

Proposed Gathabawn Windfarm

Environmental Impact Assessment Report

Chapter 18: Human Health



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CHAPTER 18 HUMAN HEALTH

EIAR 18.1 INTRODUCTION

EIAR 18.1.1 The Authors of this Chapter (Competent Experts)

The Human Health evaluations herein have been carried out by Tara Barratt who has an MSc (DIC) in Environmental Technology (specialising in environmental epidemiology) and a BSc (Hons) in Geography from the University of Birmingham. Tara has ten years' experience undertaking health impact assessments, including assessing population and human health within EIA, is an Associate of the Institute of Environmental Management and Assessment (IEMA), and contributing author to IEMAs guidance on "Determining Significance for Human Health in EIA" and "Effective Scoping of Human Health in EIA".

The Human Health evaluations have been checked by Dr Andrew Buroni who has in excess of 26 years of health assessment. Andrew is acknowledged in much of the UK HIA Guidance, is a technical advisor to the WHO, sits on the IEMA health in EIA working group and their newly formed HIA competency panel. He lectures on the subject at the Sussex University Joint Medical School, provides local authority health assessment training for the Office for Health Improvement and Disparities (OHID) and Public Health Network Cymru, and presented UK best practice at the American Planning Association Conference 2024.

EIAR 18.1.2 Sources of Information

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

Table 18-1: Sources of Baseline Information for Human Health

Consultation Sources
No Human Health specific feedback was received from statutory or other public bodies during 2026 consultations. See Chapter 3: Consultation for further details.
Desktop Sources
• Eurostat • CSO Statbank DHA12 • CSO Statbank IH296 & IH298 • CSO Statbank IH307 & IH309 Review of the other EIA Report Topic Chapters as follows: • Chapter 1: Introduction and Policy Context • Chapter 8: Water – (Water Supply) • Chapter 9: Air Quality • Chapter 10: Noise and Vibration • Chapter 11: Shadow Flicker • Chapter 12: Climate • Chapter 14: The Landscape • Chapter 16: Material Assets • Chapter 17: Population
Fieldwork
• No fieldwork was required to determine the human health baseline environment

EIAR 18.1.3 Methodology Used

The evaluations for Human Health herein have been carried out in accordance with the *Manual on Health Impact Assessment Guidance* and the *IEMA Guide to Determining Significance for Human Health in EIA*. This methodology has been used to determine the sensitivity of receptors, and the magnitude and significance of potential impacts. The methodology can be found in full in **Appendix 18.1: Methodology for the evaluation of Human Health**. The author's extensive experience with EIA preparation and human health management also informs this report.

A list of guidelines and legislation which were taken into account during the evaluation of this chapter is also included in **Appendix 18.1**.

EIAR 18.1.4 Statement on Certainty and Sufficiency of Information Provided

In respect of Human Health, no material limitations or difficulties were encountered during the course of the studies carried out to inform the assessment of impacts of the Proposed Gathabawn Windfarm alone or cumulatively on Human Health.

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 the other assessments in this EIAR, and is also collated from site-specific investigations, data and documents generated by public bodies and statutory agencies and from the other competent experts' assessments in this EIAR.

EIAR 18.1.5 Development being Considered

The subject development – the **Proposed Gathabawn Windfarm**, comprises 12 wind turbines and all associated foundations and hard-standing areas in respect of each turbine, 2 control buildings, 7.7km of access roads, 1 met mast and 1 LiDAR unit for measuring meteorological conditions, underground cabling between the turbines and control buildings, 7 site entrances, newly created Biodiversity Areas and all ancillary associated and facilitating works and activities. 7 turbines and 1 control building are proposed in the Ballylehaun Area, and 5 turbines and 1 control building are proposed in the Ballyring Area.

The overall whole Gathabawn Windfarm Project also includes a connection to the national electricity grid, which is not part of the currently proposed development. While the ultimate grid connection point is subject to a separate process with Eirgrid, a candidate route has been identified to the closest node at Eirgrid Ballyragget Substation. This **Candidate Gathabawn Grid Connection** comprises a new substation in Parksgrove (Parksgrove Substation) and three distinct underground cable (UGC) sections: Ballylehaun-Ballyring UGC, Ballyring-Parksgrove UGC, and Parksgrove-Moatpark UGC.

To facilitate the evaluation of the whole project, this candidate grid connection is included in the baseline descriptions and considered within the impact evaluations detailed below.

EIAR 18.2 SENSITIVE ASPECTS

EIAR 18.2.1 Overview of Human Health in the Local Environment

The study on human health in the local environment relates to the people living in the area and their health and wellbeing. People visiting the area are also considered.

The Proposed Gathabawn Windfarm site is located on the hills and uplands of the Cullahill Mountain range. The proposed development is located entirely in County Kilkenny. It is located between the villages of Lisdowney and Gathabawn in County Kilkenny, and Cullahill in neighbouring County Laois. The area is lightly populated with farmsteads and one-off housing located in the open countryside.

All of the Proposed Gathabawn Windfarm footprint is located in agricultural land, with 11 of the 12 turbines located in grassland fields, and the twelfth turbine in tillage lands. There are a number of waymarked walking trails in the local area. The Candidate Gathabawn Grid Connection is similarly located in agricultural lands.

EIAR 18.2.2 Zone of Influence/Study Areas

The area or zone of influence around the Proposed Gathabawn Windfarm within which the sensitive aspects of the environment could be affected by the Project is called the Study Area herein. The Study Areas for the Sensitive Aspects of the Human Health environment are set out in the table below and illustrated on **Figures 18.2 to 18.4**.

Table 18-2: Study Area of the Project in relation to Human Health

Sensitive Aspect	Zone of Influence/Study Area	Justification for the Study Area extent
Local Communities	<u>EMF</u> : Dwellings and community facilities within 100m of turbines, windfarm substation and underground cabling.	Based on professional judgement, EMF emissions can extend to this distance. However, EMF emissions are strongest close to the point at which they are generated and decrease rapidly in strength with distance from the source. At distances greater than 100m, the contribution of the project to ambient EMF levels will be extremely low or none, with effects being considered neutral or none
	<u>Construction Dust</u> : Dwellings, community facilities and local walking routes within: ○ 250m from construction works areas; ○ 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.	– based on Chapter 9 study areas
	<u>Noise emissions</u> : Noise Sensitive Locations (houses) within 2km of a proposed turbine.	– based on Chapter 10 study areas Note: The operational phase Noise and Vibration impact of the Proposed Gathabawn Windfarm is assessed in Chapter 10: Noise and Vibration as Not Significant because the operation of modern

		turbines can be controlled, so as not to exceed any noise limits imposed by condition of planning grant. However, there will be an increase in ambient noise locally and therefore the secondary effects on local population health is examined further in this chapter.
	<u>Shadow Flicker</u> ; Residences and community facilities within 1.36km of a proposed turbine.	– based on Chapter 11 study areas The operational phase Shadow Flicker impacts are assessed in Chapter 11: Shadow Flicker as Not Significant because the operation of modern turbines will be controlled so as not to exceed any shadow flicker limits imposed by condition of planning grant. While this is the case, due to anticipated stakeholder concerns, the secondary effects of shadow flicker on local population health is examined further in this chapter.
	<u>Safety</u> L58141, L1803, L5818, L1804, L1806, L18062, L1807 local roads along the construction haul routes and turbine delivery routes from the national road network.	<i>These are the roads along the construction haul route, and the roads in proximity to the turbine locations</i>
	Local groundwater supplies within 300m of construction works, and surface water supplies within downstream hydrologically connected watercourses	– based on Chapter 8 study areas
	Climate change - Irish State	– based on Chapter 12 study areas

EIAR 18.3 BASELINE ENVIRONMENT

The context and characteristics of the baseline environment, and the trends and evolution thereof, in relation to *Local Community Health* and *Visitors to the Area* are described in the subsections below.

The result of fieldwork and desktop surveys are summarised in the sections below, illustrated on the mapping listed below, with the detailed data included in the Appendices listed:

EIAR Figures (included at the end of this Chapter):

Figure 18.1: Locational Context of the Whole Gathabawn Windfarm Project

Figure 18.2: Local Residences and Community Facilities within the Air Quality, Noise and Vibration, Shadow Flicker and EMF Study Areas

Figure 18.3: Local Water Supplies

Figure 18.4: Viewpoints and Local Amenities

EIAR Appendices (included at the end of this Chapter):

Appendix 18.2: Human Health Baseline

Appendix 18.3: Explanation and Modelling of Electromagnetic Fields

EIAR 18.3.1 Context and Characteristics – Health & Wellbeing of Local Community members

EIAR 18.3.1.1 Locational Context

The **Proposed Gathabawn Windfarm** is proposed for an agricultural area on the hills in the Cullahill Mountain area of North County Kilkenny. The nearest village is Gathabawn village which is 1km southeast from the nearest Ballylehaun turbine and 3km west from the nearest Ballyring turbine. Lisdowney village is also located 3km to the northeast of the nearest Ballyring turbine, and at least 6km from the Ballylehaun turbines. The town of Ballyragget is located 6km northeast of Ballyring and 10km east of Ballylehaun, while the town of Johnstown is located 6km from Ballylehaun and 9km from Ballyring. Freshford town is located 4km to the southeast of the Ballyring turbines, and 7km from the Ballylehaun turbines.

National Schools in the area include: Scoil na Críon Coille National School in Gathabawn village and Scoil Bhríde National School in Lisdowney village.

The **Candidate Gathabawn Grid Connection** between the Ballyring area and the Eirgrid Ballyragget Substation at Moatpark follows a cross country route, avoiding the village of Lisdowney and avoiding public roads (except for road crossings). There are a small number of houses and no community facilities in proximity to the Candidate Grid Connection route.

The road network around the Whole Gathabawn Windfarm Project comprises mainly local roads, with the regional road R639 to the west of the Ballylehaun turbines, and the M8 Motorway further to the west. The N77 national secondary road which links Kilkenny City to Portlaoise is to the east and north of the Project. The Candidate Gathabawn Grid Connection crosses under the N77 (drill under road) at Parksgrove.

There is an existing 4-turbine wind farm – Lisdowney Wind Farm, on lands to the north of the Ballyring turbines, and to the west of the Ballylehaun turbines. This wind farm has been in operation since 2016.

See **Figure 18.1: Locational Context of the Whole Gathabawn Windfarm Project**.

EIAR 18.3.1.2 Local Health Circumstance

The age structure presented in Appendix 17.2 to Chapter 17: Population shows that the local population is generally of a similar demographic to the national average although there is a higher proportion of people aged ≤15 and 45+ than the national average.

In addition, the human health baseline presented in [Appendix 18.2](#) shows that the local population have comparable physical health to the national average. Regarding mental health, levels of depression in the South East are comparable to the national average and in recent years, suicide rate is lower than the national average. Lifestyle and behaviour data shows lower levels of alcohol consumption and less obesity.

Overall, this suggests that the community surrounding the Gathabawn Windfarm Project is not more sensitive to environmental and socio-economic changes than the average population in Ireland. With reference to [Appendix 18.1](#), for the purposes of the human health assessment, the sensitivity of the population is considered to be “Low”.

EIAR 18.3.1.3 Human Health - Air Quality, Noise, Vibration, Shadow Flicker and EMF

The baseline environment in relation to Air Quality, Noise and Vibration is described below, based on the findings of the relevant EIAR topic chapter.

Air Quality: Chapter 9 Air Quality examines the potential for dust and vehicular emissions. It was considered that the air quality in this predominantly rural open countryside area is considered good as it is located away from busy, congested roads and industrial sources of air pollutants.

Noise & Vibration: Existing sources of noise and vibration in the local environment include farm machinery when in operation, traffic on the local road network and the operational Lisdowney Wind Farm and Wind Farm Substation.

Shadow Flicker: The existing Lisdowney Wind Farm contributes to shadow flicker at some residences in the immediate surrounding area.

Electromagnetic Fields (EMF): There are existing sources of EMF in the local environment – from overhead electricity and telephone wires, and from electrical equipment in all local houses, community facilities and businesses. Underground cabling associated with solar farm or wind farm grid connections are also a source of EMF.

Further explanation of EMF is provided in [Appendix 18.3: Explanation and Modelling of Electromagnetic Fields](#).

EIAR 18.3.1.3.1 Local Community within Air Quality, Noise, Vibration, Shadow Flicker, EMF Study Areas

Local residences and community facilities are listed in the table below and it is indicated whether or not they are located within the various study areas for EMF, Air Quality, Noise or Shadow Flicker.

These houses/facilities and the study areas are also illustrated on [Figure 18.2: Local Residences and Community Facilities within the Air Quality, Noise and Vibration, Shadow Flicker and EMF Study Areas](#).

Table 18-3: Local Residences within Gathabawn Windfarm study areas

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H01	R32 VH9Y	807	-	-	-	✓	✓
H02	R32 DE92	783	-	-	-	✓	✓
H03	R32 XW81	959	-	-	-	✓	✓
H04	R32 EY81	824	-	-	-	✓	✓
H05	R32 X0W0	886	-	-	-	✓	✓
H06	R32 P5D2	948	-	✓	✓	✓	✓
H07	R32 P5D3	950	-	✓	✓	✓	✓
H08	E41 F851	511	-	✓	✓	✓	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H09	E41 F851	515	-	✓	✓	✓	✓
H10	E41 HN26	721	-	✓	✓	✓	✓
H11	-	644	-	-	-	✓	✓
H12	E41 YX22	694	-	-	-	✓	✓
H13	E41 E226	804	-	-	-	✓	✓
H14	E41 C8W5	711	-	-	-	✓	✓
H15	E41 DD70	604	-	-	-	✓	✓
H16	E41 P7N0	674	-	-	-	✓	✓
H17	E41 T180	802	-	-	-	✓	✓
H18	E41 XF96	780	-	-	-	✓	✓
H19	E41 RP86	756	-	-	-	✓	✓
H20	E41 P304	817	-	-	-	✓	✓
H21	E41 P9R2	716	-	-	-	✓	✓
H22	E41 YH63	685	-	-	-	✓	✓
H23	E41 R6K5 / E41 W2F7	611	-	-	-	✓	✓
H24	E41 VP94	899	-	-	-	✓	✓
H25	E41 NH97	630	-	-	✓	✓	✓
H26	E41 YE94	608	-	✓	✓	✓	✓
H27	E41 XC03	697	-	✓	✓	✓	✓
H28	E41 WD59	697	-	✓	✓	✓	✓
H29	E41 Y578	702	-	✓	✓	✓	✓
H30	E41 PW90	904	-	-	✓	✓	✓
H31*	E41 H970	959	-	-	-	✓	✓
H32*	E41 C6N4	976	-	-	-	✓	✓
H33*	-	615	-	-	✓	✓	✓
H34*	E41 X030	920	-	-	-	✓	✓
H35*	E41 F6X6	955	-	-	-	✓	✓
H36*	E41 R923	604	-	-	-	✓	✓
H37*	E41 T3H5	650	-	-	-	✓	✓
H38*	E41 XY19	509	-	-	-	✓	✓
H39	E41 FY96	523	-	-	-	✓	✓
H40	E41 E1W5	554	-	-	-	✓	✓
H41	E41 C635	559	-	-	-	✓	✓
H42	E41 V009	617	-	-	-	✓	✓
H43*	E41 N9K6	709	-	-	-	✓	✓
H44*	E41 W623	732	-	-	-	✓	✓
H45*	E41 E7C6	844	-	-	-	✓	✓
H46*	E41 YC63	870	-	-	-	✓	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H47*	E41 A7P0	854	-	-	-	✓	✓
H48*	E41 YN30	694	-	-	-	✓	✓
H49	E41 YH70	776	-	✓	✓	✓	✓
H50	E41 KD26	720	-	✓	✓	✓	✓
H51	R95 V2K1	898	-	-	-	✓	✓
H52	R95 XV34	919	-	-	-	✓	✓
H53	R95 KFN4	778	-	-	-	✓	✓
H54	R95 V240	715	-	-	-	✓	✓
H55	R95 K8WE	681	-	-	-	✓	✓
H56	R95 YYW0	617	-	-	-	✓	✓
H57	R95 DYP5	542	-	-	-	✓	✓
H58	R95 V3WF	780	-	-	-	✓	✓
H59	R95 Y899	831	-	-	-	✓	✓
H60	R95 AH22	691	-	-	-	✓	✓
H61	R95 PRP4	822	-	-	-	✓	✓
H62	R95 E6D5	815	-	-	-	✓	✓
H63	R95 V8VC	997	-	-	-	✓	✓
H64	E41 PR83	775	-	-	✓	✓	✓
H65	E41 EY95	703	-	✓	✓	✓	✓
H66	R32 YK28	1185	-	-	-	✓	✓
H67	R32 R9C5	1085	-	-	-	✓	✓
H68	R32 FF64	1019	-	-	-	✓	✓
H69	-	1297	-	-	-	✓	✓
H70	R32 W9K1	1153	-	-	✓	✓	✓
H71	R32 Y6W6	1159	-	-	✓	✓	✓
H72	R32 YD52	1328	-	-	-	✓	✓
H73	R32 F9D7	1394	-	-	-	-	✓
H74	R32 YX81	1458	-	-	-	-	✓
H75	E41 NN96	1030	-	-	-	✓	✓
H76	E41 DE48	1290	-	-	-	✓	✓
H77	E41 XC57	1020	-	-	-	✓	✓
H78	E41 A322	1028	-	-	-	✓	✓
H79	E41 HX62	1445	-	-	-	-	✓
H80	E41 W738	1311	-	-	-	✓	✓
H81	E41 F642	1430	-	-	-	-	✓
H82	E41 AK53	1392	-	-	-	-	✓
H83	E41 K065	1367	-	-	-	-	✓
H84	E41 DY90	1340	-	-	-	✓	✓
H85	E41 E6P0	1305	-	-	-	✓	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H86	E41 NP92	1084	-	-	-	✓	✓
H87	E41 CK00	1092	-	-	-	✓	✓
H88	E41 H261	1096	-	-	-	✓	✓
H89	E41 T186	1179	-	-	-	✓	✓
H90	E41 HY65	1177	-	-	-	✓	✓
H91	E41 KT18	1299	-	-	-	✓	✓
H92	E41 VW11	1274	-	-	-	✓	✓
H93	E41 H012	1333	-	-	-	✓	✓
H94	E41 P527	1033	-	-	-	✓	✓
H95	E41 N924	1080	-	-	-	✓	✓
H96	E41 EW29	1363	-	-	-	-	✓
H97	E41 C583	1474	-	-	-	-	✓
H98	E41 F1W8	1303	-	-	-	✓	✓
H99	E41 VH58	1347	-	-	-	✓	✓
H100	E41 TP65	1492	-	-	-	-	✓
H101	E41 ND23	1163	-	-	-	✓	✓
H102	E41 P864	1259	-	-	-	✓	✓
H103	E41 PR62	1162	-	-	-	✓	✓
H104	E41 XN47	1108	-	-	-	✓	✓
H105	E41 HP82	1100	-	-	-	✓	✓
H106	E41 H958	1085	-	-	-	✓	✓
H107	E41 NT68	1011	-	-	-	✓	✓
H108	E41 V020	1051	-	-	-	✓	✓
H109	E41 YX38	1051	-	-	-	✓	✓
H110	E41 Y680	1031	-	-	-	✓	✓
H111*	E41 W621	1024	-	-	-	✓	✓
H112	R32 V6K6	1047	-	-	-	✓	✓
H113*	E41 C6H3	1021	-	-	-	✓	✓
H114	E41 FT52	1419	-	-	-	-	✓
H115	E41 H599	1221	-	-	✓	✓	✓
H116	E41 FW95	1226	-	-	-	✓	✓
H117	E41 A580	1178	-	-	-	✓	✓
H118	E41 XA07	1258	-	-	-	✓	✓
H119	E41 HE94	1208	-	-	-	✓	✓
H120	E41 CK07	1269	-	-	-	✓	✓
H121	E41 K590	1284	-	-	-	✓	✓
H122	E41 W778	1300	-	-	-	✓	✓
H123	E41 DP68	1319	-	✓	✓	✓	✓
H124	E41 NW60	1291	-	✓	✓	✓	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H125	E41 PW71	1265	-	-	✓	✓	✓
H126	E41 XE17	1176	-	-	-	✓	✓
H127	E41 CF97	1205	-	-	-	✓	✓
H128	R95 WV90	1038	-	-	-	✓	✓
H129	R95 K2PA	1082	-	-	-	✓	✓
H130	R95 EY97	1138	-	-	-	✓	✓
H131	R95 P953	1173	-	-	-	✓	✓
H132	R95 E3Y1	1403	-	-	-	-	✓
H133	R95 NDY2	1423	-	-	-	-	✓
H134	R95 E36V	1386	-	-	-	-	✓
H135	R95 YK59	1456	-	-	-	-	✓
H136	R95 EY71	1486	-	-	-	-	✓
H137	R95 K6X2	1482	-	-	-	-	✓
H138	R95 W2Y2	1474	-	-	-	-	✓
H139	R95 CYV6	1479	-	-	-	-	✓
H140	R95 A008	1481	-	-	-	-	✓
H141	R95 T3Y9	1496	-	-	-	-	✓
H142	R95 Y8X0	1431	-	-	-	-	✓
H143	R95 HP49	1414	-	-	-	-	✓
H144	R95 P224	1247	-	-	-	✓	✓
H145	R95 EW86	1436	-	-	-	-	✓
H146	R95 C2F3	1202	-	-	-	✓	✓
H147	R95 HXR9	1105	-	-	-	✓	✓
H148	R95 YD77	1105	-	-	-	✓	✓
H149	R95 YY83	1043	-	-	-	✓	✓
H150	R95 C1P3	1117	-	-	-	✓	✓
H151	R95 C9R2	1141	-	-	-	✓	✓
H152	R95 FX31	1313	-	-	-	✓	✓
H153	R95 W215	1317	-	-	-	✓	✓
H154	R95 H7FE	1484	-	-	-	-	✓
H155	R95 EY27	1370	-	-	-	-	✓
H156	R95 HE92	1321	-	-	-	✓	✓
H157	R95 ANP2	1366	-	-	-	-	✓
H158	R95 X038	1443	-	-	-	-	✓
H159	R95 YY04	1339	-	-	-	✓	✓
H160	R95 VH34	1287	-	-	-	✓	✓
H161	R95 X4HY	1082	-	-	-	✓	✓
H162	R32 X4A8	1950	-	-	-	-	✓
H163	R32 DH00	1576	-	-	-	-	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H164	R32 P620	1792	-	-	-	-	✓
H165	R32 NX29	1914	-	-	-	-	✓
H166	R32 T9RR	1935	-	-	-	-	✓
H167	R32 R1H5	1694	-	-	-	-	✓
H168	R32 RC67	1653	-	-	-	-	✓
H169	R32 Y5W7	1584	-	-	-	-	✓
H170	R32 K2C2	1559	-	-	-	-	✓
H171	R32 A9P7	1513	-	-	-	-	✓
H172	R32 VE02	1881	-	-	-	-	✓
H173	R32 YP95	1879	-	-	-	-	✓
H174	R32 N765	1960	-	-	-	-	✓
H175	R32 KVY9	1897	-	-	-	-	✓
H176	R32 E4P9	1775	-	-	-	-	✓
H177	R32 N6P1	1802	-	-	-	-	✓
H178	R32 F8D9	1750	-	-	-	-	✓
H179	R32 T8KP	1767	-	-	-	-	✓
H180	R32 Y5TE	1547	-	-	-	-	✓
H181	R32 XA61	1624	-	-	-	-	✓
H182	E41 TC63	1691	-	-	-	-	✓
H183	E41 P276	1645	-	-	-	-	✓
H184	E41 XR84	1791	-	-	-	-	✓
H185	E41 CY61	1998	-	-	-	-	✓
H186	E41 RX38	1999	-	-	-	-	✓
H187	E41 K188	1912	-	-	-	-	✓
H188	E41 H009	1793	-	-	-	-	✓
H189	E41 K1W6	1725	-	-	-	-	✓
H190	E41 XF53	1605	-	-	-	-	✓
H191	E41 KN36	1642	-	-	-	-	✓
H192	E41 TK82	1720	-	-	-	-	✓
H193	E41 NP66	1673	-	-	-	-	✓
H194	E41 C1W7	1652	-	-	-	-	✓
H195	E41 A033	1727	-	-	-	-	✓
H196	E41 H6V2	1765	-	-	-	-	✓
H197	E41 A309	1871	-	-	-	-	✓
H198	E41 HE03	1878	-	-	-	-	✓
H199	E41 X094	1998	-	-	-	-	✓
H200	E41 T802	1958	-	-	-	-	✓
H201	E41 X925	1978	-	-	✓	-	✓
H202	E41 XE62	1987	-	✓	✓	-	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H203	E41 T665	1984	-	✓	✓	-	✓
H204	E41 C827	1711	-	-	-	-	✓
H205	E41 V8N7	1606	-	-	-	-	✓
H206	E41 XT61	1880	-	✓	✓	-	✓
H207	E41 W718	1823	-	✓	✓	-	✓
H208	E41 A440	1682	-	✓	✓	-	✓
H209	E41 V577	1652	-	✓	✓	-	✓
H210	E41 D789	1896	-	✓	✓	-	✓
H211	E41 VW74	1859	-	✓	✓	-	✓
H212	E41 T258	1980	-	-	-	-	✓
H213	E41 P208	1835	-	-	-	-	✓
H214	E41 N2D0	2006	-	-	-	-	✓
H215	E41 V3W8	1900	-	-	-	-	✓
H216	E41 Y032	1643	-	-	-	-	✓
H217	E41 PC65	1844	-	-	-	-	✓
H218	E41 E430	1772	-	-	-	-	✓
H219	E41 D516	1781	-	-	-	-	✓
H220	E41 E9X3	1721	-	-	-	-	✓
H221	E41 HT02	1810	-	-	-	-	✓
H222	R95 W2V6	1712	-	-	-	-	✓
H223	R95 P270	1707	-	-	-	-	✓
H224	R95 RK64	1611	-	-	-	-	✓
H225	R95 YH33	1857	-	-	-	-	✓
H226	R95 FP95	1865	-	-	-	-	✓
H227	R95 PK29	1859	-	-	-	-	✓
H228	R95 WK03	1798	-	-	-	-	✓
H229	R95 A433	1677	-	-	-	-	✓
H230	R95 DX21	1690	-	-	-	-	✓
H231	R95 EK25	1793	-	-	-	-	✓
H232	R95 R240	1853	-	-	-	-	✓
H233	R95 X406	1693	-	-	-	-	✓
H234	R95 KT52	1574	-	-	-	-	✓
H235	R95 KPR8	1571	-	-	-	-	✓
H236	R95 V8N7	1539	-	-	-	-	✓
H237	R95 W8D4	1821	-	-	-	-	✓
H238	R95 NP78	1751	-	-	-	-	✓
H239	R95 TX40	1733	-	-	-	-	✓
H240	R95 W9W8	1768	-	-	-	-	✓
H241	R95 W603	1605	-	-	-	-	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
H242	R95 R8FT	1581	-	-	-	-	✓
H243	R95 T8F5	1658	-	-	-	-	✓
H244	R95 WF54	1619	-	-	-	-	✓
H245	R95 KC58	1597	-	-	-	-	✓
H246	R95 KH59	1742	-	-	-	-	✓
H247	R95 HF53	1736	-	-	-	-	✓
H248	R95 XW53	1690	-	-	-	-	✓
H249	R95 F3CH	1900	-	-	-	-	✓
H250	R95 CK61	1889	-	-	-	-	✓
H251	R95 RW82	1927	-	-	-	-	✓
H252	R95 XE93	1572	-	-	-	-	✓
H253	R95 C860	1652	-	-	-	-	✓
H254*	E41 RV00	1859	-	-	-	-	✓
H255	E41 V205	1832	-	-	-	-	✓
H256	E41 EH26	1739	-	-	-	-	✓
H257	E41 XV30	1714	-	-	-	-	✓
H258	E41 CD86	1667	-	-	-	-	✓
H259	E41 DT22	1566	-	-	-	-	✓
H260	E41 EF98	1509	-	-	-	-	✓
H261	R32 V226	1826	-	-	-	-	✓
H262	R32 E6P3	1714	-	-	-	-	✓
H263	R32 R7F6	1660	-	-	-	-	✓
H264	E41 A6Y8	1193	-	-	-	✓	✓
H265	E41 T2N3	1233	-	-	-	✓	✓
H266	R95 W63R	1390	-	-	-	-	✓
H267	R95 P9KW	1232	-	-	-	✓	✓
H268	R95 PD90	1308	-	-	-	✓	✓
H269	R95 WN80	1183	-	-	-	✓	✓
H270	R95 EK58	1156	-	-	-	✓	✓
H271	R95 NX9R	1484	-	-	-	-	✓
H272	R32 DK09	1999	-	-	-	-	✓
H273	R32 DXA9	1998	-	-	-	-	✓
H274	E41 C7N0	2021	-	-	-	-	✓

* House is also within at least one of the Candidate Gathabawn Grid Connection study areas

Table 18-4: Community Facilities within Gathabawn Windfarm study areas

Community Facility	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m	Shadow Flicker 1.36km	Operational Noise 2km
Scoil na Críon Coille Gathabawn	E41 PW90 (H30)	904	-	-	✓	✓	✓
St. Munchin's Church Gathabawn	E41 AV63	1031	-	-	-	✓	✓
Millenium Garden Gathabawn	-	1089	-	-	-	✓	✓
Mackey's Bar Gathabawn	E41 H958 (H106)	1085	-	-	-	✓	✓
Scoil Bhríde National School Lisdowney	R95 XD45	2976	-	-	-	-	-
Lisdowney Montessori Play & Learn	R95 WNF4	2821	-	-	-	-	-
St. Brigid's Church Lisdowney	R95 VX79	2797	-	-	-	-	-
Lisdowney Community Centre / GAA Club	R95 NN93	2925	-	-	-	-	-
Scoil Tighearnach Naofa Cullahill	R32 WV79	3116	-	-	-	-	-
St. Tighernach Church Cullohill	R32 EV76	3171	-	-	-	-	-
The Harps GAA Club Cullahill	R32 PW74	3198	-	-	-	-	-
Cullohill Community Centre	R32 YK29	2807	-	-	-	-	-
O'Connell's Bar & Kitchen Cullahill	R32 D526	2947	-	-	-	-	-
Castleview Open Farm Cullahill	R32 E932	2901	-	-	-	-	-

Table 18-5: Local Community within Candidate Gathabawn Grid Connection Study Areas

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m
H31	E41 H970	231	-	✓	✓
H32	E41 C6N4	136	-	✓	✓
H33	-	144	-	✓	✓
H34	E41 X030	19	✓	✓	✓
H35	E41 F6X6	20	✓	✓	✓
H36	E41 R923	32	✓	✓	✓
H37	E41 T3H5	96	✓	✓	✓
H38	E41 XY19	37	✓	✓	✓
H43	E41 N9K6	33	✓	✓	✓
H44	E41 W623	27	✓	✓	✓
H45	E41 E7C6	48	✓	✓	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m
H46	E41 YC63	42	✓	✓	✓
H47	E41 A7P0	24	✓	✓	✓
H48	E41 YN30	204	-	✓	✓
H58	R95 V3WF	205	-	✓	✓
H59	R95 Y899	136	-	✓	✓
H60	R95 AH22	85	✓	-	-
H61	R95 PRP4	141	-	✓	✓
H111	E41 W621	244	-	✓	✓
H113	E41 C6H3	103	✓	✓	✓
H254	E41 RV00	38	✓	✓	✓
H275	R95 TN96	165	-	✓	✓
H276	R95 N8Y4	75	✓	✓	✓
H277	R95 X6X0	148	-	✓	✓
H278	R95 E5R7	49	✓	✓	✓
H279	R95 R1X6	83	✓	✓	✓
H280	R95 VW80	115	-	✓	✓
H281	R95 E8N9	181	-	✓	✓
H282	R95 AX64	217	-	✓	✓
H283	R95 V226	289	-	-	✓
H284	R95 K184	250	-	✓	✓
H285	R95 H018	247	-	✓	✓
H286	R95 NDH5	193	-	✓	✓
H287	R95 FC84	299	-	-	✓
H288	R95 VW30	116 (CGGC) / 693 (PS)	-	✓	✓
H289	-	43 (CGGC) / 560 (PS)	✓	✓	✓
H290	R95 A727	276 (CGGC) / 679 (PS)	-	-	✓
H291	R95 D9W7	253 (CGGC) / 440 (PS)	-	✓	✓
H292	R95 X0H4	117 (CGGC) / 436 (PS)	-	✓	✓
H293	R95 X440	87 (CGGC) / 421 (PS)	✓	✓	✓
H294	R95 K5X5	119 (CGGC) / 355 (PS)	-	✓	✓
H295	R95 FA3H	80 (CGGC) / 328 (PS)	✓	✓	✓
H296	R95 X884	289 (CGGC) / 559 (PS)	-	-	✓
H297	R95 F6HW	265 (CGGC) / 530 (PS)	-	-	✓
H298	R95 D6P5	129 (CGGC) / 394 (PS)	-	✓	✓

ID	EirCode	Separation Distance (m)	EMF 100m	Air Quality (Dust) 250m	Construction Noise 300m
H299	R95 N1F1	94 (CGGC) / 359 (PS)	✓	✓	✓
H300	R95 C7P2	51 (CGGC) / 313 (PS)	✓	✓	✓
H301	R95 RKW4	346 (CGGC) / 315 (PS)	-	-	✓
H302	R95 PE09	240	-	✓	✓
H303	R95 NH68	243	-	✓	✓
H304	R95 R2T7	107	-	✓	✓
H305	R95 D9V2	38	✓	✓	✓
H306	R95 C3H3	13	✓	✓	✓
H307	R95 A0CR	54	✓	✓	✓
H308	R95 W5C9	134	-	✓	✓
H309	R95 A338	159	-	✓	✓
H310	R95 P7TK	184	-	✓	✓

EIAR 18.3.1.4 Local Water Supplies

According to Chapter 16: Material Assets, there is Uisce Éireann infrastructure present in the Parksgrove/Moatpark area, where the Ballyring-Parksgrove UGC will cross under a lateral line and a main line in private lands, while the Parksgrove-Moatpark UGC will cross under a lateral line at one point in the R432 in Moatpark. Houses along these roads are expected to source their water from the public water main. These water mains are identified on [Figure 18.3: Local Water Supplies](#).

There are no registered private group water schemes in close proximity to the Project, and neither the Proposed Gathabawn Windfarm or Candidate Gathabawn Grid Connection are located within the source protection area of any Public Water Scheme or Group Water Scheme (see Section EIAR 8.3.2.1.6 in Chapter 8: Water).

The GSI has a database of recorded groundwater wells for County Kilkenny. However, the Well Database is not a comprehensive record of all private wells in the County as it is not updated and is a number of years out of date now. For example, the GSI Well Database does not include newer developments with groundwater wells and supplies.

Therefore, a conservative approach was adopted in Chapter 8: Water, for the baseline and it is assumed that all private dwellings in the vicinity of the proposed development site has a well water supply associated with it, regardless of the presence of public water pipes along the adjacent public roads, or not.

EIAR 18.3.1.5 Wellbeing - Community Resources

Local Views: Chapter 14: Landscape evaluates the impact of the development on landscape character within 20km of the windfarm site, with particular focus on effects on receptors within 5km of the site. The evaluation considers views from local and regional roads, centres of population, designated scenic views and views from amenity areas. The views from within 5km of the nearest turbine are generally the most sensitive because they are likely to be more dominated within a local landscape context. These views have been modelled from various Vantage Points (VPs) around the area, and are identified on [Figure 18.4: Viewpoints and Local Amenities](#). In summary, within 5km of the Proposed Windfarm there are:

- Views from Regional Roads R639 (VP6 & VP9)

- Views from Local Roads L5818 (VP12), L1806 (VP20)
- Views from Gathabawn (VP21), Lisdowney (VP11), Johnstown (VP25), Freshford (VP27), Cullahil (VP6).
- Views from Scenic Viewpoint on Spahill (VP22)
- Views from Scenic Viewpoints at Cullahill (VP6)
- Views from amenity areas/locations - Lisdowney GAA Club (VP11), Gathabawn Loop Walk (VP12 & VP16), Freshford GAA Club (V27).

Local Amenities: There are a number of amenities within the local area. Most of these amenities are located away from works locations. Local Amenities are identified on **Figure 18.4: Viewpoints and Local Amenities**. Amenities which interact with construction works or which are within 5km of the operational turbines include:

- Gathabawn Loop Walk
- Millenium Park Gathabawn
- Cullahill Walks - Cullahill and Healthy Way, Cullahill Binnianea Loop, Mac Giolla Phadraig Way
- Parts of North Kilkenny and Laois Cycle Routes on local roads in the area
- Mackeys Bar, Gathabawn and O'Connells Bar, Cullahill – gastro pubs
- Local Community Halls at, Lisdowney and Cullahill
- GAA Clubs at Lisdowney, Freshford, Johnstown, Durrow, Ballyragget

EIAR 18.3.1.6 Wellbeing - Fears and Aspirations for the Future

Given the quality of life enjoyed in the area, it is assumed that many people living locally would hope that their children would also settle in the local area and would have at least the quality of life enjoyed by the current generation. However, there is also the potential for the local population to worry about what the future brings for their children and grandchildren, particularly in relation to the effects of climate change. An EPA survey carried out in 2024, *Climate Change in the Irish Mind (Wave 2)* (O'Mahony *et al.* 2024) showed that:

- Consistent with the previous study, findings show widespread agreement on many climate change attitudes and strong majority support for climate action.
- Irish residents are most likely to think that future generations of people (95%), people in developing countries (93%), and plant and animal species (92%) will be harmed “a great deal” or “a moderate amount” by climate change.
- A large majority (70%) correctly identified switching to renewable energy sources as having a large effect on reducing an average person's carbon footprint.
- 81% of people in Ireland are worried about climate change and 75% think extreme weather poses a moderate or high risk to their community over the next 10 years, with increases in worry in relation to severe storms (74%) and extreme heat (54%).
- 89% report that climate change is important to them personally and 79% say climate change should be either a “very high” or “high” priority for Government, with high overall support for a range of climate action policies.
- Irish people think that climate action will increase economic growth and create jobs (56%), and actions to reduce climate change will improve quality of life in Ireland (74%).

EIAR 18.3.2 Existing Sources of Impacts

The occurrence of existing environmental impacts in the areas on or around the location of the proposal have also been considered. There are no sources of pollution in or around the windfarm site. It is noted that existing Lisdowney Windfarm turbines would contribute to ambient noise levels in the immediate vicinity of Ballyring, and under certain weather conditions and under certain circumstances, could cause shadow flicker to occur inside dwellings the vicinity. The Lisdowney Windfarm, which is operational for the last 10 years, has likely influenced local views and the sense of place within the community.

EIAR 18.3.3 Importance, Sensitivity and Vulnerability to Change**EIAR 18.3.3.1 Importance**

In the absence of good physical, mental and social health and wellbeing, individuals and communities become limited in achieving their full potential. Therefore, the health and wellbeing of local communities is of High importance.

EIAR 18.3.3.2 Sensitivity

Local Communities: Individuals are considered more sensitive if there is an existing burden of poor health within an area, or if there is a dominantly older or younger demographic. The age structure presented in **Appendix 18.2: Human Health Baseline** shows that the local population is generally of a similar demographic to the national average although there is a higher proportion of people aged ≤15 and 45+ than the national average. It also shows that the health status in Kilkenny is comparable to the national average for the majority of health status indicators. The sensitivity of the population is therefore considered to be “**Low**”.

Visitors to the Area: It is difficult to obtain demographic and health status data for visitors as their origin is unknown. However, visitors to the area will only be exposed to changes in the environment associated with the development temporarily and as a result, are not considered particularly sensitive. Overall, the sensitivity of Transient People is considered to be **Low**.

EIAR 18.3.4 Evolution of the Baseline Environment (the ‘Do-Nothing’ scenario)

There is an existing windfarm to the north and west of the proposal (Lisdowney Wind Farm) and this windfarm can be expected to continue operating in the medium to long term.

Consistent with historic national trends, public health within the study area population are likely to improve over time. While this is the case, any improvement is challenging to predict with high confidence and unlikely to be substantial. On this basis, it is considered appropriate that the present-day statistics are precautionary.

EIAR 18.3.5 Climate Change Effects to Human Health

It is expected that Climate Change will continue to cause a worry to the majority of the population and increased demands to Government for Climate Action will be a continuing trend.

According to the ESRI report *Health Impacts of Climate Change and Mitigation Policies In Ireland* (2024):

‘Ireland will be exposed to higher mean temperatures in the future. The mean annual temperature is projected to increase by 1–1.6°C by the middle of the century (i.e., 2041–2060) compared to the reference period 1981–2000, under the RCP4.5 climate scenario (the most likely scenario). With this warming will come hotter days and nights.’

The analysis finds that higher temperatures increase the number of emergency in-patient hospital admissions.

The analysis also compared the effects of rising temperature across diseases and age groups. At warmer temperatures, certain health conditions tend to be exacerbated such as circulatory, respiratory and infectious diseases as well as injuries.

Overall, these analyses highlight that even in Ireland, a country with a moderate climate, a positive relationship between higher temperature and emergency in-patient hospital utilisation is observed.

The review of the literature identifies a range of benefits and co-benefits of climate change mitigation measures, such as improved air quality (which reduces cardiovascular and respiratory disease in particular), and reductions in disease and mortality from more sustainable diets and more active travel.

The findings of increased hospitalisations from higher temperatures underscore the broad impacts of climate change on the health sector. While such impacts are higher in countries with less moderate climates, as outlined by the European Environment Agency (EEA), adapting healthcare facilities to temperature change is important even in more moderate climates. The amplified risk of extreme weather events (e.g., flooding and heatwaves) also poses significant challenges to healthcare infrastructure.

The Proposed Gathabawn Windfarm aligns with targets set in the Climate Action Plan 2025 to accelerate the actions required to respond the climate crises. The scheme is predicted to produce approximately 150,000,000 kWh which is enough to supply 33,237 houses annually with the average domestic electricity needs¹. This amount of electricity has the potential to offset 38,250 tonnes of CO₂e per annum – equivalent to 3,102ha of forestry, or 22,238 diesel/petrol cars switching to electric vehicles (see Section EIAR 1.6 of Chapter 1).

If the Proposed Gathabawn Windfarm does not proceed, the climate mitigation of 150 million kWhs of renewable energy – electricity will not occur.

¹ Based on SEAI data of 4,513 kWh annually per household in 2022. <https://www.seai.ie/data-and-insights/seai-statistics/key-statistics/residential/>

EIAR 18.4 IMPACT OF THE PROPOSED DEVELOPMENT

This Section comprises an evaluation of the impacts of the proposal on the receiving Human Health environment.

EIAR 18.4.1 Criteria & Methodology

The criteria used for impact evaluation in this report is based on the *Manual on Health Impact Assessment Guidance* and the IEMA *Guide to Determining Significance for Human Health in EIA*. The methodology for determining the significance of impacts to Human Health is based on the sensitivity of the receptors (sensitive aspect) and the magnitude of the impact, as outlined in [Appendix 18.1](#).

EIAR 18.4.2 Source-Pathway-Receptor

The following sources of impacts and pathways for these impacts to the identified receptors (sensitive aspects) of Human Health are listed below.

EIAR 18.4.2.1 Sources of Impact

Construction Phase	Operational Phase	Decommissioning Phase
Movement of machinery	Operating turbines	Operating machinery
Construction traffic	Operating substation	Dismantling of turbines
Use of local road network	Electrical equipment and cables	Earthworks/groundworks
Presence of construction works	Community Benefit Fund	Presence of oils and hydrocarbons
Vegetation clearance	Cultural heritage interactive database	Presence of construction personnel
Excavations, earthworks and		
Groundworks		
Overburden storage		
Rock breaking		
Use of fuels/oils and concrete		

EIAR 18.4.2.2 Pathways

- Surface water and groundwater
- Physical contact
- Air
- Visibility

EIAR 18.4.2.3 Receptors

- Local Residents and People using Community Facilities
- Visitors to the Area

EIAR 18.4.3 Evaluation of effects on Human Health

A summary of the findings of the evaluation of the effects of the whole Gathabawn Windfarm project on Human Health are listed in the table below. The relevant phases of the development are the construction, operational and decommissioning phases which are denoted by C, O and D respectively.

It is evaluated that there is **no likelihood** of the Whole Gathabawn Windfarm Project causing **significant adverse effects** to the Health and Wellbeing of members of the Local Community receptors or to Visitors to the Area. Short evaluations of these effects are provided in Section 18.4.3.1, with a list of these impacts provided in the table below. The relevant phases of the development are the construction, operational and decommissioning phases which are denoted by C, O and D respectively

The evaluations follow this summary table

Table 18-6: List of effects to Human Health which will not be significant

Effects of the Proposed Development which will not be significant	Phase	Impact Significance – See Section EIAR 18.4.3
LOCAL COMMUNITY IMPACTS		
Construction Phase Effects		Section EIAR 18.4.3.1
Secondary impact of a Reduction in Air Quality on Human Health	C	Not Significant
Secondary Impact of Increased Noise Levels on Health & Wellbeing	C	Not Significant
Secondary impact of Water Supply impacts on Health & Wellbeing	C	Neutral
Risk of road accidents due to construction traffic	C	No Likely Impact
Reduced access to local walking amenities during construction works	C	Not Significant
Vulnerability of the development to Major Accidents or Natural Disasters	C	Not Vulnerable – Extremely Unlikely
Operational Phase Effects		Section EIAR 18.4.3.2
Secondary impact of Operational Noise impacts on Health & Wellbeing	O	Not Significant
Secondary impact of Shadow Flicker impacts on Health & Wellbeing	O	Not Significant
Secondary impact of Electro-magnetic Fields on Health & Wellbeing	O	Imperceptible
Safety risk to landowners, walkers and the general public due to ice throw or turbine failure	O	No Likely Impact
Secondary impact of Landscape and Visual Impacts on Local Community Wellbeing and Community Resource	O	Neutral
Positive impact – Improvement in Community Resources, Facilities and Amenities due to the Community Benefit Fund and the Interactive Heritage Database	O	Slight beneficial
Positive impact – Secondary impact of Air Quality impacts on Health & Wellbeing due to Production of Renewable Electricity	O	Not Significant beneficial
Positive impact – Secondary impact of Climate impacts on Health & Wellbeing	O	Not Significant beneficial
Effects to Local Community Health & Wellbeing	D	Not significant
VISITORS TO THE AREA IMPACTS		Section EIAR 18.4.3.4
Impact on the Health & Wellbeing of Visitors to the Area	C,O,D	Not significant

EIAR 18.4.3.1 Construction Impacts which will not be Significant

All effects of the Whole Gathabawn Windfarm Project on Human Health during the construction phase will be Neutral or Not Significant. A short evaluation of these effects is provided below:

Secondary impact of a Reduction in Air Quality on Human Health (C): Not Significant. As stated in Chapter 9, the traffic volumes from the Proposed Gathabawn Windfarm during the construction stage do not meet the Transport Infrastructure Ireland criteria to require a local air quality assessment to be carried out as there would be a negligible impact on air quality. On the basis that there would be Negligible air quality impacts, it is evaluated that there would be a Negligible effect on the human health of local residents or community members as a result of vehicular emissions from construction traffic.

In relation to dust emissions, there are a small number of houses within the study area which are located along local roads in the vicinity of the windfarm site entrances and in the vicinity of the Candidate Gathabawn Grid Connection. These houses could be affected by both dust arising from works areas in the vicinity and from trackout of mud onto the local road. The pre-mitigation impact has been evaluated as Slight in Chapter 9: Air Quality, and Not Significant.

Walkers on the local roads associated with Candidate Gathabawn Grid Connection cabling works (Ballylehaun-Ballyring UGC on the L5818, L5821, L5820, L1806 and L18062 local roads, the crossing points of the Ballyring-Parksgrove UGC on the L1808, L1811 and L1807 local roads, and the Parksgrove-Moatpark UGC crossing the N77 and then on the R432 in Moatpark) could also be affected by dust. However, walkers are considered to have a lower sensitivity to dust (as they are transient in nature and would experience exposure temporarily) and dust effects were evaluated as Imperceptible in air quality terms.

Although significant effects are not expected to occur, best practice dust control measures will be implemented during the construction stage, including the use of a road sweeper, covering of loads and monitoring of dust levels. These measures will minimise and control dust, and it is considered that the overall impact to Human Health and Wellbeing will be **Negligible, and therefore Not Significant**.

Secondary impact of Increased Noise Levels on Human Health (C): Not Significant. The impacts on local Noise Sensitive Locations (NSLs) during construction is assessed in Chapter 10; Section EIAR 10.4.4. The application of standard construction techniques including binding noise limits and hours of operation, along with implementation of appropriate noise control measures, will ensure that construction noise is kept to a minimum. Given the distances between the main construction works at the windfarm sites and nearby NSLs, and considering the temporary nature of the construction phase, construction related noise and vibration sources are not considered to be excessively intrusive; in all instances, the predicted noise levels at the nearest NSLs do not exceed the relevant construction noise criteria (65 dB $L_{Aeq,1hr}$ during daytime periods), which is set to be protective of the environment and human health. Noise from Candidate Gathabawn Grid Connection works will be less than windfarm works due to the smaller size and number of machinery and the scale and linear nature of these works. Works at Parksgrove Substation will be of greater scale but in the context of an immediately adjacent national secondary road. On the basis that noise levels during construction would remain below thresholds set to be protective of the environment and human health, it is assessed that the secondary impact on local community health is Negligible. **In the context of a low sensitivity, there would be a negligible significance of effect.**

Secondary impact of Water Supply impacts on Health & Wellbeing (C): Neutral. The impacts during construction on Surface Water Abstractions (public supply) in the area is assessed in Chapter 8; Section EIAR 8.4.5.3. There is 1 no. Uisce Éireann abstraction point located downstream of the Site, connected via the Gorteenahilla watercourse, approximately 3.4km south of the Ballyring Area. The impact is assessed as Not Significant due to the sediment and pollution control measures implemented as part of construction works, and the separation distance to the abstraction point which will allow for further attenuation.

The impacts during construction on local domestic water supplies is assessed in Chapter 8, Section EIAR 8.4.5.3. The impact on groundwater quality in domestic water supplies is considered Not Significant, as areas of exposed rock will be localised with any leaks or spills or contaminants accidental only and of limited volume.

On the basis that any potential impact on surface water abstractions (public supply) and ground water abstractions (private wells) is considered to be Not Significant, it is assessed that the secondary impact on local population health is also Neutral.

Risk of road accidents due to construction traffic (C): No Likely Impact. Although there will be an increase in traffic along the main construction haulage routes – i.e. the local road L58141 from its junction with the R639 as far as Site Entrance No.s 1 and 2, on the L1803 from Site Entrance 3 as far as Gathabawn village and then on the L5818 as far as Site Entrance 4 to the Ballylehaun Control Building, and on the L1807 from its junction with the N77 as far as Lisdowney village, L1806 from Lisdowney village to Ballyring Upper and L18062 from its junction with the L1806 as far as Site Entrances 5, 6, and 7. These roads are currently lightly trafficked. In addition, these roads are regularly used by agricultural machinery. Construction traffic for the Candidate Gathabawn Grid Connection Works will be Slight with access primarily from the L1807, L1806 and L5818 and then onto the smaller local roads L1811, L1808, L18062, L5820 and L5821. With the implementation of the Road Safety Protocol and the Traffic Management Plan, and the monitoring and repair of road condition as set out in Chapter 16: Material Assets, it is evaluated that the impact on the safety of pedestrians and cyclists is anticipated to be Negligible, and an increased risk of road accidents are not likely to occur.

Reduced access to local walking amenities during construction works (C): Not Significant. Members of the local community use the Gathabawn Loop Walk and other walks in the Cullahill Mountain area as a walking amenity and the use of the area for walking is established. No part of the Proposed Gathabawn Windfarm development overlaps the route of this Loop Walk. However, along the Candidate Gathabawn Grid Connection, a temporary loss of access (c.9 weeks) to this waymarked walk may occur where it is routed along the L5818, L5821 and L5820 local roads during Ballylehaun-Ballyring UGC trenching works. For safety purposes, these roads are expected to be subject to a full road closure, and therefore there will be some disruption to access for walkers along this waymarked trail - 2 weeks on the L5818, 2 weeks on the L5821 and 5 weeks on the L5820. However, any loss of amenity will be temporary, reasonable and accessible alternative resources exist, and full access will be restored upon completion of the works. Therefore, any loss of amenity during the construction phase is considered to be Negligible.

Vulnerability of the development to Major Accidents or Natural Disasters (C):

Not Vulnerable to Major Accidents: As per Chapter 19: Vulnerability to Major Accidents, Natural Disasters and Climate Change, there are no Seveso sites in proximity to the Whole Gathabawn Windfarm Project and therefore, due to separation distance, it is considered that the Whole Gathabawn Windfarm Project is not vulnerable to Major Accidents.

Furthermore, the Proposed Gathabawn Windfarm itself will not cause a Major Accident from the use of dangerous substances during construction and operation because of the minimal volumes of such substances which will be used on site – limited to petrol and diesel used by vehicles; oils and grease/lubricants required by the wind turbines and at the substation and the very small amounts of SF₆ gas which will be used for the switch gear inside the Windfarm Substation during operation.

Extremely Unlikely Vulnerability to Natural Disasters or Climate Change: As per Section EIAR 5.11, due to the location of the windfarm in an upland area, the geological conditions at the site, the absence of peat, the installation of a sustainable drainage system during construction works, the location in agricultural grassland and the provision and maintenance of bat buffer zones around the turbines which will be kept clear of hedgerows and scrub, make the likelihood of a potential flooding or land slippage or wildfire disaster

occurring at the site is Extremely Unlikely. The turbines to be installed at the Gathabawn Windfarm will be designed in accordance with the IEC 61400 standard and will be designed to withstand at least 60 m/s (215km/h), and therefore it is considered that the turbines are not vulnerable to extreme storm events.

In relation to unrelated disasters in the locality, should a disaster occur, unrelated to the development and not affecting the development, but occurring within the locality – the use of weather forecasting, and the monitoring of construction works by the Environmental Clerk of Works, monitoring of the operating windfarm by the Asset Manager, provision of point of contact details to key stakeholders, and the ability to control the operational turbines and substation remotely will ensure that the development will not make the consequences of the unrelated event worse.

EIAR 18.4.3.2 Operational Impacts which will not be Significant

Secondary Impact of Operational Noise impacts on Health & Wellbeing (O): Not Significant.

Operational wind turbines: The operational phase Noise and Vibration impact of the Proposed Gathabawn Windfarm is assessed in Chapter 10: Noise and Vibration as Not Significant. However, the turbines would be operational 24 hours per day, and there will be an increase in ambient noise locally. As such, the secondary effects on local population health is examined **herein**:

The operation of the proposed windfarm will change the sound profile in the locality for proximate houses. These houses are identified as Noise Sensitive Locations (NSLs) in Chapter 10: Noise and Vibration:

- 65 no. NSLs are within 1km of a proposed turbine
- 104 no. NSLs are between 1km and 1.5km of a proposed turbine
- 105 no. NSLs are between 1.5km and 2km of a proposed turbine

Increases in noise have the potential to cause annoyance (during daytime periods) and sleep disturbance (during night-time periods). Operational noise limits defined in Chapter 10: Noise and Vibration have been set in the context of the quiet baseline environment and are protective of the environment and human health, including those who are most sensitive to noise.

Slight exceedances of the noise criteria are noted at 6 no. locations during the daytime period of between 0.1 dB(A) and 1.9dB(A). There is also a marginal exceedance of the noise criteria of 0.1 dB(A) at 1 no. location during the night time period. As stated in Chapter 10: Noise and Vibration, these exceedance values are immaterial and within the margin of error. As a result, it is not anticipated that there would be any material impact to population health.

To further assess the secondary impact of the change in the sound profile, a literature review was conducted into the effects of noise from operating wind turbines, including from amplitude modulation (AM) and infrasound.

Relating to wind turbine noise generally, several national studies have been undertaken to investigate potential health impacts, the results of which have informed position statements on the matter. Specifically, both the National Health and Medical Research Council (NHMRC) in Australia (NHMRC, 2015) and Health Canada (Health Canada, 2014) both concluded that there is no consistent evidence that exposure to wind turbine noise causes adverse human health effects.

Amplitude Modulation (AM) is the variation in the noise produced by wind turbines as their blades rotate. While it has been found that AM increases annoyance when present and strong AM can adversely affect deep sleep (Maijala et al., 2021; Morsing et al., 2018), van Kamp & van den Berg (2017) concluded that annoyance increased with modulation frequency, with an expected highest sensitivity for modulated sounds at 4 Hz. However, it was also found that large, modern wind turbines (2 MW or more) do not reach this frequency

and instead modulate their sound at a frequency close to 1 Hz. As the Proposed Gathabawn Windfarm would consist of 12 turbines with an individual capacity of 4.5 MW per turbine, it is unlikely that operation of Gathabawn Windfarm would cause levels of AM that are associated with high levels of annoyance or sleep disturbance.

Infrasound is a range of sound that is below 20 Hz and is often inaudible to humans. With respect to this, the WHO (WHO, 1995; van Kempen, Casas, Pershagen & Foraster, 2018), Health Protection Agency (HPA, 2010) and Australian Medical Association (Australian Medical Association, 2014), all conclude that there is no evidence to suggest that exposure to infrasound below the hearing threshold levels is capable of causing adverse health effects. As outlined in Chapter 10: Noise and Vibration, the EPA document Guidance Note for Noise Assessment of Wind Turbine Operations at EPA Licensed Sites (NG3) (EPA, 2011) states that there is no significant infrasound from wind turbines.

Several academic studies have also looked into the effects of simulated wind turbine infrasound and sham infrasound (speakers being present but not generating infrasound) on physical symptoms, annoyance levels and sleep quality. These studies all report the same findings: that no differences in reported symptoms were observed between groups exposed to real infrasound and those exposed to sham infrasound (McCunney *et al.*, 2014; Majjala *et al.*, 2021; Marshall *et al.*, 2023).

Specific health outcomes of concern associated with changes in noise exposure which are typically raised during public submissions for wind farm applications, included tinnitus, cancer, dementia and effects on people with autism and ADHD.

It has been suggested that tinnitus (in addition to other symptoms such as vertigo, migraines and sleep deprivation) are caused by exposure to infrasound and low frequency noise produced by wind turbines, and is a core symptoms of what is known as 'wind turbine syndrome', a term originally coined by Pierpont which relates to an alleged medical condition experienced by some people who live in proximity to wind turbines. However, wind turbine syndrome remains unproven and there is no clear or consistent evidence of such effects (McCunney, *et al.*, 2014), and has not found general acceptance within the scientific community (Farboud, Crunkhorn & Trinidad, 2013), where symptoms can be attributed to annoyance and stress associated with adverse perceptions of wind turbines (Chapman, St George & Waller, 2013). As such, until this effect is fully understood, it is impossible to conclude that wind turbine noise does not cause any of the symptoms described (Farboud, Crunkhorn & Trinidad, 2013).

In relation to cancer and dementia, a systematic review was commissioned by Defra to consider how the evidence base has changed following the reviews undertaken to inform the WHO Environmental Noise Guidelines (published in 2019) (Clark, Crumpler & Notley, 2020). In relation to cancer, most studies examined road traffic noise, and some studies also considered railway noise or aircraft noise. No studies were available to examine the impacts of wind turbine noise on cancer health outcomes. Similarly, the only studies able to be examined in relation to dementia were from road traffic noise. Overall, the Clark *et al.* (2020) conclude that in relation to wind turbine noise specifically, the conclusions remain limited by the low number of studies for many outcomes, and the quantification of health effects for other noise sources including wind turbine noise remains a research priority.

People with autism are generally considered to be more sensitive to changes in the noise environment, whereby a typical response from those who experience over-stimulation include avoidance behaviours such as covering the ears or eyes, compensating behaviours of unusual body movements or vocalisations, and an apparent fixation on irrelevant but possibly comforting stimuli. Howell *et al.* (2015) specifically refer to impacts on sleep disturbance associated with low frequency noise for those with autism, and how the relative sensitivity of these individuals may increase impacts, noting that further research is needed on understanding the mechanisms of how people with autism are affected by sound. While this is the case, as stated in Chapter 10: Noise and Vibration, there is a significant body of evidence to show that infrasound and low frequency

noise associated with wind turbines will be below perceptibility thresholds and typically in line with existing baseline levels of infrasound within the environment.

Overall, the available health evidence base does not establish any clear or consistent association between noise from wind turbines and human health (including from exposure to AM, infrasound and low frequency noise).

In relation to the **Parksgrove Substation**, which would also be operational 24 hours per day, the highest predicted noise level is 30 dB L_{Aeq} , which is below the criteria for night-time noise, which is protective of the environment and human health during both the daytime and night time periods.

On the basis that exceedances of noise criteria would be within the margin of error at only 6 no. NSRs, it is assessed that the secondary impact on local population health is low. In the context of a low sensitivity population, there would be a minor adverse significance of effect which is evaluated as Not Significant.

Secondary impact of Shadow Flicker impacts on Health & Wellbeing (O): Not Significant. Shadow flicker is the flickering effect caused when rotating wind turbine blades periodically cast shadows through constrained openings such as the windows of neighbouring properties under certain meteorological conditions. The main health concerns which the public generally associate with shadow flicker is the risk of seizures in those people with photosensitive epilepsy.

The operational phase Shadow Flicker impacts are assessed in Chapter 11: Shadow Flicker whereby it is concluded that prior to any mitigation, none of the receptors are expected to experience the 2006 WED Guidelines recommendation of 30 hours or more of shadow flicker per year in a real-case scenario.

However, modern turbines such as those proposed for the Proposed Gathabawn Windfarm can be fitted with shadow flicker control modules that can control the amount of shadow flicker that can occur at a given sensitive receptor. As stated in Chapter 11: Shadow Flicker, regardless of any planning condition attached to a planning grant, the developer commits to the installation of Shadow Flicker Modules on the turbines. The developer commits to use this setting at the relevant turbine/s should there be a complaint about shadow flicker effect from a residence within the 1360m Shadow Flicker Study Area (10-rotor diameters). Deployment of this module will turn off the turbine or turbines if the defined parameters for shadow flicker events, at a given receptor is predicted to occur. This will eliminate shadow flicker at the affected sensitive receptor.

As an additional mitigation measure, a report on the operation of the Shadow Flicker Control Module and compliance with any planning condition limiting shadow flicker occurrence will be prepared and submitted to the Local Authority annually after 1-year of operation.

With reference to **Table 1 in Appendix 18.1**, a hazard source by itself (in this case, shadow flicker) does not constitute a health risk. It is only when there is a hazard source, a receptor and a pathway of exposure that there is any potential risk to human health. In this case, the pathway of exposure will be controlled by the Shadow Flicker Control Modules to eliminate exposure to shadow flicker completely, and any potential health risks (including photosensitive epileptic seizures).

On the basis that shadow flicker will be eliminated through the installation of Shadow Flicker Control Modules, it is assessed that the secondary impact on local population health of shadow flicker effect locally is negligible. **In the context of a low sensitivity population, there would be a negligible significance of effect which will be Not Significant.**

Secondary impact of Electro-magnetic Fields on Health & Wellbeing (O): Imperceptible. While the turbines, the Windfarm Control Buildings and the Parksgrove Substation are not located within 100m of any local residences, community facilities or local amenities, other parts of the Whole Gathabawn Windfarm Project are located within 100m of these sensitive receptors, namely, the underground electric cabling between Ballylehaun and Ballyring and the underground cabling between Ballyring and Moatpark.

Public exposure guidelines are provided by ICNIRP, whereby the reference level for electric and magnetic fields is 5000V/m and 100 μ T, respectively, and are set to be protective of human health.

While not an Irish entity, the former UK Department of Energy and Climate Change (DECC) published a voluntary Code of Practice (CoP) titled *“Power Lines: Demonstrating compliance with EMF public exposure guidelines”* which details the recommended approach for demonstrating compliance with adopted public exposure guidelines. The CoP states that compliance with the public exposure guidelines is assumed for transmission infrastructure operated at 132 kV or less, without the need for more detailed assessment. The proposed transmission infrastructure in this instance is 33kV and 110kV.

While this is the case, EMF modelling has been undertaken by Compliance Engineering Ireland, and is included as **Appendix 18.3**. In summary, the worst case magnetic field from any part of the Whole Gathabawn Windfarm Project would be 12.175 μ T directly above the 110kV double trefoil underground cabling. There would be no measurable electric fields emitted above ground level on the basis that the cable sheath and fill material above the cables shields the electric field. This is compliant with the ICNIRP 1998 EMF public exposure guidelines for electric fields (5000V/m) and magnetic fields (100 μ T).

On the basis that EMF levels would remain substantially within public exposure guidelines which are set to protect human health, it is assessed that the secondary impact on local population health is negligible. In the context of a low sensitivity, there would be an imperceptible significance of effect.

Safety risk to landowners, walkers and the general public due to ice throw or turbine failure (O): No Likely Impact – Ice Throw. Under certain weather conditions, ice, white frost or snow can build up on the rotor blades of turbines. This usually happens when there is high air humidity, rain or snow while temperatures are around zero degrees Celsius. Ice formation occurs when water droplets freeze on the blade surface. White frost build-up occurs when the moisture particles in the air are already frozen; the rotor blades pick up these particles which then adhere to the blade surface. Ice and white frost build-up can reduce a turbine's efficiency and increase the strain on the material, particularly due to imbalance. In addition, ice deposits may represent a hazard to people in the vicinity of the turbine when they begin to melt and drop away. Ice build-up most frequently occurs at temperatures between 1°C and -4°C. It does not usually occur at temperatures above +10°C and below -7°C. The available air humidity is too low at temperatures below -7°C.

The presence of ice can be detected by the turbine control system and remedial action would be taken depending on the specific site requirements. Ice detector systems use sensors on top of the tower and/or at the base to measure the outside temperature and then to determine the presence of icy conditions. Then because the presence of ice reduces the efficiency of the blades and thus the total output, the turbine control system can be set to detect a drop in production in conjunction with suitable icing conditions. Limit values of the control system can be set within defined parameters to further optimise the responsiveness of the ice detection system. The control system can be set to shut down the affected turbines within a narrow tolerance range i.e. before the thickness of the ice layer becomes a hazard to the dynamic loading of the rotor blade. The time required to de-ice the blades is then calculated based on the outside temperature. During this period, the turbine does not start up automatically. When the ice has melted and before manual start up, a visual inspection of the blades can be carried out to check that any ice that has formed has fallen directly and safely to the ground.

Ice detection systems will be deployed at Gathabawn Windfarm, which will protect windfarm personnel, local landowners and the general public from any hazard of ice throw.

No Likely impact – Turbine Failure. Modern turbines have two independent fail-safe mechanisms to stop the turbine. The aerodynamic braking system is the main braking system, with mechanical brakes as a backup system. This is additional to the yawing and blade pitch mechanisms, which protect the blades from very

strong winds by turning and allowing the wind to flow over the blades with least resistance. At the design stage, the blades are tested strategically by applying weight to bend the blades and dynamically testing the blades ability to withstand fatigue from repeated bending (more than 5 million times).

The rigorous safety checks imposed on the turbines during design, construction and commissioning should ensure that the risks to humans will be negligible. The health and safety record of the wind industry is exceptionally good. The operation of a wind farm has practically no potential for severe accidents to the general public. Regular safety audits of control measures in place on the site will be conducted during the operational phase to ensure that these control measures are effective at reducing risk to persons and property. Overall, catastrophic turbine failures are unlikely to occur.

Secondary impact of Landscape and Visual Impacts on Local Community Wellbeing and on Community Resource (O): Neutral. In Chapter 14: Landscape it is assessed that the landscape impact in the vicinity of the proposed turbines (within 5km) varies from Slight to Substantial Moderate depending on proximity, viewing angle and topography. The secondary impact on local population health will be subjective in nature and can be considered from a negative perspective – imposition of large infrastructure locally and/or a positive perspective – climate action. This is supported by research; McCunney *et al.* (2014) report that participants who have a negative attitude towards the visual effect of wind turbines on the landscape scenery report higher levels of annoyance to wind turbine noise.

Overall, while there is potential for dissatisfaction, and associated adverse impacts on wellbeing from the operational Gathabawn Windfarm, over time the wind turbines would become part of the landscape, as the existing Lisdowney Windfarm turbines have, and any adverse perceptions are likely to improve. As a result, the secondary impact of the addition of large infrastructure to the landscape on local population health is negligible. In the context of a low sensitivity population, there would be a Neutral significance of effect.

Positive Impact – Improvement in Community Resources, Facilities and Amenities due to the Community Benefit Fund and the Interactive Heritage Database (O): Slight positive impact. The Gathabawn Windfarm Community Benefit Fund will be based on €2/MWhr, which is expected to be c.€300,000 (based on a production of 150,000 MWhrs. The fund will be used to support local initiatives and provide direct payments to households within specific proximity to the wind turbines, in line with the RESS rules. The windfarm community benefit fund will contribute to the enhancement of amenities and facilities in the local area, which will have an indirect low beneficial impact on access to community resources and sense of place, considered social determinants of health and wellbeing, over the long-term. In the context of a low sensitivity population, there would be a Slight beneficial significance of effect.

In addition, the funding and creation of an interactive database for the local community to record their local cultural and natural heritage will further contribute to positive effects on community resources.

Positive Impact – Secondary impact of Air Quality impacts on Health & Wellbeing due to the production of Renewable Energy (O): Not Significant positive impact. The proposed windfarm development will result in an estimated saving of 39 tonnes NO_x per annum. This is equivalent to 0.1% 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 1,375 tonnes NO_x savings. This will have a long-term, slight, positive impact to air quality. While the operational impact on air quality would be positive, the benefits are diffuse across the region/Ireland and do not directly or materially improve local air quality. As a result, it is assessed that the secondary impact on local population health is negligible. **In the context of a low sensitivity population, there would be a negligible significance of effect.**

Positive Impact – Secondary impact of Climate impacts on Health & Wellbeing (O): Not Significant positive impact. The primary impacts associated with climate change include increased temperatures, increased atmospheric CO₂, sea level rise and increased incidence of extreme weather events. These primary impacts

affect several environmental functions (such as water availability, salinization, varying crop yields, wildfires, ozone/PM concentrations, and migration patterns) which could plausibly alter the prevalence of a range of population and health outcomes.

In Chapter 12: Climate it is assessed that over the lifetime of the Gathabawn Windfarm (35 years), the production of renewable electricity will result in total GHG emissions savings of 38,250 tonnes of CO₂e each year and once initial emissions from the construction of the development are offset (within 8 months of production). The annualised GHG saving equates 1% of the 2030 Electricity sector carbon budget of 3 MtCO₂e.

Institute of Environmental Management & Assessment significance (IEMA, 2022) states that where the fundamental reason for a proposed project is to combat climate change (e.g. a wind farm) and this beneficial effect drives the project need, then it is likely to be significant. Considering the significance criteria set out in Chapter 12, the impact of GHG emissions from the proposed Gathabawn Windfarm align with Ireland's GHG trajectory to net zero by 2050 as per TII Guidance (TII, 2022), this is therefore considered a Significant, Positive, Long-Term impact to climate. This project will assist in the CAP24 goal of producing up to 80% renewables for the grid.

While the operational impact on climate change would be positive, the benefits are diffuse nationally/globally and require collective action for any material change. While the proposed development would contribute positively to climate change action, overall improvements in climate change are therefore uncertain. Furthermore, it is more likely that global and collective climate action would prevent the worsening of climate change (and associated population health outcomes), rather than improve our climate in a way which directly improves population health outcomes.

However, as outlined in Section EIAR 17.3.1.1.5 of Chapter 17, on the basis that 79% of the Irish population surveyed (EPA, 2024) say climate change should be either a "very high" or "high" priority for Government (EPA, 2024), the delivery of the Gathabawn Windfarm project may improve perception of climate change action, with associated wellbeing benefits to those locally.

As a result, it is assessed overall that the secondary impact of positive climate actions on local population health is low. In the context of a low sensitivity population, there would be a minor beneficial significance of effect (Not Significant).

EIAR 18.4.3.3 Decommissioning Impacts which will not be Significant

Effects to Local Community health and wellbeing during decommissioning (D): Not significant. The decommissioning phase will be of a short duration (approx. 6 months). Traffic volumes will be less than for the construction phase and similarly below the Transport Infrastructure Ireland criteria to require a local air quality assessment. On the basis that there would be negligible air quality impacts, it is evaluated that there would be a negligible effect on the human health of local residents or community members as a result of vehicular emissions from construction traffic.

Earthworks and movement of machinery during the decommissioning phase will be substantially lower than construction phase works, and therefore dust effects, if any occur, will have a negligible effect on human health, and will be of Neutral significance, and therefore Not Significant.

Noise from groundworks, dismantling works and movement of machinery during the decommissioning phase will be substantially lower than during the construction phase, and will be localised to the turbine locations, therefore noise effects, will have a low magnitude of effect during decommissioning works, and will have Neutral impacts on human health or on the enjoyment of local walking amenities in the vicinity.

It is also noted, that with decommissioning comes the end of the community benefit fund, this may have a negative effect on the community who may at that time potentially depend on the fund for particular services or running of community facilities, for example.

EIAR 18.4.3.4 Effects on Visitors to the Area which will not be Significant

Impact on the Health & Wellbeing of Visitors to the Area (C, O, D): Not significant. In relation to the health and wellbeing of visitors to the area, there are small number of visitor facilities or attractions in the immediate environs of the windfarm site and the Candidate Grid Connection route. The main potential for effects to the health and wellbeing to visitor relates to the construction phase of the project, due to the presence of construction works on the public road networks, along with an increase in traffic delivering materials to the site.

The waymarked Gathabawn Loop Walk is partially located on the L5818, L5820 and L5821 and partially overlaps the route of the Ballylehaun-Ballyring UGC - during construction works these roads are likely to be subject to road closures, and the consequent closure of this part of the Gathabawn Loop Walk for 7 – 8 weeks. The closure of the road/walk prevents risks to visiting walkers coming into close proximity to the temporary road works on these public roads. Loss of amenity to visitor health will be negligible as there are alternative walking routes in the immediate area that will be unaffected (e.g. Cullahill Healthy Way Loop Walk, Cullahill Binnianea Loop Walks).

Disruptions to travelling visitors will experience adverse traffic, noise or dust impacts (if any) for brief periods, with any impacts being reversible with the movement of the visitors out of the area. Visitors of heritage and tourism sites in the wider surrounding area will be at a substantial distance from the windfarm site, will be moving through or visiting the area for brief periods and therefore there is no potential for significant effects on visitors health and wellbeing.

In relation to EMF from the Ballylehaun-Ballyring electric cables under the L5818 and L5820, and at public road crossing locations along the Candidate Grid Connection, walkers or visitor will be briefly exposed to increased magnetic fields from the underground cabling. However, EMF levels will be substantially below the ICNIRP 1998 EMF public exposure guidelines with levels quickly reducing as a walker/visitor moves away from the cables.

EIAR 18.4.3.5 Cumulative Effects of the Whole Project

Cumulative impacts of the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection will be Neutral (negative) to Minor (positive), this is generally due to the temporary duration of construction works and the small extent of locational overlap of the Proposed Gathabawn Windfarm with the Candidate Grid Connection.

Overall, it is evaluated that the **cumulative effect of the Whole Gathabawn Windfarm Project** on members of the Local Communities and on Visitors to the Area will be **Not Significant**.

EIAR 18.4.3.6 Summary of Impacts

There are **no likely Moderate, Significant, Very Significant or Profound impacts to Human Health** arising from the construction, operation or decommissioning of the Whole Gathabawn Windfarm Project.

All of the effects of the Proposed Gathabawn Windfarm, and the Whole Gathabawn Windfarm Project on Human Health will **not be significant**.

EIAR 18.4.4 Environmental Protection Measures

Measures which form part of standard windfarm construction/operation will be implemented during the construction/operation/decommissioning of the development to protect the Human Health environment and avoid/reduce these not significant effects. The environmental protection measures are identified below and are in the Environmental Management Plan 2026 for the Whole Gathabawn Windfarm Project.

Table 18-7: Environmental Protection Measures relevant to the protection of Human Health

<u>Construction Phase mitigation measures</u>	
WM12 GM12	The <u>Environmental Management Team</u> will <u>monitor construction works</u> for compliance with the Environmental Management Plan. The project Environmental Management Team which includes an Environmental Clerk of Works, the Project Ecologist and specialists as required such as archaeologists, invasive species specialists and hydrologists, who are independent of the site contractors. The Environmental Management Team will report to the owner's Project Manager.
WM29 GM26	<u>Environmental Management Plan</u>: The construction of the Gathabawn Windfarm Project will be carried out in accordance with the Environmental Management Plan (EMP). The EMP will include all of the mitigation measures and monitoring arrangements for the Project. An Environmental Clerk of Works will be appointed, independent of the main construction Contractor, and will carry out weekly audits on EMP compliance. If non-compliance is detected, then, prompt corrective action will be agreed and committed to by the Contractor, with a view to the swift and effective resolution of any deviations from the EMP requirements. The EMP will be an important contract document for the main construction contractor (Contractor) who will be contractually obliged to comply with the EMP and the requirements of the Environmental Clerk of Works. Furthermore, if a significant unforeseen environmental effect takes place, then, the Environmental Clerk of Works will have a '<u>stop-works</u>' authority to temporarily stop works until the issue is resolved.
GM09	<u>Confirmatory road condition surveys</u> involving pre-construction and post-construction inspections and high-definition video surveys will be undertaken along the routes of concentrated construction traffic and road works locations the affected sections of the N77, the R432, the L1807, L1811, L1808, L1806, L1804, L5818, L5821 and L5820, and along road works locations on the L5818, L5820, L5821, L1806, L18062, L1808, L1811, L1807, N77 and R432.
WM24 GM23	<u>Monitoring – Dust</u> : During working hours, the construction contractor will monitor dust control methods and 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 will be regularly inspected for cleanliness and regular dust soiling checks of surfaces along public roads and within 100m of site access points 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.
WM72	<u>Dust control</u>: Dust minimisation measures will be implemented during the construction works as follows: • The site roads will be regularly inspected and swept to remove build up of mud and aggregate materials from their surface, • Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and windy conditions. • Vehicles delivering material with dust potential will be enclosed or covered with tarpaulin to restrict the escape of dust. Public roads in the vicinity of the site will be regularly inspected for cleanliness, and cleaned as necessary
GM61	<u>Dust Control</u> : Any loads of material which have the potential for dust emissions (such as aggregate) will be covered during transportation.
WM71 GM60	<u>Public Road – cleanliness</u> : To ensure that local roads are kept clean, a road sweeper will be used daily at road works locations, and as required at site access points.

WM73 GM62	<u>Work hours:</u> Construction operations shall generally be restricted to between 0700-1900hrs Monday to Friday, and 0800-1300hrs on Saturdays. Site activities which are likely to create high levels of noise or vibration will be limited to these hours of operation, with no noisy operations on Sundays or Public Holidays. However, to ensure that optimal use is made of good weather period or at critical periods within the programme, it could be necessary on occasion to work outside of these hours.
WM74 GM63	<u>A Community Liaison Officer (CLO)</u> will be appointed. The CLO will liaise with and keep the local community up-to-date with relevant construction work schedules, through the use of letter drops to or direct contact with nearest neighbours. The CLO will be the point of contact for local residents and local landowners for matters relating to noise, dust or traffic. The Environmental Clerk of Works will liaise with the CLO and will be the point of contact between the contractor/developer and the Local Authority regarding any matters relating to noise or vibration from the construction works.
WM75	<u>Vibration along site roads:</u> The Windfarm Site Roads will be maintained to an even surface in order to reduce the potential for vibration from lorries travelling over them.
WM76 GM64	<u>Noise and emissions from plant/machinery:</u> Plant and machinery will not be permitted to idle. Machinery used intermittently will be shut down when not in use. The best means practicable, including proper maintenance of plant, will be employed to minimise the GHG emissions and noise produced by on-site operations. All vehicles and plant will be fitted with effective exhaust silencers. Noise dampeners will be fitted where required. To protect residential amenity, if any plant/machine is required to operate before 07:00hrs or after 19:00hrs Monday to Friday, or before 08:00hrs or after 13:00hrs on a Saturday, then it will be surrounded by an acoustic enclosure or portable screen.
WM77	<u>Noise management:</u> The Contractor undertaking the construction of the Gathabawn Windfarm will be obliged to take specific noise abatement measures when deemed necessary to comply with the recommendations of BS5228-1 (BSI 2014a). The Contractor will coordinate with the construction teams for other developments in order to minimise the cumulative noise effects.
WM78	<u>Noise – rock breaking:</u> If rock breaking is required at the borrow pits, then the following measures will be employed: (i) the rock-breaking tool will be fitted with a suitably designed muffler or sound reduction equipment (without impairing machine efficiency); (ii) the Contractor will ensure that all air lines are sealed, and regular checks will be carried out for air lines leaks; (iii) an acoustic screen will be erected between the compressor or generator and noise sensitive area; (iv) when possible, the line of sight between the top of the machine and reception point will be obscured; and (v) the breaker or rock drill will be enclosed in a portable or fixed acoustic enclosure with suitable ventilation.
WM25	<u>Monitoring of construction noise</u> will be carried out at a number of nearby residences during critical periods of the wind farm construction works.
WM88	<u>Public Road Repair:</u> Any damage to structures or road pavements along widening sections, cable routes or along concentrated construction haul routes, because of the construction works and deliveries to the works areas, will be repaired to at least as good a condition as pre-works.
WM85	<u>Roadside boundaries</u> will be maintained during the construction phase and following the removal of the boundary to provide a widened transport area or to provide sightlines, a post and mesh boundary fence will be erected immediately.
WM89 GM72	<u>The Traffic Management Plan</u> will be a key construction contract document and will be implemented to safely coordinate and manage traffic during the construction works. The Traffic Management Plan will be developed in coordination with Kilkenny County Council.
WM90 GM73	<u>Flag-men</u> will be used on public roads at road works locations. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the public road network in a safe and efficient manner.
WM91 GM74	<u>Local Communication:</u> Local residents likely to be affected by road works, will be kept up to date on works schedules by the Community Liaison Officer.
WM94	<u>A road safety and courtesy protocol</u> will be implemented for the duration of construction. All companies delivering to site will have to sign up to this protocol as part of their supply contract. Courtesy for other road users is fundamental to the protocol. Vehicles will slow down or stop, as

	appropriate, for other road users, in particular for pedestrians and cyclists along the construction haulage routes. Appropriate signage will be maintained for the duration of the project with clear signs at all junctions on the L1807, L1806 and L1804, L1803, L5818 and L58141 local roads.
Operational Phase mitigation measures	
WM102 GM93	<u>Environmental Management Plan for the Operational Phase</u> : Following the completion of the construction and commissioning of the Project, the Environmental Management Plan will be updated, and the operation of the Gathabawn Windfarm Project will be carried out in accordance with the updated Plan. A suitably qualified Environmental Manager will be appointed by the Project Promoter, and it will be their responsibility to ensure that the EMP is implemented through liaising with the Asset Manager and by carrying out regular audits on EMP compliance. The EMP will be an important contract document for the Asset Management contractor who will be contractually obliged to comply with the EMP and the requirements of the Environmental Manager.
WM103 GM92	<u>A Community Liaison Officer</u> will be appointed for the duration of the operational phase and will act as a point of contact for the local community.
WM104	<u>The Community Benefit Fund</u> will be distributed in line the Government's Renewable Energy Support Scheme (RESS) 'Community Benefit Fund Good Practice Principles Handbook'. The Fund will be registered with SEAI and a Report will be prepared annually and submitted to the SEAI, to demonstrate compliance with the RESS Handbook.
WM105	<u>The Community Benefit Fund</u> will be set up once the windfarm becomes operational and will be distributed annually. The Community Liaison Officer will be available to local community groups at the set-up stage of the Fund to assist in the organisation of a fund committee and thereafter during the distribution of funds. The latest recipients of the funding will be listed on the community website www.ecopowergathabawn.ie Annually, the opening of the fund for applications will be advertised on the community website, on Local Radio and in the Local Newspapers
WM106	<u>Cultural heritage interactive database</u> : Offsetting of effects will be further provided by the implementation of an interactive database which will enable members of the local community to record folklore and other intangible cultural heritage of the area around the Gathabawn Windfarm Project. This database will be available to the public, for example through the local libraries and online, the data will be checked before being made publicly available, and the database will be demonstrated in the local schools, community centres and with local heritage groups. The windfarm owner will fund the ongoing maintenance of this database.
WM107	<u>Curtailment Strategy – Noise</u> : A noise curtailment strategy will be developed and implemented to ensure that the operating windfarm complies with the prescribed operational noise criterion. In order to develop this strategy: (i) a pre-construction noise survey will be carried out to establish the background noise levels and to confirm the applicable wind turbine noise criteria at identified Noise Sensitive Locations (NSL) and (ii) following the commissioning of the Project and the commencement of operation of the wind farm, a second noise survey will be carried out at the NSLs to establish compliance with the noise limit conditions applied to the development. This survey will be carried out according to the IOA GPG and Supplementary Guidance Note 5: Post Completion Measurements (July 2014). Where exceedances are confirmed during surveys, then appropriate sound power operating modes will be activated for specified turbines operating in specified wind conditions as required to reduce noise output when exceedance at a NSL is predicted by the wind turbines computer SCADA software. A third noise survey will be carried following the activation of sound power modes to confirm the effectiveness of the curtailment strategy.
WM108	<u>Amplitude modulation</u> : In the event of a complaint which indicates potential amplitude modulation (AM) associated with turbine operation, the windfarm operator will employ an independent acoustic consultant to assess the level of AM experienced by the complainant in accordance with the methods outlined in the Institute of Acoustics IOA Noise Working Group (Wind Turbine Noise) Amplitude Modulation Working Group Final Report: A Method for Rating Amplitude Modulation in Wind Turbine Noise (9 August 2016) or subsequent revisions. The measurement method outlined in the IOA AMWG document, known as the 'Reference Method', will provide a robust and reliable indicator of AM and yield valuable information on the frequency and duration of occurrence, which can be used to evaluate mitigation requirements. The mitigation measures, if required, will consist of the implementation of

	operational controls on specified turbines, which will curtail or stop the relevant turbines under specific operational conditions, so that OAM is eliminated.
WM114 GM89	<u>Vegetation Monitoring</u> : The rate of re-vegetation of exposed soils and growth of newly planted hedgerows and trees will be checked by the Asset Manager during quarterly site inspections. Where revegetation is slower than expected, that area will be prepared and re-seeded or replanted in an appropriate manner, as advised by a suitably qualified ecologist.
WM109	<u>Shadow Flicker Control</u> : The wind turbines will be fitted with a Shadow Flicker Control Module, comprising a central processing unit (CPU) and light sensors. Should a complaint regarding shadow flicker be received from a neighbouring resident, the occurrence of shadow flicker at the receptor will be investigated and the Control Module will be set to automatically turn off the turbine at the request of the resident, if the defined parameters for shadow flicker events, at a given sensitive receptor, are predicted to occur. This will eliminate shadow flicker at the residence in question. A report on the operation of the Shadow Flicker Control Module and compliance with any planning condition limiting shadow flicker occurrence will be prepared and submitted to the Local Authority after Year 1 of operation, and every 3 years thereafter.
<u>Decommissioning Phase mitigation measures</u>	
WM122 GM95	<u>Environmental Management Plan</u> : Any decommissioning works will be carried out in accordance with the updated EMP. A suitably qualified Environmental Manager will be appointed by the Project Promoter, and it will be their responsibility to ensure that the EMP is implemented through liaising with the Asset Manager and the decommissioning Contractor(s) and by carrying out regular audits on EMP compliance. The EMP will be an important contract document for the decommissioning contractor(s) who will be contractually obliged to comply with the EMP and the requirements of the Environmental Manager
WM123 GM94	<u>Up-to-date Best Practice</u> : Prior to the commencement of decommissioning works, a <u>review of these protective measures</u> listed herein will be carried out to ensure that the most up-to-date measures are implemented during decommissioning works to comply with best practice at the time.
WM124 GM101	<u>Consultation & Supervision of Works</u> : The works will be carried out in consultation with Kilkenny County Council and under the supervision of a suitably qualified engineer and ecologist. Re-vegetation of the site will be carried out under the supervision of a suitably qualified ecologist.
WM125 GM100	<u>A Community Liaison Officer (CLO)</u> will be appointed for the duration of the decommissioning phase and will be the point of contact for local residents.
WM135	<u>Land reinstatement</u> : Following the completion of decommissioning, the hardcore areas at the turbines and at widened site entrances and facilitating works locations will be covered over, using the soil in the deposition areas. The areas will be reseeded/replanted as appropriate to the location. The areas will be fenced from livestock until revegetation has occurred. Land reinstatement works will not take place during periods of prolonged heavy rain or exceptional rainfall events or when the soil is waterlogged.
WM136 GM107	<u>Revegetation</u> : The Asset Manager and Project Ecologist will check the rate of re-vegetation of exposed soils and reinstated areas quarterly following decommissioning works (until revegetation is attained). Where revegetation is slower than expected, that area will be prepared and re-seeded in an appropriate manner.

EIAR 18.5 CUMULATIVE EFFECTS WITH OTHER PROJECTS

Other existing and permitted projects, and projects advanced in the planning system were examined for their potential to cumulatively affect Human Health with the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection. These projects are referred to as 'Other Projects' herein. The potential for off-site and secondary consequential development were also considered.

The Cumulative Study Areas which were used to identify Other Projects in the Air Quality, Noise and Vibration, Material Assets (Roads), and for Local Water Supply are relevant to the Human Health cumulative evaluation. The cumulative study area for EMF is also identified below:

- Air Quality: 500m from construction works areas and site exit points, 100m from main transport routes used by construction traffic, and 200m from roads which will experience a significant change in traffic levels
- Construction Noise: 300m from works areas
- Local Water Supply: 2km from the red line boundary of the windfarm
- Traffic: haul routes on local roads, road works locations
- EMF: 200m from works areas
- Operational Noise: 5km from turbines
- Operational Shadow Flicker: 2km

The Other Projects which were scoped IN for evaluation of cumulative effects in the Air Quality (construction), Noise and Vibration (operation), Local Water Supply (construction), Material Assets (traffic) and Shadow Flicker are also scoped in for cumulative evaluation in EIAR 17.3.1 below.

In relation to EMF, as set out in [Appendix 18.3](#), other energy projects within 200m of the electrical components of the Whole Gathabawn Windfarm Project are included for cumulative evaluation below.

The Other Projects which have been Scoped-IN to the cumulative evaluations herein are identified in [Figure 18.5: Other Projects Scoped-In to the Human Health Cumulative Evaluations](#) (included at the end of this chapter).

EIAR 18.5.1 Evaluation of Cumulative Impacts with Other Projects

The potential for cumulative effects with Other Projects is evaluated in hereunder. The evaluation takes into account existing sources of pollution or damage identified in Section EIAR 18.3.2.

EIAR 18.5.1.1 Construction Phase Cumulative Health Impacts from increased dust and noise

Due to separation distance to the Proposed Gathabawn Windfarm, the potential for cumulative impacts only relates to the Candidate Gathabawn Grid Connection.

Although it is unlikely to occur, there is potential that the Extension to the EirGrid Substation compound, the Battery Energy Storage development, the Ballynalacken WF grid connection (all consented, but not yet constructed) and the grid connections for Briskalagh and Seskin Wind Farms (should they be granted permission) could all be constructed during the same time period as the Gathabawn project works. When dust and noise emissions from all of these works is considered cumulatively, it is evaluated that following standard site-specific mitigation measures at all construction sites (including the Candidate Gathabawn Grid Connection), the cumulative impacts will be short-term, localised, negative and imperceptible. Therefore, the potential for cumulative impacts is significantly reduced and are collectively predicted to be **Neutral and not significant**.

EIAR 18.5.1.2 Construction Phase Cumulative Health Impacts from effects to water supply

In relation to local water supply, due to the shallow nature of the works associated with grid connections, the Eirgrid Substation and the BESS projects, no effects to local wells or springs are anticipated. In relation to piped water mains, the application of pre-works surveys, standard construction methodologies during works in close proximity to mains, use of a banksman and the reversibility or any damage to mains pipes means that any impacts will be unlikely to occur, however, where a water main is damaged, impacts are quickly and easily repaired, and therefore any impacts be brief, and cumulatively **Not Significant** to local community health.

EIAR 18.5.1.3 Construction Phase Cumulative Health Impacts from increased construction traffic and road works

In relation to traffic, due to the absence of other large developments sharing the same local road network as the proposed windfarm, with the exception of the potential Killoshulan WF Grid Connection which will spatially overlap the candidate grid connection in the L1806, which will not result in significant impacts due to the minor extent of overlap and sectional working, the carrying capacity of the N77 national and short duration of overlap with other projects on the R432, including implementation of the Traffic Management Plan, any cumulative impacts to local traffic during the construction phases of the various grid connections is considered to be cumulatively **not significant**.

EIAR 18.5.1.4 Operational Phase Cumulative Impacts from increased noise and from shadow flicker

As stated in Chapter 10: Noise and Vibration, the noise assessment is cumulative as required by the Institute of Acoustics Good Practice Guidelines, in that Lisdowney Windfarm (operational) turbines are included in the predicted noise levels. Other wind farms, including Seskin WF (in-planning) are at too great a distance from the NSLs included in this assessment to have any cumulative noise effects. The potential Killoshulan Wind Farm was also considered for cumulative noise effects on local health and wellbeing, and the implementation of noise control modules and conditioned noise levels for the Killoshulan project will protect local health and wellbeing. As such, no further assessment is required and the potential effects on human health remain the same as in the main assessment (**minor adverse and not significant**).

In relation to cumulative shadow flicker, the developer commits to the installation of Shadow Flicker Modules on the turbines, to remain within the threshold limits set by An Coimisiún Pleanála, and to use this setting to eliminate shadow flicker from particular turbine/s should there be a complaint about shadow flicker effect from a residence within the 1360m Shadow Flicker Study Area (10-rotor diameters).

Therefore, the assessment for the secondary effects on health from the Noise and Shadow Flicker impact from the windfarm alone also apply to the cumulative assessment of Gathabawn Windfarm with the existing Lisdowney Wind Farm.

As stated in Chapter 11: Shadow Flicker, there is potential for 5 no. sensitive receptors to exceed the 2006 Guidelines of 30 minutes of shadow flicker per day in the cumulative scenario. However, no sensitive receptors would exceed the 30 hours or more of shadow flicker per year in the cumulative scenario. On this basis, and considering that shadow flicker modules will be installed in the turbines to automatically operate the turbines to limit the occurrence of shadow flicker to within the allowable levels or eliminate it completely at certain times, if so required, cumulative human health effects would be **negligible and not significant**.

Due to the transient nature of walkers and visitors to the area, cumulative impacts will be **Negligible and not significant**.

EIAR 18.5.1.5 Operational Phase Cumulative Impacts from changes to the visual environment

In Chapter 14: Landscape it is assessed that the cumulative landscape impact is considered to be medium but will vary somewhat depending on proximity, viewing angle and topography. The secondary impact on local population health will be subjective in nature and can be considered from a negative perspective – imposition of large infrastructure locally and/or a positive perspective – climate action. This is supported by research; McCunney *et al.* (2014) report that participants who have a negative attitude towards the visual effect of wind turbines on the landscape scenery report higher levels of annoyance to wind turbine noise.

Overall, while there is potential for dissatisfaction, and associated adverse impacts on wellbeing from the operational Gathabawn and Lisdowney wind farms, over time the wind turbines would become part of the landscape and any adverse perceptions are likely to improve. As a result, the secondary impact of the addition of large infrastructure to the landscape on local population health is negligible. **In the context of a low sensitivity population, there would be a negligible significance of effect.**

Due to the transient nature of walkers and visitors to the area, cumulative impacts will be **Negligible and not significant**.

EIAR 18.5.1.6 Operational Phase Cumulative Impacts due to Community Benefit Funds (positive)

When the Gathabawn Windfarm community benefit fund is considered together with the other renewable energy projects subject to RESS rules regarding these funds – i.e. Ballynalacken Windfarm (€280,000 p.a.) and Parksgrove Solar Farm (€50,000 p.a.), it is assessed as Moderate positive effect with more than €500,000 going into local communities every year to fund various projects and activities. These renewable energy community benefit funds, in addition with the payments of rates to the Local Authority (as per Ch.17) will contribute to the enhancement of amenities and facilities in the local area, which will have an **indirect minor positive** cumulative effect on community resources and sense of place over the long-term.

EIAR 18.5.1.7 Operational Phase Cumulative Impacts due to Climate Mitigation (positive)

The Proposed Gathabawn Windfarm is a Climate Mitigation project, and the largest positive effect of the Gathabawn Windfarm is the contribution to national Climate Mitigation targets due to an increase in Renewable Energy generation, Carbon Emission Offset and Energy Security. **The production of renewable energy has been evaluated as a Significant Positive impact in Chapter 12: Climate.**

Primary climate change impacts (e.g. increased temperatures, increased CO₂, sea level rise and increased extreme weather events) can affect several environmental functions (e.g. water availability, salinization, food production, wildfires, PM concentrations, property damage), which in turn have the potential to alter a range of health and outcomes.

On the basis that the Proposed Gathabawn Windfarm, along with the existing Lisdowney Wind Farm, and the existing Parksgrove Solar Farm and the consented Ballynalacken Windfarm would contribute to renewable energy infrastructure, evaluated as Significant Positive in Chapter 12 Climate, and that this Climate Mitigation together with other Climate Mitigation and adaptation measures implemented by individuals, businesses and governments, would cumulatively result in positive contributions towards national policy and global targets inherently linked to sustainability, health and wellbeing and is considered where International targets are met, that the impact to human health and wellbeing on global, national and local scale will be remain as **minor beneficial (not significant)** over the long term.

EIAR 18.5.2 Summary of Cumulative Evaluations

Overall, it is evaluated that **adverse cumulative impact to Human Health of the Gathabawn Windfarm cumulatively as a whole project and with Other Projects will be Not Significant.**

It is also evaluated that **positive cumulative impacts** to Human Health of the Gathabawn Windfarm cumulatively as a whole project and with Other Projects will be Minor Positive.

EIAR 18.6 SUMMARY CONCLUSION

LOCAL COMMUNITIES: The Proposed Gathabawn Windfarm alone and cumulatively with the Candidate Gathabawn Grid Connection will cause adverse as well as beneficial health and wellbeing effects to Local Communities.

During the construction of the Proposed Gathabawn Windfarm, adverse effects will not be significant, this is mainly due to the relatively small number of houses in the vicinity of the windfarm site and along construction haul routes, and the temporary nature of construction, with the reversibility of any impacts on air quality, ambient noise levels, access and enjoyment of the area by local walkers, or increased levels of construction traffic on local roads upon the completion of construction. The implementation of a road safety protocol for construction traffic will ensure that people using the local road networks are not significantly affected by HGV construction traffic. No effects to local water supplies are likely to occur, and there will be no significant adverse cumulative impacts with other projects during the construction of the Proposed Gathabawn Windfarm or the Candidate Gathabawn Grid Connection.

During the operation of the Proposed Gathabawn Windfarm, the potential for adverse effects to the health and wellbeing of local populations due to shadow flicker, noise, EMF, visual impact and safety risk were examined. The nearby Lisdowney Wind Farm was also taken into consideration in relation to cumulative noise and shadow flicker effects on local health and wellbeing. The potential Killoshulan Wind Farm was also considered for cumulative noise effects on local health and wellbeing. It was evaluated that with the implementation of mitigation measures for noise and shadow flicker (comprising control modules in the turbines), the extremely low levels of EMF combined with the separation from local dwellings and brief exposure to landowners, walkers and the general public over underground cables or right beside turbines, the rigorous safety checks imposed on the turbines during design and the implementation of health and safety control measures and risk assessments, that significant impacts will be avoided.

In relation effects on community resources - sense of place, due to the addition of large turbines in the Ballylehaun Area and in the Ballyring Area, the secondary impact on local population health would be subjective and very much dependent on attitudes towards onshore wind projects and renewable energy in general. While there is potential for dissatisfaction, over time the wind turbines would become part of the landscape – as the Lisdowney turbines have, over the last 10 years since they started operation, and therefore any adverse perceptions as a result of the Gathabawn turbines are likely to improve. As a result, the secondary impact of the addition of turbines to the landscape on local population health will not be significant.

The funding and implementation of an interactive cultural heritage database will positively contribute to the communities' sense of place and community resources, through the documentation and dissemination of their own community histories and folklore.

Other positive effects of the Proposed Gathabawn Windfarm include the annual Community Benefit Fund, which at c.€300,000 per annum, will have a beneficial effect on the local communities through the funding of various projects and activities which will enhance community amenities and facilities in the long term. As the community benefit fund will support a broad range of local projects, it is anticipated that associated benefits would directly and indirectly support physical, mental and social wellbeing through strengthening the local economy. Over the lifetime of the windfarm, the Community Benefit Fund will directly contribute c.€10 million to the local communities. This is evaluated as a minor beneficial effect to community wellbeing and way of life.

There would be a long-term positive impact on air quality during operation due to NO_x savings. However, as these benefits would be diffuse across the region/Ireland, the resultant effect on local population health would be negligible at a local level.

The Proposed Gathabawn Windfarm is a Climate Mitigation project, and the largest positive effect of the Gathabawn Windfarm is the contribute to national Climate Mitigation targets due to an increase in Renewable Energy generation, Carbon Emission Offset and Energy Security. Primary climate change impacts (e.g. increased temperatures, increased CO₂, sea level rise and increased extreme weather events) can affect several environmental functions (e.g. water availability, salinization, food production, wildfires, PM concentrations, property damage), which in turn have the potential to alter a range of health outcomes. On the basis that the Whole Gathabawn Windfarm Project would contribute to renewable energy infrastructure, evaluated as Significant Positive in Chapter 12 Climate, and that this Climate Mitigation together with Climate mitigation and adaptation measures implemented by individuals, businesses and governments, would cumulatively result in a positive change contributing towards national policy and global targets inherently linked to sustainability, health and wellbeing and is considered where International targets are met, that the impact to human health and wellbeing on global, national and local scale will be minor beneficial over the long term.

VISITORS TO THE AREA: The effect of the Proposed Gathabawn Windfarm on people visiting the area was examined and it was found that there would be no negative impacts on the health and wellbeing of visitors to the area due to the brief periods visitors would be in the area.

MITIGATION MEASURES: Measures to minimise the impact on Human Health include the adherence to Noise Control Standards, the implementation of Shadow Flicker Control Modules, the implementation of a Traffic Management Plan and the appointment of a Community Liaison Officer and Environmental Clerk of Works.

CLIMATE CHANGE: It is expected that climate change will continue to cause a worry to the majority of the population and increased demands to Government for Climate Action will be a continuing trend. Gathabawn Windfarm will produce approximately 150,000,000 kWh of renewable energy, aligning with the governments targets to accelerate actions to respond to the climate crisis.

Overall, it is evaluated that the impact of the Proposed Gathabawn Windfarm on Human Health, both alone and cumulatively as the Whole Gathabawn Windfarm Project, and cumulatively with Other Projects, will be Not Significant.

EIAR 18.7 Glossary, List of Abbreviations

Glossary of Terms

Term	Definition
Electoral Division (ED)	Defined by the CSO as the smallest legally defined administrative areas in the State for which Small Area Population Statistics are published from the Census. There are 3,440 legally defined in the State.
Gathabawn Windfarm	Twelve wind turbines are proposed for two areas – seven turbines in the Ballylehaun area and five turbines in the Ballyring area. In addition to the turbines and their hardstanding areas, the windfarm also includes site access roads, two Control Buildings; a met mast, underground cabling, temporary works to facilitate turbine deliveries, and other associated and ancillary works.
Candidate Gathabawn Grid Connection	Underground cabling between the Ballylehaun and Ballyring Areas (Ballylehaun-Ballyring UGC), underground cabling from the Ballyring Area (from Ballyring Control Building) to a new substation at Parksgrove (Ballyring-Parksgrove UGC), the Parksgrove Substation, and underground cabling from the substation to the existing Eirgrid Ballyragget Substation in Moatpark (Parksgrove-Moatpark UGC). The Candidate Gathabawn Grid Connection is not included as part of this Planning Application, it will be subject of a separate Planning Application, at a future date. The Candidate Gathabawn Grid Connection is considered in this EIA Report in order to facilitate the cumulative evaluation of the Whole Project.

List of Abbreviations

Abbreviation	Full Term
AM	Amplitude Modulation
CSO	Central Statistics Office
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Fields

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EIAR 18.9 List of Figures for Human HealthFIGURES (overleaf)

Figure 18.1	Locational Context of the Whole Gathabawn Windfarm Project
Figure 18.2	Local Residences and Community Facilities within the Air Quality, Noise and Vibration, Shadow Flicker and EMF Study Areas.
Figure 18.3	Local Water Supplies
Figure 18.4	Viewpoints and Local Amenities
Figure 18.5	Other Projects Scoped-In to the Human Health Cumulative Evaluations

EIAR 18.10 List of Appendices for Human HealthAPPENDICES (overleaf)

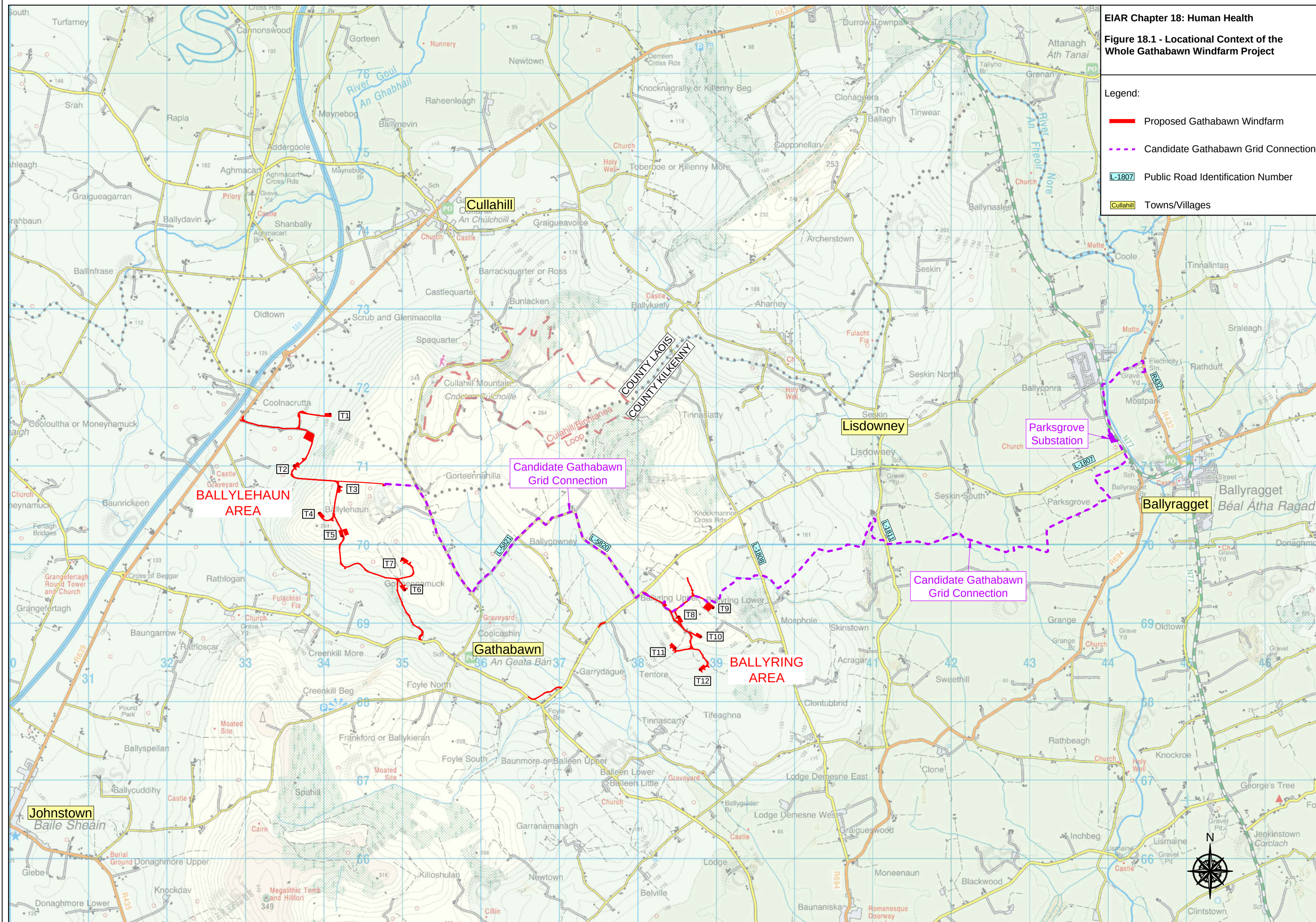
Appendix 18.1	Methodology for the evaluation of Human Health
Appendix 18.2	Human Health Baseline
Appendix 18.3	Explanation and Modelling of Electromagnetic Fields

Figures

Figure 18.1 - Locational Context of the Whole Gathabawn Windfarm Project

Legend:

- Proposed Gathabawn Windfarm
- Candidate Gathabawn Grid Connection
- Public Road Identification Number
- Towns/Villages



EIAR Chapter 18: Human Health

Figure 18.2 - Local Residences and Community Facilities within the Air Quality, Noise and Vibration, Shadow Flicker and EMF Study Areas

- Legend:
- Proposed Gathabawn Windfarm Construction Works Area
 - 250m Study Area from Proposed Gathabawn Windfarm Construction Works Area
 - Candidate Gathabawn Grid Connection Construction Works Area
 - 250m Study Area from Candidate Gathabawn Grid Connection Construction Works Area
 - Residential Properties within 2km of a Gathabawn Turbine
 - 2km Study Area
 - 1.6km Study Area
 - 50m Study Area
 - Local roads used by construction vehicles or delivery vehicles
 - Public Road Identification Number
 - Towns/Villages

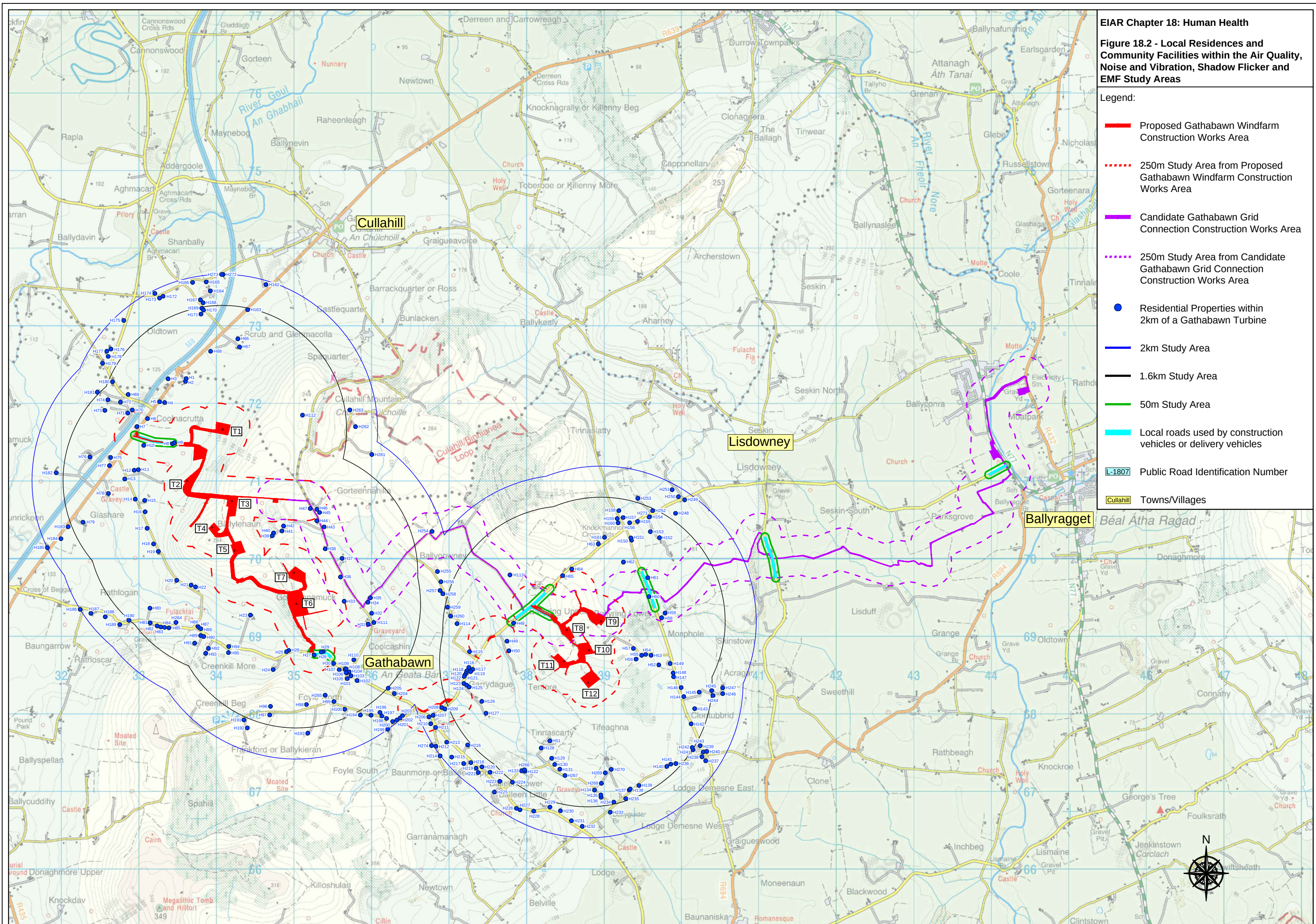
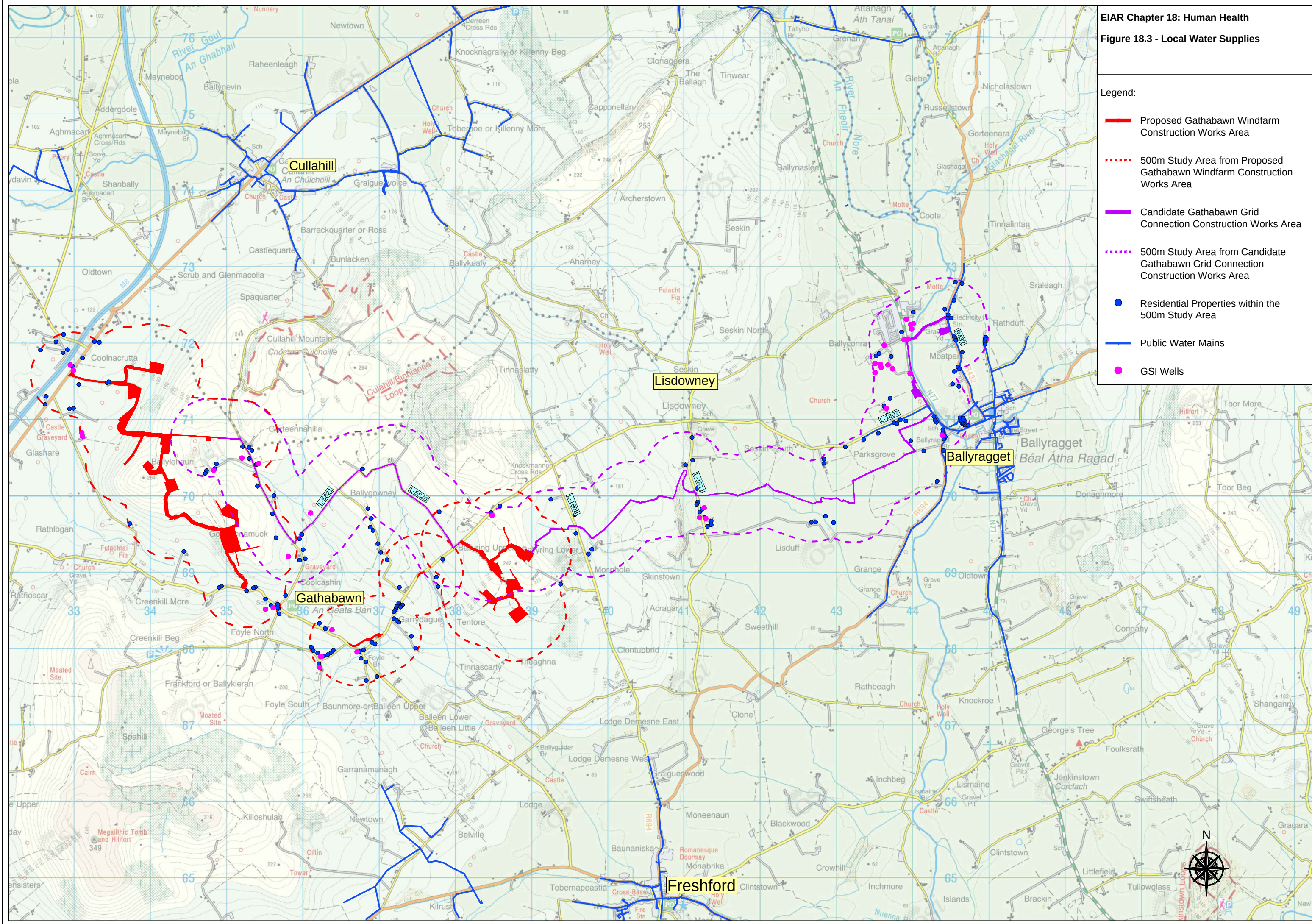
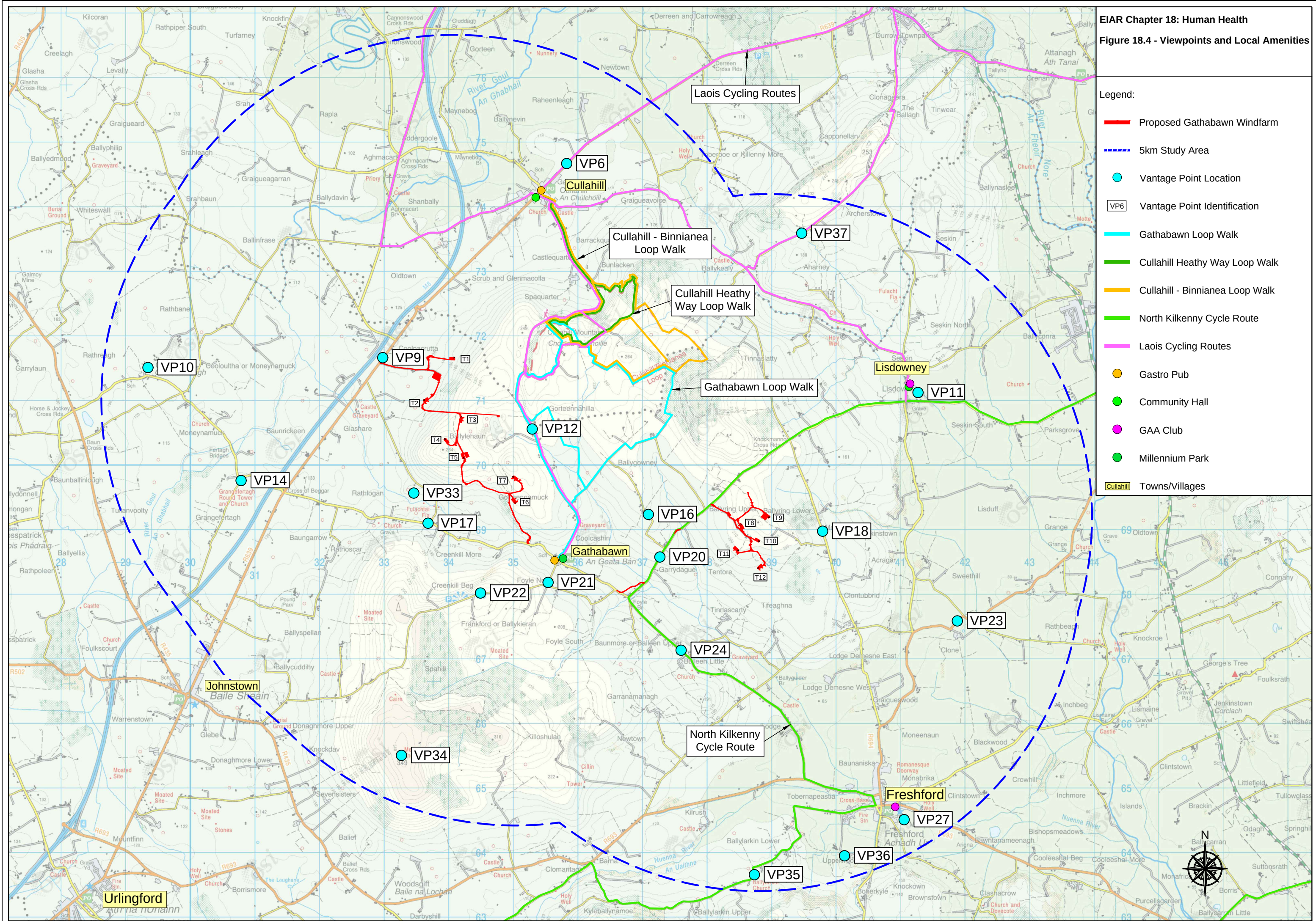


Figure 18-3 - Local Water Supplies

- Legend:
- Proposed Gathabawn Windfarm Construction Works Area
 - 500m Study Area from Proposed Gathabawn Windfarm Construction Works Area
 - Candidate Gathabawn Grid Connection Construction Works Area
 - 500m Study Area from Candidate Gathabawn Grid Connection Construction Works Area
 - Residential Properties within the 500m Study Area
 - Public Water Mains
 - GSI Wells



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 Figure 18.4 - Viewpoints and Local Amenities



Appendix to Chapter 18: Human Health

Appendix 18.1: Methodology for the evaluation of Human Health

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A18.1 Methodology Applied during the Preparation of Chapter 18: Human Health

A18.1.1 Methodology – Health Impact Assessment

The 'Scoping' section of the Manual on Health Impact Assessment Guidance states that health effects that are considered to be 'likely' and 'potentially significant' require further analysis and should be scoped in. Figure M11 sets out when an effect is 'likely' and 'significant', and is replicated below.

Figure M11. When is an effect likely and significant?

'Likely' health effects are those that, based on the scientific literature, have a *plausible* theoretical link between source-pathway-receptor, the occurrence of which in the relevant context is *probable* based on professional judgement.

'Significant' health effects are those that, based on professional judgement, are *important* (a positive or negative effect), highly *desirable* (a positive effect) or *unacceptable* (a negative effect) for population health with regards to changes triggered by the proposal in question.

Consistent with Figure M11, the Human Health assessment methodology follows a source-pathway-receptor model to identify and assess the potential human health effects that are plausible and directly attributable to the Gathabawn Windfarm.

As shown in the table below, a hazard source by itself does not constitute a health risk. It is only when there is a hazard source, a receptor and a pathway of exposure that there is any potential risk to human health. The same is true for potential health benefits, where a positive influence must be present alongside a pathway of exposure and a receptor for there to be a potential health improvement.

Where a source-pathway-receptor linkage exists, it is then the nature of the specific hazard source or positive influence; the magnitude of impact via the pathway of exposure; and the sensitivity of the receptor that will determine what level of health risk or benefit is predicted, if any.

Table 1: Source-pathway-receptor model

Source	Pathway	Receptor	Plausible health impact	Explanation
X	✓	✓	No	There is not a clear source from where a potential health impact could originate.
✓	X	✓	No	The source of a potential health impact lacks a means of transmission to a population.
✓	✓	X	No	Receptors that would be sensitive or vulnerable to the health outcome are not present.
✓	✓	✓	Yes	Identifying a source, pathway and receptor does not mean a health outcome is a likely significant effect; health impacts should be assessed (describing what effect will occur and its likelihood) and likely health effects are then evaluated for significance.

This has been applied in the context of the Gathabawn Windfarm through consideration of inter-related topics with the potential to have secondary impacts on Human Health. The results and key outputs from the following Chapters of this EIAR were examined:

- Chapter 8: Water (Water Supply)
- Chapter 9: Air Quality
- Chapter 10: Noise and Vibration
- Chapter 11: Shadow Flicker
- Chapter 12: Climate
- Chapter 14: The Landscape
- Appendix 18.3: Explanation and Modelling of EMF

The assessments included in the above inter-related Chapters of this EIAR provide an independent consideration of sensitivity of the receiving population and the magnitude of any change/impact. The Human Health chapter draws from and builds upon this analysis to determine whether the proposal has the potential to change ‘risks to human health’ in a way ‘likely’ to ‘significantly’ affect population health through consideration of population sensitivity and magnitude of change/impact in a human health and wellbeing context.

The **sensitivity of a population from a human health perspective** can be informed by some or all of the following: life stage; deprivation; health status; daily activities; inequalities; outlook; capacity to adapt; and/or resource-sharing with the project. Sensitivity is considered in relation to the general population and vulnerable groups. The criteria for defining sensitivity in this chapter are outlined in the table below.

Table 1: Sensitivity descriptors

Sensitivity	Description
High	High levels of deprivation (including pockets of deprivation); reliance on resources shared (between the population and the project); existing wide inequalities between the most and least healthy; a community whose outlook is predominantly anxiety or concern; people who are prevented from undertaking daily activities; dependants; people with very poor health status; and/or people with a very low capacity to adapt.
Medium	Moderate levels of deprivation; few alternatives to shared resources; existing widening inequalities between the most and least healthy; a community whose outlook is predominantly uncertainty with some concern; people who are highly limited from undertaking daily activities; people providing or requiring a lot of care; people with poor health status; and/or people with a limited capacity to adapt.
Low	Low levels of deprivation; many alternatives to shared resources; existing narrowing inequalities between the most and least healthy; a community whose outlook is predominantly ambivalence with some concern; people who are slightly limited from undertaking daily activities; people providing or requiring some care; people with fair health status; and/or people with a high capacity to adapt.
Very low	Very low levels of deprivation; no shared resources; existing narrow inequalities between the most and least healthy; a community whose outlook is predominantly support with some concern; people who are not limited from undertaking daily activities; people who are independent (not a carer or dependant); people with good health status; and/or people with a very high capacity to adapt.

Source: IEMA Guide to Determining Significance for Human Health in EIA

The **magnitude of change/impact from a human health perspective** can be informed by some or all of the following: exposure; scale; duration; frequency; severity; population extent; outcome reversal; and/or service quality implications. The criteria for defining magnitude of impact in this chapter are outlined in Table 3.

Table 2: Magnitude descriptors

Magnitude of impact	Description
High	High exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness/injury outcomes; majority of population affected; permanent change; substantial service quality implications.
Medium	Low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or major change in quality-of-life; large minority of population affected; gradual reversal; small service quality implications.
Low	Very low exposure or small scale; short-term duration; occasional events; severity predominantly related to minor change in morbidity or moderate change in quality-of-life; small minority of population affected; rapid reversal; slight service quality implications
Negligible	Negligible exposure or scale; very short-term duration; one-off frequency; severity predominantly relates to a minor change in quality-of-life; very few people affected; immediate reversal once activity complete; no service quality implication.

Source: IEMA Guide to Determining Significance for Human Health in EIA

The **significance of effect** is determined based on the sensitivity of a receptor and the magnitude of an impact. The method employed for this assessment is presented in Table 4. Where a range of significance levels are presented, the final assessment for each effect is based upon evidence based expert judgment. For the purposes of this assessment, any effects with a significance level of minor or less are not considered to be significant.

Table 3: Significance matrix

		Magnitude of impact			
		Negligible	Low	Medium	High
Sensitivity	Very low	Negligible	Negligible	Minor/negligible	Minor/negligible
	Low	Negligible	Minor	Minor	Moderate/minor
	Medium	Minor/negligible	Minor	Moderate	Major/moderate
	High	Minor/negligible	Moderate/minor	Major/moderate	Major

Source: IEMA Guide to Determining Significance for Human Health in EIA

Appendix to Chapter 18: Human Health

Appendix 18.2: Human Health Baseline

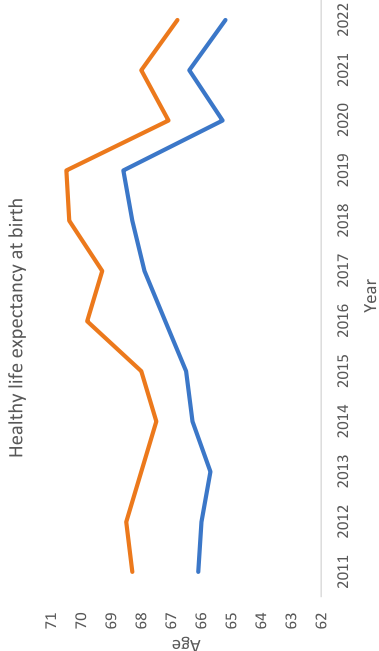
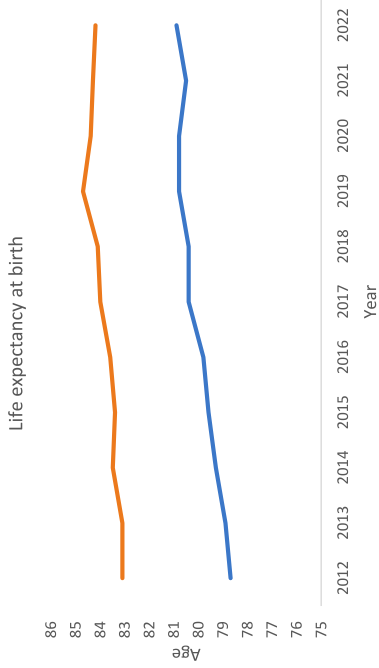
Appendix 18.2: Human Health Baseline

Introduction

Individuals and communities vary in their susceptibility to adverse and/or beneficial population and health impacts associated with changes in environmental and socio-economic conditions as a result of demographic structure (i.e. age); existing burden of poor health; behaviours and lifestyle choices that constitute risk factors; and socio-economic circumstance. The following information, which makes up this human health baseline, is intended to contextualise the local health circumstance of the communities surrounding Ballynalacken Windfarm using publicly available statistics. When feasible, data has been collected for the Electoral Divisions (ED) (i.e. Glashare, Balleen and Lisdowney) and were compared to the national average. County data (Kilkenny) or NUTS3 data (South-East) were utilised in instances where ED data were not available as a representative alternative.

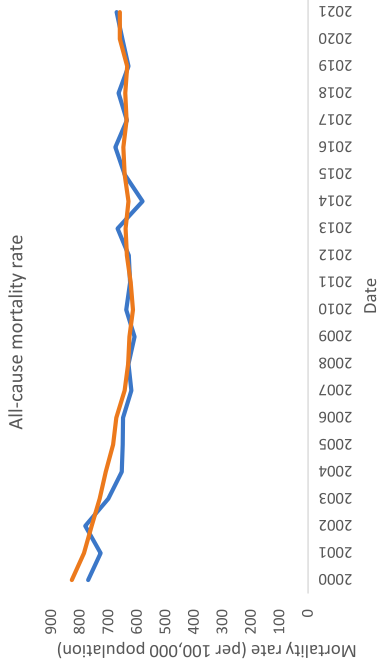
Life expectancy and physical health

Key

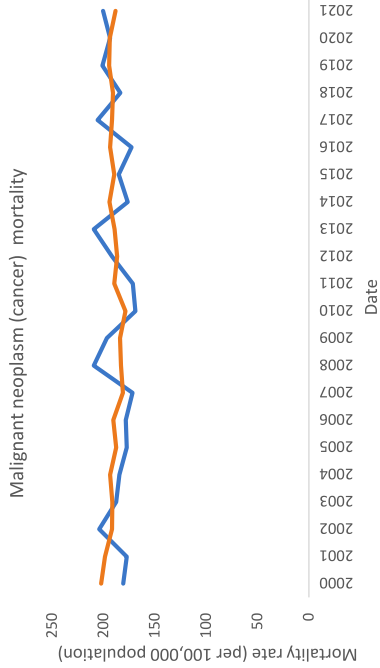


Source: Eurostat

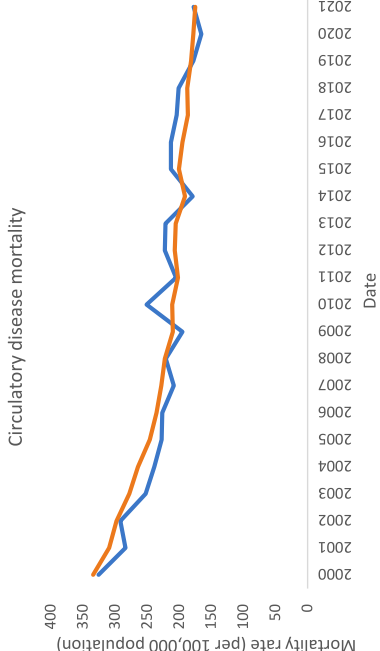
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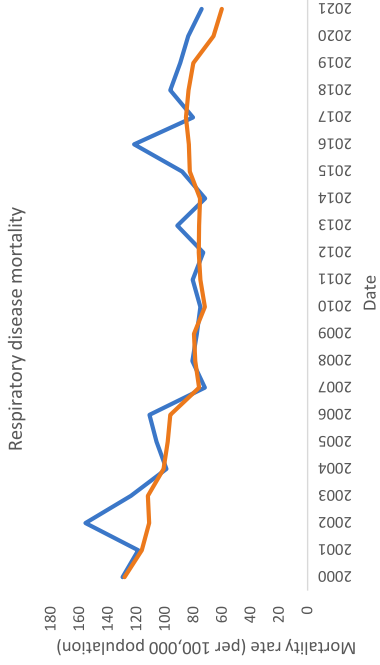
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Source: Statbank (DHA12)



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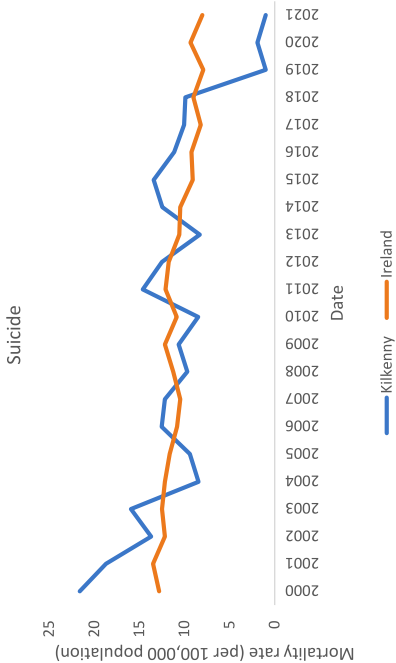
Life expectancy statistics are available for Ireland only. Both male and female life expectancy (LE) at birth have shown a general increase since 2012. Healthy life expectancy (HLE), which represents the number of years a person is in good health, also increased for both males and females since 2013 and 2014, respectively. Despite this, there was a decline in HLE between 2019-20 and 2021-22, which may be associated with the Covid-19 pandemic. Overall, female LE and HLE is consistently higher than for males.

All cause mortality rate in Kilkenny has fluctuated above and below the Ireland average since 2000, with most recent statistics showing a marginally higher all-cause mortality rate than nationally. Similar relationships can be seen when analysing specific causes of mortality (respiratory disease, circulatory disease and cancer). Consistent with national trends, mortality rate from respiratory disease and circulatory disease in Kilkenny have shown a general decrease over the years; mortality from all causes has also seen a general decrease over the years, which has plateaued in recent years; and mortality from cancer in Kilkenny has remained relatively static.

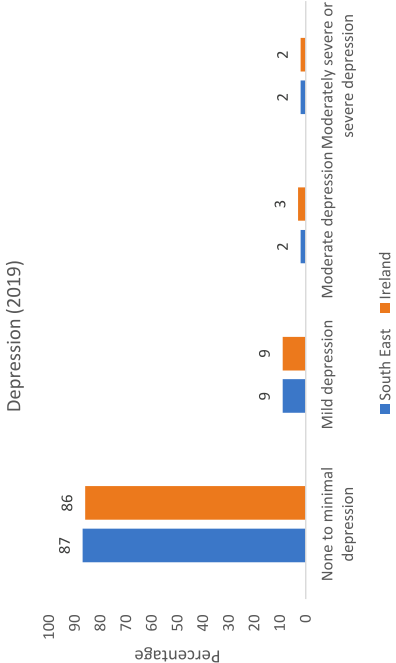
Mental health

The suicide rate in Kilkenny has fluctuated substantially over the years between 10-15 per 100,000 population and above/below the national average. In recent years (2019-21), suicide rate in Kilkenny has reduced to between 1-2 per 100,000 population, whereas the national average has remained fairly static at between 8-9 per 100,000 population.

Depression statistics are based on the data collected via The Irish Health Survey (IHS) conducted in 2019. The self-reported depression status reflects how respondents felt in the two weeks prior to the Survey. The depression rates among people aged 15 years and over are the same for the South East as are similar to the national average, with 1% more people in South East having none to minimal depression and 1% less people in South East having moderate depression. The proportion of the South East population experiencing mild or moderately severe/severe depression is the same as the

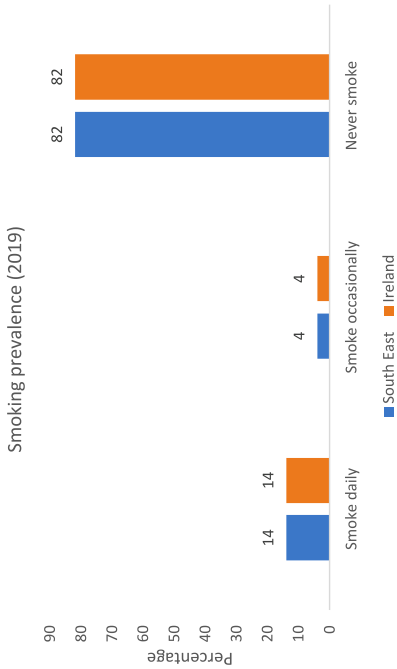


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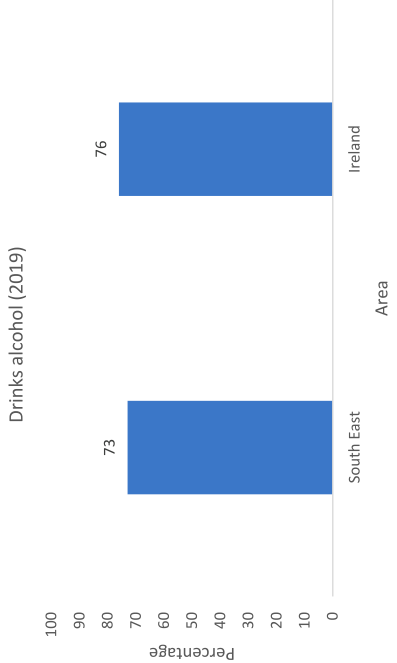


Source: Statbank (IH245 & IH243)

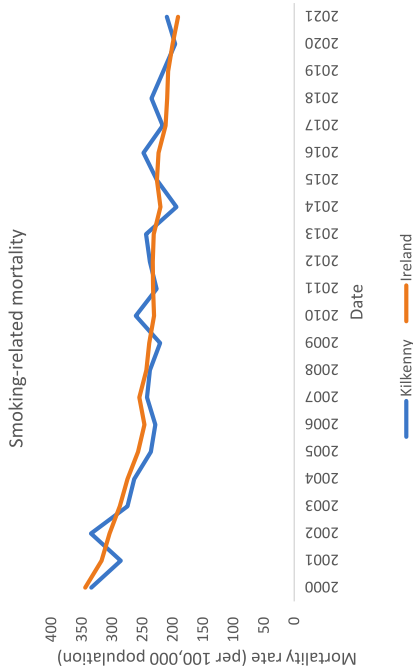
Lifestyle and behavioural factors



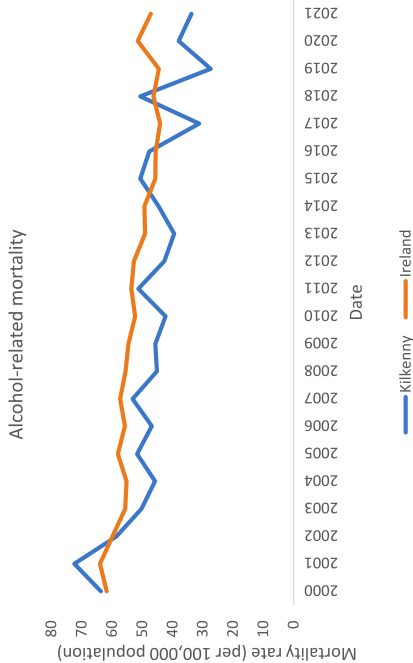
Source: Statbank (IH296 & IH298)



Source: Statbank (IH296 & IH298)



Source: Statbank (DHA12)



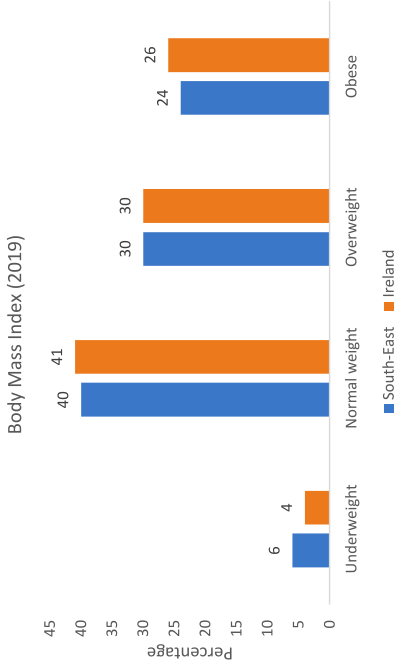
Source: Statbank (DHA12)

Source: Statbank (IH307 & IH309)

Smoking prevalence in the South East is the same as for the national average, with 14% of the population smoking on a daily basis, 4% smoking occasionally and 82% never having smoked. This is reflected in the smoking-related mortality statistics for Kilkenny, which show a general decrease over the years and fluctuation above and below the national average.

The proportion of the population who drink alcohol is 3% lower in the South East compared to the national average. Again, this is largely reflected in the alcohol-related mortality statistics for Kilkenny, which show a general decrease over the years and are more consistently below the national average.

The distribution of Body Mass Index across the South East shows that there is a higher proportion of people who are underweight than the national average. Comparatively, there is a lower proportion of people in the South East who are obese or normal weight. The proportion of people who are overweight in the South East is the same as the national average.



Conclusions

Overall, the population living within the study area have comparable physical health to the national average. Regarding mental health, levels of depression in the South East are comparable to the national average and in recent years, suicide rate is lower than the national average. Lifestyle and behaviour data shows lower levels of alcohol consumption and less obesity. Overall, the local health circumstance of the communities surrounding Ballynalacken Windfarm is similar to the national average, and therefore individuals are not considered to be more sensitive than average.

Appendix to Chapter 18: Human Health

Appendix 18.3: Explanation and Modelling of Electromagnetic Fields

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A18.3 Explanation and Modelling of Electromagnetic Fields

A18.3.1 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).

A18.3.2 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.

A18.3.2.1 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, extends

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 Gathabawn Windfarm Project EIA Report.

A18.3.2.2 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 A18.2.3 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 0.2 μT to 0.4 μT 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).

A18.3.3 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: Electric Fields measured from electrical power system infrastructure

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

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
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

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.

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 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 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 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.

A18.3.4 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 Gathabawn 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 modelled using the criteria outlined in Table 5, the results are summarized in Table 6.

Table 5: Criteria for modelling theoretical worst-case effects

Gathabawn Windfarm Project Element	Worse-Case Scenario Criteria
Proposed Gathabawn Windfarm	
Gathabawn Windfarm Turbines	The closest distance of a person to electrical parts – i.e. at ground level, right beside the turbines (0m distance)
Windfarm Cabling	The modelling is based on 33kV cables. The maximum capacity possible of these cables is 30MW, the associated electrical current of 525 Amps. The configuration of the cable design is the trefoil configuration. The minimum distance between the cables and the ground surface is 0.95m. At the Ballylehaun Control Building there are three cable sets routed adjacent to each other, into the Control Building, with a combined maximum of 31.5MW. 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
Windfarm Control Buildings	The Control Buildings which will collect the windfarm cabling 33kV cable circuits. The worst-case scenario EMF from the equipment is modelled from the Control Buildings external wall and is referred to throughout this report as the measurement of EMF at '0 meters'.
Candidate Gathabawn Grid Connection	
Parksgrove Substation	The closest piece of electrical apparatus from the Parksgrove 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'.
Underground Cabling (UGC)	The modelling is based on 33kV cables for the Ballylehaun-Ballyring UGC, 33kV cables for the Ballyring-Parksgrove UGC, and 110kV for the Parksgrove-Moatpark UGC. The maximum capacity possible of 33kV cables is 30MW, the associated electrical current of 525 Amps. The maximum capacity possible of 110kV cables is 170MW, the associated electrical current of 892 Amps The configuration of the cable design is the trefoil configuration for the Ballylehaun-Ballyring UGC and Parksgrove-Moatpark UGC and double trefoil for the Ballyring-Parksgrove UGC and the Parksgrove-Moatpark UGC. The minimum distance between the cables and the ground surface is 0.95m.

A18.3.4.1 Summary of Modelling Results

The results of this modelling (see Table 6 and Section A17.2.4.1 below) demonstrate that the electric field and magnetic field emissions from the Gathabawn Wind Turbines, Control Buildings, underground internal Windfarm Cabling, and from the Parksgrove substation and Underground Cabling for the Candidate Gathabawn Grid Connection will be at a level substantially less the ICNIRP limit of 5000 V/m and 100 μ T respectively. Furthermore, the magnetic field levels will rapidly dissipate with increasing distance from the source.

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

Project Element	Electric Fields	Magnetic Fields
Proposed Gathabawn Windfarm		
Gathabawn Windfarm 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.
Windfarm Cabling	The electric fields generated by the underground cables will be <u>completely screened</u> 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 Windfarm Cables, the maximum level of the magnetic fields, generated by the underground cables, will be 4.105μT
Windfarm Control Buildings	Electric fields will be very low due to the shielding which will be provided by the extensive metalwork within the control buildings, 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 buildings, 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.
Candidate Gathabawn Grid Connection		
Parksgrove Substation	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. 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 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 1μT.
Underground Cabling (UGC)	The electric fields generated by the underground cables will be <u>completely screened</u> 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.	33kV Cables: Directly above the double trefoil 33kV cables, the maximum level of the magnetic fields, generated by the underground cables, will be 6.256μT 110kV Cables: Directly above the single trefoil 110kV cables the maximum possible level of the magnetic fields, generated by the underground cables, will be 7.265 μT

A18.3.5 Worst Case EMF emissions from the Gathabawn 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 Gathabawn 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 Gathabawn Windfarm

Gathabawn Windfarm	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m) ⁴	Worst Case Electric Field Contribution from the project (V/m)	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m) ⁵	ICNIRP Guideline Limit (V/m)
Proposed Gathabawn Windfarm					
Gathabawn Wind Turbines (4.5MW)	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 Cabling (underground circuits) 33kV	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 Buildings (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
Candidate Gathabawn Grid Connection					
Parksgrove Substation (110kV)	0m	less than 1	40	41	5000
	30m	less than 10	20	30	5000
	100m	less than 20	less than 1	21	5000
Underground Cabling (underground double 33kV and 110kV circuits)	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 Gathabawn Windfarm

Gathabawn Windfarm	Distance from operational electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (μT)	Worst Case EMF Contribution from the Gathabawn Windfarm Grid Connection (μT)	Predicted Worst Case Ambient EMF levels during the operation stage (μT)	ICNIRP Guideline Limit (μT)
Proposed Gathabawn Windfarm					
Gathabawn Wind Turbines (4.5MW)	0m	0.01	0.2	0.4	100
	30m	0.01	0.07	0.27	100
	100m	0.01	0.07	0.27	100
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 Buildings (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
Candidate Gathabawn Grid Connection					
Parksgrove Substation	0m	0.01	1	1.05	100
	30m	0.01	0.4	0.42	100
	100m	0.01	0.16	0.23	100
Ballylehaun-Ballyring Underground Cabling (underground 33kV circuit)	0m	0.01	3.213	3.223	100
	30m	0.01	0.016	0.017	100
	100m	0.01	0.001	0.011	100
Ballyring – Parksgrove Underground Cabling (underground double 33kV circuit)	0m	0.01	6.256	6.266	100
	30m	0.01	0.31	0.32	100
	100m	0.01	0.003	0.013	100
Parksgrove – Moatpark UGC (underground 110kV)	0m	0.2	7.265	7.465	100
	30m	0.2	0.039	0.239	100
	100m	0.2	0.004	0.204	100

A18.3.6 Worst Case EMF emissions from Other Projects

In order to facilitate a cumulative assessment a study area of 200m has been applied to the electrical parts of the Whole Gathabawn Windfarm Project.

There are no Other Projects within 200m of the Proposed Gathabawn Windfarm Turbines, the internal Windfarm Cabling or the Windfarm Control Buildings.

The potential for cumulative EMF only relates to the Candidate Gathabawn Grid Connection, and the following electricity based Other Projects (existing or consented) are relevant:

- Farranrory WF Grid Connection - existing 110kV underground cabling. The Candidate Gathabawn Grid Connection double 33kV circuit cross will cross over the Farranrory cables at the crossing point of the L1811, and is adjacent to this circuit at the Pinewood Substation.
- Parksgrove SF Grid Connection – existing 38kV underground cabling. The Candidate Gathabawn Grid Connection double 110kV circuit crosses over the Parksgrove cables in the verge along the N77 road. (the Parksgrove cables were installed under the N77 and River Nore by drilling technique at this location)
- Briskalagh WF Grid Connection – consented 110kV underground cabling. The Candidate Gathabawn Grid Connection double 110kV circuit will cross over the Seskin cables in agricultural lands beside the N77.
- Seskin WF Grid Connection – proposed 110kV underground cabling. The Candidate Gathabawn Grid Connection double 110kV circuit will cross over the Seskin cables in agricultural lands beside the N77.
- Ballynalacken WF Grid Connection – consented 110kV underground cabling. The Candidate Gathabawn Grid Connection double 110kV circuit will be routed alongside the Ballynalacken cables on the Regional Road R432.

Worst case scenario's are modelled to reflect the potential for combined EMF with other projects locally:

1. Crossing of a single 110kV trefoil circuit (Farranrory) with the double 33kV trefoil circuit associated with the Gathabawn Ballyring-Parksgrove UGC.
2. Crossing of a single 110kV trefoil circuit (Farranrory/Parksgrove/Briskalagh/Seskin) with the 110kV trefoil circuit associated with the Gathabawn Parksgrove-Moatpark UGC.
3. Up to four sets of 110kV cables installed in the public road or the verge side by side, as a result of the Ballynalacken (single trefoil), Briskalagh (single trefoil) and Gathabawn (single trefoil) cables on the R432.

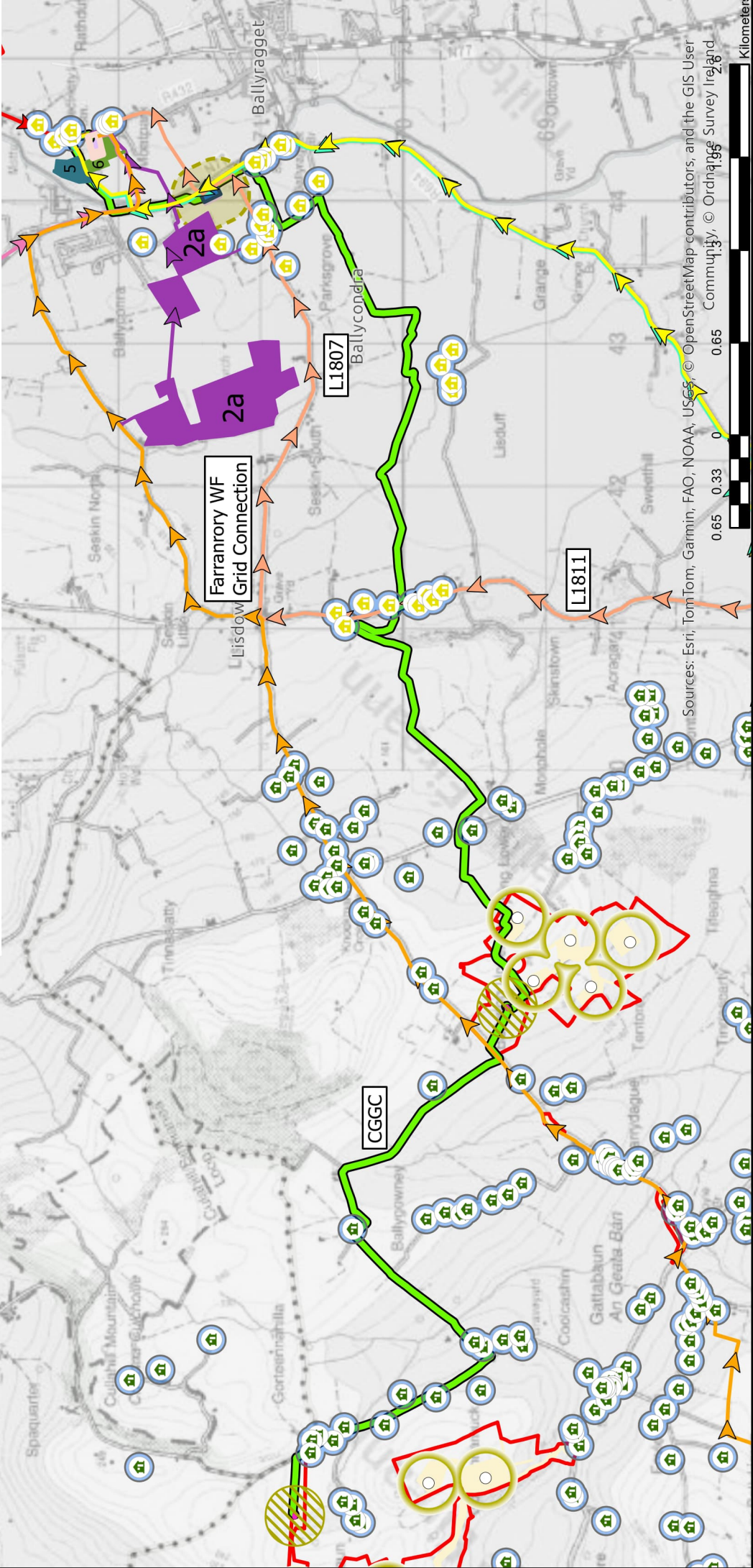
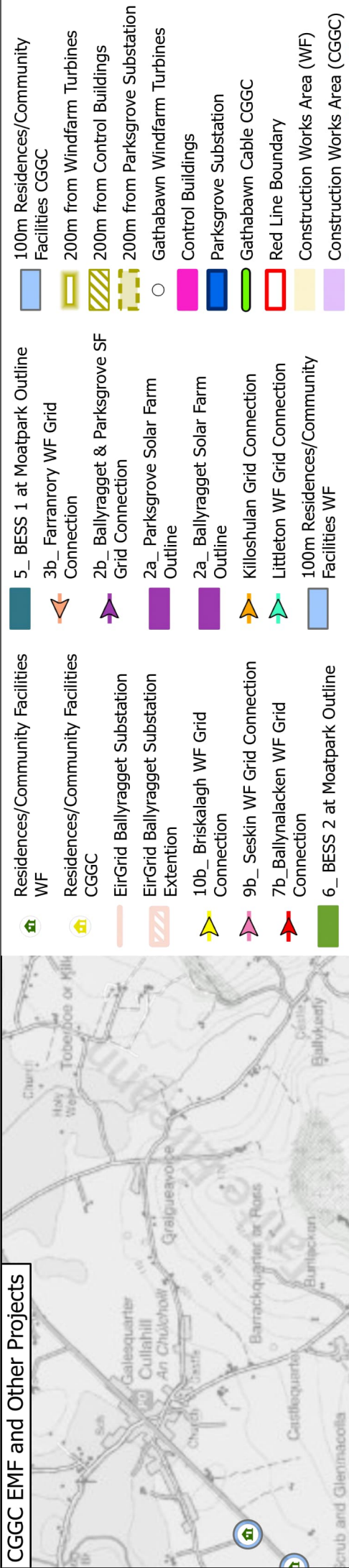
Only magnetic fields are presented below as there is no electric field above ground level for underground cables (associated with the Other Projects), as the soil, earth materials and metallic sheath, which surrounds each cable, removes the potential for cumulative electric fields effects outside the cable.

The cumulative EMF is measured from the crossing point of the cables – i.e. the 0m distance. For Scenario 3, the cumulative EMF is measured from the centre of the road.

Table 9: Cumulative ambient magnetic fields (worst case scenario)*(relevant to the Candidate Gathabawn Grid Connection only)*

Candidate Gathabawn Grid Connection	Distance from operating electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (μT)	Worst Case EMF Contribution from the Gathabawn Grid Connection (μT)	Predicted Worst Case Ambient EMF levels during the operation stage (μT)	ICNIRP Guideline Limit (μT)
Scenario 1 – Ballyring-Parksgrove double 33kV circuit crossing point of the Farranrory WF 110kV UGC					
Crossing point of double 33kV UGC with single 110kV UGC	0m	3.079	6.256	9.335	100
	25m	0.024	0.045	0.069	100
	50m	0.006	0.011	0.017	100
	75m	0.003	0.005	0.008	100
	100m	0.001	0.003	0.004	100
Scenario 2 – Parksgrove-Moatpark 110kV circuit crossing point with other 110kV UGCs					
Crossing point of 110kV UGC with single 110kV UGC	0m	3.079	6.017	9.096	100
	25m	0.024	0.056	0.08	100
	50m	0.006	0.014	0.02	100
	75m	0.003	0.006	0.009	100
	100m	0.001	0.004	0.005	100
Scenario 3 – Ballyring-Parksgrove Ballynalacken, Briskalagh and Gathabawn WF 110kV UGC					
Centre of the road over 110kV UGC associated with Ballynalacken, Briskalagh and Gathabawn	0m	6.158	6.017	12.175	100
	25m	0.048	0.056	0.104	100
	50m	0.012	0.014	0.026	100
	75m	0.006	0.006	0.012	100
	100m	0.002	0.004	0.006	100

CGGC EMF and Other Projects



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, OpenStreetMap contributors, and the GIS User Community, © Ordnance Survey Ireland 2019

Kilometers

Ballyragget Area EMF and Other Projects

