigation and adaptation measures.
- **CC 2 Transition to a low carbon, climate-resilient society:** It is a policy objective of the Planning Authority to support the transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050, by way of reducing greenhouse gases, increasing renewable energy, and improving energy efficiency.
- **CC 3 County Galway Climate Adaptation Strategy 2019-2024:** To implement the County Galway Climate Adaptation Strategy 2019-2024 as appropriate.
- **CC 4 Local Authority Climate Action Plan:** Support the preparation of a Climate Action Plan for County Galway.
- **CC 5 Climate Action and Mitigation:** To promote, support and direct effective climate action policies and objectives that seek to improve climate outcomes across County Galway through the encouragement and integration of appropriate mitigation and adaptation considerations and measures into all development and decision-making processes.CC 6: seeks to support the implementation of the Renewable Energy Strategy.
- **CC 7 Climate Action Fund:** Support the delivery of sustainable development projects under the European Green Deal and utilise the Climate Action Fund/ Just Transition Fund established under the National Development Plan to encourage public and private climate mitigation and adaptation projects in line with criteria set out by the Fund at that time.

Appendix 1 of the CDP contains the Galway Renewable Energy Strategy (LARES).

The LARES notes the lack of high capacity 220kC and 400kC transmission infrastructure in the region which will need to be developed if the abundant renewable energy sources in the region are to be realised.

The LARES specifically discusses Alternative Technologies under Section 9.8. The document recognises that "*lack of energy storage capacity has long been a barrier to the* *efficient use of renewable energy"* and the *"technology in this field has now advanced to the point that utility-scale battery storage systems are being utilised in order to enable more efficient use of renewable energy"*. The Strategy outlines the renewable energy potential within the county to facilitate the transition to allow carbon economy. The LARES recognises that *"natural gas, particularly renewable and indigenous gas, will continue to have a role to play in the transition to a low carbon economy. As such, renewable energy developments may require support from such sources in times of high energy demand."* It goes on to state that *"the gas network plays a key role as part of the supporting infrastructure for renewable energy developments".*

The key policy objectives outlined in the strategy and relevant to the proposed development are presented below.

- ***LARES Policy Objective 1 - Transmission Grid Network***
  To support the development of the transmission grid network in order to sustainably accommodate both consistent and variable flows of renewable energy generated in County Galway.
- ***LARES Policy Objective 2- Renewable Energy Transmission***
  Proposed renewable energy generation projects shall fully consider the capacity of the existing transmission grid network in determining the optimal grid connection for the project, in accordance with the proper planning and sustainable development of the area.
- ***LARES Policy Objective 4 - Prioritisation of 'Strategic Areas' for renewable energy development***
  The areas that are identified as 'Strategic Areas' for renewable energy development will be prioritised for renewable energy uses over other uses, in accordance with the proper planning and sustainable development of the area.
- ***LARES Policy Objective 32 Diversification of Renewable Energy Mix***
  To recognise and encourage the deployment of alternative renewable energy devices where they add demonstrable capacity and efficiencies to existing renewable energy developments and/or diversify the renewable energy mix of County Galway.
- ***LARES Policy Objective 33 Alternative Renewable Energy***
  Alternative renewable energy developments will be supported where they are not likely to have significant impacts on the built and natural environment and can be evidently accommodated on the transmission grid network in accordance with the proper planning and sustainable development of the area.
- ***LARES Policy Objective 39 Regional Renewable Energy Development***

Renewable energy developments of either a regional or county boundary significance will be considered in accordance with Regional Policy Objectives of the RSES and of adjoining Local Planning Authorities.

As is evidenced from the above policies in the CDP and LARES, the proposed development conforms with policy objectives and support and promote sustainable improvements and the transition to a net zero and climate neutral economy. Given the location of the development in respect of the existing Oldstreet 400kV Substation, siting of the projects conforms with the principles of proper planning and sustainable development and is compatible with the overarching framework of plans and policies. Other Chapters of this EIAR examine and assess conformance of the development proposal with objectives and policies contained with the CDP relating to, but not limited to, Landscape, Cultural Heritage, Natural Heritage, Biodiversity, Transport, Environmental Protection and Air Quality.

5 POPULATION & HUMAN HEALTH

5.1 INTRODUCTION

This Chapter presents an assessment of impacts on Population & Human Health. The recitals to the 1985 and 2011 Directives refer to *'Human Health'* and include 'Human Beings' as the corresponding environmental factor. The 2014 Directive changes the title of this factor to "Population and Human Health".

While there are a range of issues which may impact on human beings many of these have been considered within other disciplines within this EIAR, including Planning Policy (Chapter 4), Water Environment (Chapter 8), Air Quality (Chapter 9), Noise and Vibration (Chapter 11), Landscape and Visual (Chapter 12), Traffic and Transport (Chapter 13). Cultural Heritage (Chapter 14) and Climate (Chapter 15). This approach is consistent with the EPA EIAR Guidelines (2022)[28].

This Chapter is therefore focused on potential impacts which have not been assessed elsewhere within the EIAR.

5.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

5.2.1 METHODOLOGY

A desk-based assessment was undertaken to examine relevant information pertaining to the population impact assessment. Information on population statistics, employment and social data for the relevant Electoral Division (Eds) was obtained from the Central Statistics Office (CSO) for census years 2022. Fáilte Ireland's EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects and specifically the potential impact of the proposed development on Tourism is considered. Given the rural setting, much of the potential for impacts is addressed in Chapters 6 (Biodiversity) and 12 (Landscape and Visual) of this EIAR.

5.2.1.1 Study Area

The Study Area for the assessment of *"Population and Human Health"* includes a review of relevant information on a county and national scale but is mainly concentrated on the Electoral Districts (EDs) and Small Areas (Small Area Population Statistics (SAPS)) within which the Proposed Development is located.

[28] EPA, Guidelines of the Information to be contained in Environmental Impact Assessment Report, 2022

The EIA Directive does not define the term *"human health"*, however the 2017 EC Guidance on the preparation of the EIAR states that:

> *"human health is a very broad factor that would be highly project dependent. The notion of human health should be considered in the context of the 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. In addition, these would concern the commissioning, operation and decommissioning of a Project in relation to workers on the Project and surrounding population".*

The assessment of human health is a qualitative rather than quantitative assessment, due to the diverse nature of health determinants and health outcomes which are assessed.

Local Authority

The proposed development lands are located approximately 4.5km north of Portumna Co. Galway within the jurisdiction of Galway County Council.

Electoral Divisions

Electoral Divisions (EDs) are the smallest legally defined administrative areas in the State. Therefore, in order to discuss the receiving human environment and other statistics in the vicinity of the proposed development site, the Study Area for this assessment has regard to Electoral Divisions (EDs) within or located close to the proposed development site. The proposed development is located in the Portumna ED.

Small Area

Small Areas were first published for Census 2011 following work undertaken by the National Institute of Regional and Spatial Analysis (NIRSA) on behalf of Ordnance Survey Ireland (now Tailte Éireann) and in consultation with the CSO. They were designed as the lowest level of geography for the compilation of statistics in line with data protection guidelines and typically contain between 50 and 200 dwellings. A further constraint imposed when creating these new areas was that they nested within Electoral Division boundaries. Finally, they are generally comprised either of complete townlands or neighbourhoods. Small Areas within a 1km radius from the centre of the proposed development lands are included in this assessment. This includes two small area named as A067188003 and A067188004 by CSO.

5.2.1.2 Desktop Study

A desk study was undertaken to assess the baseline environment (including the indicative routes for the underground gas pipeline to Project 1). The desk study involved the assessment and review of data from the Central Statistics Office (CSO) and a review of the Galway County Development Plan (CDP) 2022-2028. Information was also obtained from the following sources:

- Environmental Protection Agency (www.epa.ie);
- Galway County Council (https://www.galway.ie/en/
- Central Statistics Office (http://www.cso.ie);
- Geohive (https://airomaps.geohive.ie/ESM);
- Health and Safety Authority (http://www.hsa.ie/eng/);
- Pobal (https://maps.pobal.ie/WebApps/DeprivationIndices/index.html);
- All-Island Research Observatory (AIRO) (https://airo.maynoothuniversity.ie/).

As there is no loss of residential or community lands as a result of the proposed developments, the impacts from the loss of private property are not further considered. Similarly, the development of either or all of the proposed projects will not result in negative adverse impact to the local economy. Positive effects on the local economy, supply chains, and employment opportunities (particularly) during construction is anticipated.

5.2.1.3 Field Work

A site walkover of the proposed development lands and windscreen survey of the wider study area was undertaken on the 24 November 2023, 08 February 2024, 22 March 2024, 03 April 2024 and 22 April 2024 as part of this assessment.

5.2.2 DETERMINATION OF SENSITIVE RECEPTORS

The sensitivity of the existing baseline environment defines the ability of the receptor to respond to potential effects.

5.2.2.1 Employment

This assessment considers the impact on the workforce in County Galway and the Region, as this is where the majority of effects are likely to occur. The Proposed Development may provide direct and indirect job opportunities. Direct jobs include the temporary workforce required to construct the Proposed Development in the short to medium term, as well as the workforce required to operate the facility in the longer term. Indirect jobs include those created in the supply chain to provide material, specialist labour and demolition and remediation services for the workforce. There is no consolidated methodology or practice for assessing the magnitude of the impact on employment in EPA Guidelines. It has therefore been assessed based on professional opinion in which the size of the workforce in the impact area is considered, relative to the number of jobs that the Proposed Development and will create.

5.2.2.2 Severance

Severance of land as a result of the proposed development and the loss of rights of ways or amenities is considered in this assessment along with the separation of residents from facilities and services, they use within their community caused by new or improved roads or by changes in traffic flows. The Proposed Development could cause severance effects by changing levels of traffic congestion on existing roads and / or introducing traffic management measures. This may lead to separation of residents from facilities and services which they use. All severance impacts are direct impacts. The assessment of magnitude is informed by the assessment results presented in Chapter 13 (Traffic and Transport).

5.2.2.3 Landuse Change

A description of the existing site is presented in Chapter 2 and assessed in the context of Planning & Policy and Material Assets in Chapter 4 and Chapter 10 respectively. Land use changes can affect populations in different ways. Planning policy plays an important role in guiding and facilitating approximate changes in land use which can influence settlement as well as transportation patterns. Planning policy ensures these changes are managed sensitively and are appropriate to the unique existing and emerging social, economic and environmental conditions. The primary consideration relating to land use change is to assess whether the proposed development conforms with land use policy and to identify if the proposed development is likely to change the intensity of patterns, types of activities and land uses. Therefore, a review of planning policy was carried out as part of this assessment as well as an assessment of the existing and emerging baseline and its capacity to absorb predicted changes. Landuse Change is further discussed in Chapter 10 (Material Assets)

5.2.2.4 Health and Safety

The primary legislation in Ireland is the Safety Health and Welfare at Work Act 2005. There are a number of amendments to the Act, as well as Regulations and Codes of Practice. Primary legislation can be referenced from the HSA website and the Act can be downloaded from the Irish Statue Book. Within the legislation responsibilities have been assigned to each party at the different stages of the development of a project. These apply to any construction project and are applicable to the three projects discussed within this EIAR. The Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the "COMAH Regulations") implement the Seveso III Directive (2012/18/EU) and aim to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious harm to people and/or the environment, with the overall objective of providing a high level of protection in a consistent and effective manner. An Environmental Risk Assessment (ERA) and Consequence Assessment Study of the proposed development was carried out by DNV Services UK Limited and are presented in Appendices 4.1 and 4.2 respectively.

5.2.3 SIGNIFICANCE CRITERIA

The assessment of significance is a professional appraisal based on the sensitivity of the receptor and the magnitude of the effect. Within any area, the sensitivity of individuals in a population will vary.

The purpose of the population assessment is to identify the likely significant impacts as they might affect users of the proposed development and the local community. It usually follows that impacts of a population and human health nature are a function of:

- The location and character of the local environment,
- The sensitivity of the local population and its capacity to absorb change,
- The nature of the environmental effect,
- The scale or extent of the effect in terms of area or population affected,
- The duration and frequency of an effect, and,
- The probability of an impact's occurrence and possibility of effectively reducing the effects through mitigation.

Impacts result from direct, indirect, secondary and cumulative effects on existing environmental conditions. Effects can be positive, neutral or negative. The significance of an effect depends on, among other considerations, the nature of the environmental effect, the timing and duration of an effect and the probability of the occurrence of an effect. The significance of an effect is described as imperceptible, slight, moderate, significant, very significant or profound. The impacts may be short term, medium-term or long-term. The duration of an effect may be momentary, brief, temporary, short-term, medium-term, long-term, permanent or reversible in accordance with the timescales. The frequency of that effect can also influence significance i.e., if the effect will occur once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually.

The population and human health assessment addresses impacts at a community level rather than for individuals or identifiable properties, although impacts for individual properties are discussed where these are significant or located within proximity to the proposed development, as appropriate.

This EIAR is focused on providing a clear documentary trail of analysis used to arrive at conclusions. The criteria used to describe the predicted effects is outlined in Table 5.1 in accordance with Table 3.4 of the 2022 EPA Guidelines[29].

Table 5.1 Description of Effects [Magnitude]

Effect Characteristic	Description
Quality	
Positive	A change which improves the quality of the environment
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
Negative	A change which reduces the quality of the environment
Duration of Effect	
Brief	Effects lasting <1 day
Temporary	Effects lasting <1 year
Short-term	Effects lasting 1-7 years
Medium-term	Effects lasting 7-15 years
Long-term	Effects lasting 15-60 years
Permanent	Effects lasting over 60 years
Reversible	Effects that can be undone, e.g., through remediation or restoration
Probability of Effects	
Likely	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented
Unlikely	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented
Significance of Effects	
Profound	An impact which obliterates all previous sensitive characteristics.
Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Moderate	An impact that alters the character of the environment in a manner that is consistent with existing or emerging trends
Slight	An impact that alters the character of the environment without affecting its sensitivities
Imperceptible	An impact capable of measurement but without noticeable consequences

[29] EPA, Guidelines of the Information to be contained in Environmental Impact Assessment Report, 2022

5.3 DESCRIPTION OF RECEIVING ENVIRONMENT

5.3.1 POPULATION AND SETTLEMENT PATTERNS

The proposed development lands are located in southeast Galway, approximately 4.5km north of the town of Portumna. The development lands are within Galway County Council's jurisdiction (see Figure 5.1),

Figure 5.1 Galway County Council Area

Galway County Council is responsible for the administrative area of County Galway, excluding Galway City. The Council is responsible for the County's Housing, Planning, Roads, Environment, Fire, Libraries and Economic Development functions. Galway County Council is the custodian of the environment and through its planning and environment policies seeks to enhance the County's attractiveness while protecting its unique character and atmosphere. The Council takes an active role in the promotion and development of the County's industrial, economic, business, social, arts, heritage and cultural affairs. Galway County Council covers an area of 6,149 square kilometres (km^2) and includes five municipal districts (MDs). The proposed development lands are located in the Loughrea MD. According to the CSO (2022) the population of Galway County Council is 193,323. A breakdown of population is presented in Figure 5.2

Figure 5.2 Galway County Council - Population

The subject development lands are located the electoral division (ED) of Portumna (see Figure 5.3) which has a population of 2,540 people (1,233 males and 1,271 females). A breakdown of the ED population is presented in Figure 5.4. The largest settlement in the ED is the town of Portumna, which has a population of 1,450 people. The ED of Killimor adjoins the northern boundary of Portumna ED. The Killimor ED has a population of 702 people of which 336 live in the settlement of Killimor. Loughrea and Ballinasloe are the closest settlements with populations greater than 5,000 people. Both settlements are approximately 20km from the proposed development lands.

Figure 5.3 Setting – Electoral Division

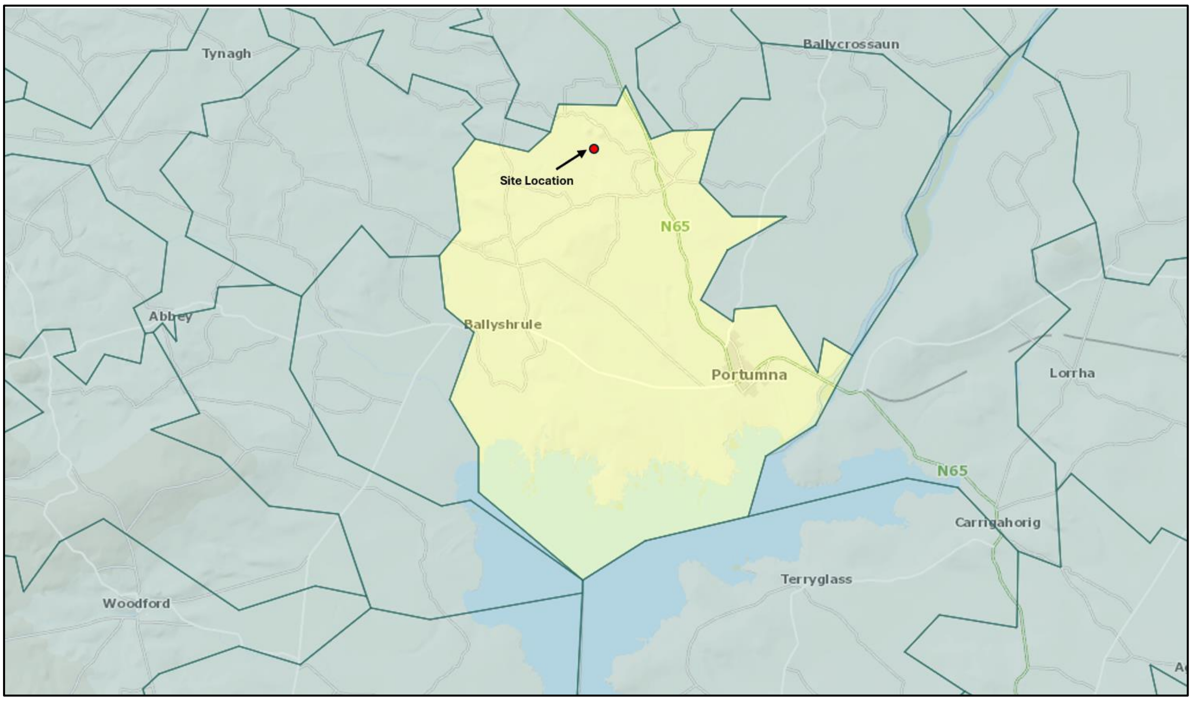
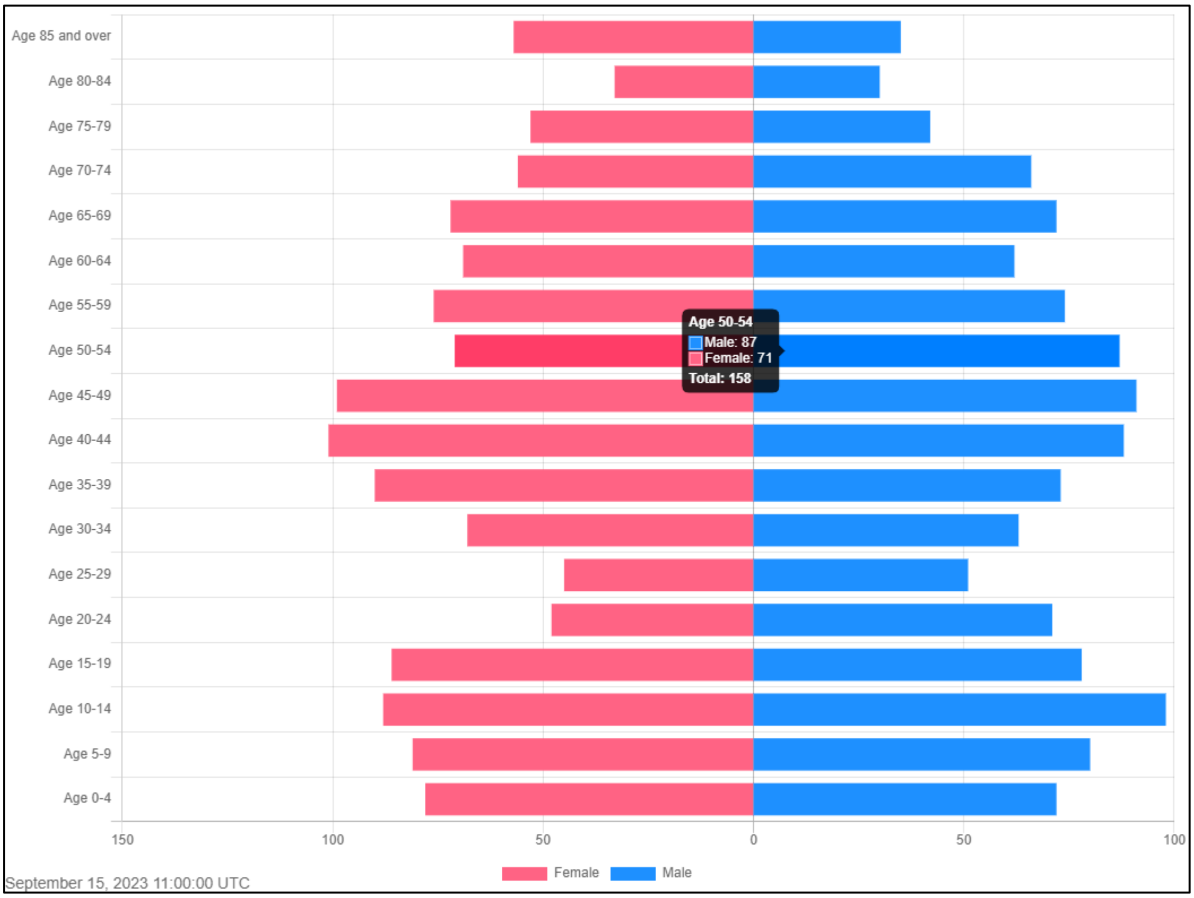


Figure 5.4 Portumna ED - Population Breakdown



The Pobal[30] deprivation indices describe the Portumna ED as being *"Marginally Below Average"* (index -3.55) compared with the County of Galway being *"Marginally above Average"* (Index 2.34). Further details are presented in Figure 5.5 and Table 5.2.

Figure 5.5 ED Deprivation Indices Map

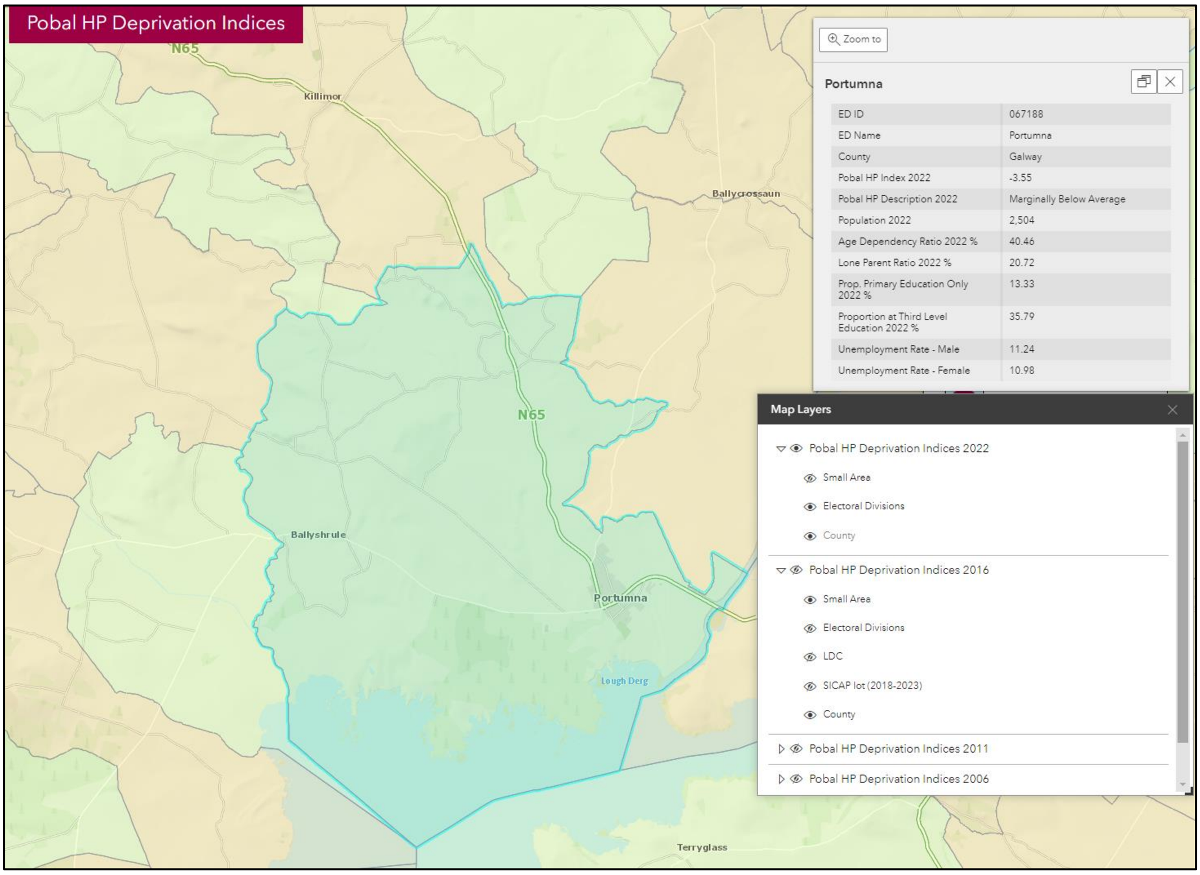


Table 5.2 Townland Populations Portumna ED Deprivation Indices

ED ID	067188
ED Name	Portumna
County	Galway
Pobal HP Index 2022	-3.55
Pobal HP Description 2022	Marginally Below Average
Population 2022	2,504
Age Dependency Ratio 2022 %	40.46
Lone Parent Ratio 2022 %	20.72
Prop. Primary Education Only 2022 %	13.33

[30] https://data.pobal.ie/portal/apps/experiencebuilder/experience/?data_id=dataSource_1-18b85a45500-layer-28-Pobal_HP_Deprivation_ED_2022%3A3095&id=3b0acba7eb694ffa85340a60f81d516c

Proportion at Third Level Education 2022 %	35.79
Unemployment Rate - Male	11.24
Unemployment Rate - Female	10.98

A map showing the boundary of small area population statistics (SAPS) which intersect a 1km radius of the main project areas within the proposed development lands is provided in Figure 5.6 and breakdown of population for each areas is presented in Figure 5.7 and Figure 5.8. The combined populations of the area delineated in Figure 5.6 is 481 people. Pobal HP Deprivation details for SAPS Area ID 067188003 and 067188004 describe both geographic units as "Being Marginally Below Average".

Figure 5.6 Small Areas Map – Radius of 1km

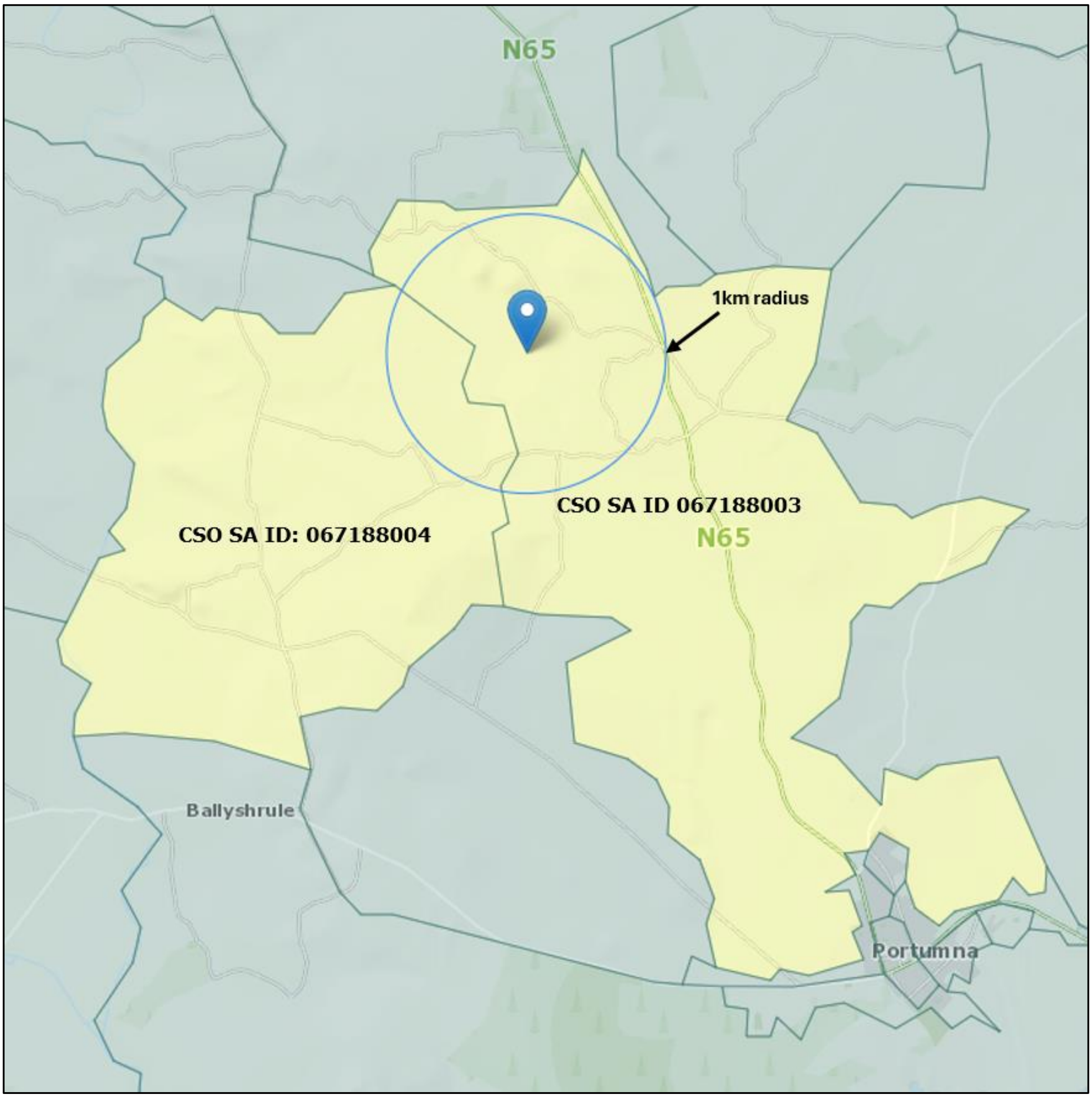


Figure 5.7 Small Areas: 067188003 (149 males, 134 females)

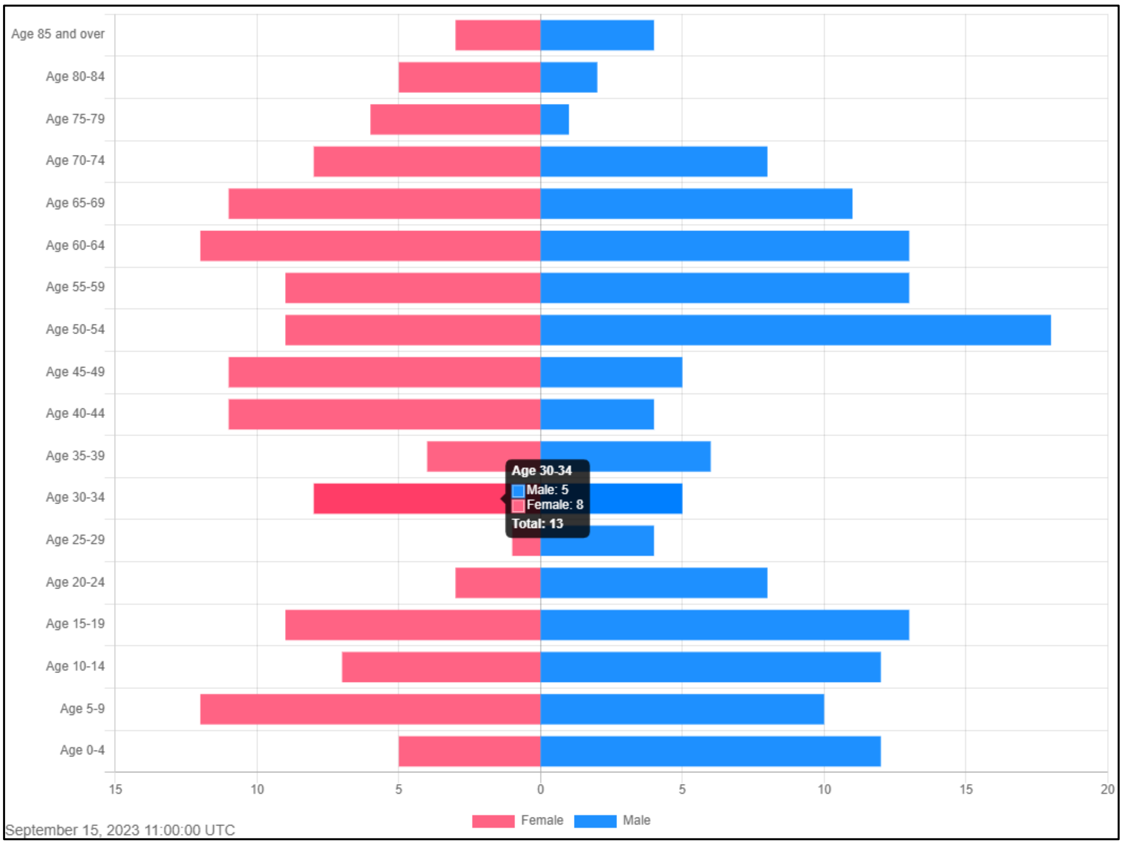
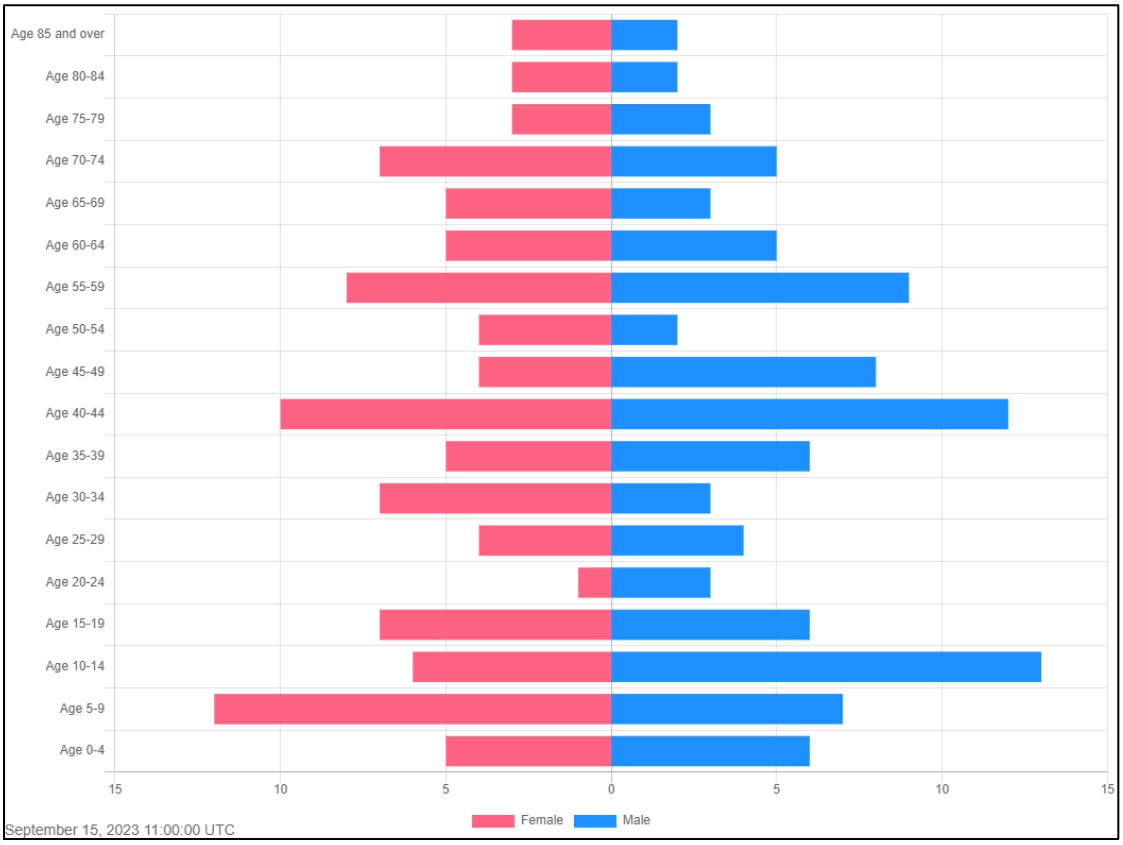


Figure 5.8 Small Areas: 067188004 (99 males, 99 females)



The number of persons enumerated in the townlands which the proposed development lands are located (see Figure 5.9) in 2016 by CSO is presented in Table 5.2

Figure 5.9 Setting – Townlands

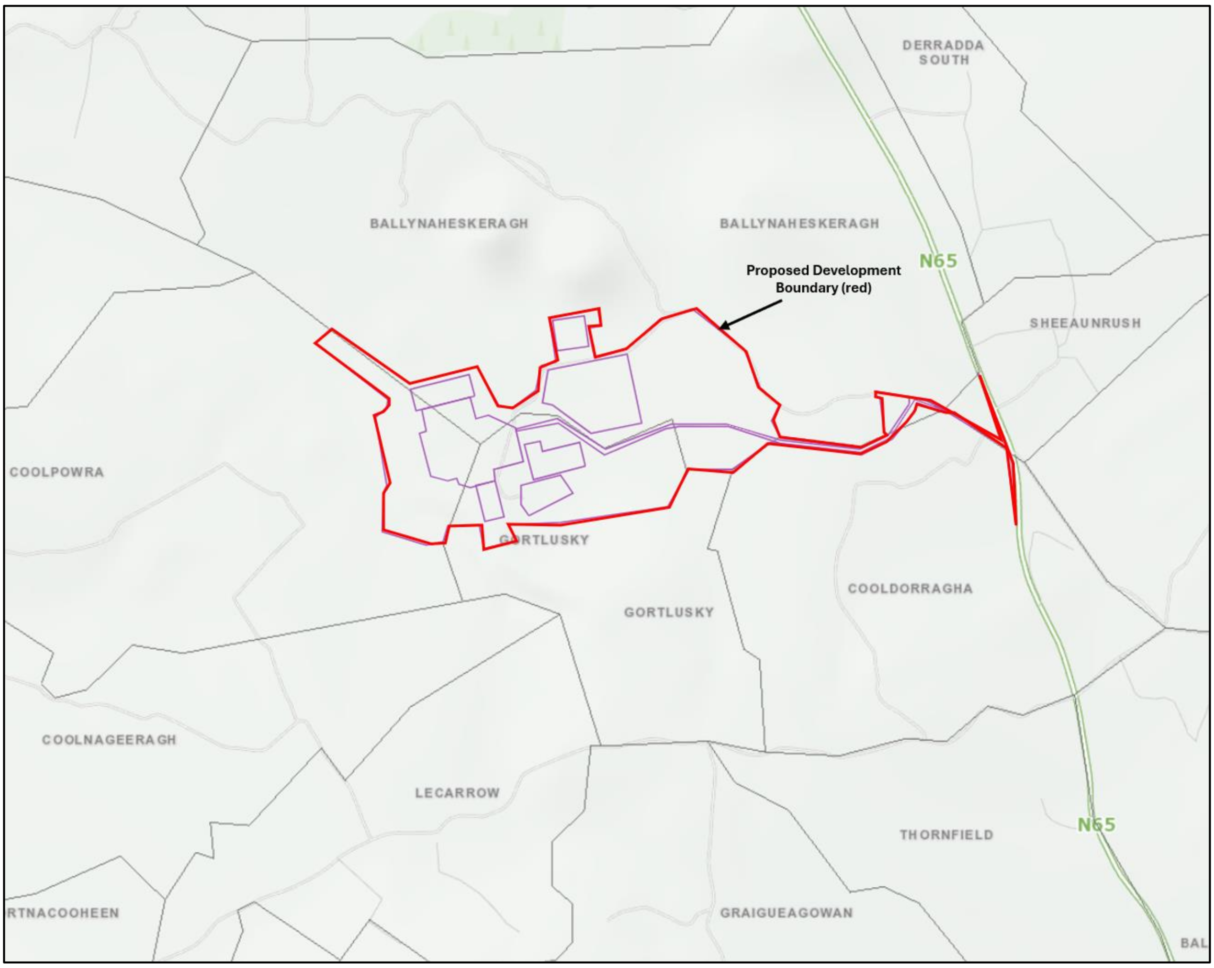


Table 5.2 Townland Populations

Townland	Number of People
Coolpowra	21 people
Cooldorragha	0
Coolnageeragh	31 people
Ballynaheskeragh	16 people
Gortlusky	Value suppressed[Note 1]
Sheeaunrush	Value suppressed[Note 1]

Note 1 OSI report that values are supressed in the following cases:

- The number of permanent, private households in the Townland is 1 or 2.
- All the population in the Townland is male or all the population is female.
- No permanent private households and the population is greater than 0.

5.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

5.4.1 DO NOTHING SCENARIO

If the proposed projects are not developed the site remain in agricultural use and the existing substation continues to function as an AIS substation on the 400kV network. However, in light of electricity supply and network challenges which have been publicised and reported by the TSO, failing to address the challenge will have a direct impact on the future growth of the economy. The development lands were carefully selected to avoid impact to sensitive receivers and provide the system with low carbon reserve capacity and flexible carbon free ancillary services. The development proposals support further integration of renewable generators, such as offshore renewables, whilst providing for security of supply.

5.4.2 POPULATION AND SETTLEMENT PATTERNS

This project does not contain a housing or services element and is not considered to have any direct positive or negative impacts on the local or regional population levels. However, the plant will attract employees who are not based in locally to relocate to the town to reduce commuting distances. During the construction phase there is the potential for limited impacts on the residential amenity of the local population. The overall impact is considered to be imperceptible in terms of population. Temporary /short term slight adverse impacts associated with an increase in traffic (construction) levels will likely occur. With the recommended traffic and transport mitigation measures in place, no significant adverse roads and traffic related environmental impacts are anticipated during the construction, operational or decommissioning phases of the proposed development.

5.4.3 SEVERENCE

The effect of the impact associated with development of each of the individual projects or in combination is considered as neutral and long-term. The proposed improvements and upgrades to the N65/L8763 and to the Oldstreet AIS substation will have a positive long term moderate effect.

5.4.4 HEALTH AND SAFETY

Given the buffer to residential properties and nearby settlements, the sensitivity of receiver is considered to be low. An Environmental Risk Assessment Report and Consequence Assessment Study have been prepared. The predicted impact on air quality is short term and not significant hence the potential human health impact during construction is imperceptible. Air quality and noise are dealt with separately in Chapters

9 (Air Quality) and 11 (Noise and Vibration) and 15 (Climate). The air quality impacts associated with the proposed developments will be well within the relevant Air Quality Standards. The impacts are deemed to be not significant and long-term. Due to the size and nature of the development and the nature and volume of the potential emissions, the construction phase activities will not have a significant impact on climate and will be short-term in duration while the operational phase activities will have an imperceptible impact on climate and a not significant impact on air quality and will be long-term in duration. A Stage 1 Road Safety Audit has been carried out in accordance with TII's publication *'GE-STY-01024 – Road Safety Audit'* and is included under the Traffic and Transport Appendix. All issues raised in the Road Safety Audit have been addressed so the proposed development will be satisfactory in terms of traffic operations and safety. In terms of COMAH, the Environment Risk Assessment and Consequence Assessment studies prepared by DNV (Appendix 4.1 and 4.2 respectively) conclude that the level of mitigated risk posed by the development is acceptable and therefore the potential effect is considered long-term neutral.

5.5 MITIGATION MEASURES

In order to control potential negative impacts during construction, a Construction Environmental Management Plan (CEMP) is prepared for each project. This will be further developed and implemented by the nominated Contractor in advance of construction works and agreed with the planning authority. Mitigation measures outlined within the various Chapters of the EIAR will be incorporated into the CEMP along with any conditions applied by the planning authority. Post mitigation impacts to population and human health during the construction (and decommissioning stages) are predicted as temporary /short-term, direct and indirect slightly adverse effects. Given the setting and sensitivity of identified receptors, the potential effects associated with operation of the proposed development is considered neutral.

5.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

Based on the assessment, the proposed development will not give rise to any significant negative population and human health effects.

5.7 CUMULATIVE EFFECTS

Based on the assessment findings presented in all Chapters of the EIAR which have interactions with Population and Human Health, the magnitude of potential effects associated with operation of the proposed development in combination is considered imperceptible.

6 BIODIVERSITY

6.1 INTRODUCTION

This chapter provides an assessment of the impacts of the proposed development on the ecological environment, i.e. biodiversity, flora and fauna. It has been compiled in compliance with the European Communities Legal requirements with regard to Environmental Impact Assessment and follows the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

6.2 METHODOLOGY

This chapter of the EIAR concentrates on ecological features within the development area of particular significance, primarily designated habitats and species. This includes habitats/species listed in Annex I, II and IV of the EU Habitats Directive, rare plants listed in the Flora Protection Order and other semi-natural habitats of conservation value.

A Report for the purposes of Appropriate Assessment Screening was undertaken by Moore Group for the proposed development which is presented as Appendix 6.1 to this chapter.

In order to screen out a project, it must be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

6.2.1 LEGISLATION

6.2.1.1 EU Habitats Directive

The "*Habitats Directive*" (Council Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna) is the main legislative instrument for the protection and conservation of biodiversity within the European Union. The Habitats Directive provides for the designation, conservation and protection of sites comprising Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), collectively forming the Natura 2000 network of 'European sites'. Article 3 of the Habitats Directive obliges Member States to designate as SACs sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II of the Habitats Directive. Article 10 of the Habitats Directive requires that Member States endeavour to improve the ecological coherence of the Natura 2000 network to manage and conserve features of the landscape which are of major importance for wild fauna and flora, for example ecological corridors or stepping-stones which are important for the migration, dispersal and genetic exchange of species.

Article 6(2) obliges Member States to take the necessary measures to avoid the deterioration of an SAC, or disturbance of a species for which the site is designated. Article 6(3) sets out the requirement for an “Appropriate Assessment”, to ensure that a proposed plan or project will not have an adverse effect on the integrity of a SAC. Article 7 applies the requirements of Article 6(2) and 6(3) of the Habitats Directive to SPAs designated under the Birds Directive.

In addition, and separate to the Appropriate Assessment requirements, Article 12 of the Habitats Directive obliges Member States to establish a regime of strict protection for certain species listed in Annex IV of the Directive, wherever they occur within their natural range. The protection for species under Article 12 of the Habitats Directive is not confined to the boundary of SACs. Species listed in Annex IV include the otter and certain species of bat.

6.2.1.2 EU Birds Directive

The “*Birds Directive*” (European Council (2009) Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds) confers legal protection to all naturally occurring wild birds within the EU territory. Member States are obliged to adopt the necessary measures to maintain the population of bird species, and that includes, in accordance with Article 3, an obligation to create, maintain and manage habitats for birds, and specifically for the species of Bird listed in Annex I of the Directive, Article 4 requires Member States to create SPAs which, by virtue of Article 7 of the Habitats Directive, form part of the Natura 2000 network of European sites and are subject to the Appropriate Assessment requirements under Article 6(3) of the Habitats Directive.

Additionally, Article 5 of the Birds Directive requires that Member States establish a general system of protection for all naturally occurring wild birds within the EU territory, similar to the system of strict protection required for Annex IV species under the Habitats Directive.

6.2.1.3 Wildlife Acts (1976 - 2021[31])

The primary domestic legislation providing for the protection of wildlife in general, and wild birds in particular, and the control of some activities adversely impacting upon wildlife is the Wildlife Act of 1976, as amended. The aims of the Wildlife Act, according to the National Parks and Wildlife Service (NPWS) are “... to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important

[31] Wildlife Act 1976, as amended. Administrative consolidation of the Wildlife Act 1976, Law Reform Commission (2021)

ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims." All wild bird species are protected under the Act. The European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) made significant amendments to the Wildlife Acts to ensure consistency with the Habitats and Birds Directives.

6.2.2 METHODOLOGY & GUIDANCE

The Biodiversity survey was carried out in three stages, firstly through desktop assessment to determine existing records in relation to habitats and species present in the potential Zone of Influence of the Proposed Development. This included research on the NPWS metadata website, the National Biodiversity Data Centre (NBDC) database and a literature review of published information on flora and fauna occurring in the development area.

Sources of information that were used to collate data on biodiversity in the potential Zone of Influence are listed below:

- The following mapping and Geographical Information Systems (GIS) data sources, as required:
  - National Parks & Wildlife (NPWS) protected site boundary data;
  - Ordnance Survey of Ireland (OSI) mapping and aerial photography;
  - OSI/ Environmental Protection Agency (EPA) rivers and streams, and catchments;
  - Open Street Maps;
  - Digital Elevation Model over Europe (EU-DEM);
  - Google Earth and Bing aerial photography 1995-2022;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie including:
  - Natura 2000 - Standard Data Form;
  - Conservation Objectives;
  - Site Synopses;
- National Biodiversity Data Centre records;
  - Online database of rare, threatened and protected species;
  - Publicly accessible biodiversity datasets.
- Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2019); and
- Relevant Development Plans in neighbouring areas:
  - Galway County Development Plan 2022-2028

Other environmental information for the area was reviewed, e.g. in relation to soils, geology, hydrogeology and hydrology. Interactions in terms of the chapters on these topics presented in this EIA Report were important in the determination of source vector pathways and links with potentially hydrologically connected areas outside the proposed development site.

The second phase of the survey involved site visits on 02 April 2024, and again on 01 and 08 May 2024 to establish the existing environment in the footprint of the proposed development area. Areas which were highlighted during desktop assessment were investigated in closer detail according to the Heritage Council Best Practice Guidance for Habitat Survey and Mapping (Smith *et al*., 2011). Habitats in the proposed development area were classified according to the Heritage Council publication "A Guide to Habitats in Ireland" (Fossitt, 2000). This publication sets out a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. This form of classification uses codes to classify different habitats based on the plant species present. Species recorded in this report are given in both their Latin and English names. Latin names for plant species follow the nomenclature of "An Irish Flora" (Parnell & Curtis, 2012).

Habitats were surveyed by conducting study area walkovers covering the main ecological areas identified in the desktop assessment. The survey dates are within the optimal survey periods for botanical species.

Signs of mammals such as badgers and otters were searched for while surveying the study area noting any sights, signs or any activity in the vicinity especially along adjacent boundaries.

Bats and Birds were surveyed using standard transect methodology and signs were recorded where encountered during the field walkover surveys. The preliminary results of the updated surveys are presented in Appendix 3. Methodologies are not repeated here in the interest of avoiding repetition.

The final part of the assessment involves an evaluation of the study area and determination of the potential impacts on the habitats of the study area. This part of the assessment forms the basis for Impact Assessment and is based on the following guidelines and publications:

- Guidelines for Ecological Impact Assessment in the UK And Ireland Terrestrial, Freshwater, Coastal and Marine September 2018 Version 1.1 - Updated September 2019 (CIEEM, 2019);
- EPA Guidelines on Information to be contained in an EIAR (EPA, 2022);

- Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011);
- Ecological Surveying Techniques for Protected Flora & Fauna (NRA, 2008);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009);
- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, December 2009, Rev 2010);
- Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2007).

While prepared for linear projects the TII Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) are still relevant and outlines the methodology for evaluating ecological impacts of the project in the present report. According to the TII Guidelines, the Ecological Study should address:

- Designated conservation areas and sites proposed for designation within the zone(s) of influence of any of the Project options,
- All the main inland surface waters (e.g. rivers, streams, canals, lakes and tanks) that are intersected by any of the route corridor options, including their fisheries value and any relevant designations,
- Aquifers and dependent systems and turloughs and their subterranean water systems,
- Any known or potentially important sites for rare or protected flora or fauna that occur along or within the zone(s) of influence of any of the route options,
- Any other sites of ecological value, that are not designated, along or in close proximity to any of the route corridor options,
- Any other relevant conservation designations or programmes (e.g. catchment management schemes, habitat restoration or creation projects, community conservation projects, etc.),
- Any other features of particular ecological or conservation significance along any of the route options.

The TII Guidelines set out a method of evaluating the importance of sites identified and in turn the evaluation of the significance of impacts. The Evaluation Scheme is presented in Appendix 1 for reference.

Impact Assessment is then based on CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland, 2019.

6.2.3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Coolpowra Flex Gen Limited (CPFL) propose to develop a Reserve Gas-Fired Generator (Project 1), a grid-connected Energy Storage System (ESS) facility (Project 2) and a Gas Insulated Switchgear (GIS) Electricity Substation (Project 3) in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway. The development is considered of significant economic importance at both state and regional levels due to its strategic positioning on the 400kV transmission network. The proposed GIS substation (Project 3) will upgrade and enhance the existing AIS intermediate substation on the 400kV line at the Oldstreet node and will facilitate and provide for connection of the Reserve Gas-Fired Generator and Energy Storage System projects to the 400kV electricity network.

6.2.3.1 Project 1: Reserve Gas Fired Generator

The Reserve Gas Fired Generator comprises three open cycle gas-fired generator (OCGT) units positioned within a building (OCGT Hall) along with auxiliary equipment. An OCGT unit consists of a turbine connected to an electric power generator and the three turbines are designed to operate independently of each other. The OCGT units will receive natural gas from the gas network via an underground pipeline to an Above Ground Installation (AGI) compound within the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI.

The proposed OCGT units are dual fuel units as required by system requirements required by the Grid Code published by Eirgrid. Natural gas will be the primary and combustion fuel to each of the OCGT units when operating.

The indicative route for an associated gas pipeline has been considered as part of this assessment. This will commence at New Inn, just north of the M6 Motorway and approximately 23.5 km north-west of the development site. The pipeline will be established by Gas Networks Ireland (GNI) through a separate planning application, and this will complete a full assessment of the preferred route associated full assessment.

Secondary fuel (gas oil) will be stored in a bunded structure outside the OCGT building along with ancillary items of electrical plant and machinery such as coolers and transformers.

The Reserve Gas-Fired Generator is designed to operate intermittently and provide generation capacity during periods of high demand or when renewable energy generators cannot meet system demand.

6.2.3.2 Project 2: Energy Storage System (ESS)

The Energy Storage System (ESS) facility comprises (a) a Long Duration Energy Storage (LDES) static battery positioned within a secure outdoor compound, and (b) a Synchronous Condenser which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid.

Battery storage is a technology that enables power system operators and utilities to store energy for later use. A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed. A BESS facility is made up of batteries, a battery management system, a power conditioning system, and an energy management system. Sufficient separation distance between enclosures is included within the design to allow for safe access and replacement of modules. Each module will include control equipment, to provide for ventilation, air conditioning and fire suppression equipment. MVPS (or PCS) units and small transformers will also be positioned in self-contained weather-proof enclosures. At a system level, UL9540A[1] is the recognised test method for evaluating thermal runaway in battery storage systems that reduces the risk of a single cell event spreading to the rest of the system. This is a global standard that technology suppliers test their products under to demonstrate compliance. The proposed development will comply with the UL9540A standard industry and other recognised best practice and in terms of fire management.

The plant will absorb and inject energy as demanded by the power system. BESS plants are designed to economically and rapidly provide arbitrage and system support services when needed, allowing immediate system recovery.

Synchronous condenser technology has been around since the mid 1900’s and is demonstrated and mature technology having been formerly used by utilities worldwide. The rotating generator is connected to the transmission system via a step-up transformer. The synchronous condenser is started up and stopped by a frequency controlled electric motor (pony motor). An inverter (static start device / startup frequency converter) is used to drive the generator to reach the operating speed and synchronises it with the system frequency. Once synchronised it acts as a motor providing reactive and short circuit power to the electricity network. There is no combustion or emissions from a synchronous condenser. The synchronous condenser will provide short-circuit power, inertia, and reactive power for dynamic loads and stabilise the network through voltage

[1] https://www.ul.com/services/ul-9540a-test-method

recovery during faults. The project is designed to complement and support the reserve gas fired generator by providing zero carbon, instantaneous and balancing power to the grid.

6.2.3.3 Project 3: Gas Insulated Switchgear (GIS) Electricity Substation

The Gas Insulated Switchgear (GIS) Electricity Substation comprises a two-storey building positioned and secured within a palisade fenced compound. This component of the overall development will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of Project 1 and Project 2 to the electricity transmission network. The HV lines and electric plant associated with Reserve Gas Fired Generator and ESS facility, and which will connect the projects to the GIS substation, are included with the planning application for Project 3.

A full description of the proposed development is provided in Chapter 2 of this EIAR.

6.3 DESCRIPTION OF EXISTING ENVIRONMENT

6.3.1 GENERAL

The site comprises a mosaic of open farmland fields (GA1) which are either heavily grazed or under Arable Crops (BC1).

The fields are bordered by low gappy sections of Hedgerows with occasional semi-mature or mature trees.

The following is a description of the flora and fauna of the existing environment in the study area.

6.3.2 DESIGNATED CONSERVATION AREAS

A Zone of Influence (ZoI) of a proposed development is the geographical area over which it could affect the receiving environment in a way that could have significant effects on the Qualifying Interests of a European site. In accordance with the OPR Practice Note (2021), PN01, the ZoI should be established on a case-by-case basis using the Source- Pathway-Receptor framework.

The European Commission's *"Assessment of plans and projects in relation to Natura 2000 sites guidance on Article 6(3) and (4) of the Methodological Habitats Directive 92/43/EEC"* published 28 September 2021 states at section 3.1.3, that:

"Identifying the Natura 2000 sites that may be affected should be done by taking into consideration all aspects of the plan or project that could have potential effects on any Natura 2000 sites located within the zone of influence of the plan or project. This should take into account all of the designating features (species, habitat types) that are significantly present on the sites and their conservation objectives. In particular, it should identify:

- *any Natura 2000 sites geographically overlapping with any of the actions or aspects of the plan or project in any of its phases, or adjacent to them;*
- *any Natura 2000 sites within the likely zone of influence of the plan or project Natura 2000 sites located in the surroundings of the plan or project (or at some distance) that could still be indirectly affected by aspects of the project, including as regards the use of natural resources (e.g. water) and various types of waste, discharge or emissions of substances or energy;*
- *Natura 2000 sites in the surroundings of the plan or project (or at some distance) which host fauna that can move to the project area and then suffer mortality or other impacts (e.g. loss of feeding areas, reduction of home range);*
- *Natura 2000 sites whose connectivity or ecological continuity can be affected by the plan or project".*

The range of Natura 2000 sites to be assessed, i.e. the zone in which impacts from the plan or project may arise, will depend on the nature of the plan or project and the distance at which effects may occur. For Natura 2000 sites located downstream along rivers or wetlands fed by aquifers, it may be that a plan or project can affect water flows, fish migration and so forth, even at a great distance. Emissions of pollutants may also have effects over a long distance. Some projects or plans that do not directly affect Natura 2000 sites may still have a significant impact on them if they cause a barrier effect or prevent ecological linkages. This may happen, for example, when plans affect features of the landscape that connect Natura 2000 sites or that may obstruct the movements of species or disrupt the continuity of a fluvial or woodland ecosystem. To determine the possible effects of the plan or project on Natura 2000 sites, it is necessary to identify not only the relevant sites but also the habitats and species that are significantly present within them, as well as the site objectives.

The Zone of Influence may be determined by considering the Proposed Development's potential connectivity with European sites, in terms of:

- Nature, scale, timing and duration of all aspects of the proposed works and possible impacts, including the nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of potential pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Location of ecological features and their sensitivity to the possible impacts.

The potential for source pathway receptor connectivity is firstly identified through GIS interrogation and detailed information is then provided on sites with connectivity. European sites that are located within a potential Zone of Influence of the Proposed Development are listed in Table 6.1 and presented in Figure 6.1 and Figure 6.2, below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on 22 May 2024. This data was interrogated using GIS analysis to provide mapping, distances, locations and pathways to all sites of conservation concern including pNHAs, NHA and European sites.

Table 6.1 European Sites located within the potential Zone of Influence[32] of the Proposed Development

Site Code	Site name	Distance (km)[33]
000231	Barroughter Bog SAC	5.33
002241	Lough Derg, North-east Shore SAC	5.18
000216	River Shannon Callows SAC	5.09
004058	Lough Derg (Shannon) SPA	5.28
004096	Middle Shannon Callows SPA	5.11
004168	Slieve Aughty Mountains SPA	7.36

The Proposed Development is located within the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, between Killimor and Portumna, in southeast Co. Galway. Site surveys have established that the site, with the exception of a small section in the southeast corner, drains to the Treananearla Stream, which runs northwest from the site, and enters the Kilcrow River. The Kilcrow flows generally south, discharging into Lough Derg at Stonyisland Bay.

A drainage ditch which runs under the L8763 local road close to its junction with the N65 drains a small section of the southeast of the site which has connectivity to a watercourse which enters the River Shannon north of Portumna, and thus has connectivity with the

[32] All European sites potentially connected irrespective of the nature or scale of the Proposed Development.
[33] Distances indicated are the closest geographical distance between the Proposed Development site and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

River Shannon Callows SAC (Site Code 000216) and Middle Shannon Callows SPA (Site Code 004096), 4.6km to the southeast. However, there are no works proposed that will have any impact on this drainage ditch and in the absence of a pathway and connectivity, these two sites are screened out at this stage of the assessment.

Barroughter Bog SAC (Site Code 000231), lies close to the Kilcrow River, 5.3km to the southwest. The Kilcrow River runs along the eastern edge of the SAC boundary before it outfalls into Lough Derg. Given the location of the SAC in relation to the Proposed Development and the nature of the qualifying interests for which it is designated (terrestrial habitats) no viable source pathway receptor links are identified and therefore no potential for significant effects to this European site, and it is screened out.

The Slieve Aughty Mountains SPA (Site Code 004168) lies 7.4km to the southwest. The footprint of the Proposed Development has not been identified as an *ex-situ* foraging, roosting or breeding area for any SCI species, and it is screened out.

The Treananearla Stream has connectivity to two European sites at Lough Derg, the Lough Derg, North-east Shore SAC (Site Code 002241), and the Lough Derg (Shannon) SPA (Site Code 004058), 5.2km to the south.

It is proposed to realign a portion of the Treananearla Stream within the site boundary. This will involve construction of a new channel, prior to altering the flow of the stream. Construction management of this portion of the Proposed Development to prevent any impacts on these two European sites.

Figure 6.1 Showing European Sites & NHAs/pNHAs within the wider Potential Zone of Influence

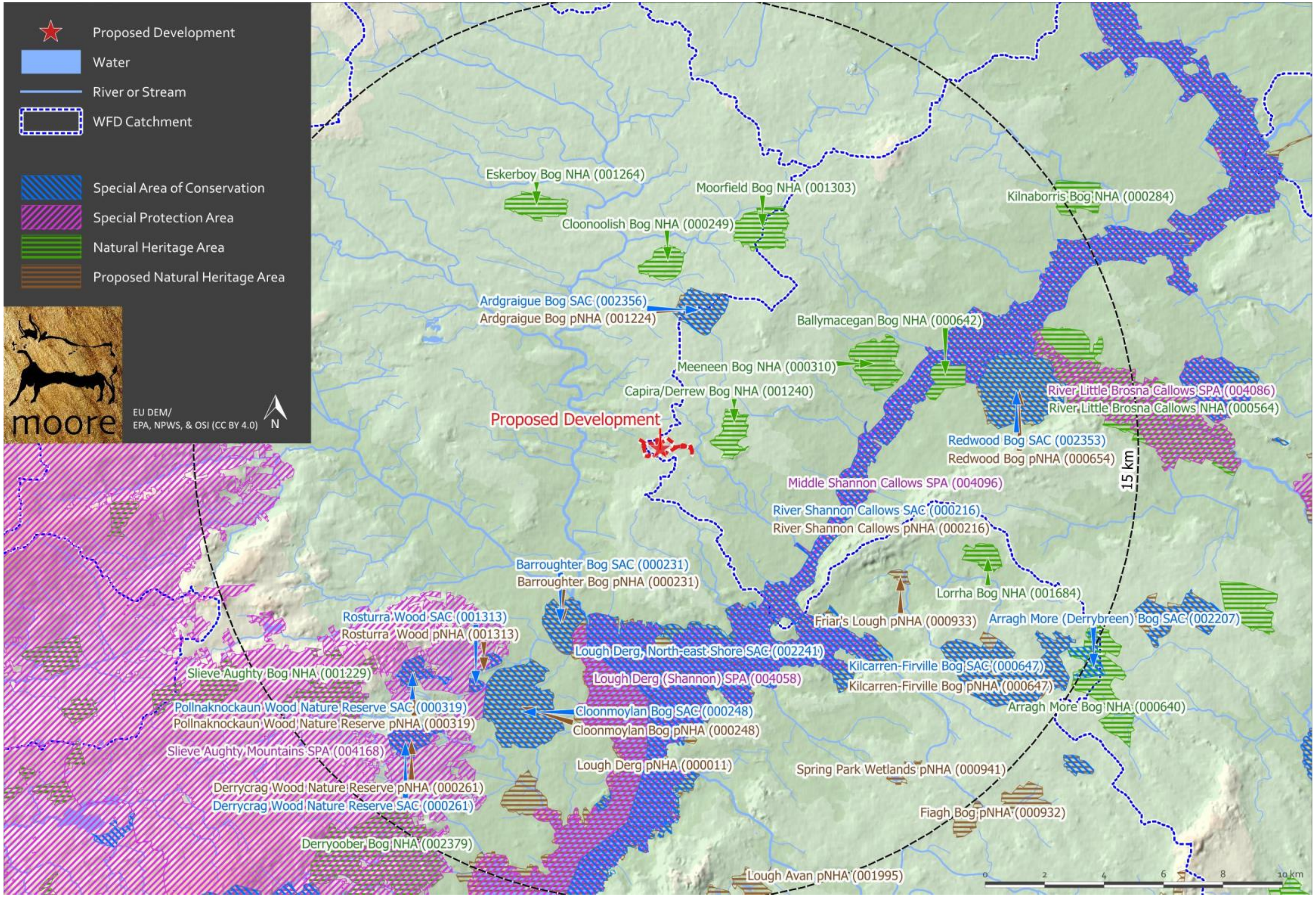
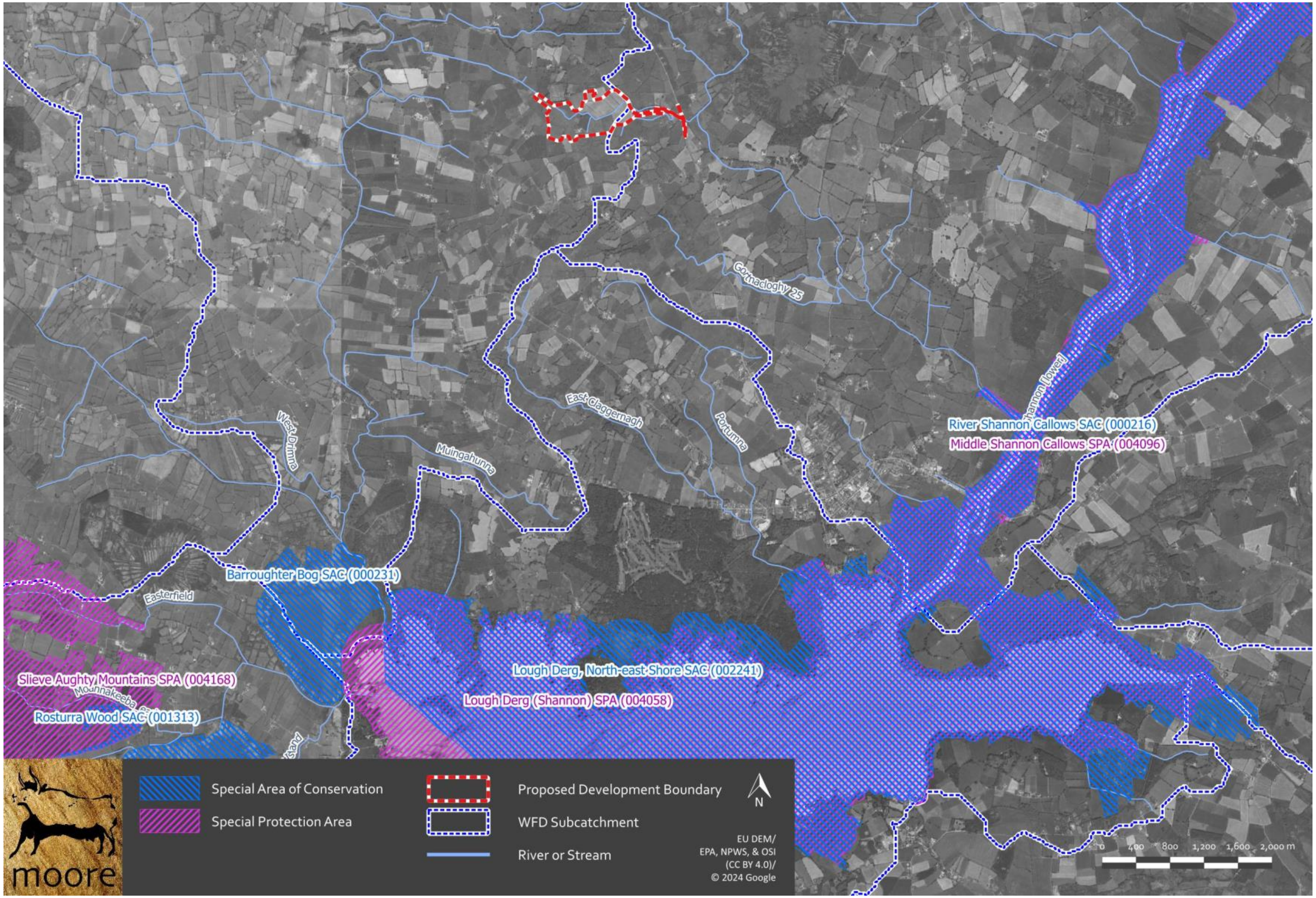


Figure 6.2 Detailed view of European sites in the nearer Potential Zone of Influence



6.3.3 NON-DESIGNATED HABITATS

The Proposed Development consists of a large area of agricultural land, bounded to the east by the L8763 local road and a small group of dwellings, to the south and west by agricultural land, and to the north by the Oldstreet 400kV substation as well as further agricultural land.

An existing farmhouse, with outbuildings and yards is situated in the southern portion of the site. These structures, as well as the main access roads to the site are classed as Buildings and Artificial structures (BL3). There are no records of rare plants in the 1km squares in which the Project site is located (M8108, M8109, M8208, M8209 & M8309).

The main habitats are presented on the recent aerial photography in Figure 6.3. A list of habitats recorded, and their corresponding Fossitt codes is presented in Table 6.2.

Table 6.2 Details of Habitats Recorded and their Corresponding Fossitt Codes

Habitat	Habitat Category	Habitat Type
(F) Freshwater	(FW) Watercourses	(FW1/4) Stream/Drainage ditches
(G) Grassland	(GA) Improved grassland	(GA1) Improved agricultural grassland
	(GS)	(GS2) Dry meadows and grassy verges
(W) Woodland and Scrub	(WS) Scrub and transitional woodland	(WS1) Scrub
	(WL) Linear woodland	(WL1) Hedgerows
		(WL2) Treelines
(B) Cultivated and Built land	(BC) Cultivated land	(BC1/3) Arable crops/Tilled Land
(B) Cultivated and Built land	(BL) Built land	(BL3) Buildings and artificial surfaces
(E) Exposed rock and disturbed ground	(ED) Disturbed ground	(ED1) Exposed sand gravel or till
		(ED3) Recolonising bare ground

6.3.3.1 (FW1/4) Stream/Drainage ditches

This habitat classification applies to drainage ditches within the site associated with low gappy hedgerows. Draining ditches are generally shallow and stagnant being self-contained draining to ground during drier weather.

The Treananearla Stream from the farmhouse bridge to the Oldstreet substation, is considered to have the greatest degree of seminatural character, with some meanders and level changes allowing slight glides and riffles to develop over a stony bottom and is classed as (FW1). Instream vegetation is generally lacking diversity; shaded portions lacking any, more stagnant sections with Reed Canary Grass (*Phalaris arundinacea*) and Bulrush (*Typha latifolia*), with Fools Water Cress (*Apium nodiflorum*) in more lotic sections. All other ditches are classed as Drainage Ditches (FW4), and all appear to have been modified to some extent. The Treananearla Stream has no fisheries value, and the drainage ditches are slow moving to stagnant in drier weather with no fisheries value.

The Kilcrow River further downstream was assessed as part of the WFD surveillance monitoring programme in rivers 2012[34]. The survey site was located upstream of Ballyshrule Bridge, approximately 6km west of Portumna, Co. Galway. Three electric-fishing passes were conducted using two boat-based electric fishing units on the 14 September 2012, along a 154m length of channel. Glide dominated the habitat, while the substrate consisted mainly of cobble and gravel. Vegetation at this site consisted of tall emergent, and small, marginal, aquatic and semi-aquatic species. A total of nine fish species were recorded in the Kilcrow River Ballyshrule Bridge site. Brown trout was the most abundant species, followed by perch, roach, minnow, gudgeon, salmon, pike, European eels and stone loach.

6.3.3.2 (GA1) Improved agricultural grassland

Most of the farmland is laid out in Improved agricultural grassland (GA1). Areas recently re-seeded form a Perennial Rye Grass (*Lolium perenne*) monoculture; most fields have a number of common weedy species in addition, such as Broad-leaved Dock (*Rumex obtusifolius*), Cuckoo Flower (*Cardamine pratensis*), Dandelion (*Taraxacum* agg.) and Meadow Buttercup (*Ranunculus acris*). Isolated lower lying areas in certain fields have wet, but still improved grassland, with Soft Rush (*Juncus effusus*) dominant.

6.3.3.3 (GS2)Dry meadows and grassy verges

The L8763 road, where the new access road will enter, has some areas of Dry meadows and grassy verges (GS2) along its verges, with species such as Erly Purple Orchid (*Orchis mascula*), Cowslip (*Primula veris*), False Brome (*Brachypodium sylvaticum*), and Wild Strawberry (*Fragaria vesca*).

[34] Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Wogerbauer, C. and Rocks, K. (2013) Water Framework Directive Fish Stock Survey of Rivers in the Shannon International River Basin District. Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin, Ireland.

6.3.3.4 (ED1) Exposed sand gravel or till

The L8763 road runs along an esker, which has been entirely levelled at the access area, however, a small area of Exposed sand, gravel or till (ED1) remains in the northern section and backing onto the existing roadside hedgerow. This has a reasonably diverse suite of species, including Early Purple Orchid, Yellowwort (*Blackstonia perfoliata*), Common Milkwort (*Polygala vulgare*) and Burnet Saxifrage (*Pimpinella saxifraga*).

6.3.3.5 (ED3) Recolonising bare ground

The access area largely comprises heavily disturbed ground with crushed gravel and patches of tarmac. Numerous ruderal species have colonised this area, which is classified as Recolonising Bare Ground (ED3), with Oxeye Daisy (*Leucanthemum vulgare*), Black Medick (*Medicago lupulina*), and Red Fescue (*Festuca rubra*) recorded.

6.3.3.6 (WS1) Scrub

Scrub (WS1) is confined to a small area along the L8763 road at the new access point, immediately north of the area of ED1, with Gorse (*Ulex europaeus*), Willows (*Salix* sp.) and dense Brambles.

6.3.3.7 (BC1/BC3) Arable crops/Tilled land

Fields to the south of the existing farmhouse comprise Arable Land (BC1/BC3). These were observed in various states of the arable cycle, with young cereal crops, newly ploughed and harrowed land all recorded.

6.3.3.8 (WL1/WL2)) Hedgerows/Treelines

This habitat refers to large parts of the site boundaries and internal dividing field boundaries. The predominant species present is Hawthorn (*Crataegus monogyna*) and Ash (*Fraxinus excelsior*) along with Willow (*Salix* spp) and frequent Elder (*Sambucus nigra*). A hedgerow survey and assessment was undertaken, see Figure 5.4 for locations described below.

6.3.3.8.1 <u>Substation Shelterbelt</u>
This woodland was planted as screening for the Oldstreet substation to the north. The east-west section is bounded by an unshaded drainage ditch, with Fool's Water Cress and Common Water Starwort (*Callitriche stagnalis*). The woodland is a mix of fast growing native and non-native species, including Sycamore, Alder, and Grey Willow. The north-south section encroaches over the Treananearla Stream with scrubby overgrowth of Hawthorn, Gorse and Bramble. As it is considerably greater than 4m in depth, it is

considered linear woodland, and although of recent establishment, it provides useful connectivity on a landscape scale, and is considered to be of moderate local biodiversity value.

6.3.3.8.2 Hedgerow 1

This section lies alongside the portion of the Treananearla Stream to the north of the substation, and is a more typical hedgerow, dominated by hawthorn and Bramble. It runs along part of the Treananearla Stream, and forms part of the boundary between the townlands of Coolpowra and Ballynaheskeragh. As such it has some heritage value, but only moderate local biodiversity value.

6.3.3.8.3 Hedgerow 2

This boundary scarcely qualifies as a hedgerow, with some scrubby Hawthorn and Willow along a fence line, and rough grasses, including False Oat-Grass (Arrhenatherum elatius) and Bramble along the larger portion of this boundary without woody species. It is of no biodiversity value.

6.3.3.8.4 Hedgerow 3, 4 & 5

These hedgerows form the western and southwestern boundaries of the Proposed Development, and are similar in character, with generally good structure, without noticeable gaps, and with evidence of some regular management. Species diversity is modest, with Hawthorn most abundant, but with some Hazel and Ash, and dense Bramble filling any gaps. The connectivity value of these hedgerows are their most important aspect, and they are considered to be of low to moderate local biodiversity value.

6.3.3.8.5 Hedgerow 6

This hedgerow runs roughly north south, from the Treananearla Stream to the southern perimeter of the site and forms part of the historic boundary between the Gortlusky and Coolpwra townlands. It has good structure, without gaps, and a similar suite of species to most on the site, with Hawthorn, Privet, Elder and Blackthorn, and Hogweed, Cleavers (Galium aparine) and Cow Parsley at the base. It holds some heritage significance, and on account of its connectivity is of low local biodiversity value.

6.3.3.8.6 Hedgerow 7

This hedgerow zigzags in a roughly north south direction. It is of modest size, rather thin (<1m), with numerous small gaps, and dominated by Hawthorn with considerable Ivy growth. It is assessed to be of low local biodiversity value.

6.3.3.8.7 Treananearla Hedgerow

This hedgerow runs alongside and over the Treananearla Stream, from the bridge to the substation shelterbelt. It is proposed to realign the stream to the north, resulting in the loss of this hedgerow. With the exception of a 10m scrubby gap in the northern section, this hedgerow has good structure, with a height of approximately 5-8m for most of its length. There is rather good tree and shrub diversity, with Hawthorn, Elder, Ash, Grey Willow (*Salix cinerea*), Osier (*Salix viminalis*), Dog Rose and Bramble. In the understorey and stream banks Hogweed, Angelica, Great Willowherb and Nettle were recorded, with some Fool's Water Cress and Brooklime (*Veronica beccabunga*) in the less heavily shaded parts of the stream. The hedgerow runs along the boundary between the townlands of Ballynaheskeragh to the north, Coolpowra to the west, and Gortlusky to the south, and as such have some heritage significance; combined with the structure, condition, diversity and the associated stream, this is a hedgerow of high local biodiversity value and significance.

6.3.3.8.8 Hedgerow 8

This hedgerow arcs along the north and eastern boundary of an arable field, is tightly managed, approximately 1.5m tall and 1m deep. Species recorded include Hawthorn, Elder and occasional taller Ash, with rough grasses and Cleavers at the base. It has some connectivity value and is assessed as of low local biodiversity value.

6.3.3.8.9 Hedgerow 9

This is a relatively short hedgerow dividing fields of improved grassland and runs from the Treananearla Stream to the farm buildings. Several taller Ash trees punctuate a row dominated by Hawthorn, Privet and Bramble. Management of the hedgerow has given it a tight profile, and it is without gaps. It offers connectivity and local biodiversity value.

6.3.3.8.10 Hedgerow 10

This hedgerow stands alongside a drainage ditch, and runs northeast – southwest, with a slight dogleg to the south of where an access track passes through. The row is generally well maintained, roughly 2m tall by 1.5m deep, with no gaps. A number of tall Willows line the central portion, while for the most part, Hawthorn, Elder and Privet are the dominant tree species. Bramble is common, with occasional Dog Rose, and Ground Ivy and Hogweed at the foot of the hedge. The drainage ditch is relatively unshaded, and slow-moving, with Reed Canary Grass, Water Cress and Fool's Water Cress abundant. This is assessed as of low to moderate local value for biodiversity.

6.3.3.8.11 Hedgerow11

This is a long row running along the southern boundary of the site, which has generally good structure, with no obvious gaps. Several taller Ash were noted, most with some signs of Ash dieback, with the remainder of the hedgerow is once again dominated by Hawthorn and Bramble. An extensive hedgerow such as this provides obvious connectivity value, and this is assessed as of moderate local biodiversity value.

6.3.3.8.12 Hedgerow 12

A hedgerow running north south from the Treananearla Stream to the southern site boundary. It is of generally low species diversity, with Hawthorn dominant, and Bramble, Ivy and Cleavers common. It is of low local biodiversity value.

6.3.3.8.13 Hedgerow 13

This hedgerow forms part of the historic townland boundary between Gortlusky and Ballynaheskeragh and forms the southern and western boundaries of a field of tilled land in the east of the site. Despite its presumed age, this hedgerow is similar in its modest species diversity to most others on the site, once again with Hawthorn the predominant tree. The structure of the row is considered good, with some management evident in the face, while parts of the top have grown out. This hedgerow is assessed as having low local biodiversity value, largely due to its connectivity to other hedgerows.

6.3.3.8.14 Hedgerow 14

This hedgerow forms part of the historic townland boundary between Ballynaheskeragh and Cooldorragha, and runs along a drainage ditch on the southeastern perimeter of the site. The hedgerow has quite good structure, with some outgrowth along the top. Hawthorn, Ash and Elder were the principal species recorded, while the ground flora was dominated by Nettle and Cow Parsley. This is assessed as of low local biodiversity value.

6.3.3.8.15 Avenue Hedgerow

This comprises the hedgerows on both sides of the access road as far as the bridge, with a further section along the substation access also included. This is a tightly maintained row, to 2m dominated by Hawthorn and Bramble, with Snowberry (*Symphoricarpos albus*) dominant in the eastern portions. The ground flora is dominated by nutrient demanding species such as Hogweed, Cow parsley and Nettle.

6.3.3.8.16 Hedgerow 15

This hedgerow runs along the Treananearla stream from the bridge to the point at which the stream arises from artificial drainage ditches in the centre of the site. These central hedgerows are generally tightly maintained, without gaps. Species diversity is moderate, with abundant Hawthorn and some Privet, Elder and occasional taller Ash. The drainage ditch is shaded for the most part by thick brambles and tall grasses, but with some Fool's Water Cress instream. This hedgerow runs along the townland boundary between , and as such has heritage significance. This historic aspect, together with the associated stream, and connectivity value make this a hedgerow of moderate significance, and moderate local biodiversity value.

6.3.3.8.17 Hedgerow 16

This is a short section of a longer hedgerow on the northern perimeter of the site. The row is generally rather thin, with well grown Hawthorn and Elder in parts, but with little density and some larger gaps. A low earthen bank runs along the base of the hedgerow, where Primrose and Ground Ivy (*Glechoma hederacea*) were recorded. Management has been restricted to cutting back to a narrow, top-heavy row, and the structure has deteriorated as a result. The hedgerow is considered to be of moderate significance low local biodiversity value for its evident age and habitat connectivity.

6.3.3.8.18 Esker Hedgerow/Treeline

The eastern boundary of the site lies along the L8763 road, which runs along an esker. The boundary is lined by a roadside hedgerow with stone wall, with a steep bank dropping to the fields of the site: this bank has been cleared of vegetation, with the exception of several mature Scots Pine (*Pinus sylvestris*). The hedgerow contains a good mixture of species typical of calcareous soils on eskers, including Hazel, Whitebeam (*Sorbus* spp), Blackthorn and Ash, with Hogweed, Cleavers, Primrose, Wild Strawberry and Bush Vetch comprising the ground flora. This hedgerow and treeline form a significant landscape feature, and have a diverse suite of species indicative of good quality calcareous habitat, and this linear feature is assessed as of high local biodiversity value.

Figure 6.3 Showing Habitats Recorded at the Proposed Development Site

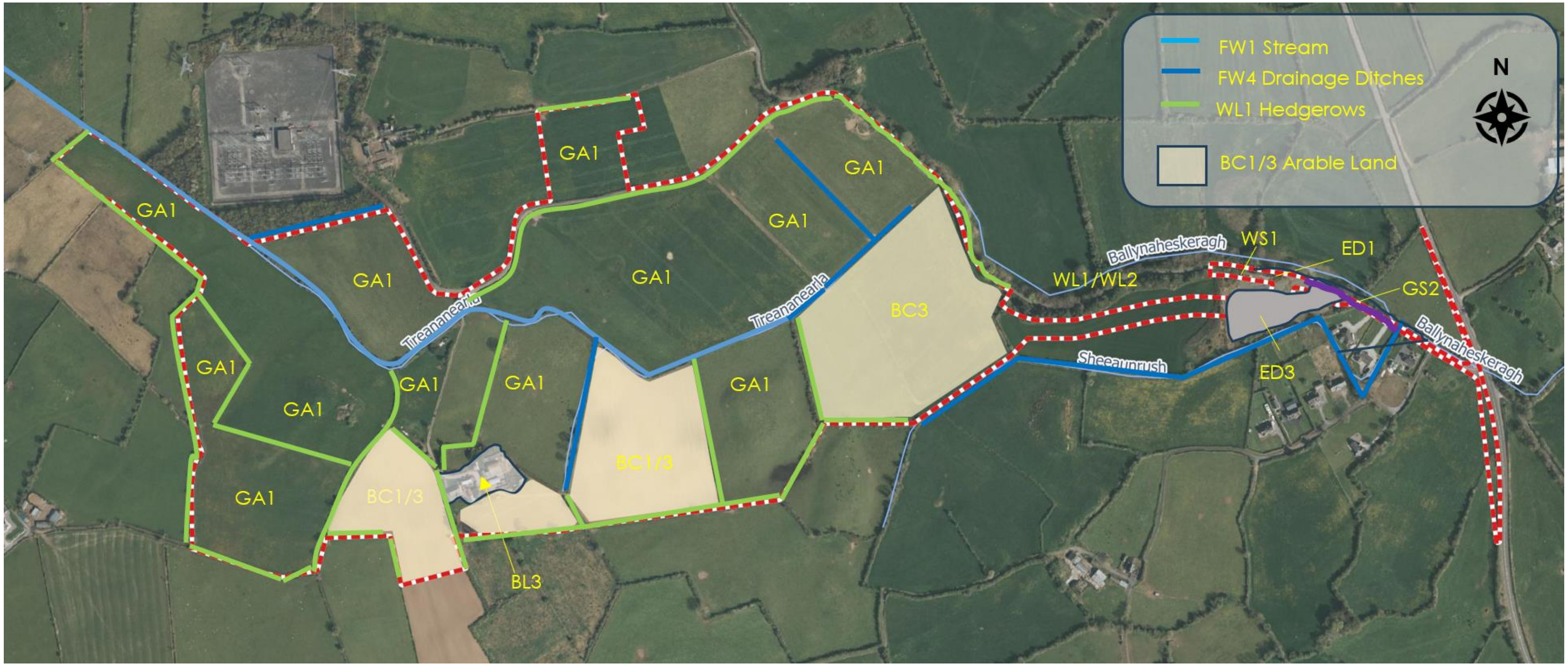
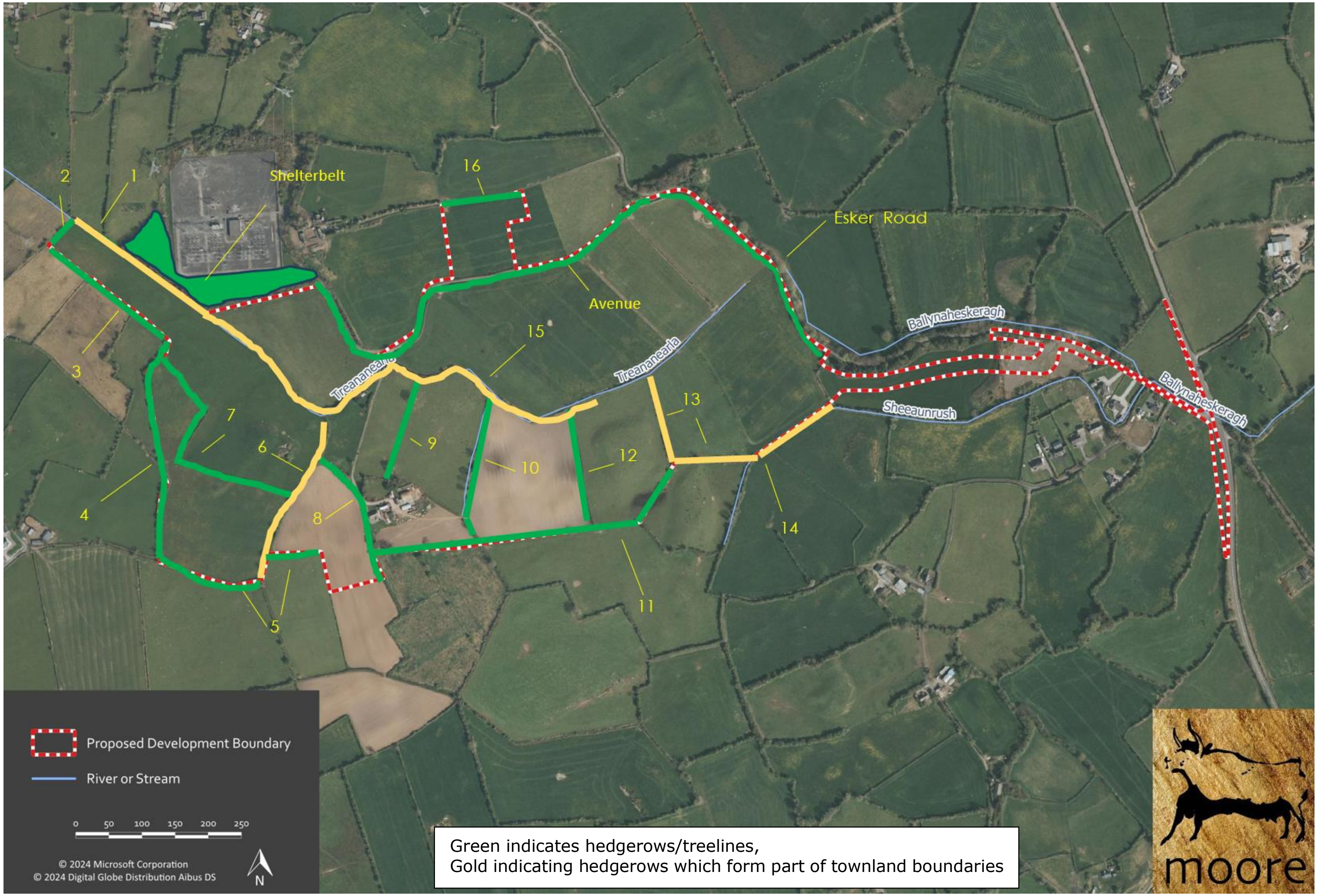


Figure 6.4 Hedgerows described in this report (Green



6.3.4 INVASIVE SPECIES

No invasive species were recorded during surveys.

6.3.5 FAUNA

6.3.5.1 Badgers

There were no badger setts along field boundaries which would be disturbed and no signs of badgers in the study area.

6.3.5.2 Otters

There were no signs of otters in the site or along the stream or drainage ditches which have no fisheries value.

6.3.5.3 Bats

A single occupied dwelling with some bat roosting potential and several sheds were found on site. All buildings were examined for bat roosts. The aim of the surveys was to compile information on actual and potential access points and roosting locations. This was done by searching for evidence of bats including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises.

Trees within the site were also assessed with reference to (Andrews H. , 2018) "*Bat Roosts in Trees*". In addition, static detector surveys were conducted to establish bat activity levels within the site.

The NBDC database was consulted for details on bat records held for the site and the surroundings. The database was consulted on the 28 May 2024 for details on historical records from the site and the surrounding 6km given this is the furthest likely zone of influence for Irish bat roosts. No bat species were recorded within 2km, however six of the nine confirmed resident bat species known to occur in Ireland have been recorded within 6km of the subject site.

A planning application by ESB for the Oldstreet kV Substation Extension in 2023. The proposal involves the demolition of a derelict dwelling. Bat surveys conducted in 2022 found Common pipistrelle maternity roost (max of 28 bats observed emerging). As part of the application a purpose-built bat building was proposed. This application was granted, and the bat building has been built, however the existing bat roost has yet to be demolished. The dwelling is located 56m to the north of the site while the new bat building is located 180m to the north. Both have good connectivity to the subject site.

6.3.5.3.1 Potential Building Roosts

An occupied dwelling with sheds can be found within the site. The house and two sheds have some roosting potential. A large metal shed to the rear has low potential. In addition, a small derelict mobile home was examined and noted as having low bat roosting potential.

6.3.5.3.2 Potential Tree Roosts

Trees are a highly important feature of landscapes in that they provide roost sites throughout the year as well as being essential sources of insect prey. Therefore, the removal of such trees reduces the availability of shelter and feeding sites for bats (NRA 2005). The use of trees as roost sites is well established. Discovery of such roosts may be established by a variety of means including the use of a bat detector survey or alternatively by examination of all suitable crevices and cavities; commonly referred as Potential Roost Features (PRF's). Trees most likely to serve as bat roosts should be identified by a bat specialist from a walk-through of the route, from aerial photography or from a tree survey report.

Trees were examined for potential to host bat roosts on the 25 January and the 23 February 2024 following guidelines set out in the Bat Tree Habitat Key (Andrews H. , 2016) and BCT Guidelines for professional ecologists ed 2 and 3. All trees were assessed from ground level using binoculars.

Examples of crevice features include:

- Natural holes;
- Cracks/splits in major limbs;
- Loose bark; and
- Hollows/cavities.

Dusk emergence and transects surveys were carried out within the site. Each contact with a bat was recorded. Where possible, a positive identification to species level was made. Information on the behaviour was also recorded where available.

Each tree was assessed and ranked from category 1 – 4. In total 37 category 1 and 2 trees were recorded (See Bat Survey Report for details). Very few trees of these most suitable categories for bat interaction are located to the West of the site, with highest concentrations of potential roost trees to the south centre and of the site. The majority of these trees will not be impacted by the proposed development.

6.3.5.3.3 Static Bat Detector Surveys

Song Meter Mini full spectrum bat recorders were deployed within the study area during May 2024. Five detectors were placed within the site;

- D1; along an East to West hedge line adjacent to the Oldstreet 400kV Station,
- D2; placed on a tree to the South of the site,
- D3; placed on a powerline pole in the centre of the site,
- D4; located in open, actively-grazed grassland,
- D5; placed on the northern most hedge line with connectivity to a historical roost on the site.

The aim of this survey was to examine how bats utilize the various habitats within the site. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats. Per SNH (2019) guidance, static units (SM-Mini) were programmed to commence half an hour before sunset and finish half an hour after sunrise to ensure that bat species that emerge early in the evening and return to roosts late are recorded. Detectors were left out for 10 nights in May 2024. Results are shown in Table 6.3.

6.3.5.3.4 Emergence Surveys

Emergence surveys were conducted on sites on two dates, 01 and 23 May 2024.

6.3.5.3.4.1 Location 1 (dwelling house)

Common and Soprano Pipistrelle, Leisler's bat and unknown Myotis bat were recorded. No bats were found emerging from the dwelling.

6.3.5.3.4.2 Location 2 (sheds)

Common and Soprano Pipistrelle, Leisler's bat were recorded. Common Pipistrelle was the most frequently recorded bat. No bats were found emerging from the sheds.

6.3.5.3.4.3 Locations 3a and 3b (trees north of dwelling house)

No bat was found emerging from either tree. Common and Soprano Pipistrelle were recorded overflying however activity was low.

6.3.5.3.4.4 Location 4 (ash tree at east of site)

No emerging bat was found. The first recorded bat was a Leisler's bat 40 minutes after sunset. Common Pipistrelle and Unidentified Myotis were recorded.

6.3.5.3.5 Transect

A transect was walked in the tilled fields to the back of the survey area and occasional Common Pipistrelle were observed hunting on the tree line.

Table 6.3 Static Bat Detector Survey Results

Detector	Leislers	Common Pip	Soprano Pip	Pip 40kHz	Brown Long Eared	Natterers	Myotis	Total	Mins.	Passes
1	156	287	121	27	8	24	116	739	5,716	7.8
2	1	99	5	0	0	0	1	106	5,716	1.1
3	55	39	22	3	0	0	1	120	5,716	1.3
4	86	67	20	3	5	1	3	185	5,716	1.9
5	136	1702	353	35	16	8	7	2,257	5,716	23.7
Total	434	2194	521	68	29	33	128	3,407	28,580	7.2

Five species of bat were positively identified during the various bat surveys: Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Natterer's Bat (*Myotis nattereri*), Leisler's bat (*Nyctalus leisleri*) and Brown Long-eared Bat (*Plecotus auritus*).

A number of contacts or recordings of Myotis sp. bats were also made. It can be very difficult to separate the three species of Myotis bat that are regularly found in Ireland and it was not possible in these instances. 68 registrations have been labeled as '40kHz Pipistrelle'.

Over the 10 nights, each static detector was set recording for a total of 95 hours and 15.6 minutes or 5716 minutes (28580 minutes total), with a combined total of 3407 registrations logged. This equates to 7.2 bat passes per hour (Bp/Hr). This is a relatively low number from a lowland habitat.

Detectors 5 and 1 have marked higher activity levels with significantly more Common Pipistrelle activity than other locations. These locations have connectivity (via treelines and conifer edge) to the existing bat roost. Southern sections of the site have a marked lower activity level. Surprisingly, detector 2 located by the treeline to the south had lowest activity. Typically edge habitats have far higher activity than open areas (locations 3 and 4). For further detail please refer to Appendix 6.1 for Bat Survey Report.

6.3.5.4 Other Mammals

There were signs of fox recorded and a hare was observed in the western grassland fields. These species are of low ecological concern and are not protected.

6.3.5.5 Birds

Bird Surveys were conducted from January to May 2024. Survey types were determined most appropriate to establish a baseline species assemblage, along with spatial and temporal distribution of species activity within the proposed planning boundary.

A desk study which included the following sources of information: Bird Atlas 2007-2011 (the breeding and wintering birds of Britain and Ireland) (Balmer *et al* 2013). IWeBS survey data and NDBC data within 10km of the site, found 66 species recorded within the vicinity of the Proposed Development.

Walkover surveys (wintering and breeding) were undertaken during the survey visits which included the area within the site of the proposed development. All bird species observed or heard within the site and the surrounding area were recorded during the walkover survey. Two vantage point (VP) surveys were conducted at site in January and May. Each VP was undertaken for 6 hours. All species were noted and target species were sketched onto field maps. Hinterland surveys, which comprised of point counts around surrounding lands and encompassed waterbird distribution were also carried out. In addition, vantage point surveys, dedicated Barn Owl survey and breeding bird transect surveys were conducted on site.

Target species for the surveys included designated species for the nearby SPA's, wintering swans and geese, birds of prey, ducks, plovers, lapwings, sandpipers, gulls and terns. For the purposes of the survey raptors were also considered to be target species. In line with I-WeBS methodology, Cormorant, Shag, Little Egret, Grey Heron, and Kingfisher were also included (Lewis, 2017)

Winter bird surveys would normally start in October, however due to the late appointment of Eire Ecology, these surveys were not carried out. Barn owl have been breeding within a derelict ruin to the south of the site. The site is managed by the Barn Owl Project. Surveys and impact assessment has been conducted for barn owls as part of the project.

Species of note found within the site include Buzzard, Kestrel, Snipe, as well as the red listed species, Redwing and Meadow pipit (See Table 6.4 and Table 6.5). Several amber listed passerines were present on-site including Goldcrest, Willow warbler, Skylark, Linnet, House martin and Barn swallow. Mallard, Black-headed Gull, Grey Heron and Whimbrel were observed flying over the site in small numbers. A White-tailed eagle was observed on one occasion flying adjacent to the site. The site was found to contain breeding Barn swallow, Starling, Linnet and possible breeding Willow Warbler. Species of note found within the hinterland included; Barn Owl, Northern Lapwing, Black-headed gull, Teal and Mallard.

Table 6.4 Summary of VP Species of interest

Species	No. of obs.	Max no. observed	1% National Population	BoCCI4	Season for BOCCI4 designation
Buzzard	1	1	Unknown	Green	-
Grey Heron	3	2	25	Green	-
Kestrel	1	1	Unknown	Red	Breeding
Redwing	185	50	Unknown	Red	Wintering
Mallard	1	1	280	Amber	Breeding/ Wintering

Table 6.5 Summary of Transect Species of Interest Results

Species	No. of obs.	Max no. observed	Breeding Assessment	1% National Population	BoCCI4	Season for BOCCI4 designation
Black-headed Gull	3	6	Wintering	Unknown	Amber	Breeding/Wintering
Buzzard	7	2	Wintering	Unknown	Green	-
Grey Heron	1	1	Wintering	25	Green	-
Kestrel	2	1	Wintering	Unknown	Red	Breeding
Mallard	1	1	Wintering / Non-Breeding	280	Amber	Breeding/Wintering
Meadow Pipit	11	6	Probably Breeding	Unknown	Red	Breeding
Redwing	7	20	Wintering	Unknown	Red	Wintering
Snipe	7	3	Wintering	Unknown	Red	Breeding/Wintering
Whimbrel	1	10	Non-Breeding	Unknown	Green	-
White-tailed Eagle	1	1	Non-Breeding	Unknown	Red	Breeding

The aim of the wintering VP survey was to examine if the site is a feeding ground or on a regular flightpath for wintering waterbirds such as Whooper Swans or Curlew. The survey results shows the site is not used by these species.

Very low numbers of birds of interest were found during hinterland surveys. Lapwing were observed in a field beside the town of Portumna in January 2024 but were not there on subsequent visits. Teal and Mallard were at one location south of the site in a ponding area of a field, but these were also only seen once at this location.

No Nationally Important flocks of birds were recorded from the hinterland surveys.

Barn Owl is a scarce resident mainly in central and southern Ireland. It no longer breeds in large patches of northern, western and eastern Ireland, and is Red-listed in Ireland due to a significant decline in the breeding population. The European population is currently evaluated as Declining. Due to a reported barn owl nest site close to the site, a survey was conducted on the 01st May 2024 to establish Barn owl presence at given location. One barn owl was observed in the area, however a Nest site Verification Survey was not conducted as this would cause unnecessary disturbance to the species. No Barn owls were observed on site. Please refer to Appendix 6.2 for Bird Survey Report.

6.3.6 HABITAT EVALUATION

The ecological value of the site was assessed following the guidelines set out in the Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment (2019) and according to the Natura Scheme for evaluating ecological sites (after Nairn & Fossitt, 2004). Additionally, the TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) outlines the methodology for evaluating ecological impacts Judgements on the evaluation were made using geographic frames of reference, e.g. European, National, Regional or Local, see Table 6.6 below.

Due cognisance of features of the landscape which are of major importance for wild flora and fauna, such as those with a *"stepping stone"* and ecological corridors function, as referenced in Article 10 of the Habitats Directive were considered in this assessment.

Table 6.6 Details of TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)

Ecological valuation: Examples

International Importance:

- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
- Proposed Special Protection Area (pSPA).
- Site that fulfills the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.[4]
- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level)[5] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[6]

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level)[7] of the following:
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing 'viable areas'[8] of the habitat types listed in Annex I of the Habitats Directive.

County Importance:

- Area of Special Amenity.[9]
- Area subject to a Tree Preservation Order.
- Area of High Amenity, or equivalent, designated under the County Development Plan.
- Resident or regularly occurring populations (assessed to be important at the County level)[10] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
- County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP,[11] if this has been prepared.
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
- Resident or regularly occurring populations (assessed to be important at the Local level)[12] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

The Proposed Development is located on a site which, with the exception of a small section in the southeast corner, drains to the Treananearla Stream, which runs northwest from the site, and enters the Kilcrow River. The Kilcrow flows generally south, discharging into Lough Derg at Stonyisland Bay.

A drainage ditch which runs under the L8763 local road close to its junction with the N65 drains a small section of the southeast of the site which has connectivity to a watercourse which enters the River Shannon north of Portumna, and thus has connectivity with the River Shannon Callows SAC (Site Code 000216) and Middle Shannon Callows SPA (Site Code 004096), 4.6km to the southeast. However, there are no works proposed that will have any impact on this drainage ditch and in the absence of a pathway and connectivity, these two sites are screened out at this stage of the assessment.

The Treananearla Stream has connectivity to two European sites at Lough Derg, the Lough Derg, North-east Shore SAC (Site Code 002241), and the Lough Derg (Shannon) SPA (Site Code 004058), 5.2km to the south.

It is proposed to realign a portion of the Treananearla Stream within the site boundary. This will involve construction of a new channel, prior to altering the flow of the stream. Construction management of this portion of the Proposed Development to prevent any impacts on these two European sites.

There is no potential for connectivity to any other European sites.

Given the above analysis, it is considered that there will be no potential for significant effects on any European sites considered and therefore potential effects on European sites can be excluded at the screening stage.

The open field habitats are considered of low biodiversity value at a local level while internal and boundary hedgerows range from low to high local value.

There are no rare or protected habitats recorded in the study areas inside the licenced areas. Overall, the proposed development area is of Low Local Ecological Value, with the exception of the Treananearla Stream west of the farmhouse bridge, and the esker hedgerows and treelines.

6.4 POTENTIAL EFFECTS ON BIODIVERSITY

6.4.1 POTENTIAL DIRECT EFFECTS

The open field habitats are considered of low biodiversity value at a local level as are most of the internal hedgerows. The Treananearla Stream will be realigned, with features including meanders and fringing hedgerows to encourage a seminatural habitat. Approximately 330m of hedgerow, along the Treananearla Stream will be removed, along with sections of other internal hedgerows of low local value. This will be considerably outweighed by the planting of approximately 7,500m^2 native woodlands along the southern boundaries of the site, together with more biodiversity friendly management of remaining hedgerows, to give considerable biodiversity net gain.

Potential direct effects on breeding birds through loss of internal hedgerow can be avoided by appropriate timing.

The Treananearla Stream is of relatively low biodiversity value in terms of its topography being a relatively shallow water course with no potential for fisheries value. It has a variable course ranging from drainage ditch type to semi-natural. The realignment of the stream will be achieved by constructing a new landscaped water course with a more naturalised bed and enhancement features such as pea-gravel and increased meandering to create riffle and glide areas. The old water course will be diverted to the newly landscaped course with no significant loos of aquatic habitat. The diversion will be carried out having regard to the pathway to the Kilcrow River and Lough Derg much further downstream.

In the absence of mitigation measures during diversion and overall site development near water courses, the potential for pollution for elevated suspended solids and/or chemical spills or hydrocarbons is uncertain in the absence of construction management measures.

There will be a loss of c. 330m of hedgerow where the Treananearla Stream will be diverted to a new landscaped course.

There will be a loss of c. 150m of hedgerow to the east of the farm buildings.

There will also be a loss of two sections of c. 30m to facilitate the new access road to the site.

The overall cumulative loss of hedgerow will be c.540m.

This will be replaced by a linear band of woodland and wildflower meadow for a loped distance of 1.4km to the south of the site. Additional hedges will be placed around the AGI area to the north for c.100m. This provides an ecological corridor between the Oldstreet Compound and the old remaining access road into the site where existing hedges will be allowed to grow out to a less intensive management regime.

The potential direct effects on habitats will be imperceptible and neutral.

6.4.2 POTENTIAL INDIRECT EFFECTS

The Treananearla Stream will be realigned, with a new channel dug, prior to the diversion of the stream. Construction management will avoid any impacts on the hydrologically connected Lough Derg European sites.

Guidance on lighting has been based on the Bats & Lighting document; (BCI, 20 the Bats and artificial lighting in the UK Guidance Note 08/18 (BC T, 2018) and Guidelines for consideration of bats in lighting projects. EUROBATS Publication Series No. 8 (Voigt, 2018). Lighting can alter the behaviour of bats and the insects they prey on.

The potential direct effects on Biodiversity will be imperceptible and neutral.

6.5 MITIGATION MEASURES

6.5.1 MITIGATION MEASURES FOR HABITATS

Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March 01 to August 31. If this cannot be enforced, then the site will be surveyed for the presence of nesting birds and/or nests prior to cutting and if none are recorded the vegetation may be removed within 48 hours.

6.5.2 MITIGATION MEASURES FOR BATS

Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March.

6.5.3 MITIGATION MEASURES FOR BIRDS

Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March.

In order to minimise the extent of light spill onto perimeter habitats, all lights that are pole mounted will be directional and/or cowled to ensure that light is directed downward and inwards. Lights will be programmed or otherwise to be off unless required.

Mitigation measures proposed will reduce the impact on all bird species while enhancement (such as planting of nature woodland, SUDS features (ponds) providing habitat) and roost houses /bird boxes) measures should result in a net overall benefit for the local bird population. The proposed development will not have a significant impact on any bird species on a local or county basis.

6.6 RESIDUAL IMPACTS

Specific local mitigation measures include the avoidance of cutting of vegetation during the bird nesting season with regard to the construction phase. The planting of approximately 7,500m^2 native woodlands along the southern boundaries of the site, and remaining hedgerow habitat to be conserved in site. There will be a loss of relatively low value local habitats including sections of low value gappy hedgerow, scrub, grassland and overgrown drainage ditches. The overall effect is considered neutral, imperceptible, and long-term.

With the employment of appropriate mitigation measures with regard to local biodiversity, the Proposed Development will have a neutral, imperceptible and long term effect on biodiversity.

6.7 CUMULATIVE EFFECTS

Three potential routes for gas pipelines connections to the proposed development are being considered by Gas Networks Ireland. These connections will form a sperate planning application. Any gas connection pipeline will be undergrounded. There is potential for pipelines to impact on unknown habitats and fauna such as badgers will be mitigated by appropriate avoidance measures to ensure no cumulative effects occur.

The Galway County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of influence of the Proposed Development site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the proposed development area and surrounding townlands in which the proposed development site is located, would be avoided.

A review of developments granted permission in the vicinity in most cases have been granted with conditions relating to sustainable development by the consenting authority in compliance with the relevant Local Authority Development Plan and in compliance with the Local Authority requirement for regard to the Habitats Directive. Any consented development cannot have received planning permission without having met the consenting authority requirement in this regard. There are no predicted in-combination or cumulative effects given that it is predicted that the Proposed Development will have no effect on any European site.

6.8 MONITORING AND FURTHER WORKS

No ecological monitoring is required during the construction phase of development. The mitigation measures specifying review of the lighting plan by a bat ecologist may require additional surveys and monitoring during site construction and operation. The Local Authority may propose additional monitoring in order to address this.

No reinstatement measures are proposed.

6.9 SUMMARY OF SIGNIFICANT EFFECTS

There will be no significant effects on designated sites in the potential Zone of Influence of the proposed development.

There will be no significant effects on low value local biodiversity.

6.10 REFERENCES

- CIEEM (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine; September 2018; Version 1.1 - Updated September 2019. Institute of Ecology and Environmental Management.
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- EC (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43EEC. European Commission, Brussels.
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7 SOILS & GEOLOGY

7.1 INTRODUCTION

This Chapter of the EIAR assesses the potential effects associated with the proposed development on the soils and geology. The chapter provides an overview of the baseline geological and soil conditions across the development lands and an assessment of potential significant effects during the construction, operational and decommissioning stages. A description of the existing site setting and proposed development is presented in Chapter 2 of this EIAR:

For the purpose of the Environmental Impact Assessment (EIA) the following is defined:

1) The term *"Geology"* refers to the bedrock and superficial deposits.
2) The term *"Soil"* refers to the material produced largely by weathering and biological activity which are often principally derived from the underlying bedrock and superficial geology.

The amended EIA Directive introduces Land as a prescribed environmental factor. Recital 9 gives context to this addition, showing that it relates to the issue of *'land take'*. This aspect is separately discussed under Material Assets (Chapter 10).

The assessment of potential effects on Soils and Geology involved the following:

- Review of development proposals.
- Review of site-specific reports.
- Consultation with relevant statutory authorities /databases to help establish baseline conditions and identify any significant concerns in the area.
- Consideration of potential interactions and identification of possible impacts.
- Assessment of impacts, within the context of the receiving environment including cumulative effects.
- Identification of measures and solutions to avoid, minimise and mitigate potential impacts; and,
- Assessment of residual impacts, taking account of mitigation measures.

7.1.1 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Coolpowra Flex Gen Limited propose to develop a Reserve Gas-Fired Generator (Project 1), a grid-connected Energy Storage System (ESS) facility (Project 2) and a Gas Insulated

Switchgear (GIS) Electricity Substation (Project 3) in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway. The development is considered of significant economic importance at both state and regional levels due to its strategic positioning on the 400kV transmission network. The proposed GIS substation (Project 3) will upgrade and enhance the existing AIS intermediate substation on the 400kV line at the Oldstreet node and will facilitate and provide for connection of the Reserve Gas-Fired Generator and Energy Storage System projects to the 400kV electricity network.

7.1.1.1 Project 1: Reserve Gas Fired Generator

The Reserve Gas Fired Generator comprises three open cycle gas-fired generator (OCGT) units positioned within a building (OCGT Hall) along with auxiliary equipment. An OCGT unit consists of a turbine connected to an electric power generator and the three turbines are designed to operate independently of each other. The OCGT units will receive natural gas from the gas network via an underground pipeline to an Above Ground Installation (AGI) compound within the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI.

The proposed OCGT units are dual fuel units as required by system requirements required by the Grid Code published by Eirgrid. Natural gas will be the primary and combustion fuel to each of the OCGT units when operating.

The indicative route for an associated gas pipeline has been considered as part of this assessment. This will commence at New Inn, just north of the M6 Motorway and approximately 23.5 km north-west of the development site. The pipeline will be established by Gas Networks Ireland (GNI) through a separate planning application, and this will complete a full assessment of the preferred route associated full assessment.

Secondary fuel (gas oil) will be stored in a bunded structure outside the OCGT building along with ancillary items of electrical plant and machinery such as coolers and transformers.

The Reserve Gas-Fired Generator is designed to operate intermittently and provide generation capacity during periods of high demand or when renewable energy generators cannot meet system demand.

7.1.1.2 Project 2: Energy Storage System (ESS)

The Energy Storage System (ESS) facility comprises (a) a Long Duration Energy Storage (LDES) static battery positioned within a secure outdoor compound, and (b) a Synchronous Condenser which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid.

Battery storage is a technology that enables power system operators and utilities to store energy for later use. A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed. A BESS facility is made up of batteries, a battery management system, a power conditioning system, and an energy management system. Sufficient separation distance between enclosures is included within the design to allow for safe access and replacement of modules. Each module will include control equipment, to provide for ventilation, air conditioning and fire suppression equipment. MVPS (or PCS) units and small transformers will also be positioned in self-contained weather-proof enclosures. At a system level, UL9540A[35] is the recognised test method for evaluating thermal runaway in battery storage systems that reduces the risk of a single cell event spreading to the rest of the system. This is a global standard that technology suppliers test their products under to demonstrate compliance. The proposed development will comply with the UL9540A standard industry and other recognised best practice and in terms of fire management.

The plant will absorb and inject energy as demanded by the power system. BESS plants are designed to economically and rapidly provide arbitrage and system support services when needed, allowing immediate system recovery.

Synchronous condenser technology has been around since the mid 1900's and is demonstrated and mature technology having been formerly used by utilities worldwide. The rotating generator is connected to the transmission system via a step-up transformer. The synchronous condenser is started up and stopped by a frequency controlled electric motor (pony motor). An inverter (static start device / startup frequency converter) is used to drive the generator to reach the operating speed and synchronises it with the system frequency. Once synchronised it acts as a motor providing reactive and short circuit power to the electricity network. There is no combustion or emissions from a synchronous condenser. The synchronous condenser will provide short-circuit power, inertia, and reactive power for dynamic loads and stabilise the network through voltage recovery

[35] https://www.ul.com/services/ul-9540a-test-method

during faults. The project is designed to complement and support the reserve gas fired generator by providing zero carbon, instantaneous and balancing power to the grid.

7.1.1.3 Project 3: Gas Insulated Switchgear (GIS) Electricity Substation

The Gas Insulated Switchgear (GIS) Electricity Substation comprises a two-storey building positioned and secured within a palisade fenced compound. This component of the overall development will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of Project 1 and Project 2 to the electricity transmission network. The HV lines and electric plant associated with Reserve Gas Fired Generator and ESS facility, and which will connect the projects to the GIS substation, are included with the planning application for Project 3.

A full description of the proposed development is provided in Chapter 2 of this EIAR.

7.2 METHODOLOGY & SIGNIFICANCE CRITERIA

7.2.1 ASSESSMENT METHODOLOGY

This assessment has been undertaken in line with the *Source – Pathway – Receptor* Model as per the documents *"Guidelines on the Information to be contained in Environmental Impact Assessment Impact Assessment Reports" 2022* and *"Advice Notes for Preparing Environmental Impact Statements",* 2003.

At the impact assessment stage, any potentially beneficial or adverse impacts associated with the development are identified and assessed with reference to the baseline environment. This requires consideration of:

- Sensitivity/value of the receptor,
- Magnitude of the impact,
- Impact duration,
- Whether impact occurs in isolation, is cumulative or is interactive; and
- Performance against environmental quality standards or other relevant thresholds.

7.2.2 ASSESSMENT CRITERIA AND IMPACT ASSESSMENT METHODOLOGY

This assessment considers the potential risk to environmental receptors and the pathways by which the receptors may be affected. Definitions of the key descriptors are detailed below:

- Source: potential contaminant sources,
- Pathway: the mechanism by which the source may affect a receptor, and

- Receptor: identified features that may be affected, based on the sensitivity of the site.

The strength of the pathway between a source and a receptor is a function of the distance between the two and the ease or otherwise of the migration pathway. For example, on sites underlain by impermeable clays, the migration pathway via groundwater would be weak even over short distances, whereas within sands or gravels, the migration pathway would be strong for receptors in close proximity to a source and weak for receptors at some distance from the source.

The significance of predicted impacts likely to occur during all phases of the proposed development was determined by considering the value and sensitivity of the key attributes that may be affected and the magnitude of the predicted impact.

7.2.3 DETERMINING VALUE & SENSITIVITY OF RECEPTOR THROUGH BASELINE STUDIES

The value or sensitivity of a receptor is largely determined by its quality, rarity and scale. The determination of value or sensitivity takes into account the scale at which the attribute is important. For the purpose of assessing the significance of environmental impacts predicted as part of this assessment, the value of receptors is scaled based on the relative importance of the receptor defined as follows:

3) LOCAL LEVEL: On the development lands or immediately adjacent to it.
4) DISTRICT LEVEL: Beyond the development land boundary but within the district.
5) COUNTY LEVEL: County Level e.g., Galway
6) REGIONAL LEVEL: Northern and Western Region
7) NATIONAL LEVEL: Ireland.
8) INTERNATIONAL LEVEL: European Community.

A receptor's value and sensitivity must be defined using available guidance and professional knowledge and taking into account the site sensitivities. In some cases, the inherent value of the receptor has been recognised and been afforded a statutory designation (e.g., Special Areas of Conservation (SAC's)), which makes the value assignment more straightforward. The judgement of receptor significance is made on a case-by-case basis for each receptor or resource identified as having the potential to be subject to impacts associated with the proposed development.

Irrespective of its recognised value, all receptors/features would exhibit a degree of sensitivity to the changes imposed by new development. The *"sensitivity"* element of the criterion ensures that this characteristic of each receptor is assessed. The classification for determining sensitivity of receptors is detailed in Table 7.1. This classification is used as a generic methodology and professional judgement has been applied in each case.

Table 7.1 Receptor Sensitivity and Typical Descriptors

Sensitivity	Descriptors
Very Low	Feature / receptor is generally insensitive to impact, no discernible changes e.g., soils are not in use, the land is used for industrial/commercial purposes and /or mainly covered by hard standing.
Low	Feature / receptor has some tolerance to accommodate the proposed change. It responds in a minimal way such that only minor changes are detectable e.g., landscaped areas.
Medium	Feature / receptor has a low capacity to accommodate the proposed form of change. It clearly responds to effects in a quantifiable manner e.g. low-grade agricultural land and recreational ground.
High	Feature / receptor has a very low capacity to accommodate the proposed form of change. The response is a major change e.g. agricultural land use for food production, allotments.

7.2.3.1 Magnitude of Impacts

Magnitude refers to the *"scale"* or *"amount"* of an impact. Key impacts have been identified and the likely magnitude of each potential impact has been determined through the predicted change from the baseline conditions throughout the various phases of development. The magnitude of an impact is a measure of aspects such as the impacts:

- Extent (i.e., the geographical area over which the impact occurs),
- Duration (i.e., the time for which the impact is expected to last prior to recovery or replacement of the resource or feature: short, medium or long term),
- Likelihood (i.e., the probability that the impact will occur),
- Direct or Indirect (i.e., difficult to avoid), and,
- Reversibility (i.e., an irreversible (permanent) impact is one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it: Temporary or Permanent).

In order to help define the level of impact magnitude the following guidance has been adopted for the purpose of providing a transparent assessment. The professional judgement of the author is used in the decision-making process when characterising impacts in accordance with the criteria set out in Table 7.2.

Table 7.2 Assessment of Criteria

Magnitude	Assessment Criteria
No Change	• No loss or alteration of characteristics, features or elements. • No observable impact on receptors/features.
Negligible	• Noticeable, temporary (for part of the development duration) change; or • Barely discernible change for any length of time, over a small area, to any key characteristics or features. • Impact unlikely or rarely to occur. • Results in effects on attribute of insufficient magnitude to affect the use/integrity.
Slight	• Noticeable, temporary (during the project duration) change, over a partial area, to key characteristics or features. Impact will possibly occur. • Impact predicted to extend over a small area. • Impact predicted to affect small numbers of people. • Impact predicted to affect a small number of other receptors (ecological, businesses, facilities). • Impact not predicted to have trans-boundary effects, but possibility remains. • Slight but discernible change in environmental conditions predicted. • Impact not predicted to entail unusual/complex effects for receptors. • Impact not predicted to affect particularly scarce features/resources. • Impact not predicted to result in breaches of legislation or statutory Environmental Quality Standard or Objectives. • Impact not predicted to result in loss of attribute. • Impact will continue for a short period of time only. • Impact will be temporary. • Impact will be intermittent and/or rare. • Impact will be reversible. • Impact will be possible to avoid, reduce, repair, or compensate for; or • Slight positive change in environmental conditions resulting in minor improvements in quality or value of a receptor.
Moderate	• Significant, permanent / irreversible changes, over the majority of the development area and potentially beyond, to key characteristics or features. Impact certain or likely to occur. • Impact predicted to extend over a moderate area. • Impact predicted to affect moderate numbers of people. • Impact predicted to affect some other receptors (ecological, businesses, facilities). • Impact unlikely to have trans-boundary effects, but possibility remains. • Moderate change in environmental conditions predicted.

Magnitude	Assessment Criteria
	• Impact unlikely to entail unusual/complex effects for receptors but possibility remains. • Impact unlikely to affect particularly scarce features/resources but possibility remains. • Impact entails a low probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur. • Impact unlikely to result in loss of attribute but possibility remains. • Impact will continue for a moderate period of time. • Impact will be semi-permanent. • Impact will be intermittent. • Impact will be possible to avoid, reduce, repair, or compensate for; or • Notable positive change in environmental conditions resulting in measurable improvements in quality or value of a receptor.
Substantial	• Very significant, permanent / irreversible changes, over the whole development area and beyond (i.e. off-site), to key characteristics or features of character or distinctiveness. Impact certain or likely to occur. • Impact predicted to extend over a large or very large area. • Impact predicted to affect considerable numbers of people. • Impact predicted to affect considerable numbers of other receptors (ecological, businesses, facilities). • Impact predicted to have trans-boundary effects. • Significant change in environmental conditions predicted. • Impact will entail unusual/complex effects for receptors. • Impact will affect particularly scarce features/resources. • Impact entails a high probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur, • Impact will result in total loss of attribute. • Impact will continue for extended periods of time. • Impact will be permanent rather than temporary. • Impact will be continuous rather than intermittent, or were intermittent, frequent rather than rare. • Impact will be irreversible. • Impact will be very difficult to avoid, reduce, repair, or compensate for; or • Significant positive change in environmental conditions resulting in major improvements in quality or value of a receptor.

7.2.3.2 Impact Significance

Part 10 of the Planning and Development Regulations, 2001, as amended, focuses on the procedures and criteria for identifying and assessing *"significant environmental effects"* of proposed developments in Ireland. Therefore, an assessment of significance is necessary in order to identify the main environmental effects of the proposed development and assist in determining what weight these effects should be given. Definitive guidance in the preparation of EIA in the soils and geological environment exists *in "Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements",* issued by the Institute of Geologists of Ireland (IGI 2013). From the guidance, a significant effect is defined as *"an impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment".*

It is widely recognised that *"significance"* reflects the relationship between the magnitude of an impact and the sensitivity (or value) of the affected environmental receptor.

To assist in the assessment process, the Impact Significance Matrix (ISM) (Table 7.3) provides a transparent methodology to ensure consistency and ease of interpretation of the judgement of impact significance.

An initial indication of impact significance (adverse or beneficial) is gained by combining magnitude and sensitivity / value in accordance with the ISM provided. It should be noted that although the ISM provides a good framework for the consistent assessment of impacts across all environmental parameters, there is still an important role for professional judgement and further objective assessment to play in moderating an impact's significance. Given that the criteria represent levels on a continuum or continuous gradation, professional judgement and awareness of the relative balance of importance between magnitude and sensitivity / value is required.

Features to which legal designations apply have automatically been determined to be of high value (or of a higher value than non-designated features), and any impact tends to be of a greater significance than an impact of features to which no designation applies. Hence, for designated features, the use of the value criteria leads to an initial presumption that impacts will be of a high significance. Information on sensitivity can then be used to modify or maintain this initial assessment.

Table 7.3 Impact Significance Assessment

Magnitude[1]	Value/Sensitivity of Receptor[2]			
	Very Low	Low	Medium	High
No Change	Negligible	Negligible	Negligible	Minor
Negligible	Negligible	Minor	Minor	Moderate
Slight	Minor	Minor	Moderate	Major
Moderate	Minor	Moderate	Major	Major
Substantial	Moderate	Major	Major	Major

Note 1 Refer to Table 7.2
Note 2 Refer to Table 7.1

Given the use of professional judgement in the assessment process, there may be some variation between subject areas (i.e., different environmental parameters) in the significance rating process. This may be as a result of limited information on the sensitivity of features and / or the complexity of interactions that require assessment in determining the magnitude of change. However, the ratings derived through the impact assessment process, as set out in Table 7.3 can also be described in a generic fashion as given in Table 7.4. The following definitions are proposed in relation to the significance of environmental impacts predicted throughout this EIAR.

Table 7.4 Impact Significance Definitions

Level of Significance	Description
Negligible	No discernible effect. An impact that is likely to have imperceptible or insignificant impact.
Minor	Slight, very short or highly localised impact of no significant consequence. These effects may be raised as local issues but on their own are unlikely to be of importance in the decision-making process. When combined with other effects these could have a more material influence.
Moderate	Intermediate limited (extent / duration / magnitude) impact that may be considered as significant. These effects are likely to be important considerations at a local level. These could have influence on decision making especially when combined with other similar effects.
Major	Very large or considerable impact (extent/duration/magnitude). Effects, both adverse and beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation. In isolation, these could have a material influence on the decision-making process.

7.2.3.3 Impact Mitigation Measures

Following the implementation of mitigation measures the identified impacts may be reduced to environmentally acceptable levels (or not).

It is best practice to consider mitigation measures for all impacts that are of a minor negative significance (i.e., slight, very short or highly localised impact of no significant consequence) or higher and this has been adopted for the purpose of this assessment.

The purpose of mitigation is to reduce the significance of the residual impact (see below) to a minor adverse or negligible level, which is a level that is expected to be acceptable by local authority, environmental regulators, and the public. Individual impacts assessed as being of minor adverse or negligible significance have not automatically been considered to require mitigation. However, where appropriate, and taking into account views and comments received through consultation, consideration has been given to the implementation of mitigation measures designed to reduce minor adverse impacts to a negligible level.

Mitigation measures can be incorporated at various stages in the proposed development. The preferred hierarchy of mitigation is as follows:

- Prevention: At the design stage: avoid, relocate, modify the design and / or do not process with the development.
- Reduction: introduce design modification or additional structures (e.g., screens), reduce size and scale of development etc.; and,
- Compensation or remediation: compensation to provide like-for-like replacement for any lost environmental elements. When adverse impacts are unavoidable, it may also be possible to limit the duration of an impact by undertaking remedial works. For example, the impact on the landscape of mineral extraction is largely unavoidable, but the land can be progressively restored following the completion of extraction to complement or enhance the character of the landscape.

7.3 DESCRIPTION OF RECEIVING ENVIRONMENT

7.3.1 INTRODUCTION

The proposed development is located in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway, and is located approximately 4km north of Portumna and 3.1km south of Killimor. Lands within the development site boundary are in agricultural use and include a farmhouse and outbuildings which will be demolished. The proposed lands are situated at an elevation of c. 51-54m AOD and are accessed by road via the N65 (National Road) and the L8763 (local road). The N65 connects the towns of Loughrea and Portumna.

The study area for the geology and soils assessment is focused on land within the Site boundary and outward to 2km.

7.3.2 HISTORICAL LAND USE

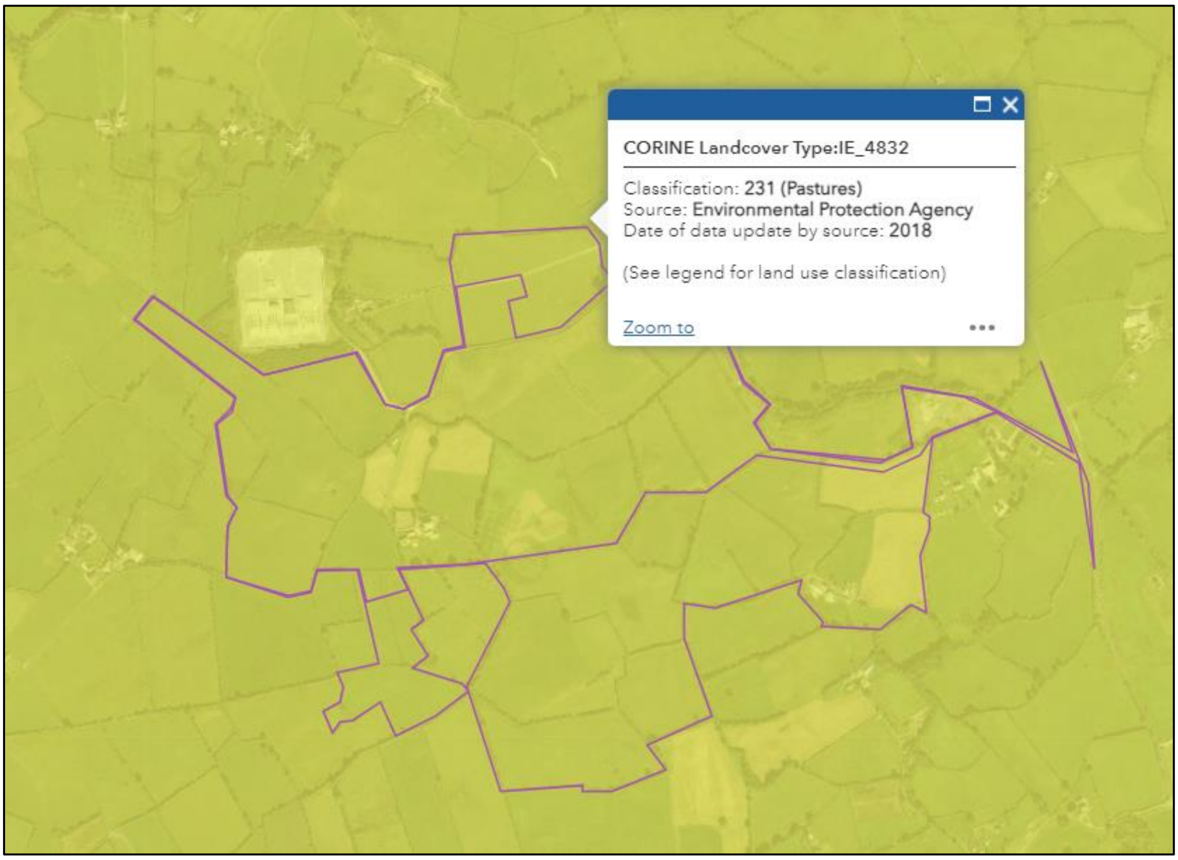
Review of historical maps[36] and aerial imagery that the site was historically used as agricultural lands containing open grassland, pockets of woodland and scrub. In more recent years (last 30 years), aerial imagery shows that the lands are being used for grazing and tillage farming.

7.3.3 DESKTOP STUDY

7.3.3.1 Soils

The current land use is described as agricultural pastures depicted by the yellow colour on Figure 7.1.

Figure 7.1 Corine Landcover Type (EPA, 2018)



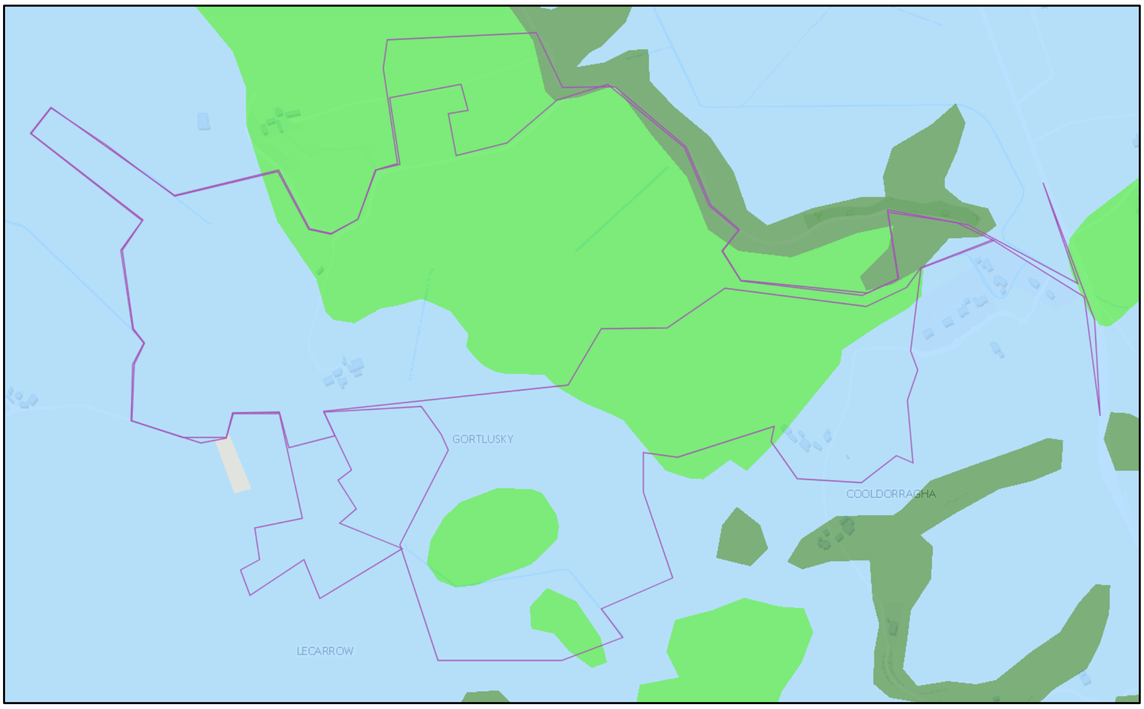
Soils comprise the unconsolidated geological deposits which overlie the subsoil (i.e. the topsoil). The main soils across the development lands as classified by Teagasc are largely deep well drained mineral soil (mainly basic). The Geological Survey of Ireland's (GSI) *"Quaternary Geology of Ireland – Sediments Map"* is a representation of the superficial geology (drift) of Ireland at a scale of 1 to 50,000. The map shows the sediments mapped

[36] 6" (dated 1829-1841) and 25" (1897-1913)

within 1 metre of the surface, which were laid down during the Quaternary period as well as bedrock at or close to the surface, water bodies and made ground.

The mapped sediments underlying the site are describe as *"Till derived from limestones"* in the western and southern areas of the site and *"Gravels derived from Limestones"* in the northern and eastern areas of the site as shown on Figure 6.3*.* A narrow esker ridge (*Eskers comprised of gravels of basic reaction*) trending north-west /south-east is shown to be present beneath the public road which defines a section of the eastern boundary of the development lands. The Killimor Esker (Code GY078), a moderate-sized ridge comprised of esker sands and gravels, deposited under the ice sheet and trends east west is located 2.6km north of the site at its nearest point.

Figure 7.2 Quaternary Sediments

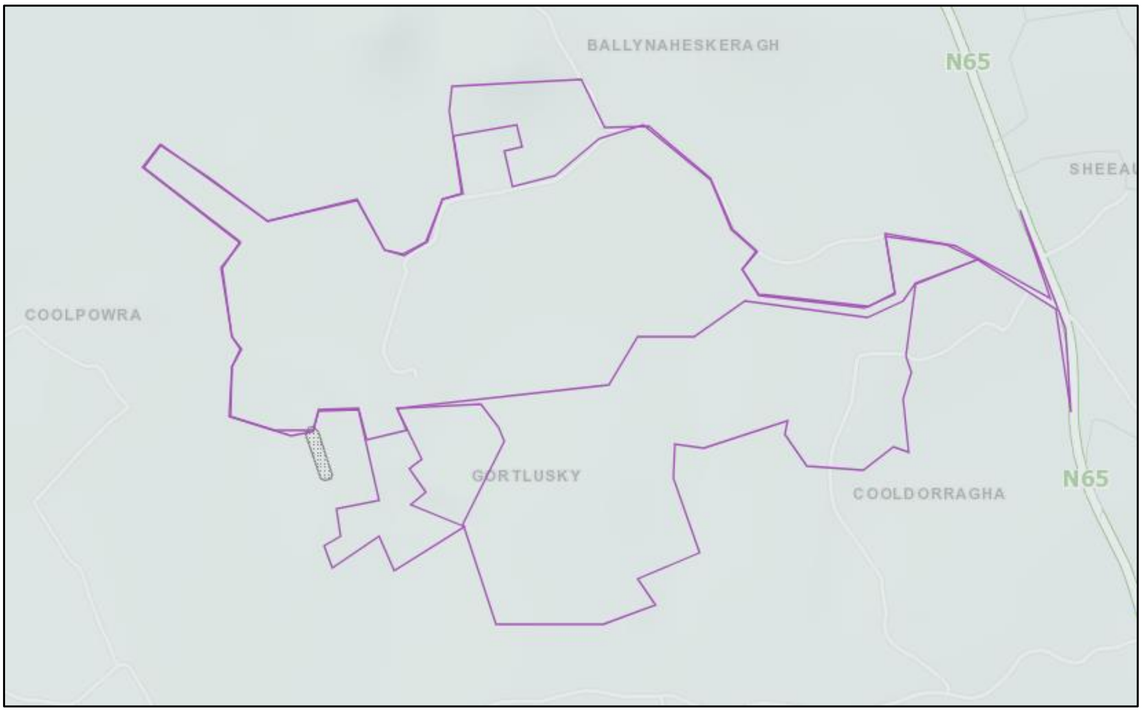


The Irish Soil Information System (ISIS) project was established in 2008, following a comprehensive inventory of Irish soil data, which had highlighted that soil data coverage of Ireland was incomplete in both detail and extent. The overall objective of the ISIS project was to conduct a programme of structured research into the national distribution of soil types and construct a soil map, at 1:250,000 scale which would identify and describe the soils according to a consistent national legend. The soil type classified at the site is Mullabane (Soil Association Code 1100q), which is described as *"mostly Brown Earths and Calcareous Brown Earths on drift with limestones, associated with Luvisols and some inclusions of Rendzinas and Peat".* Area of peat bogs are located approximately 1km east and northeast of the site.

7.3.3.2 Bedrock Geology

The bedrock geology underlying the site is mapped on the GSI 1:100,000 bedrock formations map. This data shows that the bedrock geology underlying the development lands is mapped as Dark Limestone and Shale ("calp") of Lucan Formation.

Figure 7.3 Bedrock Geology 100k (GSI)



The formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar. The formation ranges from 300m to 800m in thickness. A small area of outcropping bedrock is shown to be present beyond the boundary in the south-eastern area of the site.

7.3.3.3 Karst

Karst landscapes develop through the process of karstification, this occurs primarily in soluble rocks such as limestone and dolomite. Karstification takes place due to calcite dissolution from meteoric water. As rain descends through the atmosphere it picks up additional CO_2 causing a chemical reaction within the soluble limestone, leading to the development of numerous surface and subsurface features. There are no karst features within or near (within 2.5km) the site. The closest karst features to the site are a spring (Karst Feature Unique ID IE_GSI_Karst_40K_8186) and an Enclosed Depression (Karst Feature Unique ID IE_GSI_Karst_40K_2815) which are located approximately 3km from the southern redline boundary of the site.

7.3.3.4 Geological Heritage

The GSI in conjunction with the Geoparks network and GSNI have undertaken the programme *"Geoheritage"* dedicated to the protection and promotion of regions and features of geological importance throughout the country. The sites are identified as County Geological Sites for inclusion in County Development and Heritage Plans. According to the GSI There are no recorded sites of geological interest within or close to the development boundary.

7.3.3.5 GSI wells and Springs

There are no GSI recorded wells or springs within the study area. There are no group schemes or public supply source protection areas within 2km of the development lands.

7.3.3.6 Landslide /Ground Stability

There is no risk of landslide within the development lands (GSI classification of susceptibility is *"low"*). A small section of the public road to the east of the site which runs along the raised ridge is classed as *"moderately low"*. No development works (excavation or soil stripping) are proposed in this area.

7.3.3.7 Geotechnical Site Records

There are no Geotechnical Site Records recorded by GSI within 2km of the proposed development lands.

7.3.3.8 Radon

According to the EPA, approximately 1 in 10 homes in this area is likely to have high radon levels.

7.3.3.9 Hydrogeology, Hydrology and Groundwater

Refer to Chapter 8, Waters, for further detail.

7.3.3.10 Previous Ground Investigations /Mineral Exploration Boreholes

There is no record of previous ground investigation with the proposed development lands. A record of a mineral exploration borehole is shown within 1km (800m) north-west of the development lands (ITM Grid Coordinate 581154.73E, 709832.22N). The borehole was drilled by Priority Drilling Co Limited between 21 July and 24 August 1966 to a depth of 504.44m in the townland of Treananearla. The Irish Base Metals Drill Record shown overburden (assorted boulders and sand) overlying "Calp Limestone".

7.3.3.11 Designated Sites

There are no Special Protection Areas (SPA) or Special Area of Conservation (SAC) within the 2km study area. Capira/Derrew Bog NHA (Site Code 001240) is located 660m east of the junction of the N65 with the L8763 and 1.5km from the main development areas (project compounds) within the site.

7.3.3.12 Historic Land Use and Contamination

A review of review of historical mapping and aerial photography of the proposed development lands and surrounding study area does not indicate any historical potentially contaminative land uses.

7.3.4 FIELD WORK

7.3.4.1 Soils

As part of site assessment works a number of trial pits were excavated across the development lands on the 11 and 12 April 2024 to depths of c.2.7m below ground level (bgl) for the purposes of foul and storm drainage design. No bedrock was encountered in any of the trial pits excavated and no groundwater was observed. All trial pits indicated a well-drained subsoil profile. Shallow bedrock was suspected to be presented in the southwestern area of the site. Photographs of the trial pits are presented in Figure 7.4 to Figure 7.7.

Figure 7.4 Northwestern area of site

Figure 7.5 Centre of development site

Figure 7.6 Trial Pit 2 (Centre of development site)

Figure 7.7 Trial Pit 3 (Northeastern area of site)

7.3.4.2 Geology

A groundwater abstraction well is located within the development lands to the east of the house which is to be demolished as part of the proposed development. The well is used as a potable water supply to the existing residence and to the farm buildings and surrounding farmlands (farm animal drinking troughs). It was reported by the former owner of the property that the well was drilled to a depth of approximately 30m below ground level by Mulcairs Well Drilling in the 1960's and static water level is at 5.5mbgl. Well yield was reported as being *"good".*

7.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

This section provides an assessment of the potential environmental impacts of the proposed development on the soils and geological environment. Judgments made are based on an assessment of the magnitude of contamination sources, geotechnical hazards and mineral sterilisation as obtained from desk study, existing ground investigation and monitoring information, which form the baseline conditions and an assessment of the *source – pathway – receptor* philosophy and identified pollutant linkages.

The development lands and the area within its immediate environs (i.e. 2 km of development land boundary) have been considered in detail to assess the changes in ground conditions.

The receptors potentially at risk that could be present are indicated in Table 6.11 and their relative sensitivity is assessed to enable predicted impact to be determined.

7.4.1 RECEPTOR SENSITIVITY

The receptors considered for the risk assessment are detailed in the Table 7.5 below and considered in relation to their relative importance and receptor sensitivity; justifications for the classification are provided.

Table 7.5 Receptor Sensitivity

Receptor	Relative Importance	Receptor Sensitivity	Justification
Shallow Soils	Local Level	Low	The receptor does not make a significant contribution to local character or distinctiveness. The receptor is considered very local.
Underlying Drift Deposits (Till)	Local Level	Low	The development is expected to cause minimal change to the drift deposits in the local area, e.g., any

Receptor	Relative Importance	Receptor Sensitivity	Justification
			excavated drift depositions will remain on site and will be used as part of landscaping works (berming).
Bedrock Geology (Limestone)	County Level	Low	Based on the findings from the baseline assessment undertaken, construction of the proposed development at the site will not result in impact to the underlying limestone bedrock.

7.4.2 CONSTRUCTION PHASE

The main potential environmental effects during the construction phase have been tabulated below. As the construction activities for the three projects proposed as part of the overall development are similar, the information has been outlined within one table.

Table 7.6 Construction Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.10
	Loss of shallow soils and drift through construction onsite e.g., buildings, compounds, access roads and car park.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.10
	Earthworks have the potential to cause disturbance of contaminated soil.	No change	Negligible No mitigation measures required. The impact is considered reasonable as there are no known sources of contamination within the soils on-site.
Bedrock Geology (Low)	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.10.
	Contamination of bedrock due to foundation construction and road works	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.10.

7.4.3 OPERATIONAL PHASE

7.4.3.1 Reserve Gas-Fired Generator (Project 1)

Table 7.7 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination of underlying drift deposits and soils due to road drainage, chemicals (distillate /gas oil) stored on site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11
	Contamination of underlying drift deposits and soils due to leaks/spills of fuel (distillate /gas oil) storage tanks, oils from transformers (LV, MV and HV)	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11
Bedrock Geology (Low)	Contamination of bedrock due to road drainage, and storage of chemicals (distillate /gas oil), oils and lubricants required for maintenance activities.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11.
	Contamination of bedrock due to leaks/spills of fuel (distillate /gas oil) storage tanks, oils from transformers (LV, MV and HV)	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11

7.4.3.2 ESS Facility (Project 2)

Table 7.8 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination of underlying drift deposits and soils due to road drainage, chemicals stored on the for-maintenance activities s e.g., paints, lubricants, oils.	Slight	Minor (without mitigation) Mitigation is proposed in Table 7.11
	Contamination of underlying drift deposits and soils due to leaks/spills of oils from transformers	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11
Bedrock Geology (Low)	Contamination of bedrock due to road drainage, chemicals stored on site and used during site operations e.g., paints, lubricants, oils.	Slight	Minor (without mitigation)

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
			Mitigation is proposed in Table 7.11.
	Contamination of bedrock due to leaks/spills of oils from transformers.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11

7.4.3.3 GIS Substation (Project 3)

Table 7.9 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination of underlying drift deposits and soils due to road drainage and small volumes of maintenance chemicals (oils, solvents, detergents and lubricants)	Slight	Minor (without mitigation) Mitigation is proposed in Table 7.11
Bedrock Geology (Low)	Contamination of underlying drift deposits and soils due to road drainage and small volumes of maintenance chemicals (oils, solvents, detergents and lubricants)	Slight	Minor (without mitigation) Mitigation is proposed in Table 7.11.
	Contamination of bedrock due to leaks/spills of oils from transformers (LV, MV and HV)	Slight	Minor (without mitigation) Mitigation is proposed in Table 7.11

7.5 MITIGATION MEASURES

7.5.1 CONSTRUCTION PHASE

Due to similar potential environmental effects being common to the three projects, mitigation is presented in single table for the proposed development for each of the construction and operational phases of projects.

Table 7.10 Mitigation of Potential Environmental Effects

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, solvents, detergents lubricants, adhesives, oils etc.	Moderate	Soils and bedrock geology	Construction	• Construction compounds will be located at least 30m from local the stream on site;. • Dedicated area of hard standing for material deliveries separated a minimum of 10m from adjacent watercourses; • Concrete will be mixed off–site and imported to the site. • Dedicated area of hard standing for vehicle wash-out; • Specific areas for oil storage and refuelling, separated a minimum of 10m from adjacent watercourses and comply with legislation, including providing bunds which contain 110% of on-site fuel storage capacity; • Use spill kits, fill point drip trays, bunded pallets and secondary containment units; • Enclosed and secured site and fuel storage areas will be secondarily secured; • Appointed contractor to development Construction Environmental Management Plan (CEMP); • Develop a site-specific Incident Response Plan; • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area; • Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the project site, and the proper use, storage and disposal of many substances used on construction sites, such as lubricants, fuels and oils and their containers can prevent soil contamination.	Negligible
Loss of shallow soils and drift through construction onsite e.g., buildings, compounds, access roads and car park.	Moderate	Soils and Drift	Construction	• All excavated material will be retained on site as used for landscaping berming. Thereby the original material will be available as part of decommissioning works.	Negligible

7.5.2 OPERATIONAL STAGE

The main potential environmental effects during the operational phase of the three projects have been tabulated below.

Table 7.11 Mitigation of Potential Environmental Effect

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination of receptor due to road drainage, chemicals stored on site and used throughout the site operations e.g., paints, lubricants, oils. - (Project 1) Contamination of receptor due to leaks/spills of fuel / gasoil (secondary fuel) storage tanks, oils from transformers (LV, MV and HV) - (Project 1) Contamination of receptor due to leaks/spills of oils from transformers (Project 2) Contamination of receptor from road drainage and use of maintenance chemicals (oils, solvents, detergents, lubricants, oils from transformers (LV, MV and HV)	Moderate (For Project 1 and Project 2) Minor (For Project 3)	Soils and Bedrock	Operational	• All roads are designed to drain to the filter drains running parallel with the proposed access road and shown on the drainage drawings. This system shall allow runoff to filter down through the stone media providing filtering and delay and storage action. This stone shall be wrapped in a permeable membrane allowing runoff to infiltrate into the surrounding soils thus providing reduction action. • Dedicated indoor chemical storage areas within the three projects are provided for the storage of chemicals. The secondary fuel and other oils will be stored in bunds • Specific areas for oil storage and re-fuelling, are provided and are separated from local drainage. Secondary containment (bunding) is designed to comply with best practice – the greater of (a)110% of the largest tank or drum within the bund or (b) 25% of the total volume of substance within the bund. • Bunds floor fall to internal sump areas which will allow bunds to be emptied via pump only (following manual inspection).	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				• Bund sumps will have impermeable surfaces Pumps will either be permanently fitted in sumps / bunds (submersible) or dry mounted at bund wall height with suction lift (self-priming). Mobile pumps will also be used for smaller bunded structures as and when required. • Site drainage network are designed in consideration of SuDS principles. Stormwater moving through 'dirty' site areas (e.g., parking, deliveries) to pass through oil interceptor prior to being infiltrated. • Spill kits, fill point drip trays, bunded pallets and secondary containment units provided will be provided across all projects. • Enclosed and secured site and fuel storage areas will be secondarily secured. • A site-specific Incident Response Plan will be put in place for each project • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area. • The drainage system is designed to ensure separation and isolation of 'contaminated' surface water with 'uncontaminated' surface water. In order to ensure that uncontaminated surface drains are not mixing with possibly contaminated surface drains, risk areas will discharge into a separate system. Small areas that have the potential for causing	

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				contamination of surface drain water are separated from the overall surface water drainage; • Interceptors containing oil contaminated rainwater will be contained before being exported off-site for suitable disposal; • The application for EPA licensing associated with Project 1 will be progressed and put in place in advance of operation. • Appropriate surfacing and containment or drainage facilities for all operational area is designed taking into consideration collection capacities, surface thicknesses, strength/reinforcement; falls, materials of construction, permeability, resistance to chemical attack, and inspection and maintenance procedures	

7.5.3 DECOMMISSIONING

Prior to decommissioning, a site closure and decommissioning plan will be completed to ensure the identification and mitigation of any further effects present at that time. Successful clean closure will be demonstrated by completion of an independent closure audit.

7.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

The proposed development will not have any significant residual effects on soils and geology post implementation of mitigation. The site development will result in the creation of low permeability and impermeable surfaces (particularly in the Reserve Gas Fired Generator Project), limiting the potential for contamination of the subsurface.

7.7 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

Within the European Commission - Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, dated May 1999, cumulative effects are described as *"impacts that result from incremental changes caused by other development, plans or projects together with the proposed development or developments"*. The cumulative impacts of the proposed development in conjunction with current and future developments in the vicinity of the subject site are considered in this report. The cumulative impacts of the Project 1, 2 and 3 have been considered within this assessment with various overlapping activities considered in the assessment. Connection of the Reserve Gas Fired Generator (Project 1) to the natural gas pipeline will be managed and undertaken by Gas Networks Ireland (GNI). The nature of that work is such that the works in the immediate vicinity of the site would be temporary and very short term and the additional construction phase impacts are assessed as short-term and imperceptible in the overall site context.

7.8 MONITORING AND FURTHER WORKS

Whilst the development proposals have the potential to cause detriment to receptors identified, the recommended mitigation measures will ensure that the risk of potential effects are reduced to negligible. Give the receptor sensitivities are classed as low at and in the vicinity of the development lands, no future monitoring is recommended during the construction programmes. The Reserve Gas Fired Generator will require an Industrial Emissions Licence. If successfully obtained, the licence will prescribe specific conditions including monitoring requirements designed to monitor and protect the existing quality of soils and geology. The licence will also require preparation of a baseline site report (to establish existing condition, which will inform the decommissioning plan (closure plan) and satisfy environmental liability and risk assessment (ELRA) legislative requirements.

8 WATER ENVIRONMENT

8.1 INTRODUCTION

This chapter of the EIAR identifies and assesses the potential effects associated with the proposed development on the Water Environment.

For the purpose of the Environmental Impact Assessment (EIA) the following is defined:

- The term *"Hydrology"* refers to surface waters;
- The term *"Hydrogeology"* refers to groundwater.

The assessment of potential effects on Waters involved the following:

- Review of development proposals.
- Review of site-specific reports.
- Consultation with relevant statutory authorities /databases to help establish baseline conditions and identify any significant concerns in the area.
- Consideration of potential interactions and identification of possible impacts.
- Assessment of impacts, within the context of the receiving environment including cumulative effects.
- Identification of measures and solutions to avoid, minimise and mitigate potential impacts; and,
- Assessment of residual impacts, taking account of mitigation measures.

The assessment of impacts on the Water Environment considers changes in water quality, hydrology, hydrogeology, hydromorphology, flood risk and water resources, as well as how these changes could impact on water dependent ecosystems, such as and on the Water Framework Directive (WFD) status of the identified waterbodies.

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU, was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 3002). It applies to rivers, lakes, groundwater, and transitional coastal waters and provides for the protection of the quality status of all waters.

The Directive requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the Directive is not compromised.

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. RBMPs include identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland the first RBMP covered the period from 2010 to 2015 with the second cycle plan covering the period from 2018 to 2021. The third cycle covers the period 2022-2027. The River Basin Management Plan objectives, which have been integrated into the design of the proposed development, include;

- Ensure full compliance with relevant EU legislation,
- Prevent deterioration and maintain a 'high' status where it already exists,
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027,
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (a) targeting water bodies close to meeting their objectives, and (b) addressing more complex issues that will build knowledge for the third cycle.

Our understanding of these objectives is that water bodies, regardless of whether they have *'Poor'* or *'High'* status, should be treated the same in terms of the level of protection and mitigation measures employed.

A Stage 3 Flood Risk Assessment (FRA) is provided in Appendix 8.2 (refer to EIAR Volume III) which assesses flood risk for the Site. The FRA considers the proposed development including rerouting of part of an existing stream (Treananearla) which traverses the site (decommissioning of 370m of existing channel and creation of 170m of new channel) and new crossings of the stream with internal roads with the development lands.

8.1.1 DESCRIPTION OF THE PROPOSED DEVELOPMENT

It is proposed to develop a Reserve Gas-Fired Generator (Project 1), a grid-connected Energy Storage System (ESS) facility (Project 2) and a Gas Insulated Switchgear (GIS) Electricity Substation (Project 3) in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway. The development is considered of significant economic importance at both state and regional levels due to its strategic positioning on the 400kV transmission network. The proposed GIS substation (Project 3) will upgrade and enhance the existing AIS intermediate substation on the 400kV line at the Oldstreet node and will facilitate and provide for connection of the Reserve Gas-Fired Generator and Energy Storage System projects to the 400kV electricity network.

8.1.1.1 Project 1: Reserve Gas Fired Generator

The Reserve Gas Fired Generator comprises three open cycle gas-fired generator (OCGT) units positioned within a building (OCGT Hall) along with auxiliary equipment. An OCGT unit consists of a turbine connected to an electric power generator and the three turbines are designed to operate independently of each other. The OCGT units will receive natural gas from the gas network via an underground pipeline to an Above Ground Installation (AGI) compound within the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI.

The proposed OCGT units are dual fuel units as required by system requirements required by the Grid Code published by Eirgrid. Natural gas will be the primary and combustion fuel to each of the OCGT units when operating. Secondary fuel (gas oil) will be stored in a bunded structure outside the OCGT building along with ancillary items of electrical plant and machinery such as coolers and transformers.

The Reserve Gas-Fired Generator is designed to operate intermittently and provide generation capacity during periods of high demand or when renewable energy generators cannot meet system demand.

8.1.1.2 Project 2: Energy Storage System (ESS)

The Energy Storage System (ESS) facility comprises (a) a Long Duration Energy Storage (LDES) static battery positioned within a secure outdoor compound, and (b) a Synchronous Condenser which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid.

Battery storage is a technology that enables power system operators and utilities to store energy for later use. A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed. A BESS facility is made up of batteries, a battery management system, a power conditioning system, and an energy management system. Sufficient separation distance between enclosures is included within the design to allow for safe access and replacement of modules. Each module will include control equipment, to provide for ventilation, air conditioning and fire suppression equipment. MVPS (or PCS) units and small transformers will also be positioned in self-contained weather-proof enclosures. At a system level, UL9540A[37] is the recognised test method for evaluating thermal runaway in battery storage systems that reduces the risk of a single cell event spreading to the rest of the system. This is a global standard that technology suppliers test their products under to demonstrate compliance. The proposed development will comply with the UL9540A standard industry and other recognised best practice and in terms of fire management.

The plant will absorb and inject energy as demanded by the power system. BESS plants are designed to economically and rapidly provide arbitrage and system support services when needed, allowing immediate system recovery.

Synchronous condenser technology has been around since the mid 1900's and is demonstrated and mature technology having been formerly used by utilities worldwide. The rotating generator is connected to the transmission system via a step-up transformer. The synchronous condenser is started up and stopped by a frequency controlled electric motor (pony motor). An inverter (static start device / startup frequency converter) is used to drive the generator to reach the operating speed and synchronises it with the system frequency. Once synchronised it acts as a motor providing reactive and short circuit power to the electricity network. There is no combustion or emissions from a synchronous condenser. The synchronous condenser will provide short-circuit power, inertia, and reactive power for dynamic loads and stabilise the network through voltage recovery during faults. The project is designed to complement and support the reserve gas fired generator by providing zero carbon, instantaneous and balancing power to the grid.

8.1.1.3 Project 3: Gas Insulated Switchgear (GIS) Electricity Substation

The Gas Insulated Switchgear (GIS) Electricity Substation comprises a two-storey building positioned and secured within a palisade fenced compound. This component of the overall development will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of Project 1 and Project 2 to the electricity transmission network. The HV lines and electric plant associated with Reserve Gas Fired Generator and ESS facility, and which will connect the projects to the GIS substation, are included with the planning application for Project 3.

A full description of the proposed development is provided in Chapter 2 of this EIAR.

8.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

This assessment has been undertaken in line with the *Source – Pathway – Receptor* Model as per the documents *"Guidelines on the Information to be contained in Environmental*

[37] https://www.ul.com/services/ul-9540a-test-method

Impact Assessment Impact Assessment Reports" 2022 and *"Advice Notes for Preparing Environmental Impact Statements",* 2003.

At the impact assessment stage, any potentially beneficial or adverse impacts associated with the development are identified and assessed with reference to the baseline environment. This requires consideration of:

- Sensitivity/value of the receptor,
- Magnitude of the impact,
- Impact duration,
- Whether impact occurs in isolation, is cumulative or is interactive, and
- Performance against environmental quality standards or other relevant thresholds.

8.2.1 ASSESSMENT CRITERIA AND IMPACT ASSESSMENT METHODOLOGY

This assessment considers the potential source of risk to environmental receptors and the pathways by which the receptors may be affected. Definitions of the key descriptors are detailed below:

- Source: potential contaminant sources,
- Pathway: the mechanism by which the source may affect a receptor, and
- Receptor: identified features that may be affected, based on the sensitivity of the site.

The strength of the pathway between a source and a receptor is a function of the distance between the two and the nature of the migration pathway. For example, on sites underlain by impermeable clays, the migration pathway via groundwater would be weak even over short distances, whereas within sands or gravels, the migration pathway would be strong for receptors in proximity to a source and weak for receptors at some distance from the source.

The significance of predicted impacts likely to occur during all phases of the proposed development was determined by considering the value and sensitivity of the key attributes that may be affected and the magnitude of the predicted impact.

The value or sensitivity of a receptor is largely determined by its quality, rarity and scale. The determination of value or sensitivity takes into account the scale at which the attribute is important. For the purpose of assessing the significance of environmental impacts predicted as part of this assessment, the value of receptors is scaled based on the relative importance of the receptor defined as follows:

- LOCAL LEVEL: On the development lands or immediately adjacent to it.
- DISTRICT LEVEL: Beyond the development land boundary but within the district.
- COUNTY LEVEL: County Level e.g., Galway
- REGIONAL LEVEL: Northern and Western Region
- NATIONAL LEVEL: Ireland.
- INTERNATIONAL LEVEL: European Community.

A receptors value and sensitivity must be defined using available guidance and professional knowledge and taking into account the site sensitivities. In some cases, the inherent value of the receptor has been recognised and been afforded a statutory designation (e.g., Special Areas of Conservation (SAC's)), which makes the value assignment more straightforward. The judgement of receptor significance is made on a case-by-case basis for each receptor or resource identified as having the potential to be subject to impacts associated with the proposed development.

Irrespective of its recognised value, all receptors/features would exhibit a degree of sensitivity to the changes imposed by new development. The 'sensitivity' element of the criterion ensures that this characteristic of each receptor is assessed. The classification for determining sensitivity of receptors is detailed in Table 8.1. This classification is used as a generic methodology and professional judgement has been applied in each case.

Table 8.1 Receptor Sensitivity and Typical Descriptors

Sensitivity	Descriptors
Very Low	Feature / receptor is generally insensitive to impact, no discernible changes e.g., soils are not in use, the land is used for industrial/commercial purposes and /or mainly covered by hard standing.
Low	Feature / receptor has some tolerance to accommodate the proposed change. It responds in a minimal way such that only minor changes are detectable e.g., landscaped areas.
Medium	Feature / receptor has a low capacity to accommodate the proposed form of change. It clearly responds to effects in a quantifiable manner e.g., low grade agricultural land and recreational ground.
High	Feature / receptor has a very low capacity to accommodate the proposed form of change. The response is a major change e.g., agricultural land use for food production, allotments.

8.2.1.1 Magnitude of Impacts

Magnitude refers to the *'scale'* or *'amount'* of an impact. Key impacts have been identified and the likely magnitude of each potential impact has been determined through the predicted change from the baseline conditions throughout the various phases of development. The magnitude of an impact is a measure of aspects such as the impacts:

- Extent (i.e., the geographical area over which the impact occurs),
- Duration (i.e., the time for which the impact is expected to last prior to recovery or replacement of the resource or feature: short, medium or long term),
- Likelihood (i.e., the probability that the impact will occur),
- Direct or Indirect (i.e., difficult to avoid), and,
- Reversibility (i.e., an irreversible (permanent) impact is one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it: Temporary or Permanent).

In order to help define the level of impact magnitude the following guidance (see Table 8.2) has been adopted for the purpose of providing a transparent assessment. The professional judgement of the technical author is used in the decision-making process when characterising impacts in accordance with the criteria set out in Table 8.2.

Table 8.2 Assessment Criteria for Magnitude

Magnitude	Assessment Criteria
No Change	• No loss or alteration of characteristics, features or elements. • No observable impact on receptors/features.
Negligible	• Noticeable, temporary (for part of the development duration) change; or • Barely discernible change for any length of time, over a small area, to any key characteristics or features. • Impact unlikely or rarely to occur. • Results in effects on attribute of insufficient magnitude to affect the use/integrity.
Slight	• Noticeable, temporary (during the project duration) change, over a partial area, to key characteristics or features. Impact will possibly occur. • Impact predicted to extend over a small area. • Impact predicted to affect small numbers of people. • Impact predicted to affect a small number of other receptors (ecological, businesses, facilities). • Impact not predicted to have trans-boundary effects, but possibility remains. • Slight but discernible change in environmental conditions predicted. • Impact not predicted to entail unusual/complex effects for receptors. • Impact not predicted to affect particularly scarce features/resources. • Impact not predicted to result in breaches of legislation or statutory Environmental Quality Standard or Objectives. • Impact not predicted to result in loss of attribute.

Magnitude	Assessment Criteria
	• Impact will continue for a short period of time only. • Impact will be temporary. • Impact will be intermittent and/or rare. • Impact will be reversible. • Impact will be possible to avoid, reduce, repair, or compensate for; or • Slight positive change in environmental conditions resulting in minor improvements in quality or value of a receptor.
Moderate	• Significant, permanent / irreversible changes, over the majority of the development area and potentially beyond, to key characteristics or features. Impact certain or likely to occur. • Impact predicted to extend over a moderate area. • Impact predicted to affect moderate numbers of people. • Impact predicted to affect some other receptors (ecological, businesses, facilities). • Impact unlikely to have trans-boundary effects, but possibility remains. • Moderate change in environmental conditions predicted. • Impact unlikely to entail unusual/complex effects for receptors but possibility remains. • Impact unlikely to affect particularly scarce features/resources but possibility remains. • Impact entails a low probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur; • Impact unlikely to result in loss of attribute but possibility remains. • Impact will continue for a moderate period of time. • Impact will be semi-permanent. • Impact will be intermittent. • Impact will be possible to avoid, reduce, repair, or compensate for; or • Notable positive change in environmental conditions resulting in measurable improvements in quality or value of a receptor.
Substantial	• Very significant, permanent / irreversible changes, over the whole development area and beyond (i.e. off-site), to key characteristics or features of character or distinctiveness. Impact certain or likely to occur. • Impact predicted to extend over a large or very large area. • Impact predicted to affect considerable numbers of people. • Impact predicted to affect considerable numbers of other receptors (ecological, businesses, facilities). • Impact predicted to have trans-boundary effects. • Significant change in environmental conditions predicted. • Impact will entail unusual/complex effects for receptors. • Impact will affect particularly scarce features/resources.

Magnitude	Assessment Criteria
	• Impact entails a high probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur. • Impact will result in total loss of attribute. • Impact will continue for extended periods of time. • Impact will be permanent rather than temporary. • Impact will be continuous rather than intermittent, or where intermittent, frequent rather than rare. • Impact will be irreversible. • Impact will be very difficult to avoid, reduce, repair, or compensate for; or • Significant positive change in environmental conditions resulting in major improvements in quality or value of a receptor.

8.2.1.2 Impact Significance

An assessment of significance is necessary in order to identify the main environmental effects of the proposed development and assist in determining what weight these effects should be given. Definitive guidance in the preparation of EIA in the soils and geological environment exists in *'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements',* issued by the Institute of Geologists of Ireland. From the guidance, a significant effect is defined as *"an impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment".*

It is widely recognised that *'significance'* reflects the relationship between the magnitude of an impact and the sensitivity (or value) of the affected environmental receptor.

To assist in the assessment process, the Impact Significance Matrix (ISM) (Table 8.3) provides a transparent methodology to ensure consistency and ease of interpretation of the judgement of impact significance.

An initial indication of impact significance (adverse or beneficial) is gained by combining magnitude and sensitivity / value in accordance with the ISM provided. It should be noted that although the ISM provides a good framework for the consistent assessment of impacts across all environmental parameters, there is still an important role for professional judgement and further objective assessment to play in moderating an impact's significance. Given that the criteria represent levels on a continuum or continuous gradation, professional judgement and awareness of the relative balance of importance between magnitude and sensitivity / value is required.

Features to which legal designations apply have automatically been determined to be of high value (or of a higher value than non-designated features), and any impact tends to be of a greater significance than an impact of features to which no designation applies. Hence, for designated features, the use of the value criteria leads to an initial presumption that impacts will be of a high significance. Information on sensitivity can then be used to modify or maintain this initial assessment.

Table 8.3 Impact Significance Assessment

Magnitude[1]	Value/sensitivity of receptor[2]			
	Very Low	Low	Medium	High
No Change	Negligible	Negligible	Negligible	Minor
Negligible	Negligible	Minor	Minor	Moderate
Slight	Minor	Minor	Moderate	Major
Moderate	Minor	Moderate	Major	Major
Substantial	Moderate	Major	Major	Major

Note 1 Refer to Table 8.2
Note 2 Refer to Table 8.1

Given the use of professional judgement in the assessment process, there may be some variation between subject areas (i.e., different environmental parameters) in the significance rating process. This may be as a result of limited information on the sensitivity of features and / or the complexity of interactions that require assessment in determining the magnitude of change. However, the ratings derived through the impact assessment process, as set out in Table 8.3 can also be described in a generic fashion as given in Table 8.4. The following definitions are proposed in relation to the significance of environmental impacts predicted throughout this EIAR.

Table 8.4 Impact Significance Definitions

Level of Significance	Description
Negligible	No discernible effect. An impact that is likely to have imperceptible or insignificant impact.
Minor	Slight, very short or highly localised impact of no significant consequence. These effects may be raised as local issues but on their own are unlikely to be of importance in the decision-making process. When combined with other effects these could have a more material influence.
Moderate	Intermediate limited (extent / duration / magnitude) impact that may be considered as significant. These effects are likely to be important considerations at a local level. These could have influence on decision making especially when combined with other similar effects.
Major	Very large or considerable impact (extent/duration/magnitude).

	Effects, both adverse and beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation. In isolation, these could have a material influence on the decision-making process.

8.2.1.3 Impact Mitigation Measures

Following the implementation of mitigation measures the identified impacts may be reduced to environmentally acceptable levels (or not). It is best practice to consider mitigation measures for all impacts that are of a minor negative significance (i.e., slight, very short or highly localised impact of no significant consequence) or higher and this has been adopted for the purpose of this assessment.

The purpose of mitigation is to reduce the significance of the residual impact (see below) to a minor adverse or negligible level, which is a level that is expected to be acceptable by local authority, environmental regulators, and the public. Individual impacts assessed as being of minor adverse or negligible significance have not automatically been considered to require mitigation. However, where appropriate, and taking into account views and comments received through consultation, consideration has been given to the implementation of mitigation measures designed to reduce minor adverse impacts to a negligible level.

- Mitigation measures can be incorporated at various stages in the proposed development. The preferred hierarchy of mitigation is as follows:
- Prevention: At the design stage: avoid, relocate, modify the design and / or do not process with the development.
- Reduction: introduce design modification or additional structures (e.g., screens), reduce size and scale of development etc.; and,
- Compensation or remediation: compensation to provide like-for-like replacement for any lost environmental elements. When adverse impacts are unavoidable, it may also be possible to limit the duration of an impact by undertaking remedial works. For example, the impact on the landscape of mineral extraction is largely unavoidable, but the land can be progressively restored following the completion of extraction to complement or enhance the character of the landscape.

8.3 DESCRIPTION OF RECEIVING ENVIRONMENT

8.3.1 INTRODUCTION

The proposed development is located in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway, and is located approximately 4km north of Portumna and 3.1km south of Killimor. Lands within the development site boundary are in agricultural use and include a farmhouse and outbuildings. The proposed lands are situated at an elevation of c. 51-54m AOD and are accessed by road via the N65 (National Road which connects the towns of Loughrea and Portumna) and the L8763 (local road). The study area for the Waters assessment is focused on surface water and groundwater bodies within the development boundary and outward to 2km. Downstream waterbodies and protected waterbodies within 5km have also been considered. The study area for the FRA is separately detailed (see Appendix 8.1).

8.3.2 SOILS AND GEOLOGY

A summary of the soils and geology environment is provided below. Further details are presented in Chapter 7 of this EIAR.

8.3.2.1 Historical Land Use

Review of historical maps[38] and aerial imagery that the site was historically used as agricultural lands containing open grassland, pockets of woodland and scrub. In more recent years (last 30 years), aerial imagery shows lands as arable and grazing pastures.

8.3.2.2 Geology

Bedrock formation beneath the site is Lucan Formation (Dark limestone & shale (calp)) comprising dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey.

8.3.2.3 Soils

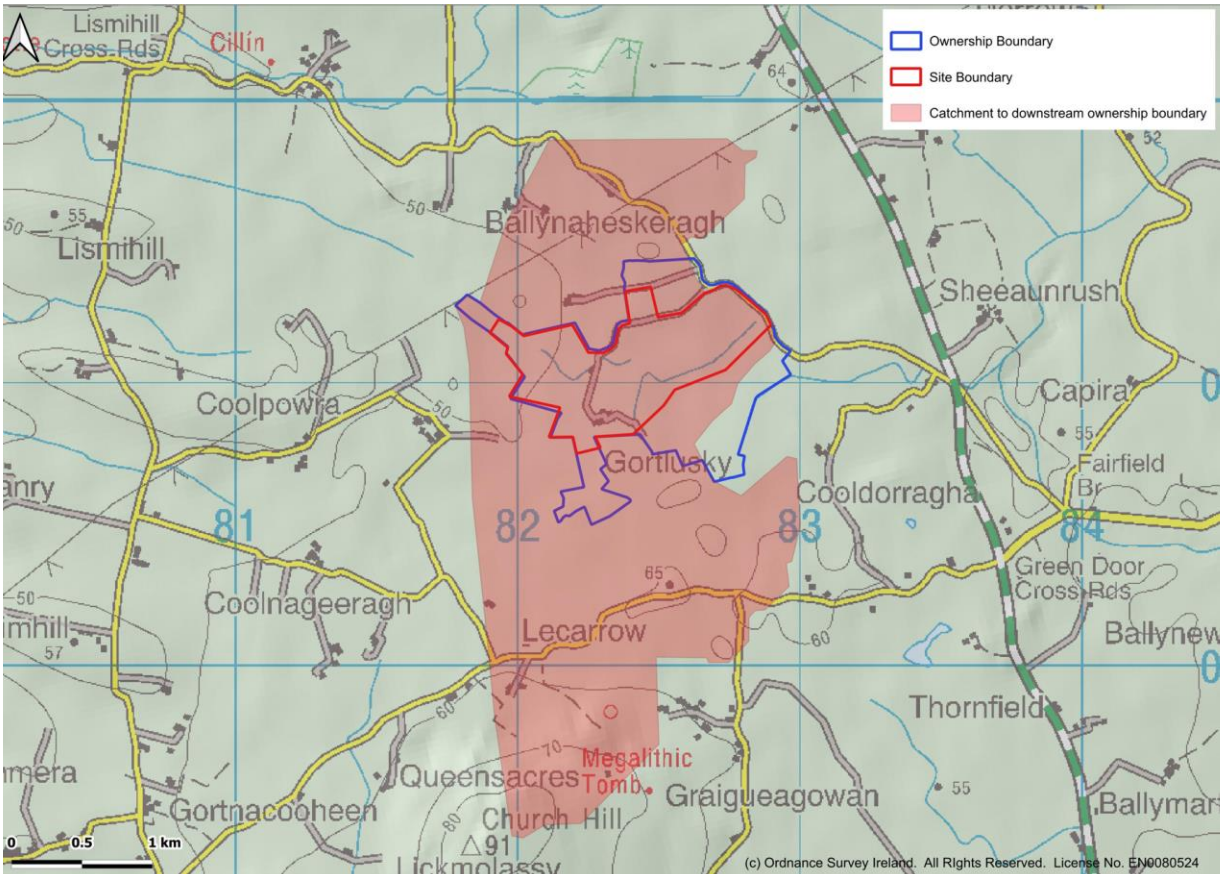
Soils on the site are described as Mullabane (Teagasc Code 1100q) and described as mostly Brown Earths and Calcareous Brown Earths on drift with limestones, associated with Luvisols and some inclusions of Rendzinas and peat. The soils are classed as well drained (Type BminSW).

[38] 6” (dated 1829-1841) and 25” (1897-1913)

8.3.3 HYDROLOGY

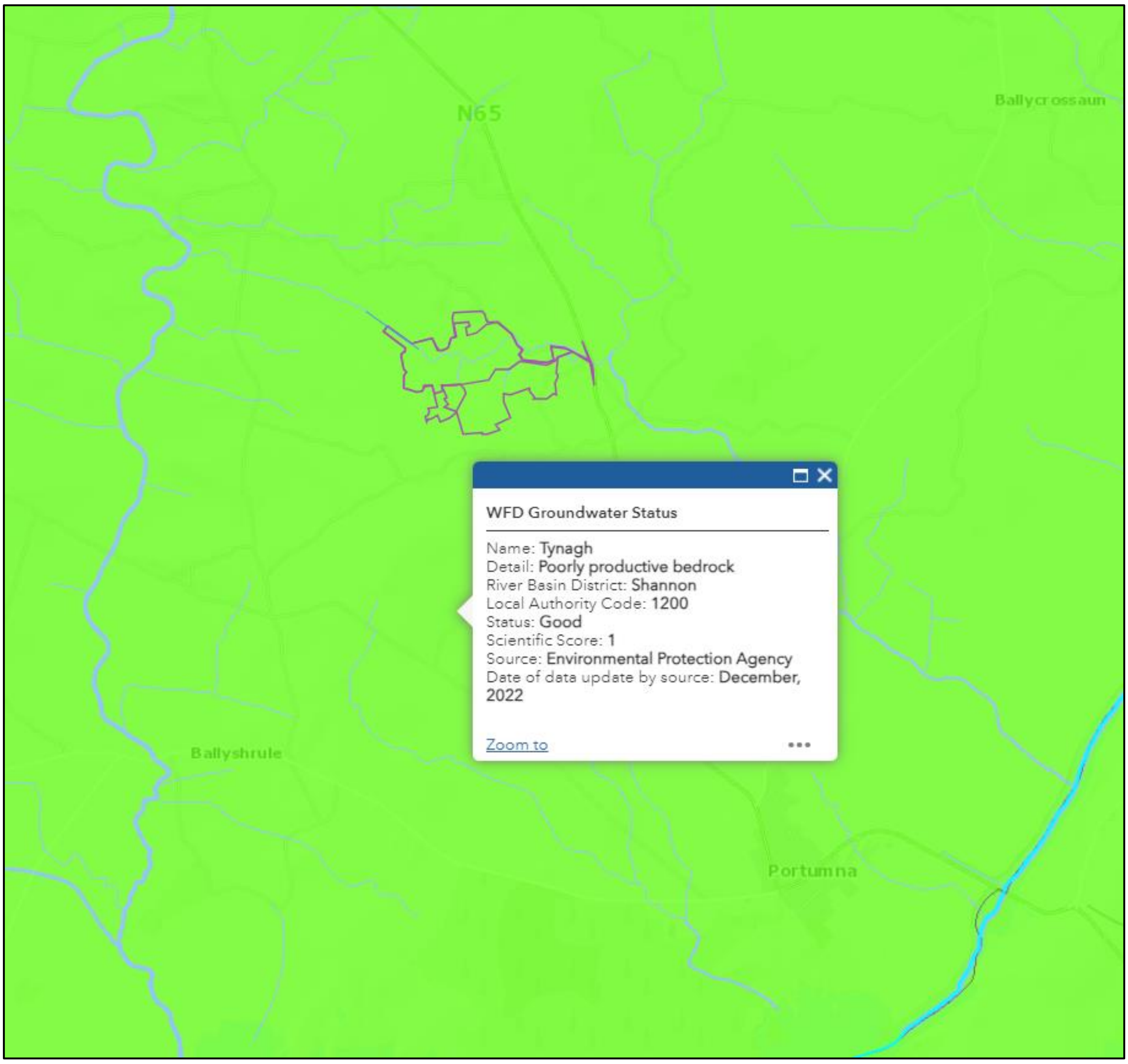
The two dominant sub-catchments in the area are the Gortaha (Catchment 025B), which drains to the east, and the Kilcrow (Catchment 025C), which drains to the west. These rivers are both part of the Lower Shannon Hydrometric Area. Following ground truthing it was established that the vast majority (main area of development works) of the proposal are contained in the Kilcrow_070 WFD subbasin (IE_SH_25K010700) of the Lower Shannon surface water catchment (Catchment ID 25C). There are several field boundary drains present within the site that contribute to the runoff at its downstream end. The largest of these drains extends 950m south, outfalling to the central stream just east of the on-site dwelling. This drainage channel has a sub-catchment of 0.675 km^2. There are two culverts present on this tributary, with pipe diameters of 650 mm and 500 mm. The 500mm culvert lies immediately upstream of the confluence of the tributary and the main channel whilst the 650mm culvert acts as a field crossing further upstream. There is a 1m drop from the invert of the tributary channel to the invert of the main channel, resulting in a high velocity cascading flow regime at the confluence. The combined flows then continue westward. There are no other drainage channels that contribute significant flow to the central channel within the site.

Figure 8.1 Catchment Map



The catchment (see Figure 8.1) falls within the Tynagh groundwater body (European Code IE_SH_G_236). According to the EPA, the GWB is classed as *"not a risk"* and of *"Good"* status (EPA 2022), see **Error! Reference source not found.**.

Figure 8.2 Tynagh WFD Groundwater Status



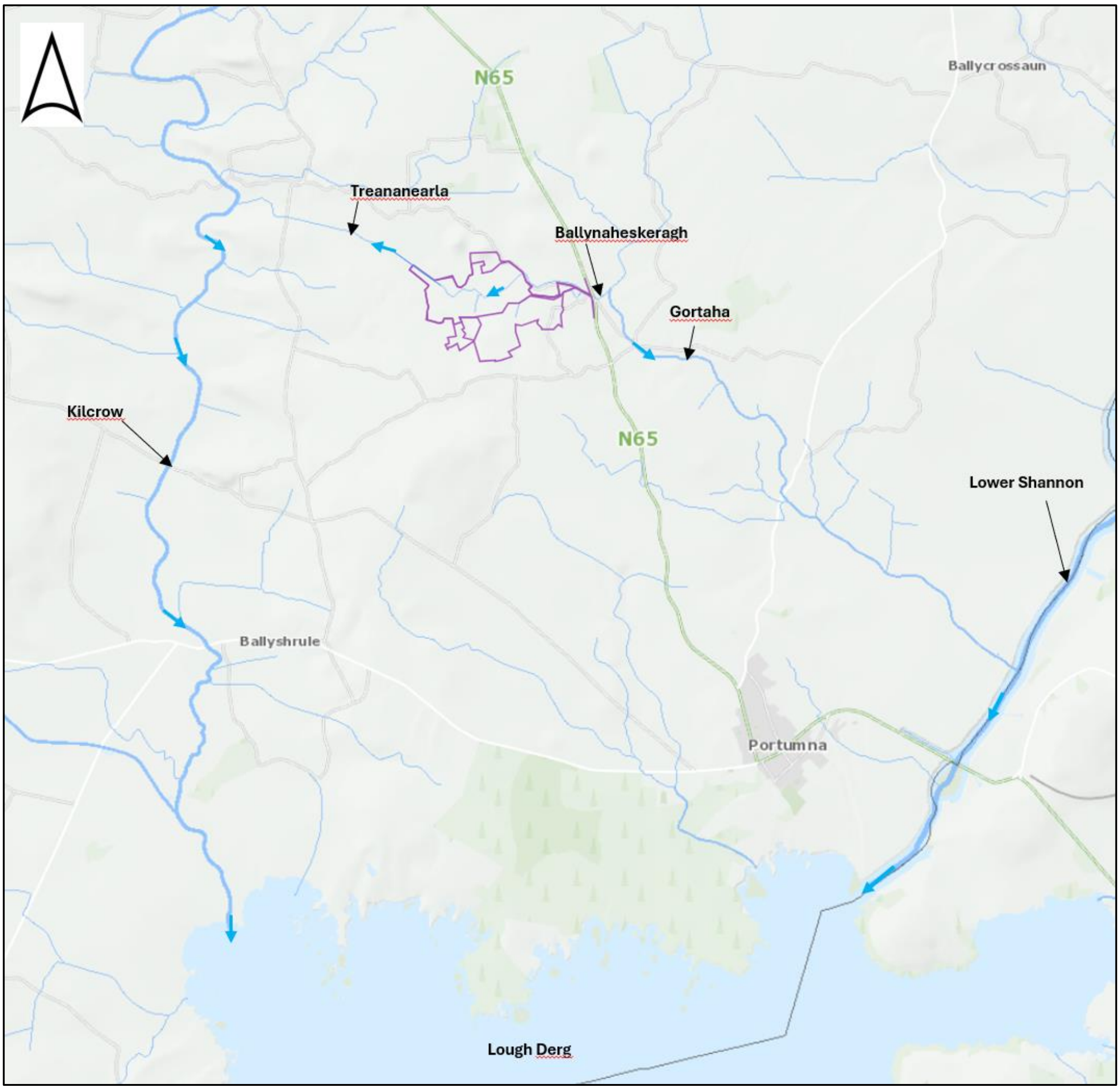
Surface water features within the study area are shown in Figure 8.3.. The main watercourse within the developments is the Treananearla stream which flows west and northwest through the development lands[39] before discharging to the Kilcrow River (1.9km to the west). There are two culverts in place along the central channel of the Treananearla stream within the site boundary. These provide road crossings for access to farmland and a dwelling (proposed to be demolished as part of works). Both culverts have a diameter of 950mm. The Kilcrow_070 River is classed as *"at risk"* and of *"moderate"* status (2016-2021). The EPA have operational river monitoring stations upstream (Moat Bridge) and

[39] The EPA map viewer (https://gis.epa.ie/EPAMaps/Water) incorrectly shows the watercourse as the Gortaha_010 and to be flowing east and southeast.

downstream of the confluence (Kilcrow-Newbridge and Ballyshrule Bridge). The Kilcrow River then flows south for approximately 11km and enters Lough Derg close to Stoneyisland. Benefitting land maps show that The Treananearla stream flowing through the site is maintained as part of the Killimor/Cappagh arterial drainage scheme.

The Sheeaunrush stream flows east beyond the main development areas with the proposed development land before its confluence with the Ballynaheskeragh stream on the northern side of the L8463. The waterbody then flows into the Gortaha River and southeast for 6.1km before merging with the Lower Shannon, 1km north of Portumna Bridge.

Figure 8.3 Local Hydrology



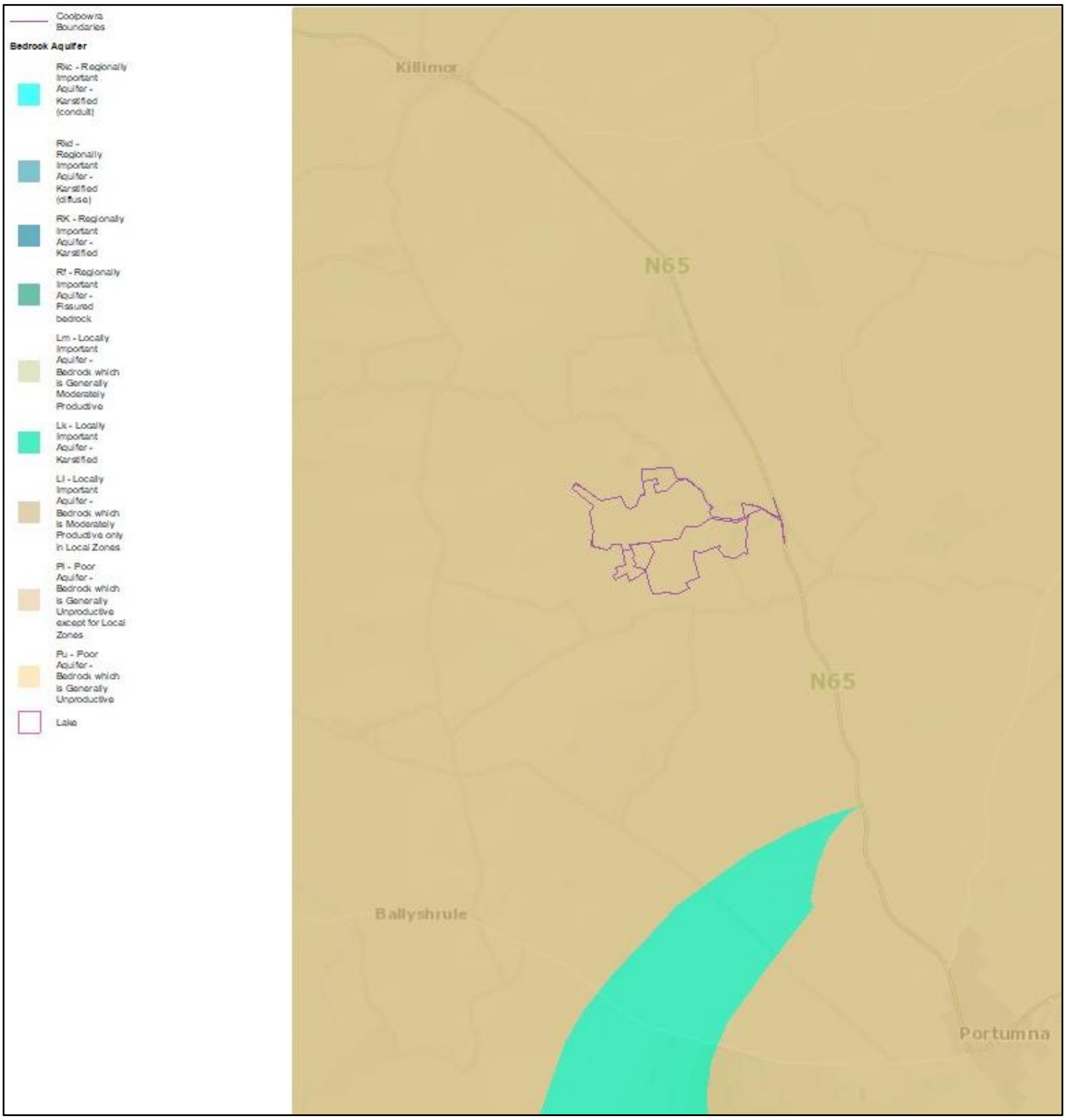
8.3.4 HYDROGEOLOGY

The Tynagh GWB (European Code IE_SH_G_236) is bounded to the west, north and northeast by surface water catchments, to the southeast and south by Lough Derg. The GWB is comprised of generally low transmissivity and storativity rocks. The older rock units (i.e., Silurian and Devonian) are likely to have the lowest transmissivities, whereas the Pure Unbedded and Upper Impure (i.e. younger rock units) will have better flow properties. Where gravels, extensive alluvium or very sandy till overlies the bedrock aquifer, this can contribute to the storage. Flow occurs along fractures, joints and major faults. The faults within the ORS act both as groundwater flow conduits and barriers. Within the pure limestones and to a much more limited extent the Upper Impure Limestones, transmissivity may have been enhanced further by dissolution of calcium carbonate along fracture and bedding planes. Flows in the aquifer are typically concentrated in a thin zone at the top of the rock. An epikarstic layer probably exists at the top of the Pure Unbedded Limestones, at least in the vicinity of Lough Derg.

Aquifers within the GWB are mainly unconfined. They are probably only confined where raised bogs with low permeability clayey bases overlie the aquifers. Depending upon the local topography, the water table can vary between a few metres up to >10 m below ground surface.

Locally, groundwater flows to surface water bodies. Flow path lengths in the upland and lowland areas are short (≤ 300 m). Groundwater discharges to springs and to the numerous streams and rivers crossing the aquifer, and to Lough Derg. No field data was available to determine groundwater flow direction or gradient across the site. However, groundwater flow in this instance is expected to follow topography, flowing generally south /south-eastwards. It is likely that groundwaters will have a calcium-bicarbonate signature, i.e. will be very hard (typically ranging between 380–450 mg/l) and will have elevated hydrogen sulphide levels due to impure limestones. The bedrock aquifer is described as a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (LI), see Figure 8.4.

Figure 8.4 Bedrock Aquifer



8.3.4.1 Bedrock Aquifer

An aquifer is defined as a geological formation that is capable of yielding significant quantities of water. Aquifers generally consist of clean, coarser geological materials where permeability has developed in response to a variety of geological processes. There are a variety of aquifer types in Ireland. Limestone, dolomite, sandstone and volcanic strata are bedrock aquifers and sands and gravels are unconsolidated aquifers. The aquifer beneath the proposed development lands is classed as a *"locally important aquifer – bedrock which is moderately productive only in local zones"*.

In Ireland the entire land surface is divided into four vulnerability categories - extreme (E), high (H), moderate (M) and low (L) - based on geological and hydrogeological factors. The term *'vulnerability'* is used to describe the ease with which groundwater may be contaminated by human activities (DELG et al., 1999). The vulnerability of groundwater depends on the time of travel of infiltrating water (and contaminants), the relative quantity of contaminants that can reach the groundwater and the contaminant attenuation capacity of the geological materials through which the water and contaminates infiltrate. These are more specifically determined at the site by the type and permeability of the subsoils, the thickness of the unsaturated zone through which the contaminant moves and the recharge type, whether point or diffuse. The classification guidelines, as published by the GSI, are given in Table 8.5 below. It shows that the less permeable and thicker the overburden overlying an aquifer is, the lower the vulnerability of the aquifer to contamination.

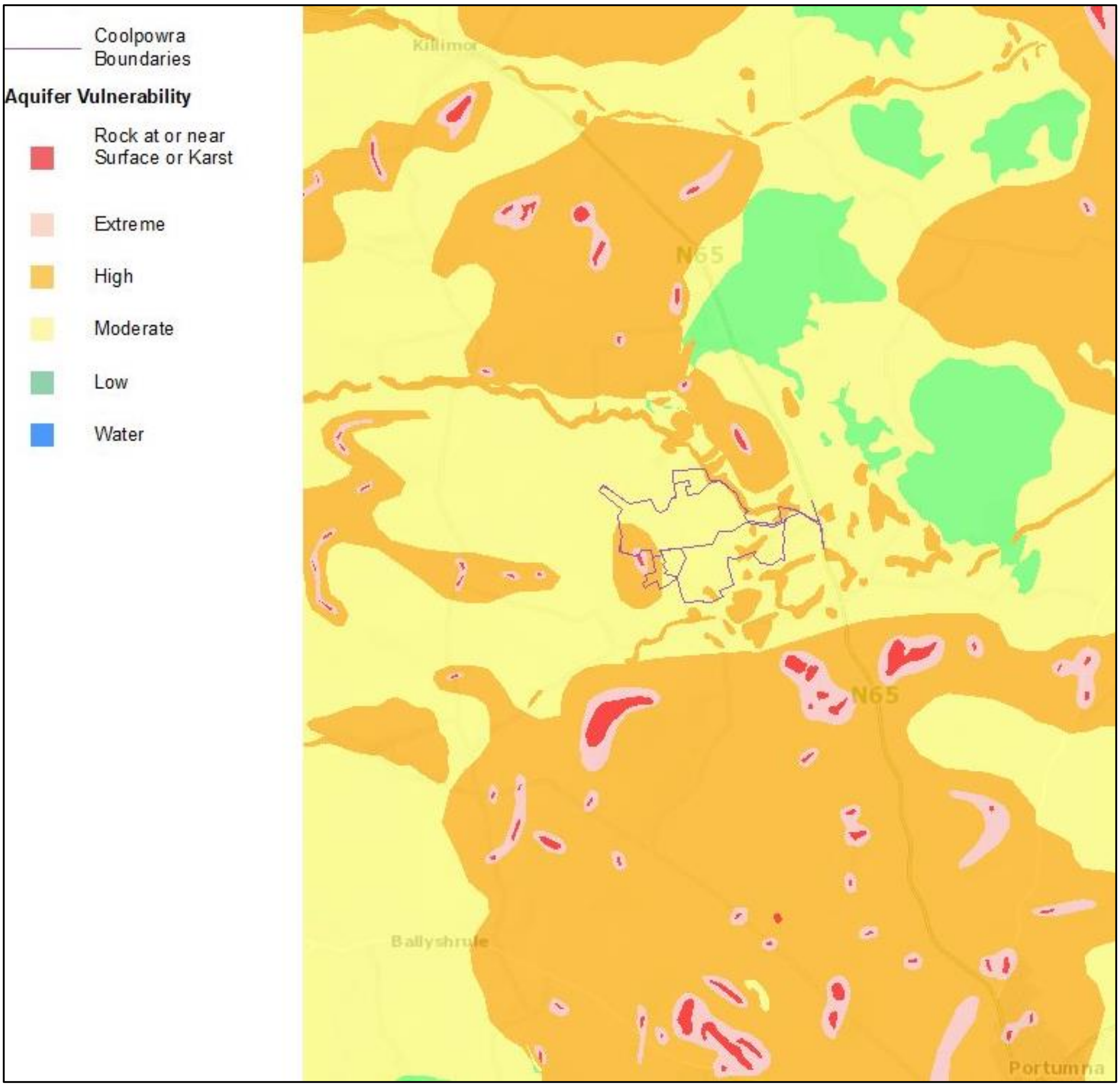
Table 8.5 GSI Groundwater Vulnerability Guidelines

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) & Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, clay, peat)	(sand/gravel aquifers only)	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable
(2) Precise permeability values cannot be given at present
(3) Release point of contaminants is assumed to be 1-2m below ground surface.

Groundwater vulnerability across the vast majority of the development lands is classed as *'Moderate'* vulnerability (Figure 8.5). An area of high vulnerability is shown to be present in the southwestern corner of the site where shallow bedrock is expected to be present.

Figure 8.5 Aquifer Vulnerability

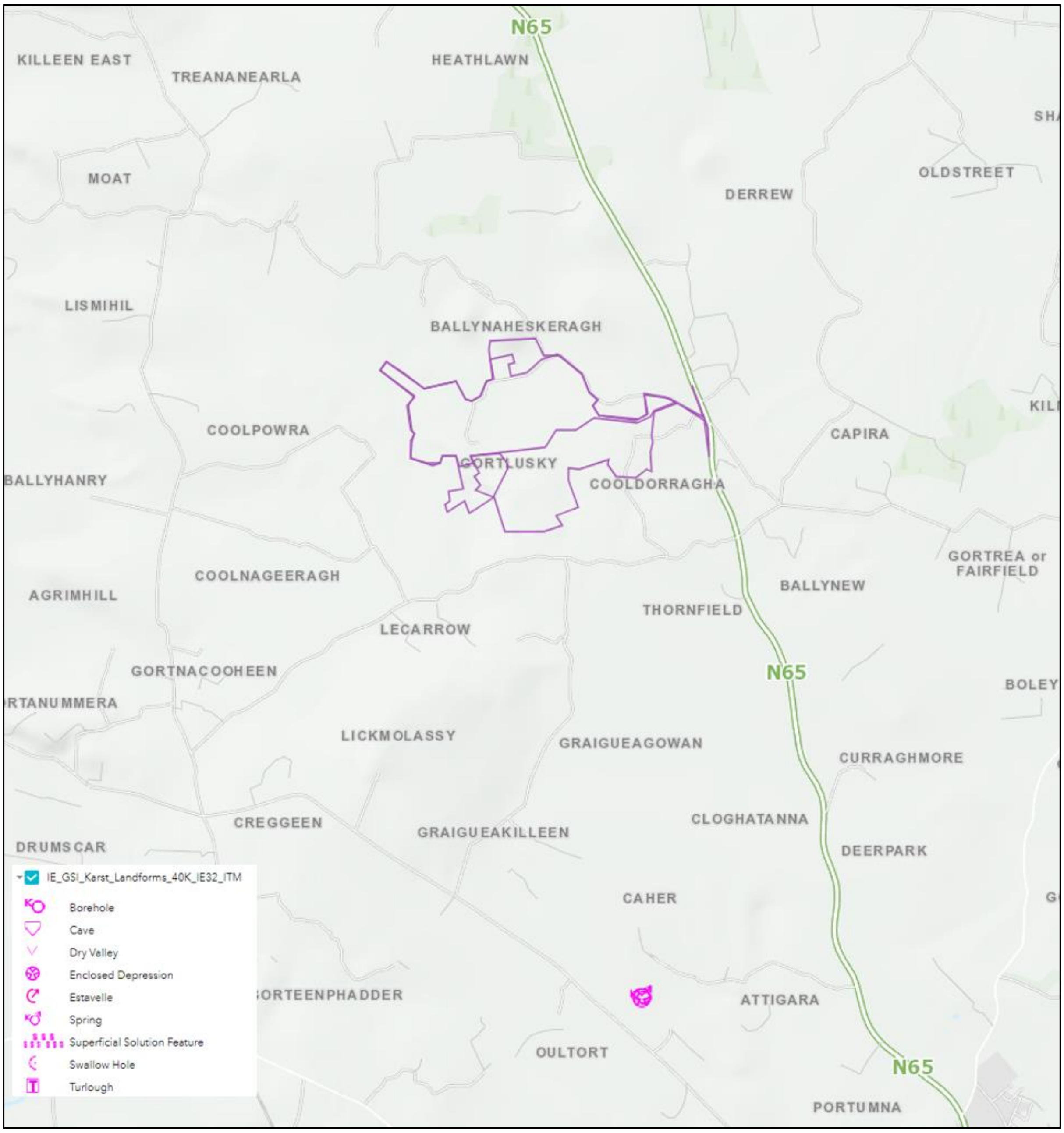


8.3.4.2 Karst

Karst landscapes develop through the process of karstification, this occurs primarily in soluble rocks such as limestone and dolomite. Karstification takes place due to calcite dissolution from meteoric water. As rain descends through the atmosphere it picks up additional CO_2 causing a chemical reaction within the soluble limestone, leading to the development of numerous surface and subsurface features. There are no karst features within or near (within 5km) the site.

There are no karst features within or near (within 2.5km) the site (Figure 8.6). The closest karst features to the site are a spring (Karst Feature Unique ID IE_GSI_Karst_40K_8186) and an Enclosed Depression (Karst Feature Unique ID IE_GSI_Karst_40K_2815) which are located approximately 3km from the southern redline boundary of the site.

Figure 8.6 Groundwater Karst Features



Groundwater recharge is the primary method by which water enters an aquifer. This occurs mainly through downward movement of surface water to groundwater. Both point and diffuse recharge occur. Diffuse recharge occurs via rainfall percolating through the permeable subsoil and rock outcrops. Point recharge occurs by means of swallow holes, collapse features/dolines, and where flow is concentrated in the epikarst.

The groundwater recharge in a region depends mainly on the precipitation change during the major recharge season. Data acquired by the Geological Survey of Ireland shows the average recharge rate for the area in brown to be 20mm/year with a recharge coefficient of 4%. The hydrogeological setting for the areas highlighted in brown are described as having "Moderate permeability subsoil, cut peat".

The southwestern area of the site, shown in light green, is shown to have an average recharge rate of 319mm/yr with a recharge coefficient of 60%. Northern areas of the site, again are shown in light green, are shown to have an average recharge rate of 319mm/yr with a recharge coefficient of 60%. The hydrogeological setting for the areas shown in green are described as having "Moderate permeability subsoil overlain by poorly drained (gley) soil".

8.3.4.3 Geological Heritage

The Geological Survey of Ireland in conjunction with the Geoparks network and GSNI have undertaken the programme *"Geoheritage"* dedicated to the protection and promotion of regions and features of geological importance throughout the country. The sites are identified as County Geological Sites for inclusion in County Development and Heritage Plans. There are no sites of geological interest within or close to the development boundary.

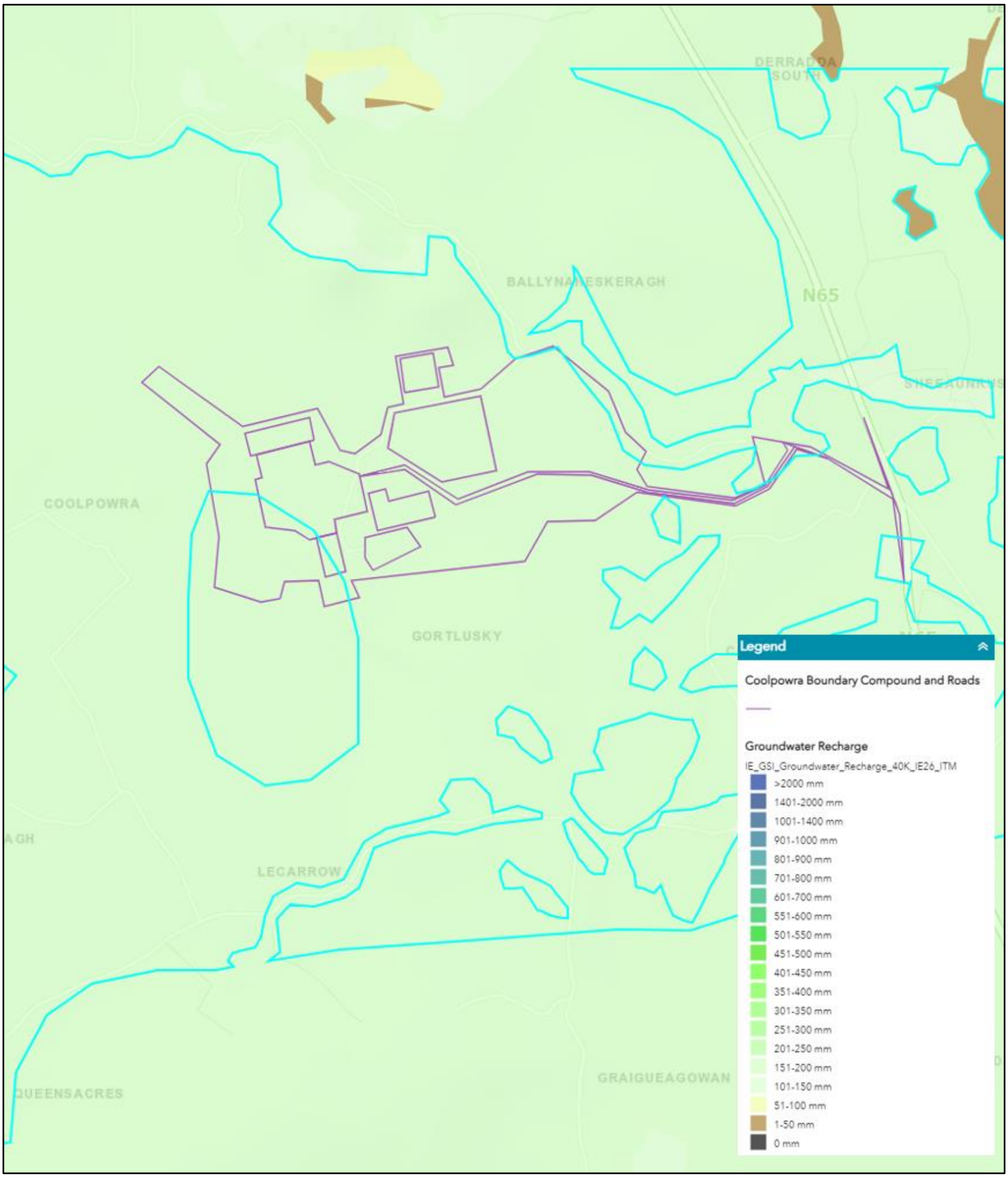
8.3.4.4 Groundwater Recharge

Groundwater recharge is the primary method by which water enters an aquifer. This occurs mainly through downward movement of surface water to groundwater. Both point and diffuse recharge occur. Diffuse recharge occurs via rainfall percolating through the permeable subsoil and rock outcrops. Point recharge occurs by means of swallow holes, collapse features/dolines, and where flow is concentrated in the epikarst.

The groundwater recharge in a region depends mainly on the precipitation change during the major recharge season. Data acquired by the Geological Survey of Ireland shows the annual average recharge rate to be 200mm/year (range 151-200) with a recharge coefficient of 60%. The Average Recharge (mm/yr) Pre-Cap[40] is 371mm/year. The hydrogeological setting for the proposed development lands are described as having *"Moderate permeability and overlain by well drained soil".*

[40] effective rainfall x recharge coefficient, not limited by maximum recharge capacities

Figure 8.7 Groundwater Recharge



8.3.5 FLOODING

A Stage 3 Flood Risk Assessment was undertaken to support the proposed development. The study concluded that the application site is currently in Flood Zone C and will remain in Flood Zone C following proposed works (i.e. not at risk of flooding). The proposed works will not result in an increased flood risk within the site or downstream (See Appendix 8.1)

8.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

This section provides an assessment of the potential environmental impacts of the development proposals on the water environment during the construction and operational phases of the development. Judgments made are based on an assessment of the magnitude of contamination sources, geotechnical hazards and mineral sterilisation as obtained from desk study, existing ground investigation and monitoring information, which form the baseline conditions and an assessment of the source – pathway – receptor philosophy and identified pollutant linkages.

The overall development site and the area within its immediate environs have been considered in detail to assess the changes in ground conditions. The receptors potentially at risk that could be present are indicated below and their relative sensitivity is assessed using the criteria listed in Table 7.6 to enable predicted impact to be determined.

8.4.1 RECEPTOR SENSITIVITY

The receptors considered for the risk assessment are detailed in Table 8.6 below and considered in relation to their relative importance and receptor sensitivity (using the criteria listed in Table 8.1 to enable predicted impact); justifications for the classification are provided.

Table 8.6 Receptor Sensitivity

Receptor	Relative Importance	Receptor Sensitivity	Justification
Groundwater	County Level	Low	The current *"good status"* of groundwater should be protected. The desktop study and ground investigation works undertaken support the groundwater vulnerability across the site as being classed "as moderate" with some localised areas (west and near the main site entrance) classed as "high".
Surface Water	County Level	Low	The main watercourse within the development lands is the Treananearla stream which flows west and northwest through the development lands before discharging to the Kilcrow River (1.9km to the west). There are also several field boundary drains present within the site that contribute to the runoff at its downstream end

8.4.2 CONSTRUCTION PHASE

Table 8.7 Construction Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.11
	Earthworks have the potential to result in overland run-off of silty water to local drainage	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.11
	Earthworks have the potential to cause disturbance of contaminated soil and subsequent surface water pollution.	No change	Negligible No mitigation measures required The impact is considered reasonable as there are no known sources of contamination within the soils on-site.
Groundwater (Low)	Increased vulnerability of the aquifer as a result of soil removal.	Negligible	Minor (without mitigation) Mitigation is proposed in Table 8.11.
	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.11
	Contamination of groundwater by concrete, cement paste or grout.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.11.
	Decreased infiltration due to increase in hard standing onsite	No Change	Negligible No mitigation measures required
	Earthworks have the potential to cause disturbance of contaminated soil and subsequent groundwater pollution.	No Change	Negligible No mitigation measures required The impact is considered reasonable as there are no known sources of contamination within the soils on-site.

8.4.3 OPERATIONAL PHASE

8.4.3.1 Reserve Gas-Fired Generator (Project 1) Assessment

Table 8.8 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination of underlying drift deposits and soils due to leak from road drainage, chemicals stored on site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12
	Contamination of surface water due to leaks/spills of fuel / gasoil storage tanks, oils from transformers	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12
Groundwater (Low)	Contamination of underlying drift deposits and soils due to leak from chemicals stored on site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12.
	Contamination of groundwater due to leaks/spills of fuel / gasoil storage tanks, oils from transformers (LV, MV and HV)	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12
	Decreased infiltration due to increase in hard standing onsite. A large proportion of the Flexgen site is surfaced with impermeable material. Drainage is collected and routed via fire wastewater retention tank and oil/water separator.	No change	No mitigation measures required The impact is considered reasonable due to the connection between the groundwater and surface water environments

8.4.3.2 ESS (Project 2) Assessment

Table 8.9 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination of underlying drift deposits and soils due to leak from road drainage, chemicals stored on the BESS site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12
	Contamination of surface water due to leaks/spills of oils from transformers or within the	Moderate	Moderate (without mitigation)

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
	synchronous condenser compound.		Mitigation is proposed in Table 8.12
Groundwater (Low)	Contamination of underlying drift deposits and soils due to leak from chemicals stored on the BESS site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12.
	Contamination of groundwater due to leaks/spills of oils from transformers (LV, MV and HV) or within the synchronous condenser compound.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12
	Decreased infiltration due to increase in impermeable areas (predominantly around the synchronous condenser compound.	No change	Negligible No mitigation measures required The impact is considered reasonable due to the connection between the groundwater and surface water environments

8.4.3.3 GIS (Project 3) Assessment

Table 8.10 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination of surface water due to leaks from transformers	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12
Groundwater (Low)	Contamination of underlying drift deposits and soils due to road drainage and leaks from chemicals stored on site and used on site e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 8.12
	Decreased infiltration due to increase in hard standing onsite	Slight	Minor No mitigation measures required

8.5 MITIGATION MEASURES

8.5.1 CONSTRUCTION PHASE

Due to similar potential environmental effects being common to the three projects, mitigation is presented in single table for each of the construction and operational phases of projects.

Table 8.11 Mitigation of Potential Environmental Effects

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Surface Water Groundwater	Construction	• Construction compounds will be located at least 30m from the main stream running through the site. • Dedicated area of hard standing for material deliveries separated a minimum of 10m from adjacent watercourses; • Concrete will be mixed off–site and imported to the site. • Dedicated area of hard standing for vehicle wash-out; • Specific areas for oil storage and refuelling, separated a minimum of 10m from adjacent watercourses and comply with legislation, including providing bunds which contain 110% of on-site fuel storage capacity; • Use spill kits, fill point drip trays, bunded pallets and secondary containment units; • Enclosed and secured site and fuel storage areas will be secondarily secured; • Develop a Construction Waste Management Plan; • Develop a site-specific Incident Response Plan; • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area;	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				• Excavation and disposal off-site of contaminated soils (where required). • Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the project site, and the proper use, storage and disposal of many substances used on construction sites, such as lubricants, fuels and oils and their containers can prevent soil contamination.	
Realignment of part of the Treananearla stream	Moderate	Surface Water	Construction	• Realignment of the water channel will be undertaken at the start of development work. Works will be sequenced, i.e. the new channel will be dug in accordance with an agreed specification and best practice and the water will be rediverted. The redundant channel (once isolated from the downstream watercourse) will then be infilled. As the stream is a part of an arterial drainage scheme, OPW will be consulted in advance of the proposed works. A method statement will be developed and agreed with all stakeholders. Silt fencing and other controls will be installed to prevent any impact on the downstream receptor.	Negligible
Earthworks have the potential to result in overland run-off of silty water to local drainage	Moderate	Surface Water	Construction	• Minimisation of exposed ground and soil stockpiles, through careful earthworks design. • Minimising the time that ground is exposed and excavations are open through careful construction programming. • Stockpiles will be located away from watercourses, limited in height to 3m (topsoil) and the surface smoothed. • Silt fences will be placed around the stockpiles where required to limit the potential for rainfall to wash fines into the drainage system (GIS compound area). These comprise a technical filter fabric positioned as a fence around the	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				exposed soil and sediment to catch fines within the runoff and reduce the input of fine sediment to the drainage system. Stockpiles which may be present for some time will be covered or seeded. • Areas around infrastructure will be landscaped, and restored with topsoil and revegetated as soon as possible. • Track drainage, designed to prevent the interception of large volumes of water, will be porous and act as soakaways thereby minimising any direct discharge to watercourses. • Wheel washing activities will be conducted in designated areas, with runoff waters being conducted to soakaways constructed according to best practice. • Use of buffer zones, silt traps and settlement ponds to avoid sediment reaching watercourses.	
Contamination of groundwater by concrete, cement paste or grout.	Moderate	Groundwater	Construction	• A suitable casing will be used where wet concrete is proposed to ensure protection of groundwater until concrete has set.	Negligible
Increased vulnerability of the aquifer as a result of soil removal.	Negligible	Groundwater	Construction	• Land disturbance is expected to be minimised and quickly re-stabilised during the construction; • Due to the limited soil and superficial cover present onsite, it is not thought that large quantities of soils and superficial deposits will be moved during construction; • During construction, areas where the bedrock aquifer is exposed should be protected from surface activities through utilisation of appropriate surface coverings.	Negligible

8.5.2 OPERATIONAL STAGE

The main potential environmental effects during the operational phase have been tabulated below.

Table 8.12 Mitigation of Potential Environmental Effect

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination from road drainage, spills or leaks of fuel/oil and hazardous substances stored onsite e.g. paints, lubricants, adhesives, oils etc.	Moderate	Surface Water Groundwater	Operational	• All roads are designed to drain to the filter drains running parallel with the proposed access road and shown on the drainage drawings. This system shall allow runoff to filter down through the stone media providing filtering and delay and storage action. This stone shall be wrapped in a permeable membrane allowing runoff to infiltrate into the surrounding soils thus providing reduction action. • Dedicated indoor chemical storage areas within the three projects are provided for the storage of chemicals. The secondary fuel and other oils will be stored in bunds • Specific areas for oil storage and re-fuelling, are provided and are separated from local drainage. Secondary containment (bunding) is designed to comply with best practice – the greater of (a)110% of the largest tank or drum within the bund or 25% of the total volume of substance within the bund. • Bunds floor fall to internal sump areas which will allow bunds to be emptied via pump only. • Bund sumps will have impermeable surfaces Pumps will either be permanently fitted in sumps / bunds (submersible) or dry mounted at bund wall height with suction lift (self-priming). Mobile pumps will also be used for smaller bunded structures as and when required.	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				• Site drainage network are designed in consideration of SuDS principles. Stormwater moving through 'dirty' site areas (e.g., parking, deliveries) to pass through oil interceptor prior to being infiltrated. • Spill kits, fill point drip trays, bunded pallets and secondary containment units provided will be provided across all projects. • Enclosed and secured site and fuel storage areas will be secondarily secured. • A site-specific Incident Response Plan will be put in place for each project • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area.	
Contamination of waters due to leaks/spills from pipework and storage plant /tanks	Moderate	Groundwater Surface Water	Operational	• Engineered controls included within the design to contain and recover spills • Water-efficient techniques will be used at source where possible to maximise reuse. Water will be recycled within the process from which it issues. • The drainage system is designed to ensure separation and isolation of 'contaminated' surface water with 'uncontaminated' surface water. In order to ensure that uncontaminated surface drains are not mixing with possibly contaminated surface drains, risk areas will discharge into a separate system. Small areas that have the potential for causing contamination of surface drain water are separated from the overall surface water drainage; • Appropriate surfacing and containment or drainage facilities for all operational area is designed taking into consideration collection capacities, surface thicknesses, strength/reinforcement; falls, materials of	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				construction, permeability, resistance to chemical attack, and inspection and maintenance procedures; • Bunded (secondary containment) is provided for all storage tanks – site areas where tanks located fully bunded; • Interceptors containing oil contaminated rainwater will be contained before being exported off-site for suitable disposal; • The application for EPA licensing (IE Licence) associated with the Project 1 will be progressed and put in place in advance of operation.	

8.5.3 DECOMMISSIONING PHASE

Prior to decommissioning, a site closure and decommissioning plan will be completed to ensure the identification and mitigation of any further effects present at that time.

8.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

The proposed development will not have any significant residual effects on the water environment post implementation of mitigation. The site development will result in the creation of low permeability and impermeable surfaces (particularly Project 1), limiting the potential for contamination of the subsurface.

8.7 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

Within the European Commission - Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, dated May 1999, cumulative effects are described as *"impacts that result from incremental changes caused by other development, plans or projects together with the proposed development or developments"*. The cumulative impacts of the proposed development in conjunction with current and future developments in the vicinity of the subject site are considered in this report. The cumulative impacts of each project contained within the proposed development have been considered within this assessment with various overlapping activities considered in the assessment. Connection of Project 1 to the natural gas pipeline will be managed and undertaken by Gas Networks Ireland (GNI). The nature of that work is such that the works in the immediate vicinity of the site would be temporary and very short term and the additional construction phase impacts are assessed as short-term and imperceptible in the overall site context.

8.8 MONITORING AND FURTHER WORKS

Whilst the development proposals have the potential to cause detriment to the sensitive receptors identified, the recommended mitigation measures will ensure that the risk of potential impacts are reduced to negligible. Water monitoring is recommended downstream of the site during the construction programme. Project 1will require an Industrial Emissions Licence. If successfully obtained, the licence will prescribe specific conditions including monitoring requirements designed to monitor and protect the existing quality of receiving waters (surface water and groundwater). The licence will also require preparation of a baseline site report which will inform the decommissioning plan (closure plan) and satisfy environmental liability and risk assessment (ELRA) legislative requirements.

9 AIR QUALITY

9.1 INTRODUCTION

This Chapter of the Environmental Impact Assessment Report (EIAR) considers the potential air quality impacts associated with the proposed development. Impacts of site operations are considered by taking account of the existing baseline, the projected impacts and compliance with relevant standards.

9.2 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The overall proposed development for which planning permission is sought comprises three elements – the Reserve Gas-Fired Generator, the GIS Electrical Substation and the proposed Energy Storage System (ESS) using long duration energy storage (LDES) battery and synchronous condenser technology.

The Reserve Gas-Fired Generator project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system in three (3 No.) open-cycle gas turbines (OCGT) and associated infrastructure. GNI will separately manage the process of managing and delivering the underground natural gas pipeline to the proposed site. In accordance with the requirements of the Commission for Regulation of Utilities (CRU), the proposed OCGT units are dual fuel units. Natural gas will be the primary combustion fuel to each of the OCGT units when operating, with gas oil as the secondary fuel. In order to ensure compliance with the requirements set by the CRU in the event of interruptions to the natural gas supply, the Reserve Gas-Fired Generator is capable of running continuously for 72 hours using secondary fuel.

The Electrical Substation project will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of the Reserve Gas Fired Power Generator and Energy Storage System to the electricity transmission network. The GIS substation itself includes a two storey building and associated ancillary site development works.

The proposed Energy Storage System (ESS) facility comprises a Long Duration Energy Storage (LDES) static battery positioned within a secure outdoor compound, and a Synchronous Condenser which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid.

The potential emissions to atmosphere during operation are limited to those from the Reserve Gas Fired Generator since there are no operation phase emissions associated with either the GIS or ESS projects.

A full description of the proposed development and processes is provided in Chapter 2 of this EIAR.

9.3 IMPACT ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

9.3.1 INTRODUCTION

The impact assessment methodology involves identification and characterisation of the air quality impacts that may be associated with the project, characterisation of the baseline environment to benchmark the existing situation, quantitative prediction of air quality effects and assessment of the effects against recognised Air Quality Standards (AQS) and guidelines. From this assessment comes a definition of mitigation measures that are required to ensure that all aspects of the effects of the project, through the operational phase, are managed and controlled to protect human health, the environment and amenity.

The report meets the requirements of the relevant regulations and has been prepared in accordance with the EPA Guidelines on Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

The project will:

- have regard to the Guidelines on the information to be contained in Environmental Impact Statements, 2022, as appropriate; and,
- have regard to the relevant topics contained in the EPA's Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) September 2003.

The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports were published in May 2022. These Guidelines take account of the revised EIA Directive (2014/52/EU) which are considered in this assessment. Effects are described in the EPA Guidance in terms of quality, significance, magnitude, probability, duration and type. A description of the significance of effects is presented in Table 9.1 and Table 9.2 presents the description of the duration of effects as shown in the Guidelines.

In addition to considering the above guidance, the general approach adopted for the air quality impact assessment is summarised as follows.

- Describe the existing baseline air quality at the site and in the vicinity of receptors – addressed in Section 9.5;
- Describe the potential impacts of the development on air quality – addressed in Section 9.6;
- Identify appropriate criteria against which to assess the significance of the impacts associated with the proposed development – addressed in Section 9.3;
- Propose mitigation and avoidance measures where required.
- Identify and assess all cumulative impacts with potential to impact upon the receiving environment.

Table 9.1 Describing the Significance of Effects from EPA Guidelines

"Significance" is a concept that can have different meaning 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	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.

Table 9.2 Describing the Duration of Effects from EPA Guidelines

'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	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.

9.3.2 STUDY AREA

The Study Area for the assessment is shown in Figure 9.1. The study area includes all areas that could potentially be affected by the emissions from the proposed development. The study area was determined using professional judgement and from a consideration of the potential impacts on receptors located near the proposed development. Although potential impacts are not significant across the entire study area, the assessment considers all of these areas in order to demonstrate that sensitive receptors will not be adversely affected by the emissions to atmosphere from the proposed development. Construction Phase impacts are assessed in accordance with guidance at distances up to 250m from the proposed site boundary and the operational phase impacts are assessed at distances up to 15km from the proposed site boundary.

In addition to the general description of the Study Area, specified Receptors are selected for detailed study as representative receptors to assess impacts of the proposed development. Sensitive receptors across the study area were identified for detailed study as shown in Figure 9.2Table 9.2 (human receptors) and in Figure 9.3 (ecological receptors). The receptors were selected as outlined in section 9.6.

Figure 9.1 Study Area

Construction Phase study area	*Operation Phase study area*

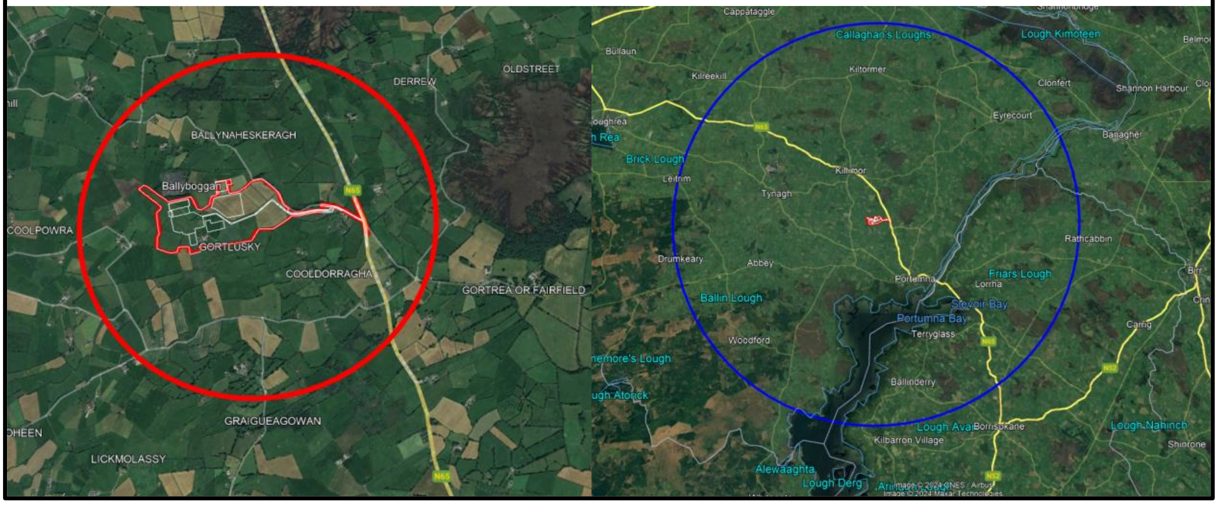
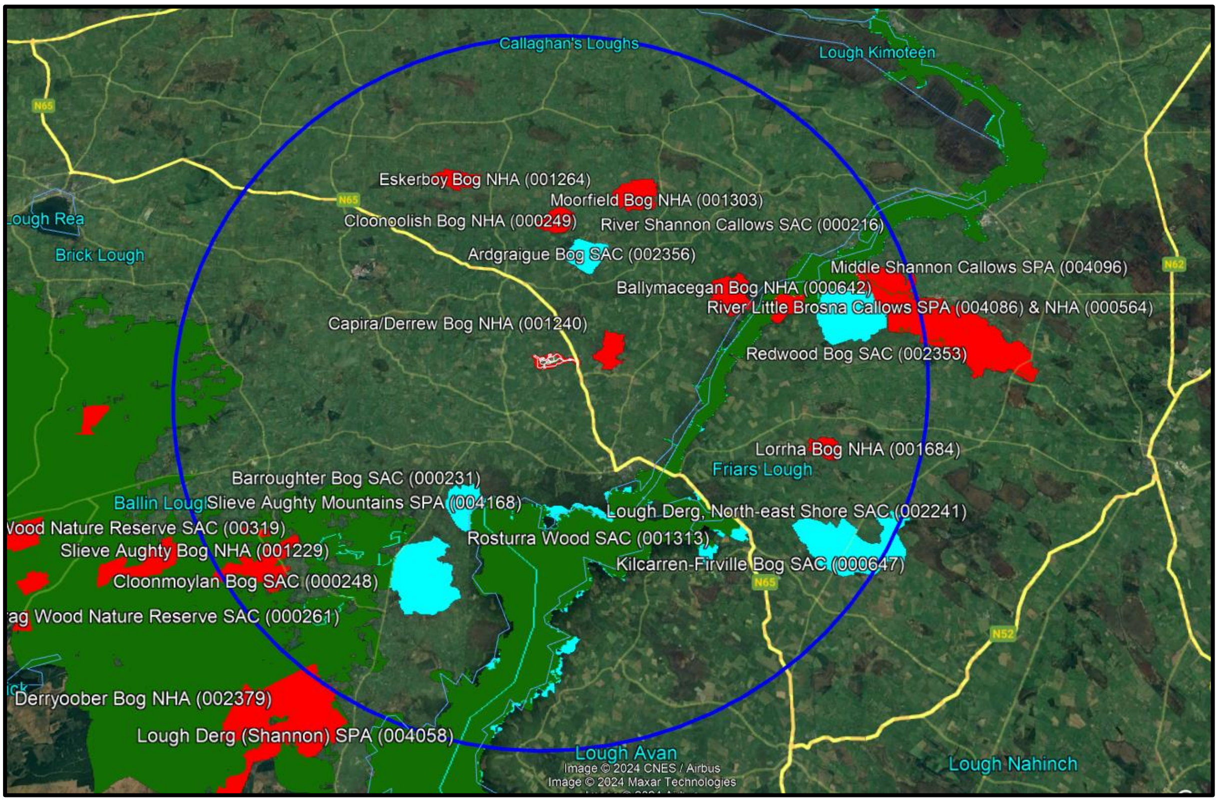


Figure 9.2 Sensitive receptors included in the detailed assessment

Figure 9.3 Ecological receptors for detailed study



Construction Phase Impact Assessment Methodology

The Institute of Air Quality Management (IAQM, 2024) *Guidance on the Assessment of Dust from Demolition and Construction* describes a five-step approach to the assessment which is summarised as follows:

- Screen the proposed development to determine if there is a requirement for a more detailed assessment;
- Assess the risk of dust impacts for each of the four activities (demolition, earthworks, construction and construction traffic) and take account of the scale and nature of the works, and the sensitivity of the area;
- Determine the site-specific mitigation for each potential activity;
- Examine the residual effects and determine whether these are significant; and
- Prepare the dust assessment report.

This approach has been applied to the proposed development. A detailed assessment is required when there are human receptors within 250m of the boundary of the project site and / or 50m of the routes of construction vehicles on the public road within 250m of the site entrance, and since the closest human receptors to the proposed development site boundaries are within this distance, a detailed assessment is deemed to be required.

The threshold distance for ecological sensitivity to dust is within 50m of the site boundary or 50m of the routes of construction vehicles on the public road within 250m of the site entrance. There are no European or Designated Sites within 50m of the site boundary or 50m of the routes of construction vehicles on the public road within 250m of the site entrance. Therefore, there are no significant Construction Phase air quality impacts predicted for ecological sites from the construction works, and this element is not assessed further.

The impacts on air quality from the Construction Phase will arise through the generation and subsequent deposition of dust and elevated local PM_{10} concentrations. Impacts of emissions to atmosphere from construction vehicles have been screened out of the assessment and are deemed insignificant. The construction activities have been assessed on the basis of the area sensitivity and the dust emission magnitude. The dust emission magnitude is based on the scale of the anticipated works and should be classified as Small, Medium, or Large. Dust emissions are defined according to the scale and nature of the work for each activity, as described in Table 9.3 below.

The two types of sensitive receptors that may be impacted by dust from construction activities, as defined by IAQM (2024), are human and ecological. These are defined as *"a location that may be affected by dust emissions during demolition and construction. Human receptors include locations where people spend time and where property may be impacted by dust. Ecological receptors are habitats that might be sensitive to dust*".

The guidance refers to human receptors as those properties that may be subject to adverse impacts of dust or PM_{10} over a time period relevant to the Air Quality Standard. Specific properties include dwellings, cultural heritage collections, food manufactures, etc. According to IAQM (2024) a single dwelling is classified as one receptor, whereas a school counts as 100. In addition, relevant designated (ecological) sites and their sensitivity to dust impacts have also been considered. Designated sites include nature sites that have special status as protected areas because of their natural importance.

Receptor sensitivity is defined by a number of factors including:

- specific sensitivities of those receptors;
- number of receptors;
- proximity to construction site;
- background PM10 concentrations; and
- site-specific factors.

The sensitivity of key receptors to each construction-related activity is determined for each of the following dust impacts:

- dust soiling;
- human health impacts; and
- impacts on ecological receptors.

The sensitivity of an area to the potential impacts of each activity is defined at various distances from the work site depending on the sensitivity and number of receptors. IAQM categorises these in several distance bands for different impacts at 20, 50, 100, and 250m. Receptor sensitivity to dust soiling and human health impacts is assessed for all distance bands. Table 9.4 defines the levels of sensitivity of areas at different distances for dust soiling, Table 9.5 defines the levels of sensitivity for human health impacts, and Table 9.6 defines the level of sensitivity for ecological impacts.

The estimated magnitudes of dust emissions from each construction activity are determined as small, medium, large and negligible, and are combined with the area sensitivity to determine the risk of dust impacts with no mitigation applied. The matrices in Table 9.7 set out a methodology for the assignment of risk level to each activity and this is the approach that is used to determine the level of mitigation that should be applied. Where a risk category is classified as negligible, no mitigation other than whatever is required by legislation is required.

Table 9.3 Quantitative Determination of the Magnitude of Dust Emissions for Demolition and Construction Activities (IAQM 2024)

Activity	Dust Emission Magnitude	
Demolition	Large	Total building volume >75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level;
	Medium	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12m above ground level; and
	Small	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6m above ground, demolition during wetter months.
Earthworks	Large	Total site area >110,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height
	Medium	Total site area 18,000 m^2 – 110,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height; and
	Small	Total site area <18,000 m^2, soil type with large grain size

Activity	Dust Emission Magnitude	
		(e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3m in heights.
Construction	Large	Total building volume >75000 m^3, on site concrete, batching, sandblasting;
	Medium	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and
	Small	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Track-out	Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m;
	Medium	20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m; and
	Small	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Table 9.4 Area Sensitivity to the Effects of Dust Soiling (IAQM 2024)

Receptor Sensitivity	Number of Receptors	Distance from the Source, m			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 9.5 Area Sensitivity to Human Health Impacts (IAQM 2024)

Receptor Sensitivity	Annual Mean PM_{10}	Number of receptors	Distance from the Source (m)			
			<20	<50	<100	<250
High	>32 µg/m^3	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10}	Number of receptors	Distance from the Source (m)			
			<20	<50	<100	<250
Medium	>32 μg/m^3	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32 μg/m^3	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	-24-28 μg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 μg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

Table 9.6 Area sensitivity to ecological impacts (IAQM 2024)

Receptor sensitivity	Distance from the Source, m	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table 9.7 Risk of dust impacts from each construction activity (IAQM 2024)

Sensitivity of area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Track-out			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low risk
Low	Low Risk	Low Risk	Negligible

9.3.3 OPERATIONAL PHASE ASSESSMENT METHODOLOGY

The potential air quality impacts are assessed principally by means of a dispersion modelling study using computerised dispersion modelling to evaluate the impact of emissions to atmosphere during the Operational Phase on ambient air quality. The results of the assessment are compared with benchmarks, as discussed in Section 9.3.7. The assessment of impact significance is based on a comparison of predicted impacts with Air Quality Standards (AQS) and guidelines, and consideration of the magnitude and duration of the potential impact.

9.3.4 METHODOLOGY FOR ASSESSING IMPACTS DUE TO ASPERGILLUS

The fungal disease known as "invasive Aspergillosis" may be contracted as a result of disturbance of materials that release fungal spores into the atmosphere and is a potential concern that requires consideration. This is a disease which is detrimental to persons with suppressed immune systems, such as hospital patients. The "National Guidelines for the prevention of Nosocomial Invasive Aspergillosis during construction/renovation activities" deals specifically with construction works occurring within or adjacent to hospitals. The report states that the fungal spores responsible for invasive Aspergillosis can originate from a number of sources such as construction, demolition, renovation, disturbance of soil, removal of fibrous insulation material, removal of suspended ceiling tiles and from poorly maintained air ventilation systems. The potential sources of the fungal spores associated with invasive Aspergillosis, as detailed above, are related to the occurrence of these operations either within or in very close proximity to the hospital buildings.

Fungal spores (the Aspergillus moulds) are found everywhere but are of particular concern when large scale demolition, excavation and earth-moving activity takes place and especially in close proximity to areas where vulnerable individuals are located. The dispersion of spores (or indeed dust or any other substance) which are released at a particular location depends on a significant number of factors which include the rate and temperature of the release, the release height, the wind speed, rainfall, wind direction, topography, local meteorological conditions, the nature of the substances released, the potential for physical or chemical interactions and the concentrations of the substances released and other factors. The dispersion of fungal spores will depend on all of the above factors and this dispersion is evaluated by considering the factors noted above and the distances from the source at which the predicted impacts are to be assessed. In the first instance, the key factors are the concentration of the spores released and the distance to sensitive receptors. Dispersion of fungal spores released as a result of any activity is a function of time and distance and would be completely dispersed i.e. no measurable concentration at approximately 250m from the source of the release.

The National Guidelines report referred to above notes that the fundamental requirement in respect of eliminating Aspergillus infection from construction works is first to minimise the dust generated during construction and second to prevent dust infiltration into patient care.

9.3.5 METHODOLOGY FOR ASSESSING CUMULATIVE IMPACTS

The cumulative impacts of known permitted and proposed developments with the proposed development were considered using the same methodologies outlined under the previous headings. The consideration of the potential incremental impact of the other known developments in combination with those of the subject development leads to a conclusion in respect of cumulative impacts.

9.3.6 AIR QUALITY IMPACT ASSESSMENT CRITERIA

The assessment of impact significance is based on a comparison of predicted impacts with air quality standards and guidelines, and consideration of the magnitude and duration of the potential impact.

Air Quality Standards in Ireland have been defined to ensure compliance with EC Directives; they are developed at different levels for different purposes. European legislation on air quality has been framed in terms of two categories, limit values and guide values. Limit values are concentrations that cannot be exceeded and are based on WHO guidelines for the protection of human health. Guide values are set as a long-term precautionary measure for the protection of human health and the environment. The WHO guidelines differ from EU air quality standards in that they are primarily set to protect public health from the effects of air pollution, whereas Air Quality Standards are recommended by governments, and other factors such as socio-economic factors, may be considered in setting the standards.

The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) is an amalgamation of the Air Quality Framework Directive and its subsequent daughter Directives and sets out limit and target values for named air quality parameters. The fourth daughter Directive (European Parliament 2004) also sets out limit values to be met for certain air quality parameters. The CAFE Directive was transposed into Irish legislation by the Ambient Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022). The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2022 (S.I. No. 739 of 2022).

The air quality standards and guidelines referenced in this report are summarized in Table 9.8. The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) and the Ambient Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022) set out the main standards against which the potential impact of the proposed development on air quality are assessed.

In addition to the Air Quality Standards Regulations and the Directive Standards, it is also appropriate to consider the World Health Organisation (WHO) Guidelines. These guidelines were developed by the WHO to provide appropriate air quality targets worldwide, based on the latest health information available. The air quality guidelines for particulate matter (PM_{10}), nitrogen dioxide and sulfur dioxide, and $PM_{2.5}$ are considered in this report (WHO, 2021). While the WHO Guidelines are not mandatory, they represent current informed opinion on the levels to which we should be aspiring in order to minimise adverse health impacts of air pollution. The WHO guidelines referenced in this report are summarized in Table 9.9.

There are no national or European Union air quality standards with which dust deposition can be compared. However, a figure of 350 mg/m^2-day based on the German Standard TA Luft Regulations is commonly applied by Local Authorities and the EPA (Environmental Protection Agency) to ensure that no nuisance effects will result from specified industrial activities. This criterion is the principal impact assessment criterion for the construction phase of the proposed project.

Table 9.8 Air Quality Standards Regulations 2022 (based on EU Clean Air For Europe [CAFE] Directive 2008/50/EC)

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	None	200 μg/m^3 NO_2
		Annual limit for protection of human health	None	40 μg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 μg/m^3 NO +NO_2
Sulfur Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 μg/m^3	350 μg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 μg/m^3
		Annual & Winter limit for the protection of human health and ecosystems	None	20 μg/m^3

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 μg/m^3
		Annual limit for protection of human health	20%	40 μg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health (Stage 1)	20% from June 2008. Decreasing linearly to 0% by 2015	25 μg/m^3
		Annual limit for protection of human health (Stage 2)	None To be achieved by 2020	20 μg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m^3 (8.6 ppm)
Benzene	2008/50/EC	Annual limit for protection of human health	0% by 2010	5 μg/m^3

NOTE

The Air Quality Standards Regulations 2012 (SI 739 of 2022) transposed EU Directive 2008/50/EC (CAFE) into Irish law.

Table 9.9 WHO Air Quality Standards

Pollutant	Averaging time	Interim target				2021 Guidelines
		1	2	3	4	
Particulate matter (as $PM_{2.5}$), μg/m^3	Annual limit for protection of human health	35	25	15	10	5
	24-hour limit for protection of human health Note [1]	75	50	37.5	25	15
Particulate matter (as PM_{10}), μg/m^3	Annual limit for protection of human health	70	50	30	20	15
	24-hour limit for protection of human health Note [1]	150	100	75	50	45
Ozone, μg/m^3	Peak season Notes [2]	100	70	NA	NA	60
	8-hour Note [1]	160	120	NA	NA	100
Nitrogen Dioxide, μg/m^3	Annual limit for protection of human health	40	30	20	NA	10
	24-hour limit for protection of human health Note [1]	120	50	NA	NA	25
Sulphur Dioxide, μg/m^3	24-hour limit for protection of human health Note [1]	125	50	NA	NA	40
Carbon Monoxide, mg/m^3	24-hour limit for protection of human health Note [1]	7	NA	NA	NA	4

Note [1] Expressed as the 99th percentile

Note [2] Average of daily maximum 8-hour mean O_3 concentration in the six consecutive months with the highest six-month running-average O_3 concentration.

9.4 AIR QUALITY IMPACT IDENTIFICATION

9.4.1 AIR QUALITY IMPACTS OF EXISTING ACTIVITIES

The subject site is currently a greenfield site and in agricultural use. The only potential for emissions to air from the site are associated with the occasional use of agricultural machinery on the land or from ruminants grazing on the land. Existing activities in the immediate vicinity of the site of the proposed development have the potential to exert an influence on air quality by release of emissions associated with the following:

- emissions of particulate matter (PM_{10} and $PM_{2.5}$), Sulfur dioxide (SO_2), nitrogen oxides (NO_x) and carbon monoxide CO from heating sources in the area;
- emissions of particulate matter (PM_{10} and $PM_{2.5}$), SO_2, NO_x, CO from traffic in the area; and
- Emissions of ammonia, particulate matter or dust from agricultural activities.

The magnitude of the emissions from the existing site is very small relative to the dominant influence on air quality in the surrounding area which is traffic from the adjoining road network.

9.4.2 AIR QUALITY IMPACT IDENTIFICATION OF PROPOSED ACTIVITIES

9.4.2.1 Construction Phase Air Quality Impacts

The proposed development for which planning permission is sought will involve a significant amount of earthworks to prepare the site, construction of the buildings on the site and installation of plant and machinery. The potential air quality impacts on the surrounding environment that require consideration for a proposed development of this type includes two distinct stages, the short-term construction phase and the long-term operational phase.

The potential air quality impacts during Construction are summarised as follows:

a) Dust emissions associated with excavations and demolition works

There are minor demolition works proposed for the proposed development. The most significant of the potential air quality impacts associated with the construction site is dust. Dust can be generated as a result of disturbance of materials, as a result of wind blowing across exposed surfaces and as a result of construction vehicle movements across exposed surfaces.

There are three potential impacts on air quality of the dust / particulate matter emissions. Dust deposition on surfaces is the main potential impact associated with the larger particles, nuisance effects such as reduced visibility could be associated with excessively high levels of suspended particulate matter and respiratory effects could occur as a result of excessive levels of fine particles such as PM_{10} and $PM_{2.5}$.

Dust emissions associated with the Construction Phase of the proposed development are expected to be predominantly in the 10 – 75µm particle size range so these particles, because of their size, will generally be deposited within 100m of the emission source. Only under exceptional meteorological conditions would the dusts be carried further downwind.

Suspended particulate matter (SPM) may also be released and this matter may remain suspended in the air. The main effect would be on visibility but this type of material could also be a respiratory nuisance if present at excessive levels. Emissions of dust in the form of fine particulate matter, PM_{10} and $PM_{2.5}$, may also occur, primarily as a result of materials handling and storage since the dominant particle size of the main construction materials is in the lower size ranges. There may also be some emissions of particles in these size ranges from the general site activities.

b) Construction transport emissions

Emissions of dust raised by vehicle movement on the roads near the site and also on site are considered under the general construction phase emissions in section (a) above. Emissions from the construction vehicles as a result of fuel combustion are considered here. The emissions include PM_{10} and $PM_{2.5}$, NO_2 and NO_x and CO and benzene.

c) Aspergillus emissions from excavation and earthmoving activity

There is concern about a fungal disease, "invasive Aspergillosis” which may be contracted as a result of disturbance of materials that release fungal spores into the atmosphere. Fungal spores (the Aspergillus moulds) are found everywhere but are of particular concern when large scale demolition, excavation and earth-moving activity takes place.

9.4.2.2 Operational Phase Air Quality Impacts

The most significant potential impacts are emissions of combustion gases such as CO, SO_2 and NO_2 from the gas turbines and the associated back up and emergency units.

Sulfur dioxide emissions originate from the sulfur in the fuel used in the combustion process. Since natural gas is the principal fuel to be used sulfur dioxide emissions will be negligible. Nitrogen oxides are also present in the emission stream as a result of the combustion process. Much of the emissions are in the form of nitric oxide (NO) which is expected to be substantially oxidised to nitrogen dioxide in the atmosphere. Nitric oxide emissions from sources using natural gas as fuel are significantly lower than the emissions associated with other fuels. For the subject project, low emission DLE burners will be employed to reduce the nitrogen oxides emissions.

Particulate matter and carbon monoxide may also arise from the combustion process in the emission stream but only in minor amounts. Again, natural gas is a very clean fuel and particulate emissions are predicted to be very low.

There is the potential for a number of greenhouse gas emissions to atmosphere which may give rise to CO_2 emissions.

There is a requirement to run the turbines using gas oil to ensure that there is always a guaranteed energy supply, and substances present in the emissions to atmosphere from the use of gas oil are the same as those associated with natural gas combustion. Emissions when using gas oil will be slightly higher for sulfur dioxide since there is a higher sulfur content in the fuel and higher limits for nitrogen oxides will apply for the gas oil fuel usage scenario.

9.4.2.3 Transport Air Quality Impacts

The traffic associated with the proposed development during construction and operation will lead to emissions to atmosphere which are considered in the assessment. The principal substances that are associated with transport activity are particulate matter, nitrogen oxides and carbon monoxide. Dust emissions associated with construction traffic are also possible.

9.5 DESCRIPTION OF THE RECEIVING ENVIRONMENT

9.5.1 METEOROLOGICAL CONDITIONS

The magnitude of potential impacts of the proposed development on air quality will largely be influenced by the local meteorological conditions, in particular by wind speed and direction and by precipitation rates. An evaluation of the climatic conditions at the site is therefore useful for an assessment of the type required for this study.

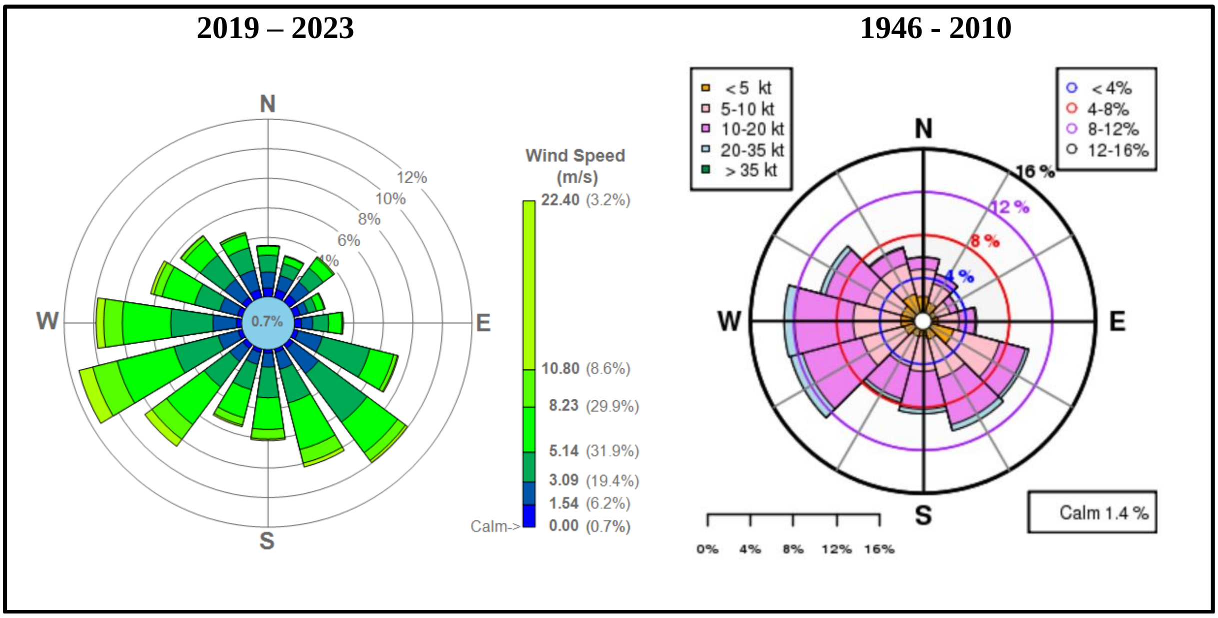
Met Éireann operate a Synoptic Network of weather stations at Belmullet, Malin Head, Rosslare (closed since 2008), Johnstown Castle, Birr, Clones, Kilkenny and Mullingar while the Aviation Division of Met Éireann maintains observing stations at Shannon Airport, Knock Airport, Casement Aerodrome, Dublin Airport and Cork Airport. There is no continuous meteorological monitoring on the subject site but the general guidance on selection of meteorological data for air quality impact assessments is to choose representative data, recently acquired, which best represents conditions at the site. At least three years of recently acquired data is preferred.

Comprehensive monitoring data is available for Shannon Airport (located 92km southwest of the subject site) which would be indicative of the meteorological conditions that are experienced at the proposed site. Therefore, for the purpose of obtaining reliable information about the climatological conditions at the site of the proposed development, a full set of meteorological data for the period 2019 – 2023 recorded at Shannon Airport was analysed. This is considered an appropriate data set for the study because of the close proximity of the station to the site and the similarity in topography in the immediate area and at the site of the proposed development. Comprehensive data for Mullingar (located 80km northeast) and Casement Aerodrome (located 120km northeast) are also available and were considered for the purpose of testing the sensitivity of the modelling predictions to the input meteorological data.

Wind speed and direction in particular is important in determining how emissions associated with the activity are dispersed. The prevailing wind direction determines which areas are most significantly affected by the emissions from the activity and wind speed determines in part the effectiveness of the dispersion of the emissions.

The windrose for Shannon is presented in Figure 9.4 for the years 2019 – 2023 together with the long term average windrose for 1946 – 2010. The dominant wind direction for Shannon is from the southwest quadrant with wind blowing from this quadrant for more than 40% of the time. The average long-term wind speed over the period 1991 to 2020 is 4.7m/s.

Figure 9.4 Windrose for Shannon Airport



9.5.2 INFLUENCES ON AMBIENT AIR QUALITY

The existing activities at and in the vicinity of the site have the potential to exert an influence on ambient air quality by release of emissions to atmosphere as follows:

- emissions of fine particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO) from domestic, commercial and industrial heating;
- emissions of particulate matter (PM_{10} and $PM_{2.5}$), SO_2, NO_x, CO and benzene from traffic on adjoining roads;
- emissions of ammonia, dust and PM from agricultural activities.

Overall, the contribution of traffic travelling on the surrounding road network, agriculture and heating sources in the area are considered to be the dominating influence on air quality in the immediate vicinity of the site.

The main substances which are of interest in terms of existing air quality are sulfur dioxide, nitrogen oxides, particulate dusts including PM_{10} and $PM_{2.5}$ which could originate from combustion sources and traffic. There are no new substances expected to be present in emissions released from the proposed development. A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development and is presented in the following section.

9.5.3 EXISTING AMBIENT AIR QUALITY

The proposed development site is located in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway, and is located approximately 4.5km north of Portumna and 3.1km south of Killimor. Lands within the development site boundary are in agricultural use and include a farmhouse and outbuildings which will be demolished. The proposed lands are situated at an elevation of c. 51-54m AOD and are accessed by road via the N65 (National Road) and the L8763 (local road). The N65 connects the towns of Loughrea and Portumna. The site is located adjacent to, and south of, the existing operational 400kV AIS electricity substation at Oldstreet.

The dominant influences on air quality in the area are emissions from domestic heating, agriculture and traffic. Emissions from traffic sources are expected to be the principal contributors to ambient air quality in the vicinity of the site.

The main substances which are of interest in terms of existing air quality are sulfur dioxide, nitrogen oxides (nitric oxide, NO and nitrogen dioxide NO_2, collectively referred to as NO_x), fine particulate matter including PM_{10} and $PM_{2.5}$ which could originate from combustion sources and traffic. Carbon monoxide is also potentially of interest, and benzene may also be of interest from traffic sources. There are no significant new substances expected to be present in emissions released from the proposed development relative to the existing situation.

Particulate matter is made up of tiny particles in the atmosphere that can be solid or liquid and is produced by a wide variety of natural and manmade sources. Particulate matter includes dust, dirt, soot, smoke and tiny particles of pollutants. Particulate matter of 10 micrometers in aerodynamic diameter or less are also referred to as PM_{10} or more strictly, particles which pass through a size selective inlet with a 50% efficiency cut-off at 10 μm aerodynamic diameter. Similarly, $PM_{2.5}$ refers to particulate matter of 2.5 micrometers or less in aerodynamic diameter. In the past domestic coal burning was a major source of particulate matter in Irish cities during winter months. Levels of particles have decreased significantly since then following the introduction of abatement strategies including Special Control Areas and other Regulations regarding the use, marketing, sale and distribution of certain fuels. The significance of particulate matter is predominantly related to human health and respiratory effects.

Nitrogen oxides (NO_x, which is the sum of NO and NO_2), are generated primarily by combustion processes. The main anthropogenic sources are mobile combustion sources (road, air and traffic) and stationary combustion sources (including industrial combustion).

The main source of nitrogen oxides in the vicinity of the site is traffic. The significance is health-related for nitrogen dioxide (NO_2) and ecological for nitrogen oxides (NO_x).

Sulfur dioxide also originates from combustion but predominantly from heating sources and not traffic. The trend in ambient SO_2 concentrations in Ireland is very clearly downward and this pollutant is not a matter for concern in Ireland. This reduction can be attributed to fuel switching from high-sulfur fuels, such as coal and oil, to natural gas and to decreases in the sulfur content of oil.

Carbon Monoxide (CO) is a colourless and odourless gas, formed when carbon in fuel is not burned completely. It is a component of motor-vehicle exhaust, which accounts for most of the CO emissions nationwide. Consequently, CO concentrations are generally higher in areas with heavy traffic congestion.

A description of existing levels of the various substances in ambient air is required to allow for the evaluation of air quality impacts associated with the development. The available data from the National Ambient Air Quality Network is a reliable data set for consideration in this study.

The Environmental Protection Agency (EPA) and local authorities maintain and operate a number of ambient air quality monitoring stations throughout Ireland in order to implement EU Directives and to assess the country's compliance with national air quality standards. Ireland's small population and generally good air quality means that a relatively small number of monitoring stations are sufficient across the country for the purposes of implementing the EU Air Directives. For ambient air quality management and monitoring in Ireland, four zones, A, B, C and D are defined in the Air Quality Standards (AQS) Regulations (S.I. No. 739 of 2022) and are defined as follows:

- Zone A: Dublin Conurbation.
- Zone B: Cork Conurbation.
- Zone C: 24 cities and large towns. Includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Newbridge, Mullingar, Letterkenny, Celbridge and Balbriggan, Portlaoise, Greystones and Leixlip.
- Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B &C.

The subject site is considered to be located in Zone D and is considered a rural location site for assessment purposes. Air Quality Data from representative air monitoring stations in Zone D are therefore considered representative of air quality at the subject site. The EPA publishes Ambient Air Quality Reports every year which details the air quality in each of the four zones. The most recent report, published by the EPA in 2023, is the Air Quality in Ireland 2022 report, which contains monitoring data collected during 2022.

The EPA maintains monitoring stations in a number of rural locations including Castlebar, Claremorris, Emo, Enniscorthy, Kilkitt and Longford to monitor rural background air quality. Other monitoring stations have operated at various times and some new stations have been added to the network, but long-term data is available for the above stations. Data from the most recent published Air Quality Monitoring Annual reports for 2020 - 2022 was reviewed and a summary of the data for representative stations for the three most recent years is presented for each parameter of interest in Table 9.10.

The approach taken is to take the average of the three most recent years for each of the Zone D rural stations detailed above and the averages of the values for the stations are reported in Table 9.10. This is the data set which is used in the assessment of the potential impact of the proposed development on air quality. A graphical comparison of the data with the relevant Air Quality Standards is given in Figure 9.5.

It is noted from the data that existing ambient air quality is good for all health-related pollutants. All concentration levels are well within the EU Standards for all parameters of interest.

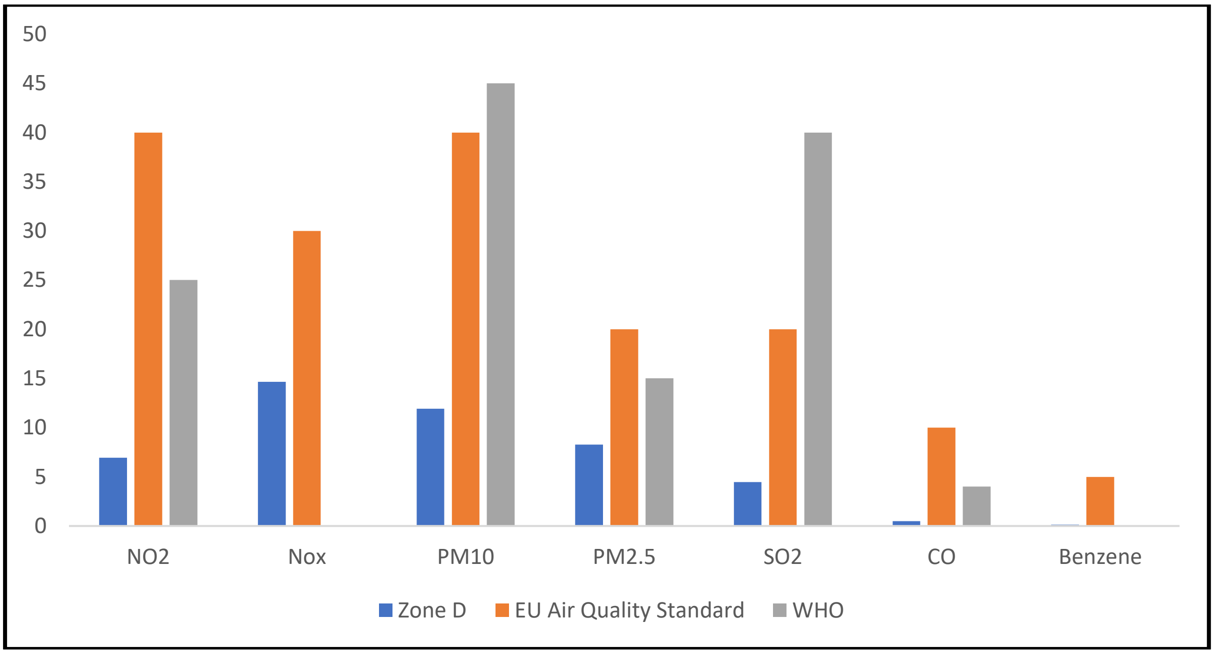
Table 9.10 Summary baseline air quality data (2020-2022)

Data set	Parameter and averaging interval		Concentration µg/m³
Rural background	Nitrogen dioxide NO_2	*Annual Mean, µg/m³*	6.9
Rural background	Nitrogen oxides, NO_x	*Annual Mean, µg/m³*	14.7
Rural background	Particulate Matter PM_{10}	*Annual Mean, µg/m³*	11.9
Rural background	Particulate Matter $PM_{2.5}$	*Annual Mean, µg/m³*	8.3
Rural background	Sulfur dioxide, SO_2	*Annual Mean, µg/m³*	4.5
Rural background	Carbon Monoxide CO	*Annual Mean 8-hour, mg/m³*	0.5
Rural background	Benzene	*Annual Mean, µg/m³*	0.1

NOTE

1. Data summarised from the EPA Annual Ambient Air Quality Monitoring Reports 2020 to 2022
2. No Zone D measurements recorded during this interval but a value of 0.1 m*g/m³ was recorded for Zone C.*

Figure 9.5 Comparison of Zone D Background Air Quality and Ambient Air Quality Standards



9.5.4 SITE SPECIFIC AMBIENT AIR QUALITY MONITORING

A survey of air quality in the area of the site was carried out during the period February to May 2024. The survey consisted of deployment of a series of diffusion tubes to measure ambient levels of nitric oxide (NO), nitrogen dioxide (NO_2), nitrogen oxides (NO_x), sulfur dioxide (SO_2) and ammonia (NH_3) levels at 5 locations at and in the vicinity of the site. A continuous monitoring survey of nitrogen oxides (NO, NO_2 and NO_x) and PM_{10} was also undertaken at one of these locations. The detailed results of the surveys are presented in Appendix 9.1 (diffusion tube surveys) and in Appendix 9.2 (continuous monitoring surveys). A summary of the- results is presented in Table 9.11 to Table 9.16.

The results of the ambient air quality survey are consistent with expectations in that the levels are generally low and are clearly influenced by emissions from traffic on the surrounding road network. All of the monitoring results are compliant with the annual mean air quality standard for nitrogen oxides and sulfur dioxide and the results are consistent with the longer-term EPA monitoring data for rural locations. Levels of nitric oxide are extremely low which indicates that the main sources of NO_x in the area are removed from the site and are likely to be traffic on the surrounding roads. Peaks in NO detected occasionally during the monitoring period were attributed to machinery working on site for intensive investigations, while the ammonia would originate from agricultural activity in the area. The site-specific monitoring data are generally lower than the longer-term EPA data which is not surprising given the limited duration of this survey. In the absence of a longer site-specific monitoring data set, the longer-term EPA data is likely to be more representative of the annual average concentrations and is therefore selected for use in this assessment. The data from the continuous monitoring survey is a useful benchmark, it confirms the dominant influence of traffic emissions on air quality at the site. Using the higher long term monitoring data from the EPA is a conservative approach and may overestimate the impact of the proposed development on ambient air quality in the area.

Table 9.11 Diffusion tube NO_2 survey results

Location	08 – 22 Feb 2024	22 Feb– 07 Mar 2024	07 – 22 Mar 2024	Average (µg/m³)
AS-101	1.5	1.1	1.6	1.4
AS-102	1.8	1.4	1.6	1.6
AS-103	1.5	1.2	1.6	1.4
AS-104	1.4	1.2	1.4	1.3
AS-105	1.5	1.2	1.6	1.4

Table 9.12 Diffusion tube NOx survey

Location	08 – 22 Feb 2024	22 Feb– 07 Mar 2024	07 – 22 Mar 2024	Average (µg/m³)
AS-101	< 3.2	< 3.2	< 3	< 3.1
AS-102	< 3.2	< 3.2	< 3	< 3.1
AS-103	< 3.2	< 3.2	< 3	< 3.1
AS-104	< 3.2	< 3.2	6.0	4.1
AS-105	< 3.2	< 3.2	< 3	< 3.1

Table 9.13 Diffusion tube SO_2 survey

Location	08 – 22 Feb 2024	22 Feb– 07 Mar 2024	07 – 22 Mar 2024	Average (µg/m³)
AS-101	< 2	< 2	< 1.9	< 2
AS-102	< 2	< 2	< 1.9	< 2
AS-103	< 2	< 2	< 1.9	< 2
AS-104	< 2	< 2	< 1.9	< 2
AS-105	< 2	< 2	< 1.9	< 2

Table 9.14 Diffusion tube NH_3 survey

Location	08 – 22 Feb 2024	22 Feb– 07 Mar 2024	07 – 22 Mar 2024	Average (µg/m³)
AS-101	0.8	0.9	2.7	1.5
AS-102	3.7	0.9	1.3	2.0
AS-103	0.7	< 0.5	1.2	0.8
AS-104	1.0	0.9	0.9	0.9

Location	08 – 22 Feb 2024	22 Feb– 07 Mar 2024	07 – 22 Mar 2024	Average ($\mu g/m^3$)
AS-105	1.1	0.7	1.3	1.0

Table 9.15 Continuous monitoring survey for NOx

Location	09 April to 23 May 2024		
	NO_2, $\mu g/m^3$	NO, $\mu g/m^3$	NOx, $\mu g/m^3$
AS-105 Survey average	6.4	0.6	2.8

Table 9.16 Continuous monitoring survey for PM_{10}

Location	09 April to 23 May 2024		
	PM_{10}, $\mu g/m^3$	PM_1, $\mu g/m^3$	$PM_{2.5}$, $\mu g/m^3$
AS-105 Survey average	3.1	2.2	3.0

9.6 ASSESSMENT OF LIKELY SIGNIFICANT IMPACTS

9.6.1 EXISTING ACTIVITIES

Section 9.5 describes the existing air quality at and in the vicinity of the site. The available data supports the conclusion that traffic emissions are the dominant influence on air quality in the area. The existing air quality complies with the Air Quality Standards and indicates that existing activities are not exerting an unacceptable effect on air quality. A site-specific survey of air quality was undertaken during the period February to May 2024 to support the assessment and a review of the EPA National monitoring database was also undertaken. It is considered appropriate to use the long-term data from the EPA to describe existing air quality at the site for the purpose of modelling and impact assessment.

9.6.2 CONSTRUCTION PHASE IMPACTS

The proposed Project is considered under the Project headings of Reserve Power Generator, ESS and GIS Projects. The construction phases of these projects are projected, if granted permission, to overlap and the overall assessment has therefore considered the likely overall impacts associated with each phase of the overall development.

Guidance on assessment of dust from demolition and construction was published in 2024 by the Institute of Air Quality Management (IAQM) as set out in Section 9.3. This Guidance describes a five-step approach to the assessment which has been outlined in Section 9.3.3. This approach has been applied to the development at the proposed site and the assessment results are summarised below.

9.6.2.1 Step 1 Screen the need for a detailed assessment

A detailed assessment is required when there are human receptors within 250m of the boundary of the site and / or within 50m of the routes of construction vehicles on the public road within 250m of the site entrance. Since the closest human receptors to the site boundary are within these threshold distances, a detailed assessment is required and has been completed.

There are no European or Designated Sites within 50m of the site boundary or 50m of the routes of construction vehicles on the public road within 250m of the site entrance, which is the threshold distance for ecological sensitivity to dust, so there are no significant construction impacts predicted for ecological sites. Capira / Derrew Bog NHA is located approximately 670m east of the entrance to the site which is outside the assessment threshold distance. Therefore, there are no significant Construction Phase air quality impacts predicted for ecological sites from the construction works, and this element is not assessed further.

9.6.2.2 Step 2 Assess the risk of dust impacts

The risk of dust being emitted in sufficient quantities to cause a nuisance or health impacts is evaluated by considering the scale of the works programme. The IAQM Guidance Note gives advice on classifying the magnitude of the potential dust impacts and using the advice and information derived from the Construction and Demolition Plan for the site, the magnitude of the predicted dust emissions is estimated as shown in Table 9.17. This assessment is based on the scale of the proposed works and the design details available for the proposed development.

Table 9.17 Assessment of Magnitude of dust emissions for Construction Programme

Activity	Magnitude of Dust Emission
Demolition	Small
Excavations	Medium
Construction	Large
Construction Traffic	Medium

This stage of the assessment also requires that the sensitivity of the area is defined. The potential dust emissions are predominantly in the 10µm to 75µm size range, so PM_{10} impacts from construction are screened out as insignificant for this assessment. The assessment therefore focuses on the larger particle sizes. This qualitative analysis provides the overall level of risk of impacts for dust soiling, human health and ecology, and the assessment findings for sensitivity are shown in Table 9.18.

Table 9.18 Assessment of area sensitivity to dust effects for Construction Programme

Activity	Sensitivity of receptors and surrounding areas		
	Dust Soiling	Human Health	Ecological
Demolition	Low	Low	Low
Excavations	Low	Low	Low
Construction	Low	Low	Low
Construction Traffic	Low	Low	Low

The proposed development consists of a construction programme with very minor demolition works required. The construction phase is estimated to last for up to 28 months with the bulk of the Civil & Structural and Mechanical & Electrical works complete in ca 18 months. Excavation work is required as the site is a greenfield site with by far the majority of excavated materials being soils (grassed topsoil, topsoil and subsoil). The Construction programme is moderately significant and therefore potentially significant emissions could be expected.

The significance of the dust emissions and impacts is evaluated in terms of the sensitivity of the receptors in the area that could be affected by the emissions. In general, receptors located close to the construction site boundary are considered high sensitivity with sensitivity decreasing with increasing distance from the source reflecting the exponential decrease in dust levels as distance increases. The highest receptor sensitivity in the immediate vicinity of the proposed site is medium and is low for the vast majority of the construction activity. This assessment is based primarily on the distance from the site of the proposed works to the closest receptors.

The potential air quality impact arises from emissions of particulate matter and may result in deposition of dust around the site, and trackout onto the roads in the vicinity of the site. The magnitude of the potential emissions associated with Construction is assessed as Low using the above criteria.

Using the alternative assessment approach outlined in the EPA Guidelines on Environmental Impact Assessment as outlined in Section 9.3, the significance of potential dust emissions during construction is summarized in Table 9.19.

Table 9.19 Assessment of Significance of Dust Emissions for Construction Programme

Activity	Significance of Dust Emission	Duration of Dust Emission
Demolition	Imperceptible	Momentary
Excavations	Slight	Short term
Construction	Slight	Short-term
Construction Traffic	Not significant	Short-term

This assessment shows that the most significant potential impacts are those associated with construction. Damp weather and low wind speeds will reduce the level of impact experienced at the receptor locations. There will be a short term, slight impact on the closest receptors during the construction works. Construction traffic impacts will not be significant and experienced in the short-term. In the absence of mitigation measures, the overall impact of dust arising during the construction phase is considered to be short term in duration and its significance will vary from not significant to slight.

Raw materials required for the construction will be delivered to the sites using conventional Heavy Goods Vehicles (HGVs) and any wastes requiring removal from the site will be removed using HGVs. The principal substances that are emitted from the vehicles are fine particulate matter, nitrogen oxides and carbon monoxide. Dust and particulate matter impacts associated with the passage of vehicles on roads has already been assessed as part of the dust and particulate matter impacts. The level of traffic movements has been reviewed in the context of potential contributions to air quality in the area.

The traffic impact assessment calculates that during peak construction activity, the site will engage approximately 180 – 200 construction personnel for the Reserve Gas Fired Generator, 130 - 150 construction workers for the ESS Project and 50 construction workers for the GIS Project. As a worst-case assessment, it is assumed that site works will generate 200 staff trips (one-way) during the peak hour periods. It is envisaged that peak hour heavy goods vehicle (HGV) traffic will depend on the construction activities active on the site when considering the worst-case construction scenario. Most construction vehicles will stay on site for the duration of construction. It is estimated that up to 50 vehicles will enter the site each day delivering materials during construction, spread across the working day. This level of traffic movement will not lead to noticeable impacts during construction works.

The fundamental requirement in respect of eliminating *Aspergillus* infection from construction works is first to minimise the dust generated during construction. It is considered that in the absence of mitigation measures the potential construction phase impact of Aspergillus is short term and imperceptible.

In the absence of mitigation measures the construction phase activities will range from an imperceptible to slight impact on local air quality depending on the activities occurring and, in all cases, will be short-term in duration.

9.6.3 OPERATION PHASE IMPACT ASSESSMENT

9.6.3.1 Introduction and operating scenarios assessed

The only predicted air quality impacts associated with operation of the proposed development are emissions to atmosphere from the turbines and the backup generators. The assessment of the impact of the emissions from these sources is carried out by dispersion modelling. A detailed modelling assessment was undertaken using the current version of the United States EPA's model AERMOD Prime model in accordance with the guidance offered by the Environmental Protection Agency (EPA) in their AG4 Guidance Note. The dispersion model computes average ground-level concentrations of pollutants emitted from either elevated or ground-level emission sources. Separate utilities associated with the dispersion modelling software allow for computation of ground-level concentrations of pollutants over defined statistical averaging periods, and additional features permit suitable consideration to be given to building downwash effects and the effects of elevated terrain near the proposed development.

The Air Dispersion Model considered information relating to topography at the site and in the surrounding areas, design details for the building structures and emission sources and five years of meteorological data. The output from the Dispersion Model is the predicted ambient concentrations of substances emitted from the proposed development at locations beyond the site boundary for every hour of the five-year meteorological data sets. In addition to predicting concentrations in the broader environment, the Model predicted concentrations at 175 individual sensitive human and ecological receptors as discussed in section 9.3.1. A detailed description of the Model and Modelling methodology is provided in Appendix 9.3.

The emissions to atmosphere arise due to the combustion process. The three (No) Open Cycle Gas Turbines (OCGT) are intended to run on natural gas but provision is made to use gas oil as a back-up fuel for emergencies and to comply with the requirements of the Commission for Regulation of Utilities (CRU). Consequently, both scenarios are considered in the assessment. In addition, the Emergency Generators may be required in emergency situations to start the turbines in which case they would be used to start the first turbine which will then be used for the remaining starts; their operation is therefore very limited.

The dispersion model considered a number of possible operating scenarios as follows.

(i) OCGT Operating Scenario #1: Natural gas (Normal Operation, 1500hours)

A conservative assumption of 1500 operating hours per year was made with units expected to run for much shorter times. An assumption of 2 hours operation per day during the morning (06:00 – 08:00) and evening (16:00 – 19:00) peak demand periods was made. The turbines start very quickly and reach steady state normal operation in approximately 10 minutes. The assessment assumes that 30% of the operating hours are start-up or shut down for the purpose of modelling. The use of gas oil fuel is tested every month and a run time of 2 hours per month is assumed for the testing. The Emergency Generators are tested for 8 hours every month, and this has been included in all model runs.

(ii) OCGT Operating Scenario #2: Natural gas fuel (Worst-Case, full time operation)

A conservative assumption of full-time operation using natural gas as fuel was made to ensure that all worst-case meteorological conditions were investigated. This is an unrealistic scenario and is not expected to occur. However, the test is a useful sensitivity test to test the sensitivity of the model predictions to the meteorological conditions for the short term one-hour averaging periods. The Emergency Generators are tested for 8 hours every month, and this has been included in all model runs.

(iii) OCGT Operating Scenario #3: Gas Oil fuel (Worst-Case, full time

operation)

A conservative assumption of full-time operation of the turbines using gas oil as fuel was made to consider what would occur in the event of a national gas distribution network outage and to ensure that all worst-case meteorological conditions were investigated. This is an unrealistic scenario and is not expected to occur. However, the test is a sensitivity test to test the sensitivity of the model predictions to the meteorological conditions for the short term one-hour averaging periods and to the use of diesel instead of natural gas. The Emergency Generators are tested for 8 hours every month, and this has been included in all model runs.

(iv) OCGT Operating Scenario #4: Gas Oil fuel (500 hours per annum)

An assumption of 500 operating hours per year was made. The units are required to be capable of operating on gas oil and a 72-hour gas oil fuel reserve has been specified by the Commission for Regulation of Utilities. This operating scenario was assessed on an assumption that the operating hours would run continuously and separately as an average across the entire year and the worst-case outcome was reported for evaluation. The use of gas oil fuel is tested every month and a run time of 2 hours per month is assumed for the testing. The Emergency Generators are tested for 8 hours every month, and this has been included in all model runs.

(v) Emergency Generators

These units will run in emergencies and will be tested once every month. For the purpose of this assessment a Model run was executed with the units operating every month for 8 hours. This run was assimilated into all of the main operating scenarios.

These operating scenarios represent conservative approaches and will lead to an overestimate of the predicted ambient concentrations beyond the site boundary. The stack height for the assessment was determined to be 45m and the detailed assessment as reported in Appendix 9.3 also considered alternative stack heights as discussed below.

9.6.3.2 Input data for Operation Phase Impact Assessment

Emission characteristics predicted for the emission sources are summarised in Table 9.20 and in Table 9.21 to Table 9.23. Information on dimensions and physical characteristics of the main emission sources was obtained from the developer and from a consideration of the nature and scale of the processes that will be carried out at the plant, the chemical composition of the fuels, information supplied by the manufacturers of the plant, and consideration of the levels of emissions that would normally be expected from a plant of this type.

The worst possible emissions scenario is one where the maximum permissible emission rates from the plant occur. For the purposes of modelling and air quality impact assessment, the maximum possible emission values were used in accordance with relevant Guidance. The maximum permissible emission limits are the Large Combustion Plant Emission Limit Values for nitrogen oxides, carbon monoxide, PM_{10} and sulfur dioxide. The maximum potential sulfur dioxide (SO_2) emission rates are derived from the fuel usage rate and permissible sulfur content. Best practice guidance requires that the impact assessment must represent a worst-case emissions scenario, thereby determining the maximum potential impact of plant emissions on ground level concentrations of pollutants in the vicinity of the plant.

Table 9.20 Stack and emission characteristics

Emission Point	Stack Co-ordinates		Stack Height, m	Exit Diameter, m
OCGT #1	5489774	5887146	45	6.8
OCGT #2	549017	5887156	45	6.8
OCGT #3	549056	5887164	45	6.8
Emergency Generator #1	549010	5887111	4.755	0.5
Emergency Generator #2	549011	5887108	4.755	0.5
Emergency Generator #3	549012	5887104	4.755	0.5

Note: UTM Coordinate system

Table 9.21 Process emissions data for proposed Reserve Power plant (Natural Gas Fuel)

Emission Point	Fuel Type	Temp K	Flow Nm^3/hour	Exit velocity m/sec	NO_x Emission		CO Emission		SO_2 Emission		PM_{10} Emission	
					mg/Nm^3	g/sec	mg/Nm^3	g/sec	mg/Nm^3	g/sec	mg/Nm^3	g/sec
OCGT Operating Scenario #1: Natural gas (Normal Operation, 1500 hours per annum); maximum daily emission rate												
OCGT #1-#3	Natural gas (1500 hr pa)	883.15	7,498,800	57.36	50	104.15	100	208.30	Note 3	Note 3	Note 3	Note 3
OCGT Operating Scenario #1: Natural gas (Normal Operation, 1500 hours per annum); annual average emission rate												
OCGT #1-#3	Natural gas (1500 hr pa)	883.15	7,498,800	57.36	35	72.91	40	83.32	Note 3	Note 3	Note 3	Note 3
OCGT Operating Scenario #2: Natural gas fuel (Worst-Case, full-time operation); maximum daily emission rate												
OCGT #1-#3	Natural gas (Full time)	883.15	7,498,800	57.36	50	104.15	100	208.30	Note 3	Note 3	Note 3	Note 3
OCGT Operating Scenario #2: Natural gas fuel (Worst-Case, full-time operation); annual average emission rate												
OCGT #1-#3	Natural gas (Full time)	883.15	7,498,800	57.36	35	72.91	40	83.32	Note 3	Note 3	Note 3	Note 3

Notes:
1. Emissions are stated at STP.
2. Start up duration 10 minutes; model conservatively assumes 0.33 hr duration.
3. SO_2 and PM_{10} emissions are negligible for natural gas combustion and are therefore screened out of assessment

The dispersion model ran the maximum permissible daily emission rates as worst-case scenario for full time operation on natural gas; the annual average emissions were assessed separately

Table 9.22 Process emissions data for proposed Reserve Power plant (Gas Oil fuel) for full time operation

Emission Point	Fuel Type	Temp K	Flow Nm^3/hour	Exit velocity m/sec	NO_x Emission		CO Emission		SO_2 Emission		PM_{10} Emission	
					mg/Nm^3	g/sec	mg/Nm^3	g/sec	mg/Nm^3	g/sec	mg/Nm^3	g/sec
OCGT Operating Scenario #3: Gas Oil fuel (Worst-Case, full-time operation) **Maximum daily emissions**												
OCGT #1-#3	Gas oil (Full time)	808.15	6,732,000	51.49	50	93.5	100	187.0	66	123.42	10	18.70
OCGT Operating Scenario #3: Gas Oil fuel (Worst-Case, full-time operation) **Annual average emissions**												
OCGT #1-#3	Gas oil (Full time)	808.15	6,732,000	51.49	NS	NS	NS	NS	60	112.20	5	9.35

Notes:
1. An assumption of full time operation on Gas oil is run due to the potential scenario of an interruption to the availability of natural gas.
2. The dispersion model ran the highest daily emission rates listed as worst case scenario for full time operation on gas oil; the annual average emissions were assessed separately
3. NS means None Specified

Table 9.23 Process emissions data for proposed Reserve Power plant (Gas Oil fuel), < 500 hours per year)

Emission Point	Fuel Type	Temp K	Flow Nm^3/hour	Exit velocity m/sec	NO_x Emission		CO Emission		SO_2 Emission		PM_{10} Emission	
					mg/Nm^3	g/sec	mg/Nm^3	g/sec	mg/Nm^3	g/sec	mg/Nm^3	g/sec
OCGT Operating Scenario #4: Gas Oil fuel (500 hours per annum) **Maximum daily emissions**												
OCGT #1-#3	Gas oil (< 500 hr pa)	808.15	6,732,000	51.49	250	467.50	100	187.00	66	123.42	10	18.70
Annual average emissions												
OCGT #1-#3	Gas oil (< 500hr pa)	808.15	6,732,000	51.49	NS	NS	NS	NS	60	112.20	5	9.35

Notes:

1. The dispersion model ran the highest daily emission rates listed as worst case scenario for operation on gas oil when operating less than 500 hours per year; the annual average emissions were assessed separately
2. Where the gas turbines operate on gas oil less than 500 hours per year , the emission limit for nitrogen oxides is 250mg/Nm^3 and no emission limit for CO applies.

9.6.3.3 Impact Assessment for Normal Operation on Natural Gas

Full details of the modelled scenarios are given in Appendix 9.3. The most sensitive pollutant is nitrogen dioxide so the detailed discussion presented here is for nitrogen dioxide; results for carbon monoxide are also presented as this is also a regulated pollutant under the Large Combustion Plant Directive. All other substances are emitted at lower concentrations and the impacts are less significant. The results of the runs are presented in Table 9.24 for NO_2 and in Table 9.25 for CO.

The modelling predictions show that the predicted concentrations are all significantly lower than the relevant air quality standard. For the most sensitive pollutant, nitrogen dioxide, the predicted ambient concentrations expressed as the Process Contribution for the 99.8-percentile of 1-hour concentrations will not exceed the air quality standard.

The cumulative air quality impact expressed in terms of the Predicted Environmental Concentration (PEC) is assessed by considering the background air quality in the area and the incremental contribution to ambient concentrations from the proposed process. The modelling predictions indicate that the cumulative impact of the operation of the turbines with existing activities will not exceed the Air Quality Standards. As is evident from the contour plot presented in Figure 9.7, the highest predicted Process Contributions (PCs) are close to the facility with concentrations reducing with distance from the source as expected.

Table 9.24 Predicted NO_2 concentrations for Normal Operation on Natural Gas, OCGT Operating Scenario #1: Natural gas (Normal Operation), 1,500 operating hours per year

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
Maximum daily emission rate						
2019 - 2023	99.8th %ile of 1-hour means	38.1	13.8	51.9	200	19.1
	Annual mean	0.28	6.9	7.2	40	0.7
Annual average emission rate						
2019 - 2023	99.8th %ile of 1-hour means	38.5	13.8	52.3	200	19.3
	Annual mean	0.29	6.9	7.2	40	0.7

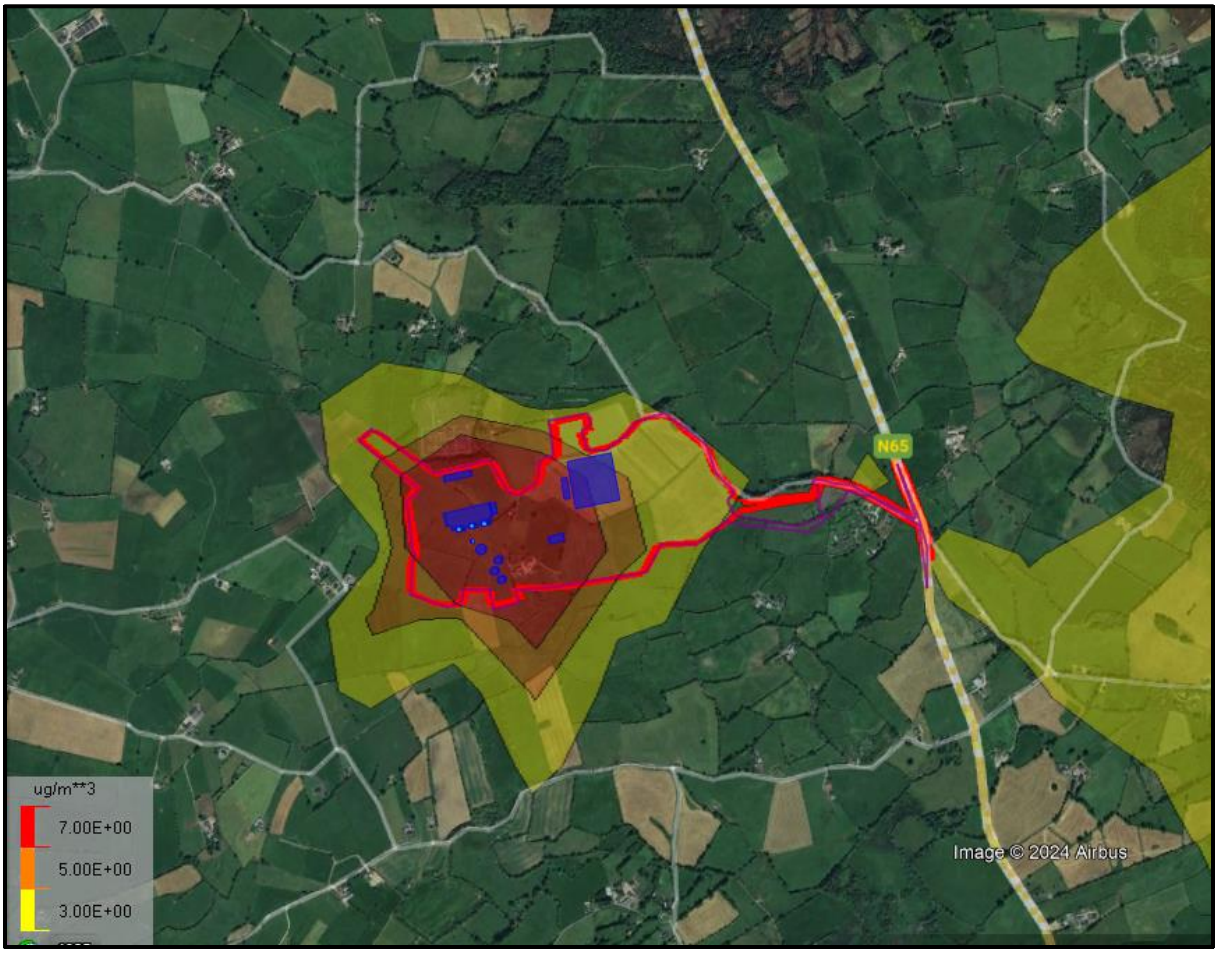
NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 9.25 Predicted CO concentrations for Normal Operation on Natural Gas, OCGT Operating Scenario #1: Natural gas (Normal Operation), 1,500 operating hours per year

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
Maximum daily emission rate						
2019 - 2023	Maximum 8-hour mean	143	500	643	10,000	1.4
Annual average emission rate						
2019 - 2023	Maximum 8-hour mean	196	500	696	10,000	2.0

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Figure 9.6 Isopleth showing predicted ground level concentrations of NO_2 expressed as the 99.8-percentile of 1-hour NO_2 for the normal operation of the facility on natural gas, OCGT Operating Scenario #1: Natural gas (Normal Operation), 1500 operating hours per year , Annual average emissions



9.6.3.3.1 Impact Assessment for Worst Case Operation on Natural Gas

Results are presented for nitrogen dioxide and carbon monoxide as both are regulated pollutants under the Large Combustion Plant Directive. All other substances are emitted at lower concentrations and the impacts are less significant. The results of the runs are presented in Table 9.26 for NO_2 and in Table 9.27 for CO.

The modelling results show that even if the plant were to run full time on natural gas, which is not proposed, the predicted ambient concentrations for the most sensitive pollutant, nitrogen dioxide, expressed as the Process Contribution will not exceed the air quality standard for the 99.8 percentile of one-hour concentrations.

The cumulative air quality impact expressed in terms of the Predicted Environmental Concentration (PEC) is assessed by considering the background air quality in the area and the incremental contribution to ambient concentrations from the proposed process. The modelling predictions indicate that the cumulative impact of the operation of the turbines with existing activities will not exceed the Air Quality Standards. As is evident from the contour plot presented in Figure 9.7, the highest predicted Process Contributions (PCs) are close to the facility with concentrations reducing with distance from the source as expected.

Table 9.26 Predicted NO_2 concentrations for Worst Case Operation on Natural Gas, OCGT Operating Scenario #2: Natural gas fuel (Worst Case), Full time operation on natural gas

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
Maximum daily emission rate						
2019 - 2023	99.8th %ile of 1-hour means	38.6	13.8	52.3	200	19.3
	Annual mean	0.29	6.9	7.2	40	0.7
Annual average emission rate						
2019 - 2023	99.8th %ile of 1-hour means	38.5	13.8	52.3	200	19.3
	Annual mean	0.29	6.9	7.2	40	0.7

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 9.27 Predicted CO concentrations for Worst Case Operation on Natural Gas, OCGT Operating Scenario #2: Natural gas fuel (Worst Case), Full time operation on natural gas

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
Maximum daily emission rate						
2019 - 2023	Maximum 8-hour mean	426	500	926	10,000	4.3
Annual average emission rate						
2019 - 2023	Maximum 8-hour mean	196	500	696	10,000	2.0

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Figure 9.7 Isopleth showing predicted ground level concentrations of NO_2 expressed as the 99.8-percentile of 1-hour NO_2 for the full time operation of the facility on natural gas, OCGT Operating Scenario #2: Natural gas fuel (Worst Case), Full time operation on natural gas, Annual average emissions

9.6.3.3.2 Impact Assessment for Worst Case Operation on Gas Oil

Results are presented for nitrogen dioxide and for carbon monoxide as both are regulated pollutants under the Large Combustion Plant Directive. Results are also presented for sulfur dioxide as the sulfur content of diesel is higher than that in natural gas although the emission are still relatively low. The results of the runs are presented in Table 9.28 to Table 9.33.

The modelling results show that even if the plant were to run full time on gas oil, which is not proposed, the predicted ambient concentrations for the most sensitive pollutant, nitrogen dioxide, expressed as the Process Contribution will not exceed the air quality standard for the 99.8 percentile of one-hour concentrations.

The cumulative air quality impact expressed in terms of the Predicted Environmental Concentration (PEC) is assessed by considering the background air quality in the area and the incremental contribution to ambient concentrations from the proposed process. The modelling predictions indicate that the cumulative impact of the operation of the turbines with existing activities will not exceed the Air Quality Standards.

Table 9.28 Predicted SO_2 concentrations for Worst Case Operation on Gas Oil, OCGT Operating Scenario #3: Gas oil fuel (Worst case), Full time operation on gas oil, Annual average emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2019 - 2023	99.7th %ile of 1-hour means	164,1	9.0	173.1	350	46.9
	99.2 %ile of 24-hour means	33.5	4.5	38.0	125	26.8
	Annual mean	1.3	4.5	5.8	20	6.5

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 9.29 Predicted PM_{10} concentrations for Worst Case Operation on Gas oil, OCGT Operating Scenario #3: Gas oil fuel (Worst case), Full time operation on gas oil, Annual average emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2019 - 2023	90.4th %ile of 24-hour means	0.23	11.9	12.1	50	0.4
	Annual mean	0.32	11.9	12.2	40	0.8

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 9.30 Predicted NO2 concentrations for Worst Case Operation on Gas oil, OCGT Operating Scenario #3: Gas oil fuel (Worst case), Full time operation on gas oil, Maximum daily emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) μg/m³	Background concentration μg/m³	Predicted Environmental Concentration (PEC) μg/m³	Air Quality Standard μg/m³	PC as % of Air Quality Standard
2019 - 2023	99.8th %ile of 1-hour means	38.6	13.8	52.4	200	19.3
	Annual mean	0.29	6.9	7.2	40	0.7

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 9.31 Predicted CO concentrations for Worst Case Operation on Gas oil, OCGT Operating Scenario #3: Gas oil fuel (Worst case), Full time operation on gas oil, Maximum daily emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) μg/m³	Background concentration μg/m³	Predicted Environmental Concentration (PEC) μg/m³	Air Quality Standard μg/m³	PC as % of Air Quality Standard
2019 - 2023	Maximum 8-hour mean	511	500	1011	10,000	5.1

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 9.32 Predicted SO_2 concentrations for Worst Case Operation on Gas oil, OCGT Operating Scenario #3: Gas oil fuel (Worst case), Full time operation on gas oil, Maximum daily emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) μg/m³	Background concentration μg/m³	Predicted Environmental Concentration (PEC) μg/m³	Air Quality Standard μg/m³	PC as % of Air Quality Standard
2019 - 2023	99.7th %ile of 1-hour means	180.6	9.0	189.6	350	51.6
	99.2 %ile of 24-hour means	36.8	4.5	41.3	125	29.4
	Annual mean	1.4	4.5	5.9	20	7.0

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 9.33 Predicted PM_{10} concentrations for Worst Case Operation on Gas oil, OCGT Operating Scenario #3: Gas oil fuel (Worst case), Full time operation on gas oil, Maximum daily emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2019 - 2023	90.4th %ile of 24-hour means	0.39	11.9	12.3	50	0.8
	Annual mean	0.33	11.9	12.2	40	0.8

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

9.6.3.3.3 Impact of emissions on ecosystems

This element of the assessment considers the following scenarios which are representative of potential worst case operating scenarios:

- OCGT Operating Scenario #2: Natural gas fuel (Worst-Case, full-time operation); annual average emissions
- OCGT Operating Scenario #3: Gas oil fuel (Worst-Case, full-time operation); maximum daily emissions

Any other operating scenarios such as shorter operating times represent less significant emissions scenarios with reduced air quality impact relative to the scenarios assessed.

The assessment of impact is based on consideration of the predicted ground level airborne concentration of nitrogen oxides on the environment and on designated ecological sites as well as considering the impact of nitrogen and sulfur dioxide deposition on the environment and on designated ecological sites. One element of the assessment considered all receptors outside the site boundary regardless of designated status, and the second element of the assessment considered the designated sites specifically.

Designated ecological sites within 15km of the site were identified and included in the assessment. There were 37 designated ecological sites selected for inclusion in the assessment as shown in Table 4.5 and in Figure 4.3 contained in Appendix 9.3. Receptors within these designated sites were included in the dispersion modelling assessments and detailed modelling predictions are contained in Appendix 9.3.

9.6.3.3.4 Impact of Fulltime operation on natural gas fuel on ecosystems

The impact of nitrogen oxides (NOx) emissions on sensitive ecosystems was assessed by modelling the NOx emissions from the worst case scenario with the turbines operating full time on natural gas. This is not the most likely operating scenario for the facility but it represents maximum potential impact on ecosystems and was therefore considered as a conservative approach to the assessment. The assessment considers all locations outside the site boundary and receptors located in the designated ecological sites.

The impact predictions for the concentration of nitrogen oxides in air at ground level are presented in Table 9.34. The predictions presented in Table 9.34 are the highest concentrations predicted at the designated ecological sites.

Table 9.34 Predicted NOx concentrations for Worst Case Operation on Natural Gas (Ecological sites), Highest concentrations predicted at any designated ecological site for full time operation on natural gas, annual average emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) μg/m³	Background concentration μg/m³	Predicted Environmental Concentration (PEC) μg/m³	Air Quality Standard μg/m³	PC as % of Air Quality Standard
2019 - 2023	Annual mean	0.18	14.7	14.9	30	0.6

NOTE
The background concentration is the annual mean when evaluating annual or daily predictions.

The maximum predicted Process Contributions are considered with the background concentrations to arrive at a Predicted Environmental Concentration (PEC). The background concentration selected is for the areas closest to the site where maximum predicted Process Contributions (PCs) arise which is likely to be conservative given the surrounding land uses and the dominating influence of traffic from the surrounding road network on ambient air quality.

The results indicate that the cumulative impact of the proposed development with existing activities will not exceed the air quality standard of 30 $\mu g/m^3$ expressed as an annual mean for ground level concentration of NO_x. The results therefore indicate that the emissions from the facility will not exert a significant adverse impact on any receptor outside the site boundary or, specifically, any designated ecosystems. The maximum predicted process contribution to ground level concentration as a result of the proposed development is less than 1% of the Air Quality Standard for full time operation on natural gas at designated ecological sites. The results indicate that the cumulative impact of the proposed development with existing activities will not exceed the air quality standard.

9.6.3.3.5 Impact of Fulltime operation on Gas oil fuel on ecosystems

The impact of nitrogen oxides (NOx) emissions on sensitive ecosystems was assessed by modelling the NOx emissions from the worst-case scenario with the turbines operating full time on Gas oil. This is an unlikely operating scenario for the facility, but inclusion of the scenario in this assessment is considered prudent. The assessment considers all locations outside the site boundary and separately receptors located in the designated ecological sites.

The impact predictions for the concentration of nitrogen oxides in air at ground level are presented in Table 9.35 for maximum ground level concentrations predicted at the designated ecological sites.

The maximum predicted Process Contributions are considered with the background concentrations to arrive at a Predicted Environmental Concentration (PEC). The background concentration selected is for the areas closest to the site where maximum predicted Process Contributions (PCs) arise which is likely to be conservative given the surrounding land uses and the dominating influence of traffic from the road network on ambient air quality.

The results indicate that the cumulative impact of the proposed development with existing activities will not exceed the air quality standard of 30 µg/m^3 expressed as an annual mean for ground level concentration of NO_x. The results therefore indicate that the emissions from the facility will not exert a significant adverse impact on any designated ecosystems. The maximum predicted process contribution to ground level concentration as a result of the proposed development is 3.7% of the Air Quality Standard for full time operation on Gas oil at any designated ecological site for full time operation on gas oil.

Table 9.35 Predicted NOx concentrations for Worst Case Operation on Gas oil (Ecological sites), Highest concentrations predicted at any designated ecological site for full time operation on gas oil, annual average emissions

Meteorological data	Avg'ing interval	Process Contribution (PC) µg/m^3	Background concentration µg/m^3	Predicted Environmental Concentration (PEC) µg/m^3	Air Quality Standard µg/m^3	PC as % of Air Quality Standard
2019 - 2023	Annual mean	1.1	14.7	15.8	30	3.7

NOTE

The background concentration is the annual mean when evaluating annual or daily predictions.

9.6.4 IMPACT OF NITROGEN DEPOSITION FROM THE PROPOSED FACILITY ON ECOSYSTEMS

The potential impact of the emissions on ecosystems is also considered using the projected nitrogen deposition rate which is derived from the gaseous nitrogen oxides concentration. The most sensitive habitat for this purpose is bog ecosystems and a recommendation of 5kg N ha^{-1} $year^{-1}$ has been made [UNECE 5 – 10 kg N ha^{-1} $year^{-1}$ and EPA *Research Report 390: Nitrogen–Sulfur Critical Loads: Assessment of the Impacts of Air Pollution on Habitats (2016-CCRP-MS.43)* 5kg N ha^{-1} $year^{-1}$] as the critical load for habitat protection. The maximum rate of deposition of total nitrogen at any of the designated ecological receptors within 15km of the proposed site was determined from dispersion modelling as follows with data provided for the highest concentration predicted from the five years of meteorological data for any receptor at the designated ecological sites represented by E1 – E37.

The predicted deposition rates for the worst-case operating scenario are well within the critical loads. The contribution from the process to the nitrogen deposition rate is less than 7% of the recommended level under maximum adverse conditions. The levels may also be considered in the context of measured nitrogen deposition rates at Valentia Observatory [EPA *Research Report 390: Nitrogen–Sulfur Critical Loads: Assessment of the Impacts of Air Pollution on Habitats (2016-CCRP-MS.43)*]. This study estimated deposition rates of 8.3 kg N ha−1 y−1 for 2006 - 2015, with a maximum deposition of 19.3 kg N ha−1 y−1 during 2009. The Research Report found that dry deposition made up 40% of total deposition, which was dominated by reduced species (56%), that is, wet ammonium, dry particulate ammonium and dry gaseous ammonia. None of these species are significant in the current study but it is useful to note that nitrogen oxides are not the dominant contributor to nitrogen deposition in Ireland. Agricultural emissions are a much more significant source of deposition in rural environments than traffic or any facility of the type proposed here.

When these concentrations are converted to nitrogen deposition rates following the methodology outlined in the EPA Guidance Note AG4, and using the specified deposition velocities of 0.0015 (grassland) or 0.003 (forest), the assessment predicted a maximum potential nitrogen deposition rate at ecological sites as shown in Table 9.36 . The data presented in Table 9.36 shows that even if the plant runs continuously on either gas or Gas oil, with Gas oil being the worst-case scenario, the maximum potential impact at any location in the protected ecological sites, is significantly lower than the relevant critical loads as set out above.

Table 9.36 Total Nitrogen deposition at designated ecological sites as a result of emissions from the proposed Reserve Power plant: worst case operating scenario (Gas oil full time operation, maximum daily emissions)

Maximum impacted Ecological Receptor	Maximum Total nitrogen deposition, kg N ha^{-1} $year^{-1}$	
	Deposition velocity 0.0015m/sec	Deposition velocity 0.003m/sec
Process Contribution	0.158	0.316
Contribution from background	2.11	4.23
Total environmental contribution	2.26	4.54

Note
This data is for Site E19 Meneen Bog NHA where maximum impact is observed. Data for all sites is presented in Appendix III.

9.6.5 IMPACT OF SO_2 DEPOSITION FROM THE PROPOSED FACILITY ON ECOSYSTEMS

Nitrogen oxide emissions are significant in the emissions and the principal pollutant with potential to impact ecosystems is nitrogen oxides which are assessed in the report. Emissions to atmosphere of SO_2 are negligible when burning natural gas as fuel. As a result, the potential impact on ecosystems is negligible and is not further considered. Emissions of SO_2 when using gas oil as fuel are higher than when using natural gas due to the higher sulfur content in the fuel. But the emission rates are still extremely low and unlikely to exert a measurable impact on ecosystems. Although SO_2 emissions are not expected to exert a measurable impact when burning gas oil as fuel, this section of the report considers the impact of sulfur dioxide on ecosystems. There are no other emissions, and specifically no ammonia or acid gases (HCl, H_2SO_4, HNO_3) in the emission stream so no further emissions require assessment.

The potential impact of SO_2 emissions on ecosystems is assessed using (a) the predicted ground level concentration of SO_2 and (b) the projected SO_2 deposition rate which is derived from the gaseous sulfur dioxide concentration. The predicted ground level concentrations of SO_2 as a result of emissions during the worst-case scenario of operating full time on gas oil show that the maximum annual mean predicted ground level concentration of SO_2 is 1.6% of the Air Quality Standard from the Process emissions with background levels more than 10 times higher. The overall predicted environmental concentration from the small Process contribution combined with the background contribution does not exceed the relevant Air Quality Standard for protection of ecosystems.

The maximum rate of deposition of total SO_2 at any of the designated ecological receptors within 15km of the proposed site was determined from dispersion modelling as follows with data provided for the highest concentration predicted from the five years of meteorological data for any receptor at the designated ecological sites represented by E1 – E37.

Table 9.37 Total SO_2 deposition at designated ecological sites as a result of emissions from the proposed Reserve Power plant: worst case operating scenario (Gas oil full time operation, annual average emissions)

Maximum impacted Ecological Receptor	Maximum Total SO_2 deposition, keq ha^{-1} $year^{-1}$	
	Deposition velocity 0.012m/sec Grassland	Deposition velocity 0.024m/sec Forest
Process Contribution	0.0567	0.1134
Contribution from background	0.5196	1.039
Total environmental contribution	0.5763	1.1524

There are no universal critical loads for habitat protection for SO_2 deposition. Critical Levels for SO_2 are set in the UK according to the Publication *UKCLAG, 1996. Critical levels of air pollutants for the United Kingdom*. UK Critical Loads Advisory Group, Institute of Terrestrial Ecology, Edinburgh. The Critical Level for forestry and natural vegetation as a winter mean concentration, 15 ug m^{-3}, is set for the critical level in areas with colder winter climates, because SO_2 is known to be more damaging under these conditions. This low temperature area is mainly confined to Scotland and northern England. The limit would not be relevant in Ireland but if it were applicable, the highest level of SO_2 predicted to occur as a result of the Process is 0.32ug/m^3 which is less than 2% of this advisory limit. Certain groups of lichen are the most sensitive known organisms to SO_2; so a critical level of an annual mean of 10 ug m^{-3} has been set to protect the most sensitive of these organisms. The highest level of SO_2 predicted to occur as a result of the Process is 0.32ug/m^3 which is just 3% of this advisory limit. The background concentration of SO_2 is nearly four times higher than the Process contribution but the combined concentrations still do not exceed the advisory limits of 10 and 15mg/m^3. There is therefore no adverse impact from the deposition of SO_2 from the Process on agriculture or ecosystems.

9.6.5.1 GIS operational impact assessment

There are no significant operational phase emissions associated with the operational phase of the GIS Project. The air quality impacts of this project are considered to be long-term and imperceptible.

9.6.6 ESS OPERATIONAL IMPACT ASSESSMENT

There are no significant operational phase emissions associated with the operational phase of the ESS Project. The air quality impacts of this project are considered to be long-term and imperceptible.

9.6.7 OPERATIONAL TRAFFIC IMPACT ASSESSMENT

The operational traffic impacts were considered in the context of projected vehicle movements during the operational phase. The projected traffic volumes are low and lead to an imperceptible change in air quality. The impacts are assessed as long term and imperceptible.

9.7 MITIGATION MEASURES

A Dust Management Plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The principal objective of the Plan is to ensure that dust emissions do not cause significant nuisance at receptors in the vicinity of the site. The most important features of the Dust Management Plan are summarised in Table 9.24 Table of Mitigation Measures.

The design of the construction programme and the location and layout of the construction compound and the storage of materials will be carefully planned to ensure that air quality impacts are minimised. Table 9.38 presents a summary of the main mitigation features of the project and the specific mitigation measures which will be employed in order to minimise emissions from the activity and the associated impacts of such emissions.

Table 9.38 Table of Mitigation Measures

Character of potential impact	Mitigation measure
	Construction Phase
Dust	A designated Site Agent will be assigned overall responsibility for Dust Management;
Dust	Implementation of the Construction and Environmental Management Plan.
Dust	The design of the site and Construction programme considers dust impact management and chooses design approaches to minimise dust emissions;
Dust and general air quality	An effective training programme for site personnel will be implemented for the duration of the Construction Programme;
Dust and general air quality	A strategy for ensuring effective communication with the local community will be developed and implemented;
Dust	A programme of dust minimisation and control measures will be implemented and regularly reviewed;
Dust	A monitoring programme will be implemented.
Dust	Activities with potential for significant emissions will wherever possible be located at a position as far as possible removed from the nearest residential and commercial receptors;
Dust	The areas on site which vehicles will be travelling on will generally be hard-surfaced or compressed ground thus significantly reducing the potential for dust emissions from the vehicles;
Dust	The construction compound area will have hard standing areas to minimize dust generation from windblow.
Dust	In order to minimise the potential for wind-generated emissions from material storage bays, these bays will be oriented away from the dominant wind direction to minimise the effects of wind on release of dust and particulate.
Dust	Fixed and mobile water sprays will be used to control dust emissions from material stockpiles and road and yard surfaces as necessary in dry and/or windy weather.
Dust	A daily inspection programme will be formulated and implemented in order to ensure that dust control measures are inspected to verify effective operation and management.
Dust	A dust deposition monitoring programme will be implemented at the site boundaries for the duration of the construction phase in order to verify the continued compliance with relevant standards and limits.
Aspergillus Risks	The National Guidelines will be followed with regard to the effective management of Aspergillus risks.

9.8 CUMULATIVE IMPACTS

The cumulative impacts of the proposed development in conjunction with current and future developments in the vicinity of the subject site are considered in this report. The cumulative impacts of the Reserve Power plant, ESS and GIS projects have been considered in this assessment with various overlapping activities considered in the assessment. The connection to the gas pipeline will be managed and undertaken by Gas Networks Ireland and is not discussed in detail here. The nature of that work is such that the works in the immediate vicinity of the site would be temporary and very short term and the additional construction phase impacts are assessed as short-term and imperceptible in the overall site context.

9.9 DO NOTHING SCENARIO

There will be no significant change in air quality impacts if the proposed development does not proceed.

9.10 HUMAN HEALTH IMPACTS

Air Quality Standards (AQS) are set to protect vulnerable people, such as those with respiratory illnesses, the old and infirm. Hence, the human health impact assessment has relied on compliance with the AQS to determine whether significant impacts will arise on human health or not.

The air quality impact assessment notes that dust and particulate matter are the primary sources of construction related impacts for all of the Proposed Project elements. A short-term Slight adverse impact is predicted for the closest receptors during the Construction Phase with potential short-term impacts from traffic on the surrounding roads within approximately 50m of the proposed Project site. There will be no lasting impact, and the short-term impact will be managed by means of an effective Construction Environmental Management Plan (CEMP) incorporating the mitigation measures outlined in Section 9.7 of this EIAR. The CEMP will include a specific Dust Minimisation Plan which will ensure that dust impacts are prevented or minimised during the Construction Phase of the Proposed Project.

The predicted impact on air quality is short term and not significant hence the potential human health impact during construction is imperceptible.

There will be no significant emissions to atmosphere during the Operation Phase and the impact has been assessed as imperceptible. Therefore, the potential human health impact during Operation is imperceptible.

9.11 RESIDUAL IMPACTS

During the construction phase of the proposed development there will be some dust impacts experienced at the nearest receptors to the subject site. It is predicted that the mitigation measures proposed will ensure that the air quality impacts are kept to a minimum. The predicted air quality impacts on the receiving environment during the construction phase are considered to be not significant and short-term and may affect a small number of properties.

The only predicted air quality impacts associated with operation of the development are emissions to atmosphere from the turbines and traffic associated with the development. The change in traffic movements and the emissions will have a slight negative impact on air quality. The predicted air quality and climate impacts on the receiving environment during the operational phase are considered to be imperceptible and long-term.

Due to the size and nature of the development and the nature and volume of the potential emissions, the construction phase activities will have a not significant impact on climate and will be short-term in duration while the operational phase activities will have an imperceptible impact on climate and will be long-term in duration.

9.12 INTERACTIONS ARISING

The main interactions with air quality are in relation to human beings and flora and fauna.

The impact of air quality on human beings living in the area of the proposed development has been addressed above for both the construction and operational phase of the proposed development. The impact assessment shows that the air quality impacts that will be experienced by human beings in the vicinity of the proposed development are all within the prescribed criteria. This interaction is described as negative for the construction phase and neutral for the operational phase and is quantified as Not Significant for both phases.

In relation to the interaction of emissions to atmosphere from the proposed development with flora and fauna, Table 9.8 sets out Air Quality Standards for the protection of vegetation and ecosystems. This assessment has shown that the emissions generated from the development are very limited and do not have potential to generate a significant adverse impact on the local ecosystems including birdlife and wildlife. Air Quality in the area is good as shown in Section 9.5 and the Air Quality Standards will not be exceeded as a result of the development thereby ensuring that no significant adverse impact on ecosystems arises. This interaction is described as neutral and quantified as Not Significant.

9.13 MONITORING

In order to mitigate against air quality effects at receptors during the Construction Phase, Best Practice Measures will be adopted. These measures will include techniques such as those outlined in the IAQM's (2024) *Guidance on the Assessment of Dust from Demolition and Construction*.

The Contractor will be required to produce an Air Quality and Dust Management Plan including Best Practice Measures to control dust and, in particular, measures to prevent dust nuisance. The principal objective of the Air Quality and Dust Management Plan will be to ensure that dust emissions do not cause significant nuisance at receptors near the Proposed Project. The Air Quality and Dust Management Plan will include a daily inspection programme which will be formulated and implemented in order to ensure that dust control measures are being operated and managed effectively. A dust deposition monitoring programme will be implemented during the Construction Phase in order to verify the continued compliance with relevant standards and limits.

9.14 ACCIDENTS OR UNPLANNED EVENTS

There are no accidents or unplanned events as a result of the proposed project that could occur that will have an adverse or significant impact on air quality or climate that have not already been considered in this chapter.

9.15 REFERENCES

- Environmental Protection Agency (2022). Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- Environmental Protection Agency. Air Quality in Ireland2020, 2021, 2022: Indicators of Air Quality.
- Health Protection Surveillance Centre (2018). National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities.
- Institute of Air Quality Management (2024). Guidance on the Assessment of Dust from Demolition and Construction.
- Institute of Air Quality Management (2014). Guidance on the Assessment of Odour for Planning.
- Institute of Air Quality Management (2017). Land-Use Planning and Development Control: Planning for Air Quality.
- European Union (1996). Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management [1996].
- European Union (2004). Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air [2004].
- European Union (2008). Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe [2008].
- Air Quality Standards Regulations 2022 – S.I. No. 739 of 2022.
- Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 – S.I. No. 58 of 2009

10 MATERIAL ASSETS

10.1 INTRODUCTION

This Chapter of the EIAR evaluates the impacts, if any, which the development will have on material assets. Material assets are resources that are valued and intrinsic to the Site and the surrounding area. With regard to Material Assets, the 2022 EPA EIAR Guidelines ("EPA Guidelines") state:

> *"Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes transport infrastructure. Sealing of agricultural land and effects on mining or quarrying potential come under the factors of land and soils."*

Material assets of *natural origin* and the existing quality of natural resources such as air, water, soils, landscape, lands and soil, etc., are discussed in depth in earlier Chapters of the EIAR along with those of human origin such as traffic and transport infrastructure, soils, archaeological /architectural heritage and flood protection.

Material assets of natural and human origin which are included in this assessment are the following

- Ownership and access
- Land Use
- Services
- Demolition works

The objective of the assessment is to ensure that these assets are used in a sustainable manner, so that they will be available for future generations, after the development of the project.

10.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

10.2.1 METHODOLOGY

This assessment was carried out by a desktop study from publicly available information and from information provided by the Applicant to determine the baseline environment existing utility arrangements within the study area which could be impacted by the proposed development.

10.2.1.1 Desktop Study

The study area for the assessment is defined as the proposed development lands and lands immediately adjoining the development lands. This is considered a reasonable distance in terms of sensitive land uses and built services asset receptors (such as residential receptors) with respect to the Proposed Development.

A desk study of the proposed development area and the surrounding study area was completed in advance of undertaking the walkover survey. This involved consultation with publicly available environmental and planning datasets:

- Environmental Protection Agency database https://gis.epa.ie/EPAMaps/
- Geological Survey of Ireland database (www.dcenr.maps.arcgis.com);
- Tailte Eireann https://store.osi.ie/
- Geohive Environmental Sensitivity Mapping https://airomaps.geohive.ie/ESM/
- Galway County Council Planning database https://www.galway.ie/en/services/planning/online/
- Property Registration Authority (PRA) land registry services (https://www.landdirect.ie/)

10.2.1.2 Field Work

Walkover surveys of the Proposed Development Site and receiving environment was undertaken by Halston on the 24 November 2023, 08 February 2024, 22 March 2024, 03 April 2024 and 22 April 2024 to verify the findings of the desk study and to obtain an understanding of the local site and wider area.

10.2.2 SIGNIFICANCE CRITERIA

The purpose of the population assessment is to identify the likely significant impacts as they might affect material assets. Impacts result from direct, indirect, secondary and cumulative effects on existing environmental conditions. Effects can be positive, neutral or negative.

The significance of an effect depends on, among other considerations, the nature of the environmental effect, the timing and duration of an effect and the probability of the occurrence of an effect. The impacts may be short term, medium-term or long-term. The duration of an effect may be momentary, brief, temporary, short-term, medium-term, long-term, permanent or reversible in accordance with the timescales. The frequency of that effect can also influence significance i.e., if the effect will occur once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually.

The criteria used to describe the predicted effects is outlined in Table 10.1 in accordance with Table 3.4 of the 2022 EPA Guidelines[41]. A matrix for determining significance is presented in Table 10.2.

Table 10.1 Description of Effects

Effect Characteristic	Description
Value of Change	
Major	Effects, both adverse and beneficial, which are likely to be important considerations at a regional or national level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation. In isolation, these could have a material influence on the decision-making process.
Moderate	Intermediate limited (extent / duration / magnitude) impact that may be considered as significant. These effects are likely to be important considerations at a local level. These could have influence on decision making especially when combined with other similar effects.
Minor	Slight, very short or highly localised impact of no significant consequence. These effects may be raised as local issues but on their own are unlikely to be of importance in the decision-making process. When combined with other effects these could have a more material influence.
Negligible	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Sensitivity	
High	Feature / receptor has a very low capacity to accommodate the proposed form of change. The response is a major change e.g. agricultural land use for food production, allotments.
Medium	Feature / receptor has a low capacity to accommodate the proposed form of change. It clearly responds to effects in a quantifiable manner e.g. low-grade agricultural land and recreational ground.
Low	Feature / receptor has some tolerance to accommodate the proposed change. It responds in a minimal way such that only minor changes are detectable e.g., landscaped areas.
Very Low	Feature / receptor is generally insensitive to impact, no discernible changes e.g., soils are not in use, the land is used for industrial/commercial purposes and /or mainly covered by hard standing .
Magnitude	
Substantial	Loss of resource and/ or quality and integrity of resource, severe damage to key characteristics, features or elements. Large scale or major improvement of resource quality; extensive restoration or enhancement major improvement of attribute quality (Beneficial).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/ damage to key characteristics, features or elements (Adverse).

[41] EPA, Guidelines of the Information to be contained in Environmental Impact Assessment Report, 2022

Effect Characteristic	Description
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Slight	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No Change	No loss or alteration of characteristics, features or elements, no observable impact in either direction.

Table 10.2 Matrix for Determining Significance

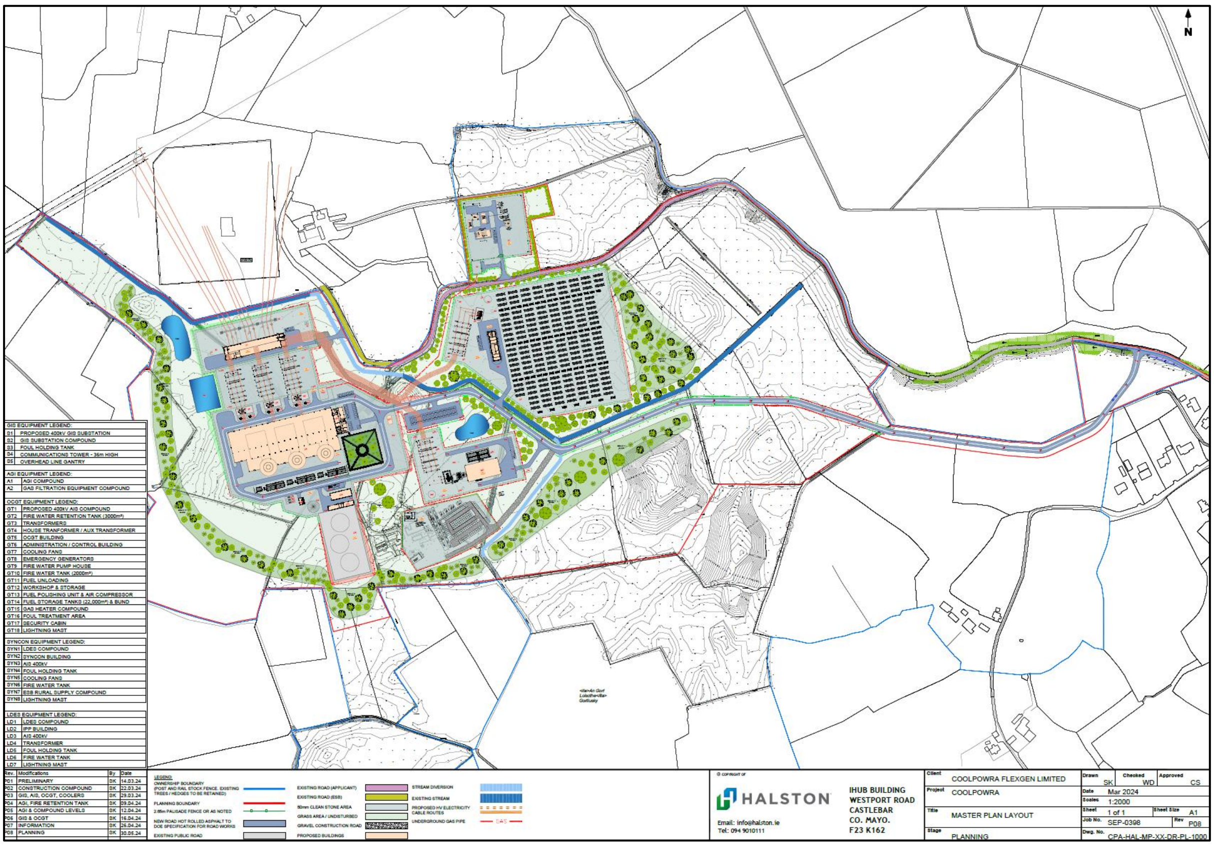
Magnitude	Sensitivity			
	Very Low	**Low**	**Medium**	**High**
No Change	Negligible	Negligible	Negligible	Minor
Negligible	Negligible	Minor	Minor	Moderate
Slight	Minor	Minor	Moderate	Major
Moderate	Minor	Moderate	Major	Major
Substantial	Moderate	Major	Major	Major

10.3 DESCRIPTION OF RECEIVING ENVIRONMENT

10.3.1 GENERAL

The proposed development is located on a 42.3 hectares (ha) (105 acres) site in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway (See Chapter 2, Figure 2.2 and Figure 2.3). The site is located approximately 4.5km north of the town of Portumna and 3.7km south of the village of Killimor. The town of Portumna is located on the northern shores of Lough Derg. The proposed lands are situated at an elevation of c. 51-54m AOD and are accessed by public road via the N65 (a National Road which is a notable landuse in the study area) and the L8763 (a local road which runs along an esker ridge beyond the northern boundary of the site). The main portion of development (compounds for the three projects) within the site is positioned 500 m west of the N65 with an internal site access road providing connection to the public road (L8763).

Figure 10.1 Map showing layout within development lands



10.3.2 OWNERSHIP AND ACCESS

Coolpowra Flex Gen Limited (CPFL) is applying for full planning permission for the proposed development which includes three projects. The projects have been determined by the planning authorities (An Bord Pleanála and Galway County Council) as being distinct in the context of applying for, and obtaining, valid planning consents under the Planning and Development Act 2000, as amended, (*"the Act").*

There will be no severance of land as a result of the proposed development or loss of rights of ways or amenities. The vast majority of the proposed development lands are privately owned. Relevant landowner consents letters associated with the development proposal are provided in Volume 3 of this EIAR. The applicant company has put in place agreements with relevant landowners associated with road improvement work at the N65 /L8763 junction. The proposed development lands are currently accessed via the L8763 which defines part of the northern boundary of the site. The proposed development includes construction of a new primary access to the development lands from the L8763.

A minor public road (L-87632-0), which is located beyond the northern redline boundary of the proposed development, provides access to a vacant residential property east of the Oldstreet AIS substation. It is noted that Eirgrid plc was granted planning permission (Galway County Council Ref. 23/60849) to construct *"Series Compensation Equipment"* on lands to the east of the Oldstreet substation. Works include for demolition of the existent vacant farmhouse and all associated farm outbuildings. The proposed development does not affect or impact this consented development. The proposed development will not affect or impact connection of the *Series Compensation Equipment* to the grid at Oldstreet.

The road serving the existing residential property within the proposed development lands includes a right of way in favour of Electricity Supply Board (ESB) and it provides access to the Oldstreet AIS Substation. No changes are proposed to the road with respect to the right of way. The proposed development has been designed so that when operational the proposed GIS substation will also be accessed using this road.

10.3.3 LANDUSE

The proposed development is located on greenfield lands and are not zoned under the County Development Plan (white lands). The lands are not being used by the public and there are no public open spaces or community lands within or adjoining the lands.

There are no ground stability issues identified within the proposed development lands and there the historic landuse doesn't differ from its current use (agricultural).

There are no active or expired waste licences within the proposed development lands. The closest EPA licensed activity to the site is Green Isle Foods Limited (Reg. No. P0816-01) which is 4.7km south/southeast of the site. The activity is located on the south side of Saint Joseph's Road (R352), west of Portumna town centre and adjoins Portumna Forest Park. There are no other EPA licensed sites within a 5km radius of the site.

The proposed development is located adjacent to, and south of, the existing operational 400kV AIS electricity substation (Oldstreet). The existing Oldstreet 400kV substation is one of the more notable single land uses within the study area. The proposed site was chosen as the preferred site following analysis of alternative sites along the two 400kV transmission lines, which traverse the country from west to east. The proposed site adjoins the Moneypoint to Woodland[42] 400kV line and the Oldstreet intermediate 400kV AIS substation (the only one) along this line.

[42] The Woodlawn substation incorporates a connection to the East West Interconnector (EWIC). The East West Interconnector (EWIC) is a high-voltage direct current submarine and underground power cable which links the electricity transmission grids of Ireland and Great Britain and facilitates growth in renewable energy.

In terms of existing land use, the principal form of land cover within the study area and is pastoral farmland bound by mixed mature hedgerow vegetation. The surrounding local landscape comprises relatively flat terrain intersected by small, shallow, winding river valleys. A small stream flows through the development lands and confluences with the Kilcrow River approximately 1km west of the site.

The proposed development includes for the demolition and removal of a residential property within the site, which comprises a single storey house, associated outhouses and farm sheds. The property is served by a septic tank for foul effluent and water is supplied from an on-site groundwater well. There are a limited number of residential properties within the surrounding area, and these are described as dispersed rural once-off housing comprising a combination of linear clusters of residential dwellings, small cross-road settlements and isolated farmsteads. There are a total of 40 recorded occupied residential properties within a 1km offset from the project compounds with the proposed development lands. The closest residential dwelling to the proposed development boundary is approximately 300m to the west of the development site. It is understood that properties along the L8763 are supplied a by public supply which runs north along the N65 from Portumna. Portumna water treatment plant supplies water to approximately 2,719 people. The raw water source is Lough Derg.

The development proposal will involve realignment of an existing stream which runs through the development lands. This work will be undertaken at the start of proposed construction works. It is expected that this works will be sequenced[43] as follows:

- Excavate proposed realignment channels;
- Decommission redundant stretches and structures;
- Construction of two bridges along Channel 01;
- Installation of a new culvert on Channel 02;
- Maximise potential for development of ecological habitat in the recommissioned channels. This will include suitability for fish passage, and provision of areas suitable for spawning;
- Minimise the amount of damage to existing habitat when diverting flow from channel currently in use to new channel reach.

As it is proposed that two proposed bridges will cross the channel that is maintained as part of an arterial drainage scheme, permission will be sought from the OPW by way of a Section 50 application. The proposed bridges have been designed to meet OPW criteria, i.e. that a where a channel is maintained as part of an arterial drainage scheme the

[43] Refer to EIAR Volume 3; Stage 3 FRA

opening must be capable of transmitting the Q100 with a 1.6 drainage factor applied, plus climate change.

Siting and selection of the development proposals was undertaken following consideration of alternatives. The existence of the Oldstreet 400kV AIS substation was a major consideration in the selection of the proposed site. The development proposals conform with overriding policy and best practice in relation to the siting of such infrastructure.

10.3.4 SERVICES

10.3.4.1 Water and Wastewater

The existing on farm residence and farm activity is served by a groundwater well on site. Similarly foul wastewater from the existing residence is management and treatment by an on-site wastewater treatment system.

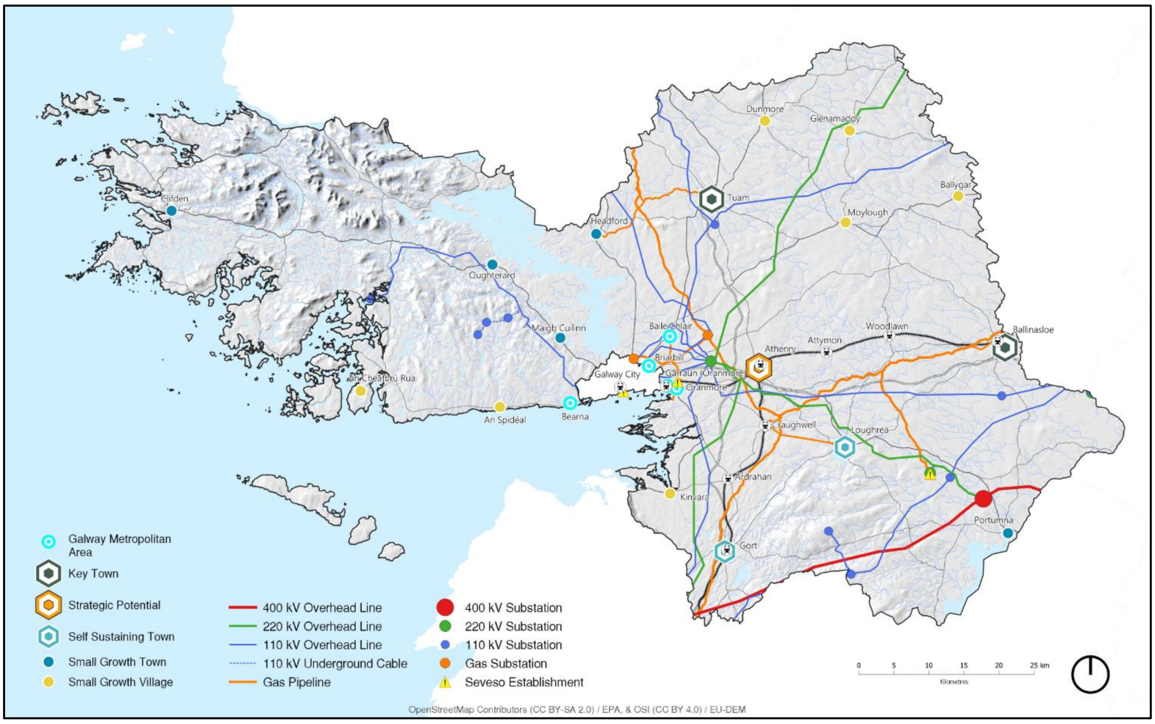
The existing groundwater well will be used to serve the water requirements of the development proposals which are very low. Foul wastewater which will be generated from the projects will be managed and treated using an onsite proprietary package wastewater treatment plant (domestic wastewater treatment system with a population equivalent ≤ 10) for Project 1 and foul holding tanks for Projects 2 and 3. Due to the nature, type of projects and future occupancy levels during operation, the volume of foul wastewater which will be generated is low.

In accordance with best practice, stormwater arising from development of impermeable surfaces (e.g., roof of buildings, roadways) stormwater will be collected and infiltrated to ground and/or attenuated before being discharged at greenfield run-off rates to the watercourse traversing the site. Storm water generated from oil risk areas (e.g., certain impermeable areas within Project 1 such as the secondary fuel storage bund) will pass through a Class 1 bypass petrol interceptor and grit trap prior to discharge. Minimal process wastewater will be generated during the operational phase. Any process wastewater will be collected and disposed of by a waste permitted contractor at a suitably waste authorised facility.

10.3.4.2 Electricity

The existing residential property which is to be demolished as part of proposed work is connected to the LV electricity network via an overhead cable rural supply which routes southwest to the property from the N65. The site adjoins the Moneypoint to Woodland[44] 400kV line and the Oldstreet intermediate 400kV AIS substation. The existing substation also connects an existing 220kV circuit (Cashla to Oldstreet) to the network. The proposed Reserve Gas-Fired Generator Project and ESS Project will connect to the electricity transmission system via a proposed 400kV Gas Insulated Switchgear (GIS) electrical substation, which will be located within the development lands boundary. The proposed GIS will also enhance and upgrade the existing AIS substation. Figure 10.2 presents a map of utilities infrastructure within Galway County.

Figure 10.2 Map of Utilities Infrastructure (source Galway CDP 2022-2028)



10.3.4.3 Gas

The indicative route for an associated gas pipeline has been considered as part of this assessment. It is expected that it will commence at New Inn, just north of the M6 Motorway and approximately 23.5 km north-west of the development site. The pipeline will be established by Gas Networks Ireland (GNI) through a separate planning application, and this will complete a full assessment of the preferred route associated full assessment. There is no existing gas supply running through the proposed development lands and no requirement to consider in the baseline.

[44] The Woodlawn substation incorporates a connection to the East West Interconnector (EWIC). The East West Interconnector (EWIC) is a high-voltage direct current submarine and underground power cable which links the electricity transmission grids of Ireland and Great Britain and facilitates growth in renewable energy.

10.3.5 DEMOLITION WORKS

The development proposals will involve demolition and removal of a single storey house, outhouses and agricultural sheds. The buildings will be demolished and removed from site in accordance with best practice. Works will involve careful decommission and removal of all structures at the site. Anticipated wastes which will be generated include soils, bricks and blocks; concrete and reinforced concrete; timber; metal sheeting and steel. Materials arising from this process will be recycled /disposed of at authorised waste management facilities.

10.3.6 SETTLEMENTS

Impacts and mitigation measures associated with population are detailed in Chapter 5 (Population and Human Health) as outlined previously.

10.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

10.4.1 DO NOTHING SCENARIO

The '*do-nothing'* impact refers to the non-implementation of the proposed development. The primary effect of this would be that the impacts and effects identified would not directly occur. In this regard there will be no change of landuse, no realignment of the existing watercourse on site, no beneficial impacts with regard to the upgrade of the Oldstreet substation and no beneficial effect associated with the upgrade of the N65 /L8763 junction which is proposed as part of the development.

10.4.2 PROJECT 1: RESERVE GAS-FIRED GENERATOR

Construction of the proposed development will result in change of use of lands from agricultural to industrial use. Soils excavated as part of development works will be used within the overall development boundary to create rolling landscaped berms to screen development from sensitive receivers. The planted berm will be constructed to enhance the terrestrial ecosystem and ensure biodiversity net gain (BNG). Stormwater arising from newly constructed impermeable area will be controlled and managed in accordance with SUDS principles before being infiltrated to ground and /or attenuated in open lagoons prior to being discharged to receiving waters. The effect on landuse is classed as Minor; it is acknowledged that there will be a change in landuse (agricultural to industrial), however the sensitivity of the receptor is considered as low and the magnitude is considered slight. In addition it should be noted that even though the proposed development is located on a 42.3ha site, a substantial portion of lands (>50%) within the proposed development lands will remain as "green areas" and will be landscaped and enhanced to provide for biodiversity gain.

The proposed development will be located on lands under the control of the applicant (one private landowner). The development will not impact existing access rights associated with the lands. No changes are proposed to existing roads within the development lands with respect to rights of way. The potential effect on landownership is described as negligible.

There are no direct or indirect negative effects on services. The Reserve Gas-Fired Generator will positively benefit the electricity transmission system by providing a low carbon secure and resilient supply of energy which is critical to a well-functioning economy. The Project will also support and promote sustainable improvement and expansion of the electricity transmission system and gas transmission network. The potential effect of the proposed development on services is Moderate-Major Beneficial.

10.4.3 PROJECT 2: ENERGY STORAGE SYSTEM

Development of the project will result in change of use of lands from agricultural to industrial use. Soils excavated as part of development works will be used within the overall development boundary to create landscaped berms in the northern and north-western areas of the site. The planted berm will be constructed to enhance the terrestrial ecosystem. Stormwater arising from newly constructed impermeable areas will be dealt with in accordance with SUDS principles before infiltration to ground and /or attenuation and controlled discharge to receiving waters. Due to the nature and characteristics of the project, the effect on landuse change is considered Minor.

The proposed development will be located on lands under the control of the applicant (one private landowner). The development will not impact existing access rights associated with the lands. No changes are proposed to existing roads within the development lands with respect to rights of way and the effect is described as negligible

There are no direct or indirect negative effects on material assets. The ESS Project will positively benefit the electricity transmission system by providing a carbon free secure and resilient supply of energy which is critical to a well-functioning economy. The Project will also support and promote sustainable improvement and expansion of the electricity transmission and distribution network. The potential effect of the proposed development on services is Moderate-Major Beneficial.

10.4.4 PROJECT 3: GIS SUBSTATION

Development of the project will result in change of use of lands from agricultural to industrial use. Soils excavated as part of development works will be used within the overall development boundary to create landscaped berms along the western side of the site. The planted berm will be constructed to enhance the terrestrial ecosystem. Stormwater arising from newly constructed impermeable area will be dealt with using percolation infiltrations and /or attenuation and discharge to the receiving watercourse (stream). Due to the nature and characteristics of the project, the effect on landuse change is considered Minor.

It is proposed to locate the proposed project on lands under the ownership of one landowner (currently under private ownership). Once developed, ownership of the proposed GIS Project will transfer to ESB Networks (ESBN) (as transmission asset owner (TAO)). The GIS upgrade and reinforce the existing node on the electricity system and will be operated by Eirgrid (as transmission system operator (TSO)). It is proposed that ESBN and Eirgrid will access the asset via the existing road which provides access the Oldstreet AIS substation. The effect on landownership is described as negligible.

There are no direct or indirect negative effects on material assets. The GIS project will positively benefit the electricity transmission system by assisting with network upgrade works. Construction of the proposed GIS electrical substation is in accordance with policy objectives as detailed in Chapter 4 of this EIAR (which deal with electricity infrastructure) and will simplify and minimise potential effects associated with connection of the Reserve Gas-Fired Generator and ESS projects to the electricity transmission system. In terms of potential environmental effect once operational, the impact of the GIS on Material Assets is Moderate-Major Beneficial.

10.5 MITIGATION MEASURES

Construction of the proposed development will require connections to infrastructure and services but will not require any connections outside the proposed development land boundary. Improvements to the N65 /L8763 junction in accordance with TII design standards are incorporated into the design. Soils arising from earth movement works will be used to create boundary berms and will be retained on site.

10.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

Construction of the proposed development will result in temporary short-term effects on material assets examined in this chapter during construction and no negative impact on the material assets once operational. Improvements to the N65 /L8763 junction in accordance with TII design standards are incorporated into the design and these will have a long-term positive benefit to the local community.

10.7 CUMULATIVE EFFECTS

The Reserve Gas-Fired Generator will require construction of an underground natural gas pipeline from the existing gas transmission system to the north. Construction of the underground pipeline will be undertaken by GNI (non-contestable work). The potential impacts during construction are short term, minor and not significant. The operational phase of the underground pipeline project is long-term, neutral and negligible impact.

The proposed development does not affect or impact the consented Eirgrid *Series Compensation Equipment* project to the north of the proposed development. Development of both sites will have a neutral effect on material assets.

Development of the three projects described as part of the proposed development will have a positive, significant, long-term synergistic effect on material assets.

10.8 SUMMARY OF SIGNIFICANT EFFECTS

Overall, there are no predicted significant adverse impacts arising from the proposed development on material assets. The potential effects of the proposed development are deemed to be positive, long-term and beneficial at local, regional and national level.

11 NOISE & VIBRATION

11.1 INTRODUCTION

This chapter identifies and assesses the potential noise and vibration impacts and related effects arising from both the construction and long-term operational phases of the proposed development which includes three separate energy support projects in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway. In addition, the short-term impacts and effects associated with the construction of an underground gas pipeline to the proposed site by Gas Networks Ireland has been assessed.

Key issues to be addressed in this chapter include identification and assessment of potential temporary/short-term construction noise and vibration impacts arising from the construction and site development phases and potential long-term noise impact and effects at nearby Noise Sensitive Receptors (NSRs) arising from the operational phase of each of the three proposed separate developments. The cumulative impacts and effects of all three proposals combined have also been assessed for both the short and long-term phases.

11.2 ASSESSMENT METHODOLOGY & SIGNFICANCE CRITERIA

11.2.1 CHARACTERISATION OF THE RECEIVING ENVIRONMENT

The receiving sound environment or existing soundscape has been characterised by field survey. Two site visits were completed on 22 and 24 April 2024 by Redkite Environmental personnel to:

- identify existing sources, the location of the nearest NSRs and local topographical features that may influence noise propagation,
- set up unattended sound level meters (SLMs) for continuous monitoring during the day, evening and night, and,
- complete a number of short-attended measurements during the daytime at a selection of the nearest NSRs.

The programme of monitoring was primarily designed to establish existing ambient and background sound levels at the nearest Noise Sensitive Receptors (NSRs) to the overall main Development Site.

Continuous monitoring using unattended SLMs was completed within the period between 22-26 April 2024. Attended measurements were completed on the 24 April 2024.

The measurement methodology followed was in accordance with the recommendations of the following:

- International Standards Organisation Document: ISO 1996 Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 1, Basic Quantities and Assessment Procedures (2016) and Part 2 Determination of Environmental Noise Levels (2017), and,
- The EPA Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities, (NG4), revised January 2016.

Ambient noise monitoring was undertaken at the Noise Monitoring Points (NMP1 to NMP8) as illustrated in Figure 11.1below and as described in Table 11.1.

Figure 11.1 Noise Monitoring Points (NMP 1- 8)

Unattended monitoring was conducted at the following NMPs for the following approximate durations:

- 2- day period at NMP1 and NMP2 from 13.30 hrs on the 22 April 2024, to 15.40 hrs on the 24 April 2024,
- 4-day period at NMP3 and NMP4 commencing between 13.00hrs on the 22 April 2024 to 17.30 hrs on the 26 April 2024.

Short term attended measurements were conducted at NMPs 5 – 8 on the 24 April 2024 between 11.15 and 15.45 hrs. Three no. 15-minute repeat measurements were completed in series at each attended measurement point.

Table 11.1 Noise Monitoring Points

Location	Grid Ref.	Description
Un-Attended Long-term		
NMP1	181714E; 208797N	Approximately 242m west of boundary as shown in Figure 11.1. Cluster of 3 dwellings and farmyard. SLM placed in the garden of a bungalow. Microphone at 4m height as adjacent dwelling is 2-storey.
NMP2	183433E;209004N	Approximately 119m south of boundary as shown in Figure 11.1. Cluster of dwellings both 1 and 2-storey close to N65. SLM placed in the back garden of a 2-storey dwelling. Microphone at 4m height.
NMP3	181959E; 208084N	Approximately 530m southwest of boundary as shown in Figure 11.1. 1-storey dwelling. Meter placed on adjacent shed roof with microphone at similar level to velux windows in roof.
NMP4	181757E; 209638N	Approximately 325m north/northwest of boundary as shown in Figure 11.1. Cottage style dwelling, one storey. Meter placed in back garden with microphone at 1.5m in height.
Attended Short-term		
NMP5	182218E; 209782N	Approximately 375m north of boundary as shown in Figure 11.1. Country roadside location, close to existing NSRs.
NMP6	183115E; 208762N	Within site boundary as shown on Figure 10.1 Country roadside location.
NMP7	183058E; 208241N	Approximately 340m southeast of boundary as shown in Figure 11.1. Country roadside location, close to existing NSR.
NMP8	181567E; 208256N	Approximately 645m southwest of boundary as shown in Figure 11.1. Country roadside location, close to existing NSR.

Photographs of each monitoring location are contained in Appendix 11.1.

Ambient monitoring was conducted during the day, evening and night - time periods at the unattended locations, NMP1 – NMP4.

Attended measurements, conducted at NMP5 – 8 were completed during daytime hours to gain a comprehensive understanding of the soundscape present.

The parameters measured at both attended and unattended locations included L_{Aeq}, L_{A90}, L_{A10}, L_{Amax} and L_{Amin}. 1/3 octave band data was also recorded. Three unattended SLMs was set to record in continuously over 15-minute intervals. One SLM, located at NMP1, was set to record continuously. The data was then post-processed into 15-minute intervals using dedicated Nti Noise Explorer software v. 2.2. Survey personnel noted all primary noise sources contributing to the ambient sound environment during the set-up and collection of the meter at unattended locations and during attended measurements.

Overall weather conditions prevailing during the surveys were suitable for noise monitoring. Data from unattended monitoring at NMP3 and NMP4 was discarded for the period extending from 16.00 – 21.00hrs on the 25 April 2024 due to rainfall. Weather data from the nearby Met Eireann stations at Gurteens Co. Tipperary and Rathruddy West, Loughrea, Co. Galway was reviewed. Temperatures ranged from 2 – 16 ^{o}C. Lowest temperatures occurred during the night-time.

Windspeeds were on average below 5 m/sec with lower windspeeds occurring during the night-time period when calm conditions prevailed. Occasional short periods (<1hr) were noted each day where speeds up to 5.8 m/sec occurred. Wind direction was mainly from the north/northwest.

11.2.1.1 Equipment

Sound measurement was carried out using Type 1 SLMs and associated equipment (calibrators, tripods, outdoor kit etc) and software. The meters were placed in open areas >3.5m from reflecting surfaces and a minimum of 1.2m above ground level at all locations. The microphones were placed at approx. 4m high at NMP1, NMP2 and NMP3 as these NSRs are either two-storey dwellings or dormer style bungalows. The microphones were calibrated before and after use at each location. The observed drift during measurement was within acceptable limits. The sound levels were measured using the A-weighted network, and a fast-sampling interval. Wind speed during attended measurements was measured using a portable anemometer. Further details of the monitoring equipment used are set out in Table 11.2 below.

Table 11.2 Monitoring Equipment

Manufacturer	Model Number	Serial Number
Sound Level Meters		
Nti	XL2-TA	A2A-16311-E0 A2A-08898-E0
Cirrus	CR171C	G303805, G300784, G080561
Calibrators		
Larson Davis	CAL200	16757,1178
Bruel & Kjaer	4231	1795641

11.2.2 DESK-BASED STUDY

Road traffic noise mapping in accordance with the requirements of the Environmental Noise Directive 2002/49/EC and available on the EPA Mapping Website https://gis.epa.ie/EPAMaps/ was reviewed as part of the characterisation of the baseline soundscape. No roads are mapped in the immediate vicinity of the site or NSRs.

11.2.3 IMPACT ASSESSMENT

The EPA document entitled Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022 contains general guidance on the assessing of environmental effects in terms of quality, significance, duration, magnitude and type. This document has been considered where appropriate in defining noise and vibration impacts, however the following guidance and standards form the main basis for setting of suitable noise and vibration criteria and assessment of impacts and effects on human beings related to noise:

11.2.3.1 Short-term Construction Phase:

- BS5228-1:2009 +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 1: Noise and Part 2: Vibration;
- BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration;
- BS6472-1:2008: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting;
- UK Highways Agency Design Manual for Roads and Bridges, Sustainability and Environmental Appraisal, LA11, Noise and Vibration, Rev 2, May 2020;
- Transport Infrastructure Ireland (TII) publication Guidelines for the Treatment of Noise & Vibration in National Road Schemes, March 2014, and,
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Rev1, TII, (formerly National Roads Authority (NRA)), October 2004.

11.2.3.2 Long-Term Operational Phase:

The proposed OCGT units will require licensing by the EPA. Therefore, noise limits and conditions will apply to this element of the proposal. The latest edition of NG4 was followed in the determination of suitable limits and assessment of the long-term impact:

- The EPA Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities, (NG4), revised January 2016.

In addition, BS4142:2014+A1:2019 was applied to assess the impact of noise emission. BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound uses outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

In simple terms, this method relies on comparing the specific noise level from an activity (including penalties for characteristics such as tonality to determine a rating level), to existing background noise levels to determine the impact magnitude or change in noise levels. However, the assessor must also take account of the context in which the change occurs to determine the significance of the change. Context can include other extraneous sources present, frequency of occurrence of the specific noise, absolute level of sound etc.

The following is noted in Clause 11 of BS4142 with regards to the assessment of impacts:

> *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

The following is noted with regards to the initial estimate of magnitude of impact, i.e. where the measured background is subtracted from the rating level:

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on context.
- A difference of around +5 dB is likely to be an indication of an adverse impact depending on context.

- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on context.

11.2.3.3 Noise Model

Predicted noise levels at the nearest NSRs as a result of the likely future operations of the proposed developments were calculated both separately and cumulatively in accordance with the requirements of ISO 9613-2-1996 - Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

DGMR iNoise 2024, a proprietary noise calculation software package, loaded with ISO9613-2-1996, was used to predict free-field noise levels at the façade of the nearest NSRs.

ISO 9613 calculates the equivalent continuous downwind octave band sound pressure level at a receiver point using the equation:

$L_{ft(}DW)-L_w+D_c-A$

Where:

L_w is the octave band sound power level, in decibels produced by the point sound source relative to a reference sound power of 1 picowatt;

DW means downwind.

D_c is the directivity correction, in decibels, that describes the extent by which the equivalent continuous sound pressure level from the point sound source deviates in a specified direction from the level of an omnidirectional point sound source producing sound power level L_w; D_c equals the directivity index D_1 of the point sound source plus an index D_Ω that accounts for sound propagation into solid angles less than 4Π steradians; for an omnidirectional point sound source radiating into free space D_c= 0dB.

A is the octave band attenuation, in decibels, that occurs during propagation from the point sound source to the receiver.

The attenuation term A in the above equation is given by the following:

$A=A_{div} +A_{atm} +A_{gr} +A_{bar} +A_{misc}$

A_{div} is the attenuation due to geometrical divergence.

A_{atm} is the attenuation due to atmospheric absorption.

A_{gr} is the attenuation due to the ground effect.

A_{bar} is the attenuation due to a barrier.

A_{misc} is the attenuation due to miscellaneous other effects (details in Annex A of the standard and include foliage).

General methods for calculating the first four terms in the above equation are specified in the standard.

The effects of meteorological conditions are simplified in the standard to calculate downwind sound pressure at receivers under the following conditions:

Wind direction at an angle of ±45° to the direction connecting the centre of the dominant noise sound source and the centre of the receiver region, with the wind blowing from source to receiver, and,

Wind speeds range 1-5m/sec, measured at a height of 3-11m above ground.

The equations and calculations also hold for average propagation in scenarios such as moderate temperature inversions which can occur on cold calm nights.

The estimated accuracy associated with ISO9613 in the scenario modelled at Coolpowra is ±3dB.

The following assumptions and input data apply:

11.2.3.4 Input Layout:

A digital terrain model was inputted into the model to provide existing contours and height lines for the surrounding topography which undulates. The proposal was superimposed as a background map and developed in the model in 3D using heights elevations provided by the design team. During the site visits, details of NSR façades, building heights and any existing screening provided by barns etc. were noted.

Model Calculation Parameters:

The following atmospheric attenuation has been assumed for all calculations:

Table 11.3 Atmospheric Attenuation Assumed

Temp. ^0C	Humidity (%)	Air Pressure (kPa)	Frequency (Hz)								
			31	63	125	250	500	1k	2k	4k	8k
10	70	101.33	0.03	0.12	0.41	1.04	1.93	3.66	9.66	32.77	116.88
Air absorption dB/km											

Ground Factor = 1 for soft ground. Areas of hard ground were delineated where relevant in the model.

Meteorological Correction C_{met} = 0.5 due to distance to receivers and source height.

Further detail on the source sound power values inputted into the model are provided later in Section 11.4.2.

11.2.4 DEFINITIONS

The following definitions apply in this chapter:

- $\mathbf{L_{Aeq}}$ is the A – weighted equivalent continuous sound level – the sound level of a steady sound having the same energy as a fluctuating sound over a specified measurement period.
- $\mathbf{L_{A10}}$ is the A-weighted noise level which is exceeded for 10% of the specified measurement period. This gives an indication of the upper limit of fluctuating noise such as that from road traffic.
- $\mathbf{L_{A90}}$ is the A-weighted noise level exceeded for 90% of the measurement period and is useful in providing an indication of the background noise level experienced over the measurement period.
- $\mathbf{L_{AFmax}}$ is the maximum A-weighted noise level measured during a cycle with a fast time weighting.
- $\mathbf{L_{AFmin}}$ is the minimum A-weighted noise level measured during a cycle with a fast time weighting.
- $\mathbf{L_{ASmax}}$ is the maximum A-weighted noise level measured during a cycle with a slow time weighting.
- $\mathbf{L_{Ar,T}}$ The Rated Noise Level is equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and/or impulsiveness of the sound.
- $\mathbf{L_{den}}$ Day-evening-night level. It is a descriptor of noise level based on energy equivalent noise level (Leq) over a whole day with a penalty of 10 dB(A) for night-time noise (23.00-07.00) and an additional penalty of 5 dB(A) for evening noise (i.e.19.00-23.00).

- **L_{night}** Night equivalent level: Leq. A-weighted, Sound Level, measured overnight 23.00 – 07.00 hours.
- ***L_{ft}*(DW)** Predicted equivalent continuous downwind octave band sound pressure level in decibels. A-weighted.
- ***L_{Pa}*** Predicted equivalent continuous total downwind sound pressure level in decibels. A-weighted.
- **L_w** Sound power level is the sound power measured on a decibel scale. Sound power is the sound energy radiated per unit time by a sound source measured in watts. It is an absolute value associated with a sound source.
- **Residual sound** – ambient sound remaining at an assessment location when the specific sound source (source under assessment) is absent.
- **Rw** Weighted sound reduction index – a single number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies.
- **Specific sound source** – source under assessment.
- **Tonal** sounds are defined as sounds which cover a range of only a few Hz which contains a clearly audible tone, i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.

The "A" suffix denotes sound levels that have been "A-weighted" in order to account for the non-linear nature of human hearing to sounds of different frequencies. All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10-5 Pa.

11.3 DESCRIPTION OF RECEIVING ENVIRONMENT

11.3.1 SITE CONTEXT

The overall proposed development site lies approximately 550m east of the N65 and approximately 5km north of Portumna, Co. Galway. Accordingly, based on proximity to the N65, it does not fall within the specified criteria for defining 'quiet areas' as set out in NG4.

The site and surrounding lands are mainly in agricultural use with detached residential dwellings located off local roads. The Oldstreet 400kV station lies 20m north of the site boundary. The main noise sources in the area are road traffic on the N65 national route, a distinctive sound from the Oldstreet substation transformers and typical rural intermittent noise sources.

The N65 is a busy route between the M6 to the northwest and the M7 to the south via the N52. During the site visits and attended measurements, road traffic noise from the N65 was noted as frequently intermittent in nature. The influence of road traffic noise reduces further west of the site and was not audible at NMPs 1,3 and 8 to the west. The typical noise from transformers was audible from the Oldstreet sub-station and was noted as present at NMP1 and 3. Overall, the site and surrounding lands comprise a typical rural soundscape. Wind speed and direction is likely to influence traffic and transformer propagation.

The nearest NSRs to the overall proposed development site (within approximately 1km of the site centre) are existing detached dwellings (NSR 1, 2 and 3) (Refer to Figure 11.2) to the west of the site (NMP1 on Figure 11.1). NSRs lie to the north, south, east and west. The nearest NSRs within approximately 1km of the site centre are listed below in Table 11.4. A total of 40 NSRs have been identified.

Table 11.4 Nearest NSRs

No.	Grid Ref.	Description
1	181723E, 208821N	2-storey dwelling. In cluster with NSR2 and 3 plus surrounding farm buildings.
2	181700E, 208807	1-storey bungalow. Location of NMP1.
3	181702E, 208880N	2-storey vernacular type cottage with 1 storey extension
4	181538E, 208653N	1-storey bungalow
5	181766E, 208254N	2-storey house
6	181965E, 208066N	Dormer style bungalow with height. Location of NMP3.
7	182032E, 208082N	1-storey bungalow
8	181674E, 208194N	2-storey house
9	181499E, 208092N	1-storey vernacular cottage with outbuildings. Roadside entrance is location of NMP8.
10	181448E, 208274N	2-storey house
11	181382E, 208314N	2-storey house
12	181294E, 208371N	1-storey bungalow
13	181264E, 208385N	1-storey bungalow
14	181357E, 208829N	Building under construction. 2-storey level applied in model.
15	181257E, 208812N	1-storey bungalow
16	181220E, 208787N	2-storey vernacular type cottage
17	181244E, 208737	1-storey vernacular type cottage

No.	Grid Ref.	Description
18	181127E, 208733N	1-storey bungalow
20	181761E, 207901N	1-storey bungalow
21	181970E, 207925N	Split level type 2- storey house
22	182010E, 207934N	Vernacular 2-storey. (may not be occupied).
23	183096E 208251N	1-storey bungalow. Derelict 2-storey also present. Location of NMP7.
24	183342E, 208281N	1-storey cottage/bungalow L-shaped
25	183220E, 208455N	1-storey bungalow (elevated on ridge)
26	183111E 208593N	1-storey vernacular type farmhouse with outbuildings
28	183368E, 208996N	1-storey bungalow
29	183340E, 208980N	2-storey house
30	183313E, 208964N	2-storey house
31	183280E, 208944N	2-storey house
32	183390E, 208920N	2-storey house
33	183483E, 209010N	1-storey cottage (under renovation)
34	183455E, 209023N	Dormer Bungalow. Location of NMP2.
35	183404E, 209032N	1-storey bungalow
36	183377E, 209058N	1-storey bungalow
37	182344E, 209691N	2-storey house, attached to derelict buildings. Unoccupied at present. In dip from local road.
38	182332E, 209705N	1-storey bungalow. Close to NMP5.
39	181763E, 209649N	1-storey vernacular cottage with extension and adjacent sheds and farm buildings. Location of NMP4.
40	182020E, 209621N	Dormer style bungalow/vernacular type dwelling with farm buildings.
41	182080E 209596N	1-storey vernacular cottage with surrounding farm buildings.
42	181796E 210010N	Dormer bungalow

Note:
No. 19 is not included as it was incorrectly identified as a potential NSR – following ground truthing No. 19 was removed.
The numbering matches the numbering used in the noise model to avoid confusion. No. 27 is excluded as it under the ownership of the applicant company (CPFL)

Figure 11.2 Noise Sensitive Receptor Locations

11.3.2 AMBIENT SOUND SURVEY SUMMARY RESULTS

Table 11.8 below present the summary results for unattended measurements at monitoring points NMP1- NMP4.

Table 11.9 outlines the summary findings of the shorter attended monitoring completed at NMPs 5 – 8.

More comprehensive logged field data for each individual 15-minute interval is contained in Appendix 11.2. The data in Appendix 11.2 is provided for each 15-minute interval as $L_{Aeq,15min}$, L_{Amax} and percentiles. L_{n3} is $L_{A10,\ 15min}$ while L_{n5} is $L_{A90,15min}$ for the data from the Cirrus meters.

Table 11.5 Summary Results NMP1

L_{Aeq}	Range			Description of Ambient Noise Environment
	L_{A10}	L_{A90}[45]	L_{AFmax}	
Daytime (07.00 – 19.00 hrs)				
55	38-73	37[1] 36, 29-43	51-84	Typical rural sources audible. L_{Amax} values due to passing tractors and lawnmower operated close to meter. Energy at 100 and 315 Hz noted from the Oldstreet substation. Audible but mostly masked during the daytime.
Evening time (19.00 – 23.00 hrs)				
43	32-55	32[1] 34, 26-38	41-73	Lawnmower or chainsaw type machinery operating on evening of 22/4/24. Continuous energy at 315Hz, masked at times but identified as an intermittent tone when other sources reduced.
Night-time (23.00 – 07.00 hrs)				
45	31-64	29[1] 27, 24-42	38-76	Tone at 315Hz more continuous during early hours as other sources receded. Some animal sounds including dogs barking which contributed to peaks. Dawn chorus started around 05.00hrs and was at maximum at approx. 05.45 hrs. Tonal-like energy also present at 100Hz but below the threshold of audibility for this frequency.

Table 11.6 Summary Results NMP2

L_{Aeq}	Range			Description of Ambient Noise Environment
	L_{A10}	L_{A90}[1]	L_{Amax}	
Daytime (07.00 – 19.00 hrs)				
54	51-71	41[1] 42, 36 - 48	57-88	Intermittent passing traffic on N65 audible. Otherwise, typical rural sounds.
Evening time (19.00 – 23.00 hrs)				
50	33-60	30[1] 30, 20*-43	56-82	Intermittent passing traffic on N65 audible. Otherwise typical rural sounds.
Night-time (23.00 – 07.00 hrs)				
51	21-64	29[1] 20*, 20* - 48	32 - 71	Very occasional intermittent passing traffic on N65 audible during early and late-night period. Otherwise, typical rural sounds. Dawn chorus as per NMP1.

**Min value that Cirrus software will calculate for $L_{A90,15min}$. Lowest values within these 15-minute intervals were 17 – 18 dB*

Table 11.7 Summary Results NMP3

L_{Aeq}	Range			Description of Ambient Noise Environment
	L_{A10}	L_{A90}[1]	L_{Amax}	
Daytime (07.00 – 19.00 hrs)				
50	41-72	35[1] 37, 29-49	50-93	Occasional passing car on local road. Typical rural sounds. Chainsaw in operation resulted in high

[45] NG4 requires that the average background noise levels for a specific period is calculated as the arithmetic average of the measured $L_{AF90,15min}$ values during the relevant period to determine if an area is defined as low background. The values in Tables 10.5 to 10.8 for L_{A90} are presented as arithmetic means with a modal value and range also presented.

L_{Aeq}	Range			Description of Ambient Noise Environment
	L_{A10}	L_{A90}[1]	L_{Amax}	
				LAmax value recorded. Substation noise at 315Hz was just audible during the daytime visit.
Evening time (19.00 – 23.00 hrs)				
44	32-59	32[1] 35, 25-41	42-75	Results indicative of quiet rural location.
Night-time (23.00 – 07.00 hrs)				
39	21-50	26[1] 25,20*-41	33-68	Results indicative of quiet rural location. Dawn chorus as per NMP1.

Min value that Cirrus software will calculate for $L_{A90,15min}$. Lowest values within these 15-minute intervals were 17 – 18 dB

Table 11.8 Summary Results NMP4

L_{Aeq}	Range			Description of Ambient Noise Environment
	L_{A10}	L_{A90}[1]	L_{Amax}	
Daytime (07.00 – 19.00 hrs)				
48	38-64	32[1] 32, 27-45	49-83	Quiet with typical rural sounds noted during the daytime.
Evening time (19.00 – 23.00 hrs)				
39	27-52	28[1] 28, 24-32	27-52	Results indicative of quiet rural location.
Night-time (23.00 – 07.00 hrs)				
41	25-56	30[1] 23,22-39	28-68	Results indicative of quiet rural location. Dawn chorus as per NMP1.

The results for continuous unattended monitoring at NMP1, 3 and 4 indicate that the majority of the nearest NSRs are in an area of low background noise as defined in Section 4.4.2 of NG4 as follows:

- Average Daytime Background Noise Level ≤ 40dB L_{AF90}, and;
- Average Evening Background Noise Level ≤ 35dB L_{AF90}, and;
- Average Night-time Background Noise Level ≤ 30dB L_{AF90}.

NMP2 did not satisfy all three criteria as the arithmetic average daytime background noise level (L_{AF90}) was ≥ 40dB. However, some of the lowest values for night-time background levels were recorded at this location. Noise levels at NMP1 were influenced by a continuous source located at the substation, which was objectively identified as tonal at times at 315Hz. Hence background values were elevated due to this source although noise levels were still below the average background noise threshold levels used to determine if an area is of low background noise during the day, evening and night.

The summary results for short-term attended measurements at other NMPs during the daytime hours are presented in Table 11.9 below.

Table 11.9 Summary Results for NMPs 5 - 8

No.	Range				Description of Ambient Noise Environment
	$L_{Aeq,15min}$	$L_{A10,15min}$	$L_{A90,15min}$	L_{AFmax}	
5	46-53	49-55	34-35	66-77	Traffic on N65 audible as frequently intermittent and distant. Individual passing cars elevated LAeq for 2 measurements. Animals sounds including dogs barking to northeast. Occasional overhead planes.
6	41-42	43-45	33-34	59-63	Traffic on N65 audible as frequently intermittent and distant. Occasional overhead planes accounted for LAmax values recorded.
7	44-52	42-44	31-33	69-77	Traffic on N65 audible as frequently intermittent and distant. Individual passing vehicles elevated LAeq for 2 measurements. Water pump in adjacent building on intermittently.
8	41-52	45-48	30-31	56-80	No road traffic audible from N65. 1 passing tractor. Mainly birdsong. Some distant heavy equipment in use to the northeast.

The attended measurements provide a snapshot of daytime ambient sound levels in the general vicinity of the proposed site. Overall results of short-term attended monitoring support the conclusion from the longer-term unattended monitoring that the area has low background noise levels.

11.3.3 VIBRATION

No existing sources of vibration were noted during the site visits.

11.4 ASSESSMENT OF POTENTIAL ENVIROMENTAL EFFECTS

As noted elsewhere in more detail in this EIAR, the proposed development includes three separate projects requiring assessment and these are described as follows:

11.4.1 PROJECT 1

- Proposed Reserve Gas-Fired Generator comprising three open-cycle gas-fired generators (OCGT) units located within a turbine hall accompanied by auxiliary equipment. Secondary fuel, (gas oil) will be stored in a bunded structure outside the turbine hall alongside cooling equipment and other electrical plant items (e.g.

transformers). The Reserve Gas-Fired Generator will include an above ground installation (AGI) compound.

- Due to the low background noise levels, the OCGT units will be contained within a turbine hall/building with high levels of noise insulation typically up to an Rw value > 50 dB. Therefore, noise from equipment located within the building is not expected to significantly contribute to predicted noise levels at NSRs.
- The main noise sources potentially impacting on NSRs are external and include the stack outlets, air intakes, coolers and transformers. Abatement has been considered in the initial design due to the low background noise levels and includes low noise coolers and a barrier. Indicative values for abated stack emission noise that typically can be achieved has been provided by the technology providers.
- The plant will operate intermittently as a peaking plant as and when required by the electricity transmission system operator.

11.4.2 PROJECT 2:

- Proposed Energy Storage System (ESS) which includes (i) a long duration energy storage (LDES) battery (200MW) positioned in an outdoor compound and (ii) a Synchronous Condenser (400MVA electrical rating) positioned in a building.
- The main noise sources potentially impacting on NSRs include external transformers and inverters. Most equipment will be housed in the Synchronous Condenser building.

11.4.3 PROJECT 3:

- Proposed 4000kV Gas Insulated Switchgear (GIS) electrical substation comprising a 2-storey building. The proposed GIS will upgrade and enhancement of the existing air insulated switchgear (AIS) substation at Oldstreet. The GIS substation will facilitate connection of the Reserve Gas Fired Generator (Project 1) and ESS (Project 3) on the existing node of the transmission network thereby securing energy supply into the future.

11.4.4 ASSOCIATED PROJECT:

- It is proposed that an underground gas pipeline is extended from the existing natural gas transmission system network to serve Project 1. This pipeline will be directed to the proposed AGI at the development site from the nearest connection point on the gas transmission network, approximately 25km to the northwest. Three indicative route options A, B and C are assessed in this chapter.

The underground pipeline project is assessed as part of Project 1. Each project is assessed separately and then cumulatively for both short-term construction and site development impacts and effects and also long-term operational impacts and effects on human beings in terms of noise and vibration.

11.4.5 SHORT TERM SITE DEVELOPMENT & CONSTRUCTION PHASE

The site development and construction phases for each project can potentially give rise to temporary significant noise and vibration impact and effects at the nearest NSRs through the use of mobile and non-mobile heavy machinery and equipment. The following sections address the short-term noise and vibration impact assessments including recognised criteria applied to site development and construction phase noise and vibration.

11.4.5.1 Noise

11.4.5.1.1 Applicable Construction Noise Criteria

There is no definitive published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project.

BS5228:2009 + A1:2014: *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise* describes applicable noise level thresholds not to be exceeded at noise sensitive receptors, depending upon existing ambient levels, as described in Table 11.10 below. This table is based upon report E3.2, Table E.1 of BS5228:2009 + A1:2014 Part 1.

Table 11.10 Threshold of Significant Effect at Dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00-07:00)	45	50	55
Evening and Weekends	55	60	65
Daytime (07:00-19:00) and Saturday (07:00-13:00)	65	70	75
NOTE 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level. NOTE 2: If the ambient noise level exceeds the threshold values given, in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3dB due to construction activity. NOTE 3 Applied to residential receptors only.			

A) Cat A: Threshold values to use when ambient noise levels (rounded to nearest 5dB) are less than these values B) Cat B: Threshold values to use when ambient noise levels (rounded to the nearest 5dB) are the same as Cat A values C) Cat C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Cat A values D) 19:00-23:00 weekdays, 13:00-23:00 Saturday and 07:00-23:00 Sunday is deemed 'evening and weekend' period.

Category A daytime threshold value can be applied to NSRs in the area based on the ambient sound levels recorded during the baseline survey. The threshold values apply to the sum of both the ambient and construction noise levels.

In addition to the above, the following acceptable levels are described in the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2004 and 2014. These limits are applied during the construction of road infrastructure projects at the facades of NSRs:

Table 11.11 TII Indicative Levels for the Acceptability of Construction Noise

Day	Working Hours	Level dB ($L_{Aeq,1hr}$)	Level dB (L_{ASmax})
Mon-Fri	07.00 – 19.00	70	80
Mon-Fri	19.00 – 22.00	60*	65*
Saturday	08.00 – 16.30	65	75
Sundays & Bank Holidays	08.00 – 16.30	60*	65*

*Note *: Construction activity at these times, other than emergency works, will normally require specific permission from the local authority.*

Road projects are linear in nature and non-static in one location. Therefore, higher limits than those potentially derived from the used of BS5228 may be more acceptable. These limits may therefore also be applicable to the pipeline construction element and the proposed road upgrades at the junction of the N65/L8763.

There will be no requirement for night-time (23.00 -07.00 hrs) or evening (19.00 – 23.00 hrs) construction works.

Accordingly, based on current ambient sound levels and BS5228 methodology, the following construction noise threshold is proposed for NSRs arising from the construction of the main built elements (excluding the proposed pipeline construction and changes to road infrastructure close to the N65):

- 65 dB $L_{Aeq,1hr,}$ Mon-Fri (07.00 – 19.00hrs) and Sat (07.00 – 13.00 hrs).

Limits or threshold values are typically applied to control demolition and construction noise as it is temporary to short term in nature and will not have long-term effects on NSRs. BS5228-1 notes that a potentially significant negative effect will occur if the predicted construction noise level plus ambient at an NSR is equal to, or exceeds, the applicable threshold value. BS5228-1 also notes that factors such as the number of receptors affected, and the duration and character of the impact may need to be considered to determine if there is an actual significant effect.

The recently published UK LA111 similarly notes that the magnitude of impact is major if the construction noise impact is greater than or equal to the threshold value (from BS5228-1) +5dB e.g. ≥ 65+5 dB = 70 dB. A moderate impact magnitude is above or equal to the threshold value and below the threshold value +5 dB. Impacts of major and moderate magnitude are then considered to constitute a significant effect *depending* on duration.

In this regard, the standard notes that construction noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights;
- A total number of days exceeding 40 in any 6 consecutive months.

The following summary table applies with regards to magnitude of impact and construction noise level:

Table 11.12 Magnitude of Impact & Construction Noise Descriptors

Magnitude of Impact	Construction Noise Description
Major	Above or equal to threshold value +5 dB
Moderate	Above or equal to threshold value and below threshold value +5 dB
Minor	Above or equal to baseline and below threshold value

Magnitude of Impact	Construction Noise Description
Negligible	Below baseline.

LA111 also offers guidance on short-term construction related traffic noise as follows:

Table 11.13 Magnitude of Impact at NSRs for Construction Traffic

Magnitude of Impact	Increase in Baseline Noise Level of Closest Public Road Used for Construction Traffic (dB)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

11.4.5.1.2 Prediction of Site Development and Construction Phases Noise Impact

The duration of the overall proposed construction programme is approximately 20 - 28 months with an envisaged start date in October 2026 subject to planning consent. There are four main stages of development works. The stage with potential for the highest noise impact is Stage 1 (E&P) when large amounts of heavy earth moving equipment will be used. This stage will overlap for Projects 1 and 3 and to a lesser extent with Project 2 over a combined 8-month period. The second stage (C&S) will be last up to 13 months and will mostly overlap for all 3 projects. Refer to the earlier Chapter 2 for a more detailed description of the construction programme. The nearest NSRs to each Project area are listed in Table 11.14 below:

Table 11.14 Distance from NSRs to Construction Works

Project	Nearest NSRs	Distance (m)
1	NSRs 1-3 to west	325m to proposed western berm footprint and 400m from footprint of the Reserve Gas-fired Generator.
1	NSR38 to north of AGI	360m to AGI boundary.
2	Nearest NSRs grouped 28 – 36 to southeast.	630m from berm and 667m from compound.
2	NSR26 to south	597m from berm 683m from ESS compound.
2	NSR38 to north	485m north of ESS.
3	NSR40 to north	381m north of GIS compound boundary.

In addition to the main project areas, an access route will be constructed to the west off the L8763. The proposed route lies approximately 30m from NSR36, located in the group of NSRs (28 – 36) to the southeast close to the L8763/N65 junction. Accordingly, this element of development has the potential to have a greater short-term impact on ambient noise levels compared to the remaining elements of the project. For the purposes of this project is it considered as part of Project 1.

Project 1 Access Route

The proposed access road will be constructed initially and will provide access to the construction compound located at the southern site boundary. Typical stages of road construction include earthworks, laying of sub-base and base, paving and landscaping. However, it is likely that initially only earthworks and laying of base will be constructed for construction traffic access before completion later in the project programme for long-term access.

Equipment needs can include the following:

- Earthworks - excavators, crawler loaders, dozers, scrapers, dump trucks and motor graders.
- Aggregate (laying of sub and base layers) – truck delivery of aggregate, motor graders, crawler loaders, dump truck, dozer.
- Paving (later stage) – trucks delivery of asphalt mix, pavers and roller for compaction.

Table C.5. of BS5228 provides sound level data on equipment in use for road construction. As some of data in Table C.5. is provided only as an L_{Amax} values arising from vehicle pass-bys, other values are also used from Table C.2 on site preparation and Table C.4. on general site activities. Refer to below for source details used in the prediction of construction noise impact.

Table 11.15 Source Data Used for Construction Noise Impact

Source	Frequency (Hz)								SPL@ 10m
	63	125	250	500	1k	2k	4k	8k	
	dB(A)								
Earthworks									
Tracked Excavator	50	63	66	72	76	74	71	64	80
Tracked Excavator loading lorry	54	63	67	74	73	71	67	58	78
Articulated Dump Truck Tipping Fill	54	60	64	67	69	67	64	57	74
Spreading Aggregate									
Dozer Spreading Fill	56	68	67	72	78	77	71	61	82
Articulated Dump Truck Tipping Fill	54	60	64	67	69	67	64	57	74
Trenching									
Wheeled Excavator	46	50	53	67	63	63	58	52	70
Mini Tracked Excavator	45	55	57	56	59	59	55	47	65
Paving									
Asphalt paver and tipper lorry	52	61	63	69	71	70	63	55	76
Rolling and Compaction									
Vibratory Roller	64	66	64	69	70	66	60	53	75
Vibratory Compactor Asphalt	50	62	65	74	77	78	74	69	83

The proposed access route is a single carriageway and the footprint is small. It should therefore be noted that not all of the above equipment will be used or be in use at the same time for each stage. Due to logarithmic noise calculation methodology, predicted noise levels at NSRs will generally be as a result of the closest and/or noisiest piece of equipment for that activity.

The calculated noise levels at NSR36, using the data above from BS5228:1, based on the prediction methodology set out in ISO9613-:1996, are presented in Table 11.16 below for each phase during a typical 1-hour period and without mitigation. It is important to note that the construction process is subject to change e.g. through a tendering process. Therefore, with regards to prediction of construction noise at NSRs the following factors are relevant:

- The sound power ratings (or sound pressure levels at known distance) used in the assessment may vary from the ratings for the actual equipment chosen by the contractor and used on site;
- Depending on conditions encountered in real-time, different types of equipment may be chosen and the number of units may vary. Usage may also vary in terms of length of time operating or in terms of intensity, character and location.

The predicted values are conservative as only geometric divergence (attenuation with distance) is considered.

Table 11.16 Conservative Estimated Construction Noise at NSR36

NSR36		
Source & Assumptions	**Source Data from BS5228 $L_{Aeq,t}$ @10m**	**Predicted $L_{Aeq,1hour}$ (dB)**
Earthworks		
Tracked Excavator, 66% of time on @30m	80	69
Articulated Dump Truck, tipping fill, 20% of time on @60m	74	
Tracked excavator loading a lorry, 10% of time on @30m	78	
Spreading Aggregate		
Dozer spreading aggregate, 66% of time on @30m	82	72
Articulated Dump Truck, tipping fill, 20% of time on @30m	74	
Paving		
Asphalt paver and tipper lorry 66% of time on @30m	76	64
Rolling and Compaction		
Vibratory Compactor Asphalt 66% of time on @30m	83	71

As can be seen from Table 11.16, the TII acceptable limit of 70 dB ($L_{Aeq,1hr}$) may be exceeded at times by 2 dB during certain works associated with the road construction. The impact magnitude rating, based on the criteria in Table 11.12 is temporary moderate negative in the absence of mitigation. However, to determine if a significant effect will occur, the duration of the impact should be considered. The total construction of the road element will be short within the overall programme. However, each individual step will move away from NSR36 (and other NSRs within the cluster represented by NSR36 to the southeast) as road construction is linear in nature. Therefore, the duration will be temporary and typically will not be above the following:

- 10 or more days or nights in any 15 consecutive days or nights;
- A total number of days exceeding 40 in any 6 consecutive months.

Accordingly, a significant effect on any individual NSR arising from the proposed access road construction is not predicted to occur.

Project 1: E&P Stage

The E&P stage for Project 1 will mainly involve earthmoving/excavation works and the preparation of level surfaces for the berm, siting of the equipment and buildings. The excavation and stockpiling of soils and sub-soils presents one of the highest risks of construction noise impact as generally, the loudest machinery such as tracked excavators, lorries and dump trucks will be used during this period. Piling will not be required.

The nearest NSRs to the proposed western berm construction site are NSRs 1, 2 and 3 approximately 325m to the west. The calculated noise levels at NSRs1-3 are presented in Table 11.17 below for earthworks during a typical 1-hour period and without mitigation.

Table 11.17 Conservative Estimated Construction Noise at NSRs 1-3

NSRs 1-3		
Source & Assumptions	**Source Data from BS5228 LAeq,t @10m**	**Predicted $L_{Aeq,1hour}$ (dB)**
Earthworks		
2 No. Tracked Excavator, 66% of time on @325m	80	52
2 No. Tracked excavator loading a lorry, 10% of time on @325m	78	

As can be seen from Table 11.17, the threshold value of 65 dB ($L_{Aeq,1hr}$) and the existing baseline as measured at NMP1 will not be exceeded. The impact magnitude rating, based on Table 11.12 is therefore temporary negligible negative. Therefore, the effect is deemed to be insignificant.

Project 1 Pipeline Installation

Three indicative proposed gas pipeline routes are indicated as blue, green and yellow on Figure 1.2 in Chapter 1. The potential noise impacts and effects associated with the short-term excavation and installation of a connecting gas pipeline on each of these routes has been considered. In general, it can be stated that the routes are not located in close proximity to a large number of NSRs as they pass through agricultural land. From a noise perspective, there is little preference for one route over another.

As with the main earthworks, the pipeline route excavation will involve the use of an excavator to dig out trenches and refill material once the pipeline is laid. However, equipment is likely to be smaller as trench width is 1.5m. This element of the works is linear in nature therefore works will not be static in one location and will progress relatively quickly. In summary, elevated noise levels above existing ambient noise levels may occur at times however they will be very brief in nature. Additionally, the construction noise limits, as set out in Table 11.11, recognise the brief to temporary nature of construction works and therefore allow for higher permitted levels during this stage of development. Broad - based mitigation measures to minimise the impact of construction noise on the nearest NSRs and to ensure compliance with construction noise limits are set out later in Section 11.5.

Construction Phase Traffic

The estimated number of HGVs accessing the construction site is 30 per day or 60 trips. This is negligible in the context of existing traffic flows on the N65. However, during the 20-28-month construction period, these HGVs will access the site via the L8763 and the new access route, located 30m north of existing NSR36. The existing daytime ambient sound level during the daytime as measured at NMP2 is $L_{Aeq,12hr}$ 54 dB.

The noise level from construction HGVs on the access route has been estimated using a typical SEL value of 85 dB(A) for HGV pass-by at 5m. Up to 4 HGVs will pass by per hour. Therefore, the predicted noise level at NSR36 (30m distant) from construction traffic is $L_{Aeq,1hr}$ 41 dB. The combined noise level with the existing ambient is $L_{Aeq,1hr}$ 54 dB. The impact is therefore short-term negligible negative and the effect is deemed to be insignificant.

Project 2: ESS

Project 2 is expected to result in a lower estimated noise impact due to increased distance attenuation. The predicted impact is expected to be temporary negligible negative. Therefore, the effect is deemed to be insignificant.

Project 3: GIS

Similarly, Project 3 is expected to result in a lower estimated noise impact due to increased distance attenuation. The predicted impact is expected to be temporary negligible negative. Therefore, the effect is deemed to be insignificant.

11.4.5.2 Vibration

11.4.5.2.1 Applicable Vibration Criteria

Vibration impacts can typically potentially occur during demolition and construction phases of development particularly through the use of equipment such as rock breakers (transient), HGVs on uneven surfaces (transient) or piling (transient or continuous, depending on method employed). Vibration can affect both human beings and buildings. Humans are more sensitive to vibration stimuli although the risk of cosmetic or structural damage to buildings is the more usual concern for site development/ construction.

Guidance relevant to the protection of building structures is contained in the following documents:

- British Standard BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration, and;
- British Standard BS 5228: 2009+A1 2014: Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

Both standards contain similar guidance relating to building damage criteria. Table 11.18 below details the transient vibration guide values for cosmetic damage to buildings as set out in BS5228-2:

Table 11.18 Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 – 15 Hz	15 Hz and above
Reinforced or Framed Structures Industrial and Heavy Commercial Buildings	50mm/sec at 4 Hz and above	50mm/sec at 4 Hz and above
Unreinforced or Light-weight Structures Residential or Light Commercial Buildings	15mm/sec at 4Hz increasing to 20mm/sec at 20Hz	20mm/sec at 15Hz increasing to 50mm/sec at 40Hz

Note 1: Values Referred to are at the base of a building. Note 2: For Line 2, at frequencies below 4Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

The above values are for transient or intermittent vibrations which do not cause a resonant response in buildings. The criteria should be reduced by 50% for more sustained or continuous vibration which may occur during activities such as continuous piling methods which are not proposed as part of the works. The values should also be reduced by 50% for listed buildings although they may not necessarily be more vulnerable than new builds.

The following limits therefore apply for continuous vibrations:

- Light Buildings – 7.5mm/sec
- Heavy Buildings – 25mm/sec

BS7385-2 indicates that the probability of damage tends towards zero at a component PPV of 12.5 mm/sec.

The TII Guidelines (2004 & 2014) suggest that vibration levels should be limited to 8 mm/sec at frequencies of <10Hz, to 12.5 mm/sec at frequencies 10 – 50Hz and to 20 mm/sec at 50Hz and above.

BS5228-2 also provides the following range of vibration values and associated potential effects on humans:

Table 11.19 Vibration Criteria – Human Beings

Vibration Level mm/sec PPV	Effect
0.14	Vibration might just be perceptible in the most sensitive in the most sensitive situations for most vibration frequencies.
0.3	Vibration might just be perceptible in residential environments.
1	A vibration level of this magnitude is likely to cause complaint.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

As can be seen from Table 11.19 above, the limits for humans are much lower than for cosmetic damage to buildings.

Based on the intervening distance from NSRs to the three proposed projects footprints, it is highly unlikely that vibration impacts on human beings or buildings could occur during short-term construction phase.

There are no buildings of architectural heritage within the study area that require consideration.

The access route, proposed as part of Project 1, is however closer to existing NSRs (NSR36) at 30m.

No piling is proposed. Vibratory rollers will likely be used during the road construction and HGVs travelling on uneven surfaces can also generate transient vibrations. Rock-breakers may be used on occasion with potential transient vibrations generated.

Prediction of vibration levels at receptors is complex and dependent on several variables such as the excavation method, the nature of the used equipment, the properties of the subsoil, the heterogeneity of the soil deposit, the distance to the receptor and the dynamic characteristic of the adjacent structures. Therefore, limits or threshold criteria as set out in BS5228-2 are applied for buildings and humans.

BS5228-2 provides some historic data on vibration levels measured on sites from different types of piling equipment under specific conditions e.g. soil type, however there is no data for other types of equipment.

Taking account of the distances to nearby receptors and notwithstanding ground conditions present, it is not anticipated that the vibration criteria in Table 11.18 and Table 11.19 will be exceeded. Nevertheless, precautionary vibration monitoring at the boundary with receptors such as NR36 is proposed to ensure compliance with the limits or threshold values and will be included in the CEMP as a preventative measure.

11.4.6 LONG TERM OPERATIONAL PHASE

11.4.6.1 Noise

11.4.6.1.1 Project 1

As noted earlier, the majority of equipment will be housed within a turbine hall with a high level of sound insulation. Therefore, the main noise sources associated with Project 1 are the stack outlets, air intakes, cooling fans and transformers. The following noise source data was provided by the design team for prediction of the noise impact on existing ambient noise levels for Project 1.

Table 11.20 Noise Source Data

Source	Frequency (Hz)									Total L_{WA}
	31.5	63	125	250	500	1000	2000	4000	8000	
Gas Turbine Stack Outlet*	85	87	87	89	92	93	94	86	80	99
Filter-house Intake*	73	83	78	73	78	83	84	82	78	90
Cooling Unit	-	72	80	84	89	90	83	76	64	94
Transformer**	70	70	85	92	97	94	90	85	76	100
Transformer**	55	55	70	77	82	79	75	70	61	85

**: Directivity factors were assumed in the model for the stack outlets and filter house intakes. **: Transformer total energy over 1/1 octaves is derived from other transformer units as only an indicative total sound power value was provided for the transformers.*

The cooling fans proposed are quiet models due to the low background levels at the nearest NSRs. Similarly, the values for the stack outlet and filter intake are indicative of abated noise at source.

The following number of sources were modelled:

- 3 x stack outlets,
- 3 x air intakes;
- 3 x cooling units;
- 3 x transformers;
- 6 x step-up transformers.

The transformers are surrounded on 3 sides by fire walls up to 9.55m in height.

Pumps for the fire-fighting water and the back-up diesel generators were not modelled as these are not part of typical operations and will only be used during an emergency scenario.

The gas turbines and associated sources are expected to operate as a peaking plant, spending most of the time on stand-by. Therefore, they will only operate intermittently throughout the year when renewable sources are affected by climate such as low wind.

The predicted values at each NSR is provided in Table 11.21 below. The values range from 16 – 34 dB(A) and are below the night-time limit of 35 dB(A) for low background areas.

Table 11.21 Predicted Noise Levels at each NSR as a result of Project 1

Receptor No.	Receptor Height	Predicted Noise Level (dB(A))
1	4.0	33
2	1.5	29
3	3.0	33
4	1.5	26
5	4.0	26
6	1.5	21
7	1.5	24
8	4.0	25
9	1.5	21
10	4.0	23
11	4.0	23
12	1.5	22
13	1.5	22
14	4.0	28
15	1.5	25
16	3.0	24
17	1.5	24
18	1.5	16

Receptor No.	Receptor Height	Predicted Noise Level (dB(A))
20	1.5	22
21	4.0	25
22	3.0	23
23	1.5	21
24	1.5	21
25	1.5	22
26	1.5	24
28	1.5	29
29	4.0	26
30	4.0	27
31	4.0	28
32	4.0	27
33	1.5	28
34	4.0	26
35	1.5	29
36	1.5	29
37	4.0	33
38	1.5	29
39	1.5	27
40	1.5	30
41	1.5	34
42	4.0	30

The significance of the noise impact has been considered in accordance with BS4142:2014+A1:2019. The existing modal values for night-time background ($L_{A90,8hrs}$) range from 20 – 27 dB. Based on the predicted values for NSRs 1-3, 6, 34 and 39, where unattended monitoring took place, this indicates that the magnitude of impact during part of the night-time period may be +6 dB above existing background. The magnitude of impact indicates a likely adverse impact depending on context. However, it should be noted that the units will operate intermittently as a back-up and will be on standby most of the time. The times of operation may not be during the night-time and therefore may occur when higher background levels prevail. Therefore, an adverse impact is not expected to occur when the frequency of operation, *i.e. context,* is taken into consideration.

In summary, the predicted noise levels for all NSRs are likely to be below the following recommended day, evening and night-time noise limits for low background areas:

- Daytime (07:00 to 19:00hrs) – 45dB $L_{Ar,T}$;
- Evening (19:00 to 23:00hrs) – 40dB L_{ArT};
- Night-time (23:00 to 07:00hrs) – 35dB $L_{Aeq,T}$.

11.4.6.1.2 Project 2

Project 2 comprises the ESS (BESS and Synchronous Condenser technologies). Noise from battery enclosures is not considered significant sources and are therefore excluded. Noise from the MVPS (inverter) units have been modelled along with the main transformer (which is surrounded by a concrete wall for fire protection). The synchronous condenser and the majority of ancillary equipment will be housed within a building with a high level of sound insulation, so noise will be controlled and will not contribute to external levels. The model includes data for the main transformer located within the synchronous condenser compound.

Table 11.22 ESS Noise Source Data

Source	Frequency (Hz)									Total
	31.5	63	125	250	500	1000	2000	4000	8000	L_{WA}
MVPS*	66	72	83	79	85	90	83	79	84	93
Transformer*	70	70	85	92	97	94	90	85	76	100

**Total sound pressure level at 10m provided. 1/1 octave data derived from measurements at an existing facility.*
***: Transformer total energy over 1/1 octaves is derived from other transformer units as only an indicative total sound power value was provided for the LV transformers.*

Therefore, in terms of Project 2, the following number of sources were modelled:

- 55 x MVPS,
- 2 x transformers.

The predicted values at each NSR is provided in Table 11.23 below. The values range from 15 – 33 dB(A) and are therefore below the night-time limit of 35 dB(A) for low background areas.

Table 11.23 Predicted Noise Levels at each NSR as a result of Project 2

No.	Receptor Height	Predicted Noise Level (dB(A))
1	4.0	32
2	1.5	29
3	3.0	32
4	1.5	28
5	4.0	30
6	1.5	23
7	1.5	27
8	4.0	29
9	1.5	26
10	4.0	26
11	4.0	27
12	1.5	26
13	1.5	26
14	4.0	32
15	1.5	29
16	3.0	25
17	1.5	26
18	1.5	15
20	1.5	26
21	4.0	28
22	3.0	28
23	1.5	29
24	1.5	28
25	1.5	28
26	1.5	27
28	1.5	31
29	4.0	33
30	4.0	32
31	4.0	33
32	4.0	30
33	1.5	27
34	4.0	26
35	1.5	30
36	1.5	28
37	4.0	31
38	1.5	27
39	1.5	22
40	1.5	31
41	1.5	29
42	4.0	30

The significance of the noise impact has been considered in accordance with BS4142:2014+A1:2019. The existing modal values for night-time background ($L_{A90,8hrs}$) range from 20 – 27 dB. Based on the predicted values for NSRs 1-3, 6, 34 and 39 where unattended monitoring took place, this indicates that the magnitude of impact during part of the night-time period may be +6 dB above background. The magnitude of impact indicates a likely adverse impact depending on context. However, it should be noted that the units will operate intermittently as a back-up. The times of operation may not be during the night-time and therefore may occur when higher background levels occur. Therefore, an adverse impact is not expected to occur when the frequency of operation, *i.e. context,* is taken into consideration.

In summary, the predicted noise levels for all NSRs are likely to be below the following recommended day, evening and night-time noise limits for low background areas:

- Daytime (07:00 to 19:00hrs) – 45dB $L_{Ar,T}$;
- Evening (19:00 to 23:00hrs) – 40dB L_{ArT};
- Night-time (23:00 to 07:00hrs) – 35dB $L_{Aeq,T}$.

11.4.6.1.3 Project 3

Project 3 comprises the GIS substation which has no significant noise sources.

11.4.6.2 Vibration

The primary equipment used in Project 1 (and all projects) will be maintained and balanced in accordance with manufacturer's instructions. Combined with consideration of distance to receptors, operational phase vibration assessment will not be assessed further in this chapter.

11.5 MITIGATION MEASURES

11.5.1 SITE DEVELOPMENT AND CONSTRUCTION PHASES

The following noise and vibration management measures will apply to the proposed Development to ensure the daytime threshold values specified in this chapter are complied with:

- A Site Representative will be appointed for matters related to noise and vibration.
- Any complaints received will be thoroughly investigated.
- A written complaints log will be maintained by the Site Representative. This will, at a minimum, record complainant's details (where agreed) the date and time of the complaint, details of the complaint including where the effect was observed, corrective and preventative actions taken and any close-out communications. This will ensure that the concerns of local residents who may be affected by site activities are considered during the management of activities at the site.
- Specifically with regard to the access route construction potentially affecting NSRs to the southeast at the junction of the N65/L8763 the following measures apply:

    - Noise monitoring with capability for real-time review both on-site and remotely will be conducted at the boundary points when works are planned in close proximity.
    - In the event of meeting or exceedance of the threshold values at NSRs, works will be ceased and measures implemented immediately to ensure that the limits are complied with.
    - Temporary acoustic screening or hoarding will be placed along the boundaries where possible with the proposed access route and the nearest NSR; - NSR36. As a general rule of thumb, it is recommended that temporary screening break the "line of sight" from the sources to the lower windows of the nearest NSRs where possible.
    - The operation of certain pieces of equipment, where substitution, enclosure etc. cannot be carried out will be managed through monitoring and timing of use to ensure that noise levels remain below the threshold values/criteria specified.
    - As a precautionary measure and as part of good practice, vibration monitoring will be carried out where works such as the use of rollers are in close proximity to NSR36 and other NSRs in the cluster located at the N65/L8763 junction.
- Measures such as the use of low noise plant and/or the use of enclosures will be chosen to minimise construction noise impact.
- During the construction phase all equipment will be required to comply with noise limits set out in EC Directive 2000/14/EC and the 2005/88/EC amendment on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors. The directive covers equipment such as compressors, welding generators, excavators, dozers, loaders and dump trucks.

The outline CEMP submitted with this application will include the noise and vibration management measures listed above.

11.5.2 OPERATIONAL PHASE

Mitigation measures included in the design are listed as follows:

- Enclosure of main OCGT sources within a turbine hall with an Rw value >50 dB.
- Blast walls to 9.55m partially enclosing the LV transformers;
- 7m absorptive barrier to the south and west on the coolers;
- Reduction of stack emissions and air inlets to lower sound power levels based on technology providers experience on similar projects where technically feasible.

- Berms to 4.5m in height along the western, southern and eastern boundaries.
- Inverters facing inwards towards battery units.

The project will result in the upgrade of the existing Oldstreet sub-station. A tone at 315 Hz was noted during the baseline survey. It's expected that the source will be removed as part of the upgrade.

During operations, equipment will be serviced and maintained to ensure that noise levels do not inadvertently increase and to avoid the introduction of potential tones or impulsive noise.

The following, also stated in NG4, will be complied with:

- During daytime and evening periods rigorous efforts should be made to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured LAeq,T values to determine the appropriate rating level (LAr,T)
- During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any Noise Sensitive Location.
- In addition to the foregoing recommended licence limit values, the noise from the licensed facility shall not be so loud, so continuous, so repeated, of such duration or pitch and it should not occur at such times, as to give reasonable grounds for annoyance. In this regard, for contentious cases, an assessment by a competent person will be required.
- All reasonably practicable measures should be adopted at licensed facilities to minimise the noise impact of the activity, and BAT should be used in the selection and implementation of appropriate noise mitigation measures and controls.

11.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

As mitigation measures are precautionary and/or already included in the assessment, the residual impacts and effects are as described earlier in Sections 11.5.1 and 11.5.2.

11.7 CUMULATIVE EFFECTS

11.7.1 CONSTRUCTION PHASE

Potential construction impacts at NSRs are greatest within 40m of development works, after which they reduce as noise attenuates over distance. As addition of sources is logarithmic, the highest contributing sources i.e. generally those at close distances to NSRs predominate and tend to define the noise impact magnitude. The site preparation, earthworks and construction programmes for all 3 projects are expected to overlap at times. However, due to the distance to NSRs the cumulative impact is not expected to differ from individual impacts already described.

11.7.2 OPERATIONAL PHASE

The cumulative noise impact of all three projects is described in Table 11.24 below. The values range from 18 – 35 dB(A) and are therefore at or below the night-time limit of 35 dB(A) for low background areas.

Table 11.24 Predicted Noise Levels at each NSR for the proposed development (three projects)

No.	Receptor Height	Predicted Noise Level (dB(A))
1	4.0	35
2	1.5	32
3	3.0	35
4	1.5	30
5	4.0	31
6	1.5	25
7	1.5	29
8	4.0	30
9	1.5	27
10	4.0	28
11	4.0	28
12	1.5	27
13	1.5	27
14	4.0	33
15	1.5	30
16	3.0	27
17	1.5	28
18	1.5	18
20	1.5	28
21	4.0	29
22	3.0	29
23	1.5	30
24	1.5	28
25	1.5	29
26	1.5	28
28	1.5	33
29	4.0	34
30	4.0	26
31	4.0	34
32	4.0	32
33	1.5	30
34	4.0	29
35	1.5	32
36	1.5	30
37	4.0	35

No.	Receptor Height	Predicted Noise Level (dB(A))
38	1.5	31
39	1.5	28
40	1.5	33
41	1.5	35
42	4.0	33

The significance of the noise impact has been considered in accordance with BS4142:2014+A1:2019. The existing modal values for night-time background ($L_{A90,8hrs}$) range from 20 – 27 dB. Based on the predicted values for NSRs 1-3, 6, 34 and 39 where unattended monitoring took place, this indicates that the magnitude of impact during part of the night-time period may be +10 dB above background. The magnitude of impact indicates a likely significant adverse impact depending on context. However, it should be noted that the units will operate intermittently as a back-up (not continuous operation). The times of operation may not be during the night-time and therefore may occur when higher background levels occur. Therefore, an adverse impact is not expected to occur when the frequency of operation, *i.e. context,* is taken into consideration.

In summary, the predicted noise levels for all NSRs are likely to be below the following recommended day, evening and night-time noise limits for low background areas:

- Daytime (07:00 to 19:00hrs) – 45dB $L_{Ar,T}$;
- Evening (19:00 to 23:00hrs) – 40dB L_{ArT};
- Night-time (23:00 to 07:00hrs) – 35dB $L_{Aeq,T}$.

11.8 MONITORING & FURTHER WORKS

Real-time and continuous construction noise monitoring at locations representative of the closest NSRs shall be conducted throughout all development stages at the site boundaries to ensure that the relevant criteria are not exceeded.

A noise survey shall be completed during the commissioning phase for each project to ensure that the proposed limits are not exceeded and that conditions regarding tones and impulsive noise are complied with. Measures shall be implemented in the event that the limits and conditions are not complied with fully.

11.9 SUMMARY OF SIGNFICANT EFFECTS

11.9.1 SHORT-TERM CONSTRUCTION PHASE

No significant adverse effects are expected during the short-term construction phases of development, mainly due to distance attenuation between construction operations and NSRs. Where construction is close to NSRs e.g. development of the access route, this will be temporary in duration and therefore will not be significant.

11.9.2 LONG-TERM OPERATIONAL PHASE

No significant adverse effects are expected in the long-term taking account of the assumptions relating to source noise levels, mitigation measures developed in the project including enclosure of main sources and frequency of operation.

In summary, the predicted noise levels for all NSRs are likely to be below the following recommended day, evening and night-time noise limits for low background areas:

- Daytime (07:00 to 19:00hrs) – 45dB $L_{Ar,T}$;
- Evening (19:00 to 23:00hrs) – 40dB L_{ArT};
- Night-time (23:00 to 07:00hrs) – 35dB $L_{Aeq,T}$.

11.10 REFERENCES

- BS5228:2009 +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 1: Noise and Part 2: Vibration.
- BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.
- BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- BS6472-1:2008: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.
- BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings.
- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) as published by the Environmental Protection Agency in January 2016.
- ISO 1996 Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 1, Basic Quantities and Assessment Procedures (2016) and Part 2 Determination of Environmental Noise Levels (2017).
- ISO 9613.-2 – 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

- Transport Infrastructure Ireland (TII) publication Guidelines for the Treatment of Noise & Vibration in National Road Schemes, March 2014.
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Rev1, TII, (formerly National Roads Authority (NRA)), October 2004.
- UK Highways Agency Design Manual for Roads and Bridges, Sustainability and Environmental Appraisal, LA11, Noise and Vibration, Rev 2, May 2020.

12 LANDSCAPE & VISUAL

12.1 INTRODUCTION

This Landscape and Visual Assessment (LVIA) has been prepared to accompany a planning application for the development of grid connected energy support projects on lands with an area (redline boundary) of 42.1 hectares (ha) (104 acres) in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway.

This LVIA describes the landscape context of the proposed development and assesses the likely landscape and visual impacts of the scheme on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately.

- Landscape Impact Assessment (LIA) relates to assessing effects of a development on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.
- Visual Impact Assessment (VIA) relates to assessing effects of a 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 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).

12.1.1 APPROACH

This LVIA adopts an approach that is founded in the following best practice guidance documents:

- Landscape Institute and the Institute of Environmental Management and Assessment (IEMA) publication entitled Guidelines for Landscape and Visual Impact Assessment, 2013 (GLVIA3);
- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Statements (2022); and
- 'Photography and Photomontage in Landscape and Visual Impact Assessment', Landscape Institute Technical Guidance Note 06/2019.

12.1.2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Coolpowra Flex Gen Limited (CPFL) propose to develop a Reserve Gas-Fired Generator (Project 1), a grid-connected Energy Storage System (ESS) facility (Project 2) and a Gas Insulated Switchgear (GIS) Electricity Substation (Project 3) in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway. The development is considered of significant economic importance at both state and regional levels due to its strategic positioning on the 400kV transmission network. The proposed GIS substation (Project 3) will upgrade and enhance the existing AIS intermediate substation on the 400kV line at the Oldstreet node and will facilitate and provide for connection of the Reserve Gas-Fired Generator and Energy Storage System projects to the 400kV electricity network.

12.1.2.1 Project 1: Reserve Gas Fired Generator

The Reserve Gas Fired Generator comprises three open cycle gas-fired generator (OCGT) units positioned within a building (OCGT Hall) along with auxiliary equipment. An OCGT unit consists of a turbine connected to an electric power generator and the three turbines are designed to operate independently of each other. The OCGT units will receive natural gas from the gas network via an underground pipeline to an Above Ground Installation (AGI) compound within the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI.

The proposed OCGT units are dual fuel units as required by system requirements required by the Grid Code published by Eirgrid. Natural gas will be the primary and combustion fuel to each of the OCGT units when operating.

The indicative route for an associated gas pipeline has been considered as part of this assessment. This will commence at New Inn, just north of the M6 Motorway and approximately 23.5 km north-west of the development site. The pipeline will be established by Gas Networks Ireland (GNI) through a separate planning application, and this will complete a full assessment of the preferred route associated full assessment.

Secondary fuel (gas oil) will be stored in a bunded structure outside the OCGT building along with ancillary items of electrical plant and machinery such as coolers and transformers.

The Reserve Gas-Fired Generator is designed to operate intermittently and provide generation capacity during periods of high demand or when renewable energy generators cannot meet system demand.

12.1.2.2 Project 2: Energy Storage System (ESS)

The Energy Storage System (ESS) facility comprises (a) a Long Duration Energy Storage (LDES) static battery positioned within a secure outdoor compound, and (b) a Synchronous Condenser which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid.

Battery storage is a technology that enables power system operators and utilities to store energy for later use. A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed. A BESS facility is made up of batteries, a battery management system, a power conditioning system, and an energy management system. Sufficient separation distance between enclosures is included within the design to allow for safe access and replacement of modules. Each module will include control equipment, to provide for ventilation, air conditioning and fire suppression equipment. MVPS (or PCS) units and small transformers will also be positioned in self-contained weather-proof enclosures. At a system level, UL9540A[46] is the recognised test method for evaluating thermal runaway in battery storage systems that reduces the risk of a single cell event spreading to the rest of the system. The proposed development will comply with the UL9540A standard industry and other recognised best practice and in terms of fire management. The plant will absorb and inject energy as demanded by the power system. BESS plants are designed to economically and rapidly provide arbitrage and system support services when needed, allowing immediate system recovery.

Synchronous condenser technology has been around since the mid 1900's and is demonstrated and mature technology having been formerly used by utilities worldwide. The rotating generator is connected to the transmission system via a step-up transformer. The synchronous condenser is started up and stopped by a frequency controlled electric motor (pony motor). An inverter (static start device / startup frequency converter) is used to drive the generator to reach the operating speed and synchronises it with the system frequency. Once synchronised it acts as a motor providing reactive and short circuit power to the electricity network. There is no combustion or emissions from a synchronous condenser. The synchronous condenser will provide short-circuit power, inertia, and reactive power for dynamic loads and stabilise the network through voltage recovery

[46] https://www.ul.com/services/ul-9540a-test-method

during faults. The project is designed to complement and support the reserve gas fired generator by providing zero carbon, instantaneous and balancing power to the grid.

12.1.2.3 Project 3: Gas Insulated Switchgear (GIS) Electricity Substation

The Gas Insulated Switchgear (GIS) Electricity Substation comprises a two-storey building positioned and secured within a palisade fenced compound. This component of the overall development will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of Project 1 and Project 2 to the electricity transmission network. The HV lines and electric plant associated with Reserve Gas Fired Generator and ESS facility, and which will connect the projects to the GIS substation, are included with the planning application for Project 3. A full description of the proposed development is provided in Chapter 2 of this EIAR.

12.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

This document uses methodology as prescribed in the previously mentioned GLVIA3, which follows the European Landscape Convention (ELC) definition of landscape:

> *'Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (Council of Europe, 2000). Thus, GLVIA-2013 covers all landscapes from "high mountains and wild countryside to urban and fringe farmland (rural landscapes), marine and coastal landscapes (seascapes) and the landscapes of villages towns and cities (townscapes)" - whether protected or degraded.*

12.2.1 SCOPE OF THE ASSESSMENT

GLVIA3 establishes guidelines and not a specific methodology. The preface recognises that:

> *'This edition concentrates on principles and processes. It does not provide a detailed or formulaic 'recipe' that can be followed in every situation – it remains the responsibility of the professional to ensure that the approach and methodology adopted are appropriate to the task in hand.'*

The methodology for this assessment has therefore been developed specifically for this assessment to ensure that it is appropriate and fit for purpose. The LVIA Methodology can be summarised as undertaking the following key tasks:

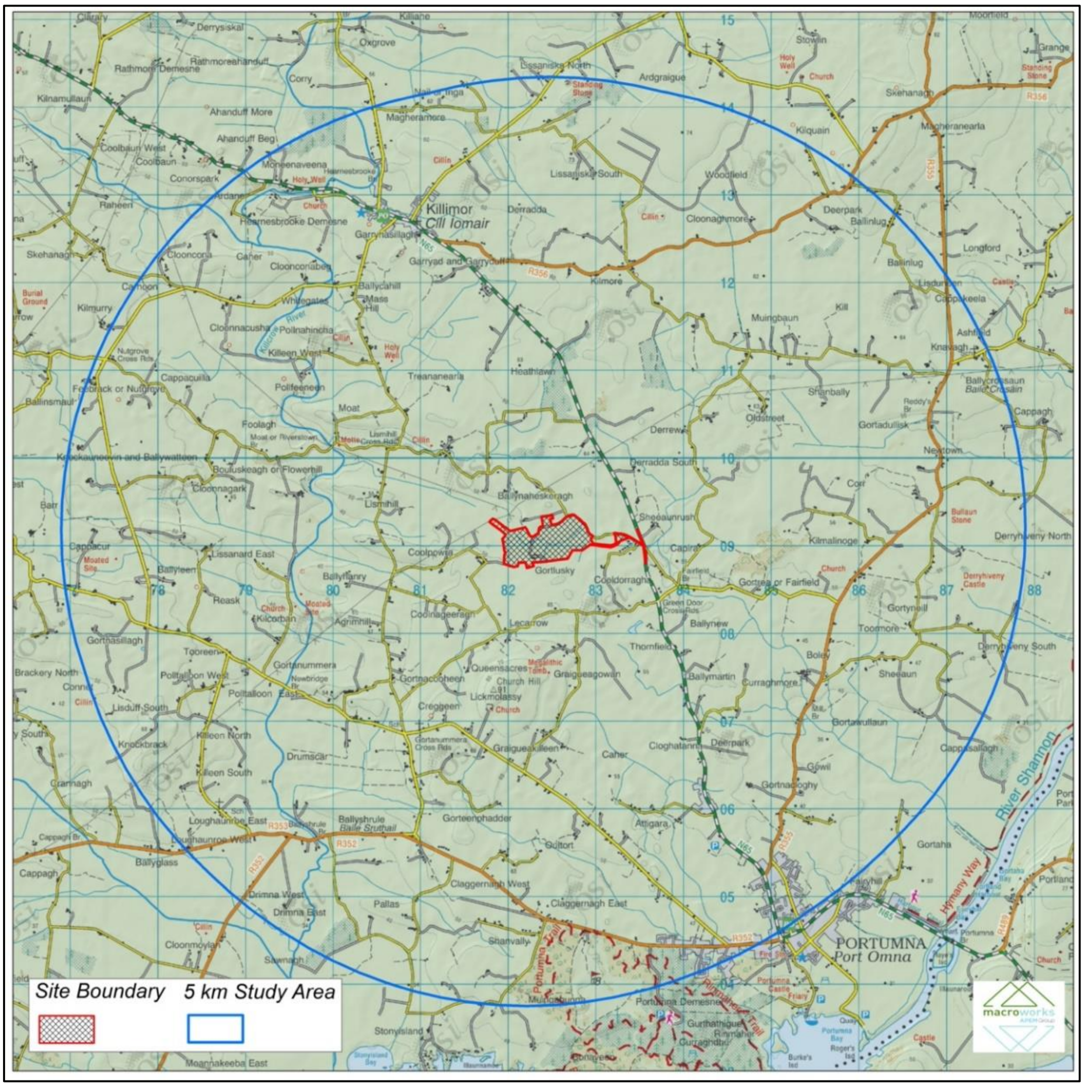
- Desk study and site visits in August 2023;
- Defining the Baseline Landscape setting and conditions;

- Identification and Evaluation of key components of the proposed development;
- Consideration of Mitigation Measures;
- Assessment of Landscape Effects;
- Assessment of Visual Effects; and
- Summary Statement of Significance.

12.2.2 STUDY AREA

From similar studies, it is anticipated that the proposed development is likely to be difficult to discern beyond approximately 5km due to the flat nature to low rolling nature of the study area and is not likely to give rise to significant landscape or visual impacts beyond approximately 2-3km. In the interests of a comprehensive appraisal, a 5km radius study area is used in this instance. However, there will be a particular focus on receptors contained within 2km, except where iconic or designated scenic viewpoints exist at greater distances out to 5km (refer to Figure 12.1).

Figure 12.1 5km Extent of the Study Area



12.2.3 LANDSCAPE IMPACT ASSESSMENT CRITERIA

This part of the LVIA provides an assessment of how the introduction of the proposed development will affect the physical features and fabric of the landscape, and then how the proposals influence landscape character with reference to published descriptions of character and an understanding of the contemporary character of the landscape as informed through desktop and site studies.

When assessing the potential landscape effects of the development, the value and sensitivity of the landscape receptor is weighed against the magnitude of impact to determine the significance of the landscape effect. Criteria outlined below are used to guide these judgements.

12.2.3.1 Landscape Sensitivity

The sensitivity of the landscape to change is the degree to which a particular setting can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics. In accordance with GLVIA3, the sensitivity of a landscape receptor (Landscape Character Area or feature) is derived from combining judgements in relation to its susceptibility to change and its value. The judgement reflects such factors as its quality, value, contribution to landscape character and the degree to which the particular element or characteristic can be replaced or substituted. Landscape Sensitivity is classified using the following criteria set out in Table 12.1

Table 12.1 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 (Area of Outstanding Natural Beauty), 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

Sensitivity	Description
	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 development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

12.2.4 MAGNITUDE OF CHANGE – LANDSCAPE

The magnitude of change is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed development and to a lesser extent the duration and reversibility of that effect. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the immediate setting that may have an effect on the landscape character. Table 12.2 outlines criteria used to inform this judgement.

Table 12.2 Magnitude of Change - Landscape

Criteria	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 extensive 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 a considerable 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 noticeable 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 that would lead to discernible changes in landscape character, and quality.
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 leading to no material change to landscape character, and quality.

12.2.5 VISUAL IMPACT ASSESSMENT CRITERIA

This part of the LVIA provides an assessment of how the introduction of the proposed development will affect views within the landscape. It therefore needs to consider:

- Direct impacts of the proposed development upon views through intrusion or obstruction;
- The reaction of viewers who may be affected, e.g. residents, walkers, road users; and
- The overall impact on visual amenity.

It has been deemed appropriate to structure the assessment around a series of representative viewpoint locations. All viewpoints are located within the public domain and are representative of views available from main thoroughfares and pedestrian areas within the vicinity of the proposed development. The selected viewpoints are considered to be comprehensive in communicating the variable nature of the visual effects.

When assessing the potential visual effects of the development, the sensitivity of the visual receptor is weighed against the magnitude of the visual impact to determine the significance of the visual effect. Criteria outlined below are used to guide these judgements.

12.2.5.1 Sensitivity of Visual Receptors

As with landscape sensitivity, the sensitivity of a visual receptor is categorised as Very High, High, Medium, Low, and Negligible. Unlike landscape sensitivity however, the sensitivity of visual receptors has an anthropocentric (human) basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity the viewer is engaged in and whether this heightens their awareness of the surrounding environment.

A list of the factors considered by the assessor in estimating the level of sensitivity for a particular visual receptor is outlined below to establish visual receptor sensitivity at each viewpoint location.

12.2.5.2 Susceptibility of Visual Receptors to Change

In accordance with GLVIA3, 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 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;
- Travellers 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;
- People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life”.

12.2.5.3 Values attached to views

The value attached to a view is determined by considering the following:

- Recognised scenic value of the view (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. These are likely to be in the form of Architectural Conservation Areas, which are incorporated within the Development Plan and 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 residential receptors. Even within a dynamic city context, views from residential properties are an important consideration in respect of residential amenity;
- 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 national or regional scale;
- Provision of vast, 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 those taking in the view of a busy street scene, for example;

- 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 / townscape feature such as a cathedral 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 special sense of wholeness and harmony at the viewing location;
- 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 higher sensitivity, and no relative importance is inferred by the order of listing.

It is recognised that a viewer’s interpretation and experience of the landscape can have preferential and subjective components. Where relevant, judgements are made on those elements of the landscape that are considered to contribute more prominently and positively to the visual landscape resource as well as those elements that contribute negatively. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

12.2.6 MAGNITUDE OF CHANGE – VISUAL

The magnitude of change is again a product of the scale, extent, or degree of change that is likely to be experienced as a result of the proposed development. This is directly influenced by its ‘visual presence / prominence’, as experienced by visual receptors in the landscape. These terms are somewhat quantitative in nature, and essentially relate to how noticeable or ‘dominant’ the proposal is within a particular view. Aside from the obvious influence of scale and distance, a development's visual presence is influenced by the extent and complexity of the view, contextual movement in the landscape, the nature of its backdrop, and its relationship with other focal points or prominent features within the view. It is often, though not always, expressed using one of the following terms: Minimal; Sub-dominant; Co-dominant; Dominant; Highly dominant. Criteria used to inform judgements are provided in Table 12.3.

Table 12.3 Magnitude of Change - Visual

Criteria	Description
Very High	Complete or very substantial change in view, dominant, involving complete or very substantial obstruction of existing view or complete change in character and composition of baseline, e.g., through removal of key elements.
High	A major change in the view that is highly prominent and has a strong influence on the overall view. This may involve the substantial obstruction of existing views or a complete change in character and composition of baseline, e.g. through removal of key elements or the introduction of new features that would heavily influence key elements.
Medium	Moderate change in view: which may involve partial obstruction of existing view or partial change in character and composition of baseline, i.e., pre-development view through the introduction of new elements or removal of existing elements. Change may be prominent but would not substantially alter scale and character of the surroundings and the wider setting. View character may be partially changed through the introduction of features which, though uncharacteristic, may not necessarily be visually discordant.
Low	Minor change in baseline, i.e. pre-development view - change would be distinguishable from the surroundings whilst composition and character would be similar to the pre change circumstances.
Negligible	Very slight change in baseline, i.e. pre-development view - change would be barely discernible. Composition and character of view substantially unaltered.

12.2.7 SIGNIFICANCE OF EFFECT

The significance of a landscape or visual effect is based on a balance between the sensitivity of the receptor and the magnitude of change, and is categorised as Profound, Substantial, Moderate, Slight, or Imperceptible. Intermediate judgements are also provided to enable an effect to be more accurately described where relevant. 'No Effect' may also be recorded as appropriate where the effect is so negligible it is not noteworthy.

The significance category judgement is arrived at using the Significance Matrix at Table 12.4 as a guide. This applies the principle of significance being a function of magnitude weighed against sensitivity but employs slightly different terminology that avoids the potentially confusing use of the term 'significant' (as recommended by GLVIA3 Statement of Clarification 1/13 (Landscape institute, 10 June 2013)). Indicative criteria descriptions used in relation to the significance of effect category are presented at Table 12.5.

Table 12.4 Significance Matrix

	Sensitivity of Receptor				
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

Table 12.5 Indicative significance of effect criteria descriptions

	Landscape	Visual
Profound	There are notable changes in landscape characteristics over an extensive area or a very intensive change over a more limited area.	The view is entirely altered, obscured or affected.
Substantial	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the landscape. There are notable changes in landscape characteristics over a substantial area or an intensive change over a more limited area.	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the visual environment. The proposal affects a large proportion of the overall visual composition, or views are so affected that they form a new element in the physical landscape.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. There are minor changes over some of the area or moderate changes in a localised area.	An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends. The proposal affects an appreciable segment of the overall visual composition, or there is an intrusion in the foreground of a view.
Slight	An effect which causes noticeable changes in the character of the landscape without affecting its sensitivities. There are minor changes over a small proportion of the area or moderate changes in a localised area or changes that are reparable over time.	An effect which causes noticeable changes in the character of the visual environment without affecting its sensitivities. The affected view forms only a small element in the overall visual composition or changes the view in a marginal manner.
Imperceptible	An effect capable of measurement but without noticeable consequences. There are no noticeable changes to landscape context, character or features.	An effect capable of measurement but without noticeable consequences. Although the development may be visible, it would be difficult to discern resulting in minimal change to views.

It is important that the likely effects of the proposals are transparently assessed and understood in order that the determining authority can bring a balanced, well-informed judgement to bear when making a planning decision.

As such, whilst the significance matrix and criteria provide a useful guide, the significance of an effect is ultimately determined by the landscape specialist using professional judgement, and also in the context of occasionally using hybrid judgements to account for nuance.

Effects assessed as 'Substantial' or greater (shaded cells) are considered to be the most notable in landscape and visual terms, and may be regarded as 'Significant', albeit it is important to note that this is not a reflection on their acceptability in planning terms.

12.2.8 QUALITY AND DURATION OF EFFECTS

In addition to assessing the significance of landscape and visual effects, the quality of the effects is also determined. Within this LVIA, effects are described as negative/adverse, neutral, or positive/beneficial, and the following criteria has been used to guide these judgements.

- Positive/beneficial - A change which improves the quality of the environment, enhancing the existing view/landscape;
- Neutral - No effects or effects that are imperceptible, within normal bounds of variation e.g. will neither detract from nor enhance the existing view/landscape;
- Negative/adverse - A change which reduces the quality of the environment, detracting from the existing view/landscape.

In the case of new energy / infrastructure developments within rural and semi-rural settings, the landscape and visual change brought about by an increased scale and intensity of built form is seldom considered to be positive / beneficial. Effects in these contexts are generally considered to be adverse in nature, or neutral, where the effect has little influence on the landscape/views.

12.3 DESCRIPTION OF RECEIVING ENVIRONMENT

12.3.1 LANDSCAPE AND VISUAL POLICY CONTEXT AND DESIGNATIONS - GALWAY CDP 2022-2028

The new landscape character assessment prepared for incorporation within the current Galway County Development Plan (CDP) 2022-2028 re-classifies and zones the landscape at three scales and then applies landscape sensitivity ratings.

Landscape Regions – a broad area of land with a distinctive character due to large-scale natural factors – such as mountains, plains, coasts etc.

Landscape Character Type – an area of land that has an appearance that is readily recognisable as being different and distinctive from other areas.

Landscape Character Unit – the smallest area of distinctive local features within a Landscape Type that can be practicably identified to assist in policy formulation.

As above, the landscape region is the largest scale which the County has been divided into. The proposed development is contained within the "Eastern Plains Region" with some of the more southern aspects of the study area contained within the "South Galway Region". The Eastern Plains "is underlain by younger, softer rocks. This derives most of its character from the covering blanket of glacial oils that give rise to extensive, level plains of grasslands, with many areas of bog in the north. " The Southern Galway Region is "where the Slieve Aughty Mountain's older, harder rock meet the younger, yielding geology of the Burren in the west and the Shannon basin in the east. The result is a collection of small landscapes which vary considerably as one travels from west to east."

The landscape regions of County Galway are then further divided into ten separate landscape types, of which, the proposed development is entirely contained within the *'Central Galway Complex Landscape'*, with both *the 'Shannon Environs Landscape'* type and the 'Slieve Aughty Landscape' situated in the wider periphery of the study area (refer to Figure 12.2). The most relevant *'Central Galway Complex Landscape'* is described as *"An extensive plain of grasslands comprising of medium-to-large fields with low enclosures and many areas of low stone walls used for field boundaries. It also includes distinctive features, including locally elevated feature. This area contains the majority of the county's population with associated high levels of urban generated rural housing, roads and settlements. These range from large to small settlements with associated infrastructure, services and commercial activity"*. In terms of significance and sensitivities, the current landscape assessment states that *"many areas have local sensitivities - often on account of local amenities or historic sites",* whilst the *"open countryside offers frequent extensive panoramic views from local high points".*

The landscape of County Galway is then subdivided into a further 30 geographically specific landscape units. The proposed development is contained within the 'Kilcrow Basin Unit' (Figure 12.3 refers), where the character is described as a "working landscape, locally elevated. Larger areas of bog and forestry. Elevated concentrations of settlements and infrastructure".

Section 4 of the landscape assessment for County Galway deals with the sensitivity of the receiving landscape. The sensitivity assessment states that the sensitivity of a particular area is dependent "on factors such as elevation, slope, as well as the types of land-cover and soil.". The assessment identifies four sensitivity definitions in County Galway as set out below;

- Iconic: Unique landscape with high sensitivity to change
- Special: High sensitivity to change
- High: Elevated sensitivity to change
- Low: Unlikely to be adversely affected by change

The proposed development and much of the study area associated with the 'Kilcrow Basin' landscape unit are classified with a *''Low'* landscape sensitivity (refer to Figure 12.4) highlighting the robust and settled nature of much of the surrounding landscape. Nonetheless, the southern and eastern periphery of the study area that is influenced by the lakeland landscape is classified with a 'special' landscape sensitivity classification.

In terms of landscape policy, the following policy objectives are relevant to the proposed development;

<u>Policy Objectives Landscape Conservation and Management</u>

- **LCM 1** Preservation of Landscape Character - Preserve and enhance the character of the landscape where, and to the extent that, in the opinion of the Planning Authority, the proper planning and sustainable development of the area requires it, including the preservation and enhancement, where possible of views and prospects and the amenities of places and features of natural beauty or interest.
- **LCM 2** Landscape Sensitivity Classification - The Planning Authority shall have regard to the landscape sensitivity classification of sites in the consideration of any significant development proposals and, where necessary, require a Landscape/Visual Impact Assessment to accompany such proposals. This shall be balanced against the need to develop key strategic infrastructure to meet the strategic aims of the plan.

Figure 12.2 Excerpt from the Galway CDP – Appendix 4 Landscape Character Assessment, showing the approximate location of the proposed development in relation to landscape character types

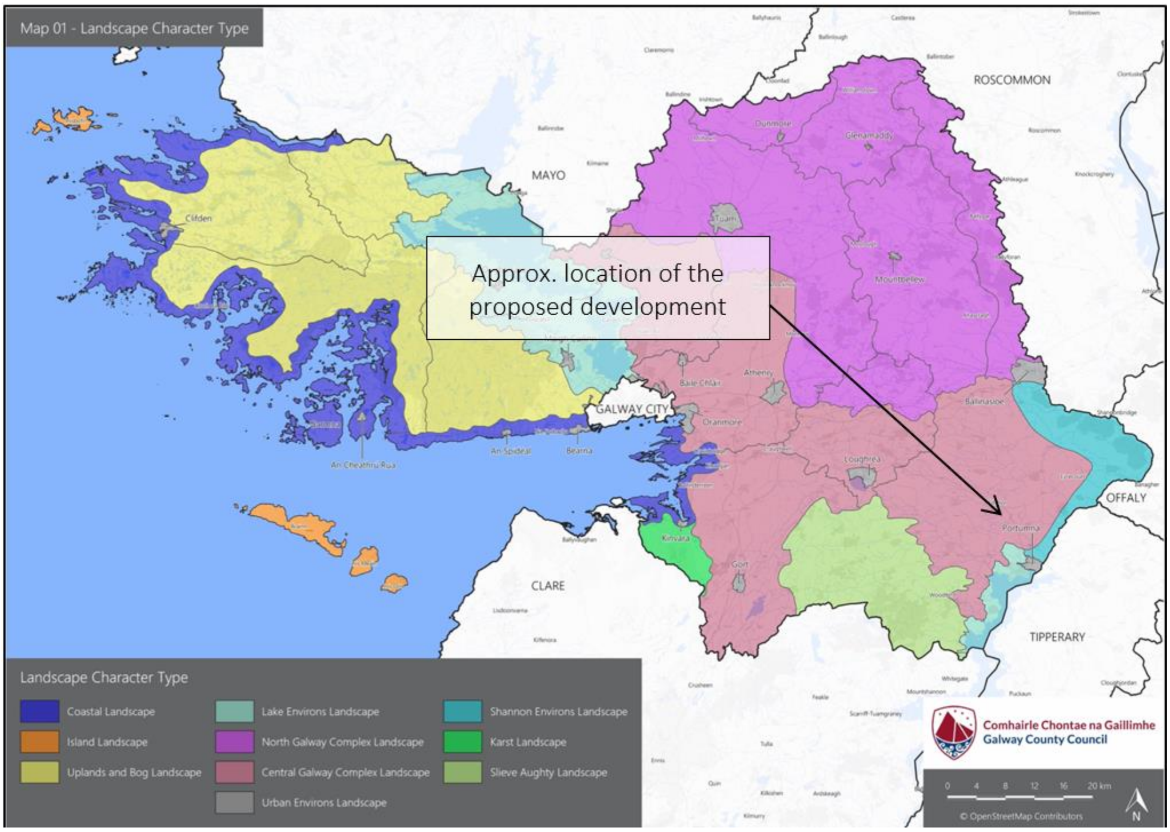


Figure 12.3 Excerpt from the Galway CDP – Appendix 4 Landscape Character Assessment, showing the approximate location of the proposed development in relation to landscape units

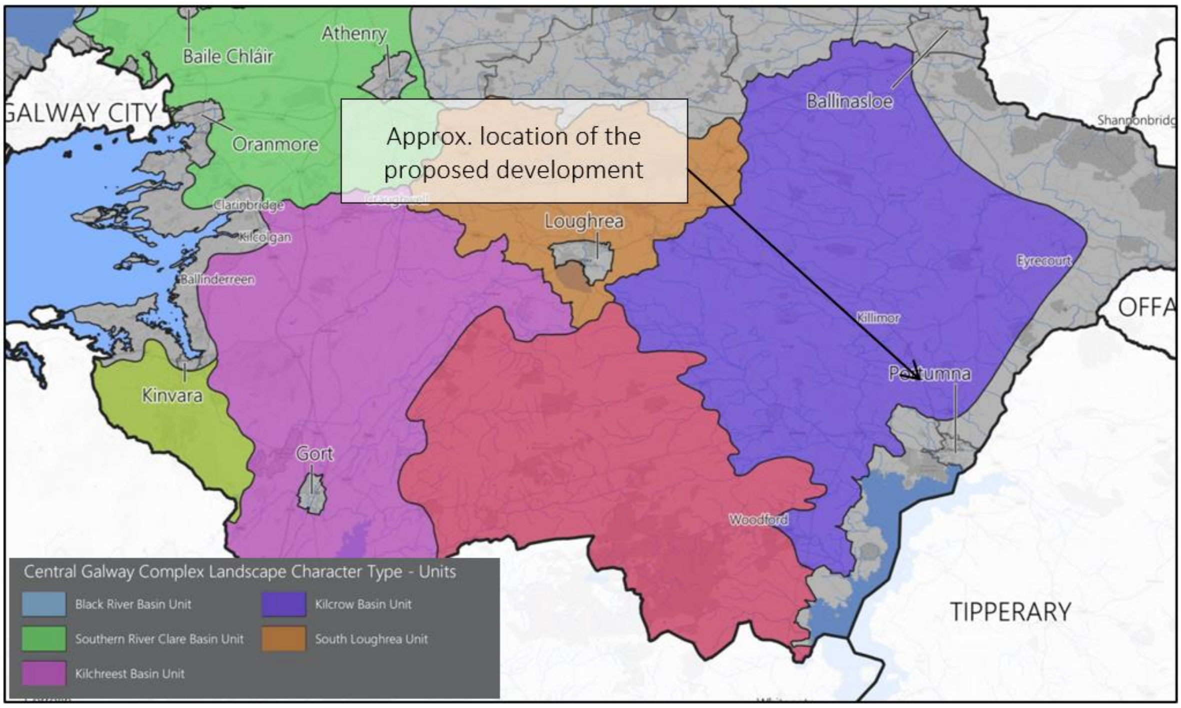
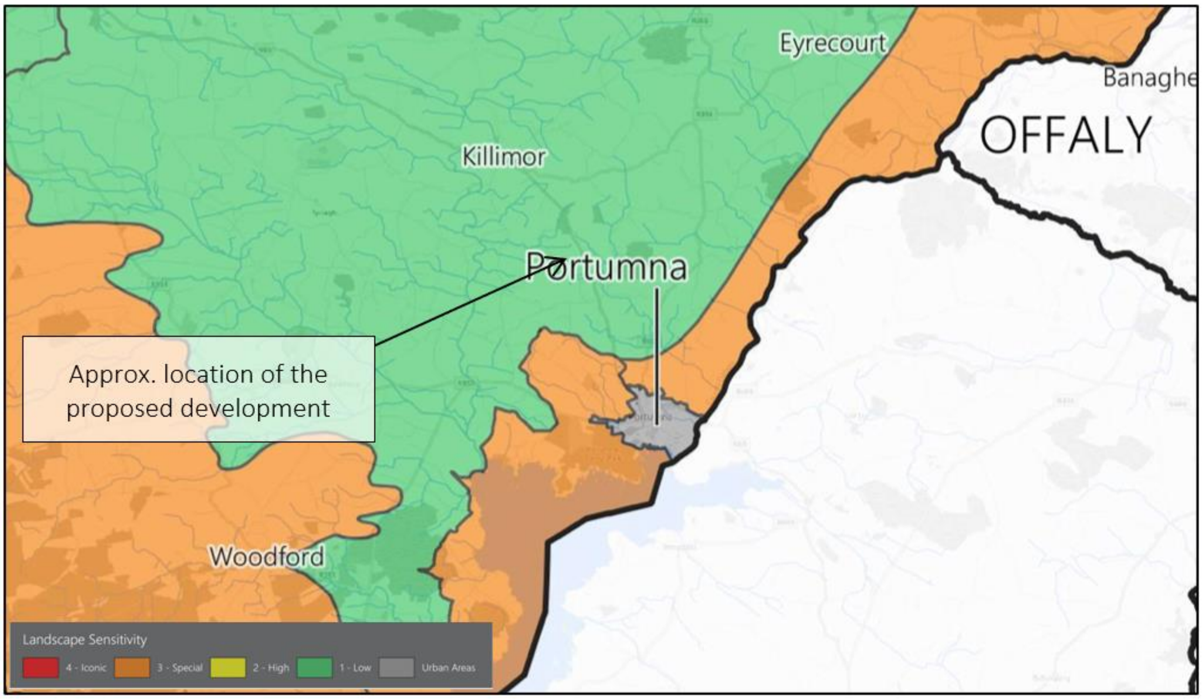


Figure 12.4 Excerpt from the Galway CDP – Appendix 4 Landscape Character Assessment, showing the approximate location of the proposed development in relation to landscape sensitivity classifications



12.3.2 LANDSCAPE BASELINE

The landscape baseline represents the existing landscape context and is the scenario against which any changes to the landscape brought about by the proposed development will be assessed. A description of the landscape context of the proposed application site (including the 110 kV substation and grid connection) and wider study area is provided below under the headings of landform and drainage, vegetation and land use, centres of population and houses, transport routes and public amenities and facilities. Although this description forms part of the landscape baseline, many of the landscape elements identified also relate to visual receptors i.e. places and transport routes from which viewers can potentially see the proposed development. The visual resource will be described in greater detail in **12.3.3**.

Figure 12.5 Landscape Context of the Immediate Study Area

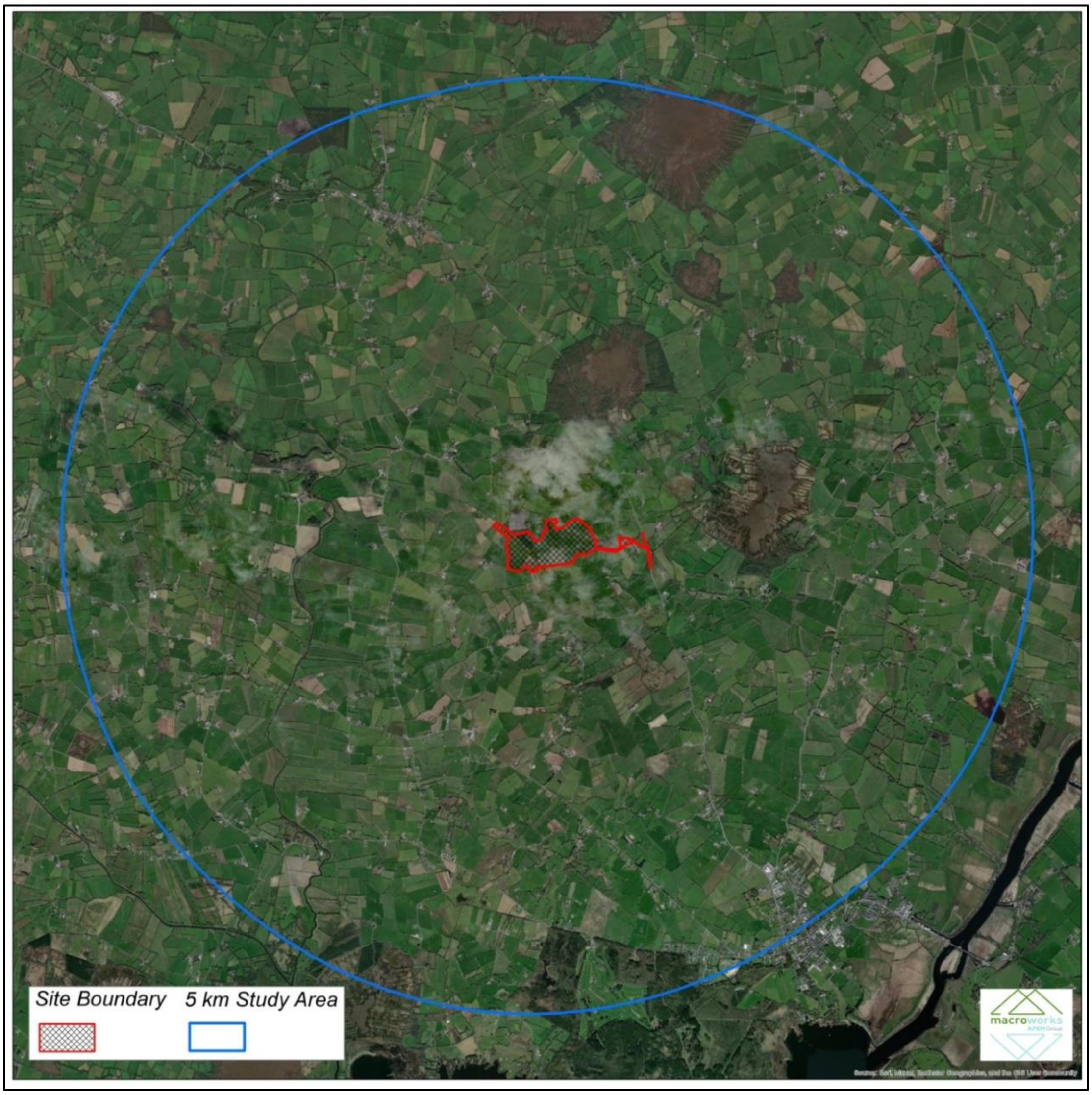
12.3.2.1 Landform and Drainage

The surrounding local landscape comprises relatively flat terrain intersected by small, shallow, winding river valleys. However, there is one moderately sized hillock, Church Hill, in the southern half of the study area, which peaks at 91m AOD. Otherwise, elevations begin to gradually decline in the western half of the study area, in the direction of the river valley associated with the Kilcrow River, which skirts past the study area in a north/south direction some c. 1.8km west of the site at its nearest point. The watercourses in the western half of the study area generally flow in a westerly direction into the Kilcrow River. On the other hand, the watercourses in the east generally flow in an easterly direction toward the River Shannon, which passes the study area to the east and is the most notable watercourse in the wider surrounding landscape. There are no particularly notable watercourses within the site or in its immediate surrounds.

12.3.2.2 Vegetation and Land Use

In terms of land use, the principal form of land cover within the study area and wider landscape is pastoral farmland bound by mixed mature hedgerow vegetation (refer to Figure 12.5 and Figure 12.6). Small blocks of forestry are dotted throughout the study area, whilst small pockets of mature woodland are also located throughout the surrounding local landscape. Some of the most notable areas of vegetation occur along the periphery of the existing peat bogs within the study area, which are also prominent land uses within the study area and are contained to the north and east of the site. The existing Oldstreet 400kV substation is one of the more notable single land uses within the study area and is located on lands immediately north of the proposed development. Other notable land uses within the study area include the N65 national secondary route, the urban settlement of Portumna and Portumna Golf Club, both of which are contained in the southern periphery of the study area.

Figure 12.6 Landscape Context (5km Study Area)



12.3.2.3 Centres of Population and Housing

The principal settlements in the study area are located along its periphery. The largest and most notable centre of population is the lakeside village of Portumna, which is situated some 4km to the south of the site and immediately north of Lough Derg. The settlement of Killimor is situated in the northern periphery of the 5km study area and is some 3.5km north of the proposed development. Aside from these two settlements, the study area comprises a modest but dispersed rural population that comprises a combination of linear clusters of residential dwellings, small cross-road settlements and isolated farmsteads.

12.3.2.4 Transport Routes

The most notable transport route within the study area is the N65, which passes through the eastern half of the study area at a distance of approximately c. 150m east of the main site entrance. The N65 passes through the study area in a general north-south direction through the study area connecting the settlements of Portumna and Killimor. All other major routes within the study area are located in its wider periphery and include the R355, located 2.3km to the east, the R352, located 3.3km southwest of the site, and the R356, located some 2.8km to the north of the site. The nearest local road to the proposed development is the L8763 local road, which is situated immediately east and north of the site. The L8805 local road also occurs a short distance to the south of the site, whilst an unnamed local road is situated just over 200m to the west of the site.

12.3.2.5 Tourism, Heritage and Public Amenities

Whilst the central study area is not highly synonymous with tourism or outdoor recreation, some aspects of the wider study area encompass some notable tourism values and assets. Due to the location of the settlement of Portumna to Lough Derg and the River Shannon, it is a popular destination for boating enthusiasts and encompasses several harbours and marinas in addition to local swimming areas. Portumna Demesne is also a notable recreation feature and comprises several loop walks and an 18-hole golf course. In terms of heritage features, there are several local heritage assets situated throughout the study area, which include old Churches and Graveyards. One of the nearest of these is Lickmolassy Graveyard, situated along Chruch Hill, some 1.6km south of the site at its nearest point.

12.3.3 VISUAL BASELINE

12.3.3.1 Views of Recognised Scenic Value – Galway County Development Plan 2022-2028

The Galway County Development Plan 2022-2028 contains an update to the previous scenic designations map. Scenic route and protected views are identified in separate maps. There are several scenic designations within the study area, which are outlined below;

- Scenic View 45 - Killimor Old Graveyard (Orientation: Southeast)
- Scenic View 47 - Portumna Church and Spire (Orientation: East)
- Scenic Route 7 - Slieve Aughty Scenic Route: This route follows the R 352 running from the outskirts of Portumna to the outskirts of Gort. The route passes through extensive areas of commercial forestry and areas of cut-over bog. Parts of the route provide expansive and panoramic views – both north and south. Large arrays of wind turbines are visible along parts of the route

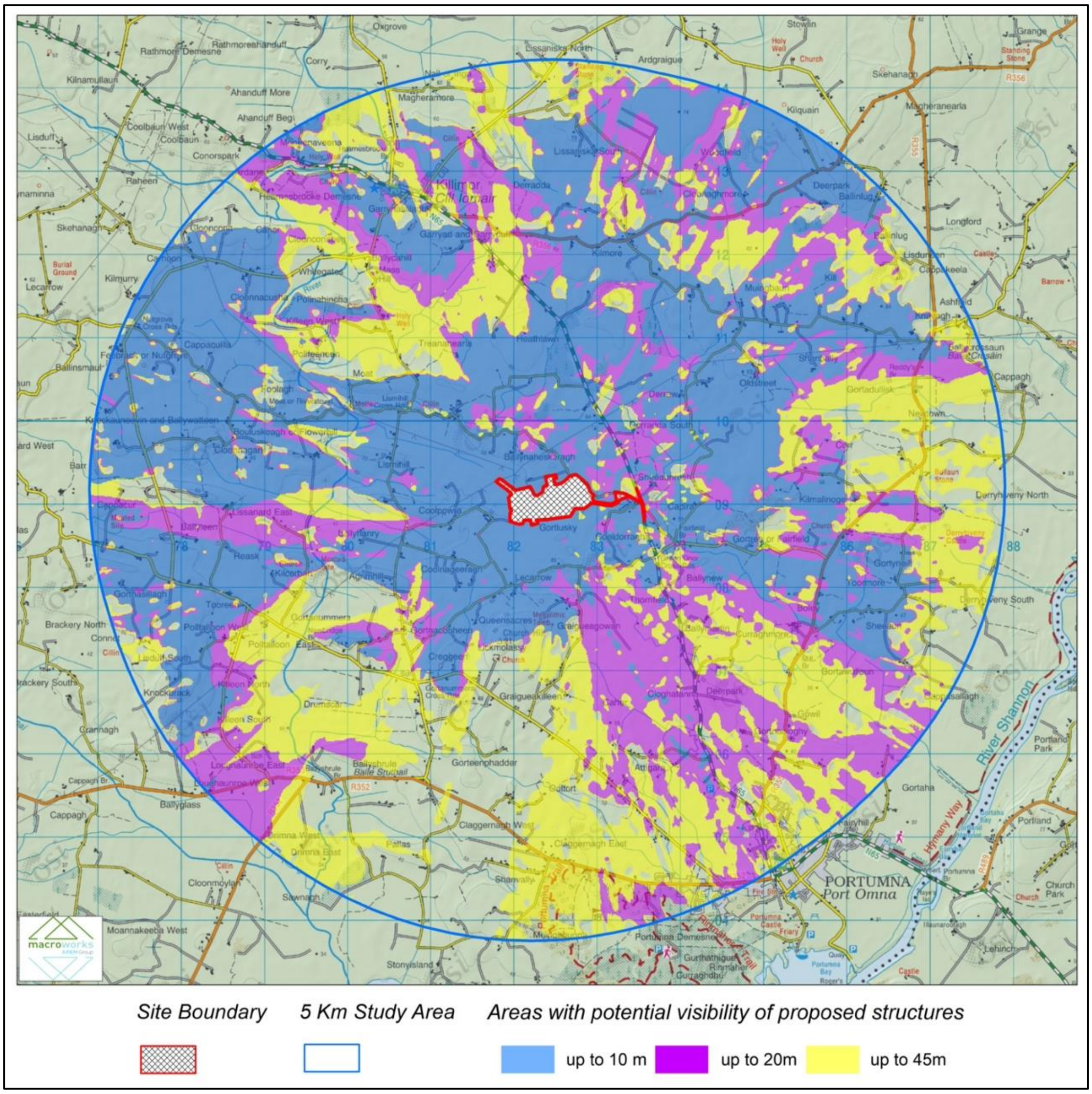
Actual visibility from scenic views and scenic routes will be assessed during site work investigations. Where there is potential for clear visibility that may impact these scenic designations, a representative viewpoint will be included in section 12.4.7 below.

In relation to scenic route designations, it is important to note that the landscape assessment states "A scenic route is not and cannot be a comprehensive protection for the entire landscape. It does provide an instrument for predicting and assessing representative measurement of what effects would be experienced by the majority of potential public viewers in the majority of circumstances."

12.3.3.2 Zone of Theoretical Visibility Analysis

Only those parts of the receiving environment that potentially afford views of the proposed development are of concern to this section of the assessment. A computer-generated Zone of Theoretical Visibility (ZTV) map has been prepared to illustrate where the proposed development is potentially visible from. The ZTV map is based solely on terrain data (bare ground visibility), and ignores features such as trees, hedges or buildings, which may screen views. Given the complex vegetation patterns within this landscape, the main value of this form of ZTV mapping is to determine those parts of the landscape from which the proposed development will definitely not be visible, due to terrain screening within the 5km study area.

Figure 12.7 Standard (bare-ground) ZTV map (Refer to Appendix A for larger scale version



The following key points are illustrated by the '<u>bare-ground' ZTV map</u> (see Figure 12.7 above):

- Comprehensive theoretic ZTV pattern (blue colour) of the full development occurs throughout much of the central study area, with some localised areas only afforded visibility of structures 10m and above.
- Due to the rolling nature of the landform within the study area, the degree of comprehensive theoretic visibility starts to dissipate beyond c. 2-3km from the site, although some notable areas of comprehensive ZTV pattern occur all the way to the 5km study extents in the wider western and northern extent of the study area.
- A notable degree of screening is afforded by Church Hill in the southwest quadrant of the study area, with a considerable part of the landscape entirely screened from

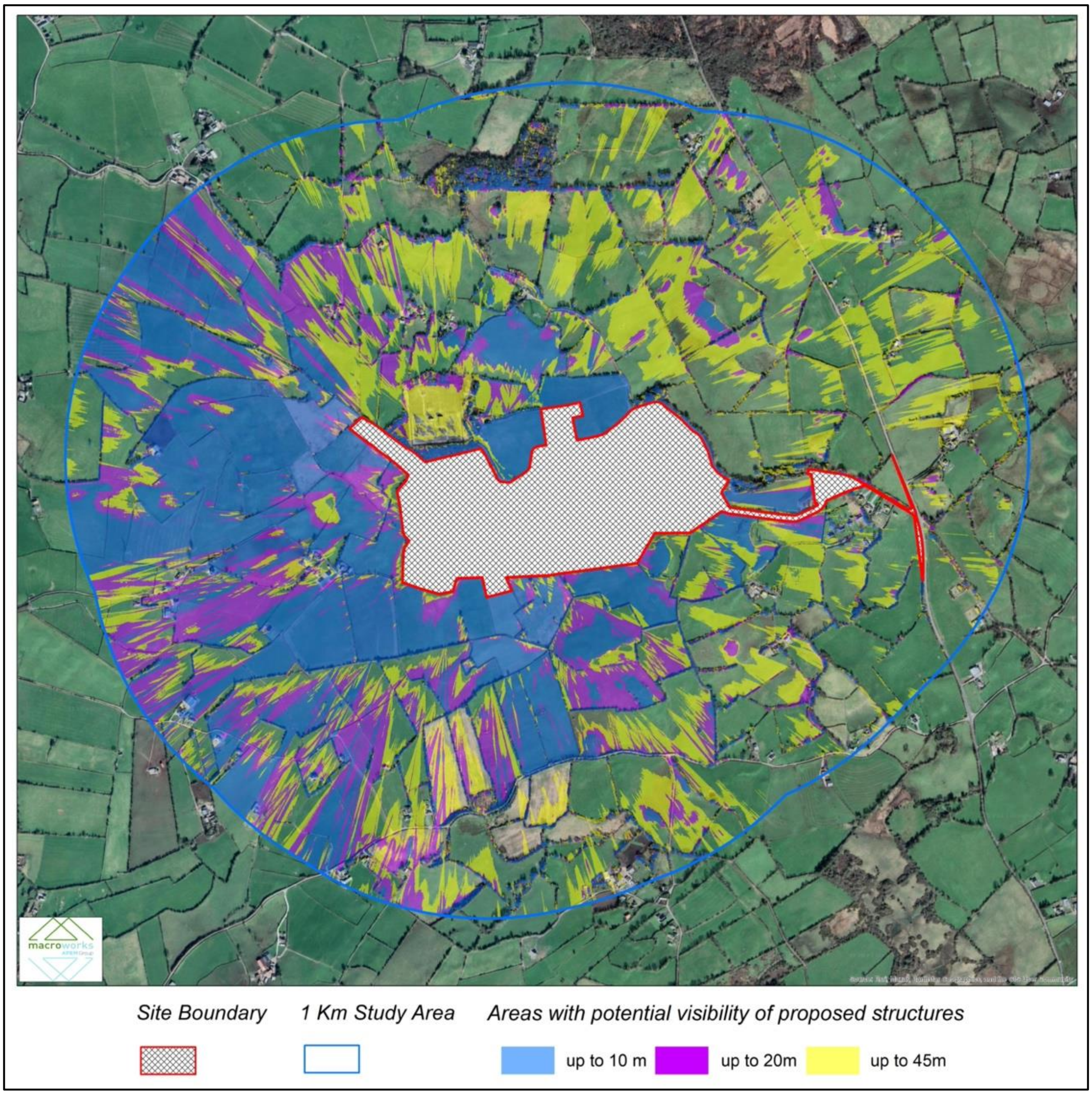
the proposed development. This also relates to a large section of the R353 regional road scenic route designation.

- Theoretic visibility of the proposed development will be limited the most elevated structures in the surrounds of Portumna in the southeast quadrant of the study area.

The most important point to make in respect of this 'bare-ground' ZTV map is that it is theoretical. Whilst the proposed development comprises several sizable structures, some of which rise to a maximum height of 45m, the surrounding layers of intervening vegetation combined, with the low rolling nature of the terrain within the study area, will result in a much lesser degree of actual visibility.

The second form of ZTV mapping relies on a Digital Surface Model ("DSM"), which also accounts for terrestrial land cover elements, such as hedgerows and buildings. This is of far more value in determining the likely visibility of the proposed development. For this finer grain of visibility analysis, a more consolidated area incorporating the surrounding network of roads and dwellings within approximately 1km of the application site boundary is used.

Figure 12.8 DSM based ZTV Map accounting for screening by surface elements such as hedgerows, treelines and forestry



As can be seen from the comparison of the 'bare-ground' ZTV map (Figure 12.7 and the Digital Surface Model (DSM) based ZTV map (Figure 12.8):

- There is a considerable reduction in the degree of actual site visibility even from some of the immediate surrounding landscape.
- The most notable reduction in visibility of the proposed development occurs to the east of the site, where in some cases, all aspects of the proposed development will be entirely screened. Indeed, there will be very limited opportunities to afford any clear visibility of the proposed development from the section of the N65 within the 1km study area.
- To the west, a much clearer view of the proposed development has the potential to be afforded, which highlights the limited degree of existing vegetation along the

western boundary of the site and in the landscape immediately beyond. Nonetheless, layers of more mature intervening vegetation are more evident in the wider western periphery of the 1km study area, where visibility tends to be reduced to partial views and glimpses (identified by the splay-like patterns).

12.3.3.3 Identification of Viewshed Reference Points as a Basis for Assessment

Viewshed Reference Points (VRP's) are the locations used to study the visual impacts of a proposed development in detail. It is not warranted to include each and every location that provides a view of a development as this would result in an unwieldy report and make it extremely difficult to draw out the key impacts arising from the proposed development. Instead, the selected viewpoints are intended to reflect a range of different receptor types, distances and angles. The visual impact of a proposed development is assessed by Macro Works using up to 6no. categories of receptor type as listed below:

- Key Views (from features of national or international importance) (KV);
- Designated Scenic Routes and Views (SR/SV);
- Local Community views (LCV);
- Centres of Population (CP);
- Major Routes (MR);
- Amenity and heritage features (AH).

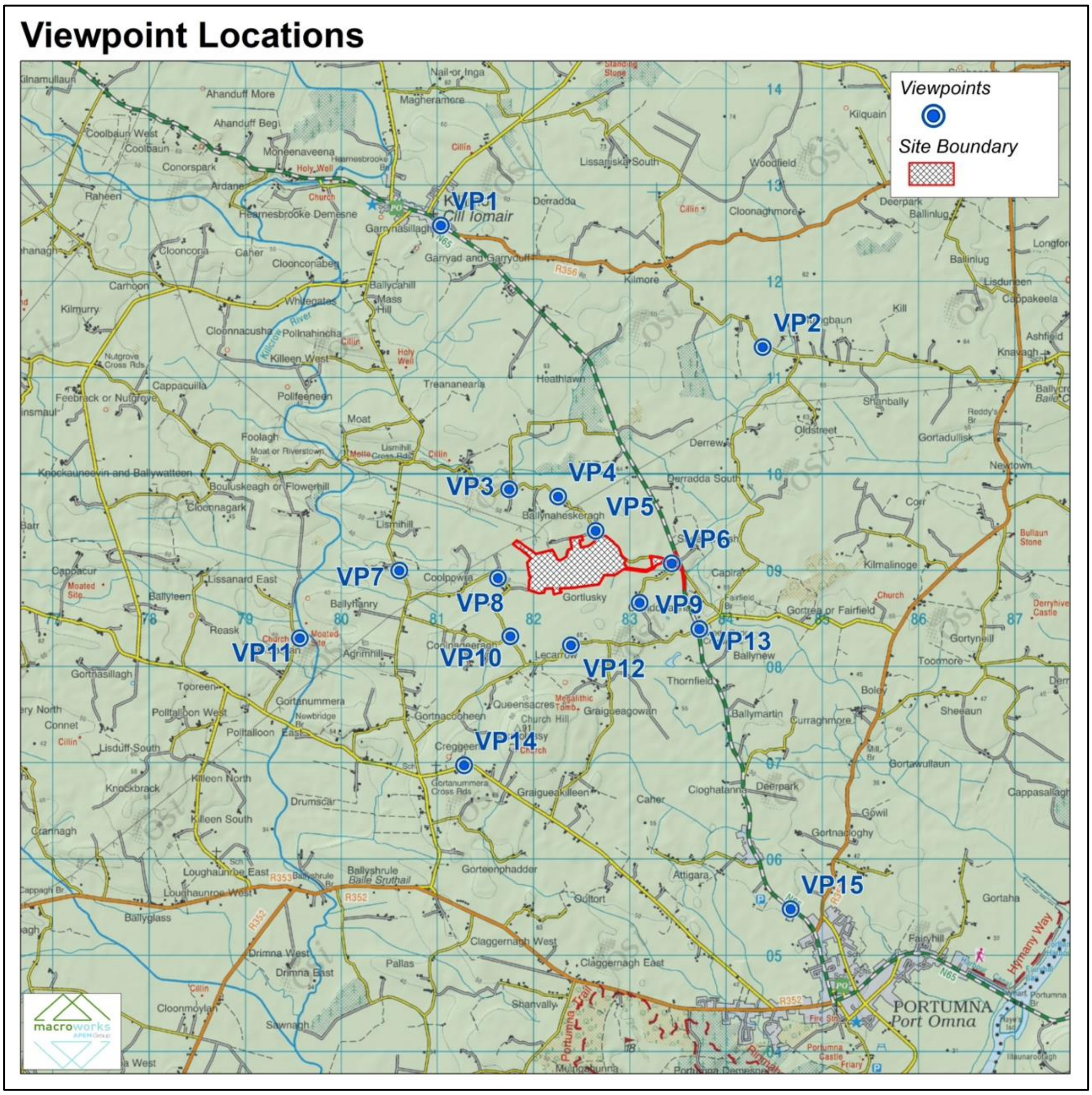
VRP's might be relevant to more than one category and this makes them even more valid for inclusion in the assessment. The receptors that are intended to be represented by a particular VRP are listed at the beginning of each viewpoint appraisal. The Viewshed Reference Points selected in this instance are set out in Table 12.6 and Figure 12.9 below.

Table 12.6 Outline Description of Selected Viewshed Reference Points (VRPs)

VRP No.	Location	Representative of	Direction of view
VP1	N59 southeast of Killimor	CP, MR	S
VP2	L8758 at Muingbaun	LCV	SW
VP3	Local road north of the site at Ballynaheskeragh (1)	LCV	S
VP4	Local road north of the site at Ballynaheskeragh (2)	LCV	S
VP5	Local road north of the site at Ballynaheskeragh (3)	LCV	S
VP6	L8763 at Ballynaheskeragh east of the site	LCV	W
VP7	Local road at Coolpowra west of the site (1)	LCV	E

VRP No.	Location	Representative of	Direction of view
VP8	Local road at Coolpowra west of the site (2)	LCV	E
VP9	Local road laneway at Cooldorragha southeast of the site	LCV	NW
VP10	Local road at Coolnageeragh southwest of the site	LCV	NE
VP11	Kilcorban Graveyard west pf the Kilcrow River	LCV, AH	NE
VP12	L8805 local road at Lecarrow south of the site	LCV	N
VP13	N65 at Green Door Crossroads	LCV, MR	NW
VP14	L4313 local road at Creggeen	LCV, CP	NE
VP15	Calvary Cemetery Portumna	AH, CP, MR	NW

Figure 12.9 Viewpoint Location Map (Showing Viewing Extents and Direction of View)



12.4 IMPACT ASSESSMENT

12.4.1 DO-NOTHING SCENARIO

The '*do-nothing'* impact refers to the non-implementation of the proposed development. The primary effect of this would be that the impacts and effects identified would not directly occur. In this regard the following issues are relevant. The site, which is currently contained in pastoral farmland, would likely be managed for typical agricultural practices, whilst the surrounding perimeter vegetation would continue to grow out, some of which would be maintained by the current landowners. It is likely that applications for other electrical infrastructure development would continue within the surrounding landscape context due to its near vicinity to the existing Oldstreet Substation.

12.4.2 ASSESSMENT OF RECEPTOR SENSITIVITY – LANDSCAPE

Landscape value and sensitivity are considered in relation to a number of factors highlighted in the Guidelines for Landscape and Visual Impact Assessment 2013, which are set out below and discussed relative to the proposed development site and wider study area.

This is a typical rural landscape comprised of relatively flat to low-rolling terrain cloaked in rolling pastoral farmland and networks of mature mixed hedgerow vegetation. It is not considered that this is a particularly rare or distinctive landscape in the context of County Galway or the wider island of Ireland. One of the principal features of the local landscape context is the existing 400kV substation development. There are no notable settlements within the immediate study area, with settlement within the immediate surrounds of the site typically comprising a modest rural population of small linear clusters of residential dwellings and isolated farmsteads. There is also no strong sense of amenity or recreation within the immediate study area, and instead, much of the local landscape value relates to the subsistence of the rural economy as opposed to any highly susceptible naturalistic, scenic or tourism values. This is further reflected in the Galway County Development Plan, where the landscape character type 'Central Galway Complex Landscape' which contains the site and most of the study area, is classified with a 'Low (1)' landscape sensitivity, defined as 'unlikely to be adversely affected by change'. Furthermore, the 'Central Galway Complex Landscape' character type is divided into landscape character units. The site is located entirely within Unit '6d – Kilcrow Basin, described as a 'Working landscape, locally elevated. Larger areas of bog and forestry. Elevated concentrations of settlements and infrastructure.'

Therefore, on balance of these factors and in accordance with the criteria outlined in Table 12.1, the landscape sensitivity is deemed to be **Medium-low**, with some areas of higher sensitivity in the wider surrounds of the study area that are principally associated with Lough Derg and The River Shannon in the wider eastern and southern periphery of the study area.

12.4.3 ASSESSMENT OF RECEPTOR SENSITIVITY – VISUAL

The study area generally presents as a typical rural landscape that is heavily influenced by typical rural land uses. Whilst the flat to low rolling nature of the study area often results in contained views along local and national routes, there are some locally elevated locations that provide more open visibility across the study area and wider landscape. Nevertheless, in terms of designated scenic amenity, the only protected views and scenic routes with the study area are contained within the wider periphery. In terms of the protected views, those within the study area tend to be of localised features such as churches and graveyards. There is one scenic route within the study area, contained within its southwest periphery. Nevertheless, much of the actual visibility from the section of this scenic route within the study area is typically contained by roadside vegetation and layers of intervening vegetation located a short distance beyond the regional road corridor. Overall, scenic views and routes within the study area are considered much more susceptible to visual change and range in sensitivity between Medium to High-medium depending on their influence from other surrounding landscape areas.

Views of the working agricultural landscape are generally pleasant in terms of its rolling pastoral aesthetic and ‘green’, settled working character. The network of hedgerows and vegetation throughout it contributes to some sense of naturalness and, combined with its undulating topography, generates a sense of containment in many locations. However, whilst a pleasant pastoral aesthetic is apparent throughout some parts of the study area, as noted above, the surrounding local and wider landscape is also influenced by an array of anthropogenic features such as major transport routes, urban settlements, and industrial development. Overall, the sensitivity of visual receptors within the more typical working landscape context tends to range between Medium and Medium-low, with those of a Medium sensitivity representing more open expansive views across the wider landscape.

Key differentials in terms of visual receptor sensitivity relate to the occupation of the visual receptor and whether views of the surrounding landscape are an inherent part of the experience. Static residential receptors are considered generally more susceptible to changes in views over those where views are experienced transiently by those travelling through the landscape, particularly on major transport routes where road infrastructure and traffic volume draw from visual amenity. Likewise, receptors located in closer proximity to the site are considered more susceptible to changes in views over those where views are experienced at a distance.

On the basis of the site-specific factors outlined above and in accordance with the general visual receptor sensitivity considerations contained in the methodology Section, visual receptor sensitivity judgement are provided for each representative viewpoint in the table below in Section 12.4.7 below

12.4.4 MAGNITUDE OF LANDSCAPE EFFECTS – CONSTRUCTION STAGE

During the construction phase, there will be a far higher intensity of activity at the site than during the operational phase. This will consist of heavy vehicle movement to and from the site as well as construction machinery within the site. Indeed, whilst there will be a clear increase in HGV traffic along the surrounding local roads, HGV traffic along the nearby N65 national secondary route is commonplace. Construction stage impact will also be generated by the introduction of temporary site lighting and the temporary storage of construction materials and excavated ground. The construction of the larger elements within the site will also require tower cranes, which will likely be visible above the intervening surrounding hedgerow networks in the near surrounds of the site. Construction phase impacts on the landscape are considered to be 'short-term' and are likely to last between 18-24 months. A summary of construction activities within the site is included below:

- HGVs transporting materials to and from the site;
- Movement of heavy earth-moving machinery and tower cranes on-site;
- Temporary storage of excavated materials and construction materials on-site;
- Gradual emergence of the proposed development, and associated works, including tower cranes;
- Security hoarding and site lighting.
- Areas of soil stripping to facilitate the proposed parking area.
- Trees and hedgerows to be retained will be protected in accordance with British Standard BS5837: 2012 'Trees in Relation to Design, Demolition and Construction

The physical construction stage works will have a significant effect on the character of the local landscape, which is primarily influenced by more typical rural land uses such as pastoral farmland. Nonetheless, there is a high degree of intervening layers of mature vegetation located in the surroundings of the site, which will notably reduce the perceived effect of the construction stage effects at receptors beyond c. 500m to 1km from the site. Furthermore, construction-related activity and its effect on landscape character will be 'short-term' in duration. For these reasons, the magnitude of landscape impacts during the construction stage is deemed to be Very High within the immediate surrounds of the site, however, this quickly reduces to Medium and Low in the wider surrounds of the study area where visibility of construction activity is likely to be very limited as a result of the surrounding dense intervening vegetation.

In combination with the Medium-low landscape sensitivity designation outlined above, the significance of construction stage impacts is deemed to be Substantial within the immediate surrounds of the site, however, this quickly reduces to Moderate-slight, Slight and in some cases Imperceptible within the wider study area where visibility of construction stage activities will be limited and in some instances, entirely screened. The quality of the construction stage effects will be Negative.

12.4.5 MAGNITUDE OF VISUAL EFFECTS – CONSTRUCTION STAGE

During construction, the main visual impacts will arise from frequent heavy vehicle movements and worker vehicles travelling to and from the site and using the site entrance. In addition, there will be construction machinery and tower cranes on site, which will rise above intervening vegetation and buildings. There will also be stockpiles of stripped topsoil and construction materials awaiting use. However, aside from the local roads located in the immediate vicinity of the site, where there is potential for clear views of the development, a large part of this 'short-term' activity within the site will remain screened and partially screened from view the surrounding mature layers of intervening vegetation. Furthermore, construction-related activity is temporary in nature and will cease once the development becomes fully operational. Thus, construction stage impacts are likely to result in a visual effect of Very High and High in the immediate surroundings of the site.

Coupled with the Medium and Medium-low visual receptor sensitivities in the near surrounds of the site, the construction stage visual impacts in the immediate vicinity of the site are deemed to range between Substantial and Substantial-moderate but will reduce considerably beyond 500m-1000m from the site, where the proposed development will be afforded a much more notable degree of screening in the form of layers of stacked hedgerow vegetation. The quality of these effects is deemed to be Negative. As a result, construction stage visual impacts are considered to result in localised significant visual effects.

12.4.6 MAGNITUDE OF LANDSCAPE EFFECTS – OPERATIONAL STAGE

With regard to the landscape character of the site and surrounding study area, it presents as a relatively typical pastoral landscape. Indeed, whilst a pleasant pastoral aesthetic is noted in some locally elevated localised areas, this is a working landscape that is influenced by anthropogenic built features like major routes and existing electrical infrastructure development such as the Oldstreet substation and its surrounding corridors of overhead electricity cable corridors and their associated pylon structures. Indeed, the working character of this landscape context is further reinforced in the current landscape assessment for County Galway, which classifies the majority of the landscape of the study area with a 'Low' sensitivity classification. Landscapes classified as 'Low' sensitivity within County Galway are those 'unlikely to be adversely affected by change'.

Nonetheless, there will be some permanent physical effects to the site's land cover, which are not readily reversible. These relate to the excavation of extensive parts of the site to facilitate the foundations of the buildings and all other infrastructure. Indeed, the proposed development will result in the loss of an extensive area of agricultural for a high-intensity extensive electrical infrastructure development. Some of the most notable impacts on the local landscape character will be generated from the overall scale of the built aspects of the development, some of which rise to a maximum height of 45m, in addition to the extensive nature of the proposed development, which will comprise several different pieces of infrastructure. However, whilst the scale and intensity of the development will result in a considerable change to the local landscape character, the proposed development represents the intensification of an established land use in the form of the neighbouring existing 400kV Oldstreet substation and its surrounding overhead cable corridors.

It is also worth noting that the extensive landscaping associated with the proposed development will notably offset some of the landscape impacts associated with the proposed development. The proposed landscaping measures will use native trees and shrub planting, amenity grass and wild-flower meadows. Several mounded berms are also proposed along the western and southern perimeter of the site, which will be planted with swathes of native woodland mix to mimic the rolling forms of the low-rolling hillocks in the surrounding local landscape. Where feasible, areas of existing hedgerows will also be protected and enhanced to maintain some sense of the existing landscape structures. Native wildflower seeding and native wetland plantings will also be located throughout the site, further bolstering the site's biodiversity values. The proposed development will also utilise an array of contemporary building materials and finishes that move away from the typical industrialised presentation of other older industrial and commercial developments within the wider landscape.

On balance of the reasons outlined above, the magnitude of landscape impact is deemed Very High.

With reference to the significance matrix (Table 12.4) above, the **Medium-low** landscape sensitivity judgement attributed to the study area, coupled with a **Very High** magnitude of landscape impact at the site scale and its immediate vicinity (<500m) is considered to result in an overall significance of **Substantial**, with the significance of landscape effect reducing considerably beyond 500m-1000m from the site.

12.4.7 MAGNITUDE OF VISUAL EFFECTS – OPERATIONAL STAGE

The assessment of visual impacts at each of the selected viewpoints is aided by photomontages of the proposed development. Photomontages are a 'photo-real' depiction of the scheme within the view utilising a rendered three-dimensional model of the development, which has been geo-referenced to allow accurate placement and scale. For each viewpoint, the following images have been produced:

- Existing view;
- Outline view (yellow outline showing the extent of the proposed development including all associated overground works overlaid on the photograph);
- Montage view
- Montage view with mitigation established.

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
VP1	N59 southeast of Killimor: This is a pleasant view afforded across rolling farmland from the N59 southeast of Killimor. The depicted view is oriented to the south and is representative of the major route receptor and centre of population. The view extends across several rolling fields and intervening layers of vegetation and is contained in the distance by stacked hedgerow vegetation	Medium-low	The proposed stacks adjacent to the proposed energy centre have the potential to be glimpsed in the distance in this view. The proposed stacks barely break the vegetated skyline in the distance and are viewed backed by the sky with a low degree of visual contrast due to the light and partially reflective finish. Whilst the built forms of the development will contrast with the more natural vegetated skyline, the proposed stacks are unlikely to draw the eye from this distance of over 3.5km. Thus, the magnitude of effect is deemed Low-negligible. The proposed mitigation screen planting will not be visible from here, and thus, the residual magnitude of effect remains Low-negligible.	Slight-imperceptible / Negative / Medium-term	Slight-imperceptible / Negative / Permanent
VP2	L8758 at Muinbaun: This is a relatively homogenous open view afforded from locally elevated lands in the townland of Muinbaun. The depicted view represents surrounding local community receptors and extends across a flat to low-rolling pastoral field. The view is contained in the distance by stacked layers of mature vegetation, whilst overhead electricity cable corridors and their associated pylon structures are visible in the distance.	Medium-low	The proposed development is almost entirely screened from here due to the layers of densely stacked mature vegetation located in the intervening landscape. Even if briefly viewed along the vegetated skyline in the distance, the development will have little effect on the visual amenity of this scene, which is already influenced by the highly utilitarian pylon structures. Thus, the magnitude of effect is deemed Low-negligible. The proposed mitigation screen planting will not be visible from here, and thus, the residual magnitude of effect remains Low-negligible.	Slight-imperceptible / Negative / Medium-term	Slight-imperceptible / Negative / Permanent
VP3	Local rod north of the site at Ballynaheskeragh: This is a pleasant view from a locally elevated section of the local road that is	Medium	The proposed development will be clearly visible from here, rising beyond several layers of intervening vegetation throughout the fore-to-middle ground of the view. Nonetheless, whilst	Moderate / Negative / Medium-term	Moderate / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	representative of surrounding local community receptors. The depicted view is oriented to the south across a rolling landscape clocked in a patchwork of pastoral farmland and layers of intervening hedgerow vegetation. The existing Oldstreet substation and its associated overhead cable corridors and pylon structures are intermittently visible in this view and slightly diminish the pleasant pastoral aesthetic.		the proposed energy centre and its large stacks will be visible here, much of the remaining proposed infrastructure is heavily screened by the surrounding layers of mature vegetation. The proposed energy centre will be a distinctive feature in this view and represents a marked contrast to the more natural vegetated skyline in its surrounds. Nevertheless, the curved forms of the proposed energy centre building slightly diminish the perceived scale and extent of the proposed building and somewhat mimic the natural forms of the surrounding rolling hills along the distant skyline. Overall, the proposed development will notably increase the intensity and quantum of built development in this view. Thus, the magnitude of visual effect is deemed Medium. Once fully established, the proposed mitigation screen planting will be barely discernible from this landscape context and tends to visually blend with the surrounding layers of existing vegetation. It will have little screening effect from here, and thus, the residual magnitude of effect remains Medium.		
VP4	Local road north of the site at Ballynaheskeragh (2): This is a partially contained view afforded from a local road adjacent to the entrance to a nearby residential land holding. The depicted view is oriented to the south and is representative of local community receptors. The view extends across the access to the residential land,	Medium-low	Whilst many of the smaller buildings and built elements will be heavily screened from this partially contained landscape context, the proposed energy centre will be clearly visible, rising above the stacked layers of vegetation at a distance of just over c. 600m. Whilst the proposed building will be a prominent feature of this aspect of the view and represents a notable degree of visual change in this view, it does not present in a highly dominant manner, nor does it	Moderate / Negative / Medium-term	Moderate / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	holding towards areas of pastoral land and a low rolling hillock. The view is contained at a near distance by dense layers of stacked vegetation. The existing pylon structures associated with the Oldstreet substation rise from the layers of vegetation intermittently throughout the view.		present with any sense of overbearing. Indeed, the curved nature of the main building volume slightly diminishes its overall perceived scale and visual mass. Nevertheless, the proposed developments' built form and highly anthropogenic finishes and textures will strongly contrast with the surrounding verdant tones and organic textures of this pastoral setting. Although the proposed development will contribute to a considerable increase in the intensity of built development within the view, it presents in the immediate context of the existing Oldstreet substation and has a strong thematic link to it. Overall, the pre-mitigation magnitude of effect is deemed Medium. Due to the dense layers of existing vegetation located in the direction of the proposed development, the proposed mitigation screen planting will be barely discernible from here. Thus, the residual magnitude of effect remains Medium.		
VP5	Local road north of the site at Ballynaheskeragh (3): This is a pleasant open view afforded from a brief section of an otherwise partially contained local road corridor in the townland of Ballynaheskeragh that is representative of local community receptors travelling along this local road. The depicted open view extends across several broad agricultural fields in the near foreground towards a low rolling	Medium	This is one of the clearest views afforded of the proposed development, where many of the buildings and pieces of electrical infrastructure will be visible at a relatively near distance just beyond the neighbouring fields. Whilst the proposed development will occupy a broad lateral extent in this view and will be one of the most notable aspects of this view, it does not present in a highly dominant manner, nor will it be visually overbearing along this open section of the local road. The proposed energy centre will be one of the most prominent features of the development, with its curved and irregular built	Substantial / Negative / Medium-term	Substantial-moderate / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	landscape cloaked in a patchwork of pastoral farmland and networks of intervening hedgerows in the middle ground. The existing Oldstreet substation is partially visible, rising above stacked vegetation in the middle ground to the west. In this distance, the view is contained by broad rolling lands cloaked in stacked vegetation.		forms drawing the eye. Nevertheless, the main curved form of the proposed energy centre moves away from the more typical and industrialised presentation of large-scale energy infrastructure, with the curved forms of the proposed building mimicking the profile of the surrounding low-rolling hillocks and distant ridges. Nevertheless, some of the surrounding ancillary infrastructure is highly industrial and will result in a significant change to the character of this site and the surrounding immediate local landscape. In terms of aesthetics, the proposed development will also generate a strong sense of visual clutter in this view, with several aspects of the proposed development viewed stacked in front of one another. Overall, the proposed development represents a marked increase in the intensity and scale of development in this view and will significantly detract from its more typical pastoral qualities, albeit these effects will be heavily localised to a brief open section of this local road corridor and is not representative of visibility along the entire route of this local road. The proposed energy infrastructure will also generate some sense of enclosure here, as it obstructs views toward the distant elevated landscape. Overall, due to the perceived scale and intensity of the proposed development, the pre-mitigation magnitude of effect is deemed Very High. Once the proposed mitigation screen planting has fully established, many of the smaller built features of the proposed development will be		

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			heavily screened and softened, and the overall scale of the development will be anchored into this rural landscape context. The proposed internal planting will break up the visual mass of the proposed development, helping the dull green tone and texture of the proposed ancillary buildings and structures blend more readily with the surrounding established and existing layers of vegetation. Nonetheless, whilst the proposed mitigation planting will result in a notable reduction in the perceived quantum of built development in this view, the proposal will still represent a marked degree of visual change in this primarily rural context. On balance of the above reasons, the residual magnitude of effect will reduce to High once the proposed mitigation screen planting has fully established.		
VP6	L8763 at Ballynaheskeragh east of the site: This is a contained view from the L8763 local road in the townland of Ballynaheskeragh that is representative of surrounding local residential receptors. The depicted view is oriented to the west from the local road corridor towards a linear cluster of dwellings that, combined with the surrounding vegetation, contains this western aspect of the view at a near distance.	Medium-low	Even from this relatively near distance of just over c. 700m from the main site compound, the proposed development will be entirely screened by a combination of screening in the form of terrain and existing vegetation. Indeed, even from the rear gardens of the neighbouring dwellings, only a partial view of the proposed energy centre stacks will be afforded from here, as noted in the wireframe view. Nonetheless, there will be minor degree of visual change to the northwest of this cluster of dwelling, where the new site entrance will be constructed. Overall, the magnitude of visual impact is deemed no greater than Low from this landscape context. The only notable area of mitigation screen planting visible here relates to new sections of hedgerow located around the proposed site	Slight / Negative / Medium-term	Slight / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			entrance. Otherwise, there will be limited visibility of the proposed screen planting in the surrounds of the main site compound. Overall, the residual magnitude of effect remains Low in the post-mitigation scenario.		
VP7	Local road at Coolpowra west of site: This is a locally elevated view afforded from a local hillock in the townland of Coolpowra that represents the surrounding local community receptors. The depicted view is oriented to the east and is partially truncated by the near rolling ridge and ridgetop vegetation. Further to the northwest, a more open and expansive view is afforded across typical rolling pastoral lands and intervening vegetation. The existing Oldstreet substation is visible in the distance to the west, whilst its surrounding overhead cable corridors and pylon structures are notable built elements within this aspect of the view.	Medium	The proposed development is visible to the east at a distance of c. 1.5km. Whilst the proposed energy centre is one of the more prominent aspects of the development, the proposed GIS substation and other surrounding infrastructure in the northern aspect of the site will also be visible from here. Whilst many of the ancillary features of the development are viewed sitting below the vegetated skyline in the distance, the proposed energy centre projects well above the skyline and is likely to draw the eye in this view. Nonetheless, in terms of the vertical extent of development in this view, the proposed energy centre does not rise above the existing Pylon structures located in its nearby surroundings. The proposed development will contribute to a clear increase in the intensity of built development in this view, and whilst it has a clear thematic relationship with the surrounding existing energy infrastructure, it will strongly contrast with the surrounding verdant tones and organic textures of the pastoral landscape context it is contained within. Overall, the magnitude of visual effect in the pre-mitigation scenario is deemed Medium-low. Once the proposed mitigation screen planting has fully established, it will screen many of the ancillary infrastructure and further partially screen and soften the proposed GIS building.	Moderate-slight / Negative / Medium-term	Moderate-slight / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			Nonetheless, the proposed energy centre will still be a prominent feature of this view and will result in a clear intensification of built development. Overall, the residual magnitude of visual effect will remain Medium-low.		
VP8	Local road at Coolpowra west of the site (2): This is a relatively typical view of rolling pastoral farmland and hedgerow vegetation afforded from a local road in the townland of Coolpowra. The depicted view is oriented to the east and is representative of the surrounding local community receptors. The view is contained at a relatively short distance to the east by layers of stacked vegetation, whilst the built and highly anthropogenic structures of the existing Oldstreet substation and visible, rising above the layers of intervening vegetation at a distance of just over c. 500m	Medium-low	A veiled view of the proposed energy centre, the proposed GIS building and infrastructure and several proposed tanks south of the proposed energy centre are afforded from this distance of just over c. 300m. The side-on view of the proposed energy centre presents as the most prominent feature of the proposed development here, albeit the side-on view results in a marginally diminished perception of its overall scale and extent. Indeed, due to the partially screened nature of this view, the perceived scale and extent of the overall development are heavily diluted here, with the eastern extent of the site entirely screened from this landscape context. Nevertheless, the proposed energy centre and the surrounding visible infrastructure will result in a marked increase in the intensity of development in this landscape context and more than double the visual envelope of electrical infrastructure development in this view. In terms of the proposed energy centre, the curved forms tend to marginally reduce the perceived scale of the proposed building, varying textures and finishes of the proposed building and stacks will also aid in reducing the perceived visual mass of the proposed structure. Notwithstanding the above, the proposed development will result in a clear detracting in the visual amenity afforded from here and results in a more intense industrial character in this aspect of the view. Thus, the	Substantial-moderate / Negative / Medium-term	Substantial-moderate / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			pre-mitigation magnitude of effect is deemed High. Once the proposed mitigation screen planting has fully established, many of the lower-built features and tanks will be heavily and, in some cases, entirely screened from this local landscape context. The proposed development will be well integrated into the surrounding landscape context, although the proposed energy centre and its associated stacks will still be a prominent feature of the view and will contribute to a more industrial character in this primarily rural local landscape context. Overall, the residual magnitude of visual effect will remain High, although it is important to note that the intensity of development is notably reduced in the post-mitigation scenario.		
VP9	Local road laneway at Cooldorragha southeast of the site: This is a heavily contained view afforded from a local road section in the townland of Cooldorragha that represents surrounding local community receptors. The depicted view is oriented to the northwest from the local road context and is truncated at a near distance by low rolling lands and intervening hedgerow vegetation.	Medium-low	Even from this near distance of just under c. 400m from the main site compound, the proposed development will be entirely screened by a combination of intervening hedgerow vegetation and low-rolling terrain. Thus, the residual magnitude of effect is deemed Negligible.	Imperceptible / Neutral / Medium-term	Imperceptible / Neutral / Permanent
VP10	Local road at Coolnageeragh southwest of the site: This is a pleasant view across flat to low-rolling lands from a local road in the townland of Coolnageeragh, that is	Medium-low	The proposed development is visible to the northeast beyond several pastoral fields and intervening sections of hedgerow vegetation and mature trees. The proposed energy centre building is viewed here, rising well above the	Moderate/ Negative / Medium-term	Moderate / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	representative of surrounding local community receptors. The depicted view is oriented to the northeast across pastoral lands intersected by mixed hedgerow vegetation that becomes stacked in perspective and contains this north-eastern aspect of the view.		vegetated skyline, and will be a prominent feature of the view, with its highly built forms, tones and textures strongly contrasting with the more typical pastoral land uses. Whilst the proposed GIS building and some surrounding tanks are partially visible from here, their muted green finish results in them visually blending with the surrounding tones and textures of the dense layers of intervening hedgerow vegetation. Nonetheless, whilst some of the surrounding proposed buildings and structures are well assimilated into this context, the proposed energy centre results in a marked degree of visual change here and contributes to a notable increase in the vertical extent of built development in this view. Overall, the proposed development will result in some detraction from the primarily rural character presented within this view and detracts from the more typical pastoral aesthetic. Nonetheless, the proposed development is well offsets from surrounding receptors and does not present in a highly dominant manner, nor does it block any highly sensitive viewing aspects. On balance of the above reasons, the magnitude of visual effect is deemed Medium. Once the proposed mitigation screen planting has fully established, the surrounding tanks and GIS building will be heavily and, in some cases, fully screened. The proposed surrounding woodland planted along the earthen berms will further anchor the development into this landscape context and will result in a much softer and less intense view of the overall development.		

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
			Indeed, it will further diminish the overall perceived scale and extent of the wider development. Nonetheless, the proposed energy centre will still be a prominent feature of the view, and thus, the residual magnitude of effect remains Medium.		
VP11	Kilcorban Graveyard west of the Kilcrow River: This is a pleasant rolling pastoral view afforded from Kilcorban Graveyard. The view is oriented to the east across the Kilcrow River valley, which is screened from view, and is representative of the heritage receptor and surrounding local community receptors. The view is contained at a short distance by rolling lands to the east and layers of intervening hedgerow vegetation.	Medium	The proposed development will be heavily screened in this view by the layers of intervening vegetation and rolling terrain to the east. Indeed, as per the wireframe view, there is only potential for partial views of the proposed stacks to be afforded from this landscape context, which will likely be further screened during the Spring and Summer months when the surrounding trees and hedgerows are in full-leaf. Overall, the magnitude of effect is deemed no greater than Low-negligible in this heavily contained landscape context. The proposed mitigation screen planting will not be visible from here, and thus, the magnitude of effect remains Low-negligible.	Slight-imperceptible / Negative / Medium-term	Slight-imperceptible / Negative / Permanent
VP12	L8805 local road at Lecarrow south of the site: This is a typical rural vista afforded from a local road in the townland of Lecarrow that is representative of surrounding local community receptors. The view extends across an adjacent pastoral field and is contained shortly beyond by layers of stacked mature vegetation. The taller, slender elements within the Oldstreet substation development are visible	Medium-low	The proposed development is clearly visible at a distance of c. 600m to the north and will be a prominent feature of this view. While prominent, the proposed development does not present in a spatially dominant manner and is well offset from this local road context. Nonetheless, the proposed development represents a marked increase in the intensity of built development in this aspect of the view and stands in contrast to the more natural, verdant and organic tones and textures of the surrounding pastoral context. Although the forms of the proposed development are clearly anthropogenic in nature, the curved	Substantial-moderate / Negative / Medium-term	Substantial-moderate / Negative / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	in the distance, rising above the layers of stacked vegetation.		forms of the proposed energy centre slightly diminish the overall perceived scale and extent of the proposed buildings, whilst the contrast between the main building volume and the proposed stacks also marginally reduced the perceived extent of the development. It is also important to note that much of the lower-lying built elements that form part of the proposed development are entirely screened in this view, which heavily dilutes the perceived scale of the overall development. Overall, the proposed industrial development will detract from the typical pastoral qualities of this aspect of the view, and thus, the magnitude of visual effect is deemed High-Medium. Once the proposed mitigation screen planting has fully established, it will screen some of the partially visible lower features within the development, such as the tanks and other ancillary infrastructure. Although, the development will still present as the principal built feature in this aspect of the view, it results in a reduction in the degree of visual clutter generated by the proposed development. Whilst this will marginally reduce the intensity of the development and will anchor it into this landscape context, the residual magnitude of effect will remain High-medium		
VP13	N65 at Green Door Crossroads: This is a view afforded from the N65 national secondary route corridor at Green Door Crossroads, representative of surrounding local community receptors and the major	Medium-low	The proposed development will not be visible from here due to the rolling terrain and dense layers of vegetation in the direction of the site. Thus, the magnitude of effect is deemed Negligible by default.	Imperceptible / Neutral / Medium-term	Imperceptible / Neutral / Permanent

VP NO.	EXISTING VIEW	VP SENSITIVITY	VISUAL IMPACT MAGNITUDE (PRE & POST MITIGATION)	PRE MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT	POST MITIGATION SIGNIFICANCE / QUALITY / DURATION OF IMPACT
	route corridor. The depicted view is oriented to the west and is contained at a short distance by the roadside vegetation and pastoral field located immediately beyond.				
VP14	L4313 local road at Creggeen: This is a view across a relatively flat area of farmland in the foreground that is representative of surrounding local community receptors. The depicted view is oriented to the north and is contained to the northeast by Church Hill, whilst directly to the north, the layers of intervening vegetation become stacked in perspective and contain the view.	Medium-low	A veiled view of the proposed energy centre has the potential to be afforded here through a mature tree line contained in winter vegetation in the middle ground of the view. The proposed structure will present backed by the sky and will contrast with the more natural and organic forms of the surrounding vegetation. Nonetheless, only the most elevated parts of the building and its associated stacks will be partially visible from here and will likely be further screened when the middle-ground tree line is in full leaf. Overall, the magnitude of visual effect is deemed no greater than Low. The proposed mitigation screen planting will not be visible from here, and thus, the residual magnitude of visual effect remains Low.	Slight / Negative / Medium-term	Slight / Negative / Permanent
VP15	Calvary Cemetery Portumna: This is a locally elevated view afforded from a local cemetery located on the outskirts of the settlement of Portumna that is representative of the local heritage feature, the centre of population and the neighbouring major route corridor. The depicted view is oriented to the north across a low rolling landscape and is contained	Medium	The proposed development will not be visible from here due to the combination of rolling terrain and dense layers of intervening vegetation in the direction of the site. Thus, the magnitude of effect is deemed Negligible by default.	Imperceptible / Neutral / Medium-term	Imperceptible / Neutral / Permanent

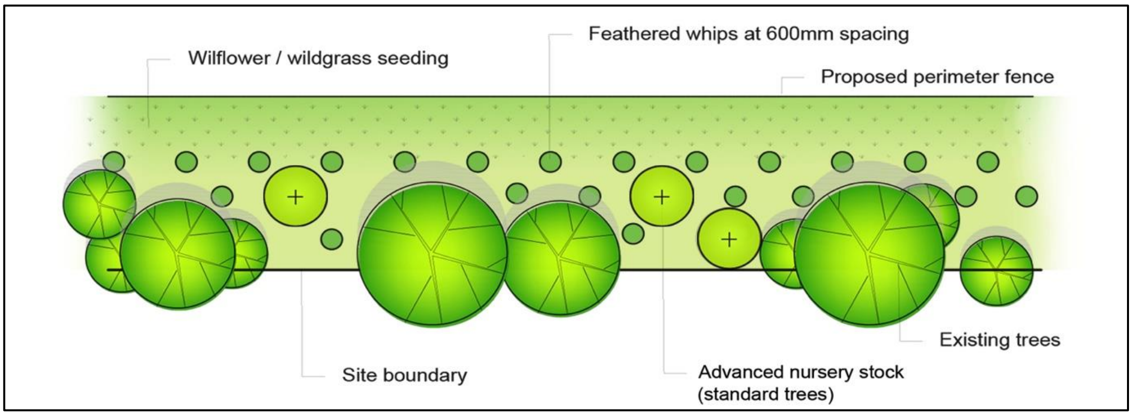
12.5 MITIGATION AND RESTORATION MEASURES

The main mitigation by avoidance measure employed in this instance is the siting of the proposed development in a robust landscape context classified with a 'low' landscape sensitivity in the current Galway County Development Plan. The proposed development is also well offset from some of its nearest surrounding visual receptors and avails of a notable degree of screening in the form of surrounding rolling terrain and dense layers of intervening hedgerow vegetation.

In addition to mitigation by avoidance measures, retention of existing hedgerow boundaries within and around the site, in so far as possible, aids visual screening, and maintains the existing field pattern. Whilst some internal sections of hedgerow will have to be removed to facilitate the full footprint of the proposed development, every effort has been made to retain sections of hedgerow where feasible so as not to considerably impacts on the existing landscape structure of the site and its surrounding landscape context.

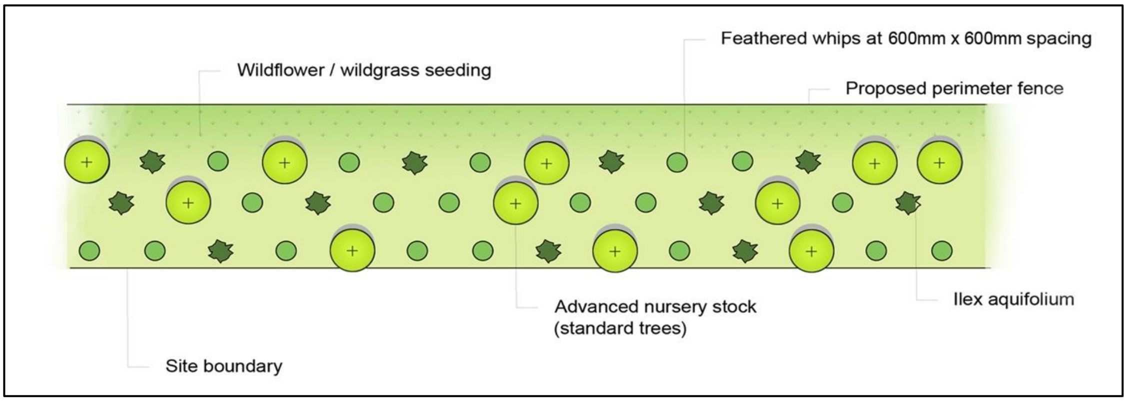
In addition to retaining the existing hedgerows within around the site, it is also proposed to bolster existing perimeter and internal hedgerows with under-planting and inter-planting of whip transplants (i.e. Hedgerow Type 1 - see Figure 12.10 below) in order to ensure dense and consistent screening of the site in perpetuity. This will be undertaken where required to thicken and fill gaps in the existing hedgerow network prior to the construction phase, thus allowing for any growth in the period between a grant of planning permission and construction of the development. Advanced nursery stock in the form of 8-10cm girth trees will be used to fill any noticeable gaps and plant species will be selected to complement the existing broadleaf hedgerow species mix around the site and will be of local provenance. Where not already exceeded by existing vegetation, it is intended to manage hedgerows up to 3-4m in height. This height will be achieved by a combination of allowing lower sections of existing hedgerows to mature, filling obvious gaps with advanced nursery stock and providing an additional line of whip planting to selected hedgerows that require densification. Refer to the Landscape Mitigation Plan LD.CLPWRA for details.

Figure 12.10 Hedgerow Type 1: indicative boundary planting detail showing the approach to inter-planting and under-planting of existing hedgerows (where consolidation is needed)



It is also proposed to plant new 'Type 2' hedgerows (Figure 12.11 refers), with whips and a high proportion of advance nursery stock trees (c.3m planted height), within the site and along the proposed new site access tracks to further assimilate the development into the surrounding landscape context whilst also bolstering the site biodiversity values. The combination of existing enhanced hedgerows and proposed new native hedgerows will also aid in visually screened some of the lower built elements of the development from surrounding local receptors. All of this planting will be allowed to mature up to a maintained height of 3-4m to aid in the screening and softening of the proposed development from nearby dwellings and surrounding local and regional roads.

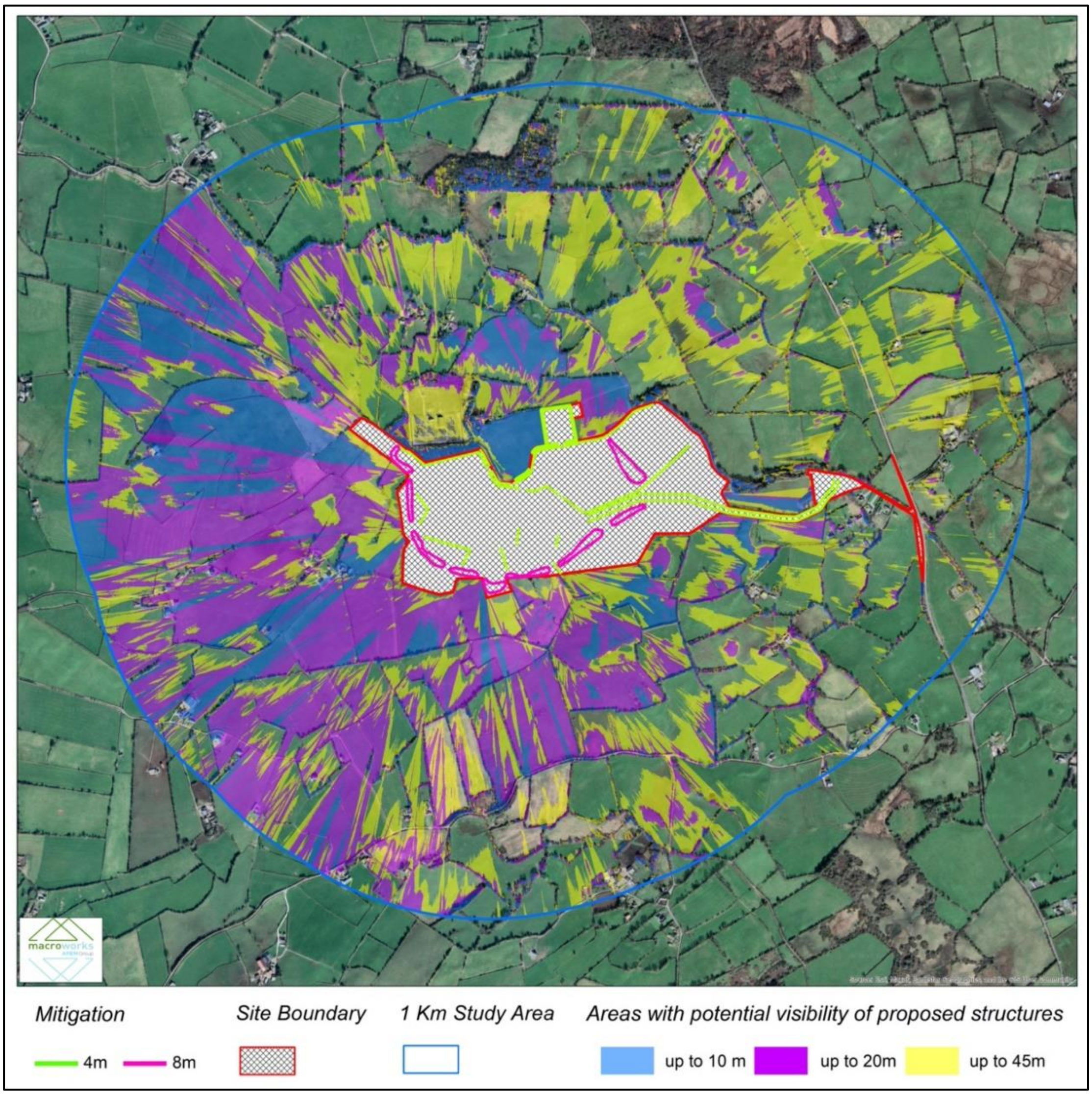
Figure 12.11 Indicative boundary planting detail showing the introduction of new boundary hedgerow TYPE 2



Sweeps of native woodland planting totalling and area of c. 19,918 sqm are also proposed along the earthen rolling berms that will rise to a max height of 5m along the western, southern and eastern boundaries of the site. This native thicket/woodland mix will be provided in the form of high canopy (dominants) species, low canopy (sub-dominant) species, understory and fringe (higher shrubs) species and understory and edge (lower shrub) species, and will comprise of a mix of advanced nursery stock and whip planting of local provenance. The proposed planting combined with the proposed earthen berms will be allowed to grow out to reach maturity and will heavily screen and soften the proposed development from surrounding local receptors. Indeed, it will anchor the proposed development to this landscape context and will enhance the ecological corridors within the central and wider study area.

As can be seen by the mitigation-based ZTV in Figure 12.12 (below), the combination of consolidated and proposed 3-4m high hedgerows and native thicket (c.8-10m high) along the earthen berms will further reduce the potential for visual impacts within the surrounding area. The most notable further screening effect relates to the western and southern extents of the immediate study area where much of the ground hugging elements below c. 10m will be heavily screened. Indeed, there will be a further screening effect in all directions, with clear visibility of the lower half of the proposed development dissipating beyond c. 500m-1000m from the site.

Figure 12.12 Mitigation ZTV illustrating the effect of proposed mitigation planting



The proposed development will also utilise an array of contemporary building materials and finishes that move away from the typical industrialised presentation of other older industrial developments. The array of proposed cladding textures will be finished in varied muted tones of green/grey, whilst the proposed energy centre building incorporates curved forms to mimic the low rolling nature of the surrounding landscape. Furthermore, the proposed energy centre stacks will be finished in a much lighter tone than the main building as they are predominately viewed against the sky and will present against it with a low degree of visual contrast. The variations in tone and texture, in addition to the variation in the built form of the proposed development, will all help diminish its perceived height and massing. When feasible, ancillary structures and buildings will be finished in a green tone or muted shades to help blend them in with the surrounding pastoral landscape context.

Wherever possible, the on-site access roads utilise the existing farm tracks and follow existing topography in order to minimise ground disturbance, alteration of physical landscape character and visual intrusion. Reinstatement of temporary construction areas, construction compounds and cable trenches to the preconstruction conditions will be carried out at the end of the construction phase. Restoration of any areas disturbed during the construction process will be undertaken on construction completion by appropriate grass seeding to return a green characteristic.

12.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

In terms of Landscape Impacts, the proposed development will have a direct physical impact on the site's land cover and will somewhat impose itself on the existing landscape structure of the site, with the removal of areas of hedgerow vegetation. Whilst existing energy infrastructure notably contributes to the local landscape character, the proposed development, in terms of its scale and intensity, will have a considerable impact on the character of the landscape, predominately at the site scale and in its immediate surroundings. Notwithstanding the above, the proposed development is considered an appropriate site development and is located within a robust 'low' sensitivity landscape in the current Galway CDP, which is associated with landscape areas that are 'unlikely to be adversely affected by change'.

Overall, due to the sizable scale and intensity of the proposed development, the operational phase significance of residual effect is deemed Substantial, which is considered 'significant' in EIA terms. Nevertheless, it is important to note that these effects are heavily localised to the site and its immediate surrounding landscape. Indeed, the significance of landscape effects reduces considerably to below significant beyond 200m from the site as the surrounding existing and proposed screening will heavily dimmish its perceived effect on the character of the surrounding landscape. As per the Notes and Clarifications on aspects of the 3rd Edition Guidelines on Landscape and Visual Impact Assessment (GLVIA3), it states, *"It should be noted that judgements of significance are not judgements of acceptability considering the policy context, which is a matter for decision-makers. For example, it may be the case that the LVIA concludes that a proposal would result in 'significant' adverse effects on a receptor but the proposal could still be consistent with policy"*. In this instance, it is considered that the proposed development is suitably sited in this landscape context and is not contrary to landscape and visual-related policies in the current Galway CDP.

In terms of Visual Impacts, the proposed development was assessed at 15no. viewpoint locations throughout the study area, representing a range of viewing angles, distances, and visual receptors. The majority of views were contained in the near and immediate local surroundings of the development, as this is where the most potential for significant visual effects are likely to occur. The sensitivity of visual receptors ranged from Medium to Medium-low, which reflects the robust nature of the study area. Those receptors identified with a Medium-low sensitivity represent typical rural views, whereas views identified with Medium sensitivity are typically related to slightly elevated or more open views across the rolling countryside.

The most notable residual effects will occur along the local road that traverses the rolling lands immediately east and north of the site. Indeed, whilst visibility from this local road is heavily contained in some areas, it also affords open, near-distant views of the proposed development. Viewpoint VP5 affords one of the clearest and nearest views of the proposed development, where a considerable extent of the site will be visible in the pre-mitigation scenario. It is important to note that this view does not represent any local residential dwelling but represents local community receptors travelling along this local road context. Due to the extensive scale and intensity of the development, which represents a marked degree of visual change in comparison to the baseline scenario, the significance of effect was deemed Substantial, which is considered 'significant' in EIA terms.

Nevertheless, once the proposed mitigation screen planting has full established, the intensity and perceived scale of the development will notably reduce. Thus, the residual significance of visual effect will reduce to 'Substantial-moderate' (below EIA significant effect threshold) once the proposed mitigation has fully established. The residual significance of effect at viewpoint VP8 was also deemed 'Substantial-moderate' due to its near distance to the proposed energy centre. Nonetheless, the perceived scale and extent of the development are heavily diminished from this landscape context as the entire eastern extent of the development will be entirely screened. The residual significance of effect ranged between Moderate to Imperceptible at all other representative viewpoints within the study area. Indeed, what is most notable is that effects will reduce considerably beyond 500-1000m from the site, and in many instances, receptors in the wider surrounds of the study area will have very little clear visibility of the proposed development.

12.7 CUMULATIVE IMPACT ASSESSMENT

In terms of the cumulative impacts of the proposed development, much of the assessment of this is already contained within the landscape and visual impact appraisal above and relates to the proposed developments cumulative landscape and visual effect with the existing Oldstreet 400kV substation development located immediately north of the site and the overhead cables and pylon structures located in the immediate surrounding landscape, both of which have been assessed as part of the baseline context of this landscape setting. Thus, it is considered that the cumulative landscape and visual effect of the development is deemed Low.

12.8 MONITORING AND FURTHER WORKS

12.8.1.1 Construction Phase

Landscape tender drawings and specifications will be produced to ensure that the landscape work is implemented in accordance with best practice. This document will include tree work procedures, soil handling, planting and maintenance. The contract works will be supervised by a suitably qualified landscape architect.

The planting works will be undertaken in the next available planting season after completion of the main civil engineering and building work.

All tree protection requirements will be installed on commencement of the development and removed on a phased basis as stages of the development are completed.

12.8.1.2 Operational Phase

This will consist of weed control, replacement planting, pruning etc. All landscape works will be in an establishment phase for the initial three years from planting. All works will be monitored on an ongoing basis to ensure the quality of the development is maintained.

12.9 SUMMARY OF SIGNIFICANT EFFECTS

Based on the landscape and visual impact judgements provided throughout this LVIA, the proposed Coolpowra development will give rise to some heavily localised landscape effects at the site scale and in the immediate surrounding landscape. The residual significance of visual effect ranged between *'Substantial-moderate'* to *'Imperceptible'*, with the significance of visual effect reducing considerably beyond the immediate context of the site. In the context of the proposed development and the receiving 'low' sensitivity landscape classification (Galway CDP), it is not considered that the proposed development represents an inappropriate addition to this landscape context and complies with landscape and visual-related policies and objectives in the current Galway CDP.

12.10 REFERENCES

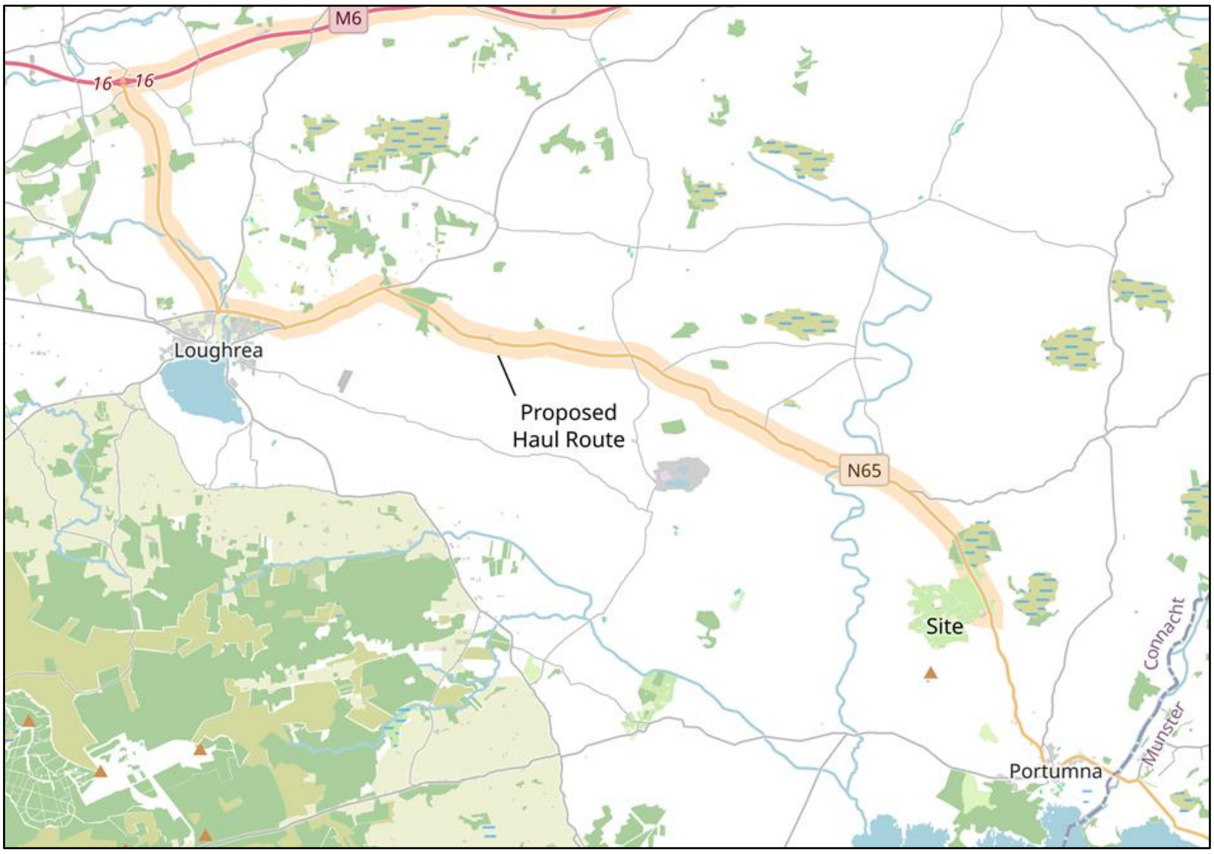
- Landscape Institute and the Institute of Environmental Management and Assessment (IEMA) publication entitled Guidelines for Landscape and Visual Impact Assessment, 2013 (GLVIA3);
- Environmental Protection Agency (EPA) publication Guidelines on the Information to be contained in Environmental Impact Statements (2022); and
- 'Photography and Photomontage in Landscape and Visual Impact Assessment', Landscape Institute Technical Guidance Note 06/2019.

13 TRAFFIC & TRANSPORT

13.1 INTRODUCTION

This chapter of the EIAR provides an assessment of the traffic and transport related impacts of the proposed development in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, Co. Galway. The proposed development site (Figure 13.1) is accessed off the L8763 local road, which in turn is accessed from the N65 national road approximately 5km to the north of Portumna and 25km to the south-east of Loughrea.

Figure 13.1 Site Location



13.1.1 OVERVIEW OF DEVELOPMENT PROPOSALS

The proposed development consists of three separate projects that are considered individually, and in combination, within this chapter:

- a Reserve Gas-Fired Generator (hereafter Generator) (Project 1),
- a grid-connected Energy Storage System (ESS) facility (Project 2), and
- a Gas Insulated Switchgear (GIS) Electricity Substation (Project 3).

13.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

The methodology adopted for the production of this chapter is detailed below.

13.2.1 LEGISLATION AND GUIDANCE

Relevant guidance on assessing the impact of a development on roads, traffic and transport is contained within: the TTA guidelines produced by Transport Infrastructure Ireland (TII)[47] and, the Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Assessment Reports[48]. The latter states that traffic impact should be assessed for the construction phase, operational phase, and for unplanned events such as traffic collisions (road safety).

13.2.2 APPROACH TO ASSESSMENT

The roads, traffic and transport impacts of the proposed development have been assessed by utilising the following approach based on the prevailing (TII) guidelines on Traffic and Transport Assessment (TTA) (May 2014). The assessment combines:

- Desktop study, for example, reviewing any neighbouring development;
- Undertaking site-based field work including traffic count surveys;
- Undertaking traffic modelling of the operation of the potentially impacted junctions during construction and operational phases of the proposed development;
- Reviewing the environmental impact of traffic related to the construction and operation of the proposed development, including road safety, against significance criteria; and,
- Considering whether mitigation measures are required to ensure that any potential roads, traffic and transport effects are kept to a minimum.

13.2.3 CONSULTATIONS

An informal technical scoping request in relation to the intended content of this chapter was issued to Galway County Council on 30 April 2024 and agreed with Galway County Council Infrastructure and Operations Units on 16 May 2024. The content of the chapter is consistent with the agreed scoping.

[47] Transport Infrastructure Ireland (2014) PE-PDV-02045 Traffic and Transport Assessment Guidelines
[48] Environmental Protection Agency (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports

13.2.4 SIGNIFICANCE CRITERIA

The main significance criteria when assessing traffic and transport impacts of a proposed development is the impact of the development on the operation of the road network in the vicinity of the development. Other criteria include, for example: any increase in road traffic collisions (which may result in environmental impacts due to spillage); likely damage to the road structure; and measurable increases in atmospheric pollutants and noise.

13.2.4.1 Traffic Impact

Traffic impact is typically assessed in terms of the impact of the traffic generated by a development on the operation of the local road network. A *'material increase'* is considered to have occurred where a development exceeds threshold values including where: traffic to and from the development exceeds 10% of the traffic flow on adjoining local and regional roads; and traffic to and from the development exceeds 10% of turning movements at junctions with and on National Roads. Exceeding these threshold values does not mean that the development results in a significant traffic or environmental impact but does mean that the impact of the development requires further assessment using traffic modelling software.

The traffic modelling software predicts Ratio of Flow to Capacity (RFC) values which are a measure of junction performance in terms of saturation. A value of 1.00, which can also be considered as 100% saturation, represents an arm of the junction operating at maximum capacity, in that any increase in the rate of vehicles arriving on the link will result in significant additional queue lengths. Traditionally a figure of 0.85 or 85% is the maximum acceptable degree of saturation when assessing priority junctions, with anything above this level considered to be congested. The assessment also takes account of queue lengths, measured in Passenger Car Units (PCUs) which are primarily used to check for blocking back through, and therefore impact on, adjacent junctions.

13.2.4.2 Road Structure Impact

Road structure impact is initially assessed by a simple visual inspection for cracking, deformation and disintegration in the vicinity of the site.[3][4] If following this visual assessment, (taking account of the types and volumes of traffic likely to be generated from a proposed development) the structural ability of the road to carry the traffic is in question, tests can be undertaken to determine the structural strength of the carriageway. Current guidance for such testing is detailed in the TII publication 'Pavement Assessment, Repair and Renewal Principles' Ref. AM-PAV-06050[5] published in March 2020.

13.2.4.3 Road Safety Impact

Road safety impact is typically assessed in terms of the collision record on the local road network in the vicinity of a development. Safety related geometric measurements are also assessed, for example, visibility to and from access points and junctions. In certain circumstances, such as the alterations to visibility splays at the N65/L8763 junction and proposed new access junction onto the L8763 local road, a Road Safety Audit can also be undertaken. Current guidance is detailed in the TII publication *"Road Safety Audit"* (standard) Ref. GE-STY-01024 [6] published in December 2017.

13.2.4.4 Traffic Noise Impact

Traffic noise is generated by a combination of noise sources including vehicle engines and the interactions between vehicles and the road surface. Noise and vibration impacts related to the proposed development are covered in more detail in Chapter 11 of this EIAR.

13.2.4.5 Traffic Related Air Quality and Climate Impact

Traffic related atmospheric pollutant emissions cause impacts at both the local and national/ international level. TII state in their publication "*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*" that "*empirical evidence has shown that there is no risk of emissions from road traffic leading to exceedances of the relevant air quality standards for any other pollutants, at even the most heavily-trafficked locations*". The impact of the increased traffic volume from the proposed development is not significant in terms of traffic volume required to cause exceedances of these critical levels. Air quality and Climate impacts related to the development are covered in more detail in Chapters 9 and 15 of this EIAR.

13.3 DESCRIPTION OF RECEIVING ENVIRONMENT

As noted with Section 13.1, the project site is to be accessed from the L8763 local road, which is accessed in turn from the N65 national road, the relevant section of which links Loughrea and Portumna. In the vicinity of the N65/L8763/L8760 junction (Figure 13.2), the N65 is formed from a single carriageway with a width of approximately 7.2m, bounded by shoulders. The posted speed limit on this section of the N65 is 100km/h which is consistent with current national guidelines on setting speed limits [9], but as a national secondary road may be reduced to 80km/h following the implementation of the Road Traffic Act 2024 [10]. The posted speed limit on the L8763 is currently 80km/h, but could similarly be reduced to 60km/h following the implementation of the Road Traffic Act 2024. Loughrea is located approximately 25km to the north-west of the Coolpowra site and

Portumna is located approximately 5km to the south of the Coolpowra Flex Gen project site. TTRSA have been informed that the intended haul route (shown on Figure 13.1) is via the M6 to Junction 16 (Kiltullagh) and N65 and therefore does not pass through either Loughrea or Portumna. Should permission be granted for the development, a specialist haulage contractor will be engaged to liaise with relevant highway authorities and secure appropriate permits for the transport of any abnormal loads such as transformer units.

13.3.1 TRAFFIC VOLUMES

An automatic traffic count survey was undertaken on 28 May 2024 on the N65 immediately to the south of the N65/L8763/L8760 junction. This traffic count survey was undertaken by TTRSA using a Metrocount RoadPodVT vehicle classifier. In a 24-hour period, the traffic count recorded 1588 vehicles in a northbound direction and 1584 vehicles in a southbound direction.

A video-based manual classified turning count survey was also undertaken on the same day at the N65/L8763/L8760 junction, for the AM traffic peak hour of 08:30-09:29 and PM traffic peak hour of 17:15-18:14.

Traffic count data is provided within Appendix 13-1.

Figure 13.2 The N65 National Road at the N65/L8763/L8760 Junction

13.3.2 COMPARISON OF PERMANENT TRAFFIC COUNT DATA FOR FACTORING PURPOSES

Data from the permanent Transport Infrastructure Ireland (TII) traffic counter site (TII traffic counter reference TMU N65 050.0 W) located on the N65 at Ballycasey, Co. Tipperary (13km to the south of Portumna) was compared for the traffic survey date of 28

May 2024, and average weekday traffic volumes over the previous 12 months (May 2023 to April 2024 inclusive). Traffic levels recorded on 28 May 2024 were approximately 1.8% higher than the average weekday traffic. On this basis, the data collected on 28 May 2024 is considered to be robust and no additional factoring has been applied to take account of seasonality.

13.3.3 BACKGROUND TRAFFIC GROWTH

The peak construction traffic impact for the Generator and GIS projects is predicted to be in December 2027, and for the ESS project is predicted to be in April and May 2028. Whilst it is predicted that the Generator and GIS projects will be operational in the second half of 2028, the ESS would not be operation until Q1 of 2029. Traffic count survey data has been factored from the base year of 2024, to peak construction years of 2027 and 2028, the opening year of 2029, and future assessment years of 2034 and 2044, using central growth rates for County Galway, taking account of 10.2% heavy commercial vehicles, as included within the TII publication '*Travel Demand Projections*' Ref. PE-PAG-02017 [11] published in October 2021. The growth rates applied being:

- 2024 to 2027, a growth factor of 1.086;
- 2024 to 2028, a growth factor of 1.116;
- 2024 to 2029, a growth factor of 1.147;
- 2024 to 2034, a growth factor of 1.217; and,
- 2024 to 2044, a growth factor of 1.372.

13.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

13.4.1 RESERVE GAS-FIRED GENERATOR (PROJECT 1)

This section assesses the impact of the Reserve Gas Fired Generator (Project 1) in isolation from the ESS (Project 2) and GIS (Project 3).

13.4.1.1 Construction Phase Impact

13.4.1.1.1 Traffic Impact

Construction and related personnel vehicle movements associated with the Reserve Gas Fired Generator project have been assigned 100% to/from the east at the Coolpowra Flex Gen site access onto the L8763 and assigned at the N65/L8763/L8760 junction based on existing proportional traffic movements on the N65. A vehicle occupancy of 1.5 persons per vehicle has been assumed for construction related personnel and 75% of arrivals and departures have been assumed to occur within the peak hour. Heavy goods vehicle movements have been assigned as per the intended haul route depicted in Table 13.1, and 15% of such movement have been assumed to occur within the peak hour. As the traffic modelling is based on PCUs, heavy goods vehicles are factored by 2.3 within the data input into the traffic model. The trip generation of the construction and operational phases of the Generator project are detailed in Appendix 13.2, and the assigned peak hour turning movements are detailed in Appendix 13.3. The modelling output for the site access junction in the 2027 AM and PM peak hours with Reserve Gas-Fired Generator construction is summarised in Table 13.1, and for the N65/L8763/L8760 junction is summarised on Table 13.2 below. Traffic modelling output files are included within Appendix 13.4. The output shows that the proposed Generator construction will have no material impact on the operation of the L8763 or N65 at these junction locations, and that both junctions will operate with a large amount of spare capacity and minimal queuing.

Table 13.1 L8763/access junction operation in 2027 with construction traffic

	AM				PM			
	Set ID	Queue (PCU)	Delay (s)	RFC	Set ID	Queue (PCU)	Delay (s)	RFC
	2027 with Max Generator Construction Trips							
Stream B-AC	D1	0.0	0.00	0.00	D5	0.2	9.21	0.10
Stream C-AB		0.0	0.00	0.00		0.0	0.00	0.00

Table 13.2 N65/L8763/L8760 junction operation in 2027 with construction traffic

	AM				PM			
	Set ID	Queue (PCU)	Delay (s)	RFC	Set ID	Queue (PCU)	Delay (s)	RFC
	2027 with Max Generator Construction Trips							
Stream B-ACD	D1	0.0	0.00	0.00	D5	0.0	0.00	0.00
Stream AB-CD		0.1	7.18	0.06		0.0	6.80	0.01
Stream D-AB		0.0	7.15	0.01		0.1	7.35	0.05
Stream D-C		0.0	9.57	0.01		0.1	10.13	0.07
Stream CD-AB		0.0	0.00	0.00		0.0	6.44	0.00

13.4.1.1.2 Road Structure Impact

The N65 national road has been constructed to be capable of withstanding higher than current traffic volumes. No significant visual defects within the immediate vicinity of the N65/L8763/L8760 junction were observed during a site visit on 29 May 2024. The level of traffic anticipated to be generated by the Generator project would not be anticipated to result in a measurable impact on the road structure of the N65. The pavement formation on the L8763 is unknown, and as such construction traffic may result in short term localised degradation to the L8763 carriageway and bordering residential frontage strips.

13.4.1.1.3 Road Safety Impact

Collision data is not currently publicly available due to ongoing issues in relation to GDPR and associated data-sharing agreements between An Garda Síochána and the Road Safety Authority. A Stage 1 Road Safety Audit (Appendix 13.5) has been undertaken on the highway related works on the L8763, including the Coolpowra Flex Gen project site access and alterations to the N65/L8763/L8760 junction. The main recommendations included within this Road Safety Audit report and agreed by the design team and client for the Coolpowra Flex Gen project are:

- Control of the speed of vehicles entering the L8763 from the proposed site access junction;
- Ensuring appropriate construction, widening and drainage of the L8763;
- Ensuring road user awareness of the revised alignment of the L8763 at the tie-in with the widened section of this local road; and,
- Minimising the impact of construction traffic on the residential frontage strips on the southern side of the L8763.

Following implementation of the recommendations of the Stage 1 Road Safety Audit and following subsequent completion of Stage 2 and Stage 3 Road Safety Audits, the impact of the proposed development on road safety is predicted to be not significant.

13.4.1.1.4 Traffic Noise Impact

The noise impact associated with Project 1 has been considered and is detailed in Chapter 11 of this EIAR.

13.4.1.1.5 Traffic Related Air Quality and Climate Impact

Due to the relatively low traffic volumes generated by the project during the construction phase, and the dispersed nature of access over the road network, no measurable impact is anticipated in relation to atmospheric pollutants from traffic related to Project 1.

13.4.1.2 Operational Phase Impact

As there will be minimal traffic movements associated with the 15-20 operatives (employed over three shifts) related to the operation of the Generator project (assuming that the access road and access junction are maintained), there will be no measurable traffic related environmental impacts during the operational phase of the project. This level of trip generation would not result in a measurable traffic capacity impact at either the L8763 site access or N65/L8760/L8763 junctions.

13.4.2 ESS ASSESSMENT (PROJECT 2)

This section assesses the impact of the ESS project (Project 2) in isolation from Projects 1 and 3.

13.4.2.1 Construction Phase Impact

13.4.2.1.1 Traffic Impact

Construction related personnel vehicle movements associated with the ESS project have been assigned 100% to/from the east at the proposed development site access onto the L8763 and assigned at the N65/L8763/L8760 junction based on existing proportional traffic movements on the N65. A vehicle occupancy of 1.5 persons per vehicle has been assumed for construction related personnel and 75% of arrivals and departures have been assumed to occur within the peak hour. Heavy goods vehicle movements have been assigned as per the intended haul route depicted in Figure 13.1, and 15% of such movement have been assumed to occur within the peak hour. As the traffic modelling is based on PCUs, heavy goods vehicles are factored by 2.3 within the data input into the traffic model. The trip generation of the construction and operational phases of the ESS project are detailed in Appendix 13.2, and the assigned peak hour turning movements are detailed in Appendix 13.3. The modelling output for the Coolpowra Flex Gen project site access junction in the 2028 AM and PM peak hours with ESS construction is summarised in Table 13.3 below, and for the N65/L8763/L8760 junction is summarised on Table 13.4 below. Traffic modelling output files are included within Appendix 13.4. The output shows that the proposed ESS construction will have no material impact on the operation of the L8763 or N65 at these junction locations, and that both junctions will operate with a large amount of spare capacity and minimal queuing.

Table 13.3 L8763/access junction operation in 2028 with ESS

	AM				PM			
	Set ID	Queue (PCU)	Delay (s)	RFC	Set ID	Queue (PCU)	Delay (s)	RFC
	2028 with Max ESS Construction Trips							
Stream B-AC	D3	0.0	8.37	0.01	D7	0.1	8.85	0.07
Stream C-AB		0.0	0.00	0.00		0.0	0.00	0.00

Table 13.4 N65/L8763/L8760 junction operation in 2028 with ESS construction traffic

	AM				PM			
	Set ID	Queue (PCU)	Delay (s)	RFC	Set ID	Queue (PCU)	Delay (s)	RFC
	2028 with Max ESS Construction Trips							
Stream B-ACD	D3	0.0	0.00	0.00	D7	0.0	0.00	0.00
Stream AB-CD		0.1	7.05	0.05		0.0	6.79	0.01
Stream D-AB		0.0	7.13	0.01		0.0	7.16	0.03
Stream D-C		0.0	9.58	0.01		0.1	10.04	0.05
Stream CD-AB		0.0	0.00	0.00		0.0	6.47	0.00

13.4.2.1.2 Road Structure Impact

The N65 national road has been constructed to be capable of withstanding higher than current traffic volumes. No significant visual defects within the immediate vicinity of the N65/L8763/L8760 junction were observed during a site visit on 29 May 2024. The level of traffic anticipated to be generated by the ESS project would not be anticipated to result in a measurable impact on the road structure of the N65. The pavement formation on the L8763 is unknown, and as such construction traffic may result in short term localised degradation to the L8763 carriageway and bordering residential frontage strips.

13.4.2.1.3 Road Safety Impact

The road safety impact of the ESS project in isolation will be as detailed in Section 13.4.1.1.3 in relation to Project 1, no measurable road safety impact is predicted to result from the ESS project subject to implementation of the recommendations of the Stage 1 Road Safety Audit and following subsequent completion of Stage 2 and Stage 3 Road Safety Audits.

13.4.2.1.4 Traffic Noise Impact

The noise impact associated with Project 2 has been considered and is detailed in Chapter 11 of this EIAR.

13.4.2.1.5 Traffic Related Air Quality and Climate Impact

Due to the relatively low traffic volumes generated by the project during the construction phase, and the dispersed nature of access over the road network, no measurable impact is anticipated in relation to atmospheric pollutants from traffic related to Project 2.

13.4.2.2 Operational Phase Impact

As there will be minimal traffic movements associated with the single operative (person) involved in the operation of the ESS project (assuming that the access road and access junction are maintained), there will be no measurable traffic related environmental impacts during the operational phase of the project.

13.4.3 GIS ELECTRICITY SUBSTATION ASSESSMENT (PROJECT 3)

This section assesses the impact of the GIS project in isolation from the Project 1 and Project 2.

13.4.3.1 Construction Phase Impact

13.4.3.1.1 Traffic Impact

Construction related personnel vehicle movements associated with the GIS project have been assigned 100% to/from the east at the proposed development site access onto the L8763 and assigned at the N65/L8763/L8760 junction based on existing proportional traffic movements on the N65. A vehicle occupancy of 1.5 persons per vehicle has been assumed for construction related personnel and 75% of arrivals and departures have been assumed to occur within the peak hour. Heavy goods vehicle movements have been assigned as per the intended haul route depicted in Figure 13.1, and 15% of such movement have been assumed to occur within the peak hour. As the traffic modelling is based on PCUs, heavy goods vehicles are factored by 2.3 within the data input into the traffic model. The trip generation of the construction and operational phases of the GIS project are detailed in Appendix 13.2, and the assigned peak hour turning movements are detailed in Appendix 13-3. The modelling output for the project site access junction in the 2027 AM and PM peak hours with GIS construction is summarised in Table 13.5 below, and for the N65/L8763/L8760 junction is summarised on Table 13.6 below. Traffic modelling output files are included within Appendix 13.4. The output shows that the proposed GIS construction will have no material impact on the operation of the L8763 or N65 at these junction locations, and that both junctions will operate with a large amount of spare capacity and minimal queuing.

Table 13.5 L8763/access junction operation in 2027 with GIS construction traffic

	AM				PM			
	Set ID	**Queue (PCU)**	**Delay (s)**	**RFC**	**Set ID**	**Queue (PCU)**	**Delay (s)**	**RFC**
	2027 with Max GIS Construction Trips							
Stream B-AC	D2	0.0	0.00	0.00	D6	0.1	8.72	0.05
Stream C-AB		0.0	0.00	0.00		0.0	0.00	0.00

Table 13.6 N65/L8763/L8760 junction operation in 2027 with GIS construction traffic

	AM				PM			
	Set ID	Queue (PCU)	Delay (s)	RFC	Set ID	Queue (PCU)	Delay (s)	RFC
	2027 with Max GIS Construction Trips							
Stream B-ACD	D2	0.0	0.00	0.00	D6	0.0	0.00	0.00
Stream AB-CD		0.1	7.02	0.04		0.0	6.80	0.01
Stream D-AB		0.0	7.24	0.01		0.0	7.12	0.03
Stream D-C		0.0	9.29	0.01		0.1	9.86	0.04
Stream CD-AB		0.0	0.00	0.00		0.0	6.49	0.00

13.4.3.1.2 Road Structure Impact

The N65 national road has been constructed to be capable of withstanding higher than current traffic volumes. No significant visual defects within the immediate vicinity of the N65/L8763/L8760 junction were observed during a site visit on 29 May 2024. The level of traffic anticipated to be generated by the GIS project would not be anticipated to result in a measurable impact on the road structure of the N65. The pavement formation on the L8763 is unknown, and as such construction traffic may result in short term localised degradation to the L8763 carriageway and bordering residential frontage strips.

13.4.3.1.3 Road Safety Impact

The road safety impact of the GIS project in isolation will be as detailed in Section 13.4.1.1.3 in relation to Project 1, no measurable road safety impact is predicted to result from the GIS project subject to implementation of the recommendations of the Stage 1 Road Safety Audit and following subsequent completion of Stage 2 and Stage 3 Road Safety Audits.

13.4.3.1.4 Traffic Noise Impact

The noise impact associated with Project 3 has been considered and is detailed in Chapter 11 of this EIAR.

13.4.3.1.5 Traffic Related Air Quality and Climate Impact

Due to the relatively low traffic volumes generated by the project during the construction phase, and the dispersed nature of access over the road network, no measurable impact is anticipated in relation to atmospheric pollutants from traffic related to Project 3.

13.4.3.2 Operational Phase Impact

As there will be negligible traffic movements associated with the operation of the GIS project, there will be no measurable traffic related environmental impacts during the operational phase of the project.

13.5 MITIGATION MEASURES

As the proposed project site access and project access junction are common to all projects presented as part of the proposed development, the mitigation measures proposed are also consistent between the individual projects.

13.5.1 RESERVE GAS-FIRED GENERATOR (PROJECT 1)

The following mitigation measures are proposed should the Generator project be granted permission:

- The recommendations contained with the Stage 1 Road Safety Audit contained in Appendix 13.5 should be implemented in full; and,
- Undertaking visual inspections prior to, during and post construction, and make good any localised degradation observed.

13.5.2 ENERGY STORAGE SYSTEM (PROJECT 2)

The following mitigation measures are proposed should the ESS project be granted permission:

- The recommendations contained with the Stage 1 Road Safety Audit contained in Appendix 13.5 should be implemented in full; and,
- Undertaking visual inspections prior to, during and post construction, and make good any localised degradation observed.

13.5.3 GIS SUBSTATION (PROJECT 3)

The following mitigation measures are proposed should the GIS project be granted permission:

- The recommendations contained with the Stage 1 Road Safety Audit contained in Appendix 13.5 should be implemented in full; and,
- Undertaking visual inspections prior to, during and post construction, and make good any localised degradation observed.

13.6 RESIDUAL TRAFFIC IMPACTS OF THE PROPOSED DEVELOPMENT

Assuming that the mitigation measures detailed in Section 13.5 are implemented, no residual traffic impact is anticipated from the development of:

- the Reserve Gas-Fired Generator (hereafter Generator) (Project 1)

- the Energy Storage System (ESS) facility (Project 2); or,
- the Gas Insulated Switchgear (GIS) Electricity Substation (Project 3)

13.7 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

This section assesses the cumulative impact of all of the elements of the proposed development progressing simultaneously, including the gas pipeline connection to Project 1.

13.7.1 CONSTRUCTION PHASE IMPACT

13.7.1.1 Gas Pipeline Connection

As part of the Reserve Gas-Fired Generator project, natural gas will be supplied to the site from the Gas Networks Ireland (GNI) transmission system. GNI will separately manage the process of delivering the underground natural gas pipeline to the proposed site. The traffic and transport impact of the delivery of the pipeline (utility works) is considered to be negligible as any utility works of this type involving for example road crossings, would be undertaken in accordance with the terms of an agreed road opening licence, and appropriate Temporary Traffic Management, which should be designed and operated in accordance with prevailing national guidance.[12, 13, 14]

13.7.1.2 Traffic Impact

The modelling output for the proposed development site access junction in the 2027 AM and PM peak hours with cumulative construction is summarised in Table 13.7 below, and for the N65/L8763/L8760 junction is summarised on Table 13.8 below. Traffic modelling output files are included within Appendix 13.4. The output shows that the proposed cumulative construction will have no material impact on the operation of the L8763 or N65 at these junction locations, and that both junctions will operate with a large amount of spare capacity and minimal queuing.

Table 13.7 L8763/access junction operation in 2027 with cumulative construction traffic

	AM				PM			
	Set ID	Queue (PCU)	Delay (s)	RFC	Set ID	Queue (PCU)	Delay (s)	RFC
	2027 with Max Cumulative Construction Trips							
Stream B-AC	D4	0.0	8.65	0.03	**D8**	**0.3**	**10.48**	**0.21**
Stream C-AB		0.0	0.00	0.00		**0.0**	**0.00**	**0.00**

Table 13.8 N65/L8763/L8760 junction operation in 2027 with cumulative construction traffic

	AM				PM			
	Set ID	Queue (PCU)	Delay (s)	RFC	Set ID	Queue (PCU)	Delay (s)	RFC
	2027 with Max Cumulative Construction Trips							
Stream B-ACD	D4	0.0	0.00	0.00	D8	0.0	0.00	0.00
Stream AB-CD		0.2	7.63	0.12		0.0	6.76	0.00
Stream D-AB		0.0	7.03	0.02		0.1	7.71	0.09
Stream D-C		0.0	10.78	0.01		0.2	10.70	0.11
Stream CD-AB		0.0	0.00	0.00		0.0	6.34	0.00

13.7.1.3 Road Structure Impact

The N65 national road has been constructed to be capable of withstanding higher than current traffic volumes. No significant visual defects within the immediate vicinity of the N65/L8763/L8760 junction were observed during a site visit on 29 May 2024. The level of traffic anticipated to be generated cumulatively by the project would not be anticipated to result in a measurable impact on the road structure of the N65. The pavement formation on the L8763 is unknown, and as such construction traffic may result in short term localised degradation to the L8763 carriageway and bordering residential frontage strips.

13.7.1.4 Road Safety Impact

No measurable road safety impact is predicted to result from the combination of the elements of the proposed development subject to implementation of the recommendations of the Stage 1 Road Safety Audit and following subsequent completion of Stage 2 and Stage 3 Road Safety Audits.

13.7.1.4.1 Traffic Noise Impact

The noise impact associated with proposed development has been considered and is detailed in Chapter 11 of this EIAR.

13.7.1.4.2 Traffic Related Air Quality and Climate Impact

Due to the relatively low traffic volumes generated by the project during the construction phase, and the dispersed nature of access over the road network, no measurable impact is anticipated in relation to atmospheric pollutants from traffic related to the proposed development.

13.7.2 OPERATIONAL PHASE

The traffic impact of the combination of all projects of the proposed development is considerably reduced during the operational phase of the project when compared to the construction phased of the project. Therefore, no significant traffic and transport related environmental impacts are predicted.

13.8 MONITORING AND FURTHER WORKS

13.8.1 MONITORING

No specific monitoring is recommended beyond mandatory health and safety monitoring required for any workplace. Depending on the axle loading of construction related vehicles and/or abnormal loads, further tests to determine the structural strength of the L8763 carriageway, or further visual inspections prior to and post construction, should be undertaken, if necessary, in agreement with Galway County Council.

13.9 SUMMARY OF SIGNIFICANT EFFECTS AND RESIDUAL IMPACTS

Based on the predicted trip generation, assessment contained within this chapter, and implementation of the recommended mitigation measures, no significant environmental effects or residual impacts are predicted as a result of the traffic and transport associated with the proposed development.

13.10 TRANS-BORDER/INTERNATIONAL IMPACTS

Whilst all traffic and transport related activity generates emissions in terms of exhaust gases and particulate matter (including trans-border emissions), due to the small number of such additional daily trips resulting from the proposed development, the traffic related environmental impact is not anticipated to be at measurable level.

13.11 DIFFICULTIES ENCOUNTERED IN COMPILING INFORMATION

No difficulties (technical deficiencies or lack of know-how) were encountered in compiling this chapter. The traffic assessment contained within this chapter uses a fixed demand matrix which reflects current travel behaviour. Changes in the nature of existing trips such as re-timing, re-routeing, and/or changes in the mode of transport used, may result in a lesser impact than stated within this chapter.

13.12 REFERENCES

- [1] Transport Infrastructure Ireland (2014) PE-PDV-02045 Traffic and Transport Assessment Guidelines [https://www.tiipublications.ie/library/PE-PDV-02045-01.pdf]
- [2] Environmental Protection Agency (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports [https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf]
- [3] DTTAS (2013) Urban Flexible Roads Manual : Pavement Surface Condition Index Volume 2 of 3 [https://www.rmo.ie/uploads/8/2/1/0/821068/psci_manual_urban_flexibleroads_04112013_lowres.pdf]
- [4] DTTAS (2014) Pavement Asset Management Guidance Section 5.0: Condition Surveying and Rating – Overview [https://www.rmo.ie/uploads/8/2/1/0/821068/ipag_-_pamg_-_section_5.0_-_condition_surveying_and_rating_-_overview.pdf]
- [5] Transport Infrastructure Ireland (2020) AM-PAV-06050 Pavement Assessment, Repair and Renewal Principles
- [6] Transport Infrastructure Ireland (2017) GE-STY-01024 Road Safety Audit' (standard)
- [7] Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes
- [8] WHO (2021) WHO global air quality guidelines [https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf]
- [9] DTTAS (2015) Guidelines for Setting and Managing Speed Limits in Ireland [https://www.speedlimits.ie/_files/ugd/971679_1d14f0eefdcc426785d3dd1058a33ae6.pdf]
- [10] Road Traffic Act 2024 [https://www.irishstatutebook.ie/eli/2024/act/10/enacted/en/html]
- [11] Transport Infrastructure Ireland (2021) PE-PAG-02017 Travel Demand Projections [https://www.tiipublications.ie/library/PE-PAG-02017-03.pdf]
- [12] DTTAS (2024) Traffic Signs Manual - Chapter 8 Temporary Traffic Measures and
- Signs for Roadworks [https://bit.ly/4c112VI]
- [13] DTTAS (2019) Temporary Traffic Management Design Guidance [https://dttassupportoffice.sharepoint.com/:b:/s/DTTASSupportOffice/EVkg7eHZV4FCj2kpCwFfP-IBrhi8Euqu14TQFrF3G3oFKA]

- [14] DTTAS (2019) Temporary Traffic Management Operations Guidance (Part 2) [https://www.trafficsigns.ie/_files/ugd/f378bf_9f2342a1a0074b71a0e530d2b5d5d8ce.pdf]

14 ARCHAEOLOGICAL AND CULTURAL HERITAGE

14.1 INTRODUCTION

The site covers an area of c. 50 hectares and largely consists of greenfield agricultural land to the west of the N65 road, with Portumna c. 4 km to the south and Killimor c. 3.1km to the north (see Appendix 13-A; Figure 1). Several wet ditches and streams are present across the site, marking field boundaries, including the Ballynaheskeragh stream. An existing operational 400kV AIS electricity substation (Oldstreet) is located directly adjacent and north of the development site. A farmhouse and associated outbuildings within the site, in the townland of Gortlusky, are scheduled for demolition.

The proposed development consists of (1) a Reserve Gas-Fired Generator that includes three open-cycle gas-fired generator units (OCGT) located within a turbine hall, an external bunded structure for storage of secondary fuel (gas oil), cooling equipment, other electrical plant and an above ground installation compound; (2) a 4000kV Gas Insulated Switchgear (GIS) Substation within a fenced compound; and (3) an Energy Storage System facility that includes a synchronous condenser within a building (Syncon) and an LDES battery facility in an outdoor compound (Appendix 14.1; Figure 2; Appendix 14.2; Plates 1–3). These are subject to the following permissions:

- Section 37 SID application to An Bord Pleanála (OCGT)
- Section 182 SID application to An Bord Pleanála (GIS)
- Section 34 application to Galway County Council (SYNCON and LDES)

The indicative route for an associated gas pipeline has also been designed to avoid any known archaeological and architectural heritage constraints (Appendix 14.1; Figure 3). This will commence at New Inn, just north of the M6 Motorway and approximately 23.5 km north-west of the development site. The pipeline will be established by Gas Networks Ireland (GNI) through a separate planning application, and they will complete an associated full assessment.

14.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

14.2.1 DESKTOP STUDY

For the purposes of this report, archaeology, architectural and cultural heritage is considered to include the following elements:

- Sites and Monuments Record (SMR)

- Record of Monuments and Places (RMP)
- National Monuments
- Sites reported in the Database of Irish Excavation Reports
- Any previously unrecorded sites
- A list of architectural heritage structures (NIAH)
- A list of Protected Structures (Galway County Development Plan 2022–2028)
- Report on archaeological assessments of the site carried out to date (Geophysical Survey)

14.2.2 RMP AND SMR

A primary cartographic source and base-line data for the assessment was consultation of the *Sites and Monuments Record* (SMR) and *Record of Monuments and Places* (RMP) for County Galway. All known recorded archaeological monuments are indicated on the 6-inch Ordnance Survey (OS) maps and are listed in these records. The SMR and RMP paper archives are not a complete record of all monuments, however, as newly discovered sites may not appear in the lists or accompanying maps. Accordingly, in conjunction with the consultation of the SMR and RMP, the digital database of recorded monuments (Historic Environment Viewer), which may be accessed through the National Monuments Service (NMS) website, was also consulted. This database of SMR records is updated daily.

The county SMR forms the basis for the statutory RMP (established under Section 12 of the National Monuments (Amendment) Act 1994). Accordingly, all sites included in the RMP are protected under the National Monuments Acts (1930–2004).

14.2.3 NATIONAL MONUMENTS

The National Monuments Service website lists Monuments covered by Preservation Orders and in the ownership/guardianship of the Minister for Housing, Local Government and Heritage by county (https://www.archaeology.ie/national-monuments/).

The term 'National Monument' is defined by the National Monuments Act (1930) as being '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'. The aforementioned Act states that the consent of the Minister is required for archaeological works at or near a National Monument in the ownership or guardianship of the Minister or a local authority, or to which a preservation order applies. The Minister is required to consult with the Director of the National Museum of Ireland in relation to such an application for consent.

14.2.4 PROTECTED STRUCTURES & NIAH SITES

Protected Structures are buildings and other structures that the planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, or technical point of view. These are protected under Part IV of the Planning and Development Acts 2000 and listed in Appendix 6: Record of Protected Structures in the *Galway County Development Plan 2022–2028*.

Heritage Structures are also recorded by the National Inventory of Architectural Heritage (NIAH), a state initiative established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. The list forms the basis for the recommendations for inclusion in the Record of Protected Structures (RPS).

14.2.5 THE TOPOGRAPHICAL FILES OF THE NATIONAL MUSEUM OF IRELAND

The topographical files of the National Museum of Ireland contain information pertaining to archaeological finds (mainly artefactual) and excavations in numerous townlands throughout the country which were reported to the museum since the 1920s. While many of these find spots are not recorded monuments, they can provide an indication of past activity in a townland and consequently add to our understanding of the archaeological potential of an area.

14.2.6 CARTOGRAPHIC SOURCES AND AERIAL IMAGERY

Potential archaeological or cultural heritage features can be marked on historic maps or be visible on aerial photography as cropmarks, soil marks and low earthworks. Both provide a useful resource in identifying sites, particularly if they no longer have any above ground remains.

Several cartographic sources were consulted as part of this assessment, namely *The Down Survey of Ireland* (1656–1658), *The Counties of Gallway* map by Hermann Moll (1728), *A Map of the County of Galway* by William Larkin (1819) (see Appendix 13-A; Figure 4), and the first (surveyed 1837 – published 1841) and third edition (surveyed 1892 – published 1894) Ordnance Survey (OS) maps (see Appendix 13-A; Figures 5–8), as well as the Cassini map (surveyed 1956 – published 1957). Aerial photographs dating between 1995 and 2013 from the Ordnance Survey of Ireland (OSi) were also examined, as was Google Earth imagery dating between 2010 and 2023.

14.2.7 EXCAVATIONS DATABASE

The Database of Irish Excavation Reports, also known as the Excavations Database, is an annual account of all investigations carried out under an excavation licence and includes excavations undertaken from 1970 to the present (www.excavations.ie). This database was consulted as part of the desktop research for this assessment, to establish if any previous archaeological investigations under excavation licence had been carried out on or near to the proposed development area.

14.2.8 NON-INVASIVE FIELD SURVEYS

A site visit was conducted to assess whether the site contained any visible evidence of any previously unrecorded areas or features of historical or archaeological significance.

A geophysical survey (24R0048; Murphy 2024) was also conducted across the site (see Section 14.3.6; Appendix 14.1, Figures 9–13). The aim of this survey was to establish the presence of any archaeological features within the site, assist in determining the extent of subsurface archaeological features present and inform any further mitigation strategies that may be required.

14.2.9 DOCUMENTARY RESEARCH

Additional desktop research included the following resources:

- The Irish Townlands Database (https://www.townlands.ie/), the Irish Placename Database (https://www.logainm.ie/en/) and the Database of Placenames in Galway County (http://www.galwaylibrary.org/) were consulted for the associated administrative divisions (baronies, civil parishes and townlands) and the meaning of the placenames within and surrounding the proposed development site. The Irish Placename Database database was created by Gaois, Fiontar & Scoil na Gaeilge in collaboration with The Placenames Branch of the Department of Housing, Local Government and Heritage. It contains archival records and placenames research conducted by the State. Many of Ireland’s geographical names are of Irish origin, while others derive from English, with a small number from Old Norse. The anglicisation process included name standardisation, which was largely carried out in the 19th century and recorded in the Ordnance Survey’s work. Toponyms can provide useful historical and cultural heritage data, such as information on administrative divisions, natural and archaeological features that may have disappeared, and the ownership or character and origins of a settlement. The Database of Placenames in Galway County was created by Galway Public

Library and includes details from the Ordnance Survey Name Books, which are notebooks compiled in the 1840s as part of the first Ordnance Survey of Ireland.

- Griffith's Valuation (1847–1864) is a property tax survey with accompanying mapping that lists and details every taxable piece of agricultural land or built property in Ireland, published county by county.
- The School's Collection, which is a collection of folklore compiled by school children in Ireland in the 1930s. It includes references to intangible cultural heritage, such as folk traditions and oral histories, and was recorded between 1937 and 1939.

14.2.10 STANDARDS AND GUIDELINES

This chapter's methodology is guided by a legislative framework that governs how aspects of archaeological, cultural and architectural heritage are protected. It has been prepared in compliance with all relevant EIAR legislation and guidance, including *Guidelines on the information to be contained in Environmental Impact Assessment Reports*, published by the Environmental Protection Agency (2022).

14.2.11 SIGNIFICANCE CRITERIA

The main purpose of this chapter is to identify, describe and present an assessment of the likely significant effects of the proposed development on archaeological and cultural heritage remains (known and unknown if present). An effect can be positive, negative, or neutral/none, direct and indirect. The effect may result from the construction phase and/or the operation phase of the project.

The potential effects will be assessed for each component of the development as described above (Chapter 2), the (1) Reserve Gas-Fired Generator, (2) ESS facility and (3) GIS Substations well as cumulatively.

This chapter aims to present a precise, concise, accurate, and credible description of the likely and significant effects of archaeological and cultural heritage and offer mitigation measures where a likely significant effect is predicted. The description of effects follows the EPA Guidelines (2022, table 3.4, fig. 3.4), whereby comparing the character of the predicted effect to the sensitivity of the receiving environment can determine the significance.

14.3 DESCRIPTION OF RECEIVING ENVIRONMENT

14.3.1 INTRODUCTION

The development site is principally located within three townlands: the east side of Coolpowra, the south side of Ballynaheskeragh and the north side of Gortlusky. The eastern extent of the development area, where the site boundary runs along the N65 road, also extends into Cooldorragha to the south and Sheeaunrush to the north. An additional area to the south-west, in the townland of Coolnageeragh, is within the ownership boundary but not part of the planning boundary, however, it was subject to geophysical survey (see Section 14.3.6; Appendix 14.1, Figure 9).

The site has an elevation of c. 51–54m Ordnance Datum (O.D.). The underlying geology consists of dark limestone and shale and is part of the Lucan Formation. It is covered by deep, well drained mineral (mainly basic) soils (Geological Survey of Ireland). The Ballynaheskeragh stream extends through the site, along the townland boundaries, and the terrain is undulating as it includes several drumlins. The site is accessed via a cul-de-sac off the L8763 (local road) that terminates at the farmyard.

Cultural Heritage is considered here to include all recorded monuments listed in the Record of Monuments and Places (RMP) and in the Sites and Monuments Record (SMR), National Monuments (i.e. those in the ownership/guardianship of the state), Protected Structures, National Inventory of Architectural Heritage (NIAH) sites, previously unrecorded sites, sites reported in the Excavations Database if not included in the RMP/SMR, find spots or sites listed in the Topographical Files of the National Museum of Ireland, and finally sites identified during a site visit, through examination of cartographic sources and aerial imagery, and through non-invasive geophysical survey.

14.3.2 HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

The relevant townlands are all within the Barony of Longford, with Coolpowra, Gortlusky, Cooldorragha, Sheeaunrush and Coolnageeragh in the Civil Parish of Lickmolassy, and Ballynaheskeragh in the Civil Parish of Killimorbologue. The following details are largely derived from the Irish Placename Database and the Database of Placenames in Galway County.

Coolpowra or *Cúil Phóire*, which roughly translates to 'back of the beans' was first mentioned in 1577 as 'Coulffurry' and again in 1585 as 'Colpary' and in 1610 as 'Coolepoury'. (https://www.logainm.ie/21233.aspx). The Ordnance Survey Name Books (OSNB), dating to the 1830s, described it as 'a townland with a village, a portion of bog to the North, several ruins and lime kilns, a few spring wells, a number of lanes and the road leading from Portumna to Eyre Court passes through it'.

Gortlusky, or *An Ghoirt Loiscthe*, was first recorded by The Ordnance Survey in 1837 with three variations of 'Gurthluckie', 'Gort Loisgthe' and 'Gurth Luskie' (https://www.logainm.ie/21241.aspx). It can be roughly translated as 'burnt field' and was described in the OSNB as containing a few farmhouses, portions of furze, spring wells, a gravel pit and two lime kilns.

Ballynaheskeragh comes from the Irish *Baile na hEiscreach*, which translates to '*Town of the Ridge (of Sand Hills)'* (https://www.logainm.ie/21215.aspx). There have been several variations of spelling of the name over the centuries, such as 'Ballanyscraigh' and 'Ballyneheskeragh' from the early 1600s, which is the earliest record of the townland name. The OSNB listed farmhouses, lime kilns, a Trig. [triangulation] station, a portion of fir planting and a small portion of bog as features within this townland (Galway County Heritage Office 2017).

Coolnageeragh or *Cúil na gCaorach*, which roughly translates to 'back of the sheep', was first mentioned in 1660 (https://www.logainm.ie/21232.aspx). The School's Collection (Vol. 0057, Page 0021) records the local tradition that this name derived from the Danes, who used to gather their sheep here long ago. The OSNB described the townland as containing 'a considerable number of farmhouses, lanes, spring wells, one lime kiln and the road leading from Portumna to Eyre Court, which forms the townlands eastern boundary'.

Sheeaunrush or *Sián Ruis*, which translates as fairy mound, was first recorded by The Ordnance Survey in 1837 (https://www.logainm.ie/21254.aspx). The associated OSNB described the townland as containing 'one small village, a few farm houses, a Trig. Station, a spring well, three lime kilns, a small portion of bog to the N. The remainder is pasture and arable. It is bounded on the South by the road from Eyrecourt to Loughrea'.

Cooldorragha or *An Chúil Dorcha*, meaning dark/black corner or nook, was first recorded in 1603 as 'Couldoroghan' when referring to the place of McDonnough (https://www.logainm.ie/21231.aspx). The OSNB described the townland as containing 'three small villages, a Danish fort, a few ruins, four lime kilns, a gravel pit and is intersected with patches of shrubbery. The road leading from Eyre Court to Portumna bounds it on the S. and on the E. by the road leading from Eyre Court to Loughrea; it is all arable'.

There are no Recorded Monuments listed within the proposed development site, or within most of the townlands within which the site is located. There is, however, an Enclosure (GA117-024----) within the eastern extent of the townland of Cooldorragha, to the far south-east of the site. Additional monuments in the surrounding landscape comprise a Mound (GA117-104----) and a Designed landscape feature (GA117-090----), located to the south-east, in the townland of Thornfield, with an additional Enclosure (GA117-063----) located to the far south of the site in the townland of Lecarrow.

Both enclosures are recorded as rectangular or sub-rectangular in plan. That in the townland of Cooldorragha is situated on a hillock but has no above ground remains surviving. It was marked on the 1839 edition of the Ordnance Survey (OS) map as measuring c. 26m ESE/WNW by c. 18m NNE/SSW, although by the time of the 1892 OS map it is depicted as a more circular-shaped enclosure with a diameter of c. 18m. That in the townland of Lecarrow is situated beside a stream and is defined by two banks and an intervening fosse, measuring 39.5m E/W by 32m N/S. The inner bank survives along the north and from the south to the west, but elsewhere a scarp forms the enclosing element. Traces of the outer bank survive along the west side and a 4.5m-wide gap to the south-west may represent an original causeway. Based on the rectangular plan, these could represent later medieval occupation such as moated sites that functioned as the settlements of lesser Anglo-Norman landholders (Holland 1994). That said, in the absence of further investigation the date and function of these enclosures remains unknown, albeit the site at Lecarrow was identified by Holland (*ibid*., 206) as representing a moated site, while that at Cooldorragha does not appear to have been included in his study of rectangular earthworks.

There are currently no further details available on the mound and the designed landscape feature, although both could relate to Thornfield House, which although no longer extant was originally to the south of these sites and formed part of the Clanricarde Estate, which was one of the largest estates in County Galway (Landed Estates Database). Thornfield House was reportedly the seat of John Davis in 1846, but by 1856 there is a record of Thomas Galbraith leasing a property valued at £7 in the townland of Thornfield; the Galbraith family had originally acquired many lands in east Galway following the Williamite settlements.

14.3.3 RECORDED ARCHAEOLOGICAL MONUMENTS (RMP/SMR SITES)

There are no monuments listed in the *Record of Monuments and Places* or the *Sites and Monuments Record* located within the site boundary (see Appendix 14-1; Figure 1). There are, however, three monuments registered within c. 500m of the site boundary (where it extends southwards along the N65 road), one to the south-east (Enclosure GA117-024----) and two to the south (Mound GA117-104---- and Designed landscape feature GA117-090----), with a fourth site within 1 km of the site boundary (Enclosure GA117-063----). Of these, three are listed in the Galway RMP (published 1997), with the fourth (Mound GA117-104----) is SMR registered and will be included in the next revision of the RMP.

14.3.4 NATIONAL MONUMENTS

No National Monuments are located on or within close proximity to the site.

14.3.5 PREVIOUSLY UNRECORDED SITES

No above ground traces for any previously unrecorded sites were noted within the proposed development area during the site walkover survey carried out in February 2024. Nor were any new sites identified from an examination of aerial imagery.

A number of potential cultural heritage sites were identified on cartographic sources, however. Within the proposed development lands in the townland of Gortlusky, a cluster of three buildings surrounded by trees are depicted on the OS 6-inch map of 1837 (Appendix 13-A; Figure 5). By the time of the OS 25-inch map of 1892, two of these structures are still depicted but the middle one has been extended into a larger farmhouse (Appendix 13-A; Figure 7). According to Griffith's Valuation (completed for Galway in 1857), this cluster of buildings (houses and offices or outbuildings) and surrounding land was occupied by John Hurley, who leased it from the Marquis of Clanricarde, George Saunderson. A farmhouse and associated outbuildings still occupy this site today and these are scheduled for demolition.

North of this, in the townland of Ballynaheskeragh, a further two structures are depicted on the OS 6-inch map of 1837 (Appendix 14.1; Figure 5), with an enclosed yard to the north-east and what appears to be an associated limekiln. The latter is depicted as a small circle with a darkened portion defining the stoke-hole, which is how such kilns were generally depicted on nineteenth-century mapping (Gillespie *at al*. 2017). Just north of these structures there is also a small, tree-lined field that may have been used as an orchard, paddock or garden plot. By the time of the 1892 map a third (unroofed) structure has been added to the north and the yard and limekiln are no longer present (Appendix 14.1; Figure 7). According to Griffith's Valuation, this house, office and land was occupied by John Quin, who also leased it from the Marquis of Clanricarde. These structures appear to have been demolished sometime before the 6-inch Cassini map was surveyed in 1956. On the 1837 map, a small, isolated structure is also recorded in the same townland in the east area of the site, along where it is proposed to construct a new road. By the time of the 1892 map this structure is no longer depicted.

Wells and springs are also frequently marked on historic maps, often as a small circle but sometimes also labelled and named (although these simple circles can also denote the location of limekilns). Within the townland of Gortlusky one such well is depicted on the map of 1837, abutting a field boundary just south of the townland boundary and approximately 60m south-east of the building cluster in the townland of Ballynaheskeragh, with another depicted c. 380m to the south-east again, abutting the east of the townland boundary on the Ballynaheskeragh side. In the same townland, approximately 350m to the north, another well is illustrated and labelled on the 1892 map, just inside the site boundary. In addition, far more field divisions are depicted on the historic mapping than in the present layout of the fields, along with the locations of several unfenced roads or farm tracks.

Townland boundaries also extend through the proposed development lands, with that along a roughly east–west axis, albeit undulating with the field divisions, separating Coolpowra, Gortlusky and Cooldorragha from Ballynaheskeragh, while a roughly north–south boundary through the west end of the site separates Coolpowra and Gortlusky (Appendix 14.1; Figure 5). The line of these townland divisions is still preserved in the layout of the fields today. Townlands represent one of the smallest divisions of land across Ireland and they have ancient origins, with the first written accounts found in pre-twelfth-century church records (Bryonie 2005). They were subsequently mapped and defined by the English administration and used as the basis for plantation grants in the sixteenth and seventeenth centuries and for the leasing of land within large estates from the early seventeenth century. Accordingly, they were used as units of measurement for taxation purposes and defined in terms of how much arable land they held (Hall 1999). They became standardised from the seventeenth century onwards and were further clarified by the completion of the first Ordnance Survey of Ireland in the 1840s. Townland names frequently referred to an easily identifiable feature of the landscape, such as Carraig or Carrick (meaning Rock), Tulach or Tully (meaning a hill), or a botanical feature such as Eanach or Annagh (meaning marsh), other times they include family names, usually reflecting those that lived there in pre-famine times, or early ecclesiastical and secular habitations, including Rath (meaning fortification), Dun (meaning fort) or Cill/Kill (meaning church) (Donaghmore Historical Society).

A number of potential archaeological features were also identified within the site as a result of a geophysical survey undertaken in February 2024 (24R0048; Murphy 2024). These are described in the section below.

14.3.6 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

To inform the EIAR and planning process, a non-invasive geophysical survey was carried out across the greenfield elements of the site, within the townlands of Ballynaheskeragh, Coolpowra, Coolnageeragh and Gortlusky (Appendix 14.1; Figures 9–13). This comprised a full detailed gradiometer survey using a Bartington GRAD 601-2 dual-sensor fluxgate gradiometer cart system. The geophysical survey was conducted by Donald Murphy, Robert Breen and Jeanne Rochford of Archaeological Consultancy Services Unit Ltd (ACSU) under licence 24R0048 issued by the Department of Housing, Local Government and Heritage (Murphy 2024).

The available survey area was divided into 19 fields (Appendix 14.1; Figure 9). No definite signs of archaeology were identified during the geophysical survey, however, anomalies of archaeological potential were recorded and these will require further assessment. For example, potential spreads/pits (M2a–d, M4, M7) and curvilinear features (M1, M3, M5, M6) of archaeological significance were recorded in Fields 3, 4–5, 7, 11, 16, 18 and 19. Some of which could represent early field systems, ploughed out enclosures or the remains of structures, pits , posts/post-holes, kilns or deposits. An archaeological interpretation for responses in these areas is tentative, however, and a natural soil/geological or recent land-use origin can also be considered.

Features depicted on the examined Ordnance Survey mapping of 1837 and 1892 were also detected, including numerous linear anomalies corresponding with former field boundaries. These were recorded in Fields 1, 3–7, 10, 12–14, 18 and 19. Linear anomalies that are not recorded field boundaries were also detected. They likely represent early field system drains or paths/access tracks and were detected in Fields 1, 6, 11, 16 and 18. Anomalies marked as 'Cultivation' represent furrows/plough marks or possible land drains. These are consistently aligned north-west/south-east in Field 2 and north-east/south-west in Field 4, indicating past cultivation practices.

The proposed development site was not subject to any other previous archaeological investigations, and there are no investigations listed within the Database of Irish Excavation Reports for the townlands of Ballynaheskeragh, Cooldorragha, Coolnageeragh, Coolpowra, Gortlusky and Sheeaunrush (www.excavations.ie). The closest archaeological assessment conducted to the site was in the village of Killimor to the far north, where test trenching (09E0057; OCarroll 2009) of a greenfield site within the zone of archaeological potential of Trinity Chapel (GA107-079----), which is also a Protected Structure, did not identified any archaeological features.

14.3.7 RPS AND NIAH

The site contains no architectural heritage sites or Protected Structures as listed in Appendix 6 of the *Galway County Development Plan 2022–2028*, and no such sites are recorded across the townlands of Ballynaheskeragh, Coolpowra, Coolnageeragh, Gortlusky, Sheeaunrush and Cooldorragha.

14.3.8 CARTOGRAPHIC SOURCES AND AERIAL IMAGERY

A review of available historic mapping for the area was carried out to include *The Down Survey of Ireland* (1656–1658), *The Counties of Gallway* map by Hermann Moll (1728), *A Map of the County of Galway* by William Larkin (1819), the first (surveyed 1837 – published 1841) and third edition (surveyed 1892 – published 1894) Ordnance Survey (OS) maps and the Cassini 6-inch map (surveyed 1956 – published 1957).

Only the County of Galway Down Survey map still survives, and this does depict the Barony of Longford, containing Portumna 'towne', with the townlands of 'Ballynahiskeragh' (Ballynaheskeragh), 'Coolnegerigh' (Coolnageeragh), 'Cowlponry' (Coolpowra) and 'Tyrihan' (Sheeaunrush) also recorded. Ballynaheskeragh, Coolpowra and Sheeaunrush are all registered as under the ownership of the Protestant Earl of Clanrickard (Clanricarde) in both 1641 and 1670, while Coolnageeragh, which was owned by the Catholic John Horne in 1641, was divided in 1670 between the Protestant landowners of Richard Butler (Earl of Arran) and the Earl of Cork.

The 1728 map by Hermann Moll depicts the Barony of Longford, 'Portumny' and Killimor, while the 1819 map (sheet 12) by William Larkin provides more detail, with a series of buildings dotted along the original N62 road, including 'Thornfield', which is illustrated as a cluster of three structures (Appendix 14.1; Figure 4). As outlined above (Section 14.3.5), the 6-inch OS map of 1837 and the 25-inch OS map of 1892 show a rural landscape of farmland, divided by field boundaries and traversed by unfenced roads or tracks, which changed over time (Appendix 14.1; Figures 5–8). A series of small cottages or vernacular houses, along with outbuildings, are also illustrated within the proposed development site, some of which are associated with farmyards, garden allotments, wells and limekilns. While most of these features no longer have any above ground expression, sub-surface remains and associated artefacts may still remain. The cluster of buildings in the townland of Gortlusky remain occupied by a farmhouse and associated outbuildings, which are scheduled for demolition. By the time of the 25-inch map of 1892, parts of the eastern area of the site are depicted as comprising rough pasture overgrown by furze.

A review of available aerial photographs was also conducted, including those dating to between 1995 and 2013 from the Ordnance Survey of Ireland and Google Earth imagery dating between 2010 and 2023. By the time of the 1995 aerial image, a number of the field boundaries depicted on the historical mapping had been removed. Beyond that, the site appears to have remained unchanged since. No monuments or sites of cultural heritage interest were identified from the examined aerial imagery.

14.3.9 TOPOGRAPHICAL FILES

The Topographical Files of the National Museum of Ireland were consulted but finds were recorded for the townlands of Ballynaheskeragh, Coolpowra, Coolnageeragh, Gortlusky, Sheeaunrush or Cooldorragha.

14.3.10 FIELD INSPECTION

A site inspection was conducted in February 2024 (see Appendix 14.2; Plates 4–9). This confirming that the site consists of undulating terrain of mixed-use pasture and tillage cultivation. A series of drumlins were noted, with the lower lying areas subject to waterlogging. The field system boundaries are predominantly maintained hedgerows with occasional mature trees. The land directly north of the farmhouse and outbuildings is overgrown.

14.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

14.4.1 ARCHAEOLOGICAL HERITAGE

There will be no effects, direct or indirect, on recorded archaeological monuments as no such monuments are located within the proposed development site.

A potential direct effect on the archaeological resource lies in the uncovering of sub-surface archaeological features during groundworks associated with the proposed development and related infrastructure within all undisturbed areas of the site. While no definite signs of archaeology were identified during the geophysical survey, anomalies of archaeological potential, were recorded, and these will require further assessment (see Section 14.5.1; Appendix 14.1; Figures 10–13). These anomalies may represent the remains of early field systems, ploughed out enclosures, structures, pits, posts/post-holes, kilns and deposits.

The Ballynaheskeragh stream also extends through the site, indicating an area that was formerly at the boundary between wetland and dryland. Such locations, where there is a readily available water source but also an adjacent area of dry ground, frequently contain the remains of *fulacht fia*, also known as burnt mounds. They are usually identified as charcoal-rich mounds or spreads of heat-shattered stones; however, in many cases the sites have been disturbed by later agricultural activity and are no longer visible on the field surface. Disturbed spreads will nonetheless often preserve underlying associated features, such as troughs, pits, post/stake-holes and gullies. They represent the remains of prehistoric water heating sites, where people mainly gathered to cook food, although they could also have been used for bathing/sauna, brewing, textile working, etc. Burnt mounds are most commonly dated to the Bronze Age (c. 2200–800 BC), largely to the Middle–Late Bronze Age (Brindley et al. 1990; Corlett 1997), however, many examples are now also known to date from the Neolithic, Chalcolithic and Iron Age (Hawkes 2018, chapter 5).

Should previously unknown archaeological features be present, the proposed development will have a direct, negative, permanent and profound or very significant effect on such remains.

14.4.2 ARCHITECTURAL AND CULTURAL HERITAGE

There will be no effects, direct or indirect, on recorded architectural heritage as no Protected Structures or sites listed within the National Inventory of Architectural Heritage (NIAH) are located within the proposed development site.

An upstanding farmhouse and associated outbuildings within the site, in the townland of Gortlusky, are scheduled for demolition. These are located on the site of a cluster of three buildings depicted on the 6-inch map of 1837, with the middle structure extended into a larger farmhouse by the time of the 25-inch map of 1892 (see Appendix 14.1; Figures 5–8). Accordingly, some aspects of the original vernacular structures may remain upstanding and will require further assessment (see Section 14.5.2).

Additional cultural heritage features depicted on the examined Ordnance Survey mapping of 1837 and 1892 were also detected within the proposed development site but have no above ground remains surviving (see Appendix 14.1; Figures 5–8). A potential direct effect on these features lies in the uncovering of sub-surface remains during groundworks associated with the proposed development and related infrastructure. These include two structures in the townland of Ballynaheskeragh that are depicted on the 1837 map with an associated enclosed yard and limekiln. The yard and limekiln are gone by the time of the 1892 map, while the structures are demolished sometime before the Cassini map of 1956. Additional potential features depicted on the historic mapping include wells in the townlands of Gortlusky and Ballynaheskeragh.

Townland boundaries also extend through the proposed development lands, with that along a roughly east–west axis separating Coolpowra, Gortlusky and Cooldorragha from

Ballynaheskeragh, while a roughly north–south boundary through the west end of the site separates Coolpowra and Gortlusky. These land divisions represent the smallest administrative divisions in Ireland and many have a deep history that goes beyond their subsequent standardisation in the seventeenth century. Accordingly, where any of the townland boundaries are to be impacted by the development they will require further assessment (see Section 14.5.2).

Should previously unknown cultural heritage features be present, the proposed development will have a direct, negative, permanent and profound or very significant effect on such remains.

14.4.3 INDIRECT EFFECTS

Indirect effects are those whereby the proposed development may have a negative (or positive) effect on the wider archaeological landscape or surrounding architectural and cultural heritage. Indirect effects may include a visual impact on the surrounding archaeological and/or architectural landscape.

The introduction of the proposed development to the area will not result in a change to the general setting of any recorded monuments, protected structures or architectural heritage as none are present within or in the immediate environs of the site.

The proposed development will therefore have no indirect effects, either temporary or permanent, on the wider cultural heritage of the area.

14.5 MITIGATION MEASURES

14.5.1 ARCHAEOLOGICAL HERITAGE

The predicted effects on the known archaeological heritage are regarded as being none. No effects on the recorded archaeological resource (SMRs/RMPs) were identified, and no indirect or visual effects on the nearest recorded monument outside the proposed development site boundary were noted.

A potential direct effect on previously unknown archaeological heritage lies in the uncovering of sub-surface remains. Accordingly, the following mitigation measures will be carried out subject to the approval of the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH) and further mitigation may be sought by the NMS.

- Archaeological test trenching (minimum of 10% of the lands available) will be carried out prior to any groundworks commencing and will be undertaken by an experienced, licence-eligible archaeologist working under licence from the Department of Housing, Local Government and Heritage. The trenches will be positioned to target anomalies identified during the geophysical survey (Appendix 14-1; Figures 9–13) and to test the site (within the footprint of the proposed development) generally (see Section 14.5.2 also). If archaeological features or deposits are exposed these shall be sufficiently sectioned in order to assess their extent, nature and significance. Once test trenching is complete, further mitigation might include preservation in situ (avoidance), excavation (preservation by record) and/or monitoring of topsoil stripping.
- Adequate time and resources will be provided by the developer for the resolution of any archaeology identified within the development site and which will be directly impacted by groundworks. Time and resources will also be allowed for any post-excavation work and specialist analysis necessary following any archaeological excavation that takes place.
- A report is required to be compiled on completion of any archaeological excavation and will be submitted to the relevant authorities.

14.5.2 ARCHITECTURAL AND CULTURAL HERITAGE

The predicted effects on the known architectural heritage are regarded as being none. No effects on Protected Structures (RPS) or sites in the National Inventory of Architectural Heritage (NIAH) were identified, and no indirect or visual effects on the nearest such site outside the proposed development site boundary were noted.

A number of potential direct effects on previously unknown architectural/cultural heritage were identified, however, and the following mitigation measures will be carried out:

- An upstanding farmhouse and associated outbuildings scheduled for demolition may incorporate earlier vernacular buildings or fabric. Accordingly, a visual assessment of the buildings, including a photographic survey, should be completed by an archaeologist with built-heritage experience prior to their demolition. Following demolition this area may also be subject to test trenching.
- The sub-surface remains of other vernacular buildings and associated features, such as limekilns and wells, may also be present across the site. Accordingly, the archaeological test trenching shall also target such features, where identified on historical mapping.

- Townland boundaries within the development site may be directly impacted. Accordingly, a townland boundary survey should be completed by an experienced archaeologist prior to any groundworks in any areas to be effected. This will comprise a comprehensive written and illustrated record of those boundaries. Where deemed appropriate, the archaeological test trenching may also target these features. Any machine-dug section through a townland boundary will be cleaned by hand and recorded as a measured survey.

14.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

The residual impacts are likely to be neutral and none to imperceptible if the mitigation measures are implemented. The table below summarises the residual effects of the proposed development on the archaeological and cultural heritage landscape. Residual impacts are defined as the overall effect of the development on archaeology and cultural heritage, on the basis of implementing the mitigation measures outlined in this report.

Table 14.1 Residual Impacts

Potential Effects	Mitigation strategy	Residual impacts
Construction Effects		
Effects to Recorded Monuments and Protected Structures/NIAH sites – none	No mitigation required.	None
Effects to previously unknown archaeological and cultural heritage sites – Demolition of buildings. Topsoil removal associated with development. Groundworks and service trenches, etc.	Assessment and photographic survey prior to building demolition. Archaeological test trenching of the footprint of the proposed development, including targeting geophysical survey anomalies, features identified on historical mapping and townland boundaries. Consultation with Licensing Section of National Monuments Service should archaeological sites or features be uncovered. Excavation and recording of any archaeological features identified, thus preserving them by record.	None
Effects to Recorded Monuments – none	No mitigation required.	None
Operational Effects		
Effects to nearby Recorded Monuments and Protected Structures/NIAH sites - none	No mitigation required.	None

14.7 CUMULATIVE EFFECTS

There are no significant cumulative effects on the archaeological and cultural heritage resource of the area as a result of the proposed development of the projects. There are no predicted effects on the known archaeological, architectural and cultural heritage of the site and the surrounding landscape. Furthermore, an existing operational 400kV AIS electricity substation (Oldstreet) is already located directly adjacent and north of the development site.

The indicative route for an associated gas pipeline has also been designed to avoid any known archaeological and architectural heritage constraints. All related due diligence will be undertaken by Gas Networks Ireland (GNI), who will complete an associated archaeological and cultural heritage assessment.

14.8 MONITORING AND FURTHER WORKS

Monitoring is required during the construction phase and will include archaeological test trenching carried out prior to any groundworks commencing, as well as assessments/surveys of any upstanding vernacular architecture and townland boundaries to be impacted. Following this, further mitigation may be required in the form of preservation in situ (avoidance), excavation (preservation by record) and/or monitoring of topsoil stripping. Such mitigation measures (as outlined in Section 14.5) should be conditioned within any planning permission for the site.

No monitoring is required during the operation phase.

14.9 SUMMARY OF SIGNIFICANT EFFECTS

Should previously unknown archaeological, architectural and cultural heritage features be present within the footprint of the proposed development, it will likely result in the permanent loss of these remains and, as such, the magnitude of the effect is profound or very significant.

15 CLIMATE

15.1 INTRODUCTION

This Chapter of the Environmental Impact Assessment Report (EIAR) considers the likely significant effects from the proposed development on climate change as well as the likely significant effects of climate change on the proposed development.

15.2 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The overall proposed development for which planning permission is sought comprises three elements – the Reserve Gas-Fired Generator, the GIS Electrical Substation and the proposed Energy Storage System (ESS) using long duration energy storage (LDES) battery technology and synchronous condenser technology. A single Environmental Impact Assessment Report (EIAR) has been prepared for all three projects proposed as part of the development. The potential environmental impacts from each project are assessed individually and cumulatively (with each other and with any other identified projects) within the EIAR.

The Reserve Gas-Fired Generator project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system in three (3 No.) open-cycle gas turbines (OCGT) and associated infrastructure. GNI will separately manage the process of managing and delivering the underground natural gas pipeline to the proposed site. In accordance with the requirements of the Commission for Regulation of Utilities (CRU), the proposed OCGT units are dual fuel units. Natural gas will be the primary combustion fuel to each of the OCGT units when operating, with gas oil as the secondary fuel. In order to ensure compliance with the requirements set by the CRU in the event of interruptions to the natural gas supply, the Reserve Gas-Fired Generator is capable of running continuously for 72 hours using secondary fuel.

The Electrical Substation project will enhance and upgrade the existing Oldstreet AIS 400kV substation and will provide for the connection of the Reserve Gas Fired Power Generator and Energy Storage System to the electricity transmission network. The GIS substation itself includes a two-storey building and associated ancillary site development works.

The proposed Energy Storage System (ESS) facility comprises a Long Duration Energy Storage (LDES) static battery positioned within a secure outdoor compound, and a Synchronous Condenser which will operate within a building in a separately secured compound. The LDES will provide peaking, active power and back start capability services to the electricity grid.

The potential emissions to atmosphere during operation are limited to those from the Reserve Gas Fired Generator since there are no operation phase emissions associated with either the GIS or ESS projects. During construction, emissions associated with each of the three projects are possible.

Ireland has ratified and are signatory to a number of international agreements and Protocols as well as being legally obliged to meet the EU requirements in respect of climate commitments. The National Energy & Climate Plan (NECP) 2021-2030, which was published in August 2020, outlines the roadmap for meeting the EU-required climate obligations and specifically includes the steps required to meet a reduction in greenhouse gas emissions from the non Emissions Trading Scheme (ETS) sector. As an electricity provider, the proposed scheme is part of the Emission Trading Scheme therefore greenhouse gas emissions from the proposed facility are exempt from consideration in terms of the targeted reduction in emissions from the non-ETS sector.

15.3 IMPACT ASSESSMENT METHODOLOGY

The impact assessment methodology is based on the Institute for Environmental Assessment and Management (IEMA) Guidance (2017, 2020, 2022) on the assessment of Greenhouse Gas Emissions and Climate Impacts. The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports were published in May 2022 and are considered in this assessment. It is noted that the assessment of climate effects uses different terminology and definitions and in particular cumulative impacts which are routinely assessed in other sections of the EIAR are not addressed in this assessment. The assessment methodology follows evolving guidance on assessment and is consistent with best international practice for assessments of this type.

This assessment report provides a Greenhouse Gas (GHG) impact assessment and Climate Change Resilience Assessment which are key elements of the IEMA Guidance on the assessment of GHG emissions and Climate Impacts. The key features of these assessments are summarised as follows:

- The Lifecycle GHG Assessment considers impacts on the climate from GHGs arising from the Proposed Development, including how the Proposed Development would affect the ability of the Irish government to meet its carbon reduction plan targets.
- The Climate Change Resilience Assessment considers the resilience of the Proposed Development to climate change.

15.4 LEGISLATION, POLICY AND GUIDANCE

Legislation and guidance have been considered from local, national and international perspectives. The principal Irish guidance considered includes the following.

(i) The Galway County Climate Adaptation Strategy (Galway County Council, 2019) outlines the risks and opportunities of climate change to the region, as well as expectations of cities and local regions to implement changes to increase resilience and mitigate effects of climate change. The key focus areas are the impacts of increased temperatures, increased rainfall, natural ecosystems, sea-level risk and ocean warming.

(ii) The Galway County Development Plan 2022-2028 (Galway County Council, 2022) sets a vision for County Galway to achieve economic growth with '*a high-quality sustainable environment for all*'. Key strategic aims relevant to the proposed development include Environmental Protection and Climate Change Adaptation.

Chapter 14; Climate change, Energy and Renewable Resource sets out County Galway's approach "*to reduce the carbon footprint by integrating climate action into the planning system in support of national targets, support indigenous renewable sources in order to reduce dependence on fossil fuels and improve security of supply and the move to a competitive low carbon economy".*

(iii) The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018). Schedule 6 to the Planning and Development Regulations 2001-2021 specifically requires an environmental impact assessment report to assess "*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*".

(iv) The Climate Action and Low Carbon Development (Amendment) Bill 2021, commits Ireland to becoming a carbon-neutral economy by no later than 2050. To reach this milestone a series of five-year carbon budgets, setting out a carbon reduction trajectory for Ireland, are to be embedded into law. The first two budgets must demonstrate a 51% reduction against a 2018 baseline by 2030. A key component of meeting this reduction target is the decarbonisation of electricity generation in Ireland. To drive this change Ireland has set a target to generate 70% of grid electricity from renewable sources by 2030.

(v) The Climate Action Plan (Government of Ireland 2022) was published December 2022 and sets out of the roadmap for achieving carbon budgets and halving emissions by 2030 and reaching net zero by 2050. Amongst the strategy, Chapter 12 considers the measures required to support the country's transition to renewable electricity. This includes the acknowledgement of flexible gas generation to replace coal and oil generation in the interim.

(vi) National Energy and Climate Plan (NECP) 2021-2030 (Department of Communications, Climate Action and Environment, 2020). The 2020 NECP incorporates all planned energy and climate policies and measures identified up to the end of 2019. It sets out in detail Ireland's objectives regarding the five EU energy dimensions (Decarbonisation (GHG emissions and removals, renewable energy), energy efficiency, energy security, internal energy market and research, innovation and competitiveness) together with planned policies and measures to ensure that these objectives are achieved. This strategy acknowledges the increasing role of natural gas in the energy mix for heat, transport and power generation including as a back up to intermittent power generation.

(vii) Ireland's Transition to a Low Carbon Energy Future 2015-2030.

(viii) National Mitigation Plan (Department of Communications, Climate Action and Environment, 2017).

(ix) National Adaptation Framework

(x) National Planning Framework is a planning framework to guide development and investment over the coming years.

(xi) The National Development Plan 2021 – 2030 notes the urgency of the climate and biodiversity emergency, and states that every public investment project with a value above €20 million must conduct a full analysis on all the potential costs and benefits associated with that project. Each cost benefit analysis is required to incorporate a quantitative assessment of the net impact on greenhouse gas emissions.

15.5 GREENHOUSE GAS ASSESSMENT

15.5.1 CONSTRUCTION PHASE GREENHOUSE GAS ASSESSMENT

Construction phase Greenhouse Gas Emissions have been estimated using currently available information about the duration and scale of the construction works and the design of the facility as currently developed. The assessment is developed using primarily the duration of 28 months for construction and assumptions based on current design development as follows.

(1) The main components of the Reserve Gas-Fired Generator Project are as follows:

- OCGT building, which will internally house and adjoining administration block containing
    - 3no. open cycle gas turbine (OCGT) modules (each having a nominal electrical output of 375MW (total 1125MW),
    - 3no. 45m high stacks positioned within outer enclosures designed to minimise heat transfer, discolouration of structures and abate noise,
    - 3 no. recessed, and roof mounted, air intake filter houses and ducts to intake air before filtering it to remove suspended particles and delivering it to the gas turbines,
    - Power control centre and balance of plant (BoP),
- Administration block adjoining the OCGT building and containing control room, administration and welfare facilities,
- AIS compound north of the OCGT building containing electrical wires and associated plant,
- Fin fan coolers to provide cooling (air cooling of water contained within a closed loop) to the gas turbine lube oil, generators and transformers,
- Secondary fuel (gas oil /distillate) storage tanks (3no. containing 19,000 tonnes) positioned within a secondary concrete storage bund, fuel unloading area, fuel polishing unit and air compressor,
- Containerised emergency generators (3no.),
- AGI compound – gas receiving station,
- Main and auxiliary transformers,
- Workshop and stores,
- Firewater tank fire suppression skid,
- Site drainage which includes firewater storage tank, oil interceptors, stormwater, attenuation pond, culverting, crossings and proprietary foul pack treatment plant, underground cabling and pipework,
    - Ancillary components including cark parking, internal roads, lighting, fencing and gates, utilities, lightning protection masts, and associated works.

(2) Construction works will be Monday to Saturday and Traffic volumes are as set out in the Traffic Chapter of the EIAR.

(3) All materials will be locally sourced where available. A 50km radius has been assumed for supply transport.

(4) Reinforced concrete foundations, reinforced concrete floor slabs, steel portal frame construction will be utilised for all large buildings (GIS, OCGT and Syncon). LDES IPP will be traditional block – timber truss roof with slates), clad with insulated

metal cladding with acoustic and thermal rating. GIS building will be a mix of block and cladding. Development will also include cast in situ concrete structures.

(5) Technologies will be sourced through open global market.

(6) Black top road (tarmac) area is 2 linear km (14,000m^2) – typical build-up of internal roads is 25mm wearing course (asphalt) 40mm base course on min 150mm subbase (clause 804) on capping layer (large stone = 6F) to bearing layer.

(7) The cut and fill design is balanced (to minimise impact on receiving environment)- no export from the site of spoil from excavation (berming provided as part of landscape). Theres will be import of stone fill material.

While the final construction plan will be dependent on the appointed contractor, should permission be granted, the available information allows for a reliable estimate of GHG emissions for the proposed development. The total GHG emissions for the construction phase of the project are estimated as set out in Table 15.1.

Table 15.1 Estimated Construction Phase GHG emissions for Proposed Reserve Power Plant

Lifecycle stage	Emission source	GHG Emissions tCO_{2E}	% of construction phase emissions
Product stage	Embodied carbon in materials	12,000	42.6
	Materials transport	1,000	3.5
Construction stage	Electricity	5,000	17.7
	Fuel usage on site	10,000	35.5
	Waste disposal	100	0.35
	Worker commute	100	0.35
Total		28,200	100%

When these emissions are compared to the Irish carbon budgets, the construction phase emissions contribute significantly less than 1% of the annual carbon budget during the projected construction period.

15.5.2 OPERATION PHASE GREENHOUSE GAS ASSESSMENT

The proposed Reserve Power plant is projected to have a lifespan of 25 years, although future developments and adaptations could conceivably lead to an extension in lifespan. At the end of the design life, the proposed Reserve Power Plant would either be decommissioned or the lifespan would be extended. For the purpose of the current assessment, a 25-year lifespan is assumed. An estimate of GHG emissions during the lifespan of the proposed plant is presented in Table 15.2 based on the following main assumptions.

- The plant is expected to operate 1500hours per year over a projected lifespan of 25 years. The primary fuel is natural gas with provision for gas oil as a secondary fuel and monthly testing of the OCGT units using gas oil at a rate of 8 hours per month.
- OCGT operating efficiency is 39%.
- Land use will change from agricultural to energy generation.
- A 1MW continuous electricity supply is assumed on standby.
- Secondary fuel transport is assumed over 50km distance.
- Natural gas will be burned at a rate of 20.14kg/sec.

The total GHG emissions for the operation phase of the project are estimated as set out in Table 15.2.

Table 15.2 Estimated Operation Phase GHG emissions for Proposed Reserve Power Plant

Lifecycle stage	Emission source	GHG Emissions tCO2E / yr	GHG Emissions tCO_{2E} / 25 yr	% of operation phase emissions
Operation stage	Fuel usage on site – gas	586,400	14,660,000	95
	Fuel usage on site – gas oil	30,000	750,000	5
	Worker commute	10	250	-
Total		616,410	15,410,250	100%

When these emissions are compared to the Irish carbon budgets, the operation phase emissions contribute up to 2% of the annual carbon budget during the projected operation period. If the plant operates using gas oil, the GHG emissions would be much higher at 42,994,300 tCO_{2E}/yr.

In accordance with the IEMA guidance on *Assessing Greenhouse Gas Emissions and Evaluating their Significance* (IEMA, 2022), the GHG effect of the Reserve Power Plant has been compared with Ireland’s current carbon budgets to 2035 in Table 15.3.

Table 15.3 Operational GHG Emissions of Reserve Power Plant Compared to Carbon Budgets

Carbon budget	Total Budget $MtCO_{2E}$	Operational emissions within budget period $MtCO_{2E}$ / yr	% contribution of operational emissions
2026-2030	200	1.85	0.93
2031-2035	151	3.1	2.1

When considered in isolation as a stand alone Reserve Power Plant, the proposed development would have a major adverse impact on climate. However, the Proposed Development would provide additional peak power generation capacity, which would contribute to providing a secure energy supply to the national grid. A key element of the national decarbonisation strategy is to target 70% renewable electricity by 2030. To allow this uptake of renewable energy to happen it is necessary to have in place sources of energy generation that can be efficiently utilised to cover any imbalances in supply and demand. Natural gas is a relatively lower-carbon option than coal or peat to provide security of supply, so when viewed in comparison with existing fossil-fuel plants, the proposed development would have a positive impact on climate. Energy security is of national importance and a mix of fuel types and approaches, and the proposed Reserve Power Plant has a role to play in the national strategy and in the achievement of energy security.

15.6 CLIMATE CHANGE RESILIENCE ASSESSMENT

The principal potential climate change impacts on the Proposed Development and the adaptation methods to increase the resilience of the Proposed Development are detailed in Table 15.4. None of the identified risks are deemed significant. Climate change resilience effects during construction are deemed to be minimal.

Table 15.4 Potential Climate Change Impacts and Resilience Assessment

Climate hazard	Receptors	Potential impact	Likelihood of occurring	Consequence	Resilience risk level	Significance
Increase in annual temperature	Built Assets Staff / visitors Access routes	Overheating / heat damage	Possible	Low	Minor	No
Increase in summer temperature	Built Assets Staff / visitors	Overheating / heat damage	Very Unlikely	Medium	Negligible	No

	Access routes					
	Staff, visitors	Thermal comfort	Very Unlikely	Low	Negligible	No
	Facility functionality	Thermal effect on efficiency	Likely	Low	Minor	No
Increase in rainfall	Built Assets Staff / visitors Access routes	Flooding	Unlikely	Medium	Minor	No
Increase in storms frequency	Built Assets Staff / visitors Access routes	Flooding	Possible	Medium	Minor	No
Increase in storms intensity	Built Assets Staff / visitors Access routes	Flooding	Possible	Medium	Moderate	No

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16 CUMULATIVE EFFECTS & INTERACTIONS

This Chapter of the EIAR describes provides an assessment of the potential for cumulative and combined effects to occur as a result of the Proposed Development. The Chapter describes the main interactions between potential impacts identified as part of the Environmental Impact Assessments of the proposed development and for each of the proposed projects in the townlands of Coolpowra, Cooldorragha, Coolnageeragh, Ballynaheskeragh, Gortlusky and Sheeaunrush, County Galway.

The interaction of environmental factors was identified and carefully considered from the outset of the project. Interactions during construction, operational and decommissioning stages of the project are considered.

Table 16.1 presents a matrix of interactions likely to occur from the proposed development (highlighted in green). The level of interaction between the various media will vary greatly but the table allows the interactions to be identified and detailed where necessary. If the development does not have the potential to impact or affect the interaction, then that interaction is not highlighted in green.

The interaction matrix is based on the potential interrelationships of the environmental media both during the construction, operation and decommissioning phases of the proposed development.

Table 16.1 Interactions between Environmental Factors

	Population & Human Health	Air & Climate	Noise & Vibration	Landscape & Visual	Biodiversity	Waters	Soils and Geology	Material Assets	Traffic & Transport	Archaeology & Cultural Heritage
Population & Human Health		C/D, O	C/D, O	C/D, O			C/D		C/D,	
Air & Climate	C/D, O				C/D, O		C/D		C/D	
Noise & Vibration	C/D, O				C/D				C/D	
Landscape & Visual	C/D, O									
Biodiversity		C/D, O	C/D			C/D, O	C/D			
Waters					C/D, O		C/D, O			
Soils and Geology	C/D	C/D			C/D	C/D				
Material Assets										
Traffic & Transport	C/D	C/D	C/D							
Archaeology & Cultural Heritage										

C/D= Construction /Decommissioning
O = Operation

Table 16.2 Summary of Interactions

Interaction of Environmental Factors	Description
Air Quality, Population, Human Health and Biodiversity	There is potential for impact to human beings living in the area of the proposed development during the construction, operation and decommissioning phases of the development. These have been outlined and assessed in the EIAR. The impact of construction activities on air quality during the construction phase of all projects is short term in duration and its significance will vary from not significant to slight. The air quality impact at the nearest residential receivers is associated with each of the projects (and in combination) is predicted to be below the relevant air quality standard limit values and is therefore determined to be negligible. Similarly, the impact on identified protected ecological site and biodiversity is not significant.
Noise, Human Beings and Biodiversity	The impact of noise on the human beings living in the area of the proposed development has been addressed during the construction, operational and decommissioning phases of the proposed development. Appropriate mitigation measures have been recommended to ensure the construction phase target noise limits are not exceeded. These will be further prescribed in a construction management plan subject to planning. The predicted noise levels at the nearest neighbouring residential properties due to the operation of the proposed projects during daytime and night-time will be in accordance with lower limits for areas of low background noise. Given the proximity of the development lands and projects to designated ecological sites, noise impacts on the local ecological receivers is not considered significant.
Landscape and Visual, Biodiversity, Population and Human Health	The landscape and visual impacts have potential interactions with impacts resulting from other environmental statement topics. The interactions of these impacts are usually highly complex in practice and this section serves to act as a brief overview to these issues. In addition, the proposed development will create varying impacts during the construction phase and the operation phase. No designated scenic views will be affected by the proposed

Interaction of Environmental Factors	Description
	development. The proposed mitigation planting (including a new berm) will increase the variety of native tree and shrub species on site and this will have a positive impact of providing increasing screening and increased ecological benefit. The management of the site vegetation will also result in a positive impact to the appearance and condition of site vegetation. The residual significance of visual effect ranged between *'Substantial-moderate'* to *'Imperceptible'*, with the significance of visual effect reducing considerably beyond the immediate context of the site. In the context of the proposed development and the receiving 'low' sensitivity landscape classification (Galway CDP), it is not considered that the proposed development represents an inappropriate addition to this landscape context and complies with landscape and visual-related policies and objectives in the current Galway County Development Plan
Soils & Geology and Water Environment	There is an interaction between soils & geology and the water environment. The disturbance of soil during construction has the potential to impact on water quality. Construction activities which disturb or expose the soil, including realignment of the stream, have the potential to elevate suspended solids in runoff from the site which could impact on local drains. Mitigation measures during the construction process will prevent sediment run-off and construction discharges. A preliminary CEMP has been prepared and shall be further development and implemented for the construction phase. This provides a framework under which construction activities which have potential for environmental impact (e.g. generation of dust, ecological impacts, surface water discharge, etc) will be managed. Mitigation measures as outlined in the EIAR are included within this plan. There will be no direct process to soils or surface water bodies during the operational phase of the developments (in isolation or in combination). Stormwater generated on the site will be managed in accordance with sustainable best practice proposals as presented in

Interaction of Environmental Factors	Description
	the drainage report for each project. Overall, the impact is not considered significant.
Traffic & Transport, population and human health, noise & vibration, and biodiversity	There will be potential interactions with increased traffic movements as a result of the construction and to a lesser extent the operation of the proposed projects with potential effects on population and human health, air quality, noise and vibration and biodiversity. This is dealt within each Chapter of the EIAR The impact of construction stage traffic on air quality, human health, noise & vibration and biodiversity is short term to not significant (depending on activities) and long term imperceptible during operation.

The proposed development of the individual and collectively development has the potential to impact on various environmental aspects, and there are interactions and inter-relationships between these aspects, as presented in Table 16.1 and described in Table 16.2. This EIAR has considered these interactions and inter-relationships throughout the design process through appropriate siting of development components, functional design in accordance with the relevant standards /codes and guidelines and incorporation of mitigation measures as recommended by the EIA team of specialists.