Proposed Ballynalacken Windfarm Project

Environmental Impact Assessment Report

Chapter 9: Air (Air Quality & EMF)

Topic Chapter Authors:

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Glossary of Terms

Term	Definition
Ballynalacken Windfarm Project	Ballynalacken Windfarm including 12 No. turbines, turbine foundations and hardstanding areas, Windfarm Site Roads, Internal Windfarm Cabling, Windfarm Control Building, Site Entrances, ancillary works at and for the windfarm, along with the Internal Cable Link, Tinnalintan Substation and ancillary works, and Ballynalacken Grid Connection and grid connection works to the Eirgrid Ballyragget Substation. The Project also involves works and activities along the turbine component haul route remote from the site, including the construction of a temporary Blade Transfer Area at HR8.
EMF Immunity	The robustness of an electrical/electronic device to EMF interference and maintain correct operation.
Equipment Interference	Electrical/electronic device failing to maintain correct operation due to EMF levels
Trackout	The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site
v/m, or kV/m	Electric Field is measured in Volts per metre, V/m, or kV/m (1000 V/m)
µT	Magnetic Field is measured in micro Tesla , µT

List of Abbreviations

Abbreviation	Full Term
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields, comprising of electric and magnetic field
EPA	Environmental Protection Agency
HDV	Heavy Duty Vehicle with a gross weight greater than 3.5 tonnes

Abbreviation	Full Term
IAQM	Institute of Air Quality Management
ICNIRP	International Commission on Non-Ionising Radiation Protection
OHL	Overhead Line
PM	Abbreviation for Particulate Matter suspended in the air. PM_{10} is airborne particulate matter with an aerodynamic diameter less than 10 microns (µm); $PM_{2.5}$ is less than 2.5µm
SAC	Special Area of Conservation
SEAI	Sustainable Energy Authority of Ireland
SPA	Special Protection Area
TII	Transport Infrastructure Ireland
V/m, or kV/m	Electric field is measured in Volts per metre, V/m or kV/m (1000 V/m)
µT	Magnetic field is measured in micro Tesla, µT

CHAPTER 9 AIR (AIR QUALITY & EMF)

EIAR 9.1 INTRODUCTION

EIAR 9.1.1 The Authors of this Chapter (Competent Experts)

The Air chapter was prepared by:

Air quality impact was assessed by Ciara Nolan, MSc in Applied Environmental Science and BSc (Hons) in Energy Systems Engineering, of AWN Consulting, a multidisciplinary environmental consultancy. Ciara is a Member of the Institute of Air Quality Management (MIAQM) and Institute of Environmental Sciences (MIEnvSc). She has over 8 years of experience in undertaking air quality and climate assessments. She has prepared air quality and climate impact assessments as part of EIARs for numerous developments including residential, industrial, commercial, pharmaceutical, windfarm and data centres.

Electromagnetic field impact was assessed by Lewis Brien BEng (Hons) in Electronics of Compliance Engineering Ireland (CEI). Lewis has carried out EIAR's for similar projects including FEMM Modelling for EMF Assessment and Shielding for Aerospace and Laboratory projects. CEI has carried out over 1000 low Frequency to radiofrequency site surveys throughout Ireland and worldwide and is recognised by Comreg as one of the foremost independent authorities on the radio frequency spectrum in Ireland. CEI General Manager Paul Reilly currently holds the chair for the EMF National Technical Committee in Ireland (TC16)

EIAR 9.1.2 Overview of Air (Air Quality & EMF) in the Local Environment

In this EIAR Chapter 9, Air relates to air quality and electromagnetic fields.

In general terms the project is located in predominantly rural areas and away from major urban areas or large centres of population. The surrounding landscape is predominantly rural, agricultural grassland and forestry. Nearby settlements include the towns of Ballyragget and Castlecomer. Outside of these areas, the area is sparsely populated, individual residential dwellings are located in ribbon style development along the local road networks. There are a number of designated ecological sites within the area also. These include the River Barrow and River Nore SAC, River Nore SPA and River Nore/Abbeyleix Woods Complex pNHA.

Air Quality relates to the quality of air in our environment and can be adversely affected by emissions of various pollutants. In terms of this chapter, nitrogen oxides ($NO + NO_2$) and particulate matter (PM_{10} and $PM_{2.5}$) are the two main air pollutants of concern. Poor air quality can impact human health, vegetation and ecosystems. Ireland in general has a good standard of air quality compared with other European countries.

A review of air quality monitoring data from the EPA for representative areas similar to that of the proposed development indicates that there is likely a good level of air quality in the area, as it is located away from busy, congested roads and industrial sources of air pollutants.

EMF: Sources of EMF in the existing environment include electric equipment, and low, medium and high voltage overhead electricity lines, overhead telephone lines, signals from existing telecommunications masts and underground communication cables which run along road boundaries and across agricultural lands.

EIAR 9.1.3 Sources of Information

Consultation, desktop studies and fieldwork were carried out in order to gather information on the baseline environment.

Table 9-1: Sources of Baseline Information for Air (Air Quality & EMF)

Type	Source
Consultation	No feedback relevant to Air Quality & EMF was received from Prescribed Bodies consulted in January 2023 and again in January 2024
Desktop	• Annual air quality monitoring reports from the EPA, 2017-2022 • Review of aerial photography, and OSI and other online mapping to identify local residential properties, local community facilities and walking/cycling routes and to identify other activities in close proximity to these properties and routes • AC Field Modelling of the electromagnetic fields from the works • Comreg, ESB and Radiological Protection Institute of Ireland online information Review of the other EIA Report Chapters as follows: • Chapter 5: Description of the Development • Chapter 7: Soils • Chapter 16: Material Assets
Fieldwork	• Site visits to establish the proximity of nearby sensitive receptors to the works areas

EIAR 9.1.4 Legislation, Regulations & Guidance Documents

The following legislation and regulations and have been taken into account in this EIA Report:

- EU Directive 2024/2881 of 23 October 2024 on ambient air quality and cleaner air for Europe (recast)
- EU Directive 2008/50/EC – Established ambient air quality standards and limit values for certain air pollutants in order to protect human health and the environment.
- S.I. No. 739/2022 – Ambient Air Quality Standards Regulations 2022
- European Commission (EC) "Electromagnetic Compatibility Directive 2014/30/EU"
- European Commission (EC) "Radio and Telecommunications Equipment Directive 1999/5/EC"
- S.I. No. 109 of 2007, European Communities (Electromagnetic Compatibility) Regulations 2007
- S.I. No. 240 of 2001, European Communities (Radio and Telecommunications Terminal Equipment) Regulations 2001.

The recommendations in the guidelines listed below, have been considered during the preparation of this chapter:

- PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document (TII, 2022)
- Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)
- ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1Hz – 100 kHz) (2010)
- EU EMF recommendation 1999/519/EC
  European Committee for Electrotechnical Standardisation (CENELEC), EN 45502-2-1:2003 Active implantable medical devices. Particular requirements for active implantable medical devices intended to treat bradyarrhythmia (cardia pacemakers).

EIAR 9.1.5 Methodology Used

The evaluation for Air Quality and Dust in Section EIAR 9.3 has been carried out in accordance with EU Directives 2024/2881/EC and 2008/50/EC, the Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction*, and the Transport Infrastructure Ireland guidance document PE-ENV-01106. The evaluation on EMF in Section EIAR 9.3 has been carried out in accordance with the International Commission on Non-Ionising Radiation Protection 1998 guidelines. These methodologies and standards have been used to determine the importance and sensitivity of receptors, and the magnitude and significance of potential impacts. The methodologies and standards can be found in full in Appendix 9.2: Methodology for the evaluation of Air (Air Quality & EMF)

EIAR 9.2 AIR (AIR QUALITY & EMF) PART 1: SCOPING FOR SENSITIVE ASPECTS OF AIR (AIR QUALITY & EMF)

The assessment of significant effects (or impacts) is an essential concept of the EIA Directive, and the primary objective of this EIA Report is to identify and evaluate the significant effects of the Project. Scoping has been carried out in accordance with the *Guidance on Scoping* (EC 2017) in order to focus the consideration of the impacts the Ballynalacken Windfarm Project may have on the environment to those which are significant or important enough to merit assessment, review and decision-making.

Scoping for the Environmental Topic – Air (Air Quality & EMF) has been carried out by the chapter authors, throughout the preparation of this Chapter, and includes scoping for the sensitive aspects of Air (Air Quality & EMF) (this Section EIAR 9.2), and later in this Chapter - scoping of impacts (see Section EIAR 9.3).

EIAR 9.2.1 Introduction to Scoping for Sensitive Aspects of Air (Air Quality & EMF) (Receptors)

The purpose of the scoping exercise, which comprises this Section EIAR 9.2, is to identify the relevant Sensitive Aspects (receptors) of Air (Air Quality & EMF). In order to identify the relevant Sensitive Aspects, the scoping exercise is carried out as follows:

1. An examination is carried out, in Section EIAR 9.2.2, of the potential sources of impacts resulting from the Project and the pathways for Impacts which link the sources of impacts to the receptors (Sensitive Aspects) of the impacts;

2. The zone of influence of the Project, within which the impacts of the Project could occur, is set out, with justification for same. The zone of influence is also called the 'Study Area' herein. The zones of influence are set out in Section EIAR 9.2.3 for the various Sensitive Aspects which occur in the environment.

3. A scoping examination of Sensitive Aspects which occur within the Study Area(s) is carried out in Section EIAR 9.2.4. The scoping examination results in a Sensitive Aspect being either scoped-in for detailed evaluation in **Part 2: Sensitive Aspect Evaluation Section (i.e. Section EIAR 9.3)** of this chapter or scoped-out from further consideration, the rationale for scoping-out is provided in Section EIAR 9.2.4.

EIAR 9.2.2 Identification of the Sources, Pathways and Receptors of Impacts

The evaluations within the EIAR identify potential impact sources and pathways between the Project and receptors (Sensitive Aspects) of the environment.

EIAR 9.2.2.1 Identification of Impact Sources

The 'source' is an origin of an impact and is associated with the Project. In order to identify the potential 'sources' of impact, the characteristics of the Ballynalacken Windfarm Project, i.e. the size and design, works, activities, use of materials and natural resources, and the emissions and wastes, associated with the construction, operation and decommissioning of the Project, as described in Chapter 5 of this EIA Report,

have been examined, and it is considered that the following Project characteristics have potential to act as a 'source' of impact to the sensitive aspects of Air (Air Quality & EMF):

Construction Stage Sources of Impact

- Delivery of construction materials to works areas;
- Excavation and relocation of soils;
- Earthmoving;
- Storage of overburden;
- Soil erosion;
- Working plant and moving machinery;
- Movement of construction traffic along access roads;
- Increase in traffic volumes;
- Road opening; and
- Rock breaking

Operational Stage Sources of Impact

- Operational Ballynalacken Windfarm turbines
- Operational Tinnalintan Substation
- Ballynalacken Grid Connection
- Internal windfarm cabling

Decommissioning Stage Sources of Impact

- Earthworks
- Movement of traffic
- Working plant and moving machinery

Note: The Ballynalacken Windfarm Project contains no sources of odour emissions to air.

EIAR 9.2.2.2 Identification of Impact Pathways

The 'pathway' is the means by which an impact can reach and affect a receptor. The characteristics of the baseline environment have been examined and it is considered that the following pathways could form a link between the Project (sources of impact) and the Sensitive Aspects (receptors):

- Air
- Wind

EIAR 9.2.2.3 Identification of Receptors

Any receptor in the environment which could be affected by a development is referred to as a 'Sensitive Aspect' in this EIA Report. The following Sensitive Aspects are relevant to the receiving environment and are subject to scoping in Section EIAR 9.2.3:

- Local Residents, Community & Amenities
- Transient People
- EMF Interference with Telecommunications Infrastructure
- EMF Interference with Electrical and Electronical Equipment

The zone of influence in relation to these Sensitive Aspects is examined in Section EIAR 9.2.3 below, with a scoping exercise for each of the Sensitive Aspects presented in Section EIAR 9.2.4.

EIAR 9.2.3 Scoping of the Study Areas (Zone of Influence of the Project)

The scoping and evaluation focuses on the area or zone of influence around the Ballynalacken Windfarm Project within which the impacts of the Project could occur. This area/zone is referred to as the Study Area. The Study Areas for the Sensitive Aspects of the Air (Air Quality & EMF) environment are set out in the table below.

Table 9-2: Study Area of the Project in relation to sensitive aspects of the Air (Air Quality & EMF) environment

Sensitive Aspect	Ballynalacken Windfarm Project Zone of Influence/Study Area	Justification
Local Residents, Community & Amenities	Dwellings, community facilities and local walking routes within: Air Quality - Construction Dust: o 250m from construction works areas; o 50m from those sections of public roads used by construction site vehicles transporting overburden or borrow pit rock within the windfarm site; o 50m from public roads used by construction vehicles or delivery vehicles, for the first 250m of the public roads from the Project site exit points. Air Quality - Ambient Air Quality & Construction Traffic Emissions: sensitive receptors (dwellings, schools, hospitals, community facilities etc.) within 200m of roads which will experience a significant change in traffic levels. EMF: Dwellings and community facilities within 100m of turbines, Tinnalintan Substation and underground cabling	Air Quality - Construction Dust: Based on the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction Activities'. Air Quality - Ambient Air Quality & Construction Traffic Emissions: Based on the Transport Infrastructure Ireland (TII) guidance document 'PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document'. EMF: Based on professional judgement, EMF field emissions can extend to this distance. At distances greater than 100m, the contribution of the Ballynalacken Windfarm Project to ambient EMF levels will be extremely low or none, with effects being considered neutral or none.
Transient People	Air Quality - Construction Dust: o 250m from construction works areas; o 50m from those sections of public roads used by construction site vehicles transporting overburden or borrow pit rock within the windfarm site; o 50m from public roads used by construction vehicles or delivery vehicles, for the first 250m of the	Air Quality - Construction Dust: Based on the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction Activities'. Air Quality - Ambient Air Quality & Construction Traffic Emissions: Based on the Transport Infrastructure Ireland (TII) guidance document 'PE-ENV-01106: Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document'.

	public roads from the Project site exit points. Air Quality - Ambient Air Quality & Construction Traffic Emissions: sensitive receptors (places of worship, sports centres, shopping areas, car parks, bus or railway stations) within 200m of roads which will experience a significant change in traffic levels and where exposure to traffic pollutants is short-term (i.e. less than 1-hour). EMF: local walking routes within 100m of turbines, Tinnalintan Substation and underground cabling	EMF: Based on professional judgement, EMF field emissions can extend to this distance. At distances greater than 100m, the contribution of the Ballynalacken Windfarm Project to ambient EMF levels will be extremely low or none, with effects being considered neutral or none.
EMF Interference with Telecommunications Infrastructure	EMF: Dwellings, community facilities and local walking routes within 100m of turbines, Tinnalintan Substation and underground cabling	EMF: Based on professional judgement, EMF field emissions can extend to this distance. At distances greater than 100m, the contribution of the Ballynalacken Windfarm Project to ambient EMF levels will be extremely low or none, with effects being considered neutral or none.
EMF Interference with Electrical and Electronical Equipment	EMF: Dwellings, community facilities and local walking routes within 100m of turbines, Tinnalintan Substation and underground cabling	EMF: Based on professional judgement, EMF field emissions can extend to this distance. At distances greater than 100m, the contribution of the Ballynalacken Windfarm Project to ambient EMF levels will be extremely low or none, with effects being considered neutral or none.

EIAR 9.2.4 Scoping of Sensitive Aspects

Any receptor in the local environment which could be affected by a development is a Sensitive Aspect. The various Sensitive Aspects of the Air (Air Quality & EMF) environment are scoped in the table below for potential to be affected by the Ballynalacken Windfarm Project. The scoping examination results in a Sensitive Aspect being either scoped-in for detailed evaluation in **Part 2: Sensitive Aspect Evaluation Section (i.e. Section EIAR 9.3)** of this chapter or scoped-out from further consideration.

a) Where it is considered that a Sensitive Aspect is likely, or has potential, to be significantly affected by the Project, that Sensitive Aspect has been scoped in for detailed evaluation in Part 2 (Section EIAR 9.3).
b) Where it is considered that there is no potential for a Sensitive Aspect to be affected, or where the likely/potential impacts to that Sensitive Aspect will be Neutral (i.e. No impact/imperceptible impact) then that Sensitive Aspect has been scoped out from further consideration, and the rationale for scoping-out is provided in the table.
c) An exception is made for Sensitive Aspects which are not likely to be significantly affected but may be of particular or local concern and merit a detailed examination, these Sensitive Aspects are also scoped in for detailed evaluation in Part 2 (Section EIAR 9.3).

Table 9-3: Scoping of Sensitive Aspects

Sensitive Aspect	**Is there a Pathway between the Project and the Sensitive Aspect?**	**Likely (or have potential) to be Significant?**	**Scope In/ Out**	**Scoping Result & Rationale *(scoped out only)***
Local Residents, Community & Amenities	Yes	Yes	Scope In	See Section EIAR 9.3.1 Part 2 Evaluation
Transient People	Yes	No	Scope Out	Air Quality: Scoped Out: There are no waymarked cycle or walking trails in close proximity to the main construction works or along construction routes on local roads. No tourist facilities or attractions in close proximity to the site or along main construction haul routes. Therefore, there is no potential for impacts as a result of construction dust emissions. Additionally, any exposure to transient people within 250m of the site would be momentary and therefore, the degree of impact would be insignificant. EMF: Scoped Out: The levels of EMF associated with the Project will be well below EU EMF Limits. Further, any exposure will be momentary to brief and occasional in nature.
EMF Interference with Telecommunications Infrastructure	Yes	No	Scope Out	Scoped Out: The levels of EMF associated with the Project are not likely to adversely affect local communication networks.
EMF Interference with Electrical and Electronical Equipment	Yes	No	Scope Out	Scoped Out: Electronic Equipment: Artificial Implantable Medical Devices (AIMDs) such as pacemakers are excluded from further evaluation as they are not commonly susceptible to 50 Hz magnetic fields and manufacturers tend to test AIMD's to ICNIRP limits for susceptibility

EIAR 9.3 AIR (AIR QUALITY & EMF) PART 2: EVALUATION SECTION

This Evaluation Section examines the scoped-in Sensitive Aspects in greater detail, and comprises a baseline description and impact evaluation for each of the Sensitive Aspects, presented in the following order:

Section EIAR 9.3.1: Local Residents, Community & Amenities

EIAR 9.3.1 SENSITIVE ASPECT: LOCAL RESIDENTS, COMMUNITY & AMENITIES

This detailed evaluation section for Local Residents, Community & Amenities is presented as follows:

- Section EIAR 9.3.1.1 - description of the baseline environment of Local Residents, Community & Amenities;
- Section EIAR 9.3.1.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Local Residents, Community & Amenities; and
- Section EIAR 9.3.1.3 – evaluation of cumulative impacts.

EIAR 9.3.1.1 Baseline Environment – Local Residents, Community & Amenities

The context, characteristics, importance and sensitivity of *Local Residents, Community & Amenities* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

EIAR 9.3.1.1.1 Baseline Air Quality

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2024). In terms of air monitoring and assessment, the proposed development site is within Zone D, which represents rural Ireland (EPA, 2024). Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The long-term monitoring data from the EPA has been used to determine background concentrations for the key pollutants in the region of the proposed development.

Long-term NO_2 monitoring at Zone D locations was carried out by the EPA at the most representative locations for the Ballynalacken Windfarm Project of Castlebar Co. Mayo, Emo Co. Laois and Kilkitt Co. Monaghan for the period 2018 - 2023[1]. Long term average concentrations are significantly below the annual average limit of 40 µg/m^3; average results range from 2 – 8 µg/m^3. Additionally, the 1-hour limit value of 200 µg/m^3 (measured as a 99.8th percentile) was not exceeded at any location. The NO_2 annual average for this six-year period suggests an upper average limit of no more than 8 µg/m^3 as a background concentration and this is considered representative of the proposed development site. Based on the above information an estimate of the current background NO_2 concentration for the region of the proposed development is 8 µg/m^3.

Continuous PM_{10} monitoring at Zone D locations was also carried out by the EPA at the most representative locations for the Ballynalacken Windfarm Project of Castlebar Co. Mayo, Claremorris Co. Mayo and Kilkitt Co. Monaghan over the period 2018 - 2023. Levels range from 7 – 16 µg/m^3 over the five-year period. In addition, the 24-hour limit value of 50 µg/m^3 (as a 90.4th percentile) was complied with at all sites[2]. Annual average concentrations at the rural background monitoring station in Kilkitt ranged from 7 – 9 µg/m^3 over the five-year period and are considered representative of the proposed development site. Based on the EPA data, an

[1] Environmental Protection Agency (EPA) (2024) *Air Quality in Ireland 2023* (and previous annual reports 2018 – 2023)
[2] Environmental Protection Agency (EPA) (2024) Air Quality in Ireland 2023 report (and previous reports 2018 – 2022)

estimate of the current background PM_{10} concentration in the region of the proposed development is 9 µg/m^3.

Monitoring of $PM_{2.5}$ takes place at the station in Claremorris Co. Mayo which is considered representative of the proposed development location. Average $PM_{2.5}$ levels in Claremorris over the period 2018 - 2023 ranged from 4 – 8 µg/m^3 [3]**Error! Bookmark not defined.**. Based on this, an estimate of the existing $PM_{2.5}$ concentration in the region of the development is 8 µg/m^3.

Overall, it is predicted that current pollutant concentrations are generally well below the relevant limit values set out in Directive 2008/50/EC. However, the current pollutant concentrations at the majority of monitoring sites are not in compliance with the 2030 limit values set out in Directive 2024/2881/EC and the clean air strategy; further measures will be needed at a National scale to reduce air pollution in future years. A background NO_2 concentration of 8 µg/m^3 has been used in this assessment. A background PM_{10} concentration of 9 µg/m^3 and a $PM_{2.5}$ concentration of 8 µg/m^3 have been used in this assessment.

EIAR 9.3.1.1.2 Sensitive Receptors - Air Quality

The area of the proposed development is predominantly rural and as such, there are not significant numbers of residential dwellings or community facilities in close proximity to the site. Agriculture is the predominant land use in the vicinity of the site along with commercial forestry. The towns of Ballyragget and Castlecomer are located 4.3 km and 4.2 km to the west and east of the site respectively. Outside of these towns where residential dwellings are located in higher densities, once-off residential properties are primarily located in ribbon style development along the local road network. Within the Study Area for dust effects, there are:

- A total of 41 residential properties within the study area,
- 22 of the 41 properties are within 50m of the construction works area boundary,
- 4 no. are within 50m of road widening works and site entrances at the windfarm site,
- 2 no. are within 50m of the site entrance to the met mast, though no works will be required at this entrance,
- 16 no. are within 50m of cable trenching works along the public road for the Internal Cable Link and the Ballynalacken Grid Connection.

The number of receptors in various distance bands to the project area are shown in Figure 9.1 - Construction Dust and Figure 9.2 - Construction Traffic Emissions.

Sensitivity: The number of receptors in closest proximity to the project elements has been used in determining the sensitivity of the area to dust impacts during construction using the IAQM criteria (see Section A9.2.1.5 in Appendix 9.2). There are a total of 2 no. high sensitivity residential properties within 20m of the proposed windfarm site, with works in close proximity relating to public road widening works. There are a total of 4 no. high sensitivity residential properties within 20m of the proposed cable routes. There are 3 proposed construction compound areas; 1 no. at Site Entrance No.4, 1 no. at Site Entrance No.6 and 1 no. at Tinnalintan Substation. There are no residential properties within 20m of these compounds. Therefore, it is considered that due to the **very low number (6) of high sensitivity receptors within close proximity**, and the **low number of receptors within the study area**, that the area of the proposed development is of **medium sensitivity to dust soiling impacts** and **low sensitivity to dust-related human health impacts (see Section A9.2.1.5 in Appendix 9.2)**.

[3] Environmental Protection Agency (EPA) (2024) *Air Quality in Ireland 2023* (and previous annual reports 2018 – 2022)

EIAR 9.3.1.1.3 Baseline EMF

Electrical objects and anything connected to them produce two types of fields - electric fields and magnetic fields. Electric and magnetic fields are produced in all residential and working environments as a result of nearby electrical wiring, appliances, power lines and telecommunication masts, among other things. Electric fields are measured in volts per meter (V/m), and magnetic fields measured in microtesla (µT). The ICNIRP guideline levels (See Section A9.2.2.4 in Appendix 9.2) in relation to the general public for exposure to frequency EMF associated with electrical power systems, is 5000V/m for electric fields exposure and 100µT for magnetic field exposure. It is assumed in this report that the existing electric field and magnetic field levels, at local residential dwellings and community facilities, are 10V/m and 0.2 µT respectively, which is substantially under the ICNIRP guideline levels. In addition, there are no electric fields above ground level for underground cables, as the soil, earth materials and metallic sheath, which surrounds each cable, removes the potential for electric fields outside the cable.

Further details on electric and magnetic fields and typical levels from common household appliances and from 110kV electrical power system infrastructure is included in Appendix 9.1: Explanation and Modelling of Electromagnetic Fields.

EIAR 9.3.1.1.4 Sensitive Receptors - EMF

The following sets out the receptors in the zone of influence for the Ballynalacken Windfarm Project:

- There are no sensitive receptors within 100m of any of the Ballynalacken Wind Turbines, the Internal Windfarm Cabling or Windfarm Control Building.
- There are 9 no. sensitive receptors within 100m of the Internal Cable Link to Tinnalintan Substation
- There are no sensitive receptors within 100m of the Tinnalintan Substation;
- There are 14 no. sensitive receptors within 100m of the Ballynalacken Grid Connection cable route
- There are no community centres within 100m of any element of the Ballynalacken Windfarm Project.

The receptors are shown in Figure 9.3 - Operational EMF

EIAR 9.3.1.1.5 Existing Sources of Impacts to Local Residents, Community & Amenities

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered. No existing pollution or damage to Local Residences, Community & Amenities is taking place at the Project site

EIAR 9.3.1.1.6 Importance of Local Residents, Community & Amenities & Sensitivity to Change

Importance:

Air Quality: The low number of residential properties is common in rural areas of Ireland, as is their distribution with the majority of properties centred around small rural villages and towns and in ribbon style development along the local road networks.

In general, there is a reasonable expectation for a good quality of air in these rural, upland areas which are remote from busy, congested roads and industrial sources of air pollutants. In relation to air quality, the importance of good air quality for local residents and members of the local community is **high**.

EMF: In general, there are sources of EMF in the existing environment from electrical power and communication systems, but these are at a commonly occurring level common to rural areas in Ireland. The importance of the levels of EMF in the locality for local residents and members of the local community is **high**.

Sensitivity to Change:

Air Quality: Local residents and people using community facilities could be sensitive to health effects such as respiratory illnesses as a result of breathing polluted air. All local residences and community facilities are considered 'high-sensitivity' locations (see Table 3 in Appendix 9.2). Construction dust impacts are the primary potential impacts from the proposed development. The area of the proposed development has been assessed as having a medium sensitivity to dust soiling impacts and a low sensitivity to dust related human health impacts (as per Section A9.2.1.5 and Table 4 and Table 5, all found in Appendix 9.2). Dust emissions will be short-term in nature and have the potential to impact sensitive receptors, such as residential properties within 250m of the works area. Once construction works cease, the air quality in the area will return to baseline conditions.

EMF: Local Residents and members of the community could raise health concerns if the levels of EMF Exposure within their residences and premises are deemed to breech the 1998 ICNIRP limits. A substantial increase in EMF levels above EU electric and electronic equipment Immunity test levels could cause the malfunction of equipment. Neither of these scenarios will occur because the power system in Ireland does not exceed either the 1998 or 2010 EMF limits.

EIAR 9.3.1.1.7 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Trends in Key Indicators over time:

Air Quality: The baseline levels of dust including PM_{10} and $PM_{2.5}$ are likely to remain at existing levels. In Ireland the primary sources of Particulate Matter (PM_{10} and $PM_{2.5}$) are vehicular emissions and burning of solid fuels for heating. Due to the nature of the area (remotely populated with no congested roads) PM emissions are unlikely to change dramatically in future years. Small fluctuations are likely in line with previous trends.

There are no specific future trends in relation to air quality. Air quality is likely to improve in future years due to government and international policies on Climate Action with the replacement of diesel and petrol vehicles with electric vehicles; and replacement of fossil fuel and solid fuel heating systems with electrical heating,

increasingly generated by renewable sources like wind and solar. However, it is assumed for the purposes of this assessment that future levels of NO_2, PM_{10} and $PM_{2.5}$ will be similar to the baseline conditions.

EIAR 9.3.1.2 Impact Evaluation – Local Residents, Community & Amenities

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 9-4: Impacts to Local Residents, Community & Amenities

Likely/Potential Impact	Evaluation
Moderate or Slight Impacts, which are likely or have potential to occur - see detailed evaluation	
Construction Phase: Increase in airborne dust	*Section EIAR 9.3.1.2.1*
Operation Phase: Savings in NO_x emissions and improvement in transboundary air pollution (positive)	*Section EIAR 9.3.1.2.2*
Non-significant impacts considered important enough (or of local concern) – see detailed evaluation	
Operation Phase: Increase in ambient EMF levels	Section EIAR 9.3.1.2.3
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below	
Construction, Operation & Decommissioning Phases: Decrease in ambient air quality as a result of traffic derived pollutants (NO_2, PM_{10}, $PM_{2.5}$)	Neutral Impact: The construction of the proposed development will not result in a change in traffic or a change in traffic speeds greater than the scoping criteria as outlined in Table 2 in Appendix 9.2, and therefore the impact is predicted to be neutral. During the operational phase, there will be vehicles accessing the site infrequently for maintenance purposes. These will be low in number and will not cause a noticeable change in the local traffic, and therefore impacts are predicted to be neutral. The change in traffic during the decommissioning phase will be less than for the construction phase and the changes will be below the scoping criteria. Therefore, impacts to air quality as a result of traffic derived pollutants are predicted to be neutral.
Construction & Decommissioning Phases: Increase in ambient EMF levels	Neutral Impact: Due to no potential for measurable effects. The use of electrical equipment during the construction and decommissioning phases will be negligible and will be limited to the site construction compounds, turbines and control building locations. Due to the limited spatial extent of EMF generation during the construction and decommissioning phases, and the separation distance from sensitive receptors, there will be no measurable increase in ambient EMF levels as a result of the construction or decommissioning of the Ballynalacken Windfarm Project.

Operation Phase: Indirect improvement in air quality due to clean, renewable electricity production	Imperceptible Positive: The production of clean renewable energy as a result of the proposed development will result in an indirect improvement in air quality by decreasing the amount of power produced by fossil fuels. The change at a local level will be imperceptible as there are no large power generating stations in close proximity to the site.
Operation & Decommissioning Phases: Increase in airborne dust	Neutral Impact: During operation, dust generating activities such as deep excavation and infilling works are not required. The only movement of soils during the operational phase relates to maintenance of the drainage networks, and the re-opening of widened junctions and bends to facilitate the (infrequent) transport of turbine components such as replacement blades. The reopening of widened junctions and bends will also likely be required during decommissioning works, and in addition some soils stored in berms will be used to cover crane hardstands. During both phases, the volumes of soils being moved will be very small, and the duration of works will be very brief. No potential for perceptible impacts.

EIAR 9.3.1.2.1	**Increase in airborne dust**
Sensitive Aspect:	Local Residents, Community & Amenities
Importance/Sensitivity:	**High Importance, Low & Medium Sensitivity** (as per Section EIAR 9.3.1.1)
Impact Source(s)	Delivery of construction materials to works areas, excavation and relocation of soils, earthmoving
Impact Pathway(s)	Air, wind
Project Stage	Construction Phase

Overview of Impact (general):

During dry and windy weather conditions, construction dust emissions will arise from construction activities such as excavations, earth moving and backfilling which may generate quantities of dust. Vehicles transporting potentially dusty material to and from the site also have the potential to cause dust generation along the concentrated haul routes from the construction areas. Dust deposition rates will be greatest within 50m of the source. An increase in airborne dust can cause dust soiling effects to property and increase the risk of health impacts to local residents.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

The area of the proposed development is of medium sensitivity to dust soiling impacts and low sensitivity to dust-related human health impacts. There are 41 no. sensitive receptors (residential properties) within 250m of the construction works s, of which 4 no. are within 50m of road widening works at the windfarm site, 2 no. are within 50m of the site entrance to the met mast (*though no work are required at the entrance, and the met mast hardstanding area is greater than 250m from sensitive receptors*), and 16 no. are within 50m of cable trenching works along the public road for the Internal Cable Link and the Ballynalacken Grid Connection. Due to the small scale of works, significant impacts are not predicted at the Blade Transfer Area (HR8).

There is at most a medium risk of dust soiling impacts related to the proposed construction works and a low risk of dust-related human health impacts as a result of the construction works. This is based on the magnitude of the works involved and the sensitivity of the surrounding area.

In the absence of mitigation, impacts will be short-term, localised, direct, negative and slight.

Impact Magnitude	Short-term, localised, direct	**Impact Significance: *(pre-mitigation)***	**Slight**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM06	During windfarm construction works, excavated material will be removed for temporary or permanent storage at designated berms and with the exception of T3 and Borrow Pit No.2, will be placed more than 50m away from any watercourse or wet drainage feature. Temporary silt control methods such as silt fencing will be placed around all overburden storage areas and the existing vegetative between the berms and watercourse / drainage features will be left in place.
MM07	All storage berms will be graded and sealed following emplacement. Topsoil and subsoil will be stockpiled separately. The upper vegetative layer (where still present) of excavated soil will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the stored spoil within the storage areas. Re-seeding will also be carried out in these areas. Measures such as interceptor ditches around the bases of these areas, sediment traps, covering of berms will also be incorporated to prevent runoff of suspended solids, dust and soil erosion.
SM23	During working hours, the construction contractor will monitor dust control methods. The Environmental Clerk of Works will monitor weather forecasts for dry and windy conditions and will carry out weekly on-site and off-site inspections to monitor dust caused by the construction works. Public roads Construction Works Areas will be regularly inspected for cleanliness and regular dust soiling checks of surfaces within 100m of site boundary will also be carried out. The frequency of monitoring will be increased when construction activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
MM34	Road traffic speed limits of 30km/hr along the local roads L5840 and L5845 at the windfarm site and along the L58442 in Tinnalintan and of 15km/hr along on-site roads throughout project site during the construction and decommissioning phases.

MM46	To ensure that local roads are kept clean, and site roadways are clear of mud, a road sweeper and dry wheel washes will be used. The dry wheel washes will be installed near the entrance to the public road at Site Entrance No.s 4, 5, and 9. All HGVs and other delivery vehicles, will drive over the wheel wash before leaving the site. The loose debris will be removed regularly from under the dry wheel washes, this material will be removed off site to a licensed facility.
MM47	Any loads of material which have the potential for dust emissions (such as aggregate) will be covered during transportation.
Effectiveness of Mitigation and Monitoring Measures: Once the mitigation measures are in place, impacts to air quality from construction dust emissions will be short-term, localised, direct, negative and imperceptible.	
Residual Impact Significance *(post-mitigation)*:	**Imperceptible**

EIAR 9.3.1.2.2	**Savings in NO_x emissions and improvement in transboundary air pollution**		
Sensitive Aspect:	Local Residents, Community & Amenities		
Importance:	**High** (as per Section EIAR 9.3.1.1)		
Impact Source(s)	Production of renewable energy		
Impact Pathway(s)	National electricity system		
Project Stage	Operation Phase		

Overview of Impact (general):

The production of clean renewable energy as a result of the proposed development will result in NO_x emissions savings by decreasing the amount of power produced by burning fossil fuels and subsequent air emissions. This will have a positive impact on transboundary air pollutants and compliance with the National Emissions Ceiling set under EU Directive 2016/2284.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

The proposed windfarm will generate an estimated 140 GWh of renewable electricity per annum. Based on data from the SEAI[4] on Ireland's electricity generation in recent years and data from the EPA[5] on Ireland's national NO_X emissions it is possible to estimate the NO_X savings associated with the production of clean renewable electricity in comparison to electricity generated from fossil fuels. The proposed windfarm development will result in an estimated saving of 53.4 tonnes NO_X per annum. This is equivalent to 0.13% of the 2020 – 2029 NO_X national emission ceiling set out under EU Directive 2016/2284. Over the predicted 35-year lifespan of the development this will equate to a total of 1,869 tonnes NO_X savings. This is an indirect, long-term, slight, positive impact to air quality.

Impact Magnitude	Long-term, indirect	**Impact Significance:** ***(pre-mitigation)***	**Slight**

Mitigation and Monitoring Measures: None required – Positive Effect

Residual Impact Significance *(post-mitigation)*:	**Long-term, indirect, slight, positive**

[4] SEAI (2023) Energy in Ireland 2023 Report (and previous annual reports)
[5] EPA (2023) Ireland's Transboundary Air Pollutant Emissions 1990 – 2030

EIAR 9.3.1.2.3	**Increase in ambient EMF levels**
Sensitive Aspect: Importance:	Local Residents, Community & Amenities **High** (as per Section EIAR 9.3.1.1)
Impact Source(s)	Operational Ballynalacken Windfarm turbines, operational Tinnalintan Substation, Ballynalacken Grid Connection, internal windfarm cabling
Impact Pathway(s)	Air
Project Stage	Operation Phase

Overview of Impact (general):

There will be some increase in electromagnetic field levels at local residences and community facilities which are within 100m of the Impact Sources listed above. Details of the modelling of worst case EMF emissions are included in Appendix 9.1: Explanation and Modelling of Electromagnetic Fields.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

- There are no sensitive receptors within 100m of any of the Ballynalacken Wind Turbines, the Tinnalintan Substation or Windfarm Control Building. The worst case magnetic field and electric field for these project elements at 100m will be 0.01 µT and 0.000 V/m respectively.
- There are no sensitive receptors within 100m of the Internal Windfarm Cabling. The worst case magnetic field and electric field for these Internal Windfarm Cabling at 100m will be 0.003 µT and 0.000 V/m respectively.
- There are 2 no. sensitive receptors within 100m of the Internal Cable Link to Tinnalintan Substation. The closest sensitive receptor is 53m away. The worst case magnetic field and electric field from the Internal Cable Link at 53m will be 0.012 µT and 0.000 V/m.
- There are 14 no. sensitive receptors within 100m of the Ballynalacken Grid Connection cable route. The closest sensitive receptor is 10m away. The worst case magnetic field and electric field from the Ballynalacken Grid Connection at 10m will be 0.099 µT and 0.000 V/m.

Considering the ICNIRP 1998 EMF Limits for Magnetic Fields is 100 µT and for Electric Fields is 5000V/m, the above values demonstrate the increase is Imperceptible and would be similar to existing ambient levels.

Impact Magnitude	Very Low	**Impact Significance:** ***(pre-mitigation)***	**Imperceptible**
Mitigation and Monitoring Measures: None required			
Residual Impact Significance *(post-mitigation)*:			**Imperceptible**

EIAR 9.3.1.3 Cumulative Impact on Local Residents, Community & Amenities with Other Projects

EIAR 9.3.1.3.1 Introduction to the Cumulative Evaluation for Local Residents, Community & Amenities

The proposed Ballynalacken Windfarm Project (*whose effects range from Neutral to Slight Adverse and Slight Positive, as per Section EIAR 9.3.1.2*) was examined for potential to have cumulative effects on Local Residents, Community & Amenities, with other existing or permitted projects and projects advanced in the planning system. The potential for off-site and secondary consequential development is also considered. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects which occur or are planned within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project.

EIAR 9.3.1.3.2 Cumulative Study Areas

Air Quality: Cumulative Study Area:

- 500m from Ballynalacken construction works areas;
- 100m from those sections of roads used by construction site vehicles to transport overburden/borrow pit rock;
- 100m of main transport routes used by construction vehicles/delivery vehicles up to 500m from the site exit points.
- Within 200m of roads which will experience a significant change in traffic levels.

Local residents, and people using local community facilities and amenities could potentially be affected by dust and emission sources from different directions either at the same time or sequentially, and therefore the distance from the source was doubled from that used for the Ballynalacken Windfarm Project (the exception being air quality along haulage routes, which remains the same, as cumulative impacts relate to any additional traffic on the haul routes).

EMF Cumulative Study Area: 200m from Ballynalacken Windfarm sources of EMF (turbines, Tinnalintan Substation and underground cabling), in order to identify local residents and the local community which could potentially be affected by EMF sources from different directions – i.e. local residences within 100m of both Ballynalacken and Other Projects with sources of EMF.

EIAR 9.3.1.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 9.4: Other Projects within Air Quality Cumulative Study Areas and Figure 9.5: Other Projects within EMF Cumulative Study Areas *(included at end of this chapter)*.

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 9.3.1.1.4.

Table 9-5: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative impact
Farranrory Wind Farm Grid Connection Ballyragget and Parksgrove Solar Farms Grid Connection	Consented	Air Quality- Construction Phase – See Section EIAR 9.3.1.2.7 No Cumulative Impact: Air Quality- Operation Phase – These projects will not produce any emissions to air once operational. No Cumulative Impact: EMF - Operation Phase- No sensitive receptors within the EMF Cumulative Study Area of 100m from Ballynalacken Grid Connection

Other Project	Status	Evaluation of Cumulative impact
Battery Energy Storage Developments at Moatpark	Consented	Air Quality- Construction Phase – See Section EIAR 9.3.1.2.7 No Cumulative Impact: Air Quality- Operation Phase – These projects will not produce dust emissions to air once operational, therefore there is no potential for cumulative air quality impacts with the Ballynalacken Windfarm Project. EMF - Operation Phase- See Section EIAR 9.3.1.2.8
Laois-Kilkenny Grid Reinforcement Project Moatpark – Loan 38kV Overhead Line Telecom Masts, Ballyouskill Other Existing OHLs	Under Construction Existing	No Cumulative Impact (Air Quality): No potential for cumulative construction dust impacts as construction phase for the 110kV OHL will be completed prior to the construction of the proposed Ballynalacken Project, and the 38kV OHL and Telecom Masts already exist. In relation to the recently approved extension to the Ballyragget Substation, effects will be negligible due to the small footprint of works. No potential for operational phase impacts as there will be no emissions to air once constructed. EMF - Operation Phase- See Section EIAR 9.3.1.2.8
Mixed Use Development, Castlecomer	Consented	No Likely Cumulative Impact (Air Quality): Cumulative construction phase impacts are not predicted as the development is at a significant distance from the main windfarm works. The haul route works within Castlecomer will be of a very small magnitude and brief duration and are therefore not predicted to lead to cumulative dust impacts to nearby receptors with the Mixed Use project.
Glanbia Milk Processing Facility	Existing	No Likely Cumulative Impact (Air Quality): This facility is considered within the air quality baseline environment. The facility is currently operational and must comply with the conditions and emissions limits within the sites IE licence (Reg. No. P0359-03) which ensures there are no significant emissions from the site and ensures the protection of the ambient environment, including air quality.
Glanbia Wastewater Treatment Plant and Anaerobic Digestor	Existing (upgrade works currently under construction), Consented	No Likely Cumulative Impact (Air Quality): Works are likely to be completed prior to commencement of the construction phase for the proposed development, therefore no potential for cumulative construction dust impacts. Due to the nature of the development, there are unlikely to be any significant air emissions during the operational phase, with the exception potentially being odour. There are no odour emissions from the operation of the proposed development, therefore there is no potential for cumulative impacts to air quality.
Hebron House (Hotel) Development	Consented	No Cumulative Impact (Air Quality): There are no sources of EMF associated with the Ballynalacken Windfarm Project within the 100m cumulative study area at this location (HR2 or HR3), and therefore no cumulative effects.
Offsite Project – Forestry Replant Lands (outside the cumulative geographical boundary)	Future activity	No Cumulative Impact (Air Quality): The replanting area distant from the proposed windfarm site, therefore there is no potential for cumulative dust emissions during replanting works.
Secondary Project – Other Energy Projects	Potential future project	No Cumulative Impact (Air Quality): It is assumed that the construction works for the proposed development would be carried out before another project works and therefore cumulative construction dust

Other Project	Status	Evaluation of Cumulative impact
connecting to Tinnalintan Substation		impacts are not predicted. There will be no emissions to air during operation therefore cumulative air quality impacts are not predicted. Not Significant Cumulative Impact (EMF): Multiple energy projects connecting to Tinnalintan Substation will not significantly increase EMF levels 100m from the Substation. Additionally, no receptors within 100m of the Tinnalintan Substation.

EIAR 9.3.1.3.4 Air Quality - Cumulative Evaluation for the Moatpark area

Although it is unlikely to occur, there is potential that the Battery Energy Storage Developments and the grid connections for the Farranrory Windfarm Grid Connection and Parksgrove Solar Farm and Ballyragget Solar Farm could all be constructed during the same time period as the Ballynalacken Windfarm Grid Connection. When dust and emissions from all of these works (where they occur in close proximity to each other – in the vicinity of the EirGrid Ballyragget 110kV Substation at Moatpark) is considered cumulatively with the dust from Ballynalacken Grid Connection construction works, it is evaluated that the cumulative impacts will be short-term, localised, negative and imperceptible.

Mitigation measures will be put in place during the construction of the proposed Ballynalacken Windfarm Project which will mitigate the potential for significant dust emissions, therefore, the potential for cumulative impacts is significantly reduced and are collectively predicted to be **Neutral and not significant**.

EIAR 9.3.1.3.5 EMF Cumulative Evaluation

Cumulative modelling can be found in Appendix 9.1 Explanation and Modelling of Electromagnetic Fields.

The Moatpark-Loan 38kV OHL passes through the windfarm site, and there are a number of existing Telecom masts also located on the high ground to the west of the turbines at Ballynalacken / Ballyouskill. The levels of EMF from the operating OHLs and telecom masts are very low and well below safety guidelines. Similarly, the levels from operating wind turbines are very low. There are no receptors within the 100m Cumulative Study Area around the wind turbines, windfarm control building or the internal windfarm cabling that could be affected by both the Ballynalacken Windfarm Project and these Other Projects. Furthermore, there is no potential for cumulative EMF from the wind turbines, Windfarm Control Building or from the Tinnalintan Substation as there are no sensitive receptors within 100m of these elements of the Ballynalacken Windfarm Project.

There is potential for the Ballynalacken Grid Connection and the Internal Cable Link to cause cumulative EMF with other underground and overhead line projects in the area. As described in the above sections, there are no electric fields above ground level for underground cables, as the soil, earth materials and metallic sheath, which surrounds each cable, removes the potential for electric fields outside the cable. Therefore, there is no potential for the additive electric field emission from the underground Ballynalacken Grid Connection or from the underground Internal Cable Link, and the potential for cumulative impacts only relates to magnetic fields.

The OHLs associated with the Laois - Kilkenny Grid Reinforcement Project, the Moatpark-Loan 38kV OHL and other existing overhead lines in the area along the cable routes have potential to contribute to cumulative EMF (magnetic fields only) with the Ballynalacken Grid Connection and Internal Cable Link cables, the potential for cumulative impacts is as follows:

- The grid connections associated with Ballynalacken and the Battery Energy Storage System projects and existing overhead lines could all occur within 100m of 3 no. local residences in the Moatpark area. At the nearest residence, the worst case cumulative magnetic fields were modelled at 1.03µT.

- The Internal Cable Link route passes under the 110kV OHL (currently under construction), there are no local residences within 100m of this crossing point, and therefore no potential for cumulative impacts.
- The Internal Cable Link route also passes under the existing 38kV OHL, with 3 no. local residences within 100m of this crossing point. At the nearest residence, the worst case cumulative magnetic fields were modelled at 0.379 µT.

Considering the ICNIRP 1998 EMF Limits for Magnetic Fields is 100 µT, it is evaluated that the cumulative increase in EMF as a result of the Ballynalacken Grid Connection and Internal Cable Link together with the overhead lines, underground cables and electrical equipment associated with Other Projects will be **Imperceptible,** as the levels of cumulative EMF will be well below safety guidelines.

EIAR 9.3.2 Statement on Certainty and Sufficiency of Information Provided

A clear documentary trail is provided throughout this chapter and chapter appendices to the competency of data and methods used and the rationale for selection of same. The information used to compile this chapter is collated from site-specific investigations, data and documents generated by public bodies and statutory agencies. The online baseline data was verified in the field.

Air Quality: The information used to compile the air quality sections of this chapter is collated from reports and documents generated by local authorities and statutory agencies, including the Environmental Protection Agency, Transport Infrastructure Ireland and The UK Institute of Air Quality Management. The most recent publications have been relied upon, with references detailed as footnotes throughout the chapter. The UK guidance has been used in the absence of equivalent Irish guidance as is considered best practice. The most recent monitoring data provided by the EPA was used to inform the baseline conditions.

EMF: The Information used to compile the EMF Section of this report is based on EMF Modelling carried out by CEI and the latest online data from Eirgrid, Comreg, RPI and International bodies.

No material limitations or difficulties were encountered during the course of the studies carried out to inform the assessment of impacts of the Ballynalacken Windfarm Project on Air (Air Quality & EMF).

EIAR 9.4 Summary Conclusion

LOCAL RESIDENTS, COMMUNITY & AMENITIES:

Overall, it is evaluated that the impact on the Environmental Factor, Air (Air Quality), will be **short-term, localised, direct, negative and imperceptible and therefore not significant.**

Overall, it is evaluated that the impact on the Environmental Factor, Air (EMF), will be **long-term, localised, negative and Imperceptible and therefore not significant.**

EIAR 9.5 Reference List for Air (Air Quality & EMF)

Council Directive (EC) 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe, available: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0050.

Council Directive (EC) 2024/2881/EC of 23 October 2024 on ambient air quality and cleaner air for Europe, available: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202402881.

Environmental Protection Agency (2023) *Ireland's Transboundary Air Pollutant Emissions 1990 – 2030*.

Environmental Protection Agency (2024) *Air Quality in Ireland 2023* and previous publications to 2018.

Government of Ireland (2023) *Clean Air Strategy for Ireland*.

Institute of Air Quality Management (2024) *Guidance on the Assessment of Dust from Demolition and Construction*, v2.2.

International Commission on Non-Ionizing Radiation Protection (1998) 'ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz)' in *Health Physics*, 74 (4), 494-522, available: https://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf.

Ireland, Government of Ireland (2023) Clean Air Strategy for Ireland.

Sustainable Energy Authority of Ireland (2022) *Energy in Ireland 2022 Report* (and previous annual reports).

Transport Infrastructure Ireland (2022) *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106*.

EIAR 9.6 List of Figures for Air (Air Quality & EMF)

FIGURES (overleaf)

EIAR 9.7 List of Appendices for Air (Air Quality & EMF)

APPENDICES (overleaf)

Figures for Air (Air Quality & EMF)

EIAR Chapter 9: Air (Air Quality & EMF)

Figure 9.1 - Construction Dust

Legend:

- Ballynalacken Windfarm Construction Works Area
- 250m Study Area
- 50m Study Area
- Local roads used by construction vehicles or delivery vehicles
- Sensitive Receptors (Residential Properties)

L5838
H37
H38
H39
H40
L5840
L5846
H19
L5845
H17
H18
H16
H15
L58451
L58442
SubH25
SubH26
SubH24
SubH23
SubH21
SubH22
SubH19
SubH20
SubH18
SubH7
SubH9
SubH6
SubH8
SubH5
SubH4
Internal Cable Link
Ballynalacken Grid Connection
SubH3
SubH2
SubH1
R432
SubH10
SubH11
SubH12
SubH13
SubH14
Tinnalintan Substation
Eirgrid Ballyragget Substation
SubH15
SubH16
SubH17
H11
H10
H8
H9
H58
H60
R694
N

EIAR Chapter 9: Air (Air Quality & EMF)

Figure 9.2 - Construction Traffic Emissions

Legend:

- Ballynalacken Windfarm Construction Works Area
- 200m Study Area
- Local roads which will experience a significant change in traffic levels
- Sensitive Receptors (Residential Properties)

H37
H38
H39
H40
H19
H17
H18
H16
H15
H11
H10
H8
H9
H58
H60
SubH25
SubH26
SubH24
SubH23
SubH21
SubH22
SubH19
SubH20
SubH18
SubH7
SubH9
SubH6
SubH8
SubH5
SubH4
SubH3
SubH2
SubH1
SubH10
SubH11
SubH12
SubH13
SubH14
SubH15
SubH16
SubH17

Internal Cable Link
Ballynalacken Grid Connection
Tinnalintan Substation
Eirgrid Ballyragget Substation

N

EIAR Chapter 9: Air (Air Quality & EMF)

Figure 9.3 - Operational EMF

Legend:

- Ballynalacken Turbine
- Internal Windfarm Cabling
- Internal Cable Link to the Tinnalintan Substation
- Tinnalintan Substation
- Ballynalacken Grid Connection
- Eirgrid Ballyragget Substation
- 100m Study Area
- Houses within 100m

Windfarm Control Building

Internal Cable Link

Tinnalintan Substation

Ballynalacken Grid Connection

Eirgrid Ballyragget Substation

H19

SubH1 SubH2 SubH3 SubH4 SubH5 SubH6 SubH7 SubH8 SubH9 SubH10 SubH11 SubH12 SubH13 SubH14 SubH19 SubH20 SubH21 SubH22 SubH23 SubH24 SubH25 SubH26

N

EIAR Chapter 9: Air (Air Quality & EMF)

Figure 9.4 - Other Projects within Air Quality Cumulative Study Areas

Legend:

- Ballynalacken Windfarm Construction Works Area
- 500m Study Area
- 100m Study Area
- Local roads used by construction vehicles or delivery vehicles
- Sensitive Receptors (Residential Properties)

Other Projects:

- Laois - Kilkenny Grid Reinforcement Project
- Moatpark - Loan 38kV Overhead Line
- Farranrory Windfarm Grid Connection
- Parksgrove and Ballyragget Solar Farms Grid Connection
- Battery Energy Storage Developments at Moatpark
- Briskalagh Windfarm Grid Connection
- Telecom Masts, Ballyouskill
- Tirlan Milk Processing Facility & Wastewater Treatment Plant and Anaerobic Digestor

L5838
Moatpark -Loan 38kV Overhead Line
Laois-Kilkenny Grid Reinforcement Project
Telecoms Mast in Ballyouskill
L5840
L5846
L5845
L58451
L58442
R694
R432
Battery Energy Storage System (BESS) Projects around Ballyragget Substation (2 no.in Moatpark townland)
Tirlan Milk Processing Facility & Wastewater Treatment Plant and Anaerobic Digestor
Laois-Kilkenny Grid Reinforcement Project
Farranrory Wind Farm Grid Connection
Ballyragget & Parksgrove Solar Farms Grid Connection
N

EIAR Chapter 9: Air (Air Quality & EMF)

Figure 9.5 - Other Projects within EMF Cumulative Study Areas

Legend:

- Ballynalacken Turbine
- Internal Windfarm Cabling
- Internal Cable Link to the Tinnalintan Substation
- Tinnalintan Substation
- Ballynalacken Grid Connection
- Eirgrid Ballyragget Substation
- 200m Study Area
- Houses within 200m

Other Projects:

- Laois - Kilkenny Grid Reinforcement Project
- Moatpark - Loan 38kV Overhead Line
- Briskalagh Windfarm Grid Connection
- ESB 38kV Overhead Line
- ESB 10kV/20kV Overhead Line
- ESB 400V/230V Overhead Line

L5838
L5840
L5846
L5845
L58451
L58442
Internal Cable Link
Ballynalacken Grid Connection
R432
Eirgrid Ballyragget Substation
Tinnalintan Substation
R694
R694
H19
SubH1
SubH2
SubH3
SubH4
SubH5
SubH6
SubH7
SubH8
SubH9
SubH10
SubH11
SubH12
SubH13
SubH14
SubH15
SubH16
SubH17
SubH18
SubH19
SubH20
SubH21
SubH22
SubH23
SubH24
SubH25
SubH26
Ballynafunshin
Earlsgarden
Attanagh
Áth Tanaí
Grenan
Attanagh Br
Glebe
Nicholastown
Russellstown
Gorteenara
Holy Well
Glashagal Br
Glashagal River
An Fheoir
River Nore
Motte
Coole
Moatpark
Ballyconra
Tinnalintan
Ballyoskill
Cromwellsfield
Ballynalacken
Ballymartin Cross Rds
Ballymartin
Commons
Firoda Upper
Garrannaguilly
Byrnesgrove
Sraleagh
Rathduff
Finnan
Seven Cross Rds
Glenmagoo or Fir
Moated Site
Fulacht Fia
Bathkyle
N

Appendix 9.1: Explanation and Modelling of Electromagnetic Fields

Appendix to Chapter 9: Air (Air Quality & EMF)

Appendix 9.1: Explanation and Modelling of Electromagnetic Fields

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Author of this Appendix:

A9.1 EXPLANATION AND MODELLING OF ELECTROMAGNETIC FIELDS

A9.1.1 Author of this Appendix

Lewis Brien B (Hons) in Electronics of Compliance Engineering Ireland (CEI). Lewis has carried out EIAR's for similar projects including FEMM Modelling for EMF Assessment and Shielding for Aerospace and Laboratory projects. CEI has carried out over 1000 low Frequency to radiofrequency site surveys throughout Ireland and worldwide and is recognised by Comreg as one of the foremost independent authorities on the radio frequency spectrum in Ireland. CEI General Manager Paul Reilly currently holds the chair for the EMF National Technical Committee in Ireland (TC16)

A9.1.2 Explanation of Electric Fields and Magnetic Fields

Electrical objects and anything connected to them produce two types of fields - electric fields and magnetic fields. The term "field" is used to describe the way an object influences its surrounding area. A temperature field, for example, surrounds a warm object, such as a space heater. EMF's surround any object that is generating, transmitting or using electricity, including appliances, wiring, office equipment, generators, batteries and any other electrical devices. EMFs are invisible and they cannot be felt or heard.

Electric fields occur as a result of the electric potential (or voltage) on these objects, and magnetic fields occur as a result of electric current flowing through these objects. Just like a temperature field, electric and magnetic fields can be measured and their levels depend on, among other things:

- Characteristics of the source of the field (voltage, current, cable configuration and formation); and
- Distance from the source of the field.

The Electric Field is measured in volts per metre (V/m) or (kV/m). Magnetic Fields are measured in microtesla (µT). Electric Fields and Magnetic Fields are highest closest to the source and their level reduces quickly with distance from the source. This is similar to the way that the heat from a candle or campfire weakens as you move farther away. Although ordinary objects do not block magnetic fields, electric fields can be easily blocked by objects such as trees and buildings.

All sources of EMF below 300 GHz in the electromagnetic spectrum (such as the subject development) are considered Non-Ionizing Radiation, which means the EMF does not carry enough energy to remove an electron from its atomic structure.

A9.1.2.1 Electromagnetic Fields in the Natural Environment

Both electric and magnetic fields occur naturally in our environment and even in our own bodies as part of the normal functioning of our cardiac and nervous systems. There is a natural electric field at the earth's surface that is created by electric charges in the upper atmosphere, also known as the ionosphere. During fair weather, these electric field levels vary between 100 and 150 volts per meter (V/m) over flat surfaces. During stormy weather, on the other hand, storm clouds often contain large quantities of electric charge, and the electric field may reach intensities up to 20,000 V/m over flat surfaces and can be considerably higher above hills or near the tops of objects such as trees. The Earth's magnetic field, which is due mainly to currents circulating in the outer layer of the Earth's core, extents from the Earth's core out into space. Its magnitude at the Earth's surface varies between about 30 µT (microTesla) at the equator and about 60 µT at the poles.

Such naturally occurring electric and magnetic fields do not change direction and are, therefore, referred to as static or direct current (DC) fields. Naturally occurring electric and magnetic fields differ from the extremely low frequency electromagnetic Fields (ELF-EMF) produced by the power system, which fluctuate at a fixed frequency and are referred to as alternating current (AC) fields. For this reason, the existing levels of naturally occurring static EMF fields are not taken into account in the Ballynalacken Windfarm Project EIA Report.

A9.1.2.2 Electromagnetic Fields in the Built Environment

In the built environment, man-made sources of EMF include the power system and communication networks. In Ireland, the AC electric and magnetic fields produced by the power system vary at a frequency of 50-Hertz (Hz) (i.e. the fields alternate direction and intensity back and forth 50 times each second). Electric and magnetic fields are produced in all residential and working environments as a result of nearby electrical wiring, appliances, power lines and telecommunication masts, among other things. A comparison of electric and magnetic fields from 110kV electrical power system infrastructure with the typical electric and magnetic fields emitted by common household appliances is included in Section A9.1.3 below. In summary this comparison demonstrates that in many cases, residential electrical appliances and tools can generate higher magnetic and electric fields in their close proximity (30cm) than at either the fence of an 110kV substation compound or directly above 110kV underground cables.

In a recent study of homes in the UK, most of homes had average magnetic field levels in the range 0.2µT to 0.4µT which were attributed to low voltage sources (i.e., wiring, appliances, and distribution circuits) (Mastanyi *et al*, 2007). Electric field measurements in residential environments, average exposures were found to be less than 10 V/m (Bracken *et al*, 1990)

A9.1.3 Typical Electric and Magnetic Fields in Residential and Working Environments

Field measurements, carried out by CEI, of the electric fields and magnetic fields near 110kV substations and underground cables are shown below in Table 1 and Table 2.

Table 1: Electric Fields measured from electrical power system infrastructure

Electrical power system	**0 meter distance[1] (V/m)**	**30 meters distance (V/m)**	**100 meters distance (V/m)**	**ICNIRP Limit**
110kV Substation	40	20	Less than 1	5000 V/m
110kV Underground Cables[2]	n/a	n/a	n/a	5000 V/m

Table 2: Magnetic Fields measured from electrical power system infrastructure

Electrical power system	**0 meter distance (µT)**	**30 meters distance (µT)**	**100 meters distance (µT)**	**ICNIRP Limit**
110kV Substation	1	0.4	Less than 0.01	100µT
110kV Underground Cables[3]	7 (See footnote 3)	Less than 0.1	Less than 0.05	100µT

Measurements of the typical electric and magnetic fields near domestic appliances are shown in Table 3 and Table 4 below.

Table 3: Typical Electric Fields Household Appliances

Electric appliance	**Electric field strength (V/m) at 30cm**	**ICNIRP Limit**
Stereo receiver	180	**5000 V/m**

[1] A distance of 0 m corresponds to the central point above the underground cable, or at the substation fence.

[2] There is no electric field above ground level for underground cables, as the soil, earth materials and metallic sheath, which surrounds each cable, removes the potential for electric fields outside the cable.

[3] Scaled to reflect similar level expected based on the maximum MVA load 72MW.

Electric appliance	Electric field strength (V/m) at 30cm	ICNIRP Limit
Iron	120	**5000 V/m**
Refrigerator	120	**5000 V/m**
Mixer	100	**5000 V/m**
Toaster	80	**5000 V/m**
Hair dryer	80	**5000 V/m**
Colour TV	60	**5000 V/m**
Coffee machine	60	**5000 V/m**
Vacuum cleaner	50	**5000 V/m**
Electric oven	8	**5000 V/m**
Light bulb	5	**5000 V/m**

Table 4: Typical Magnetic Fields Household Appliances

Electric appliance	3 cm distance (µT)	30 cm distance (µT)	1 m distance (µT)	ICNIRP Limit
Hair dryer	6 – 2000	0.01 – 7	0.01 – 0.03	**100µT**
Electric shaver	15 – 1500	0.08 – 9	0.01 – 0.03	**100µT**
Vacuum cleaner	200 – 800	2 – 20	0.13 – 2	**100µT**
Fluorescent light	40 – 400	0.5 – 2	0.02 – 0.25	**100µT**
Microwave oven	73 – 200	4 – 8	0.25 – 0.6	**100µT**
Electric oven	1 – 50	0.15 – 0.5	0.01 – 0.04	**100µT**

The ICNIRP limit[4] for EMF exposure for electric fields is 5000 V/m. As can be seen from Table 3, the typical exposure levels from common household appliances are below and in compliance with the ICNIRP limits in close proximity to the appliance. For example, an operational refrigerator can expose the user or resident to 120 V/m at a distance of 30cm from the appliance. Any exposure to electric fields at this level is typically for momentary or brief periods at any one time.

The ICNIRP limit for EMF exposure for magnetic fields is 100µT. Low voltage sources, such as home appliances, contribute significantly to our overall exposure to magnetic fields. In a recent study of homes in the UK, for example, 77% of homes had average magnetic field levels above 0.2 µT and 57% of homes had average magnetic field levels above 0.4 µT which were attributed to low voltage sources (i.e., wiring, appliances, and distribution circuits) (Mastanyi *et al*, 2007). The typical[5] magnetic fields which people can be exposed to, at various distances from electrical equipment and appliances, in residential and public premises are presented in Table 4. As can be seen from Table 4, the use of a vacuum cleaner can expose the user to 200µT at a distance of 3cm and up to 20µT at a 30cm distance from the appliance.

While the comparison between operational 110kV substations or underground cables and domestic appliances provides valuable perspective, and indeed demonstrate that some common household appliances, such as hair dryers, breach the ICNIRP limit at very close proximity, it is limited by several

[4] http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf
[5] Source: http://www.who.int/peh-emf/about/WhatisEMF/en/index3.html

differences between power lines and appliances. First, electric and magnetic fields are only associated with appliances for the duration that the appliance or tool is in use, while power lines are typically in service at all times. Furthermore, the field levels from appliances drop off at a faster rate with distance, compared to electricity transmission networks.

A9.1.4 Criteria for Modelling Theoretical Worst-Case Effects

In order to categorically demonstrate that the maximum possible power load of the electric cables and equipment associated with the Ballynalacken Windfarm Project, will comply with the EU EMF Exposure Recommendations and the ICNIRP limits, the theoretical worst-case contribution of the various electrical plant to EMF levels in the environment is evaluated in this Appendix. The worst-case levels of EMF have been modeled using the criteria outlined in Table 5, the results of the modelling are summarized in Table 6.

Table 5: Criteria for modelling theoretical worst-case effects

Ballynalacken Windfarm Project Element	Worse-Case Scenario Criteria
Ballynalacken Windfarm Turbines	The closest distance of a member of the public to electrical parts – i.e. at ground level, right beside the turbines (0m distance)
Internal Windfarm Cables	The maximum capacity possible of the electricity which a 33kV wind turbine cable will be capable of delivering – i.e. 30 MW, and the associated electrical current of 525 Amps. And at the Control Building there are three cable sets routed adjacent to each other, into the Control Building, with a combined maximum of 50.4MW. A combined model of a dual part of the circuit which enters the control building was chosen and it should be noted that this is the maximum possible power load for the electrical cables and has been modelled to demonstrate categorically compliance with the EU EMF Exposure Recommendation. The configuration of the cable design is the trefoil configuration. The minimum distance between the cables and the ground surface is 0.95m.
Ballynalacken Windfarm Control Building	The Control Building which will collect the three 33KV cable circuits. The worst case scenario EMF from the equipment in the compound is modelled from the Control Building external wall, and is referred to throughout this report as the measurement of EMF at '0 meters'
Internal Cable Link between Control Building and Tinnalintan Substation	The maximum capacity possible of the electricity which the 33kV Cable Link will be capable of delivering – i.e. 50.4MW, and the associated electrical current of 1260 Amps. It should be noted that this is the maximum possible power load for the electrical cables and has been modelled to demonstrate categorically compliance with the EU EMF Exposure Recommendation. The configuration of the cable design is the double trefoil configuration. The Current is therefore split between each circuit. The minimum distance between the cables and the ground surface is 0.95m.
Tinnalintan Substation	The closest piece of electrical apparatus from the Tinnalintan Substation Compound perimeter fence is 5m. The worst case scenario EMF from the equipment in the compound is modelled from the perimeter fence, and is referred to throughout this report as the measurement of EMF at '0 meters'
110kV underground cables between Tinnalintan Substation to the existing EirGrid Ballyragget Substation. (Grid Connection)	The maximum capacity possible of the electricity which the 110kV Grid Connection will be capable of delivering – i.e. 50.4MW, and the associated electrical current of 378 Amps. It should be noted that this is the maximum possible power load for the electrical cables and has been modelled to demonstrate categorically compliance with the EU EMF Exposure Recommendation. Two configurations of cable designs have been modelled: The configuration of the cable design is the worst case flat configuration, which is a flat formation cable design (rather than trefoil formation), and therefore less cancelation of magnetic fields between cables. The minimum distance between the cables and the ground surface using this flat formation – at a depth of i.e. 0.45m. This design is only at one location crossing a bridge at location W3 on the R432 regional road. The second configuration of the cable design modelled was the trefoil formation, which is the design used elsewhere on the cable route. The minimum distance between the cables and the ground surface using this trefoil formation – i.e. 0.95m. Both configurations were modelled to demonstrate the worst case emissions however as the flat formation is only used at one location (Watercourse W3), the design adopted elsewhere on the circuit is Trefoil and is therefore the appropriate model to use for the sensitive aspect scoped in, i.e Local Residents, Community & Amenities

	It should be noted both designs demonstrate categorically compliance with the EU EMF Exposure Recommendation.

The results of this modelling (see Table 6 and Section A9.1.4.1 below) demonstrate that the electric field and magnetic field emissions from the Ballynalacken Wind Turbines, Ballynalacken Control Building, Tinnalintan Substation, underground Internal Windfarm Cabling, underground Internal Cable Link and the underground Ballynalacken Grid Connection will be at a level **substantially less the ICNIRP limit of 5000 V/m and 100µT respectively.** Furthermore, the magnetic field levels will rapidly dissipate with increasing distance from the source.

A9.1.4.1 Summary of Modelling Results

Table 6: Summary of Worst-case Scenario EMF Modelling Results

Project Element	Electric Fields	Magnetic Fields
Ballynalacken Wind Turbines	The electric field generated by the transformer, generator and cables are screened internally by the housing over the generator, and by the steel turbine tower. The turbine's transformer and generator are also at a substantial height above ground level and **will not contribute to the ambient electric field levels**.	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork, which will include turbine housings and steelwork. The turbine and transformer are also at a substantial height above ground level. Right beside the turbine, worst case EMF are expected to be **0.2µT**
Internal Windfarm Cables	The electric fields generated by the underground cables will be *completely screened* by the earth materials such as soil and a metallic sheath which will surround each cable, and **no electric fields** will be emitted above ground.	Directly above the Internal Windfarm Cables, the maximum level of the magnetic fields, generated by the underground cables, will be **4.105µT**
Windfarm Control Building	Electric fields will be very low due to the shielding which will be provided by the extensive metalwork within the control building, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be **40 V/m.**	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the control building, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be **1µT.**
Internal Cable Link	The electric fields generated by the underground cables will be *completely screened* by the earth materials such as soil and a metallic sheath which will surround each cable, and **no electric fields** will be emitted above ground.	Directly above the Internal Windfarm Cables, the maximum level of the magnetic fields, generated by the underground cables, will be **6.927µT**
Tinnalintan Substation (110kV)	Electric fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence.	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence.

	Immediately outside the perimeter fence, the **worst-case EMF** from the substation are expected to be **40 V/m.**	Immediately outside the perimeter fence, the **worst-case EMF** from the substation are expected to be **1µT**
Ballynalacken Windfarm Grid Connection (underground 110kV)	The electric fields generated by the underground cables will be *completely screened* by the earth materials such as soil and a metallic sheath which will surround each cable, and **no electric fields** will be emitted above ground.	Directly above the Ballynalacken Windfarm Grid Connection, the **maximum possible level** of the magnetic fields, generated by the underground cables, will be **21.639 µT**

A9.1.5 Worst Case EMF emissions from the Ballynalacken Windfarm Project

The electric fields and magnetic fields were modelled, at various distances from electrical plant, using worst-case scenario criteria outlined in Table 5. The results of the modelling in relation to the Ballynalacken Windfarm Project are presented in Table 7 (electric fields) and Table 8 (magnetic fields).

Table 7: Contribution to ambient electric fields (worst case scenario) by Ballynalacken Windfarm

Ballynalacken Windfarm	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m)[6]	Worst Case Electric Field Contribution from the project (V/m)	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m)[7]	ICNIRP Guideline Limit (V/m)
Ballynalacken Wind Turbines (4.2MW)	0m	less than 1	none	No increase	**5000**
	30m	less than 1	none	No increase	**5000**
	100m	less than 1	none	No increase	**5000**
Internal Windfarm Cabling (underground double 33kV circuit)	0m	less than 1	None	No increase	**5000**
	30m	less than 1	None	No increase	**5000**
	100m	less than 1	None	No increase	**5000**
Windfarm Control Building (on the windfarm site)	0m	less than 1	40	41	**5000**
	30m	less than 10	20	30	**5000**
	100m	less than 20	less than 1	21	**5000**
Internal Cable Link (underground double 33kV circuit)	0m	less than 1	None	No increase	**5000**
	30m	less than 1	None	No increase	**5000**
	100m	less than 1	None	No increase	**5000**
Tinnalintan Substation (110kV)	0m	less than 1	40	41	**5000**
	30m	less than10	20	30	**5000**
	100m	less than 20	less than 1	21	**5000**
Ballynalacken Grid Connection (underground 110kV)	0m	less than 1	None	No increase	**5000**
	30m	less than 1	None	No increase	**5000**
	100m	less than 1	None	No increase	**5000**

[8] Assumption: Electric fields are cumulative which is unlikely

Table 8: Contribution to ambient magnetic fields (worst case scenario) by the Ballynalacken Windfarm

Ballynalacken Windfarm	**Distance from operational electrical apparatus or cables (m)**	**Existing Ambient Magnetic Fields (μT)**	**Worst Case EMF Contribution from the Ballynalacken Windfarm Grid Connection (μT)**	**Predicted Worst Case Ambient EMF levels during the operation stage (μT)**	**ICNIRP Guideline Limit (μT)**
Ballynalacken Wind Turbines (4.2MW)	0m	0.01	0.2	0.4	**100**
	30m	0.01	0.07	0.27	**100**
	100m	0.01	0.07	0.27	**100**
Internal Windfarm Cabling (underground double 33kV circuit)	0m	0.01	4.105	4.115	**100**
	30m	0.01	0.022	0.038	**100**
	100m	0.01	0.002	0.012	**100**
Windfarm Control Building (on the windfarm site)	0m	0.01	1	1.05	**100**
	30m	0.01	0.4	0.42	**100**
	100m	0.01	0.16	0.23	**100**
Internal Cable Link (underground double 33kV circuit)	0m	0.01	6.927	6.937	**100**
	30m	0.01	0.037	0.047	**100**
	100m	0.01	0.003	0.013	**100**
Tinnalintan Substation (110kV)	0m	0.01	1	1.05	**100**
	30m	0.01	0.4	0.42	**100**
	100m	0.01	0.16	0.23	**100**
Ballynalacken Grid Connection (underground 110kV)	0m	0.2	21.639	21.839	**100**
	30m	0.2	0.063	0.263	**100**
	100m	0.2	0.006	0.206	**100**

A9.1.6 Worst Case EMF emissions from Other Projects

In order to facilitate a cumulative assessment the following Other Projects/Activities have been considered.
Only magnetic fields are presented below as there is no electric field above ground level for underground cables (*associated with the Ballynalacken Grid Connection*), as the soil, earth materials and metallic sheath, which surrounds each cable, removes the potential for cumulative electric fields effects outside the cable.

Laois-Kilkenny Grid Reinforcement Project

This project is currently under construction, with construction works substantially complete. This project comprises a new GIS substation at the existing EirGrid Ballyragget Substation, along with 110kV OHLs between Moatpark and Coolnabacky in County Laois. The project also includes a new OHL between Moatpark and the Kilkenny substation at Dunbell, however, this line is outside the cumulative study area and won't contribute to cumulate EMF at local residences and community facilities. The worst case magnetic field emissions are illustrated on the place below. There are no houses within 100m of both the 110kV OHL associated with the Laois-Kilkenny Grid Reinforcement Project and the underground cables associated with the Ballynalacken Grid Connection or Internal Cable Link.

Moatpark – Loan 38kV Overhead Line

A 38kV OHL crosses over the route of the Internal Cable Link and also passes through the windfarm site. There are 3 no. local residents within 100m of the crossing point over the local public road.

House ID	Distance to Ballynalacken element & magnetic fields	Distance to Other Project & magnetic fields	Cumulative EMF
SubH23	32m to 33kV internal cable link **0.19 µT**	53m to the 38kV OHL **0.189 µT**	**0.379 µT**
SubH24	35m to 33kV internal cable link **0.16 µT**	89m to the 38kV OHL **0.168 µT**	**0.328 µT**
SubH25	47m to 33kV internal cable link **0.009 µT**	73m to the 38kV OHL **0.1 µT**	**0.109 µT**

A9.1.6.1 Worst Case EMF emissions from Laois-Kilkenny Grid Reinforcement Project cumulatively with the Ballynalacken Project

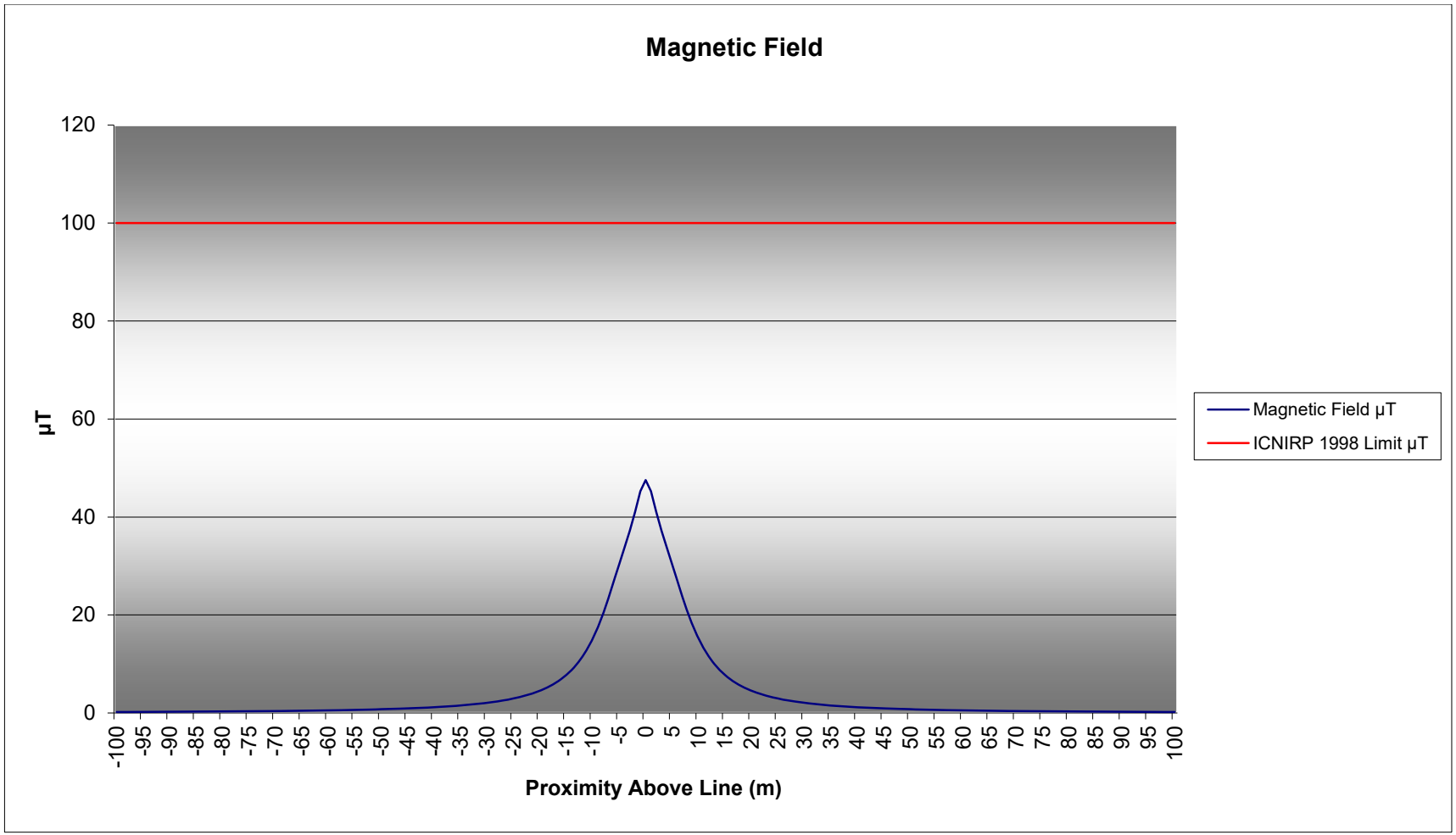

Plate 1: Maximum Possible Magnetic Field from the 110 kV OHL Cables and Ballynalacken Project

Appendix 9.2: Methodology for the evaluation of Air (Air Quality & EMF)

Appendix to Chapter 9: Air (Air Quality & EMF)

Appendix 9.2: Methodology for the evaluation of Air (Air Quality & EMF)

A9.2 Methodology Applied

A9.2.1 Methodology for Evaluating Effects to Air

The criteria used for the scoping and subsequent impact evaluation in this report is based on EU Directives 2024/2881/EC and 2008/50/EC, the Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction* and Transport Infrastructure Ireland (TII) guidance document PE-ENV-01106. The author's experience with EIA preparation and air quality management also informs this report.

A9.2.1.1 Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland are set out in Directive 2024/2881/EC of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe. The EU formally adopted this directive on 14 October 2024. This directive supersedes EU 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 and sets out new air quality standards for pollutants to be reached by 2030 which are more closely aligned with the World Health Organisation (WHO) air quality guidelines.

The Air Quality Standards Regulations 2022 (S.I. 739 of 2022) transposed EU Directive 2008/50/EC. With the adoption of Directive 2024/2881/EC, Ireland must transpose this directive into national law (i.e. update the Air Quality Standards Regulations) before October 2026.

Both Directive 2008/50/EC and 2024/2881/EC set limit values for certain air pollutants in order to protect against human health and ecological impacts. The limit values are presented in the table below. The limit values in relation to particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2) are applicable to the proposed development. The limit values set out in Directive 2024/2881/EC will need to be achieved by 2030, with the limit values set out in the Air Quality Standards Regulations 2022 (and future updated regulations) applicable until 2030.

Table 1: EU Ambient Air Quality Limit Values

Pollutant	**2008/50/EC Limit Type**	**2008/50/EC Limit Value** (applicable until 2030)	**2024/2881/EC Limit Type**	**2024/2881/EC Limit Value** (to be attained by 2030)
Nitrogen Dioxide (NO_2)	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3	Hourly limit for protection of human health - not to be exceeded more than 3 times/year	200 µg/m^3
	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	50 µg/m^3
	Annual limit for protection of human health	40 µg/m^3	Annual limit for protection of human health	20 µg/m^3

Particulate Matter (as PM_{10})	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	45 µg/m^3
	Annual limit for protection of human health	40 µg/m^3	Annual limit for protection of human health	20 µg/m^3
Particulate Matter (as $PM_{2.5}$)	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	25 µg/m^3
	Annual limit for protection of human health	25 µg/m^3	Annual limit for protection of human health	10 µg/m^3

A9.2.1.2 Transport Infrastructure Ireland (TII) Guidance on Traffic Based Air Pollutants

The TII guidance document PE-ENV-01106 (TII, 2022) uses the following screening criteria to determine if a detailed air modelling assessment of traffic emissions is required for a proposed development. If any road links[1] meet one or more of the following criteria it can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment of traffic emissions.

The proposed development will not change the traffic on the surrounding road network by an amount greater than the criteria listed in Table 2, and as a result a local air quality assessment of traffic emissions was not required.

Table 2: TII Screening Criteria for Air Quality Assessment

TII Criteria	**Criteria met?**
Road alignment change of 5 meters or more	No, no change in road alignments
Annual Average Daily Traffic (AADT) flow changes by 1,000 or more	No, daily traffic substantially below 1000 Annual Average Daily Traffic (AADT)
HDVs flows changes by 200 AADT or more	No, HDV flows below 200 vehicles/day
Daily average speed changes by 10 km/h or more	No, no change in average speed
Peak hour speed changes by 20 km/h or more	No, no change in peak hour speed

A9.2.1.3 IAQM Guidance on Construction Dust Emissions

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) outlines an assessment method for predicting the impact of dust emissions from earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase in order to predict the likely magnitude of the dust impacts on sensitive receptors and to determine the level of site-specific mitigation required.

[1] A road link is where the existing road network is broken up into sections of road with similar traffic conditions (traffic composition, speed and flow).

A9.2.1.4 IAQM Guidance on Identifying Sensitive Receptors

The IAQM Guidance states that an assessment of dust impacts will be required where there is a 'human receptor' within 250m of the boundary of the works or within 50 m of routes used by construction vehicles. Dust impacts can occur up to 250m for the source, however, the greatest impacts will occur within the first 50m. According to the IAQM Guidance **a 'human receptor'** refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling[2], or exposure to PM_{10} over a time period relevant to the air quality objectives. Examples of the different types of high, medium and low sensitivity receptors are outlined in the Table 3 below.

Table 3: Examples of Sensitive Receptors as per IAQM Guidance

Sensitivities of People to Dust Soiling Effects	
High	locations where users can expect enjoyment of a high level of amenity
	appearance, aesthetics, value of property diminished by soiling
	people or property present either continuously or for extended periods of time
Medium	locations where users expect to enjoy a reasonable level of amenity
	appearance, aesthetics, value of property diminished by soiling
	people or property not present continuously or regularly for extended periods of time
Low	locations where enjoyment of amenity is not reasonably expected
	property not expected to be diminished in appearance, aesthetics, value by soiling
	areas of transient exposure where people or property are passing through or by an area
Sensitivities of People to the Health Effects of PM_{10}	
High	Areas where people are exposed over a time period relevant to the air quality objective for PM_{10} (Air Quality Standards established under Directive 2008/50/EC are reproduced in Table 1)
Medium	locations where the people exposed are workers
Low	locations where human exposure is transient

A9.2.1.5 IAQM Guidance on Evaluating the Sensitivity of the Area

According to IAQM Guidance (2024), the sensitivity of an area to construction dust impacts from either dust soiling or health impacts from PM_{10} is assessed using the criteria outlined in Table 4 to Table 5. This is based on the sensitivity of the receptor, the number of receptors and their distance from the dust source.

With regards to the sensitivity of the area a 'worst-case' approach has been taken in this assessment whereby the area with the majority of sensitive receptors within the closest distance to the works area have been assessed. This will establish the highest possible level of risk associated with any element of the project for either dust soiling or health impacts from PM_{10}; then the appropriate level of mitigation or best practice measures can be established, if necessary, based on a high, medium or low level of risk.

In relation to the Ballynalacken Windfarm Project, it has been established that the area of the windfarm site is of **medium sensitivity** to dust soiling impacts and **low sensitivity** to dust-related human health impacts as

[2] As Per IAQM guidance 2014: Occupational settings are relevant in terms of annoyance effects.

there are 2 no. high sensitivity residential properties within 20m of the windfarm site. The area of the proposed grid connection route is considered **medium sensitivity** to dust soiling impacts and **low sensitivity** to dust-related human health impacts as there are 4 no. high sensitivity residential properties within 20m of the grid connection route.

Table 4: Sensitivity of an area to dust soiling effects on people and property (in bold)

Receptor Sensitivity	**Number of Receptors**	**Distance from the Source (m)**			
		less than 20	**less than 50**	**less than 100**	**less than 250**
High	greater than 100	High	High	Low	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	**Medium**	Low	Low	Low
Medium	1 or more	Medium	Low	Low	Low
Low	1 or more	Low	Low	Low	Low

(*Note: The sensitivity of the area to dust soils effects are identified in bold text with yellow background*)

Table 5: Sensitivity of an area to human health impacts

Receptor Sensitivity	**Annual Mean PM_{10} concentration**	**Number of Receptors**	**Distance from the Source (m)**			
			less than 20m	**less than 50m**	**less than 100m**	**less than 250m**
High	less than 24 µg/m^3	greater than 100	Medium	Low	Low	Low
		10 - 100	Low	Low	Low	Low
		1 - 10	**Low**	Low	Low	Low
Medium	less than 24 µg/m^3	greater than 10	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Low	less than 24 µg/m^3	1 or more	Low	Low	Low	Low

(*Note: The sensitivity of the area to dust soils effects are identified in bold text with yellow background*)

A9.2.1.6 IAQM Guidance on Evaluating the Magnitude of Dust Emissions

Earthworks will primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- 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 (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3 m in height.

The worst-case classification for dust emission magnitude (earthworks) is large due to the total site area involved in the project including the grid connection route, substation location, location of construction compounds and temporary borrow pits.

Construction: Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total building volume >75,000 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).

The worst-case classification for dust emission magnitude (construction) is small as there are minimal buildings involved in the proposed development. The Windfarm Control Building is the main building to be constructed along with the control buildings at the substation site. The total building volume involved will be significantly less than 12,000 m^3. The turbines themselves are constructed from metal which has a low potential for dust release.

Trackout: In relation to trackout, factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **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.

The worst-case classification for dust emission magnitude (trackout) is small as there are unlikely to be greater than 20 outward HDV movements per day during the construction of the proposed development.

A9.2.1.7 IAQM Guidance on Evaluating the Risk of Dust Impacts

The sensitivity of the area (medium sensitivity for dust soiling and low sensitivity for human health) is combined with the dust emission magnitude for the earthworks, construction and trackout categories to define the risk of dust impacts in the absence of mitigation, the results for each category are outlined in Table 6.

The proposed development has a worst-case medium risk of dust soiling impacts and a worst-case low risk of dust-related human health impacts.

Table 6: Risk of Dust Impacts in relation to earthworks, construction and trackout

Potential Impact	Dust Emission Risk		
	Earthworks	**Construction**	**Trackout**
Dust Soiling	Medium Risk	Low Risk	Low Risk
Human Health	Low Risk	Negligible Risk	Negligible Risk

A9.2.2 Methodology for Evaluating Electromagnetic Fields

The criteria used for the scoping and subsequent impact evaluation in this report is carried out in accordance with the International Commission on Non-Ionizing Radiation Protection 1998 guidelines. The author's experience with EIA preparation and air quality management also informs this report.

A9.2.2.1 Treatment of the Existing Electricity and Communications Networks

The contribution to EMF levels from existing 110kV or 220kV overhead lines is considered in the cumulative impact of the Impact Evaluation Tables for EMF. The local electricity (10kV, 20kV, 38kV) networks, telecom signals and communications (Eir) networks, on the other hand, are considered as part of the existing environment.

A9.2.2.2 Treatment of Naturally Occurring Electric and Magnetic Fields

Naturally occurring electric and magnetic fields differ from the electromagnetic Fields (EMF) which are produced by the power system because naturally occurring EMF does not change direction and is, therefore, referred to as static or direct current (DC) fields, whereas EMF from power systems fluctuates at a fixed frequency and are referred to as alternating current (AC) fields.

As EMF from the two sources (natural, power systems) differ from each other, naturally occurring electric and magnetic fields are not included in the baseline environment. Further details on electromagnetic fields is provided in Appendix 9.1: Explanation and Modelling of Electromagnetic Fields.

A9.2.2.3 Authors Methodology for Modelling Theoretical Worst-Case Effects

In order to categorically demonstrate that the maximum possible power load of the electric cables and equipment associated with the project, will comply with the EU EMF Exposure Recommendations and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) limits, the theoretical worst-case contribution of the operational project, to EMF levels in the environment is evaluated in this report. The criteria for modelling the worst-case levels of EMF are outlined in Appendix 9.1: Explanation and Modelling of Electromagnetic Fields.

A9.2.2.4 ICNIRP General Public Reference Levels

In the EIA Report chapter, the compliance of the various electrical and radio communications elements of the whole windfarm has been evaluated against the directives and legislation listed in Section EIAR 9.1.4, and against the 1998 guidelines on limiting exposures to electromagnetic fields as published by the ICNIRP. The European Union and the Irish Government have adopted the ICNIRP 1998 guidelines, which are outlined in Table 7 below. The Irish Government Department of Communications, Marine and Natural Resources, have stated "No adverse health effects have been established below the limits suggested by international guidelines".

Table 7: ICNIRP 1998 EMF Limits

Exposure Characteristics ICNIRP	**Electric Field Strength V/m**	**Magnetic Field Strength µT**
1998 General Public Reference Level	5000	100
2010 General Public Reference Level	5000	200

A conservative approach has been adopted in this EIAR, in that the lower 1998 levels have been used to evaluate the significance of any increases in EMF.

A9.2.2.5 Authors Methodology for Evaluating Magnitude and Significance of Impacts

The significance of the impact for each identified sensitive receptor will be assessed according to the impact magnitude according to Table 8 and Table 9.

Table 8: Determining Magnitude and Significance of Effects in relation to Electric Fields

Magnitude		**Significance of Effects**	
Magnitude Rating	**Field Strength**	**Local Residents, Community & Amenities**	**Electronic Equipment**
Very Low (1)	< 1 V/m	**Imperceptible** Similar to existing ambient levels	**Imperceptible** Similar to existing ambient levels
Low (2)	1V/m - 1000 V/m	**Slight** Similar to existing ambient levels from residential electric equipment	**Imperceptible** Similar to existing ambient levels from Electric Equipment
Medium (3)	1000 V/m-5000 V/m	**Slight** Under EU EMF limits Under HSA Low Action limit	**Slight to moderate** Above existing ambient levels from Electric Equipment

High (4)	5000 V/m -10000 V/m	**Moderate** Above EU EMF limits Above HSA Low Action limit	**Significant** Above EU AIMD[3] Device Immunity Test levels
Very High (5)	>10000 V/m	**Profound** Above EU EMF limits Above HSA High Action limit	**Profound** Significantly above electrical device test levels

Table 9: Determining Magnitude and Significance of Effects in relation to Magnetic Fields

Magnitude		**Significance of Effects**	
Magnitude Rating	**Field Strength**	**Local Residents, Community & Amenities**	**Electronic Equipment**
Very Low (1)	< 0.1 to 1.26 µT (micro Tesla)	**Imperceptible** Similar levels to existing ambient levels	**Imperceptible** Similar to existing ambient levels Below EU Residential and Light Industrial Electronic device Immunity limit (1.26 µT)
Low (2)	1.26-38 µT	**Imperceptible** Higher than existing ambient levels Under EU EMF limits Under HSA public limit	**Imperceptible to Slight** Above EU Residential and Light Industrial Electronic device Immunity limit (1.26 µT)
Medium (3)	38-100 µT	**Slight** Under EU EMF limits Under HSA public limit	**Slight** Above EU Industrial Electronic device Immunity limit (38 µT)
High (4)	100-1000 µT	**Moderate** EU EMF limits exceeded HSA Low Action Level reached	**Moderate to Significant** Above EU AIMD Device test levels
Very High (5)	>1000 µT	**Significant** EU EMF and HSA levels breached	**Profound** Significantly above All Electrical Device test levels

[3] AIMD is the abbreviation for 'Artificial Implantable Medical Devices' such as pacemakers and defibrillators