

Proposed Gathabawn Windfarm

Environmental Impact Assessment Report

Chapter 16: Material Assets



September 2026

Table of Contents

CHAPTER 16 MATERIAL ASSETS	16-4
EIAR 16.1 INTRODUCTION	16-4
EIAR 16.1.1 Competent Experts	16-4
EIAR 16.1.2 Sources of Information	16-5
EIAR 16.1.3 Methodology Used.....	16-5
EIAR 16.1.4 Statement on Certainty and Sufficiency of Information Provided	16-6
EIAR 16.1.5 Development being Considered	16-6
EIAR 16.2 SENSITIVE ASPECTS	16-7
EIAR 16.2.1 Overview of Material Assets in the Local Environment.....	16-7
EIAR 16.2.2 Zone of Influence/Study Areas.....	16-8
EIAR 16.3 BASELINE ENVIRONMENT	16-9
EIAR 16.3.1 Context and Characteristics of the Public Road Network.....	16-9
EIAR 16.3.2 Context and Characteristics: Telecommunications Networks and Aviation.....	16-17
EIAR 16.3.3 Existing Sources of Impacts.....	16-20
EIAR 16.3.4 Importance, Sensitivity and Vulnerability to Change	16-20
EIAR 16.3.5 Evolution of the Baseline Environment (the ‘Do-Nothing’ scenario)	16-21
EIAR 16.3.6 Relevance of Climate Change to Material Assets	16-22
EIAR 16.4 IMPACT OF THE PROPOSED DEVELOPMENT.....	16-23
EIAR 16.4.1 Criteria and Methodology.....	16-23
EIAR 16.4.2 Source-Pathway-Receptor	16-23
EIAR 16.4.3 Overview of the impacts to Material Assets.....	16-24
EIAR 16.4.4 Impacts to Public Road Netwok and Local Built Services -Not Significant.....	16-26
EIAR 16.4.5 Impacts to Telecommunication Networks and Aviation.....	16-36
EIAR 16.4.6 Summary of Impacts	16-39
EIAR 16.4.7 Environmental Protection Measures	16-39
EIAR 16.5 CUMULATIVE EFFECTS WITH OTHER PROJECTS.....	16-40
EIAR 16.5.1 Evaluation of Cumulative Impacts with Other Projects.....	16-41
EIAR 16.5.2 Summary of Cumulative Evaluations	16-42
EIAR 16.6 SUMMARY CONCLUSION	16-43
EIAR 16.7 Glossary, List of Abbreviations.....	16-45
EIAR 16.8 Reference List.....	16-46
EIAR 16.9 List of Figures	16-47
EIAR 16.10 List of Appendices	16-47

List of Figures

Figure No.	Figure Title	Location
Figure 16.1	Local Roads and Site Entrances along Windfarm Construction Access Routes	End of this Chapter
Figure 16.2	Turbine Delivery Route	End of this Chapter
Figure 16.3	OHL ESBN/Eirgrid and Eir Networks and Uisce Éireann Water Mains	End of this Chapter
Figure 16.4.1	Other Projects Scoped-In for Material Assets Cumulative Evaluations	End of this Chapter
Figure 16.4.2	Other Projects Scoped-In for Material Assets Cumulative Evaluations	End of this Chapter

List of Appendices

Appendix No.	Appendix Title	Location
Appendix 16.1	Methodology for the evaluation of Material Assets	End of this Chapter
Appendix 16.2	Traffic and Transport Assessment	End of this Chapter
Appendix 16.3	Telecommunication Impact Assessment	End of this Chapter
Appendix 16.4	Aviation Review Statement	End of this Chapter

CHAPTER 16 MATERIAL ASSETS

EIAR 16.1 INTRODUCTION

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 building, 7 site entrances, newly created Biodiversity Area 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 **Whole Gathabawn Windfarm Project** also includes the grid connection to the national electricity system. Although the final grid connection point is subject to a separate grid connection process with Eirgrid, a candidate grid connection to the closest connection point at Eirgrid Ballyragget Substation, has been identified, and the baseline for this area is also described to facilitate the evaluation of the cumulative whole project impact. The Candidate Gathabawn Grid Connection comprises 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).

EIAR 16.1.1 Competent Experts

The evaluation of Material Assets was carried out by Angeliki Kalatha of ORS. Kevin Hayes of Ai Bridges was a contributor to the evaluation of Material Assets.

Public Roads and Road Users, Electricity system, landline telephone network, water supply pipes and wastewater pipes: Angeliki Kalatha holds an MSc in Civil Engineering from Aristotle University of Thessaloniki (AUTH), 2014, and an MSc in Engineering Project Management from AUTH, 2016. She is a member of Engineers Ireland and the Technical Chamber of Greece. Angeliki is a Senior Transportation Engineer with ORS, bringing nine years of professional experience in transportation and infrastructure development.

Telecommunication network links and aviation: Kevin is a senior radio planner / engineer with Ai Bridges and holds an M.Eng. , B.Eng. in Communications & Electronic Engineering with over 30 years of experience in telecommunications network design, telecommunications software modelling services radio and roll-out of turnkey solutions for telecommunication projects. Ai Bridges is a leading supplier of telecommunications software prediction modelling solutions and services for the Renewable industry sector and also provide comprehensive turnkey solutions and have extensive experience and knowledge of network design, implementation and deployment of telecommunications software solutions.

EIAR 16.1.2 Sources of Information

In order to gather information on the baseline environment, the following sources were considered:

Table 16-1: Sources of Baseline Information for Material Assets

Consultation Sources
Uisce Éireann, ESBN, EIR, Transport Infrastructure Ireland Three Ireland, Vodafone, 2RN, An Garda Síochána, Coimisiún na Meán, BT Ireland, CIE, Eir, Enet, ESBN, Imagine Broadband, Uisce Éireann, Kilkenny County Council, Tetra Ireland, Three Ireland, Viatel, Virgin Media.
Desktop Sources
• Review of Uisce Éireann Services Mapping • Review of Eir Mapping • Review of ESBN Existing Asset Database • Review of EirGrid Functional Specifications • Review of Gas Networks Ireland Mapping • Modelling of junctions using the Transport Research Laboratory software <i>Junctions11</i> (PICADY) • 3D Modelling of turbines and microwave radio links, utilizing GIS data (topography and morphology) • Radio Path Profile and Radio Link Budget Analysis of microwave radio links
Fieldwork
• Surveys for any existing underground services and overhead lines within 20m of Gathabawn Windfarm works areas (EDL, 2026) • Passing Traffic Volume Data collection and assessment (ATC Tube Counts), (EDL, 2026) • Survey of Buried Structures (EDL, 2020, 2025) • Survey of telecom masts

EIAR 16.1.3 Methodology Used

The evaluations for Material Assets herein have been carried out in accordance with the EPA guidance document *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2022), along with the ARVI approach for impact significance assessment developed under the EC IMPERIA LIFE11 Project. 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 16.1: Methodology for the evaluation of Material Assets](#). The author's extensive experience with EIA preparation and material assets 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 16.1](#).

EIAR 16.1.4 Statement on Certainty and Sufficiency of Information Provided

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

Roads & Built Services: The information which informed the baseline descriptions and impact evaluations was collated from data and maps (mapped water mains, overhead lines and underground cables etc) which were obtained through consultation with the service owners, i.e. Eir, ESBN, Irish Water etc. In all cases the most recent data and publications are relied upon.

The information which informed the baseline descriptions and impact evaluations was collated from site visits and surveys of the local and regional road network including buried structures, carried out between 2020 and 2026. No significant limitations or difficulties were encountered.

Telecoms and Aviation: The information which informed the baseline descriptions and impact evaluations for airborne telecommunication signals was collated from field and desktop surveys of masts and signal paths in the area and through consultation with telecom operators. No significant limitations or difficulties were encountered.

Overall, no material limitations or difficulties were encountered during the course of the studies carried out to inform the assessment of impacts of the Gathabawn Windfarm Project on Material Assets.

EIAR 16.1.5 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 16.2 SENSITIVE ASPECTS

EIAR 16.2.1 Overview of Material Assets in the Local Environment

EIAR 16.2.1.1 Roads and Built Services Environment

The existing roads environment in the vicinity of the proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection consists for most of the part of lightly trafficked local roads, generally bounded by hedgerows or low roadside embankments. There are a small number of buried structures (mainly pipe culverts and one existing masonry bridge along the Ballylehaun-Ballyring UGC route) under the local road network. The National Road N77 (Portlaoise-Durrow-Ballyragget-Kilkenny) crosses the wider study area and provides the main strategic route to the site with the Regional Road R639 (Durrow-Johnstown) providing access to the Ballylehaun Area and the Regional Road R432 (Ballyragget-Ballinakill) serving the Parksgrove-Moatpark grid connection route near the EirGrid Ballyragget Substation. The villages of Gathabawn and Lisdowney lie directly on the construction access routes.

Built services in the area are mainly made up of low and medium voltage overhead electricity lines connecting local residences and farms, with high voltage transmission lines present in the vicinity of the EirGrid Ballyragget Substation associated with the Candidate Gathabawn Grid Connection. There are no Uisce Éireann water/wastewater services, Group Water Schemes or national gas supplies in close proximity to the Proposed Gathabawn Windfarm site itself, though Uisce Éireann and Gas Networks Ireland infrastructure is present within the Parksgrove/Moatpark area along the Candidate Gathabawn Grid Connection route (see Other Local Built Services Section 16.3.1.2 below).

EIAR 16.2.1.2 Telecommunications and Aviation Environment

Telecommunication networks relate to the radio telecommunications signals to and from and between telecommunication masts which provide wireless services to private, public and commercial users.

Telecommunication masts in the vicinity of the Proposed Gathabawn Windfarm include Ballyspellan Mast to the southwest of the Ballylehaun turbines on Spa Hill, and Tinnaslatty Mast to the north of the Ballyring turbines on Cullahill Mountain. Telecom Masts in the wider surrounding area include masts at Oldglass and Springfield to the north, and Freshford to the southeast.

There are also two small broadband masts at the Gathabawn Windfarm site – one at Ballylehaun and one at Ballyring, which are likely providing broadband services locally.

In relation to airport communications, there are no airports close to the proposed Gathabawn Windfarm site – Waterford, Shannon, Dublin and Cork Airports are 68km, 96km, 110km and 125km from the windfarm site respectively.

There are no local airfields or helipads within 10km of the turbines. There are four airfields/heliports between 10km and 20km from the proposed windfarm – Kilkenny Airfield, Moyne Airfield, Midlands Heliport and Abbeylax Airfield.

EIAR 16.2.2 Zone of Influence/Study Areas

The area or zone of influence around the proposed Gathabawn Windfarm Project within which 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 Material Assets environment are set out in the table below.

Table 16-2: Study Area of the Project in relation to sensitive aspects of the Material Assets environment

Sensitive Aspect	Zone of Influence/Study Area	Justification for the Study Area extent
Public Roads Road Users	The Study Area in this case are the Regional Roads and Local Roads used during the material and turbine component transportation	Public road pavements may be affected by roadworks and concentrated traffic. Road boundaries may be affected by site entrance work. Road Users using public roads subject to site access points or concentrated construction traffic may be affected by construction traffic movements associated with the development. Road Users along on public roads remote from the Project, or along national or regional roads or those who have acceptable alternative routes are not likely to be affected.
Local Built Services	Underground and overhead services within 10m of the boundary of construction works.	Potential for direct physical damage to the service during construction works and loss of services to local residences, businesses and community facilities connected to these services. The study area of 10m allows for local built services which may be located within the reach of an excavator.
Electricity Transmission & Distribution System	National electricity network within 10m of construction works, and proposed connection point of the grid connection associated with the windfarm	Potential direct contact with overhead lines during construction. Potential to disrupt, enhance or strengthen the national electricity network
Telecommunications Signals and Networks	This study area boundary, together with the telecoms signals and services emanating from mast-site infrastructure identified during the telecom operator consultations, constitutes the assessment area.	Telecommunication radio networks that operate in the environs of the proposed development site may be impacted by the erection of the Gathabawn Windfarm turbines. (e.g. the radio path of a Point-to-Point microwave radio link could be obstructed by a wind turbine, causing interference.)
Aviation	This airspace in the vicinity of Gathabawn, constitutes the assessment area. As part of the study, the aeronautical network infrastructure (aerodromes, radar sites, NAVAIDs, etc.) that are used to manage aviation activities in the vicinity of the proposed development have also been considered.	Based on professional judgement and experience from previous Aviation Assessments for wind farm developments throughout Ireland.

EIAR 16.3 BASELINE ENVIRONMENT

The context and characteristics of the baseline environment, and the trends and evolution thereof, in relation to *Public Roads, Road Users, Local Built Services, Electricity Transmission & Distribution System, Telecommunication Networks and Aviation* 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 16.1: Local Roads and Site Entrances along Windfarm Construction Access Routes

Figure 16.2: Turbine Delivery Route

Figure 16.3: OHL ESNB/Eirgrid and Eir Networks and Uisce Éireann Water Mains

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

Appendix 16.2: Traffic and Transport Assessment

Appendix 16.3: Telecommunication Impact Assessment Report

Appendix 16.4: Aviation Review Statement

EIAR 16.3.1 Context and Characteristics of the Public Road Network

EIAR 16.3.1.1 Public Roads along site access routes

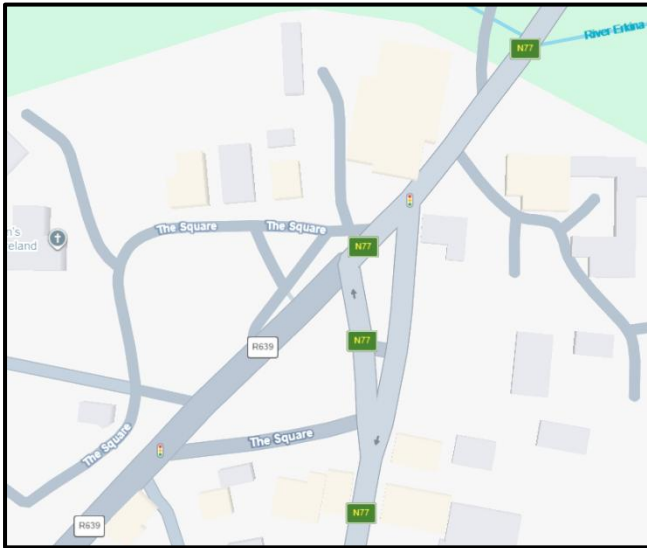
Proposed Gathabawn Windfarm: The Regional Road R639 and Local Road L58141, and the local roads L1803, L5818, L1804, L1806, L18062 and L1807 will be used to gain access to the Proposed Gathabawn Windfarm site from the National Road N77 via the junctions with the R639 at Durrow and with the L1807 at Parksgrove. These roads are identified on [Figure 16.1: Local Roads and Site Entrances along Windfarm Construction Access Routes](#).

Candidate Gathabawn Grid Connection will be accessed from the L1807, L1811, L1806, L1808, L18062, L5820, L5821, L5818 and L1804 local roads.

EIAR 16.3.1.1.1 National Road N77

The N77 National Secondary Road extends from Portlaoise, in the northwest, to Kilkenny City, in the southeast, via Durrow and Ballyragget. In the vicinity of the Proposed Gathabawn Windfarm, the N77 provides the principal strategic route serving both project areas: construction traffic for the Ballylehaun Area leaves the N77 at its junction with the R639 in Durrow (Junction 1 J1, N77/R639/The Square), while construction traffic for the Ballyring Area, and traffic associated with the Candidate Gathabawn Grid Connection, leaves the N77 at its junction with the L1807 at Parksgrove (Junction 7 J7, N77/L1807). Both junctions were the subject of manual turning-movement surveys and detailed junction capacity assessment – see [Appendix 16.2: Traffic and Transport Assessment](#). See [Figure 16.1: Local Roads and Site Entrances along Windfarm Construction Access Routes](#).

The N77/R639/The Square junction (Junction J1) is located in Durrow town centre, where the N77 which passes through the town linking Portlaoise to the northwest with Ballyragget and Kilkenny City to the southeast, meets the R639 (Durrow-Johnstown Road) and The Square. The junction is priority-controlled and four-armed, with the N77 forming the major through-route and the R639 and The Square arms each give-



way controlled onto it. The R639 joins from the west, directly opposite a landscaped green fronting a terrace of shops and businesses, forming a triangle with the two separate N77 lanes to the south; The Square forms the fourth arm serving on-street parking and the adjoining commercial premises. This is the busiest of the seven junctions surveyed, with the N77 through-movement and the R639 movement together carrying the great majority of traffic; The Square carries a comparatively small proportion. The junction has been assessed in detail using Junctions11 (PICADY) modelling, see Section 16.8.3 in [Appendix 16.2](#).

The N77/L1807 junction (Junction J7) is located at Parksgrove, where the L1807, the local road serving



Lisdowney, the Ballyring Area of the Proposed Gathabawn Windfarm, and the Parksgrove Substation of the Candidate Gathabawn Grid Connection, and which also carries the North Kilkenny Cycle Route, meets the N77. The junction is a priority-controlled, three-arm T-junction: the N77 forms the major through-route, running immediately alongside a watercourse on its eastern side, while the L1807 forms the single minor arm, joining from the west and controlled by a give-way marking with a widened paved mouth onto the N77. The N77 has a typical wide single carriageway with hard shoulder markings. The N77 through-movement is overwhelmingly dominant at this

junction; the L1807 carries a comparatively small proportion of traffic. The junction has been assessed in detail using Junctions11 (PICADY) modelling, including a cumulative Windfarm and Grid Connection scenario, given the L1807 also carries traffic to the Candidate Gathabawn Grid Connection, see Section 16.8.4 in [Appendix 16.2](#).

EIAR 16.3.1.1.2 Local Road L58141



The L58141 is a local road branch off the R639 regional road, generally travelling from east to west and measuring approximately 3.5 to 4.5 metres in width. It serves as the primary municipal access route to the Proposed Gathabawn Windfarm (Ballylehaun Area) via Site Entrances No.1 and No.2, and is the principal materials haul route and turbine/abnormal load delivery route to this area, see **Figure 16.2: Turbine Delivery Route**. There is a small number of properties along the section used by Windfarm traffic.

While there are several straight sections along the L58141 that provide good forward sightlines and passing opportunities for windfarm traffic, its narrow

carriageway and tight verges require structural upgrades to accommodate heavy commercial construction traffic. Under the current application, the road is subject to proposed permanent road-widening works (FW2). These works include a permanent 495-metre widening of the southern side by 0.5 to 2.0 metres, alongside a separate permanent 80-metre widening into the northern verge.

EIAR 16.3.1.1.3 Local Road L5818



The L5818 links the Ballygowney/Coolcashin area with Gathabawn village, and forms part of the route between the Ballylehaun Control Building and the wider local road network (via the L1803). It also carries a substantial length of the Ballylehaun-Ballyring Underground Cabling (UGC) route for the Candidate Gathabawn Grid Connection.

The L5818 is a rural local road, generally 4 to 4.5m in width, bounded by hedgerows. Automatic Traffic Counter surveys (ATC2) recorded a very low 24hr two-way AADT of 85 vehicles on this road (see Table 16.3 below and Appendix 16.2), reflecting its lightly trafficked, rural character.

The road has a number of straight sections providing reasonable forward sightlines for Windfarm and cabling-related traffic.

EIAR 16.3.1.1.4 Local Road L1803



The L1803 extends west from Gathabawn village towards the Ballylehaun Area, where it connects with Site Entrance No.3 in Gorteenamuck. It forms part of the turbine/abnormal-load delivery route to the Ballyring Area, carrying blade deliveries from the Temporary Blade Storage Area at Ballylehaun, through Gathabawn village, towards the L1804.

The L1803 is a rural local road, generally 4 to 4.5m in width, bounded by hedgerows. Automatic Traffic Counter surveys (ATC7) recorded a 24hr two-way AADT of 263 vehicles on this road (see Table 16.3).

EIAR 16.3.1.1.5 Local Road L1804



The L1804 passes through Gathabawn village, where it meets the L1803, L5818 and L5819 and continues northeast, where it meets the L1806. It forms part of the turbine/abnormal-load delivery route to the Ballyring Area. A new temporary access road (Facilitating Works FW8) has been provided between the L1804 and the L1806 in the townlands of Foyle South and Coolcashin specifically to bypass the L1804/L1806 junction.

The L1804 is a rural local road, generally 4 to 4.5m in width. Automatic Traffic Counter surveys recorded 24hr two-way AADTs of 471 vehicles in Gathabawn

village (ATC8).

EIAR 16.3.1.1.6 Local Road L1806



The L1806 is a rural local road generally travelling from north to south, with an average carriageway width of approximately 4.0 to 4.5 metres. This corridor serves as a key connecting route between Gathabawn village and the Ballyring turbine area, carrying the Ballylehaun-Ballyring UGC trench beneath its pavement and representing the primary transport path for the Ballyring turbine blades.

Fewer residential properties are situated along the section of the L1806 utilised by construction traffic, with the road primarily traversing open agricultural grasslands. There are straight sections on the road

providing acceptable forward sightlines.

To facilitate the swept-path requirements of the specialised abnormal load turbine convoys, the L1806 is subject to proposed temporary widening works (FW9) consisting of 800m² of hardcore surfacing in a grassland field at Garrydague. Additionally, the local road connects directly to the proposed FW8 temporary

access road (2,840m² in the townlands of Foyle South and Coolcashin) which has been designed to completely bypass the highly restrictive and narrow Foyle Bridge structure.

Automatic Traffic Counter surveys recorded 24hr two-way AADTs of 261 vehicles near Ballyring Upper (ATC4) and 294 vehicles at Foyle Bridge (ATC9).

EIAR 16.3.1.1.7 Local Road L18062



The L18062 is a minor local road branch off the L1806, generally travelling from east to west and ranging from 3.5 to 4.5 metres in width. It serves as the immediate access road for the Proposed Gathabawn Windfarm (Ballyring Area), serving Site Entrances No. 5, No. 6, and No. 7, and is the final section of the materials haul route and turbine delivery route to this area.

There are no residential properties on the L18062.

The L18062 ends in a cul-de-sac at Site Entrance No. 7 and is very lightly trafficked by local agricultural

operators. To facilitate safe two-way HGV traffic during construction, the road will undergo permanent widening works (FW11) of 620 metres by up to 1.0 metre on its eastern boundary into a grassland field.

Automatic Traffic Counter surveys recorded very low traffic volumes with 24hr two-way AADTs of ca. 4 vehicles (ATC12).

EIAR 16.3.1.1.8 Local Road L1807



The L1807 is a local road generally travelling from east to west, with an average carriageway width of approximately 4.5 to 5.0 metres. It connects the national secondary road network (N77) at Parksgrove to Lisdowney village.

For the Whole Gathabawn Windfarm Project, the L1807 serves as the primary municipal access corridor for the Candidate Gathabawn Grid Connection. It provides permanent access to the proposed Parksgrove Substation via Site Entrance No. 8. To accommodate the delivery of the main transformer abnormal load and substation construction traffic,

the entrance will be upgraded to provide visibility splays of 90m to the west and 40m to the east, requiring the targeted removal of 65m and 5m of roadside hedgerow respectively.

Additionally, the road pavement corridor will accommodate the trenching for the underground grid connection cabling. Baseline traffic conditions show that the L1807 functions as a moderately active rural link connecting local communities to the N77, carrying a mix of commuter and local agricultural transit.

Automatic Traffic Counter surveys (ATC6) recorded a 24hr two-way AADT of 565 vehicles on this road (see Table 16.3 below), the second highest of the local roads surveyed after the R639.

EIAR 16.3.1.2 Public Roads at Site Entrances

Proposed Gathabawn Windfarm: Access to the Proposed Gathabawn Windfarm site will be established through existing farm entrances from the public road. There will be a total of 7 no. site entrances - on the L58141 (2), L1803 (1), L5818 (1), and the L18062 (3). Two temporary entrances will also be created – one on the L1804 and one on the L1806.

Candidate Gathabawn Grid Connection: A permanent site entrance to access the Parksgrove Substation will be provided through the use of an existing farm entrance off the L1807 local road (Site Entrance No.8). Five temporary entrances will also be required on the L1807 (1), L1811 (2) and L1808 (2) to access the agricultural fields along the Ballyring-Parksgrove UGC. The Parksgrove-Moatpark UGC works areas will be accessed through existing field entrance on the N77 and on the R432. All of these temporary entrances will be at existing farm/field entrances. The Ballylehaun-Ballyring UGC is predominately on the public roads L5818/L5820/L5821, and also short sections on the L1806 and L18062.

EIAR 16.3.1.3 Road Users

There are no population centres of significant size within the Study Area; the site lies in a rural part of County Kilkenny, with the villages of Gathabawn and Lisdowney lying directly on the site access routes, and Cullohill and Kilkenny City lying further afield along the N77 and R639. The nearest towns to the site are Ballyragget (population 1,116, 2022 Census), Freshford (population 593, 2022 Census) and Johnstown (population 450, 2022 Census); turbine components will be transported through Abbeyleix (population 1,897, 2022 Census), Durrow (population 946, 2022 Census) and Cullahill village (population 362, 2022 Census). The main interaction posed by the development is the transportation of construction materials and turbine components along these routes and the local road network described above.

The traffic generated by the new development will access the site area through the national road N77, and via the regional road R639 and the local roads described above. These local roads are generally rural in nature and experience light traffic. See [Figure 16.1: Local Roads and Site Entrances along Windfarm Construction Access Routes](#).

Based on the results of the traffic counter surveys undertaken along the local roads (see Table 16.3 below and [Appendix 16.2](#)), the local road network in the vicinity of the site is very lightly trafficked, and existing road users are expected to primarily use the regional and national road network (R639, N77) for longer trips, rather than the local road network.

EIAR 16.3.1.3.1 Existing Traffic Flows

To determine the existing traffic conditions in terms of volume and ambient speed on the regional and local rural road network, Automatic Traffic Counters 'ATC Tube Counts' surveys were conducted on each of the affected roads and were undertaken during 2026. These are total two-way vehicles at the road locations identified. Furthermore, the AADT volumes specifically pertaining to Heavy Goods Vehicles (HGVs) and their respective proportions (%) of the overall AADT are also provided.

In summary, it is clear from the table below, that the local roads in the area are generally very lightly trafficked, reflecting the rural nature of the study area.

Table 16-3: Existing Traffic Volumes in Local Roads

Road Number	Total Vehicles			
	24Hr 2-way Average Annual Daily Traffic (2026 baseline)	AM Peak 2-way	PM Peak 2-way	2026 AADT HGV (%)
Proposed Gathabawn Windfarm – haulage/delivery routes				
R639	2,851	206	238	10.7%
L58141	55	4	7	2.2%
L5818	85	9	7	2.4%
L1803	263	18	26	2.8%
L1804 (Gathabawn village)	471	39	38	0.9%
L1806 (Ballyring Upper)	261	23	22	2.4%
L18062	4	0	0	0.0%
L1807	565	59	47	2.2%
Proposed Gathabawn Windfarm – roads along delivery routes/subject to trenching works				
L5818	85	9	7	2.4%
L5820	34	4	3	2.0%
L5821	Not directly surveyed	-	-	-
L1806 (Lisdowney)	424	38	37	2.1%
L18062	4	0	0	0.0%
L1808	Not directly surveyed	-	-	-
L1811	Not directly surveyed	-	-	-
L1807	565	59	47	2.2%

Notes: AADT figures are adopted values derived from Automatic Traffic Counter (ATC) surveys undertaken in May/June 2026, expanded to AADT in accordance with TII PE-PAG-02039 (see [Appendix 16.2](#), Section 16.4.1). AM/PM Peak figures are the average weekday peak-hour two-way totals recorded at each count location.

Roads marked 'Not directly surveyed' did not have an ATC located on them; these are generally low-volume cul-de-sac or spur roads serving a very small number of properties and are described qualitatively in the sections above. The L1806 carries a third count point at Foyle Bridge (ATC9, AADT 294, comparable to the L1806 figures above); Junction J4 at this location is bypassed by a new temporary access road (Facilitating Works FW8).

EIAR 16.3.1.3.1.1 Public Transport Provision

Given the nature and location of the development, it is not anticipated that trips will be made via walking, cycling or public transport and there are limited public transport options at present. There is a TFI local link bus service operating between Galmoy and Kilkenny City (491) via the villages of Gathabawn, Cullohill, Lisdowney and Freshford, operating one daily return service, one day per week. A TFI local link service (494) also serves the Urlingford Area, providing stops in Johnstown, Gathabawn, and Freshford, operating one daily return service, one day per week.

EIAR 16.3.1.3.1.2 Pedestrian & Cyclist Connectivity

In order to gain deeper insights into the current transportation modes and traffic patterns in the area, an analysis of the CSO Census of Population 2022 Small Area data for the Balleen Electoral District, Kilkenny (the

ED covering the site) was conducted. Of the 233 people recorded as travelling to work, 82.4% travel by private vehicle (car driver, car passenger, van or other), 12.4% work from home, and only 2.6% walk or cycle; no trips to work by bus were recorded (the small number of bus trips recorded are all to school or college). This confirms a rural, car-dependent travel pattern in the study area, and supports the conclusion that no material pedestrian or cyclist impact is anticipated (data.cso.ie/table/SAP2022T11T1ED).

In addition, there are waymarked cycle routes in the locality of the windfarm and grid connection – North Kilkenny Cycle Route and the Laois Cycle Route. Local waymarked walking trails include the Gathabawn Looped Walk which is partly along the L5818 and L5821 local roads. Local knowledge and observations during site visits identified that the L18062 is used as a local walking amenity by the local community. Further from the development, a number of walking trails are waymarked between Cullahill, Cullahill Mountain and Durrow.

EIAR 16.3.1.4 Electricity Transmission & Distribution System

Local electricity services within the study area (connected to local residences) are mainly made up of lower and medium voltage overhead electricity lines which are generally located in fields close to the local roads. Overhead high voltage transmission lines are present in the vicinity of the EirGrid Ballyragget Substation.

Proposed Gathabawn Windfarm: There are 3 no. overhead electricity lines within 10m of the construction works boundary associated with Facilitating Works FW1 and FW2 at the Ballylehaun Area, with one of these overhead lines crossing over an area of public road widening along the L58141. There is also 1 no. overhead electricity line crossing over the construction works area for Facilitating Works FW7 at Site Entrance No.3 at the Ballylehaun Area. At the Ballyring Area, there is 1 no. overhead electricity line which crosses through the construction works boundary southwest of the T8 hardstand.

Candidate Gathabawn Grid Connection: The route of the Candidate Gathabawn Grid Connection is crossed by a number of overhead electricity lines.

Six overhead electricity lines cross the route of the Ballylehaun-Ballyring UGC, four of the crossings are on the L5818 while there is one crossing on the L5820 and L18062.

Six overhead electricity lines cross the route of the Ballyring-Parksgrove UGC.

Two overhead electricity lines cross the route of the Parksgrove-Moatpark UGC on the R432 just north of the EirGrid Ballyragget Substation.

The Ballyring-Parksgrove UGC will also cross the Farranrory WF UGC at two locations - in the L1807 south of Lisdowney village, and in the L1807 at Parksgrove, while the Parksgrove-Moatpark UGC will cross the Ballyragget & Parksgrove SF Grid Connection within the verge of the N77.

See **Figure 16.3: OHL ESBN/Eirgrid and Eir Networks and Uisce Éireann Water Mains**

EIAR 16.3.1.5 Other Local Built Services

Proposed Gathabawn Windfarm: There are no Uisce Éireann built services or Group Water Schemes in the vicinity of the Gathabawn Windfarm site. Similarly, there are no national gas supplies in the area. Overhead telephone and fibre internet lines occur along roadside boundaries and connect to local residences in the area. Consultation with Eir shows infrastructure along the roadside boundary at the locations of Facilitating Works FW8, FW9 and FW10.

Candidate Gathabawn Grid Connection: Consultation with Eir shows infrastructure on the L5818 along the route of the Ballylehaun-Ballyring UGC. The Ballylehaun-Ballyring UGC will cross an existing pipe culvert and an existing masonry bridge, as well as a number of drainage culverts which exist under the public road. 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 on the R432 in Moatpark.

There are Eir communications cables present in the L1807 at Parksgrove and at two locations along the R432.

The Ballyring-Parksgrove UGC is routed to cross Gas Networks Ireland infrastructure in private lands in Parksgrove.

See [Figure 16.3: OHL ESBN/Eirgrid and Eir Networks and Uisce Éireann Water Mains](#)

EIAR 16.3.2 Context and Characteristics: Telecommunications Networks and Aviation

EIAR 16.3.2.1 Telecommunication Networks

Airborne telecommunication networks are systems of interconnected communication equipment or devices that facilitate communication over long distances and relate to the wireless airborne signals from and between telecommunication masts which provide wireless services to private, public and commercial users.

There is a telecommunications mast, Ballyspellan Mast, on Spa Hill to the southwest of the Ballylehaun turbines. There is also a mast, Tinnaslatty Mast, on Cullahill Mountain to the north of the Ballyring turbines. These masts relay signals to other masts in the wider area, including to the masts at Oldglass and Springfield to the north, and Freshford to the southeast. Signals from the Ballyspellan Mast and Tinnaslatty Mast pass over the Gathabawn Windfarm site.

PTP (Point-to-Point) microwave radio links to/from the Ballyspellan and Tinnaslatty Masts pass over the Gathabawn Windfarm site. A 2RN PTP UHF radio link between its masts at Kilduff and Mount Leinster passes to the south of the Gathabawn Windfarm site. A 2RN signal between its masts at Kilduff and Mount Leinster passes to the south of the Gathabawn Windfarm site.



See [Figure 16.4: Location of Masts](#)

EIAR 16.3.2.1.1 Consultation Responses

Consultations were undertaken with telecom network operators in 2025/2026 to assist in identifying telecommunication infrastructure that could be impacted by the turbines. Only two of the telecom operators raised concerns regarding the location of the windfarm in relation to their networks:

- Three Ireland identified two links that pass through the windfarm area – between the Tinnaslatty and Freshford masts, and between the Tinnaslatty and Ballyspellan masts; and
- Vodafone identified three links from the Ballyspellan mast that pass through the windfarm area, with signal paths to Ballyousskill, Springfield and Oldglass.
- 2RN noted that they had a radio link in the vicinity of the windfarm.

Further details regarding the Telecom Operator Consultations are available [Appendix 16.3: Telecommunication Impact Assessment Report](#).

EIAR 16.3.2.1.2 Field Survey Results

Field surveys of the telecommunication mast sites to the proposed Gathabawn Windfarm were carried out in 2026. During the field surveys of these sites, telecommunication links with alignments in the direction of the wind farm were recorded.

EIAR 16.3.2.1.3 Desktop Review

The wind turbines were plotted in a radio planning tool which used GIS and terrain mapping databases to accurately model the location of the turbines in relation to the Three Ireland, Vodafone and 2RN links. As a result of the consultations, field surveys and desktop modelling, it was found that two signals pass close to a wind turbine. The two signal paths close to turbines are:

- Three Ireland identified link between Tinnaslatty and Freshford; and
- Vodafone identified links between Ballyspellan and Oldglass.

All other signal paths are sufficiently far away from the turbines to not be affected.

EIAR 16.3.2.1.4 Local Broadband Services

The small masts at Ballylehaun and Ballyring provide airborne broadband signals to the local area, in addition to fibre broadband which would be servicing the area via the overhead or underground fibre network.

EIAR 16.3.2.1.5 Television Reception

Television reception to residences/properties in the surrounding and wider area would be received from the RTE Mast at Mount Leinster on the Carlow/Wexford border in the Blackstairs Mountains and the RTE Mast at Kilduff, near Lough Derg, County Tipperary.

EIAR 16.3.2.2 Aviation

Aviation refers to all aeronautical infrastructure and surfaces with the potential to be impacted by wind turbine obstacles.

EIAR 16.3.1.4.1 Airports, Radar Stations

The nearest significant airports to the proposed Gathabawn Windfarm are Waterford Airport (68km to the southeast) and Shannon Airport (96km to the west of the windfarm site).

Dublin Airport and Cork Airport are both other 100km away from the Proposed Gathabawn Windfarm and are not considered further herein as it is evaluated that there is no potential for effects.

The nearest radar surveillance installations to the proposed Gathabawn Windfarm are at Shannon Airport (97km to west) and Woodcock Hill (81km to west).

EIAR 16.3.1.4.2 Irish Air Corps, Garda Support Unit, Emergency Aeromedical Service

The nearest of the Air Corps restricted area to the proposed Gathabawn Windfarm is the low-level flight route around the M8 motorway.

The Garda Support Unit operate a fixed wing aircraft and two helicopters out of Casement Aerodrome at Baldonnell, c.90km from the windfarm site.

The Emergency Aeromedical Service operates from Custume Barracks in Athlone and Rathcoole Aerodrome in Mallow, c.75km and c.125km from the windfarm site respectively.

EIAR 16.3.2.2.1 Private airfields and Helipads

There are no existing private airfields within 10km of the proposed Gathabawn Windfarm. Within the wider area, there are three airfields and one helipad within 20km - Abbeyleix Airfield (13km to the northeast), Kilkenny Airport (15km to the southeast), Moyne Aerodrome (17km to the southwest) and Midlands Heliport (17km to the northeast).

EIAR 16.3.3 Existing Sources of Impacts

There is no existing damage to the Public Roads, the local roads relatively straight with no sharp bends along the local roads which will be used by the construction traffic. Similarly, there is no existing damage to Local Built Services and Electricity Transmission & Distribution Systems. It should be noted that 110kV underground cabling and joint bay chambers for the Farranrory WF Grid Connection have recently been installed in the L1808 and L1807 local roads. The road surfaces disturbed by this cabling installation have since been reinstated in accordance with the relevant road opening licence conditions, and no residual damage or structural deficit to the Public Roads is evident as a result of these works. This grid connection in addition to the Parksgrove Solar Farm grid connection involved the installation of cabling under the N77 road using Horizontal Directional Drilling (HDD) technique.

There is no existing damage to Airborne Signals and Networks or to Aviation.

EIAR 16.3.4 Importance, Sensitivity and Vulnerability to Change

EIAR 16.3.4.1 Importance

Road Users: According to TII, national roads are made up of motorways, primary roads and secondary roads. These are essential for the economic and social wellbeing of the country. The N77 network connects the communities of Durrow with Ballyragget and Ballyragget with Kilkenny, and allows people to travel for a variety of purposes such as employment, education, leisure, and cultural purposes, as well as enabling the movement of the goods and materials that are important for the Irish Economy. Overall, the importance of the national road network to Road Users is considered to be **High**.

Public Roads: According to the Department of Transport, regional and local roads are important from economic, social and political perspectives. These roads serve an important economic role in the Irish context and also have valuable social and community functions. Regional routes will be the more highly valued routes in terms of the volume of road users who will use these roads on a daily basis. Overall, the importance of the Public Roads are considered to be **Moderate** (Regional Roads) to **Low-Moderate** (Local Roads).

Electricity Transmission & Distribution System: The nationwide electricity transmission system allows for the transport of large volumes of electricity from generation stations, including windfarms, to bulk supply points near the main population centres where it interconnects with the distribution system before reaching the end user. The Electricity Transmission and Distribution System is considered to be of **High** importance.

Local Built Services: It is considered that public electricity and water supply is of **High** value, as it is likely to be the sole source of water for most Uisce Éireann customers, and the sole source of electricity. While there are alternatives available for communication and broadband services, the Eir network is nonetheless considered to be of **Moderate** value locally. The Gas Networks Ireland built services are considered to be of **Moderate** value locally/regionally, as an existing distribution-level gas supply serving customers within the Grid Connection study area.

Telecommunications Signals & Aviation: Telecom networks and aviation play an important role in modern society, providing essential communication and transport services to individuals, businesses, and state bodies and organisations, enabling people to communicate with each other across vast distances, aiding global communication, trade and commerce.

EIAR 16.3.4.2 Sensitivity

Public Roads: Public Roads are sensitive to damage and excavation works in the road surface, and to heavy loads that exceed axle limits. Public Roads are evaluated as having **Moderate** Sensitivity.

Road Users - Drivers: Road Users could be sensitive to changes in road use conditions such as substantial increases in traffic volumes, particularly HGVs; presence of roadworks and traffic management measures such as stop-go systems; and a reduction in road pavement quality which could either increase journey times or reduce road safety. Taking into account the economic and societal value of the roads, and the low number of road users using them, the Sensitivity of Road Users is evaluated as **Low** on the Local Roads L58141, L5818, L1803, L1804, L1806, L18062, L1807, L5820, L5821, L1808, and L1811, which have very low traffic levels, to **Moderate** for the Regional Road R639, and **High** for the National Road N77.

Cyclists or walkers are considered to be vulnerable road users and could be intimidated by the presence of heavy goods vehicles, particularly on narrow roads. There is no dedicated pedestrian or cyclist infrastructure (footpaths or cycle lanes) directly serving the windfarm site. The L5818 and L5821 are used as a walking amenity (Gathabawn Loop), and given the vulnerability of these road users, they are evaluated as having **Moderate** Sensitivity to the construction works, and **Low** sensitivity to the windfarm following its construction. The number of cyclists using the local roads are expected to be very low, and as a result the Sensitivity of Cyclists or Walkers is considered to be **Low**.

Electricity Transmission & Distribution System: Overhead electricity lines can be affected by accidental damage as a result of the use and movement of machinery during construction works, or due to adverse weather conditions such as high winds and ice. Underground Cables can be damaged during ground excavation works. Given that any such damage is generally brief and reversible through standard repair works, with a low number of end users affected at any one time, the Sensitivity of the Electricity Transmission & Distribution System is evaluated as **Low-Moderate**.

Local Built Services: Local Built Services are sensitive to any temporary loss of services due to damage to roads, pipes, cables or overhead lines, or due to planned outages in service supply. As with the Electricity Transmission & Distribution System, such effects are generally brief and reversible, affecting a low number of end users at any one time, and the Sensitivity of Local Built Services is evaluated as **Low-Moderate**.

Telecommunications Signals: Airborne signals can be affected by the presence of structures, where these structures are located within the Frenzel zones of a PTP link path. It is considered that local airborne telecom signals have **Medium** sensitivity, while the local mobile broadband service to have **Low** sensitivity to change.

Aviation: Public airports and radar stations, Air Corps, Garda and Emergency services are considered to have **High** sensitivity due to the numbers of people using them (airports) and the public service provided (Air Corps, Garda and Emergency services). Private airfields and helipads would have a **Low** sensitivity due to the private nature of these aviation features and the very low number of private individuals using them.

EIAR 16.3.5 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

TII Publication PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections, published in October 2021 predicts increases in annual traffic volumes, in the region of 1-2% per annum. This growth rate is accounted for in **Appendix 16.2 Traffic and Transport Assessment**.

The public road network is continually maintained throughout the year by Kilkenny County Council. This trend is likely to continue. No new road schemes are proposed in the vicinity of the works.

In recent years the popularity and adoption of mobile telephones and mobile broadband, and of satellite television services has grown significantly and the dependence on traditional fixed line or television reception

from masts has decreased. This trend is likely to continue into the future with the continued rollout of the National Broadband plan, and the increase and improvement in satellite technology.

In recent years, telecom networks and aviation navigation tools have evolved significantly, driven by advances in technology and changing communication needs. Modern networks use advanced technologies like 5G, fiber-optic cables, satellite communications and cloud computing to provide faster, more reliable communication services to users. These trends are likely to continue into the future.

EIAR 16.3.6 Relevance of Climate Change to Material Assets

The most immediate climate-change related risks in Ireland are those associated with weather extremes, such as floods, precipitation and storms. In particular, climate change brings systemic risks due to weather events leading to the breakdown of infrastructure networks and critical services (and an increase in demand for these services during emergency events) such as transport, energy, communications, water supply, health and emergency services.

In addition, extreme weather events (i.e. storms, flooding) have the potential to affect the structural integrity of road pavements and buried structures, while local service users could be affected by interrupted electricity supply as a result of falling trees.

Extreme weather conditions (e.g. storms) can cause significant damage to telecommunications equipment and can cause/contribute to network outages. Extreme weather events can also affect aviation and travel.

EIAR 16.4 IMPACT OF THE PROPOSED DEVELOPMENT

This Section comprises an evaluation of the impacts of the proposal on the receiving Material Assets environment.

EIAR 16.4.1 Criteria and Methodology

The criteria used for impact evaluation in this report is based on the EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022), along with the ARVI approach for impact significance assessment developed under the EC IMPERIA LIFE11 Project. The methodology for determining the significance of impacts to Material Assets is based on the sensitivity of the attribute (sensitive aspect) and the magnitude of the impact, as outlined in [Appendix 16.1](#).

EIAR 16.4.2 Source-Pathway-Receptor

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

EIAR 16.4.2.1 Sources of Impact

Operational Phase

- Movement of abnormal loads on the public road network
- Turbine structures, movement of blades

Decommissioning Phase

- Movement of abnormal loads on the public road network

<u>Construction Phase</u>	<u>Operational Phase</u>	<u>Decommissioning Phase</u>
Traffic management	Turbine structures, movement of blades	
Construction/delivery traffic		
Movement of abnormal loads on the public road network	Movement of abnormal loads on the public road network	Movement of abnormal loads on the public road network
Road widening works		
Trenching works in the public road corridor		
Relocation of telephone or electricity		

Each of the sources identified above has the potential to affect the identified receptors via one or both of the pathways below; the specific source-pathway-receptor linkages are evaluated individually in Sections EIAR 16.4.5 and 16.4.6.

EIAR 16.4.2.2 Pathways

- Physical contact
- Roadway
- Airspace

EIAR 16.4.2.3 Receptors

Public Roads	Local Built Services
Road Users	Airborne Signals and Networks
Electricity Transmission & Distribution System	Aviation

EIAR 16.4.3 Overview of the impacts to Material Assets

A summary of the findings of the evaluation of the effects of the Whole Gathabawn Windfarm Project on Material Assets 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.

The evaluations follow this summary table

The following effects are evaluated in detail to determine whether or not they are likely to be Significant.

AIRBORNE SIGNALS AND NETWORKS IMPACTS	
Interference with Three Ireland and Vodafone Link Paths (O)	16.4.5.2

All of the remaining effects of the Gathabawn Windfarm Project on Material Assets will have no likelihood of causing significant adverse effects to Material Assets receptors. A short evaluation of these effects is provided in Section EIAR 16.4.6, with a list of these impacts provided below.

Table 16-4: List of effects to Material Assets which will not be significant

Effects of the Proposed Development which will not be significant	Phase	Impact Significance – see Section EIAR 16.4
PUBLIC ROADS IMPACTS		See Section EIAR 16.4.4
Damage to National Road pavements/decrease in structural integrity	C	No Likely Impact
Damage to Regional Road pavements/decrease in structural integrity	C	No Likely Impact
Damage to Local Road pavements or decrease in structural integrity due to trenching works	C	Neutral, Slight
Damage to Local Road pavements or decrease in structural integrity due to road widening works	C	Imperceptible (positive)
Damage to Local Road pavements or decrease in structural integrity due to site entrances and construction traffic	C	Imperceptible
Damage to road boundaries	C, O, D	Neutral Impact
Damage to bridges and culverts	C, O, D	Neutral - Imperceptible (positive)
Interrupted or disrupted access to property	C, O, D	Slight
Damage to existing TII infrastructure	C	Neutral
ROAD USERS IMPACTS		See Section EIAR 16.4.4
Increased journey times for National or Regional Road users	C	Imperceptible
Increased journey times for Local Road users	C	Imperceptible - Slight
Increased journey times and disruption for road users due to transport of turbine components	C	Imperceptible
Increased journey times for road users	O, D	Not Significant
Increased risk of road accidents due to increased traffic, road works, or deterioration of road pavements	C	Slight
Increased risk of road accidents due to increased traffic, road works, or deterioration of road pavements	O, D	No Likely Impact

Improvement in public road networks due to increased County Budget	O	Imperceptible positive
LOCAL BUILT SERVICES		See Section 16.4.4
Damage to overhead electricity lines	C, O, D	Neutral
Impact of new infrastructure connected to the electricity transmission system	O	Imperceptible positive
Damage to local built services	C	Neutral
TELECOMMUNICATIONS & AVIATION IMPACTS		See Section 16.4.5
Impact on aviation from operational Gathabawn Windfarm turbines	O	No Impact
Impact on local aviation from operational Gathabawn Windfarm turbines	O	No Impact
Interference with television reception	O	No Residual Impact
Interference with local Broadband services	O	Neutral

EIAR 16.4.4 Impacts to Public Road Network and Local Built Services -Not Significant

All of the effects of the Gathabawn Windfarm Project on Material Assets – Public Road Network and Local Built Services will not be significant. A short evaluation of these effects is provided below.

EIAR 16.4.4.1 Evaluation of the Effects on Public Roads

Damage to National Road pavements/decrease in structural integrity (C): No Likely Impact. No road openings are scheduled for the N77 Kilkenny-Portlaoise Road. While the Parksgrove-Moatpark UGC element of the Candidate Gathabawn Grid Connection does cross the N77 National Road, it will do so by Horizontal Directional Drilling (HDD) and will then be routed in the grass verge along the roadside boundary of the N77 for a distance of 530m, rather than in the road pavement, before entering agricultural lands. All trenching works for the Candidate Gathabawn Grid Connection, including those in the grass verge of the N77, will be completed to EirGrid specifications and will be backfilled with concrete and aggregate, ensuring no impacts to the structural integrity of the national road. While an increase in HGV movements is anticipated, these roads are structurally capable of accommodating the increase in heavy vehicle movements.

National roads along turbine component/construction material haul routes are in good condition with a well-maintained surface along the route. Deterioration of the structural integrity of these roads as a result of construction traffic or transportation of turbine components is not anticipated. While it is proposed to deliver the main transformer to the Parksgrove Substation via the N77, it is noted that this will be a single, non-recurring abnormal load which will not result in significant impacts on the road pavement or decrease the structural integrity of the national road.

Damage to Regional Road pavements/decrease in structural integrity (C): No Likely Impact. No cable trenching works in regional roads for the Proposed Gathabawn Windfarm. Cable trenching works in Regional Roads only relate to the Candidate Gathabawn Grid Connection and are limited to a short section (c.135m) along the R432 in Moatpark, which will involve the excavation of a trench 0.6m wide and 1.25m deep. Following the installation of ducting, the road surface will be permanently reinstated, which is a standard condition of a Road Opening License. Due to the existing stability of this road, the short duration (c.2 days) of the works, with daily backfilling of the completed trench section, no instability of the pavement is expected to occur.

Increase in traffic/HGV movements: the Regional Roads R639 (Durrow-Johnstown Rd) and the R432 at Moatpark are in good condition with a well-maintained surface along their routes. Deterioration of the structural integrity of these roads as a result of construction traffic or transportation of turbine components is not anticipated.

Damage to Local Road pavements or decrease in structural integrity due to trenching works (C): Neutral (proposed windfarm) – Slight (candidate grid connection). Trenching works in the public road for the Proposed Gathabawn Windfarm only relate to the installation of ducting across the L58141 (4.5m) and along the L18062 (c.300m). Following the installation of ducting, the road surface will be permanently reinstated, which is a standard condition of a Road Opening License for a public road. Due to the very low usage of these two local roads, the short lengths affected and the reinstatement of the trench and road surface, neutral effects on the structural integrity of these roads or their road surfaces is expected to occur.

In relation to the Candidate Gathabawn Grid Connection, cable trenching works for the Ballylehaun-Ballyring UGC within the L5818, L5821, L5820, L1860 and L18062 will involve the excavation of a trench 0.6m wide and 1.25m deep and the provision of joint bays at regular intervals along the UGC route. As is standard Road Opening practices, trenches will be backfilled and the road surface reinstated daily as the ducting is installed, and effects on structural integrity or pavements is considered negligible. Joint Bays will require larger excavations and are open for longer periods. Following the electrical commissioning of the cables, the road

surface over the joint bays will be permanently reinstated, and the magnitude of impact during the works is considered to be Moderate. However, due to the existing stability of the roads, and the progressive linear nature of the works, with c.800m between joint bay locations, and permanent reinstatement of the road surface following the works, no instability of the pavement is expected to occur. Overall, considering the Low-Moderate importance of local roads, and the Moderate magnitude, roadworks on along the Ballylehaun-Ballyring UGC is evaluated as Slight adverse significance. Road crossings associated with the Ballyring-Parksgrove UGC will, similar to the cable crossing the L58141, be very limited, with backfilling and reinstatement of the trench the same day, impacts will be negligible.

Damage to Local Road pavements or decrease in structural integrity due to road widening works (C): Imperceptible (positive). Road widening works (L58141 and L18062) will involve the permanent removal of between 0.5m and 2m of roadside verge on the L58141, and up to 1m on the L18062, and underlying soils on one side of the existing road carriageway, and the provision of a public road pavement (with suitable load-bearing surface) widened similarly by 0.5m to 2m to facilitate the delivery of turbine components and construction materials to the project site. This is likely to result in a positive impact on road structures, though given the low usage of the roads, any effects will be Negligible - Imperceptible positive.

Damage to Local Road pavements or decrease in structural integrity due to site entrances and construction traffic (C): Imperceptible. Road edges at site entrances or haul route works locations are not expected to be materially affected due to the use of hardcore to provide a widened surface to accommodate access requirements at/to the site. Any impacts to the edge of road pavements will be Low magnitude. Regarding increased road traffic, local roads vary in condition from good to moderate, with evidence of uneven surfaces and puddles at certain locations. These roads are built on firm ground and primarily of 'cut and fill' construction. The deterioration of road edges or reduction in the integrity of pavements due to the additional traffic or transport of abnormal loads is not expected to occur.

Damage to road boundaries (C, O, D): Neutral Impact. The principal interaction between project activities and the road boundary relates to the set-back of certain roads to allow sufficient sightlines at the site entrances and road widening works. The design of the site entrances includes the reinstatement of the roadside boundary using post and mesh fencing behind the sightlines. Road widening works will involve the removal of 0.5m to 2m of the roadside verge and underlying soils along a section of the L58141, and up to 1m along a section of the L18062, and the laying of hardcore along the excavated verges to create a suitable load-bearing surface. The roadside boundary will be reestablished along the new road edge, with like for like reinstatement. All livestock fencing on the inside of newly planted roadside banks/hedgerows will comprise post and mesh fence.

Damage to bridges and culverts (C, O, D): Neutral – Imperceptible positive Impact. There are no culverts or bridges within the construction works areas associated with the Proposed Gathabawn Windfarm. In relation to the Candidate Gathabawn Grid Connection, there is 1 no. existing masonry bridge and 1 no. existing pipe culvert located on the public road along the route of the Ballylehaun-Ballyring UGC, as well as a number of drainage culverts which exist under the public road which have potential to be impacted upon by the trenching works. The UGC will cross the masonry bridge by Horizontal Directional Drilling, and no impacts to the structure of the bridge are expected to occur. Existing culverts mainly comprise concrete or HDPE pipes, which are not likely to be damaged during the installation of the ducting. Where an existing culvert is already damaged/collapsed, or where a culvert is damaged by works, the whole culvert will be replaced with a new double skinned 900mm HDPE pipe culvert. Therefore, it is considered that effects to buried culverts will be Neutral or Imperceptible positive.

It is not expected that the culverts under the road will be damaged by the construction traffic or turbine component deliveries as all loads will be within the legal axle loading limits.

In addition, no road opening works or works near buried structures are required during the windfarm's operational or decommissioning phases.

Interrupted or disrupted access to property (C, O, D): Slight Impact. Road widening works for the proposed windfarm along the L58141 and the L18062 will disrupt access to a small number of properties/farmland, with the majority of properties affected being involved in the project. Disrupted access will be temporary in duration, affecting a very small number of properties (c.2 houses and 4 farm properties on the L58141, and 0 houses, c.5 farm properties on the L18062), therefore any magnitude of effects will be Low, reversible upon completion of the works (c. 2 weeks at each location), and evaluated as a Slight adverse impact.

Effect of the turbine component transportation on access to property will be brief and is considered to be Imperceptible to Slight due to relatively low frequency, advance notification, brief nature of the transportation events.

Along the Candidate Gathabawn Grid Connection, no access to properties is expected along the Ballyring-Parksgrove UGC as any cable crossing road works will take one day to complete on the L1808, L1811 and L1807, with alternative routes available. At Moatpark, works on the road over 2 days will be managed with a one-lane closure and stop/go system. No access disruption is expected to occur. The potential for interrupted or disrupted access to property mainly relates to the Ballylehaun-Ballyring UGC, where works are anticipated to affect 8 no. residential/farm properties on the L5818, 3 no. properties on the L5821 and 3 no. properties on the L5820. While trenching works will proceed relatively quickly in a linear manner, the joint bays will require several periods of works and resultant road closure on the L5820 and L5821 due to the narrow nature of these roads. However, given the very low number of properties along these roads, with alternative access available to many farm properties, with access available up to the works locations, and availability of alternative routes in and out of the area using the L5820 and L5821 networks, it is evaluated overall that the magnitude of impacts will be Low-Moderate, and therefore of Slight significance.

There are no works associated with the operational or decommissioning phases which will have the potential to interrupt or disrupt access to property.

Damage to existing TII infrastructure (C): Neutral impact. The Proposed Gathabawn Windfarm involves no public road openings or works within national roads which could damage existing Transport Infrastructure Ireland (TII) infrastructure.

The Candidate Gathabawn Grid Connection has been routed to avoid TII infrastructure such as traffic counters and weather stations, while the crossing of the N77 National Secondary Road by the candidate grid connection will be done by Horizontal Directional Drilling (HDD), thereby avoiding the requirement for trenching within the public road. The crossing of the River Nore by the candidate grid connection will also be done by HDD, avoiding the need for any crossings within bridges on the national road network.

EIAR 16.4.4.2 Evaluation of the Effects on Road Users

Increased journey times for National and Regional Road users (C): Imperceptible impact. Additional HGV traffic on national and regional roads as a result of material deliveries to the construction site may affect journey times for road users. Impacts will be imperceptible due to the available capacity of all national and regional roads to accommodate larger traffic volumes, and brief road works (R432 only - 2 days).

Increased journey times for Local Road users (C): Imperceptible - Slight impact. In relation to the Proposed Gathabawn Windfarm, the anticipated peak traffic during the construction phase relates to the 12 days of concrete pours (i.e. one day of 53 concrete deliveries per turbine). These peak deliveries will be spread over 7 days at the Ballylehaun site with deliveries along the L58141, and over 5 days at the Ballyring Site with deliveries along the L1807, through Lisdowney village and then along the L1806 and L18062. Although these deliveries will be Moderate Magnitude on the pour days, due to the small number of days (12), the very small

number of users on the L58141 (3 residences, 5 landowners), the L18062 (0 residences, 5 landowners), the availability of passing bays on the L1807, and the relatively short section of the L1806 affected (3.5km), the Low-Moderate importance of local roads, it is evaluated that any increased journey times or disruption to traffic will be Not Significant. HGV Traffic during the rest of the windfarm construction phase will maximum c.192 2-way movements per week to the windfarm site over the 12-month period and taking into account the capacity of the local roads, the low volumes of traffic currently on these roads, and the temporary nature of the construction phase, it is considered that impacts to road users will be no greater than Slight, temporary, and reversible with the completion of construction works.

Deliveries to the Candidate Gathabawn Grid Connection route will be slightly higher, with the highest volumes of traffic associated with cabling works on the road corridor (i.e. on the R432 and on the L5818, L5821, L5820, L1806 and L18062). Deliveries of aggregate and concrete and removal of materials will result in c.206 2-way HGV movements per day. Trenching works will move linearly and will be temporary duration (Ballylehaun-Ballyring UGC – 3 months). HGV movements associated with joint bays will be negligible, while deliveries to the Parksgrove Substation will through Site Entrance 8, very close to its junction with the N77 national road. Overall, when the Low-Moderate sensitivity of local roads is taken into account, the available capacity on these roads, the low volumes of construction traffic and the brief-temporary duration, it is considered that increased travel times or disruption to journeys to road users along Local Roads will be Low-Moderate, and therefore of Slight significance.

Increased journey times and disruption for road users due to transport of turbine components (C, O, D): Imperceptible Impact. Due to the expected timing of turbine component deliveries outside of peak traffic hours, any delays or disruption associated with the transportation of turbine components will be brief, likely to affect a small number of road users, with effects reversible with completion of the transportation. Traffic flow will be maintained around the abnormal load by Gardaí to ensure minimal effects on national, regional or local road users. Imperceptible impacts are likely to occur.

Increased journey times for road users (O, D): Not Significant. Operational and decommissioning traffic will be very low and will not increase journey times to local traffic during the operational/decommissioning phases. The requirement for works along the public road are limited to infrequent works at joint bays and facilitating works locations, with works of brief duration, reversible with the completion of works and happening infrequently during the operational/decommissioning phases. Overall, the effects to Road Users will be Imperceptible during the operational phase and Slight during the decommissioning phase.

Increased risk of road accidents due to increased traffic, road works, or deterioration of road pavements (C): Slight. During the construction phase of the project, due to increased construction traffic volumes on local roads, the potential for reduced road safety is examined.

In relation to the Proposed Gathabawn Windfarm, material haulage will access the Ballylehaun Area from the Regional Road R639, turning onto the cul-de-sac L58141 road at Coolnacrutta. This cul-de-sac road will be widened, with two slightly wider sections which can be used as passing bays. Similar to the L58141 at the Ballylehaun Area, the Ballyring Area site entrances are from the cul-de-sac L18062 local road, which is only used for farm property access. This local road will also be widened, and passing areas will be provided at existing field entrances along the road. The widening of these road, provision of passing bays, lack of walkers or cyclists on the L58141, with a very low number of local walkers on the L18062, and extremely low local traffic volumes, means that any increased road traffic and turning movements are unlikely to increase the risk of road accidents. It is noted that best practice protection measures will be included in the EMP for the project which will include controls of delivery traffic speeds and the implementation of a Road Safety Protocol (see Section 16.4.8).

Access to the Ballyring Area will be from the N77 near Ballyragget, travelling up the L1807, through Lisdowney village, and then along the L1806 as far as the junction with the L18062. The L1806 is a relatively straight road which is wide enough to safely accommodate two way traffic. Other than at Lisdowney village, where the presence of Lisdowney NS (Scoil Bhríde) warrants particular consideration (see below), it is considered that increased risks of road accidents are not likely to occur on the L1807, L1806 and L18062 local roads.

In Lisdowney village, the L1807 meets the L1811 and L1806, at Junction J6 (see [Appendix 16.2](#)). This junction was included in the manual turning-movement surveys carried out for this assessment; although the calculated percentage increase in traffic nominally exceeds the applicable TII screening threshold, the junction was screened out of detailed capacity modelling on materiality grounds, given the modest absolute added volume (under 17 HGV/hour under the worse-case scenario, and under 9 according to the realistic scenario based on the construction programme), the absence of a national or regional road arm, the uncongested operation of the junction, and the absence of any recorded collision history (see [Appendix 16.2](#), Section 16.8.1). Standard construction traffic mitigation measures, including the Traffic Management Plan, speed limits and signage (see Section 16.4.8), will apply to construction traffic passing through the village.

It is noted that Lisdowney village includes a primary school, Lisdowney NS (Scoil Bhríde), which fronts directly onto the L1807, the road forming the construction haul route into the Ballyring Area and one of the arms of Junction J6. The general speed limit on this section of road is 50km/h, with a dedicated school warning sign and speed-reduction signage (indicating 30km/h) in place on the approach to the school; a continuous footpath with public lighting is provided along the school side of the road frontage. School doors open at 8:45am, with the school day finishing at 1:40pm for Junior and Senior Infants and at 2:40pm for 1st-6th classes; the school also operates its own set-down/collection management system at the school gate (a 'three car rule,' with parents asked to park facing Ballyragget and walk children to the school via the footpath), reflecting an established, actively-managed pattern of pedestrian and vehicle activity at this location during these periods.

Construction traffic accessing the Ballyring Area will therefore pass directly by the school on the L1807 prior to turning onto the L1806 at Junction J6. It is also noted that a material proportion of vehicles recorded during the J6 turning-movement survey were agricultural/silage vehicles (23 of the 26 agricultural vehicles recorded in the afternoon count, and 22 of the 27 recorded in the evening count); construction traffic will therefore need to safely share this road network with slow-moving agricultural vehicles and machinery, in addition to general road users and school-related traffic. The J6 manual turning-movement survey was carried out on Tuesday 26 May 2026, a normal school term-time weekday, across three periods: a Morning count (07:30-09:30), which captures the school's 8:45am opening, while the Afternoon count (12:00-14:00) captures the 1:40pm Junior and Senior Infants finish, with a discernible increase in light vehicle movements recorded in the final half hour of this count consistent with parental collection, and no HGVs recorded in this half hour on the day of survey. The school frontage is marked by existing school warning road markings and signage.

Given the direct frontage of the school onto the haul route, the existing speed-reduction and warning signage at this location, the volume of agricultural traffic on the same local roads, and the school's documented drop-off and collection times, the Traffic Management Plan and Road Safety Protocol (see Section 16.4.8) will make specific provision for construction traffic passing the school, including restricting or escorting HGV movements on the L1807 past the school during defined windows around 8:30-9:00am, 1:30-1:50pm and 2:30-2:50pm, driver briefings on sharing the road with agricultural traffic and using the passing bays provided on the L1807, and consultation with the school and Kilkenny County Council Roads Section, to be completed prior to finalisation of the Construction Traffic Management Plan.

The Ballyring Area will be accessed through Site Entrances No. 5 and 6 at Ballyring Upper, as well as through Site Entrance No.7 at the end of a cul-de-sac. Deliveries to the Ballylehaun Control Building will exit the windfarm site at Site Entrance No.3 and travel to Site Entrance No.4, which is at the end of a cul-de-sac. These

entrances, apart from the cul-de-sac roads which do not require sightlines, have been designed to achieve the required sightlines of 90m on the local roads. These local roads are very lightly trafficked, and therefore the presence of vehicular movements into site entrances are unlikely to increase the risk of road accidents.

Increased traffic and the deposition of dirt and dust on local roads can decrease the quality of pavement surfaces, potentially increasing the risk of road accidents.

Works on the public roads in the study area include trenching works, road widening works and construction of the site entrances. Safety signage will be erected at each works location and flagmen will be assigned to manage traffic flows. All road works will be completed under licence from Kilkenny County Council Roads Section. Any licence will include safety signage measures as standard. It is considered that there is a low potential for increased risk of road accidents.

Taking into consideration the low number of cyclists using the affected roads, the relatively modest increase in traffic (considering the low existing usage of these local roads), the temporary duration of the construction phase and the existing road capacity, the impact on the safety of pedestrians and cyclists is anticipated to be Negligible.

Increased risk of road accidents due to increased traffic, road works, or deterioration of road pavements (O, D): No Likely Impact. During the operational stage of the proposed Gathabawn Windfarm, the impact on traffic is projected to be negligible and will not have any long-term negative effects. The operational phase will primarily involve the automatic operation of the wind turbines, which allows for smooth and continuous functioning without substantial traffic implications. Any traffic generated for operational and maintenance purposes will be at a low volume, with occasional heavy vehicles required for specific tasks. Any requirements for road works will be very infrequent relating to maintenance or unplanned repairs (if they occur) to the Ballylehaun-Ballyring UGC or Candidate Gathabawn Grid Connection would likely involve reopening joint bays for very short periods of time. Some of the Facilitating Works may be required to facilitate turbine component transportation associated with major maintenance works at the windfarm. All of these works will be isolated, and of very brief/temporary duration, happening infrequently during the operational phase.

During the decommissioning phase, special consideration is given to the removal of turbine blades. These blades are cut into smaller, more manageable sizes, reducing their overall impact during transportation off-site. This ensures that the transportation of turbine components and materials remains efficient and poses minimal disruption to the surrounding road infrastructure. Overall, the effects to Road Users will be Imperceptible during the operational phase and Slight during the decommissioning phase.

Improvement in public road networks due to increased County Budget (O): Imperceptible positive impact. The payment of c.€800,000 per annum in commercial rates will be used to maintain the public road network in good condition, this will include the national, regional and local roads which will be used to access the development site by construction, operational and decommissioning personnel and delivery vehicles. However, in the context of the total length of public roads in County Kilkenny, this impact is considered Imperceptible positive.

EIAR 16.4.4.3 Evaluation of the Effects on Local Built Services

Damage to overhead electricity lines (C, O, D): Neutral Impact.

There are no overhead high voltage electricity lines within the study area associated with the Proposed Gathabawn Windfarm, therefore there will be no impact to overhead high voltage electricity lines as a result of damage from construction works. There are, however, a small number of low and medium voltage overhead electricity lines crossing the works locations at the Ballylehaun Area, located around the area of facilitating works FW1 and FW2, and at Site Entrance No.3, as well as 1 no. overhead electricity line which crosses through the construction works area south of T8 at the Ballyring Area.

The route of the Candidate Gathabawn Grid Connection crosses under a number of overhead electricity lines - 6 no. along the route of the Ballylehaun-Ballyring UGC, and 8 no. along the Ballyring-Parksgrove UGC - 1 no. of which is a high voltage overhead line.

It is considered unlikely that the overhead lines would be damaged, as standard construction practices would include the use of goal-posts to identify overhead lines. However, in a worst-case scenario where lines or cables are damaged during construction, any effects to end users would be brief and reversible with the repair of any damage, with a low number of users affected. Any impacts to services or end users will be Neutral.

Any haulage of large machines during the operational or decommissioning phases will be planned and goal posts erected if required. No damage to overhead electricity lines are likely to occur.

Impact of new infrastructure connected to the electricity transmission system (O): Imperceptible positive impact. The Proposed Gathabawn Windfarm will connect to the EirGrid Ballyragget Substation for the purposes of transporting electricity to the national electricity grid (via the Candidate Gathabawn Grid Connection). While this will be of benefit to the electricity grid, it will not cause significant positive impacts to the transmission system due to the size of the overall Irish transmission system.

Damage to local built services (C): Neutral impact. There are no underground Uisce Eireann or Gas Networks Ireland built services in proximity to the Proposed Gathabawn Windfarm construction works area. However, there are Eir overhead lines along the roadside boundary at the locations of Facilitating Works FW8, FW9 and FW10. Any effects to end users would be brief and reversible with the completion of relocation works, with a low number of users affected.

In relation to the Candidate Gathabawn Grid Connection, there are Eir overhead lines on the L5818 along the route of the Ballylehaun-Ballyring UGC, the L1807 at Parksgrove along the Ballyring-Parksgrove UGC, and the R432 in the vicinity of Parksgrove-Moatpark UGC works. In addition, the Ballyring-Parksgrove UGC is routed across Gas Networks Ireland infrastructure in private lands in Parksgrove.

It is considered unlikely that the overhead lines would be damaged, as standard construction practices would include the use of goal-posts to identify overhead lines, while excavations in the public road or close to known services would be supervised by a banksman. However, in a worst-case scenario where lines or cables are damaged during construction, any effects to end users would be brief and reversible with the repair of any damage, with a low number of users affected. Overall, any impact to Built Services will be Neutral.

EIAR 16.4.4.4 Whole Project Cumulative Effect

There are **no likely Moderate, Significant, Very Significant or Profound adverse impacts** to the Public Road Network, Road Users or to Local Built Services arising from the construction, operation or decommissioning of the Proposed Gathabawn Windfarm, either alone or cumulatively as a whole project with the Candidate Gathabawn Grid Connection.

When all of the effects, are considered altogether it is evaluated that the **cumulative effect of the Whole Gathabawn Windfarm Project to the Public Road Network, Road Users or to Local Built Services will not be significant**.

EIAR 16.4.4.5 Environmental Protection Measures for Public Roads/Road Users/Built Services

Best practice measures which form part of standard windfarm construction/operation will be implemented during the construction/operational/decommissioning of the development to protect the Material Assets environment and avoid/reduce these not significant effects. These environmental protection measures are identified below and are included in the Construction Environmental Management Plan for the Project.

WM09	<u>Confirmatory road condition surveys</u> involving pre-construction and post-construction inspections, high-definition video surveys and FWD surveys will be undertaken along road widening locations on the L18062, and L58141, and along the routes of concentrated construction traffic between the R639 / N77 and the windfarm Site Entrances – i.e. the L58141, L1803, L5818, L1804, L1806, L18062 and L1807.
WM10 GM10	<u>Confirmatory consultations with service operators</u> (i.e. Uisce Eireann, Eir, ESB Networks, and Gas Networks Ireland) and confirmatory ground surveys at service locations will be carried out ahead of, and throughout, excavation works or use of machinery in close proximity to existing overhead and underground services.
WM11 GM11	The <u>construction Method Statements</u> to be developed by the construction contractors will take full account of the EMP including the mitigation and monitoring measures and will be reviewed by the Project Engineer and the Environmental Manager prior to the commencement of construction works.
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.
WM37	<u>No storage of excavated material on the public road</u> along road widening sections of the L58141 or L18062. All excavations from public roads will be removed to licensed waste facilities in accordance with the Waste Management Plan.
WM54	<u>Traffic speed limits</u> of 50km/h along the Local Roads L1807, L1806, L1804 and L5818; 30km/hr along the local roads L58141, and L18062 and 15km/hr along windfarm site roads.
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.
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
WM83 GM67	<u>‘Goal Posts’</u> will be used to identify and highlight the height of nearby overhead lines.
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.
WM86	<u>Site Entrances - visibility</u> : Hedgerows and roadside vegetation within the visibility splays will be trimmed and maintained throughout the construction phase to ensure safe visibility at site entrances.
WM87 GM70	<u>Public Road Works</u> : Works along the public road network will be carried out in co-ordination with Kilkenny County Council and in accordance with “Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads (Department of Transport, Tourism & Sport, 2017).

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.
WM89 GM72	The <u>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 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.
WM92	<u>Traffic Volumes</u> : The largest traffic volumes are associated with the concrete pours for the turbine foundations. No other deliveries to the Ballylehaun Area or Ballyring Area of the Gathabawn Windfarm will be scheduled to occur on the concrete pour days in that Area.
WM93	• <u>Local Traffic Flow</u>: Site entrance works and public road widening works on the L58141 and L18062 will be carried out prior to the main construction period at the Ballylehaun Area and at the Ballyring Area.
WM94	A <u>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.
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.
GM33	<u>No storage of excavated material on the public road</u> along the UGC routes, all excavations from public roads will be removed to licensed waste facilities in accordance with the Waste Management Plan.
GM52	<u>Road traffic speed limits</u> of 50km/h along the Local Roads L1807, L1806, L1804, and L5818; 30km/hr along the local roads L5821, L5820 and L18062; and 15km/hr along windfarm site roads.
GM61	<u>Dust Control</u> : Any loads of material which have the potential for dust emissions (such as aggregate) will be covered during transportation.
WM74 GM63	A <u>Community Liaison Officer</u> (CLO) 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.
GM68	<u>All excavation works and use of large plant</u> in close proximity to services will be supervised by a banksman; and a stock of repair materials for underground water mains will be kept at active works locations along the public road. Where Uisce Eireann assets are to be crossed by the UGC, the electrical cables will be installed under the Uisce Eireann asset in accordance with Eirgrid specifications and in accordance with Uisce Éireann's Standards Codes and Practices in relation to separation distances.
	<u>Roadside boundaries</u> will be maintained during the construction phase.

GM69	
GM71	<u>Public Road Repair</u> : Any damage to structures or road pavements along cable routes and along concentrated construction haul routes will be repaired to at least as good a condition as pre-works.
GM75	<u>Steel plating</u> will be available to cover the open trench to ensure access to property is maintained.
GM76	<u>Timing of Works</u> : UGC works which overlap, or whose associated HGV traffic is along, the L1807, L1806 the will not be carried out during concrete pour days for the Gathabawn turbines in the Ballyring Area.
GM77	<u>TII</u> : As requested by TII during preplanning consultation for the windfarm, all proposals relating to the N77 national road agreed and licensed between the Road Authority and the applicant will be shared with TII.
GM78	<u>Uisce Eireann</u> : As requested by Uisce Eireann during preplanning consultations, excavated materials from cable trenches and joint bays along the public road network will be sampled to ensure the material is inert.
GM79	<u>N77 Crossing</u> : the Parksgrove-Moatpark UGC will cross the N77 by horizontal directional drilling (HDD) rather than open-cut trenching, with no works within the N77 carriageway itself.
GM80	<u>Controlling Extent of Works</u> : Cable trenching along the Candidate Gathabawn Grid Connection route will be carried out in short, progressive sections, no longer than 100m in length, with each section reinstated before the next is opened.
WM95 GM81	<u>Scheduling Deliveries to avoid school drop-off/pick-up times</u> : HGV deliveries to works or compounds that pass through Lisdowney village or Gathabawn village, will be scheduled to avoid drop-off and pick-up times associated with Scoil Bhríde National School and Scoil na Críon Coille National Schools (approximately 8:30-9:00am, 1:30-1:50pm and 2:30-2:50pm). Any deliveries within the school pickup/drop-off times will be subject to a banksman/escort protocol. Construction drivers will additionally be briefed on the reduced-speed environment at the school frontage and on the likelihood of encountering slow moving agricultural vehicles and machinery on the local road haul routes, with the construction traffic schedule having regard, where practicable, to seasonal peaks in agricultural activity such as the silage season. Consultation with the Scoil Bhríde and Scoil na Críon Coille schools and with Kilkenny County Council Roads Section on this measure will be completed prior to finalisation of the Construction Traffic Management Plan.
GM82	<u>Grid Connection Coordination</u> : The Applicant will engage with other renewable energy developers proposing grid connections to the EirGrid Ballyragget Substation, with a view to sharing or optimising the use of grid connection assets, trenching corridors and associated infrastructure, and coordinating the timing and sequencing of construction works to minimise cumulative and repeated disruption to the same sections of public road.
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.
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.

EIAR 16.4.5 Impacts to Telecommunication Networks and Aviation**EIAR 16.4.5.1 Evaluation of Impacts to Material Assets with Potential to be Significant****EIAR 16.4.5.2 Interference with Three Ireland and Vodafone Link Paths**

Sensitive Aspect: Airborne Signals and Networks

Sensitivity: **Medium** (as per Section EIAR 16.3.3)

Impact Source(s) Operational turbines

Impact Pathway(s) Air

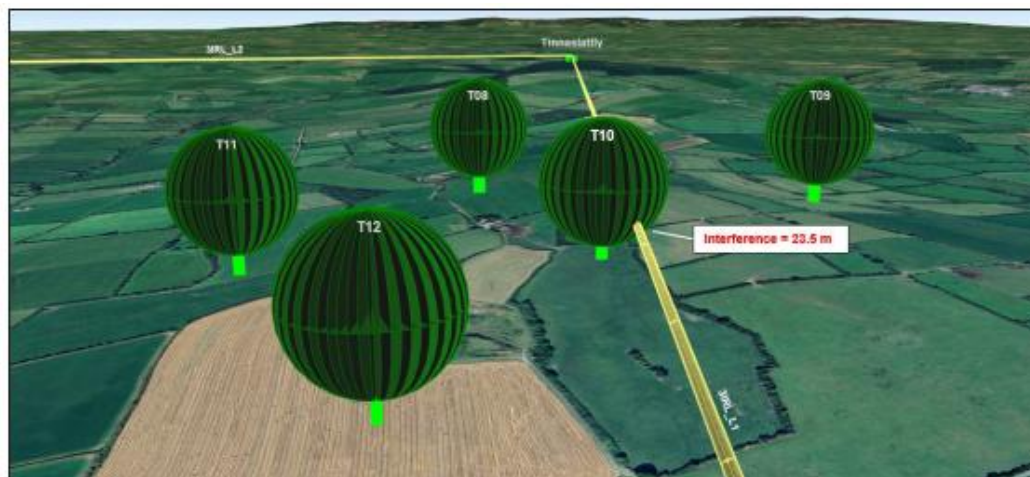
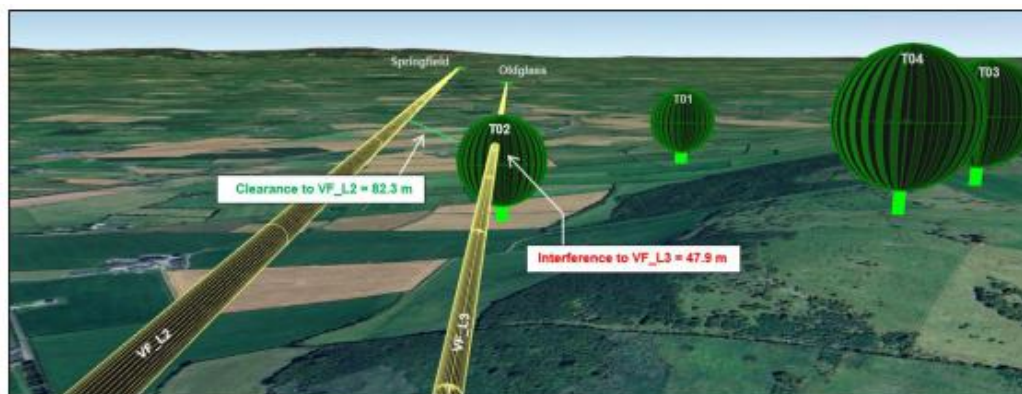
Project Stage Operational Phase

Overview of Impact (general):

Obstruction of radio link paths in the local area due to the presence and operation of the turbines.

Examination of the Impact of the Proposed Knocknamona Windfarm 2026:

Desktop modelling of local radio links found that two radio links are likely to be affected by the proposed Gathabawn Windfarm turbines – Three link between Tinnaslatty and Freshford, and a Vodafone link between Ballyspellan and Oldglass, as illustrated below:

**Three Ireland Network – 3D View****Vodafone Network – 3D View**

As these signal paths could be obstructed by the turbines, the impact on these links is considered to be significant without any remedial measures being implemented. However, mitigation Measures are readily available within the Operators networks, as outlined below.

Impact Magnitude	Medium	Impact Significance: <i>(pre-mitigation)</i>	Significant
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Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

WM82 Telecom operators will be contacted prior to the erection of the permitted wind turbines to confirm (1) requirement for mitigation measure, and (2) form of mitigation measure to be implemented – i.e. one or a combination of (a) change of telecom equipment on the existing masts; (b) change of signal pathways; (c) installation of telecom apparatus onto the windfarm met mast.

Effectiveness of Mitigation: The mitigation measures will effectively resolve any radio link path obstruction by relaying the signals to other masts in the surrounding area to avoid the signals being relayed through the windfarm site, as illustrated hereunder:

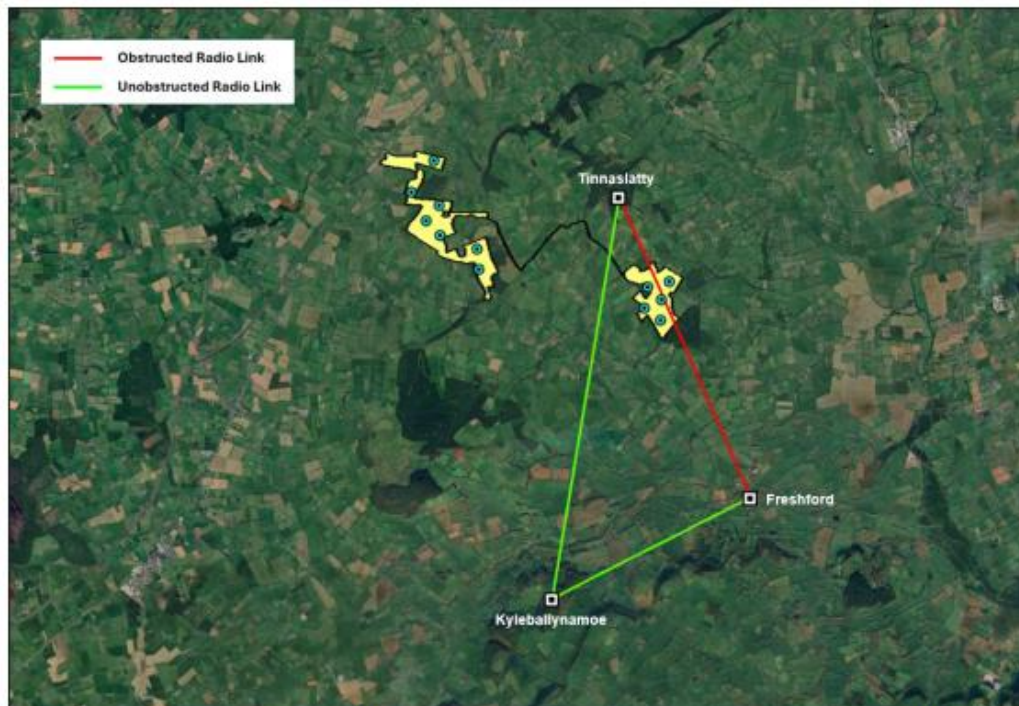


Figure 13. Example of how an existing telecoms mast could be used relay the radio link between Tinnaslatty and Freshford.



Figure 16. Example of how an existing telecoms mast could be used relay the radio link between Oldglass and Ballyspellan.

Therefore, with the implementation of this effective mitigation, there will be no residual impact of the Proposed Gathabawn Windfarm Turbines on Three Ireland or Vodafone radio links in the area.

Residual Impact Significance (post-mitigation):**No Residual Impact****EIAR 16.4.5.3 Impacts to Telecommunication Networks and Aviation -Not Significant**

All of the remaining effects of the Gathabawn Windfarm Project on Material Assets – Telecommunication Networks and Aviation will not be significant. A short evaluation of these effects is provided below.

Impact on aviation from operational Gathabawn Windfarm turbines (O): No Impact. The findings of the Aviation review (see [Appendix 16.4](#)) are included in the table below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	The proposed Gathabawn Windfarm turbines are located outside the OLS Surfaces for Shannon and Waterford Airports.
Annex 15 - Aerodrome Surfaces	None	Turbines at the proposed Gathabawn Windfarm turbines would not penetrate the ICAO Annex 15 Aerodrome Surface for Shannon or Waterford Airports.
Building Restricted Areas	None	A review shows that the proposed Gathabawn Windfarm turbines are over 50 km from the BRAs for at Shannon and Waterford Airports. At this distance there would be no impacts due to the proposed wind farm.
Minimum Sector Altitudes (MSA)	None	A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is outside 25 nautical miles from the VOR/DME at Shannon and Waterford Airports. Therefore, the MSA of the relevant sectors will not be affected and there will be no impact on the published MSA altitude figures.
Instrument Flight Procedures	None	A review shows that the instrument flight procedures for Shannon and Waterford Airports are unlikely to be impacted for precision aircraft.
Communications and Navigation Systems	None	As the proposed Gathabawn Windfarm turbines are more than 65 km from the Localizer and transmitting antenna at Shannon and Waterford Airports, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Sensors	None	The proposed Gathabawn Windfarm turbines would be located in Assessment Zone 4 (EuroControl guidelines) for SSR and PSR instruments and a detailed Impact Assessment should not be required.
Flight Inspection and Calibration	None	The annual Flight Inspection Procedures will not be impacted by the proposed Gathabawn Windfarm turbines as the proposed site is sufficiently far from the ARPs at Shannon and Waterford Airports that there would be no impact. In addition, the Flight Inspection Procedures should already account for existing obstacles.
Irish Air Corps / DoD Safeguarding	None	The proposed wind farm is partially located within an Irish Air Corps Restricted Area along the M8 motorway. However, it should be noted that low-level flights along the M8 motorway are likely to avoid the proposed wind farm site, due to high terrain to the east of the motorway and due to the existing wind turbines at Lisdowney. As set out during pre-planning consultations, the developer, in the event of planning consent being granted, will contact the IAC regarding the Military Aviation Lightning requirements for the turbines.
Obstacle Warning Light Scheme	Observation	As set out during pre-planning consultations, in the event of planning consent being granted, the developer will contact the IAA regarding the Aeronautical Obstacle Warning Light Scheme for the turbines.

Item	Impact	Summary
Garda Air Support Unit and Emergency Aeromedical Service	None	An assessment of GASU and EAS operations indicate that they are unlikely to be impacted by the proposed wind farm development.

Impact on local aviation from operational Gathabawn Windfarm turbines (O): No Impact: In relation to Private Airfields and Helipads, it is evaluated that no impacts are likely to occur as the proposed development is over 10 km from the nearest airfield/heliport and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact due to the proposed turbines.

Interference with television reception (O): No Residual Impact, while there is potential for the turbines to affect television reception locally, the developer is committed to signing up to a 2RN (RTE) protocol and implementing measures (realignment of aerials, redirection of aerials to other RTE Masts, or provision of satellite services) which will ensure any loss or degradation of television reception is restored.

Interference with local Broadband services (O): Neutral: A number of unlicensed radio link equipment were identified on mast structures, details of which were not available to the ComReg site viewer database. The equipment use case was not identifiable. Should there be any report of any potential interference from the proposed development during its operational phase the developer is committed to working with the operator of these networks to remediate any impacts caused by the proposed turbine.

EIAR 16.4.6 Summary of Impacts

All of the residual effects of the Proposed Gathabawn Windfarm, and the Whole Gathabawn Windfarm Project on Material Assets will **not be significant**.

EIAR 16.4.7 Environmental Protection Measures

In addition to the mitigation measures identified in Section 16.4.5.1, additional measures will be implemented to protect Telecommunication Networks, Television Reception and Aviation. These environmental protection measures are identified below and are included in the Environmental Management Plan for the whole Gathabawn Windfarm Project.

WM81	<u>Aviation safety</u> : the developer will notify the Irish Aviation Authority of their intention to commence crane operations at least 30 days prior to their erection. In addition, the as-constructed co-ordinates and elevations will be provided in the required format, and an aeronautical obstacle warning lighting scheme for the wind farm will be agreed with the Irish Aviation Authority
WM82	<u>Telecom operators</u> will be contacted prior to the erection of the permitted wind turbines to confirm (1) requirement for mitigation measure, and (2) form of mitigation measure to be implemented – i.e. one or a combination of (a) change of telecom equipment on the existing masts; (b) change of signal pathways; (c) installation of telecom apparatus onto the windfarm met mast.
WM110	<u>TV Signals</u> : the Promoter will sign up to the 2RN Protocol Agreement to manage and rectify interference caused by the Gathabawn turbines to television services locally. To rectify interference on TV signals caused by the Gathabawn turbines, one of the following measures would be undertaken, decided on a case-by-case basis:

	(i) TV Antenna re-alignment and increase height - In instances where user dwelling antennas are misaligned and installed either at very low heights or in attic spaces, re-aligning the aerial and increasing its height may resolve TV interference. (ii) Antenna Re-tuning to an alternative transmitter could resolve TV issues for some residences. (iii) Subscription-Free Satellite TV service (SaorSat) which would provide digital TV to residences with a once-off installation charge (covered by the developer). This service can be deployed over satellite, which would incur no interference from the wind farm.
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EIAR 16.5 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 Material Assets 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** are set out below and Other Projects located within this Study Area were identified and examined for potential for cumulative effects.

- **Public Roads and Road Users:** construction material haul routes which could be impacted upon by other projects with potential to generate significant construction or operational traffic on shared transport infrastructure. This includes the N77 national road, R639 regional road, and L58141, L1803, L1804, L1806, L18062 and L1807 local roads for the Proposed Gathabawn Windfarm, and the L5818, L5821, L5820, L1806, L18062, L1808, L1811 and L1807 local roads, and the N77, for the Candidate Gathabawn Grid Connection.
- **Built Services:** within 10m of construction works for underground pipes or cables and overhead lines to allow for machinery movement. The extent of the study area is from the fault point to the nearest valve/transformer/cabinet.
- **Telecommunication Signals:** Due to the nature of telecommunication signal paths, which once affected by one development are not available for interference by a second development (as the links are broken) – and as such are not relevant to the cumulative study.
- **Aviation** - due to the separation distance of the proposed Gathabawn Windfarm to airports, a screening review of aeronautical surfaces indicates that there is unlikely to be potential for cumulative effects with other projects.

The Other Projects which occur within the Cumulative Study Areas were subject to a cumulative scoping exercise, see [Chapter 5 Description of the Development Appendix 5.4](#). As a result of this scoping exercise, some of these Other Projects were scoped IN for evaluation of cumulative effects, and these projects are listed below.

The Other Projects which have been Scoped-IN to the cumulative evaluations herein are identified in [Figure 16.4.1: Other Projects Scoped-In for Material Assets Cumulative Evaluations](#) and [Figure 16.4.2: Other Projects Scoped-In for Material Assets Cumulative Evaluations](#) (included at the end of this chapter).

EIAR 16.5.1 Evaluation of Cumulative Impacts with Other Projects

The potential for cumulative effects with Other Projects is evaluated hereunder. The evaluation takes into account existing sources of pollution or damage identified in Section EIAR 16.3.2.

EIAR 16.5.1.1 Public Roads and Road Users – Cumulative Evaluation

Other Projects Scoped In: Briskalagh WF Grid Connection (consented), Seskin Wind Farm & Grid Connection (under appeal to ACP), Littleton WF Grid Connection (in planning), Killoshulan WF Grid Connection (preplanning), Ballynalacken WF Grid Connection (consented), Battery Energy Storage Projects in Moatpark (BESS 1 and BESS 2) (consented).

Local Roads: No cumulative impact: There are no other large developments such as wind farms, or new quarries/mines, or new large housing estates planned, or likely to be constructed/operational and which may use the same local road network as the Proposed Gathabawn Windfarm or the Candidate Gathabawn Grid Connection, and therefore no cumulative impacts to local roads or road users are expected to occur as a result of currently consented development. It is noted that the Candidate Killoshulan Wind Farm has been identified with a potential grid connection route which would run along part of the same local road network as the Candidate Gathabawn Grid Connection and the Proposed Gathabawn Windfarm's own construction haul route, namely the L1806 (Lisdowney to Ballyring), before the two routes diverge, with the Killoshulan route continuing via the L5833. As the Killoshulan Wind Farm has not yet received permission, a quantitative cumulative assessment of this potential road-network overlap cannot be undertaken at this time. Should the Killoshulan Wind Farm's grid connection proceed to planning with trenching works on the L1806, this would be managed through the Grid Connection Coordination and Sectional Working measures set out in Section EIAR 16.4.4.5 which the Applicant is already committed to for the equivalent overlaps assessed elsewhere in this section; on this basis, no significant cumulative impact to the L1806 is anticipated, subject to that coordination being carried through at the appropriate time.

Regional Roads: Neutral cumulative impact: There are no other large developments such as wind farms, or new quarries/mines, or new large housing estates planned, or likely to be constructed/operational and which may use the Regional Road R639 (Durrow – Johnstown Road) or the R432 (Ballyragget – Ballinakill Road), and therefore no cumulative impacts to local roads or road users as a result of increased traffic are expected to occur. In relation to cumulative road works, it is noted that the Ballynalacken WF Grid Connection, the Briskalagh WF Grid Connection and the Littleton WF Grid Connection will involve trenching works in the R432, with potential for more than one set of roadworks on a 1km stretch of the Regional Road, while the BESS1 & BESS 2 projects will be constructed adjacent to the candidate grid connection and works in the EirGrid Ballyragget Substation. However, any delays or disruptions will be brief and reversible with the completion of construction works, and furthermore it is considered unlikely that Kilkenny County Council would allow multiple stop-go systems in operation on a 1km stretch of this regional road. Any effects to road users will be Low. Under a robust worst-case scenario assuming simultaneous peak construction of Gathabawn's cabling works and the adjacent battery storage installations and other windfarm grid connections, cumulative HGV movements on the regional network would be minor and of short duration. When considered against baseline traffic volumes, this equates to a negligible percentage of daily traffic and is not significant in capacity terms. The carrying capacity of the R432 is more than adequate to accommodate these temporary HGV movements.

The addition of the Candidate Gathabawn Grid Connection will increase underground electricity cables in a circa 150m section of this road to 3 sets of 110kV cables, filling the capacity of this road. This is considered a potential Moderate Cumulative Impact. However, it is noted that the design of the Parksgrove Substation will include additional bays for other generator connections, and heavier cables which will be capable of

transporting both the Gathabawn project production and also additional electricity from a potential future project will be used in the Parksgrove-Moatpark UGC. These design features would facilitate a 3rd party connection and avoid the need to connect directly to the Eirgrid Ballyragget Substation (see Section EIAR 5.4.2.2), offsetting, to some degree, the cumulative taking up of road space. It is noted in Mitigation Measures GM82 that the developer of the Gathabawn Windfarm project will engage with other renewable energy developers proposing grid connections to the EirGrid Ballyragget Substation, with a view to sharing or optimising the use of grid connection assets, trenching corridors and associated infrastructure, and coordinating the timing and sequencing of construction works to minimise cumulative and repeated disruption to the same sections of public road.

National Road N77: Imperceptible cumulative impact (during any construction stage overlap) – Cumulative construction traffic from both Gathabawn Windfarm and Seskin Wind Farm projects, and potential additional traffic for the Briskalagh WF Grid Connection and the Littleton WF Grid Connection would represent a very small percentage increase on the baseline AADT (>5,000 vehicles/day), even under a worst-case peak overlap scenario. Seskin Wind Farm also has a site entrance directly onto the N77. Temporal overlap of construction works is uncertain. In a worst case scenario where all projects are constructed during the same time period – the potential overlap for works is limited to a short section (c.1km) of the N77 associated with the Briskalagh WF Grid Connection works, Candidate Gathabawn Grid Connection works, Seskin WF Grid Connection works and Littleton WF Grid Connection works, in addition to general material deliveries to these windfarms. All grid connections will involve a HDD crossing of the N77 and works in the verges of this road, with no works within the N77 pavement. Spatial separation prevents cumulative effects on local junctions. The extent of grid works for each project is relatively short, and each will be completed over a number of weeks. Furthermore, the N77 has adequate capacity to accommodate temporary construction-related HGV traffic. Overall, the magnitude for this High Importance receptor is considered to be Low and is considered to be of Slight significance. Subject to implementation of individual project Construction Traffic Management Plans and coordination with local authority roads sections, **cumulative impacts would not be significant.**

EIAR 16.5.1.2 Built Services – Cumulative Evaluation

Electricity Transmission & Distribution System and Local Built Services: Neutral cumulative impact: There are no other grid connections or other projects which would involve the movement of large machinery in the vicinity of the overhead lines which could potentially be affected by the Gathabawn Windfarm turbine delivery facilitating works on the L1804 and L1806. Due to the linear nature of the Candidate Gathabawn Grid Connection, there are a greater number of overhead lines and underground services, however the potential for cumulative impacts only relates to built services under/alongside the N77 and the R432 where consecutive impacts could occur to service operators and end users of local electricity and telephone networks and to the local Uisce Eireann water mains. However, in the scenario where a line or water main is damaged by one project and then later by another project, the effects to the service are quickly and easily reversible with implementation of repair works, and any impacts to service operators and end users will be cumulatively Imperceptible.

EIAR 16.5.2 Summary of Cumulative Evaluations

Taken together, it is evaluated that **adverse cumulative impact** to Local Roads and Road Users, and Local Built Services of the Proposed Gathabawn Windfarm cumulatively as a whole and with Other Projects **will be Not Significant.**

EIAR 16.6 SUMMARY CONCLUSION

PUBLIC ROADS: Construction haulage to the Proposed Gathabawn Windfarm will use routes from the N77 national road: via the R639 at Durrow to the Ballylehaun Area (using the L58141), and via the L1807 at Parksgrove, through Lisdowney, to the Ballyring Area (using the L1806 and L18062). The Candidate Gathabawn Grid Connection will be accessed via the L1807, L1811, L1806, L1808, L18062, L5820, L5821, L5818 and L1804. Site entrances have been designed to achieve appropriate sightlines, with two temporary entrances also proposed on the L1804 and L1806. Road widening is proposed on the L58141 and L18062 to facilitate delivery of turbine components and construction materials, and a new temporary access road is proposed between the L1804 and L1806 (Facilitating Works FW8) to bypass the L1804/L1806 junction at Foyle Bridge during turbine blade deliveries. Any damage to roads caused by construction traffic will be repaired, and pre- and post-construction road condition surveys will be carried out (SM09). The residual impact to Public Roads is evaluated as Slight and Not Significant.

ROAD USERS: Local roads subject to haulage activities were assessed with respect to societal value, vulnerability to change and the magnitude of potential impacts. Traffic counter surveys carried out at twelve locations along the haul routes, together with manual turning-movement surveys at seven key junctions (see [Appendix 16.2: Traffic and Transport Assessment](#)), demonstrate that the local roads in the area are generally very lightly trafficked. Two junctions – Junction 1 (N77/R639/The Square, Durrow) and Junction 7 (N77/L1807, Parksgrove) – were assessed in detail using Junctions11 (PICADY) modelling; both continue to operate within capacity throughout the construction, operational and decommissioning phases, in the 2026 base year and the 2027 and 2037 design years, with the observed decline in Level of Service on the Junction 1 approach attributed predominantly to background traffic growth rather than construction traffic. The remaining five junctions were screened out of detailed modelling on reasoned materiality grounds. The effect of delays to Road Users due to construction traffic and any associated road works is evaluated as Imperceptible to Slight, given the lightly trafficked nature and available capacity of the roads, the temporary duration of works, and the application of traffic management measures (including a Traffic Management Plan, speed limits, and the mitigation set out in Section 16.4.8). No significant increased risk of road accidents is anticipated as a result of construction traffic, given the modest increase in traffic volumes, the existing road capacity, appropriate sightlines at site entrances, and the transport of turbine components under Garda escort.

LOCAL BUILT SERVICES: Local electricity services in the area are mainly low and medium voltage overhead lines connecting local residences and farms, with high voltage transmission lines present in the vicinity of the EirGrid Ballyragget Substation associated with the Candidate Gathabawn Grid Connection. A small number of overhead electricity lines cross the construction works areas at the Ballylehaun and Ballyring Areas and along the Candidate Gathabawn Grid Connection route; no impacts to local electricity infrastructure are likely to occur, given standard construction practices and the low number of end users affected, while the connection of the Proposed Gathabawn Windfarm to the national electricity grid would be of imperceptible positive benefit.

There are no Uisce Éireann water/wastewater services, Group Water Schemes or national gas supplies in proximity to the Proposed Gathabawn Windfarm construction works area, and therefore no likely impact on local water or gas infrastructure is expected as a result of the development. Uisce Éireann and Gas Networks Ireland infrastructure is present within the Parksgrove/Moatpark area along the Candidate Gathabawn Grid Connection route, along with Eir overhead lines at several Facilitating Works locations; effects to these services are expected to be Neutral, being brief and reversible in the unlikely event of any damage. A masonry bridge and a number of pipe and drainage culverts occur along the Ballylehaun-Ballyring UGC route; no impact to these structures is expected, as they will be crossed by Horizontal Directional Drilling or, where a

culvert requires replacement, reinstated like-for-like, with all construction traffic remaining within legal axle loading limits.

TELECOMMUNICATIONS SIGNALS AND NETWORKS: The design and layout of the Gathabawn Windfarm turbines are likely to affect one Three Ireland radio link and one Vodafone radio link, however mitigation is readily available, and the operators will be able to route these signals around the windfarm area using their other existing masts in the surrounding area. Therefore, no residual effects to telecommunication link are expected to occur. No effects are expected to any other telecommunication signals.

In relation to television reception locally, with the implementation of mitigation measures and the commitment to an 2RN (RTE) protocol, that no residual impacts are likely to occur.

AVIATION: The proposed Knocknamona Windfarm 2026 is located in County Waterford approximately 68km northwest of Waterford Airport and 96km east of Shannon Airport, and there are no private airfields within 10km. It was found that there would be no impact to CNS infrastructure and also no impacts to users of uncontrolled airspace flying to Rules of the Air.

The proposed wind farm is partially located within the IAC Restricted Area along the low-level flight route around the M8 motorway, and the IAC may raise concerns in relation to the proposed wind farm development. However, it should be noted that low-level flights along the M8 motorway are likely to avoid the proposed wind farm site, due to high terrain of Spahill/Clomantagh Hill and Cullahill Mountain to the east of the motorway and due to the existing wind turbines at Lisdowney. During pre-planning consultations, the developer committed to agreeing the lighting scheme for the turbines with the IAC and the IAA, should planning permission be granted for the project.

MITIGATION MEASURES: Measures to further minimise the impact on Public Roads and road users include developing a Traffic Management Plan and implementing a road safety protocol in coordination with the local schools and Kilkenny County Council to safely coordinate and manage construction traffic, operating a road sweeper to keep roads clean during construction, and repairing any road damage caused by construction traffic. Other measures include the use of bankmen and pre-works consultation with built services operators.

Telecom operators will also be contacted prior to the erection of the Proposed Gathabawn Windfarm turbines to confirm the requirement for any mitigation and form of mitigation to be implemented. The developer will contact the IAA and IAC post consent regarding the lighting scheme for the turbines. The developer is also committed to signing a Protocol Agreement with 2RN and implementing measures (realignment of aerals, redirection of aerals to other RTE Masts, or provision of satellite services) which will ensure any loss or degradation of television reception is restored.

Overall, it is evaluated that the residual impact of the Proposed Gathabawn Windfarm on Materials Assets, both alone and in-combination with Other Elements of the Whole Project and cumulatively with Other Projects, will be Not Significant.

EIAR 16.7 Glossary, List of Abbreviations**Glossary of Terms**

Term	Definition
Traffic Growth	The normal expected growth in traffic over time

List of Abbreviations

Abbreviation	Full Term
AADT	Annual Average Daily Traffic
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.
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
HGV	Heavy Goods Vehicle
HV	High Voltage – i.e. 38kV, 110kV and 220kV (38,000, 110,000 and 220,000 volts respectively)
kV	Kilovolt
Km	Kilometre
NM	Nautical Mile (1 NM = 1.852 km)
OHL	Overhead Line
TII	Transport Infrastructure Ireland
TTA	Traffic and Transport Assessment
UÉ	Uisce Éireann (formerly known as Irish Water)

EIAR 16.8 Reference List

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EIAR 16.9 List of FiguresFIGURES (overleaf)

Figure 16.1	Local Roads and Site Entrances along Windfarm Construction Access Routes
Figure 16.2	Turbine Delivery Route
Figure 16.3	OHL ESBN/Eirgrid and Eir Networks and Uisce Éireann Water Mains
Figure 16.4.1	Other Projects Scoped-In for Material Assets Cumulative Evaluations
Figure 16.4.2	Other Projects Scoped-In for Material Assets Cumulative Evaluations

EIAR 16.10 List of AppendicesAPPENDICES (overleaf)

Appendix 16.1	Methodology for the evaluation of Material Assets
Appendix 16.2	Traffic and Transport Assessment
Appendix 16.3	Telecommunication Impact Assessment
Appendix 16.4	Aviation Review Statement

Figures

EIA Chapter 16: Material Assets
 Figure 16.1 - Local Roads and Site Entrances along the Windfarm Construction Access Route
 Legend:
 Proposed Gathabawn Windfarm
 Construction Materials Haul Route
 Public Road Identification Number
 Towns/Villages

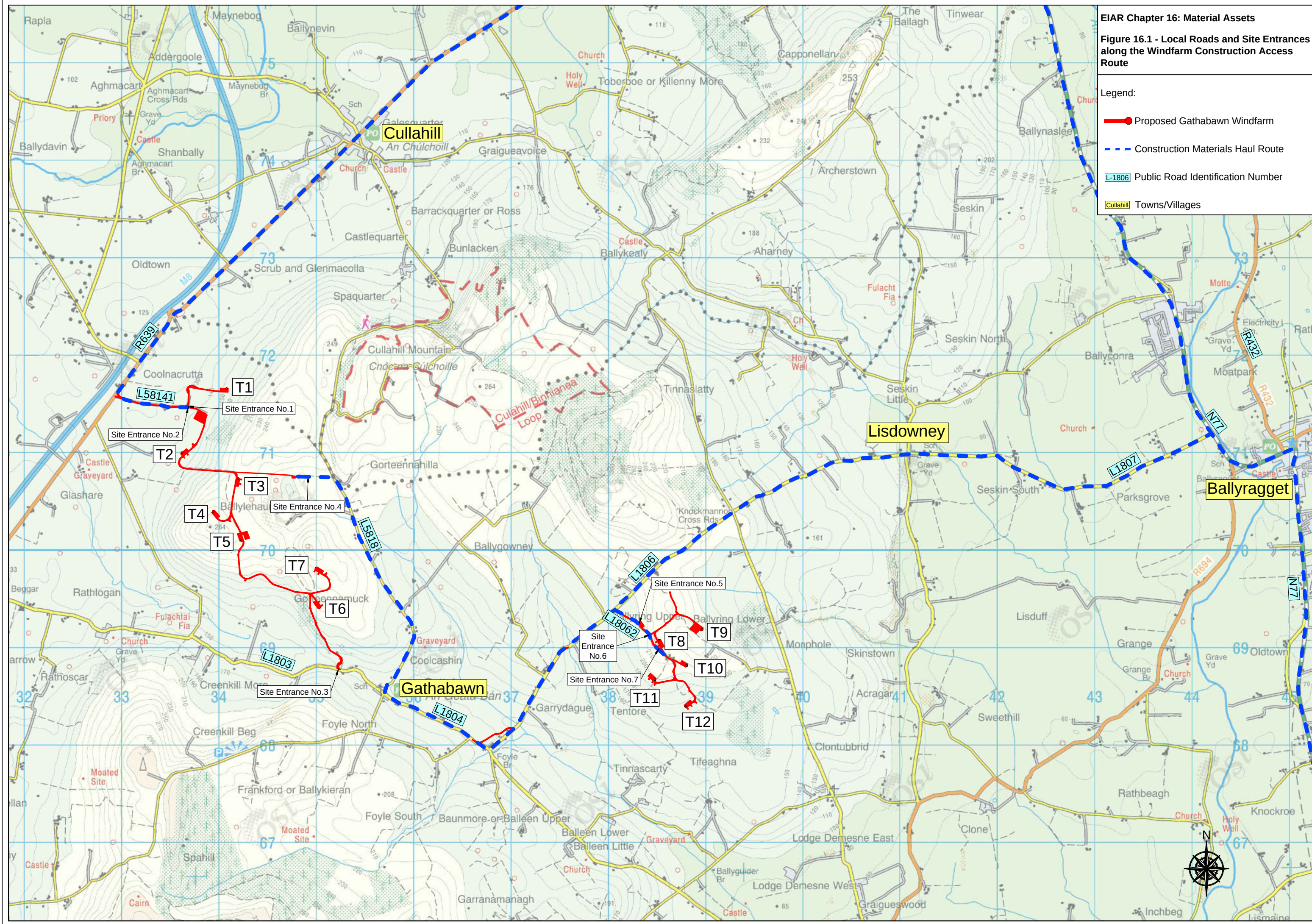
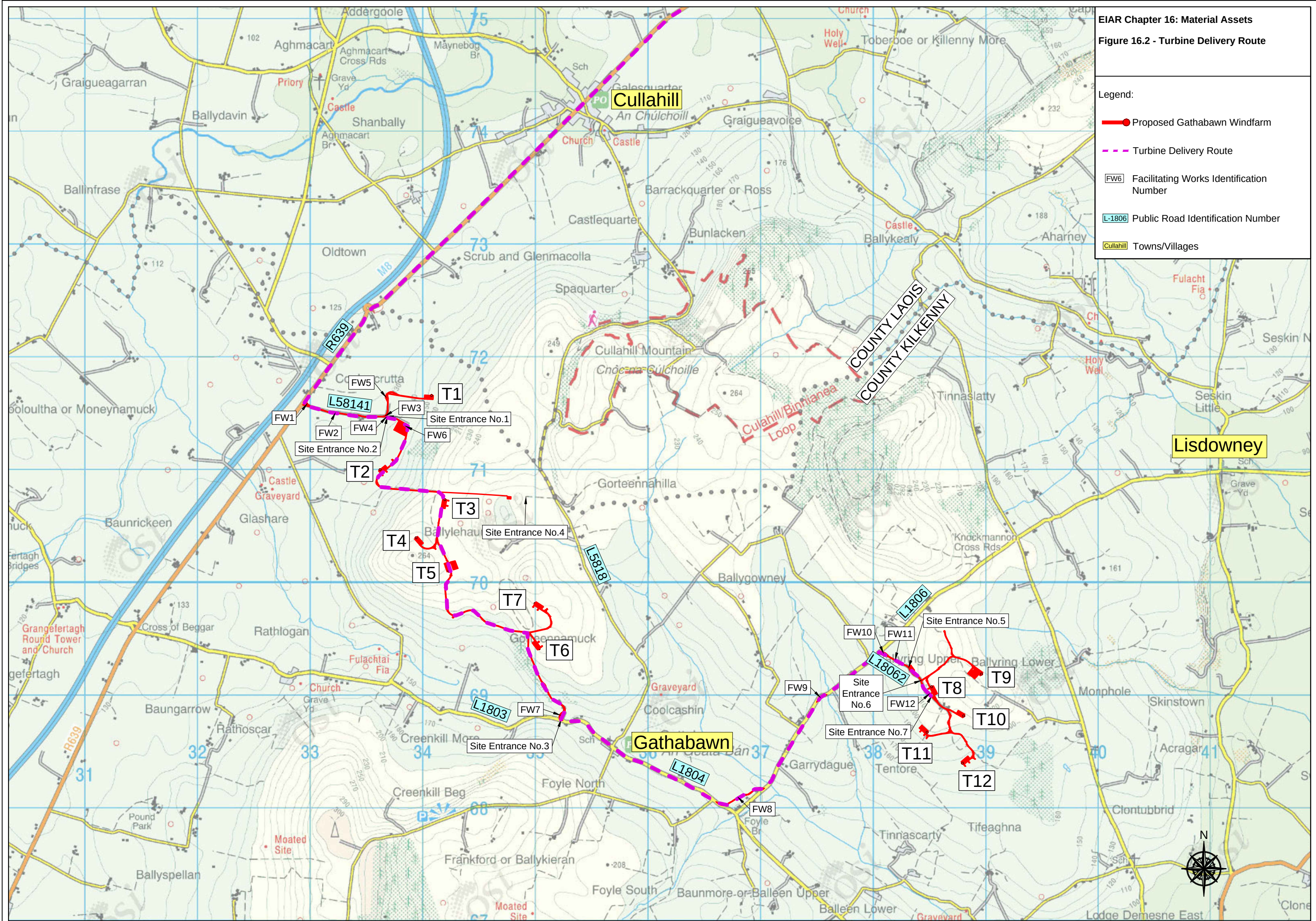


Figure 16.2 - Turbine Delivery Route

Legend:

- Proposed Gathabawn Windfarm
- - - Turbine Delivery Route
- FW6 Facilitating Works Identification Number
- L1806 Public Road Identification Number
- Cullahill Towns/Villages



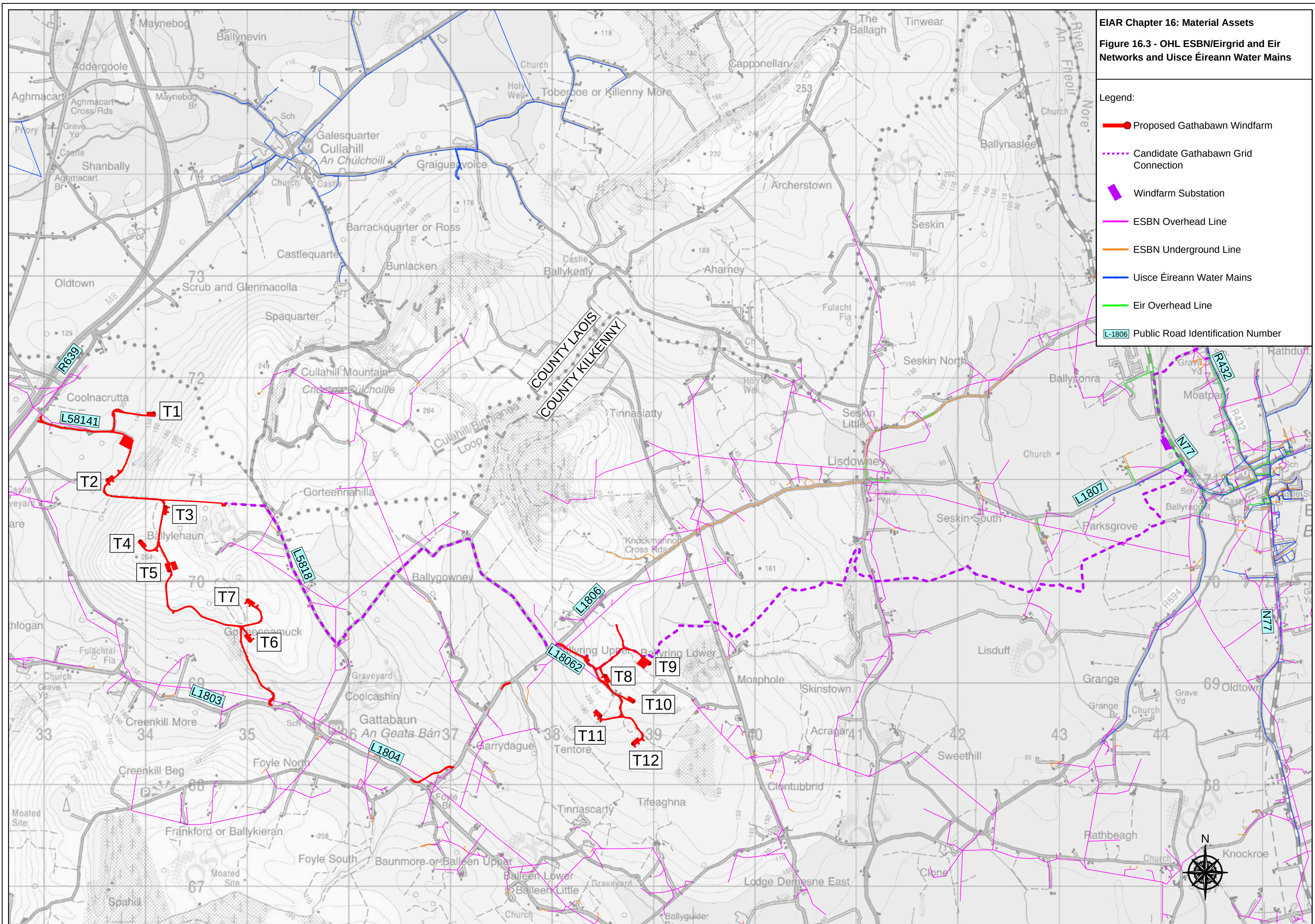


Figure 16.4.1: Other Projects Scoped-In for Material Assets Cumulative Evaluations

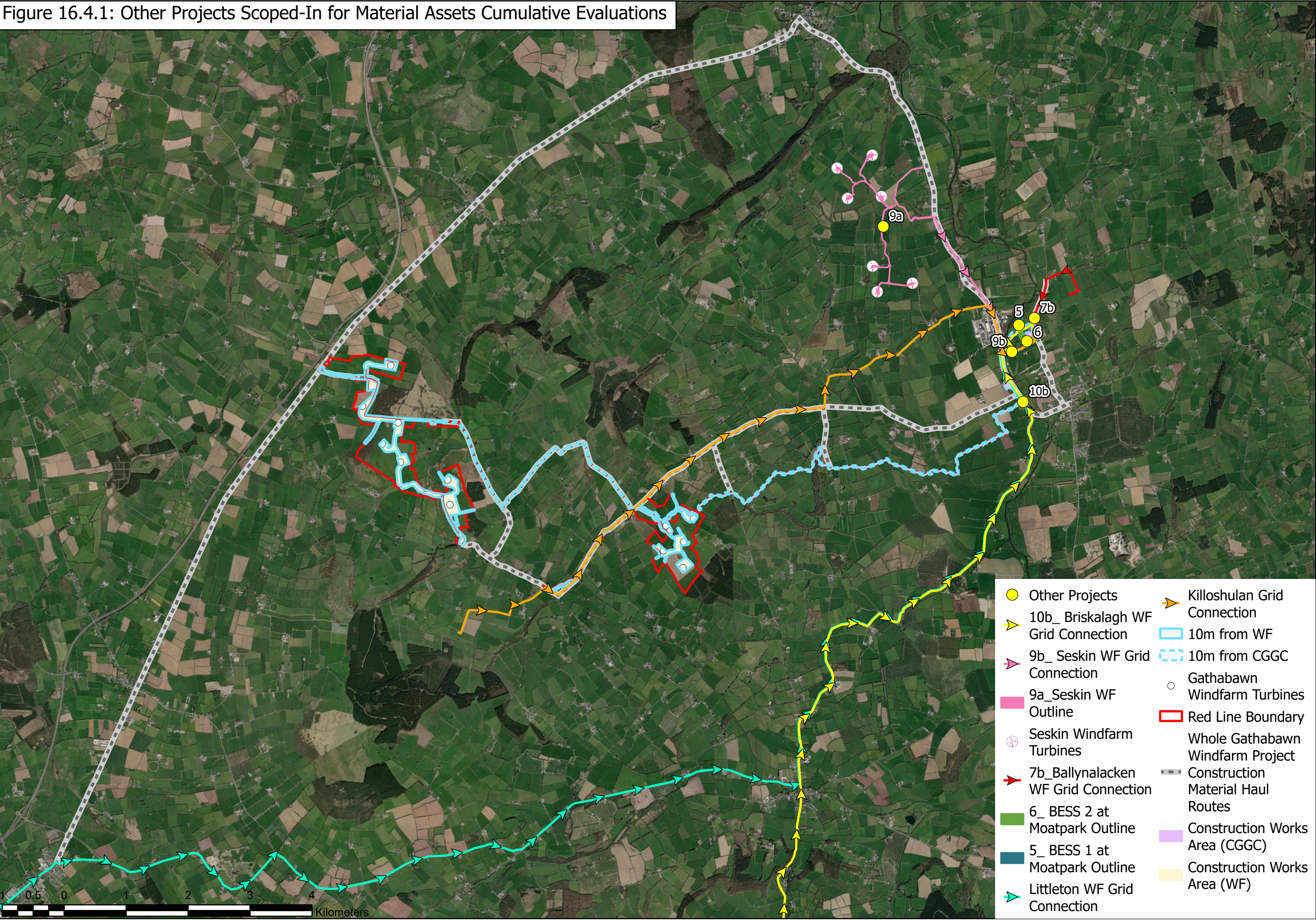
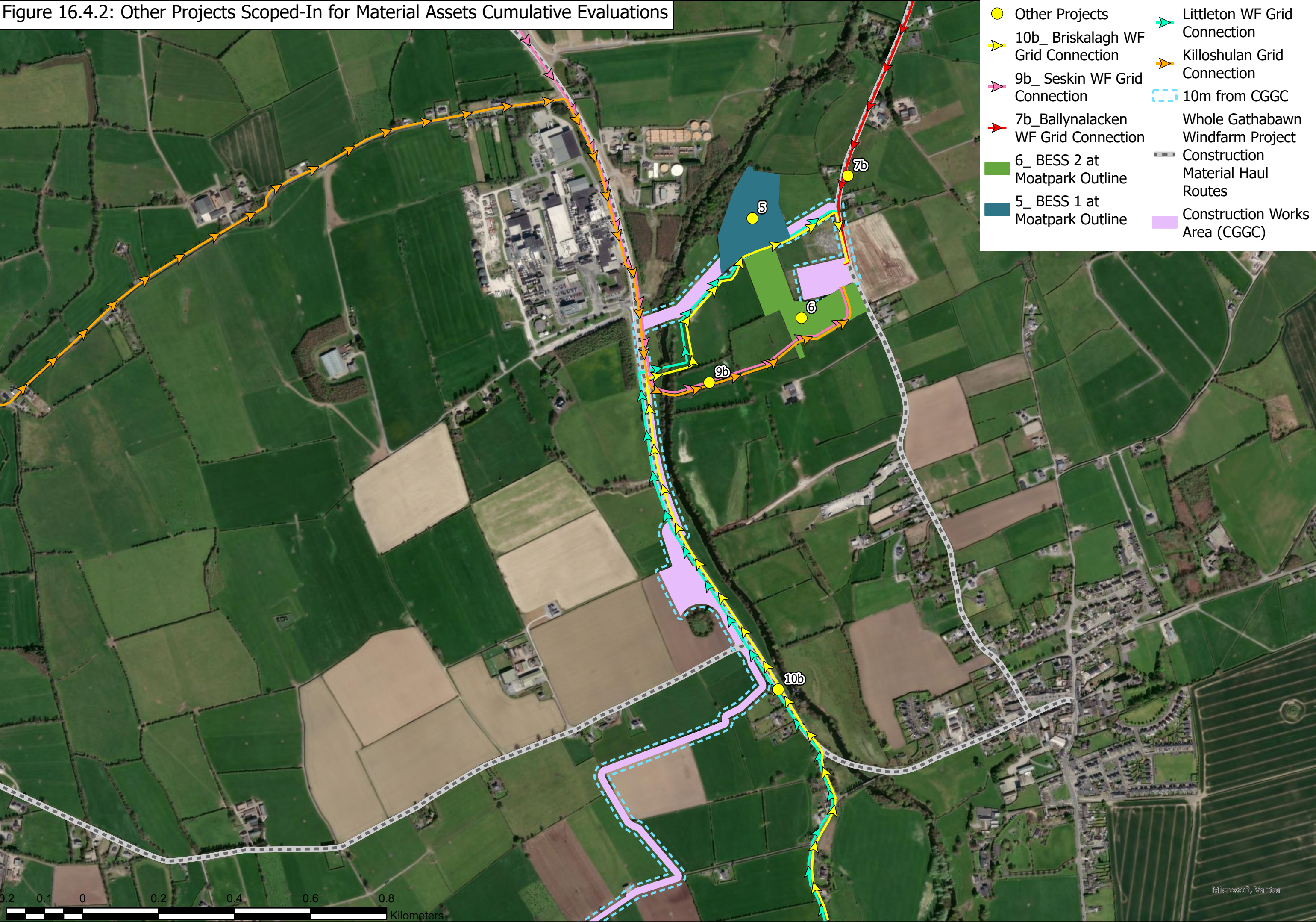


Figure 16.4.2: Other Projects Scoped-In for Material Assets Cumulative Evaluations



Appendix to Chapter 16: Material Assets

Appendix 16.1: Methodology for the evaluation of Material Assets

Contents

A16.1	Methodology Applied during the Preparation of Chapter 16: Material Assets.....	2
A16.1.1	Guidance Documents.....	2
A16.1.2	Overview of the IMPERIA Project ARVI approach.....	2
A16.1.3	Criteria for Evaluating the Sensitivity of a Receptor	4
A16.1.4	Criteria for Evaluating the Magnitude of an Impact	5
A16.1.5	Assessing the significance of an impact.....	8

A16.1 Methodology Applied during the Preparation of Chapter 16: Material Assets

In the absence of specific guidance on the evaluation of Material Assets for an EIA Report, in addition to the desktop surveys and fieldwork carried out for the Project as detailed in Section EIAR 16.1.2 of Chapter 16: Material Assets, the *Guidance on the information to be contained in EIA Reports* (EPA, 2022), along with the ARVI approach for impact significance assessment developed under the EC IMPERIA LIFE11 Project, are employed for this evaluation. The ARVI approach has been used to evaluate impact significance using a multi-criteria decision analysis, where the sensitivity of the receptor in the environment and the magnitude of the change caused by a particular project are rated, and then an overall significance can be determined.

The IMPERIA Project Report Guidelines for the systematic impact significance assessment – the ARVI approach (2015) is included in full as Appendix 2.1 of this EIAR, with the methods used for determining sensitivity, magnitude and significance reproduced below. The author's extensive experience with EIA preparation also informs this report.

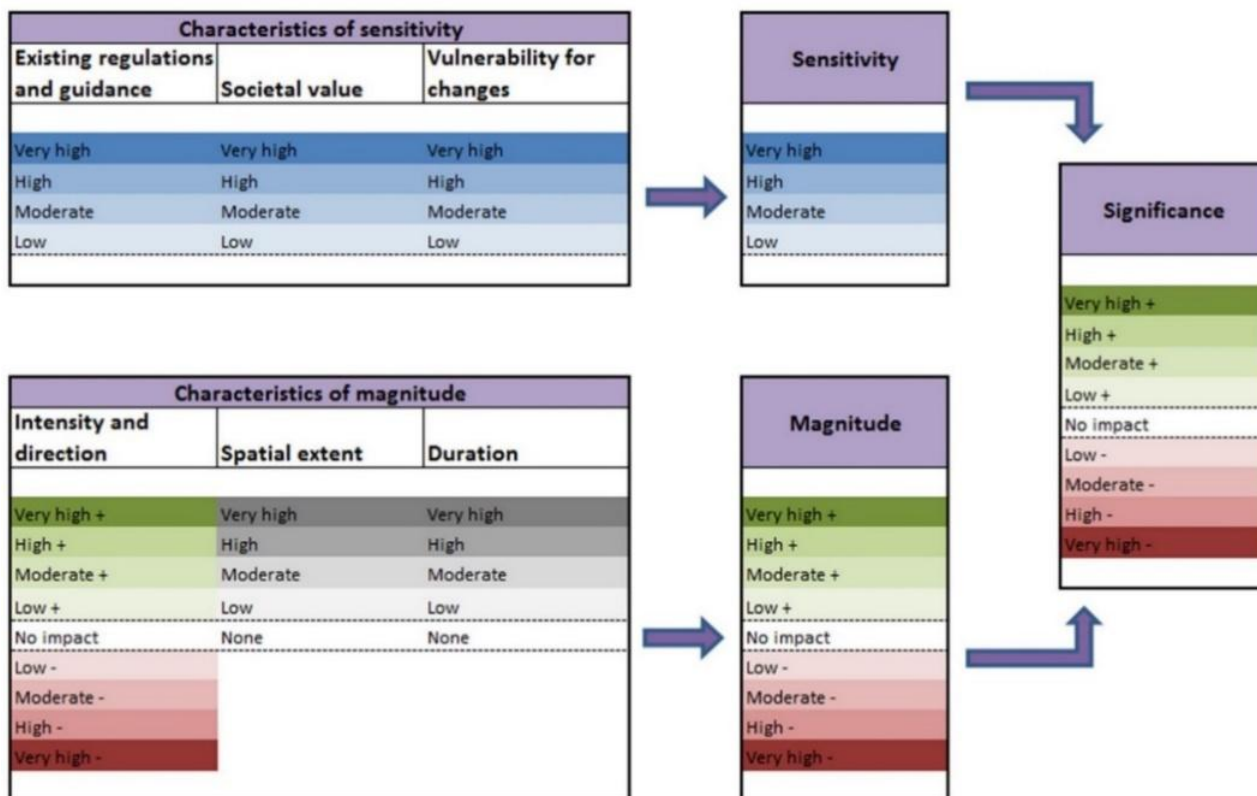
A16.1.1 Guidance Documents

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

- Transport Infrastructure Ireland (2014) *Traffic and Transport Assessment Guidelines*
- Transport Infrastructure Ireland (2013) *Design Manual for Roads and Bridges*
- Transport Infrastructure Ireland (2013) *Specification for the Reinstatement of Openings in National Roads*
- Ireland, Department of Transport (2021) *Traffic Signs Manual*
- Health and Safety Authority (2016) *Code of Practice for Avoiding Danger from Underground Services*
- Health and Safety Authority (2019) *Code of Practice for Avoiding Danger from Overhead Electricity Lines*
- Uisce Éireann (2020) *Connections and Developer Services – Code of Practice for Water Supply Infrastructure (A Design and Construction Guide for Developers)*
- Ireland, Department of Transport, Tourism and Sport (2017) *Guidelines for Managing Openings in Public Roads*

A16.1.2 Overview of the IMPERIA Project ARVI approach

In the framework developed under the EC LIFE project - IMPERIA, the evaluation of impact significance uses a replicable, multi-criteria decision analysis, where the sensitivity of the receptor (i.e. the sensitivity of a Sensitive Aspect of the environment) and the magnitude of the change caused by a project are rated using sub-criteria or scales, and then the overall significance is evaluated using a matrix.



The criteria for determining the overall sensitivity of a receptor and magnitude of the change (effect) to the receptor, is provided in the tables below. The matrix for determining the significance of the effect to the receptor is provided after these tables.

A16.1.3 Criteria for Evaluating the Sensitivity of a Receptor

Sensitivity of the receptor is a description of the characteristics of the receptor or aspect of the environment which will be affected by the development. It is a measure of 1) existing regulations and guidance, 2) societal value and 3) vulnerability for the change. The sensitivity of a receptor is estimated in its current state prior to any change implied by the project.

Existing regulations and guidance describes whether there are any such objects in the impact area, which have some level of protection by law or other regulations (e.g. prohibition against polluting groundwater and Natura areas), or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable).

Societal value describes the value of the receptor to the society and depending on the type of impact may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation) or environmental values (e.g. natural habitat). Societal value measures general appreciation from the point of view of the society. When relevant, the number of people impacted is taken into account.

Vulnerability for the change describes how liable the receptor is to be influenced or harmed by changes to its environment.

Sensitivity	Criteria Existing regulations/guidance	Criteria Societal value	Criteria Vulnerability to change
Low	Few or no recommendations which add to the conservation value of the impact area, and no regulations restricting use of the area (e.g. zoning plans).	The receptor is of small value or uniqueness. The number of people impacted is small.	Even a large external change would not have substantial impact on the status of the receptor. There are only few or none vulnerable receptors in the area.
Moderate	Regulation sets recommendations or reference values for an object in the impact area, or the project may impact an area conserved by a national or an international program.	The receptor is valuable and locally significant but not very unique. The number of people impacted is moderate.	At least moderate changes are needed to substantially change the status of the receptor. There are some vulnerable receptors in the area.
High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is unique and valuable to society. It may be deemed nationally significant and valuable. The number of people impacted is large.	Even a small external change could substantially change the status of the receptor. There are many vulnerable receptors in the area.
Very High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is highly unique, very valuable to society and possibly irreplaceable. It may be deemed internationally significant and valuable. The number of people affected is very large.	Even a very small external change could substantially change the status of the receptor. There are very many vulnerable receptors in the area.

A16.1.3.1 Determining the Overall Sensitivity of a Receptor

The **overall sensitivity of a receptor** is assessed by the competent expert on the basis on his/her assessment of the components of sensitivity. A general guide for deriving the overall sensitivity is to pick the maximum of existing regulations and guidance and societal value and then adjust that value depending on the level of vulnerability.

Determining the Overall Sensitivity of a Receptor	
Low	The receptor has minor social value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate social value may have low sensitivity if it's not liable to be influenced by the development.
Moderate	The receptor has moderate value to society, its vulnerability for the change is moderate, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major social value may have moderate sensitivity if it has low vulnerability, and vice versa.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the development.
Very High	Legislation strictly conserves the receptor, or it is irreplaceable to society, or extremely liable to be harmed by the development. Even minor influence by the proposed development is likely to make the development unfeasible.

A16.1.4 Criteria for Evaluating the Magnitude of an Impact

Magnitude of the impact describes the characteristics of the changes or effects that the planned project is likely to cause. Magnitude is a combination of 1) intensity and direction, 2) spatial extent, and 3) duration. Assessment of magnitude evaluates the likely changes affecting the receptor *without* taking into account the receptors sensitivity to those changes.

Intensity describes the physical dimension of a development. The direction of the change/effect is either positive (green) or negative (red).

Magnitude	Criteria – Intensity & Direction
Very High	The proposal has an extremely beneficial effect on nature or environmental load. A social change benefits substantially people's daily lives.
High	The proposal has a large beneficial effect on nature or environmental load. A social change clearly benefits people's daily lives.
Moderate	The proposal has a clearly observable positive effect on nature or environmental load. A social change has an observable effect on people's daily lives.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small.
No impact	An effect so small that it has no practical implication. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.

Moderate	The proposal has a clearly observable negative effect on nature or environmental load. A social change has an observable effect on people's daily lives and may impact daily routines.
High	The proposal has a large detrimental effect on nature or environmental load. A social change clearly hinders people's daily lives.
Very High	The proposal has an extremely harmful effect on nature or environmental load. A social change substantially hinders people's daily lives.

Spatial extent describes the geographical reach of, or the range within which, an effect is observable.

Duration describes the length of time during which an impact is observable and it also takes other related issues such as timing and periodicity into account. These are relevant for impacts which aren't observable all the time such as periodic impacts.

Magnitude	Criteria Spatial Extent	Criteria Duration
Low	Impact extends only to the immediate vicinity of a source. Typical range is < 1 km.	An impact whose duration is at most one year, for instance during construction and not operation. A moderate-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
Moderate	Impact extends over one municipality. Typical range is 1-10 km.	An impact lasts from one to a number of years. A long-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance.
High	Impact extends over one region. Typical range is 10-100 km.	An impact lasts several years. The impact area will recover after the project is decommissioned.
Very High	Impact extends over several regions and may cross national borders. Typical range is > 100 km.	An impact is permanent. The impact area won't recover even after the project is decommissioned.

A16.1.4.1 Deriving the overall magnitude of the change from components of magnitude

Magnitude of the change is a comprehensive synthesis of its component factors. In a case, where intensity, spatial case and duration all get the same value, the magnitude would also be given this value. In other cases, intensity should be taken as a starting point, and the assessment should be adjusted based on spatial extent and duration to obtain an overall estimate. The aim is that the overall assessment should capture the characteristics of an effect. The table below describes some example descriptions of different categories for the magnitude of the change.

Determining the Overall Magnitude of the Change/Effect	
Very High	The proposal has beneficial effects of very high intensity and the extent and the duration of the effects are at least high.
High	The proposal has beneficial effects of high intensity and the extent and the duration of the effects are high.
Moderate	The proposal has clearly observable positive effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small.
No impact	No change is noticeable in practice. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has clearly observable negative effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
High	The proposal has harmful effects of high intensity and the extent and the duration of the effects are high.
Very High	The proposal has harmful effects of very high intensity and the extent and the duration of the effects are at least high.

A16.1.5 Assessing the significance of an impact

The **assessment of the overall significance uses the matrix below**, where positive impacts are in green and negative in red. The matrix is based on the **magnitude of the change** affecting a receptor and on the **sensitivity of the receptor** to those changes.

The values obtained from the table are indicative because the most relevant dimensions for characterising an impact are dependent on the type of impact. Thus, some discretion from the expert is required, in particular in cases, where the one component is low and the other one high or very high.

Determining the Overall Significance of an Impact										
Impact Significance		Magnitude of change								
		Very High	High	Moderate	Low	No Change	Low	Moderate	High	Very High
Receptor Sensitivity	Low	Significant*	Moderate*	Slight	Imperceptible	Neutral	Imperceptible	Slight	Moderate*	Significant*
	Moderate	Significant	Significant	Moderate	Slight	Neutral	Slight	Moderate	Significant	Significant
	High	Profound	Significant	Significant	Moderate*	Neutral	Moderate*	Significant	Significant	Profound
	Very High	Profound	Profound	Significant	Significant*	Neutral	Significant*	Significant	Profound	Profound

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Note on Terms used in 'Determining the Overall Significance of an Impact' Table: The Significance rating ascribed in the Table above have been refined from the ARVI tool, to provide a more nuanced understanding of the significance and also to be compatible with the terms used throughout this EIA Report, which have been informed by the EPA Guidelines on Information to be contained in EIAR (2022) for description of effects.

In the above Table - Low has been refined as Slight or Imperceptible depending on context; High has been renamed as Significant; Very High has been renamed as Profound; No Impact is understood to also mean Neutral effect, which is defined in the EPA Guidelines as 'no effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error'.

Appendix to Chapter 16: Material Assets

Appendix 16.2: Traffic and Transport Assessment

2026

**Whole Gathabawn Windfarm Project,
Co. Kilkenny
Traffic and Transport Assessment**



**Whole Gathabawn Windfarm Project, Co. Kilkenny
Traffic and Transport Assessment**

Document Control Sheet

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Table of Contents

Executive Summary	5
16.1 Introduction	6
16.1.1 Objectives of this TTA	7
16.1.2 Methodology	10
16.1.3 ORS	11
16.1.4 Liaison with Kilkenny County Council	11
16.2 The Proposed Development	11
16.2.1 Proposed Gathabawn Windfarm	11
16.2.2 Candidate Gathabawn Grid Connection	12
16.2.3 Development Site Location	12
16.2.4 Site Access	13
16.2.5 Proposed Construction Material Delivery Route	16
16.2.6 Proposed Haul Route for Turbine Equipment (Abnormal Load Route)	17
16.3 Existing Traffic Conditions	20
16.3.1 Existing Road network	20
16.3.2 Pedestrian and Cyclist Connectivity	24
16.3.3 Public Transport Provision	25
16.3.4 Traffic Collisions Data in the Vicinity of the Site	26
16.4 Existing Traffic flows	28
16.4.1 Local Roads	28
16.4.2 Regional Roads	29
16.4.3 Junctions	29
16.5 Trip Generation & Distribution of Traffic Associated with Project	31
16.5.1 Construction Programme	31
16.5.2 Development Traffic Generation	36
16.6 Future Years Traffic Growth	41
16.6.1 Traffic and Transport Assessment Guidelines	41
16.6.2 Traffic Forecasting	41
16.7 Impact on the Road Network	42
16.7.1 Traffic Impact Assessment	42
16.7.2 Cumulative Impact	44
16.7.3 Cumulative Impact Summary and Conclusions	44
16.8 Capacity Analysis	49
16.8.1 Capacity Analysis Introduction	49
16.8.2 Junction Screening	49
16.8.3 Junction Modelling – Junction 1 (J1) – N77 & R639 & The Square	51
16.8.4 Junction Modelling – Junction 7 (J7) – N77 / L-1807	53
16.9 Mitigation Measures	56
16.9.1 Introduction	56
16.9.2 Mitigation Measures During Construction Stage	56
16.9.3 Mitigation Measures During Operational Stage	57
16.9.4 Mitigation Measures During Decommissioning Stage	57
16.10 Residual Impacts	57
16.10.1 Introduction	57
16.10.2 Residual Impacts During Construction Stage	57
16.10.3 Residual Impacts During Operational Stage	58
16.10.4 Residual Impacts During Decommissioning Stage	58
16.10.5 Cumulative Residual Impacts	58
16.11 Conclusions	58
Annex A – Traffic Data	61
Annex B – Junctions11 Modelling Data	62

Executive Summary

ORS were engaged by Ecopower Developments Limited (EDL) to undertake a Traffic and Transport Assessment (TTA) of the Whole Gathabawn Windfarm Project. The Whole Gathabawn Windfarm Project comprises two distinct elements, the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection, which are described separately for clarity and technical precision in this TTA:

- The Proposed Gathabawn Windfarm involves the construction of 12No. wind turbines distributed across two areas of high ground: 7No. in the Ballylehaun area and 5No. in the Ballyring area. These proposed turbines will have a rotor diameter of 136m, with three of the turbines (T6, T7, & T9) having an uppermost blade tip height of 150m (82m hub height) and the remaining nine having an uppermost blade tip height of 170m (102m hub height). The windfarm infrastructure also includes associated reinforced concrete foundations (c.20m diameter and c.3.2m depth) and compacted hardcore hardstanding areas (77m x 35m) adjacent to each turbine, underground windfarm cabling (8km in length), site access roads (totalling 8.3km, comprising 6.5km of new roads and the upgrading and widening of 1.8km of existing private farm tracks), two electrical control buildings (one in Ballylehaun and one in Ballyring, each within a 600m² compound), one meteorological mast (30m in height) with attached equipment, one LiDAR unit (within a 3m x 3m fenced hardcore area), temporary facilitating works along the turbine delivery route, and all ancillary associated and facilitating works and activities.
- The Candidate Gathabawn Grid Connection (not included as part of this 2026 Planning Application, but subject to a separate planning application at a future date and evaluated here for cumulative assessment) involves underground cabling 5.6km in length connecting the Ballylehaun Area to the Ballyring Area, 8.8km of underground cross-country cabling connecting the windfarm (via the Ballyring Control Building) to a new substation in Parksgrove townland. It also involves the construction of the Parksgrove Substation on a 6,450m² compound yard (containing control buildings, 18m high lightning protection monopoles, and associated electrical equipment) and a further 1.5km of 110kV underground cabling linking Parksgrove to the existing EirGrid Ballyragget Substation in Moatpark townland, along with associated site entrances, a temporary construction compound, and watercourse crossings.

This Traffic and Transportation report has been prepared in accordance with TII Traffic & Transportation Assessment Guidelines. The main objectives are:

(i) To evaluate and quantify the traffic effects of the construction, operational, and decommissioning phases of the Whole Gathabawn Windfarm Project on the existing road network, structured separately as follows:

- The Proposed Gathabawn Windfarm: Assessing the impacts of construction material haulage (such as concrete deliveries for the 12No. turbine foundations and site roads), staff transport, and the temporary facilitating works required along the delivery route to accommodate the abnormal turbine loads.
- The Candidate Gathabawn Grid Connection: Assessing the localized impacts of cross-country trenching, cabling works, and the transport of materials (including the main transformer abnormal load) to the proposed Parksgrove Substation.

(ii) To assess the adequacy of the existing road network in accommodating the physical transportation and haulage demands of both project elements.

(iii) To assess the adequacy of proposed mitigation, traffic management, and remedial actions, such as road opening licences, designated delivery schedules, wheel-wash facilities, and pre- and post-construction road condition surveys, to minimise disruptions, protect local road structures, and ensure public safety during the construction phase.

In order to gather the necessary data for this assessment, comprehensive classified traffic surveys were conducted in the vicinity of the Whole Gathabawn Windfarm Project. These surveys involved the use of twelve temporary Automatic Traffic Counters (ATCs) to collect baseline traffic data, including vehicle classifications and speeds. These counts were carried out during 2026 and were provided to ORS by EDL. Additional traffic turning counts were obtained for seven designated junctions in the vicinity of the proposed site, in order to provide a more comprehensive understanding of traffic patterns and turning movements at these specific intersections. The combined information from these surveys and counts formed the foundation for the detailed analysis and junction capacity modelling conducted in this Traffic and Transport Assessment (TTA). In addition, the 2022 Census database was consulted to obtain information regarding transport options within the local area, and the Kilkenny County

Council planning website (as well as the neighbouring Laois County Council planning website) was also consulted to include permitted or proposed developments in the area that will affect the road network in the vicinity of the site.

To ensure accuracy, the analysis incorporated the relevant Traffic Growth Factors provided by Transport Infrastructure Ireland (TII) specific to Co. Kilkenny. These factors account for projected future growth on the road network, ensuring a comprehensive and realistic assessment of the traffic impact. The impact of traffic on junctions has been assessed using the advanced software module PICADY (Priority Intersection Capacity and Delay) on *Junctions11*. These junction simulations enabled a comprehensive evaluation of future traffic conditions, based on the assumed likely construction commencement years. The assessment considered 2027 as the earliest possible start year, and 2037 assessed as the latest potential start year. This range ensures that the analysis captures the full spectrum of likely construction and operational traffic scenarios.

Based on a comprehensive traffic analysis considering the trip generation associated with the Whole Gathabawn Windfarm Project, it has been determined that with the implementation of suitable temporary traffic management measures and regular road condition surveys, any potential negative impacts on traffic capacity, transport, and road safety will be effectively mitigated. The analysis confirms that both the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection can proceed without compromising traffic flow, transport infrastructure, or road safety in the surrounding area. Specifically, the assessment demonstrates that the construction, operational, and decommissioning phases of the Proposed Gathabawn Windfarm, alongside the construction and operation of the Candidate Gathabawn Grid Connection, will have an acceptable, temporary adverse effect on the existing road network.

16.1 Introduction

This Traffic and Transport Assessment (TTA) has been prepared by ORS on behalf of Ecopower Developments Limited (EDL) for the Whole Gathabawn Windfarm Project in County Kilkenny. The purpose of this assessment is to identify, evaluate, and address the traffic, transport, and access issues associated with the construction, operational, and decommissioning phases of the development, which is structured into two separate elements: the Proposed Gathabawn Windfarm (encompassing the 12No. wind turbines, windfarm cabling, and site access roads) and the Candidate Gathabawn Grid Connection (encompassing the Parksgrove Substation, Ballylehaun-Ballyring Underground Cabling, Ballyring-Parksgrove Underground Cabling, Parksgrove-Moatpark Underground Cabling and the connection to the existing substation in Moatpark).

While windfarms offer numerous advantages in terms of renewable energy generation and environmental sustainability, one notable challenge is the transport of large wind turbine components. These components, due to their exceptional size, require careful planning and co-ordination to ensure safe and efficient transport from the port of entry to the site. For the Proposed Gathabawn Windfarm, the transport of these large turbine components (including blades and tower sections for the 150m and 170m tip height turbines) will involve temporary facilitating works and the widening of bends or junctions along the public road network, with the movement of these abnormal loads requiring close planning and co-ordination with An Garda Síochána.

While the operational phase of windfarms is largely automated and managed remotely, resulting in very low traffic volumes associated with routine maintenance, the construction phase can lead to temporary increases in traffic. For the Proposed Gathabawn Windfarm, this involves the haulage of substantial quantities of aggregates and concrete to the turbine locations in Ballylehaun and Ballyring. Similarly, the construction of the Candidate Gathabawn Grid Connection will generate localised traffic from cross-country trenching, cabling installation, and material deliveries to the proposed Parksgrove Substation compound. Due to the rural and upland location of windfarms in Ireland, this temporary surge in heavy goods vehicle (HGV) movements primarily occurs on narrow local road networks.

Therefore, a comprehensive Traffic and Transport Assessment (TTA) is crucial to identify potential impacts, evaluate the capacity of the existing road infrastructure within the Study Area to accommodate these haulage demands, and recommend appropriate mitigation measures. The Study Area in this case comprises the regional and local roads utilised during material deliveries and turbine component transport (identified on Figure 1 below.). Implementing the identified mitigation measures will ensure that the transport of wind turbines for the Proposed Gathabawn Windfarm, as well as the construction activities for the Candidate Gathabawn Grid Connection, are conducted in a manner that minimises disruptions to local communities, ensures public safety, and optimises the efficiency of the overall operation. The evaluations and findings are based on extensive site visits, physical observations of the existing road network, and a detailed review of the 2026 baseline traffic count data and junction surveys commissioned by EDL.

This report follows the principles set out in:

- TII Publication PE-PDV-02045 'Traffic and Transport Assessment Guidelines';
- TII Design Manual for Roads and Bridges;
- Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions) (TII DN-GEO-03060 May 2023);
- Rural Road Link Design (TII DN-GEO-03031 May 2023);
- Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections (TII PE-PAG-02017 October 2016);
- Guidelines for Managing Openings in Public Roads (April 2017); and
- Kilkenny City and County Development Plan 2021-2027; and
- Laois County Development Plan 2021-2027 (in respect of the regional road linkages and turbine component haulage route through Durrow and the R639).

16.1.1 Objectives of this TTA

The comprehensive traffic and transport assessment is necessary to evaluate and address the potential impact on traffic, transportation, and access associated with the construction, operation and decommissioning of the Gathabawn Windfarm. By considering factors such as the existing road network, traffic volumes and vehicle characteristics the assessment aims to identify any required mitigation measures to ensure the safe and efficient management of traffic throughout the various project phases. The assessment will also contribute to minimising disruptions and ensuring the overall success of the windfarm project.

Hence, the assessment will centre its attention on the local road network, with particular emphasis on the key national and regional roads and the seven critical junctions depicted below in Figures 1, 2, 3, 4, 5, 6 and 7.

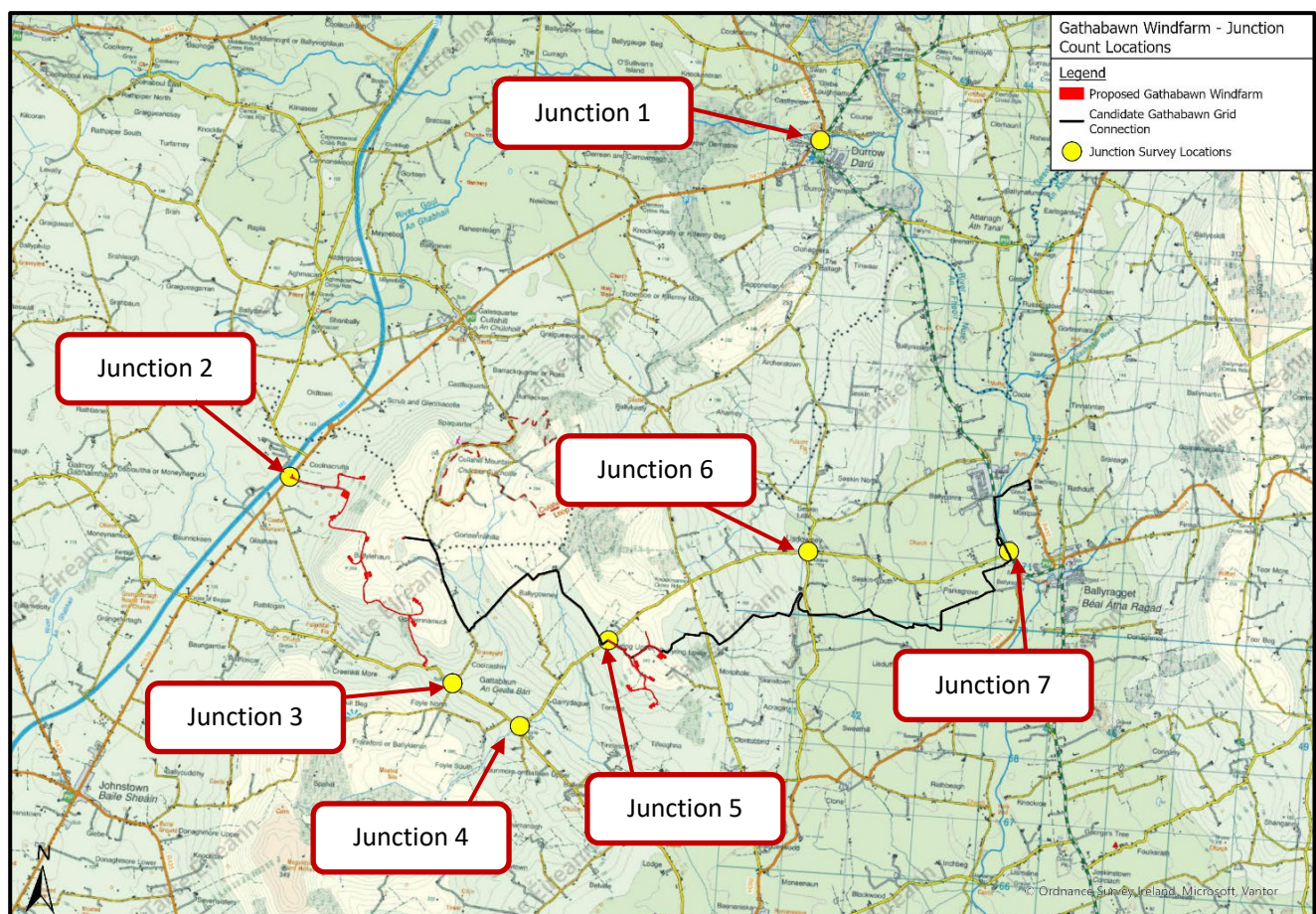


Figure 1: Locations of Junctions Analysed and Site Boundary



Figure 2: Location of Junction 1 Analysed formed by the N77/R639/The Square roads



Figure 3: Location of Junction 2 Analysed formed by the R639/L58141 roads



Figure 4: Location of Junction 3 Analysed formed by the L1803/L1804/L5818/L5819 roads



Figure 5: Location of Junction 4 Analysed formed by the L1806/L1804 roads



Figure 6: Location of Junction 5 Analysed formed by the L1806/L18062 roads



Figure 7: Location of Junction 6 Analysed formed by the L1807/L1811/L1806 roads



Figure 8: Location of Junction 7 Analysed formed by the N77/L1807 roads

Therefore, in summary, the objectives of this report are to assess:

- The prevailing traffic conditions on the public road network in the vicinity of the Proposed Development;
- The existing and predicted future baseline traffic volumes on the surrounding local road network;
- The traffic impact associated with the construction, operation and decommissioning stage, as these stages have the largest associated traffic volumes; and
- The proposed mitigation measures.

16.1.2 Methodology

The TII Publication PE-PDV-02045 sets out the methodology to be followed in any given TTA. The methodology that will be used in this assessment follows the guidelines set in this document and can be outlined as follows:

- Temporary Automatic Traffic Counters (ATC tube counters) were employed. These devices enabled the collection of data on vehicle classification and traffic speeds, providing a detailed understanding of traffic patterns and behaviours.
- Annual Average Daily Traffic (AADT) volumes that the Development will generate during the construction stage, have been estimated on the basis of the above mentioned ATCs and TII automatic traffic counter data.
- Traffic counts were factored up using appropriate TII growth rates for Co. Kilkenny for the current year (2026), the assumed commencement year 2027 and the assumed commencement year 2037 as a worst-case scenario.
- The predicted traffic generated by the Proposed Development was provided by the client based on the expected number of staff on site during peak construction stage and the anticipated daily peak number of HGV movements for delivery of materials.
- Traffic arriving to/leaving the development was assumed to coincide with the morning and evening peak hour. However, it is likely that HGV traffic will be distributed through the working day and therefore the analysis is considered conservative.
- The impact of the Development on the road network was carefully evaluated based on the TII threshold. It was determined that certain local roads exhibited a percentage increase exceeding the 10% TII Threshold. However, it is important to note that these findings are influenced by the extremely low existing traffic flow in the area.
- 2No. junctions were selected for detailed modelling using the Transport Research Laboratory (TRL) software *Junctions11* (PICADY) for future design years using Central Sensitivity Growth Factors for Co. Kilkenny to obtain the existing and proposed traffic profiles at the junctions analysed for the assumed commencement years.
- The potential impact that the Proposed Development will have on the road network was reviewed. Due to the rural location and nature of the development, trips by bicycle are not expected. There are no bicycle lanes on the local access roads.

16.1.3 ORS

Angeliki Kalatha – Senior Transportation Lead

Angeliki holds an MSc in Civil Engineering from Aristotle University of Thessaloniki (A.U.Th.), 2014, and an MSc in Engineering Project Management from A.U.Th., 2016. She is a member of Engineers Ireland and the Technical Chamber of Greece.

Angeliki is a Senior Transportation Engineer with ORS, bringing nine years of professional experience in transportation and infrastructure development. She has contributed to various transportation projects, including traffic analysis, Traffic and Transport Assessments, and initiatives promoting active travel and sustainable mobility. She is skilled in using TRL Junctions 11 and TRANSYT software for modelling and analysing roundabouts, priority junctions and signalised junctions. Drawing upon a solid foundation in civil engineering and project management, Angeliki has played integral roles in numerous infrastructure projects across Greece and Ireland.

16.1.4 Liaison with Kilkenny County Council

This Traffic and Transport Assessment has been prepared in accordance with the TII Publication PE-PDV-02045 'Traffic and Transport Assessment Guidelines' and the wider TII Publications suite referenced throughout this chapter, together with due regard to the Kilkenny City and County Development Plan 2021–2027, which establishes that proposals for wind energy developments are assessed against a full range of environmental and development management criteria at the planning stage, with particular emphasis on safeguarding the strategic function of the national road network during grid connection works and the visual impacts of turbine infrastructure through comprehensive Landscape Impact Assessments. A comprehensive Construction Traffic Management Plan has also been incorporated to manage potential impacts on road capacity and ensure public safety. ORS welcomes the opportunity to engage further with Kilkenny County Council on the scope and findings of this assessment as part of the statutory planning process.

16.2 The Proposed Development

The Whole Gathabawn Windfarm Project comprises two distinct elements, the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection, which are described separately below.

16.2.1 Proposed Gathabawn Windfarm

The Proposed Development, which is the subject of this 2026 Planning Application, involves various elements to support the installation and operation of 12No. proposed Gathabawn wind turbines distributed across two areas of high ground in North County Kilkenny: 7No. in the Ballylehaun area and 5No. in the Ballyring area. These elements include:

- 12No. wind turbines with uppermost blade tip heights of 150m and 170m, along with associated works such as reinforced concrete foundations (c.20m in diameter and c.3.2m in depth) and compacted hardcore hardstanding areas (77m x 35m, totalling 2,700m²) adjacent to each turbine;
- Internal windfarm cabling (8km of underground cabling) and site access roads (totalling 8.3km, comprising 6.5km of new site roads and the upgrading and widening of 1.8km of existing private farm tracks to a finished width of 4.5m);
- 1No. meteorological mast (30m in height) with meteorological equipment attached on a 5m x 5m x 1m deep concrete foundation in the Ballylehaun area (Rathlogon townland), and 1No. LiDAR unit installed within a 3m x 3m fenced hardcore area in the Ballyring Upper area;
- 2No. electrical control buildings (one in Ballylehaun townland and one in Ballyring Upper townland, each within a 600m² hardcore compound and containing a control building measuring 20m x 10m with a height of 7m);
- All ancillary associated and facilitating works and activities, including 2No. temporary construction compounds (Construction Compound No. 1 [5,410m²] in Glashare townland and Construction Compound No. 2 [1,100m²] in Ballyring Upper), 2No. temporary on-site borrow pits (Borrow Pit 1 [3,000m²] in Ballylehaun and Borrow Pit 2 [3,800m²] in Ballyring Lower) to win stone aggregates, overburden storage berms, livestock proof fencing, 3,700m of hedgerow removal and replanting, and 12No. temporary facilitating works (FW1 to FW12) such as temporary widened splays, site access roads, and turning heads along the public delivery route.

The Proposed Gathabawn Windfarm utilises two distinct hub heights and tip heights. The twelve (12) wind turbines will have a rotor diameter of 136m, with three of the turbines (T6, T7, & T9) having a hub height of 82m and an uppermost blade tip height of 150m, and the remaining nine turbines having a hub height of 102m and an uppermost blade tip height of 170m.

Subject to obtaining planning permission, the commencement of work at the site is anticipated upon securing the necessary permits. The construction phase of the Proposed Windfarm is estimated to last approximately 12 months. The construction start date is currently estimated to fall within a 10-year planning permission duration between 2027 and 2037.

For more info regarding the development see EIAR **Chapter 5 - Description of the Development**.

16.2.2 Candidate Gathabawn Grid Connection

The Candidate Gathabawn Grid Connection, which is not part of the current 2026 Planning Application but is subject to a separate planning application at a future date and evaluated here for cumulative assessment, involves:

- Ballylehaun-Ballyring Underground Cabling (an underground cable link, 5.6km in length, of which 160m is under internal site roads and 5.5km is under public local roads L5818, L5820, L1806, and L18062, physically connecting the Ballylehaun area and Ballyring area);
- Ballyring - Parksgrove Underground Cabling: Underground cabling, 8.8km in length, containing 11No. underground cable jointing chambers at c.800m intervals, physically routing from the Ballyring part of the windfarm site to a new substation compound in Parksgrove townland;
- Parksgrove Substation: Construction of a new substation compound on a 6,450m² compound yard (111m x 58m) surrounded by a 2.6m high perimeter palisade security fence, containing 18m high lightning protection monopoles, a main transformer abnormal load, and two control buildings, an EirGrid control building (450m²) and an IPP control building (217m²);
- Parksgrove - Moatpark Underground Cabling: A further 1.5km of 110kV underground cabling linking the Parksgrove Substation to the existing EirGrid Ballyragget Substation in Moatpark townland, utilizing horizontal directional drilling (HDD) to cross under the N77 national secondary road and the River Nore; and
- All associated ancillary works, including 1No. permanent site entrance (Site Entrance No. 8) utilising an existing farm entrance off the local road L1807, 5No. temporary site entrances at existing agricultural farm tracks (along the L1807, L1811, and L1808), a 545m² temporary construction compound beside the Parksgrove compound, watercourse crossings, and overburden storage.

For more info regarding the development see EIAR **Chapter 5 - Description of the Development**.

16.2.3 Development Site Location

The Whole Gathabawn Windfarm Project is situated entirely within the rural landscape of North County Kilkenny, with portions of the haulage route extending into neighbouring County Laois. The physical locations of both project elements are defined as follows:

- The Proposed Gathabawn Windfarm: The windfarm site is located on two distinct areas of high ground approximately 1km northwest of Gathabawn village (at its closest point in Ballylehaun) and 3km east of Gathabawn village (at its closest point in Ballyring). Lisdowney village is situated approximately 3km to the northeast of the Ballyring turbines, while the town of Ballyragget lies 6km to the northeast of Ballyring and 10km to the east of Ballylehaun. The town of Johnstown is located 6km to the west of Ballylehaun, and Freshford town is situated 4km to the southeast of the Ballyring Area. In County Laois, Cullahill village is 3km to the north of the Ballylehaun site, and Durrow town is approximately 9km to the northeast. The Proposed Windfarm infrastructure is situated within the townlands of Coolnacrutta, Glashare, Ballylehaun, Gorteennamuck, Rathlogan, Ballyring Upper, Ballyring Lower, Tentore, Foyle South, Coolcashin, and Garrydague;
- The Candidate Gathabawn Grid Connection: The Ballylehaun-Ballyring Underground Cabling is routed along the public road in the townlands of Ballylehaun, Gorteennamuck, Ballygowney and Ballyring Upper. The Ballyring-Parksgrove Underground Cabling and Parksgrove-Moatpark Underground Cabling elements are routed cross-country over private agricultural and scrub lands, extending eastwards from the Ballyring site boundary to the existing national grid infrastructure near Ballyragget. The underground cabling and substation infrastructure

are situated within the townlands of Ballyring Upper, Ballyring Lower, Lisdowney, Seskin South, Grange, Ballyconra, Parksgrove, and Moatpark. The proposed Parksgrove Substation compound is located on 0.6 hectares of scrubland/vacant land in the townland of Parksgrove, approximately 7km east of the windfarm site and 1.5km west of the existing EirGrid substation.

The existing operational Lisdowney Windfarm (commissioned in 2015) is located immediately north/northwest of the Ballyring site, approximately 1.25km from the closest proposed Gathabawn turbine. Figure 9 overleaf illustrates the regional and townland location context of the whole project.

16.2.4 Site Access

The Whole Gathabawn Windfarm Project is to be accessed from the public road network via several designated site entrances situated across the development areas in County Kilkenny. The site access points are described separately for both project elements.

The Proposed Gathabawn Windfarm: This element will be accessed via seven specific site entrances (Site Entrance No. 1 to No. 7).

- Ballylehaun Area: Site Entrance No. 1 (new, permanent, off the L-58141) and Site Entrance No. 2 (existing, permanent, off the L-58141) provide access to Turbines T1 to T7, Construction Compound No. 1, the met mast, and Borrow Pit No. 1. Site Entrance No. 3 (existing, permanent, off the L-1803) provides alternative access for Turbines T6 and T7. Site Entrance No. 4 (existing, permanent, off the L-5818) serves the Ballylehaun Control Building.
- Ballyring Area: Site Entrance No. 5 (existing, permanent, off the L-18062) serves the Ballyring Control Building and Construction Compound No. 2. Site Entrance No. 6 (existing, permanent, off the L-18062) and Site Entrance No. 7 (existing, permanent, off the L-18062) provide access to Turbines T8 to T12, the LiDAR unit, and Borrow Pit No. 2.
- Visibility and Safety: To ensure safe access, entrances will be set back 2.4m from the road, with splays widened and roadside vegetation trimmed or pruned to secure sightlines of 90m in either direction (where applicable).

Figure 10 overleaf shows the location of these seven specific site entrances (Site Entrance No. 1 to No. 7).

The Candidate Gathabawn Grid Connection: This element will be accessed via one permanent entrance and five temporary entrances.

- Substation Access: The proposed Parksgrove Substation will be accessed via Site Entrance No. 8, utilising an existing farm entrance off the local road L-1807. Visibility splays of 90m to the west and 40m to the east will be provided, requiring the targeted removal of hedgerow within the sightline envelope.
- Cabling Trench Access: Five temporary site entrances utilising existing farm/field gates will be established along the Ballylehaun-Ballyring UGC and Ballyring-Parksgrove UGC to access agricultural fields, one off the L-1807, and two each off the L-1811 and L-1808 local roads.

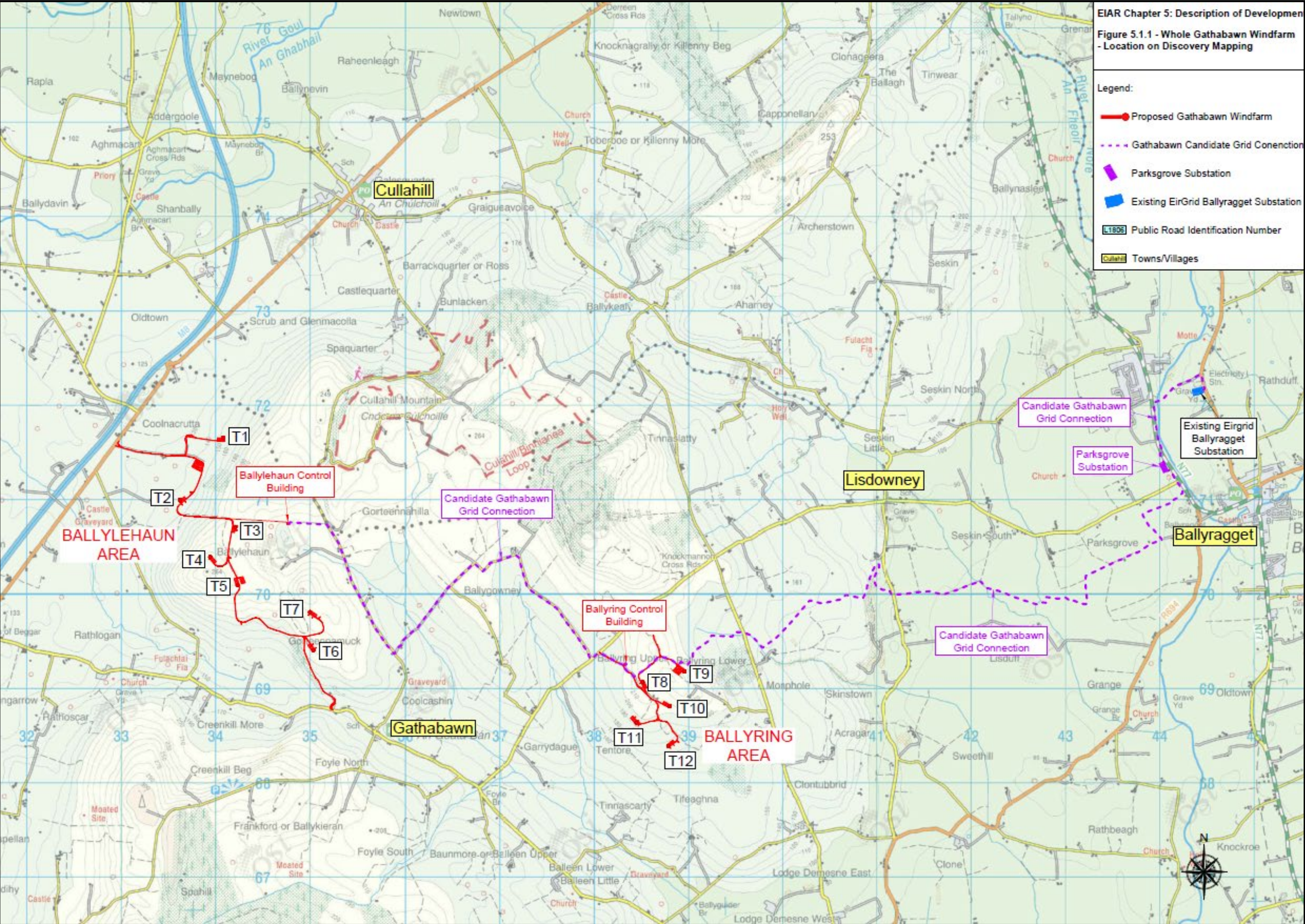


Figure 9: Whole Gathabawn Windfarm Location

Page 16-15

16.2.5 Proposed Construction Material Delivery Route

In accordance with the project requirements, a range of construction materials will be delivered to the site throughout the construction programme. These deliveries will be facilitated by a variety of heavy goods vehicles (HGVs), each serving a specific purpose.

Aggregate, Concrete and Road Surface Dressing: During the construction phase, various materials such as aggregates, concrete, reinforcing steel, and general building materials will be delivered to the site for the construction of the site access roads, turbine bases and hardstands, meteorological mast, Control Buildings, cabling trenches, and associated ancillary works. Stone aggregates and concrete are expected to be imported from local Kilkenny suppliers, including Wholesale Suppliers Limited Coolbawn, Cemex Dunmore, and Roadstone Bennettsbridge. There will also be electrical plant and switchgear required for the Control Buildings and the proposed substation compound.

Delivery vehicles accessing the site will follow the route described below:

Proposed Gathabawn Windfarm Haul Routes:

- **Inbound Route: Ballylehaun Area Inbound Route:** Delivery vehicles approaching the Ballylehaun Area will travel via the regional road network onto the R639, turning onto the L58141 local road at Coolnacrutta/Glashare to reach Site Entrances No. 1 and No. 2.
- **Ballylehaun Control Building Inbound Route:** Deliveries for the Ballylehaun Control Building will be routed through the main Ballylehaun windfarm area, exiting the site boundary at Site Entrance No. 3 onto the L1803 local road, turning onto the L5818 in Gathabawn village, and travelling along this road as far as Site Entrance No. 4.
- **Ballyring Area Inbound Route:** Delivery vehicles accessing the Ballyring Area will approach from the N77 national secondary road corridor, turning onto the L1807 local road at Parksgrove, travelling westwards through Lisdowney village, continuing along the L1806, and finally turning onto the L18062 at Ballyring Upper to reach Site Entrances No. 5, No. 6, and No. 7.
- **Outbound Routes (Proposed Windfarm):** Upon departure, all delivery vehicles will follow the exact reverse of their respective inbound routes, exiting via the local road networks to safely rejoin the R639 and N77 corridors, thereby avoiding unnecessary HGV movements on other local tertiary roads.

Candidate Gathabawn Grid Connection Haul Routes:

- **Parksgrove Substation Inbound Route:** HGVs delivering concrete, aggregates, and the main transformer abnormal load to the substation compound will approach from the N77 national secondary road, turning onto the L1807 local road at Parksgrove, and entering directly via Site Entrance No. 8.
- **Ballylehaun-Ballyring Underground Cabling:** Deliveries will approach from the N77, turning onto the L1807 and L1806, and through Gathabawn village onto the L5818, L5821, L5820, and the L1806 and L18062.
- **Ballyring-Parksgrove Underground Cabling:** Material deliveries to active trenching sites will approach from the N77 corridor, turning onto the L1807 at Parksgrove and utilizing the designated temporary field entrances off the L1807 at Parksgrove, the L1811 at Lisdowney, and the L1808 at Ballyring Lower/Lisdowney.
- **Parksgrove-Moatpark Underground Cabling:** Trenching deliveries will approach from the N77 (turning into temporary entrances on the eastern side of the road and onto the L1807 to Site Entrance No. 8) or via the R432 regional road from Ballyragget to access temporary track entrances in Moatpark townland.
- **Outbound Routes (Grid Connection):** All departing construction traffic will follow the reverse of their inbound routes, utilising the L5818, L5821, L5820, L1806, L18062, L1807, L1811, L1808, and R432 corridors to safely return to the N77 national secondary road.

There are existing lay-bys along these local and regional road corridors to facilitate traffic flow and safe vehicle passing. By strictly utilising these designated haul routes, HGV delivery traffic avoids traversing minor, substandard municipal tertiary roads, ensuring that the heavy material haulage is concentrated along corridors capable of accommodating the structural and physical demands of the development. Furthermore, all HGV movements will be co-ordinated and managed under the project's Construction Traffic Management Plan (TMP) to safeguard local road capacity and ensure public safety.

16.2.6 Proposed Haul Route for Turbine Equipment (Abnormal Load Route)

As part of the traffic and transport assessment, the transport logistics for the turbine components and substation infrastructure have been carefully planned. Specialised extendable flatbed semi-trailers, abnormal load transporters, and blade-lift trailers will be utilised to transport these heavy and oversized components from the port of entry to their respective destinations. The abnormal load routes and delivery mechanisms are described separately for both project elements:

Proposed Gathabawn Windfarm (Turbine Deliveries)

- **Ballylehaun Area Route:** Convoys carrying turbine components will utilise the motorway network as far as Portlaoise, Co. Laois, at which point they will leave the motorway and travel south along the N77 national secondary road as far as Durrow. The vehicles will then follow the R639 regional road south, turning onto the local road L58141 at Coolnacrutta/Glashare. Convoys will enter the Ballylehaun site via the proposed temporary access road at Site Entrance No. 1 and No. 2.
- **Ballyring Area Route:** Due to severe physical constraints and narrow alignments on the public road network directly surrounding the Ballyring site, the Ballyring blades will first be delivered to the Temporary Blade Storage Area (beside Ballylehaun Construction Compound No. 1) where they will be unloaded and temporarily stored. Once ready to be erected at their final positions, the blades will be reloaded onto specialised blade-lifter trailers to travel along internal site roads to Site Entrance No. 3. Convoys will then turn onto the L1803, travel through Gathabawn village, and continue along the L1804 local road. To bypass the narrow bridge junction (Foyle Bridge), convoys will turn left onto the L1806 via a proposed temporary access road (FW8) in the townlands of Foyle South and Coolcashin, travel along the L1806 as far as Ballyring Upper, utilise the temporary widening at the junction to turn onto the L18062, and access the Ballyring turbines from Site Entrance No. 7.

Figure 11 overleaf shows the turbine components transport routes.

Candidate Gathabawn Grid Connection (Transformer Delivery)

- **Parksgrove Substation Route:** The delivery of the main transformer abnormal load to the proposed Parksgrove Substation will follow a separate delivery corridor. The delivery vehicle will approach the site via the N77 national secondary road, turning west onto the local road L1807, and entering the substation compound directly via Site Entrance No. 8

Turbine Delivery Route Feasibility, Swept-Path Analysis, and Facilitating Works

An assessment of the turbine delivery route (TDR) and abnormal load routes has been completed using extensive physical site visits, detailed topographical surveys, and AutoTrack swept-path analysis software. To accommodate the Gathabawn turbine blades, which have a rotor diameter of 136m and uppermost tip heights of 150m (Turbines T6, T7, & T9) and 170m (all other turbines), the analysis has identified twelve specific facilitating works (FW1 to FW12) along the public road corridors. These facilitating works are being applied for under the current 2026 Planning Application and include:

- FW1: A temporary access road (630m²) in Coolnacrutta and Glashare townlands to provide safe access from the R639 onto the local road L58141.
- FW2: Permanent widening of 495m on the southern side of the L58141 by 0.5m to 2m, alongside a separate permanent widening of 80m into the northern verge.
- FW3 & FW4: Temporary widened site entrances at Site Entrance No. 1 (220m²) and Site Entrance No. 2 (35m²).
- FW5: Temporary site access roads before Turbine T1.
- FW6: A temporary blade storage and set-down area (4,090m²) in an agricultural field close to Site Entrance No. 2 and Construction Compound No. 1.
- FW7: Temporary widening of Site Entrance No. 3 in Gorteenamuck (2,410m²) to facilitate turning onto the L1803 local road.
- FW8: A temporary access road (2,840m²) in Foyle South and Coolcashin townlands to connect the L1804 and L1806 local roads, thereby bypassing the narrow bridge junction.
- FW9: Temporary widening of 800m² of the L1806 local road into a grassland field in Garrydague.
- FW10: A temporary hardcore area (610m²) at the junction of the L1806 and L18062 to facilitate the tight turn

into the Ballyring site.

- FW11: Permanent widening of 620m of the local road L18062 by up to 1m on the eastern boundary to accommodate HGV movements.
- FW12: Temporary site access roads to Turbine T8 approaching from the south.

While the permanent road-widening works (FW2 and FW11) will remain in place to facilitate operational maintenance and ensure long-term structural load-bearing capacity, the remaining facilitating works are temporary. These temporary lands and road boundaries will be fully reinstated with subsoil and topsoil and reseeded to return them to agricultural use once the construction phase is complete.

Off-site Activities (Temporary Street Furniture Removal)

In addition to the structural facilitating works, a small number of minor, temporary activities within the public road corridor will be required to allow the abnormal loads to negotiate tight curves. These "Off-site Activities" mainly involve the temporary removal and immediate reinstatement of street furniture, such as road signs, crash barriers, and bollards.

Specifically, the swept-path analysis indicates that the temporary removal of street furniture and traffic lights in Durrow town, Co. Laois is required to facilitate the passage of the turbine component convoys through the town's tight intersections. All temporarily removed street furniture will be taken down immediately before each convoy passes and reinstated to its original position immediately afterward. These minor off-site activities are described in detail in EIAR Section 5.13.1 and are sufficient to safely manage the transport requirements of the development.

Delivery Co-ordination and Escort Procedures

Turbine component delivery is a highly controlled activity. The transport delivery plan and schedule will be closely co-ordinated with Kilkenny County Council, Laois County Council, and An Garda Síochána. Due to the exceptional size of the blades and tower sections, all abnormal load deliveries will take place overnight or during off-peak hours to minimise local disruption and will be fully escorted. Escort vehicles will precede the main convoy to manage oncoming traffic and direct vehicles to safe passing points along the local road network

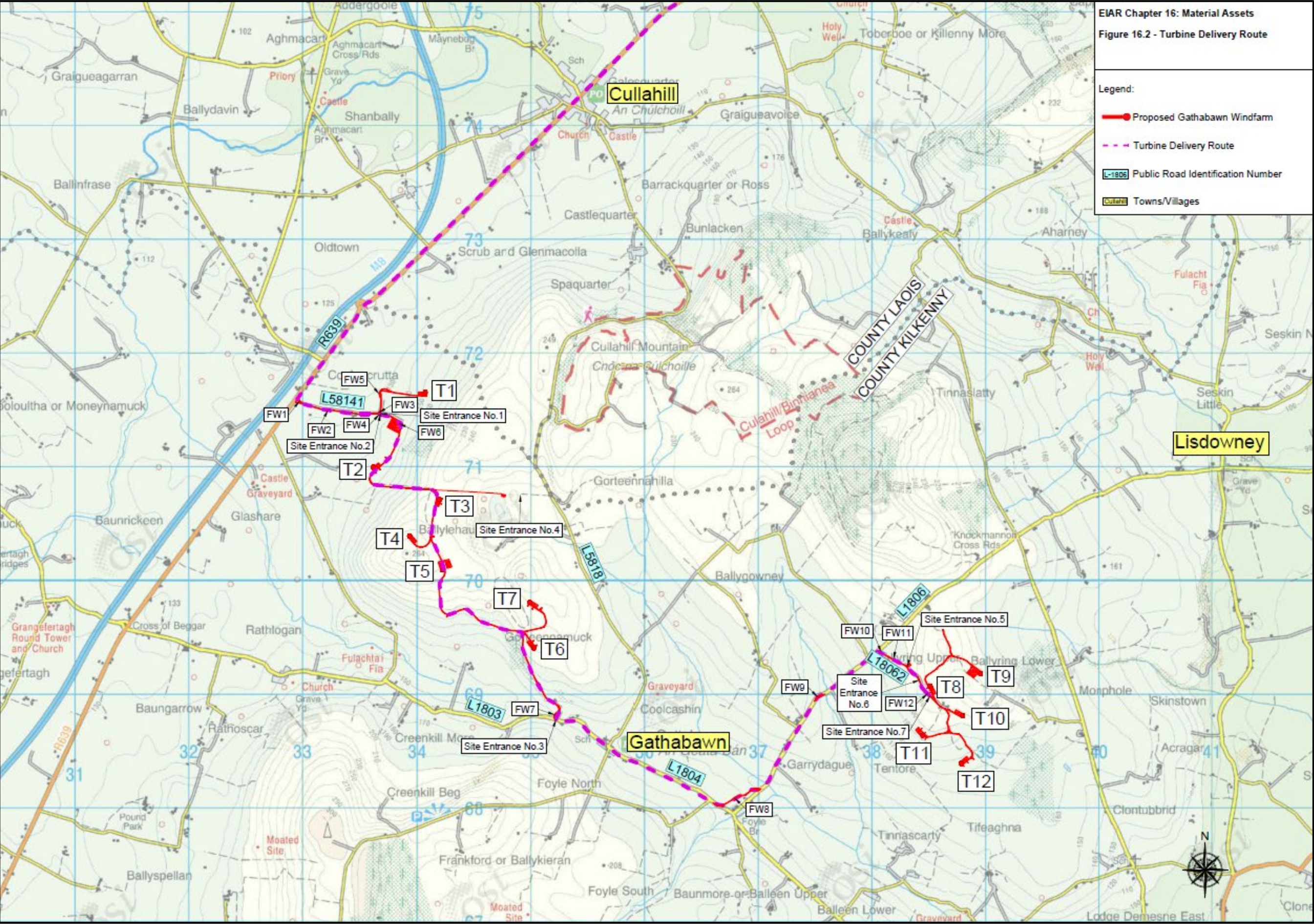


Figure 11: Turbine Components Transport Routes

16.3 Existing Traffic Conditions

16.3.1 Existing Road network

The traffic generated by the Whole Gathabawn Windfarm Project will access the development areas via several designated site entrances off the local road network in North County Kilkenny. The access schemes and construction traffic corridors are described separately for both project elements:

The Proposed Gathabawn Windfarm: Construction and material delivery traffic will access the two main turbine areas via designated regional and national transport links:

- Ballylehaun Area (Turbines T1–T7, Construction Compound No. 1, and Borrow Pit No. 1): Construction traffic will approach via the R639 regional road, turning onto the local road L58141 at Coolnacrutta/Glashare to reach Site Entrances No. 1 and No. 2.
- Ballylehaun Control Building: Accessed through the main Ballylehaun site roads, exiting via Site Entrance No. 3 onto the L1803, turning onto the L5818 in Gathabawn village, and continuing as far as Site Entrance No. 4.
- Ballyring Area (Turbines T8–T12, Construction Compound No. 2, and Borrow Pit No. 2): Construction traffic will access the site from the N77 national secondary road corridor, turning onto the L1807 local road at Parksgrove, travelling westwards through Lisdowney village along the L1806, and finally turning onto the L18062 at Ballyring Upper to access Site Entrances No. 5, No. 6, and No. 7, as shown in Figure 10 and Figure 11.

The Candidate Gathabawn Grid Connection: Construction traffic for the substation and cabling trenching works will utilise designated corridors off the N77 national secondary road:

- Ballylehaun-Ballyring Underground Cabling: Construction traffic will approach from the N77, turning onto the L1807 at Parksgrove and L1806 at Lisdowney, then from the L1806 through Gathabawn village onto the L5818, L5821 and L5820, and on the L1806 and L18062.
- Parksgrove Substation: Construction traffic will approach directly from the N77, turning west onto the L1807 local road to enter the compound via Site Entrance No. 8.
- Ballyring–Parksgrove and Parksgrove–Moatpark Cabling: Deliveries will turn off the N77 onto the L1807 at Parksgrove, the L1811 at Lisdowney, and the L1808 at Ballyring Lower to access five temporary site entrances at existing field gates, or via the R432 regional road from Ballyragget to access Moatpark.

The local roads in the study area are generally rural in nature and experience light, localised traffic. The following paragraphs provide a summary of the local road network, and which parts of the proposed development will be accessed from each road.

16.3.1.1 National Secondary Road N77 and Motorway Networks (M7/M8)

The N77 is a national secondary road in Ireland, forming the strategic regional corridor connecting Kilkenny City to Durrow, Co. Laois, and continuing northwards to Abbeyleix and Portlaoise. At Portlaoise, the corridor provides direct access to the national motorway network, including the M7 (Dublin to Limerick/Kerry) and M8 (Dublin to Cork) motorways. Within the Study Area, the N77 represents the primary trunk route for the delivery of all heavy construction materials, substation components, and abnormal turbine loads.

The N77 in this section comprises a single carriageway, two-lane road designed and maintained to national secondary standards, with high-quality pavement surfaces, clear road markings, and robust structural capacity. The corridor is engineered to accommodate heavy commercial freight and is highly suitable for the construction traffic and abnormal loads associated with both the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection due to the following characteristics:

- Classification: As a national secondary road, the N77 is designed and maintained to high standards in the national road hierarchy, specifically intended to accommodate strategic freight, regional commercial transit, and large vehicle movements.
- Capacity: The road has adequate physical and traffic capacity to absorb the temporary construction and material delivery vehicles without significant impact on the existing regional network, maintaining acceptable level-of-service thresholds.
- Pavement Strength: The road pavement is constructed to structural standards capable of accommodating frequent HGV movements, including heavily laden concrete and aggregate delivery vehicles importing materials

from regional suppliers.

- **Geometry:** The road alignment, including horizontal and vertical curvature, is designed to national road standards, facilitating the safe movement of large construction vehicles and specialized abnormal transport convoys.
- **Accessibility:** Direct connection to the motorway network (via the M7 and M8 at Portlaoise) and regional/local junctions (such as the R639, R432, and L1807) ensures highly efficient access from major ports of entry, quarries, and wider regional supply chain locations.
- **Existing Use:** The corridor already carries significant daily commercial and HGV traffic serving North Kilkenny and South Laois, with established road infrastructure to support commercial transport.

The specific transport and engineering routing configurations utilising the N77 corridor for both project elements have been detailed previously

16.3.1.2 Regional Road R639

The R639 is a strategic regional road corridor in the Irish midlands, providing connectivity between Durrow in County Laois and Johnstown and Urlingford in County Kilkenny. The route runs south-southwest from the national secondary road network (N77) at Durrow, passing through a rural open countryside landscape and serving villages such as Cullahill, Co. Laois. It supports local communities and agricultural grassland enterprises in both North County Kilkenny and South County Laois.

The R639 in the vicinity of the study area is characterized by a high-quality, stable pavement surface with a standard road carriageway width of approximately 6.0 to 6.5 metres, bounded by solid white centrelines and road-edge markings, and subject to a posted speed limit of 80 km/h (with localized speed limits down to 60 km/h near major junctions and rural clusters).

While regional roads typically present more geometric constraints than national routes, the R639 provides a highly viable and structurally sound corridor for heavy construction traffic and abnormal loads, offering a safe regional link that completely bypasses minor, substandard municipal tertiary roads.

16.3.1.3 Local Road L58141



The L58141 is a local road branch off the R639 regional road, generally travelling from east to west and measuring approximately 3.5 to 4.5 metres in width. It serves as the primary municipal access route to the Proposed Gathabawn Windfarm (Ballylehaun Area). There are residential properties situated on both sides of the road corridor.

While there are several straight sections along the L58141 that provide good forward sightlines and passing opportunities for windfarm traffic, its narrow carriageway and tight verges require structural upgrades to accommodate heavy commercial construction traffic. Under the current application, the road is subject to proposed permanent road-widening works (FW2). These works include a permanent 495-metre widening of the southern side by 0.5 to 2.0 metres, alongside a separate permanent 80-metre widening into the northern verge.

16.3.1.4 Local Road L1806

The L1806 is a rural local road generally travelling from north to south, with an average carriageway width of approximately 4.0 to 4.5 metres. This corridor serves as a key connecting route between Gathabawn village and the Ballyring turbine area, carrying the Ballylehaun–Ballyring Underground Cabling trench beneath its pavement and representing the primary transport path for the Ballyring turbine blades.

Fewer residential properties are situated along the section of the L1806 utilised by construction traffic, with the road primarily traversing open agricultural grasslands. There are straight sections on the road providing acceptable forward sightlines.

To facilitate the swept-path requirements of the specialised abnormal load turbine convoys, the L1806 is subject to proposed temporary widening works (FW9) consisting of 800m² of hardcore surfacing in a grassland field at Garrydague. Additionally, the local road connects directly to the proposed FW8 temporary access road (2,840m² in the townlands of Foyle South and Coolcashin) which has been designed to completely bypass the highly restrictive and narrow Foyle Bridge structure.

16.3.1.5 Local Road L18062



The L18062 is a minor local road branch off the L1806, generally travelling from east to west and ranging from 3.5 to 4.5 metres in width. It serves as the immediate access road for the Proposed Gathabawn Windfarm (Ballyring Area), serving Site Entrances No. 5, No. 6, and No. 7. There are no residential properties on the L18062.

The L18062 ends in a cul-de-sac at Site Entrance No. 7 and is very lightly trafficked by local agricultural operators. To facilitate safe two-way HGV traffic during construction, the road will undergo permanent widening works (FW11) of 620 metres by up to 1.0 metre on its eastern boundary into a grassland field.

16.3.1.6 Local Road L1807 (Substation Access Corridor)

The L1807 is a local road generally travelling from east to west, with an average carriageway width of approximately 4.5 to 5.0 metres. It connects the national secondary road network (N77) at Parksgrove to Lisdowney village.

For the Whole Gathabawn Windfarm Project, the L1807 serves as the primary municipal access corridor for the Candidate Gathabawn Grid Connection. It provides permanent access to the proposed Parksgrove Substation via Site Entrance No. 8. To accommodate the delivery of the main transformer abnormal load and substation construction traffic, the entrance will be upgraded to provide visibility splays of 90m to the west and 40m to the east, requiring the targeted removal of 65m and 5m of roadside hedgerow respectively.

Additionally, the road pavement corridor will accommodate a trench crossing for the Ballyring-Parksgrove UGC. Baseline traffic conditions show that the L1807 functions as a moderately active rural link connecting local communities to the N77, carrying a mix of commuter and local agricultural transit.

16.3.1.7 Local Roads L1803, L1804, and L5818 (Gathabawn Village Link & Cabling Corridor)



The L1803, L1804, and L5818 are interconnected local roads that route through and around Gathabawn village, with average carriageway widths ranging from 3.2 to 4.2 metres, while the L1804 has an average width of 5 metres. Because they collectively form the physical link between the western (Ballylehaun) and eastern (Ballyring) development areas, they are grouped for this assessment.

These roads serve several highly sensitive functions for the Proposed Gathabawn Windfarm:

- **Site Access:** The L1803 provides temporary access to Turbines T6 and T7 via Site Entrance No. 3 (Gorteennamuck), while the L5818 provides permanent access to the Ballylehaun Control Building via Site Entrance No. 4.
- **Abnormal Load Route:** The L1803 and L1804 form the delivery corridor for the Ballyring turbine blades once they are reloaded onto specialised blade-lifter trailers at the Ballylehaun set-down area.
- **Ballylehaun-Ballyring Underground Cabling:** The L5818 (along with the L5820 and L5821) carries sections of the 5.6km Ballylehaun-Ballyring Underground Cabling trench beneath its pavement. Cabling works along these roads will require temporary road closures of approximately 2 weeks on the L5821 and 5 weeks on the L5820, with construction traffic accessing these works locations via the L1804/L5818 corridor described above.

These roads are generally rural and narrow, passing through residential clusters in Gathabawn village. Baseline traffic flows show very light daily volumes. To accommodate the turbine blade transport and protect local infrastructure, these corridors will undergo temporary facilitating works, including the FW8 temporary bypass road at Foyle South/Coolcashin and the FW7 temporary entrance widening (2,410m²) in Gorteennamuck.

16.3.1.8 Local Roads L5820 and L5821 (Cabling Corridor)



The L5820 is a short rural local road connecting the L5821 to the L1806 area, carrying a section of the Ballylehaun-Ballyring Underground Cabling trench beneath its pavement. Baseline traffic recorded at ATC3 shows very light usage (34 AADT, 2.0% HGV), consistent with the other roads in this corridor. Cabling works along the L5820 will require a temporary road closure of approximately 5 weeks, with construction traffic accessing this section via the L1804/L5818 corridor described above.

The L5821 is a short rural local road forming part of the Ballylehaun-Ballyring Underground Cabling corridor, connecting the L5818 to the L1806. The Gathabawn Loop Walk pedestrian route (Section 16.2.3) is routed along the L5818 and L5821, north

of Gathabawn village. Cabling works along the L5821 will require a temporary road closure of approximately 2 weeks, with construction traffic accessing this section via the L1804/L5818 corridor described above.

16.3.2 Pedestrian and Cyclist Connectivity

The public roads within the study area (R639, L58141, L1803, L1804, L1806, L18062, L1807, L5818, L5820, L5821) are rural in character, with speed limits of 60-80km/h, narrow carriageways (3.2-6.5m), and no footpaths or dedicated cycle lanes on any road corridor, as described in Section 16.3.1.

To gain insight into current travel patterns in the area, Census of Population 2022 Small Area data for Balleen, Co. Kilkenny, the CSO Electoral Division covering the Gathabawn Windfarm site, was reviewed (Figure 12, Table 1).

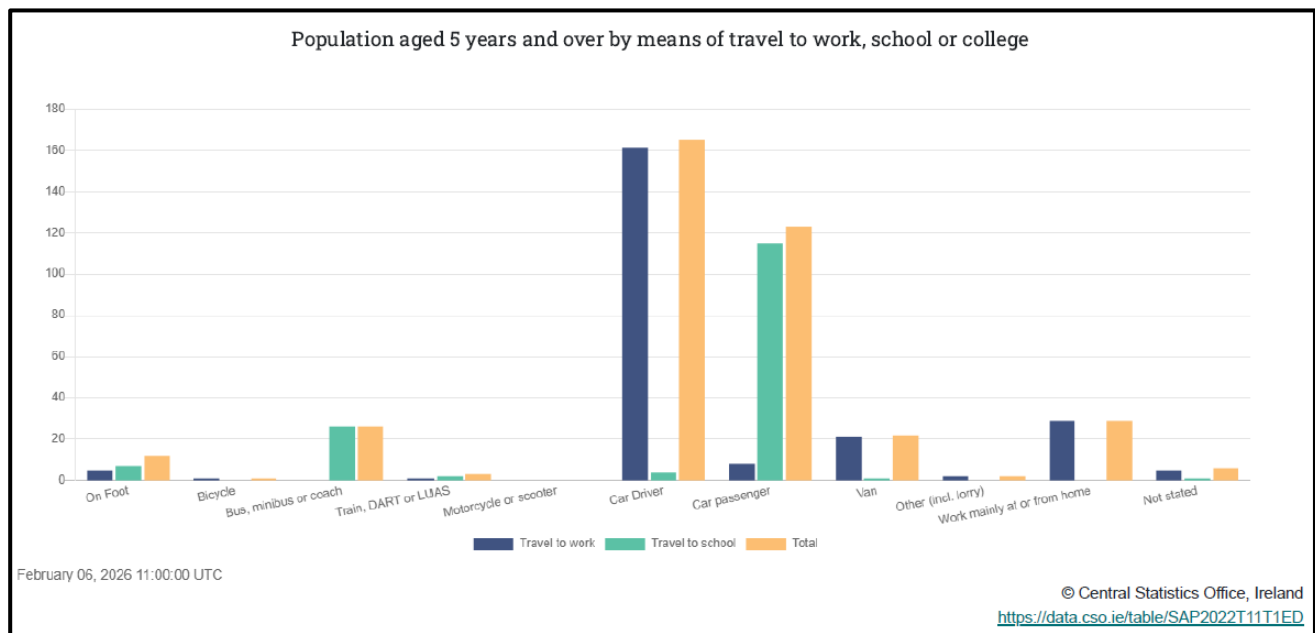


Figure 12: Means of travel to work, school or college for the Electoral Area of Balleen ED (Source: CSO.ie)

Table 1 – Population aged 5 years and over by means of travel to work, school or college, Balleen ED (Source: CSO, Census of Population 2022, <https://data.cso.ie/table/SAP2022T11T1ED>)

Means of travel	To work	To school/college/childcare	Total
On Foot	5	7	12
Bicycle	1	0	1
Bus, minibus or coach	0	26	26
Train, DART or LUAS	1	2	3
Motorcycle or scooter	0	0	0
Car Driver	161	4	165
Car passenger	8	115	123
Van	21	1	22
Other (incl. lorry)	2	0	2
Work mainly at/from home	29	0	29
Not stated	5	1	6
Total	233	156	389

Of the 233 usually resident persons aged 5 years and over recorded travelling to work, 192 (82.4%) travelled by private vehicle (161 as car driver, 8 as car passenger, 21 by van, 2 other/lorry) and a further 29 (12.4%) worked mainly from home. Only 6 persons (2.6%) travelled on foot or by bicycle, and no persons travelled to work by bus or coach;

the 26 recorded bus/minibus trips in the area relate entirely to travel to school/college, not work. 91 people leave home between 07:31-08:00 and 69 between 08:31-09:00, the two busiest half-hour departure windows, broadly aligning with the network AM peak.

This confirms the rural, private-car-dependent travel pattern already indicated by the road network description in Section 16.3.1 and supports the conclusion that pedestrian and cyclist activity along the haul route corridors is low. Given this travel pattern, the rural setting, the absence of footpath/cycle infrastructure, and the largely unstaffed nature of an operational windfarm, it is not anticipated that the development will generate material pedestrian or cyclist trips during construction or operation.

The Gathabawn Loop Walk is a way-marked recreational trail, with its trailhead in Gathabawn village. The trail comprises a Long Loop (11.5km, 2.5-3 hours) and a Short Loop (6km, 1.5 hours), both rated moderate difficulty, running over open fields, forest tracks and minor roads across Cullahill Mountain to the north of the village. From the trailhead, the route follows the L5818 and the L5821 northwards before turning off-road onto Ballygooney Lane and the forest tracks of Cullahill Mountain, rejoining the public road network briefly via Shirley's Lane before returning to Gathabawn village.

The Gathabawn Loop Walk does not cross or otherwise interact with the Proposed Gathabawn Windfarm site or the LiDAR survey area: its route lies entirely to the north of Gathabawn village, and beyond the short sections of the L5818 and L5821 it shares with the Ballylehaun-Ballyring Underground Cabling corridor, it does not use any other road or land within the Whole Gathabawn Windfarm Project's development areas or haul routes. Walkers using the trail's L5818/L5821 sections may experience the same temporary construction traffic and cabling-related road closures described in Section 16.3.1.7; no other pedestrian or amenity effects on the trail are anticipated.

16.3.3 Public Transport Provision

The Gathabawn Windfarm site is located in a rural part of North County Kilkenny, approximately equidistant from Freshford, Johnstown and Ballyragget. Public transport provision in the immediate vicinity is limited, consistent with the dispersed rural settlement pattern.

Figure 13 delineates the public transport corridors in the vicinity of Ballyragget, indicated by the colour red.

This visual representation offers valuable insight into the existing public transport routes and therefore site personnel and construction traffic will rely on private vehicle transport given the rural location and limited public transport infrastructure in the immediate vicinity of the project site.

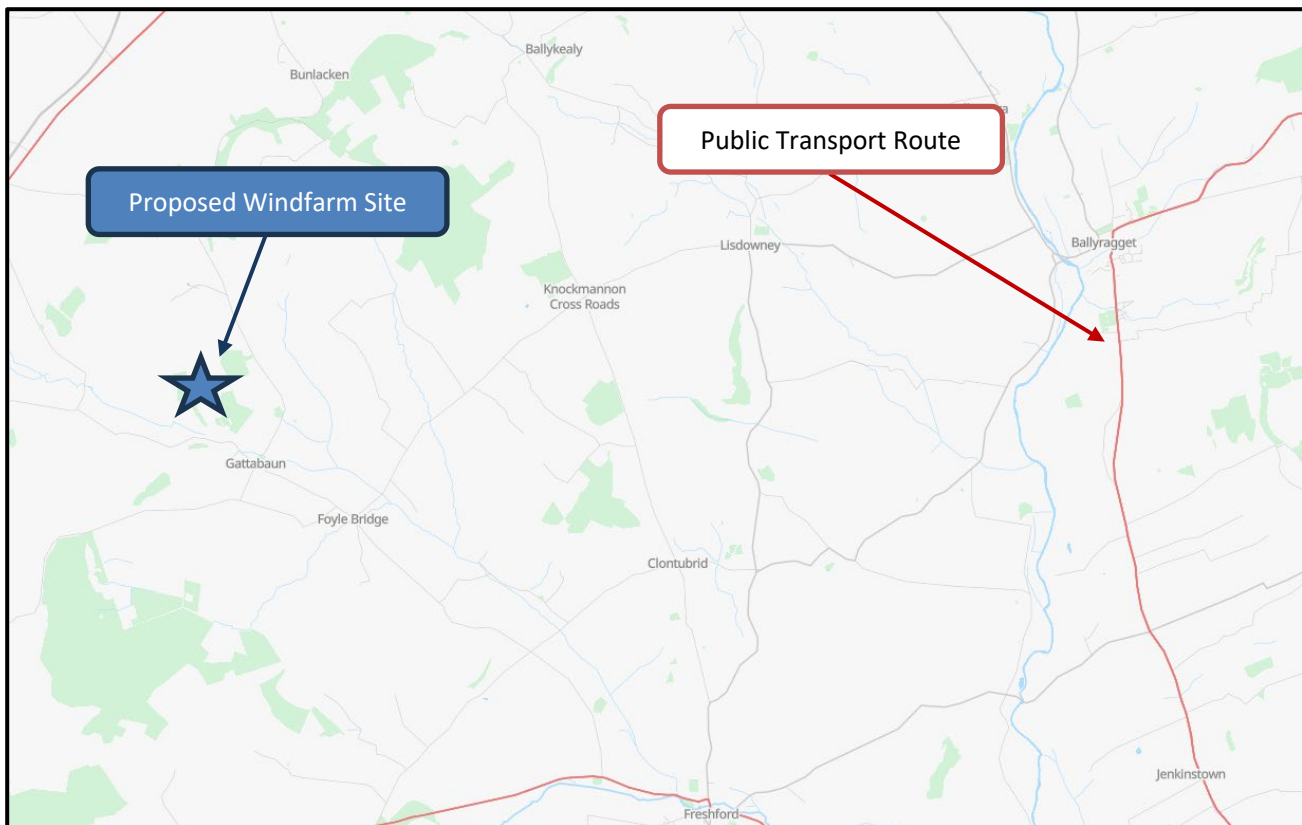


Figure 13: Public transport corridors in the vicinity of the site

Despite this general absence of scheduled public transport, a TFI Local Link demand-responsive bus service (Route 491, Galmoy to Kilkenny) does pass through Gathabawn village once weekly, on Tuesdays: it departs Galmoy at 09:00, calling at Urlingford, Crosspatrick and Gathabawn before continuing to Cullohill, Lisdowney and Freshford, and terminates at Dunnes Stores, Kilkenny, with a return service arriving back into Kilkenny at 13:45. As a demand-responsive service requiring advance booking and running only once per week, Route 491 does not materially alter the conclusion above: site personnel and construction traffic will in practice continue to rely on private vehicle transport.

16.3.4 Traffic Collisions Data in the Vicinity of the Site

Recorded road collision history for the study area was reviewed using the Road Safety Authority (RSA) online collision mapping tool, filtered to County Kilkenny (all Local Authority areas, all collision severities and years held by the tool; data current as of 27/04/2026). Figure 14 reproduces the query. County-wide, the RSA tool records 24 fatal collisions and 116 serious injury collisions for Kilkenny over the period covered by its dataset (140 in total).

Within the map extent shown in Figure 14 overleaf, which spans the wider Durrow-Cullahill-Freshford area, including the R639 corridor addressed in Table 3 (Section 16.4.2), four collisions with recorded coordinates are shown: one fatal collision on the R693 west of Freshford, and three serious injury collisions (one close to the M8/Cullahill area, and two in the vicinity of Freshford). None of the plotted collisions coincide with the local road network carrying construction traffic (L1806, L1807, L5818, L18062, L58141, L1803) or with any of the 7 junctions surveyed for this assessment (J1-J7, Section 16.4.3), which lie in the Gathabawn/Ballyring/Parksgrove area between these settlements; the great majority of the county-wide total (140 collisions) lies outside this map extent altogether, elsewhere in County Kilkenny.

On this basis, the available collision record does not indicate a pre-existing collision hotspot or road safety issue at the site access junctions or on the local road network that will carry construction traffic. This is consistent with the low existing traffic volumes established in Section 16.4.1 (AADT 34-565 on the local roads) and the rural character of the network (Section 16.3.1). The temporary increase in HGV movements during construction nonetheless warrants standard mitigation; a Construction Traffic Management Plan, appropriate signage/banksman control at site accesses, and driver briefings, as set out in Section 16.9 and the C20 Mitigation Monitoring Arrangements (MM28, MM37, MM38).

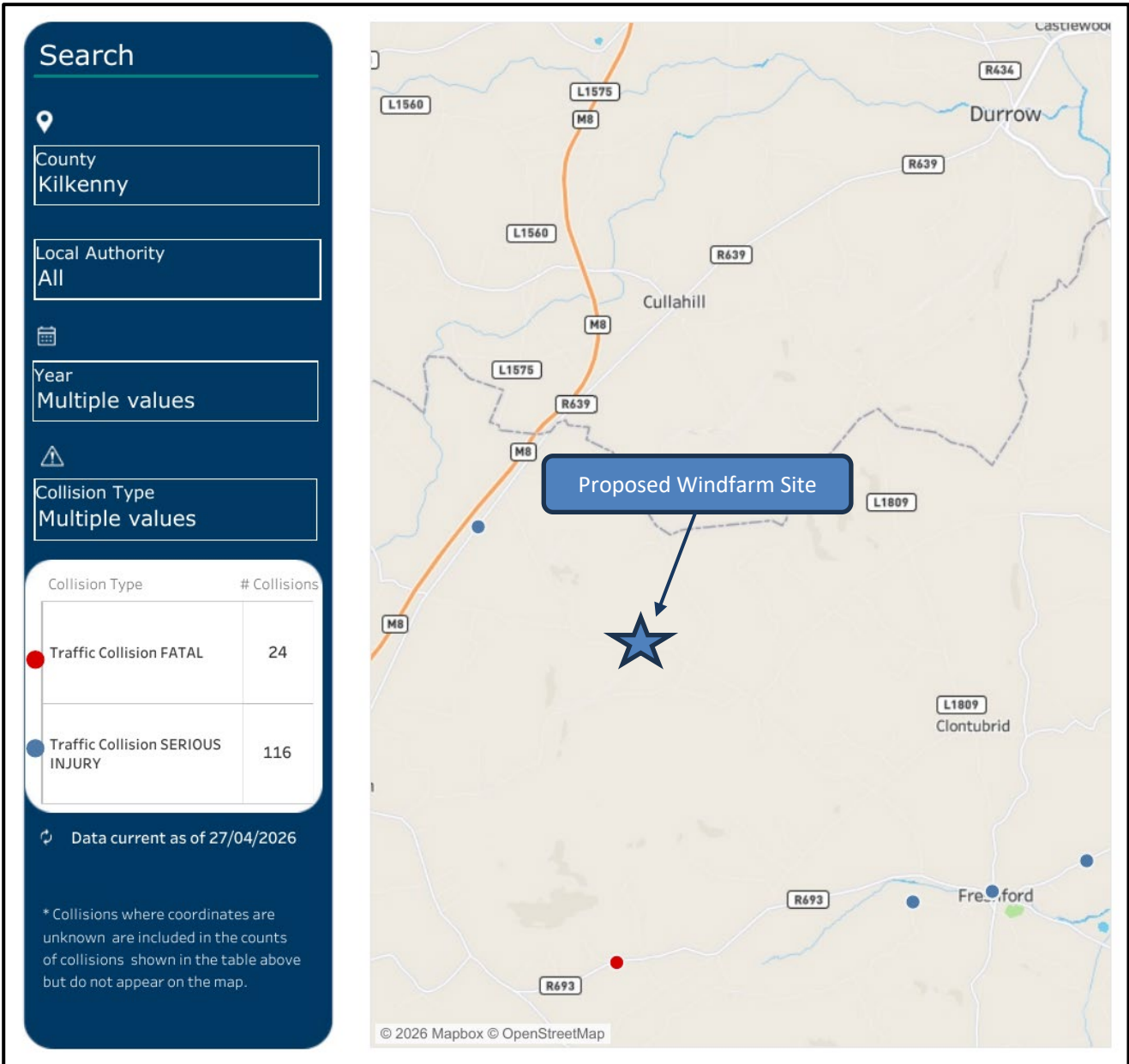


Figure 14: RSA collision map, County Kilkenny - collisions with recorded coordinates in the vicinity of the study area (Source: Road Safety Authority online collision mapping tool, data current as of 27/04/2026)

16.4 Existing Traffic flows

Existing traffic conditions were established using two complementary surveys, both undertaken along the corridors identified in Sections 16.2.5 and 16.2.6 as the proposed construction material and abnormal load haul routes:

- Automatic Traffic Counter (ATC) tube counts at 12 locations (ATC1-ATC12) (see Figure 15: Traffic Counter Locations 2026) recording classified 15-minute two-way volumes over a 7-8 day period at each location. ATC1 (R639, Coolnacrutta) and part of the ATC4/ATC5 pair (L1806) sit directly on the Ballyring Area material haul routes described in Section 16.2.5; ATC6 (L1807, Parksgrove) sits on both the Ballyring Area haul route and the Candidate Grid Connection access route. ATC2 (L5818) and ATC3 (L5820) cover the Ballylehaun Control Building route and the Ballylehaun-Ballyring Underground Cabling corridor respectively. ATC7 (L1803), ATC8 (L1804) and ATC9 (L1806) cover the Gathabawn village stretch of the Ballylehaun Control Building and turbine-blade delivery routes, including the L1804/L1806 junction at Foyle Bridge.
- Manual classified turning counts at the 7 junctions shown in Figure 1, each surveyed for AM (07:30-09:30), Midday (12:00-14:00) and Evening (16:00-18:30) peak periods on 26/05/2026. These junctions are the key decision points along the same haul routes, e.g. J1 (N77/R639/The Square) is where haul traffic leaves the N77/R639 corridor, and J5 (L1806/L18062) is the final turn into the Ballyring turbine area described in Section 16.2.5.

Figure 15 overleaf shows the precise locations where the traffic counters were installed.

16.4.1 Local Roads

Table 2 summarises traffic volumes on the local roads in the study area, expressed as Annual Average Daily Traffic (AADT). The ATC survey figures (7-8 day continuous counts, May and June 2026) were converted to AADT using the Generic Expansion Factor Method of TII PE-PAG-02039 (Project Appraisal Guidelines for National Roads Unit 16.1 - Expansion Factors for Short Period Traffic Counts, October 2016), applying the South-East region Monthly Flow Index for the relevant survey month (0.97 for both May and June 2026) to the empirical weekday-average WADT derived directly from each 7-8 day count.

Table 2 – Existing Traffic Volumes in Local Roads - ATC MetroCount exports, converted to AADT per TII PE-PAG-02039 (South-East region factors)

Road Number	Relevant Automatic Traffic Counters (ATC)	Total Vehicles			
		24Hr 2-way Average Annual Daily Traffic (2026 baseline)	AM Peak 2-way	PM Peak 2-way	HGV (%)
L-5818	ATC2 (7-14 May)	85	2.9	6.4	2.4%
L-5820	ATC3 (7-14 May)	34	2.4	2.4	2.0%
L-1806 (Ballyring Upper, nr. junction with L18062)	ATC4 (19-26 May)	261	21.7	20.6	2.4%
L-1806 (Lisdowney)	ATC5 (19-26 May)	424	37.4	31.4	2.1%
L-1807	ATC6 (18-25 May)	565	58.4	45.1	2.2%
L1803 (west of Gathabawn, nr. Site Entrance No.3)	ATC7 (10-17 June)	263	16.9	20.9	2.8%
L1804 (Gathabawn village, at J3)	ATC8 (10-17 June)	471	37.3	34.4	0.9%
L1806 (Foyle Bridge)	ATC9 (10-17 June)	294	18.1	22.7	1.0%

Note: ATC10-ATC12 (part of the same survey as ATC7-ATC9 carried out in June 2026) remain excluded from Table 2 above as their surveyed volumes (57 / 23 / 4 veh/day) are far below what the above classified roads already show

elsewhere (2,851 / 85 / 261 AADT), they are minor farm lanes or site-access spurs and do not necessitate further assessment.

16.4.2 Regional Roads

The R639 and R432 are the only regional roads within the study area used by construction traffic – the R639 by the Windfarm, and the R432 by the Candidate Gathabawn Grid Connection, which will use a short section of the R432 to access the existing EirGrid Ballyragget Substation (Section 16.3.1.2).

The existing rural road link AADT volume/capacity ratio for the R639 Regional Road, in the vicinity of the proposed development site, is provided in Table 3, on the basis of the TII DN-GEO-03031 (May 2023), for the year 2026 (when traffic counts were carried out).

Estimation of the Annual Average Daily Traffic (AADT) was carried out based on the TII Project Appraisal Guidelines for National Roads Unit 16.1 - Expansion Factors for Short Period Traffic Counts PE-PAG-02039, October 2016. Estimation of rural road link capacity for the R639 was conducted using the TII Rural Road Link Design DN-GEO-03031, (previous publication from April 2017), taking into account their typical road carriageway widths.

Table 3 – Existing Traffic Volumes in Regional Roads and Estimated Capacity

Road Location	Relevant Automatic Traffic Counters (ATC)	Total Vehicles			
		Carriageway width (m)	Average Annual Daily Traffic Capacity (vehicle) For a Level of Service D	AADT (May 2026 survey, PE-PAG-02039 converted)	AADT Volume/Capacity Ratio
R639 (Coolnacrutta)	ATC1	~6.5	~5,000	2,851	≈57%

16.4.3 Junctions

Manual classified turning counts were undertaken at all 7 junctions shown in Figure 1 (AM, Midday and Evening periods, 26/05/2026). Table 4 summarises the all-vehicle and HGV totals for each; per-arm PCU conversion will be carried out for whichever junctions are carried forward to capacity assessment (Section 16.8).

Table 4 – AM and PM Manual Traffic Counts Results

Location	Road ID	AM 07:30-09:30 (all veh / HGV)	Midday 12:00-14:00 (all veh / HGV)	Evening 16:00-18:30 (all veh / HGV)	Busiest period
J1	N77 / R639 / The Square	1,732 / 136	1,329 / 136	2,322 / 96	Evening
J2	R639 / L58141	433 / 57	338 / 38	590 / 31	Evening
J3	L1803 / L1804 / L5818 / L5819	111 / 1	75 / 0	113 / 0	Evening
J4	L1806 / L1804	121 / 1	109 / 5	151 / 0	Evening
J5	L1806 / L18062	40 / 1	39 / 2	46 / 0	Evening
J6	L1807 / L1811 / L1806	171 / 3	159 / 4	162 / 0	AM (~Evening)
J7	N77 / L1807	1,292 / 112	857 / 120	1,611 / 83	Evening

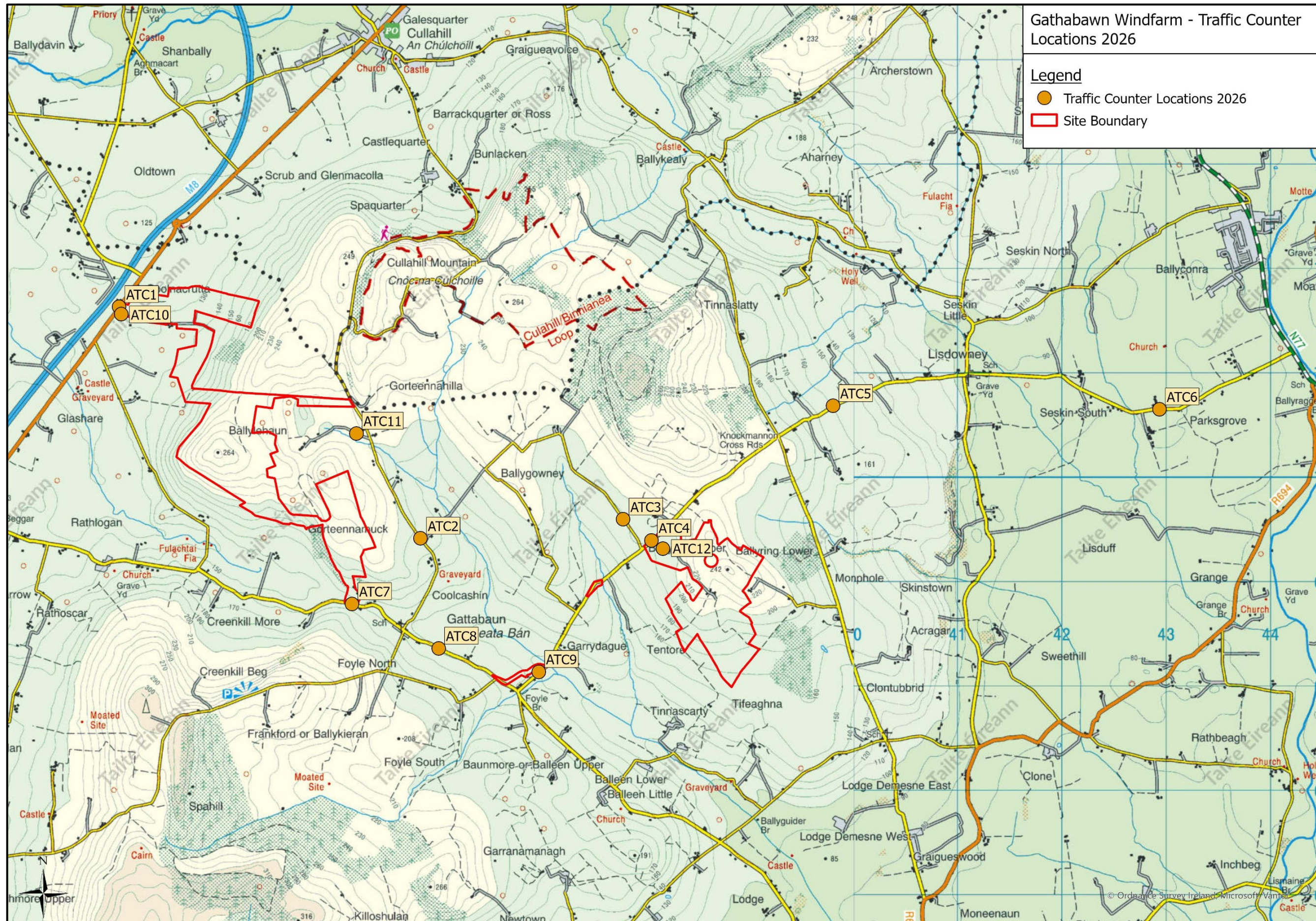


Figure 15: Mapping showing Traffic Count Locations

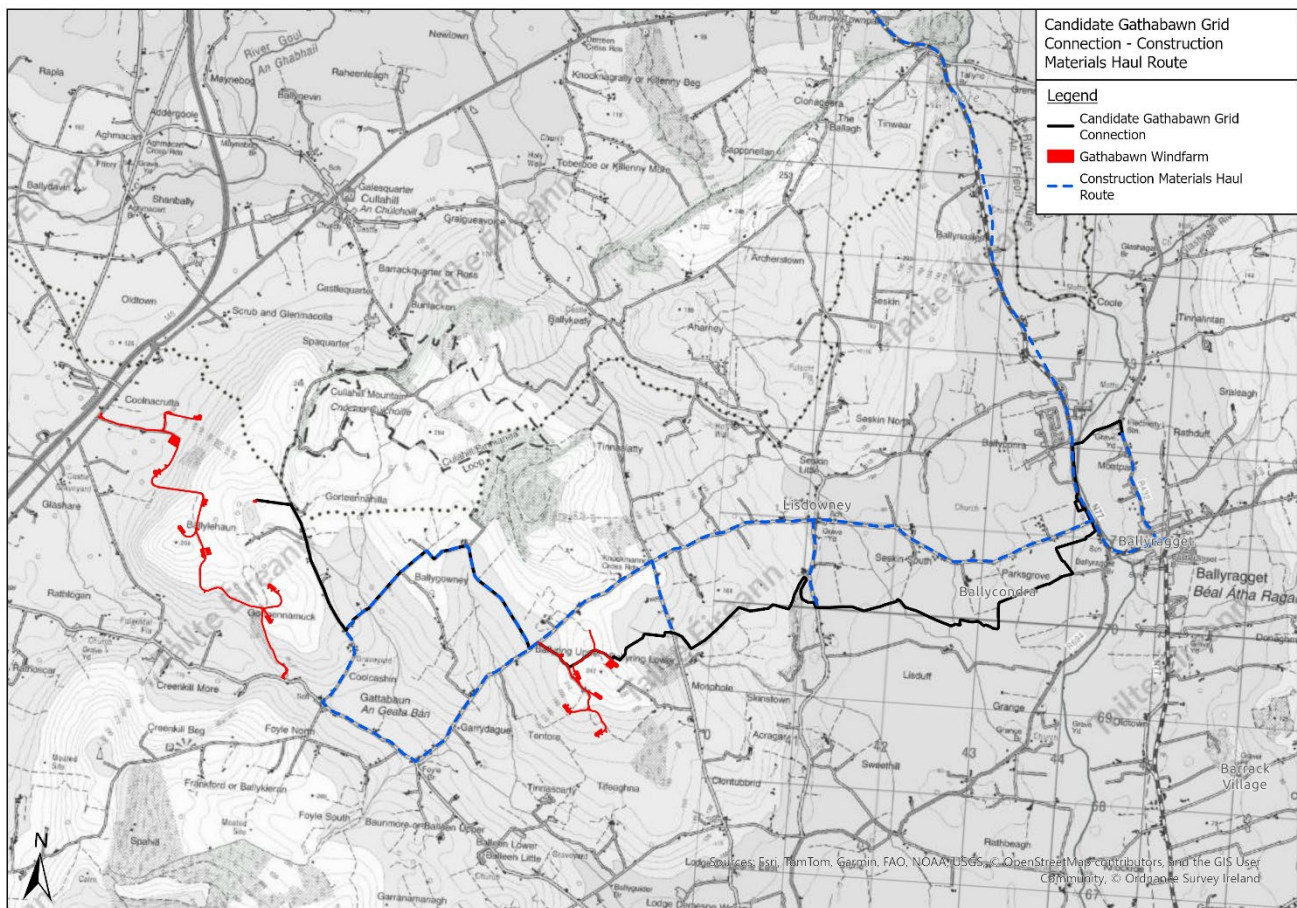


Figure 17: Construction Materials Haul Route for the Candidate Gathabawn Grid Connection in blue

Construction Hours

Construction activities for the project are scheduled to take place during the following hours: 7:00 a.m. to 7:00 p.m. from Monday to Friday, and 8:00 a.m. to 4:00 p.m. on Saturday. These working hours are subject to confirmation at the beginning of the project, and any potential changes to the hours will be discussed and agreed upon with the Local Authority.

Construction Personnel

Approximately 120 people will be engaged across the Whole Project during construction (80 on the Proposed Gathabawn Windfarm, 40 on the Candidate Gathabawn Grid Connection), covering civil, electrical, project management, legal/financial and material supply/delivery roles.

Site personnel will arrive before 07:00 and depart after 19:00 on weekdays and will arrive before 08:00 and depart after 16:00 on Saturdays, outside the network AM (08:00-09:00) and PM (17:00-18:00) peak hours. Assuming an average vehicle occupancy rate of 1.25 personnel per vehicle (representing a conservative scenario), this generates approximately 64 car/van trips/day for the Windfarm workforce and 32 car/van trips/day for the Grid Connection workforce. Since on-site canteen facilities will be provided, there will be no need for staff to leave the site during working hours.

The proposed trip generations by the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection construction are presented as two separate tables overleaf, Table 6a and Table 6b, respectively. Notes:

* The largest traffic volumes are associated with the concrete pours for the turbine foundations. No other deliveries to the windfarm will be scheduled to occur on the same days as the concrete pours (estimated at 636No. loads within a 12-week window), hence, they have not been added to the daily traffic volumes in the table below.

** Turbine Delivery Vehicle Volumes

Delivery of the wind turbine loads will be carefully coordinated with Kilkenny County Council and An Garda Síochána.

A total of 108No. delivery vehicles will be required for the transportation of the 12No. turbines (turbines, nacelles and blades). The turbine deliveries will occur during night-time with traffic management and Garda escort. As this traffic will be isolated from other daily traffic movements, it has not been added into the daily traffic volumes. It is important to note that during the off-peak traffic delivery periods, there may be temporary delays for other traffic in the vicinity.

The trip generations associated with the delivery of the Turbine components are summarised in Table 5. Based on the construction programme 9No. deliveries will take place per week in a convoy and the delivery will last 12 weeks.

As stated above the turbine deliveries will occur during night-time with traffic management and garda escort. As this traffic will be isolated from other daily traffic movements, it has not been added into the daily traffic volumes in Table 6a.

Table 5 – Turbine Delivery Traffic Volumes

Elements	Parts	Components per element	Total Components	Trips (Per week)	Weeks
Nacelle	2	12 turbines X 2 = 24	108	9	12
Blade	3	12 turbines X 3 = 36			
Tower	4	12 turbines X 4 = 48			

*** This construction traffic table is a simplified traffic volume table against staff programme. As mentioned before staff will arrive at the site prior to 7:00 a.m. and depart after 7:00 p.m. on weekdays, and before 8:00 a.m. and depart after 4:00 p.m. on Saturdays, avoiding network's peak traffic hours.

Table 6a – Typical Construction Traffic Volumes (Week 1 - 26): Proposed Gathabawn Windfarm																												
			Loads per Week																									
Task Name	Duration (weeks)	Loads	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Aggregate for windfarm (Ballylehaun / Ballyring)	29	800							30 / 20	30 / 20	30 / 20	30 / 20	30 / 20	30 / 20	30 / 20	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9
Construct turbine foundations: 53 loads/day, 1 day/week *	12	636*														53	53	53	53	53	53	53	53	53	53	53	53	
Concrete and Concrete Blocks for Control Buildings, Met Mast Foundation, LiDAR plinth	8	340				43	43	43	43	42	42	42	42															
Reinforcing steel	8	12										2	2	2	2	1	1	1	1									
Mast, LiDAR and equipment	1	3																										
Electrical & communications cabling	10	10																										1
Switchgear, electrical equipment, apparatus & plant	4	4																										
HDPE ducting	10	18							2	2	2	2	2	2	2	2	1	1										
Cable protection strips, warning tape, marker posts/plates	2	2					1	1																				
General building & fencing materials	5	5	1	1	1	1	1																					
Total HGV Per Week (1-way route)			1	1	1	44	45	44	95	94	94	96	96	54	54	24	23	23	22	21	21	21	21	21	21	21	21	22
Staff (LV) ***			64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64

Table 6a cont. – Typical Construction Traffic Volumes (Week 27 - 52): Proposed Gathabawn Windfarm																												
			Loads per Week																									
Task Name	Duration (weeks)	Loads	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Aggregate for windfarm (Ballylehaun / Ballyring)	29	800	12 / 9	12 / 9	12 / 9	12 / 9	12 / 9	10 / 8	10 / 8	10 / 8	10 / 8																	
Construct turbine foundations: 53 loads/day, 1 day/week *	12	636*																										
Concrete and Concrete Blocks for Control Buildings, Met Mast Foundation, LiDAR plinth	8	340																										
Reinforcing steel	8	12																										
Mast, LiDAR and equipment	1	3					3																					
Electrical & communications cabling	10	10	1	1	1	1	1	1	1	1	1																	
Switchgear, electrical equipment, apparatus & plant	4	4								1	1	1	1															
HDPE ducting	10	18																										
Cable protection strips, warning tape, marker posts/plates	2	2																										
General building & fencing materials	5	5																										
Total HGV Per Week (1-way route)			22	22	22	22	25	19	19	20	20	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Staff (LV) ***			64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	

Table 6b – Typical Construction Traffic Volumes (Week 1 - 26): Candidate Gathabawn Grid Connection																												
			Loads per Week																									
Task Name	Duration (weeks)	Loads	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Aggregate	20	400	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20						
Concrete	16	400	25	25					25	25	25	25	25	25	25	25	25	25	25	25	25	25						
Road Surfacing	9	45	5	5									5	5	5	5	5	5				5						
Removal of Excavations	9	450	50	50									50	50	50	50	50	50				50						
Reinforcing steel	1	1						1																				
Electrical apparatus	1	2																										
Electrical & communications cabling	5	5																				1	1	1	1	1		
Switchgear, electrical equipment, apparatus & plant	5	5																										
HDPE ducting	22	22	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				
Cable protection strips, warning tape, marker posts/plates	1	1	1																									
General building & fencing materials	6	6	1	1	1	1	1	1																				
Total HGV Per Week (1-way route)			103	102	22	22	22	23	46	46	46	46	101	101	101	101	101	101	46	46	46	102	2	2	1	1	0	0
Staff (LV) ***			32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32

Table 6b cont. – Typical Construction Traffic Volumes (Week 27 - 52): Candidate Gathabawn Grid Connection																												
			Loads per Week																									
Task Name	Duration (weeks)	Loads	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Aggregate	20	400																										
Concrete	16	400																										
Road Surfacing	9	45																										
Removal of Excavations	9	450																										
Reinforcing steel	1	1																										
Electrical apparatus	1	2														2												
Electrical & communications cabling	5	5																										
Switchgear, electrical equipment, apparatus & plant	5	5															1	1	1	1	1							
HDPE ducting	22	22																										
Cable protection strips, warning tape, marker posts/plates	1	1																										
General building & fencing materials	6	6																										
Total HGV Per Week (1-way route)			0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0	0
Staff (LV) ***			32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32

The main transformer delivery (1 abnormal load) is not included in the Total HGV Per Week row above, consistent with standard TTA practice. The combined programme summary is shown in Table 7 below.

Table 7 – Combined Programme Summary

	Proposed Gathabawn Windfarm	Candidate Gathabawn Grid Connection	Whole Project (combined, for cumulative assessment only)
Standard material loads	1,830	887	2,717
Abnormal loads	125 (108 turbine + 17 crane)	1 (transformer)	126
Removal of excavations loads	-	450	450
Total vehicle movements (materials)	1,955	1,338	3,293
Construction workforce	80	40	120
Peak weekly HGV (standard materials)	96	103	-

16.5.2 Development Traffic Generation

16.5.2.1 Traffic Generation During Construction Stage

The construction stage of the project will have the most significant traffic impact. Peak construction deliveries are assumed to occur during the initial seven months of the twelve months construction period, as presented in Table 6a and 6b above. This section outlines the potential impact of the construction stage on the existing road infrastructure and the existing traffic capacity. The Whole Gathabawn Windfarm Project comprises two distinct windfarm areas (Ballylehaun and Ballyring) plus a separate Grid Connection, each with its own haul route (Section 16.2.5), so construction traffic is described below by vehicle category and then assigned to routes separately for the Proposed Gathabawn Windfarm and the Candidate Gathabawn Grid Connection.

Construction Traffic Categories and Routing Strategy

Construction traffic for the Whole Gathabawn Windfarm Project falls into three distinct categories, each with different vehicle types, timing characteristics and routing:

Construction Materials Traffic: standard 4-axle rigid HGV tipper units (aggregate and concrete deliveries) and HGV tractor units with articulated flat-bed or tautliner trailers (other materials, plant and general supplies), operating during normal construction hours (07:00-19:00 Monday-Friday, 08:00-16:00 Saturday). This is the traffic quantified week by week in Tables 6a and 6b. For the Proposed Gathabawn Windfarm (1,830 loads, C05 Table 5-5), materials are routed to whichever of the two turbine areas they serve: the Ballylehaun Area Route (from the R639, turning onto the L58141 local road at Coolnacrutta/Glashare) serves turbines T1-T7, Compound 1 and Borrow Pit 1, with a short spur via L1803 and L5818 through Gathabawn village serving the Ballylehaun Control Building only; the Ballyring Area Route (from the N77, turning onto the L1807 at Parksgrove, through Lisdowney village, continuing on the L1806 and turning onto the L18062 at Ballyring Upper) serves turbines T8-T12, Compound 2 and Borrow Pit 2. For the Candidate Gathabawn Grid Connection (887 loads, C05 Table 5-6), materials are routed separately: Parksgrove Substation materials use the N77, turning onto the L1807, to Site Entrance No.8; Underground Cabling materials for the Ballyring-Parksgrove Underground Cabling additionally use the L1811 (Lisdowney) and L1808 (Ballyring Lower/Lisdowney) temporary site entrances, while the Parksgrove-Moatpark Underground Cabling is reached from the N77 directly and via the R432 at Ballyragget. The Ballylehaun-Ballyring Underground Cabling is accessed from the L1806 and through Gathabawn village onto the L5818, L5821 and L5820, and on the L1806 and L18062.

Staff Vehicles: cars and vans used by the construction workforce (Construction Personnel, above), travelling to/from the site before 07:00 and after 19:00 on weekdays, and before 08:00 and after 16:00 on Saturdays, outside the

network AM (08:00-09:00) and PM (17:00-18:00) peak periods. Staff use the same route corridors as the materials traffic serving their respective work area; Windfarm staff (80 people, ~64 vehicle trips/day) via the Ballylehaun and/or Ballyring Area Routes described above and Grid Connection staff (40 people, ~32 vehicle trips/day) via the Parksgrove Substation/Cabling routes.

Abnormal Load (Turbine and Transformer Component) Deliveries: specialist extendable flatbed semi-trailers and blade-transport trailers, escorted and undertaken during night-time hours (Section 16.2.6) to minimise interaction with daytime traffic. Turbine components for the Ballylehaun Area (towers and nacelle/hub units) travel via the motorway network as far as Portlaoise, then the N77 to Durrow, Co. Laois, then the R639 south, joining the Ballylehaun Area Route via the L58141 (Site Entrances No.1-2). Turbine blades for the Ballyring Area are first delivered to a Temporary Blade Storage Area beside the Ballylehaun Construction Compound, then lifted by crane onto a specialised blade-lifter trailer and transported via the Ballylehaun site roads to Site Entrance No.3, onto the L1803, through Gathabawn village, onto the L1804, then via a new temporary access road onto the L1806, to the L18062 junction at Ballyring Upper (temporarily widened for the turn), and on to Site Entrance No.7. The single Grid Connection abnormal load (the main transformer for Parksgrove Substation) routes via the N77, turning onto the L1807, to Site Entrance No.8, the same corridor used for Grid Connection materials and staff.

Table 8 below assigns each route to the traffic categories and quantities described above:

Table 8 – Combined Proposed Construction Routes

Route	Roads used	Materials assigned	Abnormal loads assigned
Ballylehaun Area (Inbound/Outbound)	R639 → L58141	Share of aggregate/concrete/general materials for T1-T7, Compound 1, Borrow Pit 1	Turbine deliveries to Ballylehaun (via R639/L58141)
Ballylehaun Control Building	L1803 → L5818	Control building materials	-
Ballyring Area (Inbound/Outbound)	N77 → L1807 → L1806 → L18062	Share of aggregate/concrete/general materials for T8-T12, Compound 2, Borrow Pit 2	Ballyring blade deliveries (via L1803/L1804/L1806/L18062, Section 16.2.6)
Grid Connection - Parksgrove Substation	N77 → L1807	Substation materials	Main transformer
Grid Connection - Cabling (Ballylehaun-Ballyring UGC)	L1806 → L1804 → L5818 → L5821 → L5820 → L18062	Cabling/trenching materials	-
Grid Connection - Cabling (Ballyring-Parksgrove UGC, Parksgrove-Moatpark UGC)	N77 → L1807 / L1811 / L1808 / R432	Cabling/trenching materials	-

Construction Material Delivery Vehicle Volumes

Across the 12-month construction programme, the Whole Gathabawn Windfarm Project will require 2,717 No. standard material loads (1,830No. to the Proposed Gathabawn Windfarm and 887 No. to the Candidate Gathabawn Grid Connection) in addition to the 126No. abnormal loads described above. These will be delivered using three vehicle types: standard 4-axle rigid HGV tipper units for aggregate and concrete; HGV tractor units with 2-4 axle articulated flat-bed or tautliner trailers for other materials, plant and general supplies; and vans/4WD vehicles towing single/double-axle trailers for smaller parts. The Candidate Gathabawn Grid Connection will also generate 45 No. loads for the removal of excavated subsoils and road surfacing, which will be carried out using standard 4-axle rigid HGV tipper units.

Table 9 overleaf sets both the volume (m³) and the load count for the three highest-volume material lines.

Table 9 – Construction Vehicle Capacity

Material	Element	Volume	No. of loads	Capacity
Concrete - turbine foundations	Windfarm	5,040 m ³	636	8 m ³ /load
Concrete & blocks - control buildings, met mast, cable link	Windfarm	3,380 m ³	340	10 m ³ /load
Aggregate	Windfarm	8,000 m ³	800	10 m ³ /load
Concrete	Grid Connection	4,000 m ³	400	10 m ³ /load
Aggregate	Grid Connection	4,000 m ³	400	10 m ³ /load
Removal of excavations	Grid Connection	250 m ³	45	5 m ³ /load

Assessment Scenarios and Traffic Assignment

Two assessment scenarios are defined:

- Scenario A: Proposed Gathabawn Windfarm standalone: the traffic subject to this 2026 planning application. This is the primary assessment case at every junction.
- Scenario B: Cumulative (Windfarm + Candidate Grid Connection): applied only at Junction 7 (N77/L1807), the one location where the Ballyring Area Route and the Grid Connection route physically converge (both turn off the N77 onto the L1807 at Parksgrove). The Grid Connection is not part of this application but is carried in the Traffic and Transport Assessment to facilitate the cumulative evaluation of the Whole Project, and that all elements are planned to be constructed concurrently so Scenario B feeds the cumulative-impact test (Section 16.7.2), not the standalone Windfarm assessment.

Traffic assignment converts the Table 6a/6b peak-week totals into peak-day and peak-hour movements using a conservative, TII-consistent convention: peak-week loads are divided by the working days in the week (5, Monday to Friday construction hours as a worst-case scenario) to give a peak one-way daily load, doubled for two-way movements, then apportioned 50:50 between the network AM and PM peak periods. A 60:40 Ballylehaun:Ballyring split is applied to the Windfarm's combined peak-week total to approximate the loading each route carries. Table 10 sets out the resulting route-level volumes.

The Ballyring-Parksgrove UGC is routed cross-country and therefore requires only small volumes of aggregate and concrete where it interacts with the public road. As a result of this, only c.11% of the total aggregate and concrete deliveries will be routed to the Ballyring-Parksgrove UGC, while c.33% of deliveries will be to the Parksgrove Substation, c.33% of deliveries will be to the Ballylehaun-Ballyring UGC works areas, and c.22% will be to the Parksgrove-Moatpark UGC works areas. In relation to staff movements for the candidate grid connection, it is expected that all staff will first travel to the construction compound at the Parksgrove Substation, before carpooling to the individual works locations.

Table 10 – Construction Route-Level Traffic Assignment, Peak Week (Windfarm peak = Week 10 and 11, 96 one-way HGV loads/week; Grid Connection peak = Week 1, 103 one-way HGV loads/week - both from Table 6a/6b)

Route	Roads	Share	Peak-day 1-way HGV loads	Peak-day 2-way HGV movements	Peak-day 2-way staff movements
Ballylehaun Area Route (+ Control Building spur)	R639 → L58141 (+ L1803) → L5818)	60%	11.5	23	76.8
Ballyring Area Route	N77 → L1807 → L1806 → L18062	40%	7.7	15.4	51.2
Grid Connection - Parksgrove Substation + Parksgrove-Moatpark UGC	N77 → L1807 (+ R432)	56%	11.5	23	64.0

Route	Roads	Share	Peak-day 1-way HGV loads	Peak-day 2-way HGV movements	Peak-day 2-way staff movements
Grid Connection – Ballylehaun-Ballyring UGC	N77 → L1807 → L1806 → L1804 → L5818 → L5821 → L5820 → L18062	33	6.8	13.6	-
Grid Connection – Ballyring-Parksgrove UGC	N77 → L1807 (+L1803 → L1808)	11	2.3	4.6	-

J1 and J7 are the busiest surveyed junctions and the recommended priority candidates for detailed capacity assessment. Applying Scenarios A and B to Table 6 gives the following peak-hour junction loadings:

Table 11 – Peak-Hour Junction Loadings at J1 and J7

Junction	Scenario	HGV movements/peak hour	PCUs/peak hour (×2.0)
J1 - N77/R639/The Square (R639 arm)	A - Windfarm, Ballylehaun Area Route only	11.5	23
J7 - N77/L1807 (L1807 arm)	A - Windfarm, Ballyring Area Route only	7.7	15.4
J7 - N77/L1807 (L1807 arm)	B - Cumulative, Ballyring Area Route + Grid Connection	28.3	56.6

Worst-Case Assessment Approach

Table 12 below expresses the same peak-week construction traffic as a 24-hour, two-way addition to the adopted AADT on each of the three roads where a background count is available, giving the percentage increase used for the Section 16.8 screening test:

Table 12 – Proposed Construction Works Traffic Volumes

Road	Element(s)	Background AADT (adopted)	Added HGV (2-way)	Added Staff (2-way)	Added Total (2-way)	% increase
R639 (Cullahill-Coolnacrutta)	Windfarm - Ballylehaun (Scenario A)	2,851	23	76.8	99.8	3.5%
L1806, Ballyring Upper	Windfarm - Ballyring (Scenario A)	261	15.4	51.2	66.6	25.5%
L1807, Parksgrove	Windfarm Ballyring + Grid Connection (Scenario B)	565	56.6	115.2	171.8	30.4%

R639 shows a comparatively modest increase (3.5%) given its higher background flow; L1806 and L1807, both low-volume rural roads, show large percentage increases, consistent with the analysis findings that J1 and J7 are the busiest surveyed junctions and the recommended priority candidates for detailed capacity assessment.

16.5.2.2 Traffic Generation During Operational Stage

During this stage the day-to-day operations for the windfarm will involve routine maintenance, inspections, and asset management activities required to ensure the safe and reliable performance of the turbines and associated infrastructure. Operational windfarms typically generate ongoing employment for skilled personnel, and Gathabawn Windfarm will be serviced by electrical and mechanical turbine technicians, high-voltage specialists for the substation, and civil contractors who will undertake twice-yearly maintenance of roads, drains, and hardstands under the supervision of the site manager.

In addition, asset management functions covering health and safety, regulatory compliance, financial administration, landowner payments, energy sales etc., will be carried out by dedicated operational staff.

Material requirements during this stage will be minimal, with specialist crews bringing their own tools and equipment to site. Occasional deliveries may include small quantities of aggregate, silt traps or fencing components needed for civil maintenance. As a result, traffic levels during operation will be very low, limited mainly to service vans and four-wheel-drive vehicles accessing the turbines for scheduled or reactive maintenance, resulting in a neutral in terms of quality, long-term in duration and imperceptible in significance effect on the traffic flow within the existing road network.

16.5.2.3 Traffic Generation During Decommissioning Stage

The decommissioning process is estimated to take approximately 3 to 4 months and will involve multiple specialist crews working simultaneously (12 weeks turbine dismantling at 1 week/turbine, plus control building, cabling and reinstatement works). A total of 16No. personnel will be present on-site during this phase. The dismantling of the turbines will be carried out using cranes and will require the same number of personnel and time as the initial erection of the turbines.

It is anticipated that the volume of traffic associated with the decommissioning stage will be significantly less than during the construction stage. The meteorological mast would be similarly dismantled by crane and either reused or recycled. During decommissioning it may be necessary to transport turbine components (at their full size for reuse) from the site, therefore the transportation of the tower sections and blades may require (depending on the transport size) the same temporary facilitating works which were put in place during the construction phase. Once all of the large loads have been transported off site, the haul route works locations would be permanently reinstated and the road side boundary would be reinstated. As a result, the overall traffic impact during the decommissioning stage is temporary and will not have a significant adverse effect.

16.6 Future Years Traffic Growth

16.6.1 Traffic and Transport Assessment Guidelines

The Kilkenny City and County Development Plan 2021–2027, requires a Traffic Assessment to be provided for significant development proposals in accordance with the TII publication *Traffic and Transport Assessment Guidelines*. The TII Publication PE-PDV-02045 Traffic and Transport Assessment Guidelines, published in May 2014, recommends that junction modelling should be carried out where new traffic exceeds 5% of existing flows if congestion already exists and if traffic generated by the development exceeds 10% where no traffic congestion is present.

Table 13 – Traffic Management Guidelines Thresholds for Transport Assessments (TII)

TII Thresholds	
YES	Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road.
N/A	Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists, or the location is sensitive
N/A	Residential development in excess of 200 dwellings
N/A	Retail and leisure development in excess of 1000m ²
N/A	Office, education and hospital development in excess of 2,500m ²
N/A	Industrial development in excess of 5,000m ²
N/A	Distribution and warehousing in excess of 10,000m ²

As indicated in Table 13, the construction-related traffic on some of the local roads will meet the first listed threshold (as presented in Section 16.7.1), therefore the production of a Traffic and Transport Assessment is recommended. To ensure a comprehensive evaluation of the transport impact, a thorough analysis was conducted, considering the existing volumes, future projections, and quantified road link capacity based on the pavement width and conditions.

16.6.2 Traffic Forecasting

Transport Infrastructure Ireland (TII) issues a range of forecasts: low growth, central growth, and high growth. The implementation of policies relating to the National Sustainable Mobility Policy will act as a deterrent to high growth in car-based travel. Low growth factors are however likely to be equally unrealistic at present, therefore, this assessment has used central growth factors, which was extracted from the TII Publication PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections, published in October 2021, outlined in Table 14 and Table 15 below.

Assuming planning permission is obtained in 2027 for a 10-year planning duration, the construction is estimated to commence between 2027 and 2037. ORS evaluated two potential construction years for the Project: 2027 and 2037. As a result, traffic counts were adjusted using growth factors corresponding to the years 2027 and 2037. This approach ensures that the assessment takes into account the projected changes in traffic volumes and patterns during the construction phase.

Table 14 – TII Annual Growth Rates (Central Growth) for Co. Kilkenny

Year	LGV	HGV
2016 – 2030	1.0124	1.0268
2030 – 2040	1.0037	1.0129
2040 – 2050	1.0027	1.0166

Table 15 – Growth Factors for Future Design Years for Co. Kilkenny

	Counts	Base Year	Construction Phase	
	2026	2026	2027	2037
LGV	1.000	1.000	1.012	1.078
HGV	1.000	1.000	1.027	1.216

16.7 Impact on the Road Network

16.7.1 Traffic Impact Assessment

Per Section 16.6.2, this assessment applies TII PE-PAG-02017 central growth factors for Co. Kilkenny to project the current (May/June 2026) survey baseline forward to both potential construction years — 2027 and 2037. Table 15's factors are given separately for LGV and HGV; since the background counts below are all-vehicle (not split by class), a blended factor is used for each road, weighting TII's LGV and HGV rates by that road's own observed HGV%: 1.0136 (2027) / 1.0927 (2037) for R639 (10.7% HGV); 1.0124 (2027) / 1.0813 (2037) for L1806, Ballyring Upper (2.4% HGV); 1.0123 (2027) / 1.0810 (2037) for L1807, Parksgrove (2.2% HGV). The added construction traffic itself is not growth-factored as it is the fixed project-generated volume (Section 16.5.2.1), independent of which year construction starts.

Section 16.5.2.1 above (Table 11 and the junction-level peak-hour loading table) already derives the added construction traffic at peak hour and over a full day, by route and by junction arm. Table 16 below applies the growth factors above to the existing AM/PM peak-hour counts and 24-hour AADT (Tables 2 and 3) on the three roads where both are currently available, R639, L1806 (Ballyring Upper) and L1807 (Parksgrove), the same three roads covered in Table 12 above, for all three assessment years: 2026 (Base Year), 2027 and 2037 (Construction Phase).

Staff trips are excluded from the peak-hour figures below: Section 16.5.2.1 confirms construction staff arrive before 07:00 and depart after 19:00, outside the network's AM/PM peak hours, so only HGV movements are compared at peak hour here; staff remain in the 24-hour AADT comparison where they are relevant.

For junction capacity assessment purposes, it was assumed that 50% of the trip generation will occur during the morning peak and the remainder during the evening peak.

As part of the proposed works, the local roads will undergo widening to accommodate the Windfarm works. It is worth noting that the TII guidance does not provide specific rural road link capacities for road carriageway widths less than 6.0 metres. To assess the capacity of the local roads, an evaluation was conducted, taking into consideration a worst-case scenario with an existing width of 4.5-5.5 metres for the local roads. The evaluation utilised *Junctions 11* software ⁽¹⁾, which indicated a minimum capacity of ~450 vehicles per hour for these local roads. Therefore, the comparison for the public roads will be presented in terms of vehicles, providing a comprehensive assessment of their capacity.

Table 16 – Traffic Impact on Assessed Roads

Local Road ID	Road Capacity	Projected Traffic 2027/2037 (vehicles)			Traffic from Developments (vehicles, two-way)			Increase in Traffic during peak times		% Estimated Road Capacity used (Resid.)
		24Hr 2-way AADT	AM Peak	PM Peak	24Hr 2-way Traffic	AM Peak	PM Peak	AM Peak	PM Peak	
R639 (2027)	5,000 AADT	2,890	200.6	228.7	99.8	11.5	11.5	5.7%	5.0%	60% (40%)
R639 (2037)		3,115	216.2	246.5	99.8	11.5	11.5	5.3%	4.7%	64% (36%)
L-1806 (2027)	450/per hour ⁽¹⁾	264.6	22.0	20.9	66.6	7.7	7.7	35%	36.8%	~6% (94%) ⁽¹⁾
L-1806 (2037)		282.6	23.5	22.3	66.6	7.7	7.7	32.8%	34.5%	~15% (85%) ⁽¹⁾
L-1807 (2027)	450/per hour ⁽¹⁾	572.0	59.1	45.7	171.8	28.3	28.3	47.9%	61.9%	~19% (81%) ⁽¹⁾
L-1807 (2037)		610.8	63.1	48.8	171.8	28.3	28.3	44.8%	58.0%	~20% (80%) ⁽¹⁾
L-1804 (2027)	450/per hour ⁽¹⁾	476.7	37.8	34.8	13.6	6.8	6.8	18.0%	19.5%	~11% (89%) ⁽¹⁾

Local Road ID	Road Capacity	Projected Traffic 2027/2037 (vehicles)			Traffic from Developments (vehicles, two-way)			Increase in Traffic during peak times		% Estimated Road Capacity used (Resid.)
		24Hr 2-way AADT	AM Peak	PM Peak	24Hr 2-way Traffic	AM Peak	PM Peak	AM Peak	PM Peak	
L-1804 (2037)	450/per hour ⁽¹⁾	508.3	40.3	37.1	13.6	6.8	6.8	16.9%	18.3%	~11% (89%) ⁽¹⁾
L-5818 (2027)	450/per hour ⁽¹⁾	86.1	2.9	6.5	13.6	6.8	6.8	234.5%	104.6%	~3% (97%) ⁽¹⁾
L-5818 (2037)		91.9	3.1	6.9	13.6	6.8	6.8	219.4%	98.6%	~3% (97%) ⁽¹⁾
L-5820 (2027)	450/per hour ⁽¹⁾	34.4	2.4	2.4	13.6	6.8	6.8	283.3%	283.3%	~2% (98%) ⁽¹⁾
L-5820 (2037)		36.7	2.6	2.6	13.6	6.8	6.8	261.5%	261.5%	~2% (98%) ⁽¹⁾

(1) Road capacity (~450 vehicles/hour) for the local roads reflects the Junctions 11 software evaluation referenced above, based on the surveyed existing carriageway widths (4.5-5.5m). The % Estimated Road Capacity used for these roads is the busier of the AM or PM peak-hour flow (existing background plus development traffic) expressed as a proportion of this hourly capacity. This differs from the R639 calculation above because R639's stated capacity (5,000 AADT) is itself expressed on a 24-hour basis, so it is appropriately compared against the 24-hour AADT flow; the local roads' capacity is a peak-hour Junctions 11 output, so it is instead compared against peak-hour flows. The R639 and local-road percentages are consequently not directly comparable to one another in this table.

As observed in Table 16, the R639 stays comfortably below the 10% TII threshold in every year since its much larger background flow absorbs the fixed HGV addition proportionally better as it grows. L1804, L1806 and L1807 exceed the 10% threshold in every year, but their percentage increases also fall slightly as background traffic grows (L1804: 19.5%→18.3% PM; L1806: 35%→32.8% AM; L1807: 47.9%→44.8% AM) because the added construction traffic is fixed while the background it is compared against grows. This is principally an artefact of a very low existing base rather than evidence of a capacity or safety problem in its own right and no pre-existing collision pattern was identified on this local road network (Section 16.3.4).

L5818 and L5820 are included in Table 16 above for the same reason: each carries the Candidate Gathabawn Grid Connection's Ballylehaun-Ballyring Underground Cabling route (Section 16.5.2.1, Table 8), assigned 13.6 HGV movements per peak day, two-way (33% of the Grid Connection's aggregate/concrete deliveries, per Table 10), independent of and additional to any Windfarm traffic already attributed to L1806 elsewhere in this table. As with L1806 and L1807, L5818's and L5820's very low existing base (2.4-6.4 veh/hr) makes the percentage increase large but principally a low-base artefact rather than evidence of a capacity problem. The 450 veh/hr capacity figure applied to L5818 and L5820 above is the same worst-case, 4.5m-carriageway Junctions 11 evaluation used for L1804/L1806/L1807, carried over as an indicative proxy rather than independently evaluated for these roads.

It should be therefore emphasised that despite the increase, the Average Annual Daily Traffic (AADT) volumes on the Local Roads would remain relatively low. The local road network will continue to operate within its carrying capacity even with the additional construction traffic, providing adequate capacity to accommodate the projected traffic volumes. By ensuring the necessary widening of the local road carriageways and aligning with the estimated capacities, the anticipated traffic conditions on these roads can be effectively managed. This approach will contribute to maintaining smooth traffic flow, accommodating the increased traffic resulting from the construction activities, and ensuring the continued functionality of the local road network.

In conclusion, the comprehensive traffic assessment conducted for the proposed Gathabawn Windfarm has provided valuable insights into the potential impact on the existing road network. The peak construction traffic during construction weeks 10 and 11 is the worst-case scenario the Proposed Development is envisaged to generate with regards to traffic. Overall, the findings indicate that that during peak construction traffic, the impact will be of short duration, resulting in a **temporary moderate negative** effect on the road network.

While this assessment has addressed the overall traffic conditions and capacity considerations, and the road-level test above establishes that R639 screens comfortably under threshold while the local roads do not in every assessment year, that is a road-level and not a junction-level conclusion. Junction modelling will provide a more detailed analysis of these areas, allowing for a thorough understanding of the traffic flow and any potential improvements that may be required. Reviewing the official haul-route figures against the 7No. surveyed junctions identifies four key locations along each route: the R639/L58141 junction at Coolnacrutta (J2), the Gathabawn village junction where the Ballylehaun Control Building spur and the Ballyring turbine-blade delivery route both turn (L1803/L1804/L5818/L5819, J3), the N77/L1807 junction at Ballyragget (J7), and the crossroads at Lisdowney village on the Grid Connection's own L1807 corridor (L1807/L1811/L1806, J6). Which of these, together with J1, J4 and J5, warrant detailed capacity assessment is addressed comprehensively in Section 16.8.1 below.

16.7.2 Cumulative Impact

16.7.2.1 Introduction and Methodology

This section assesses the potential cumulative traffic and transport impacts arising from the construction and operation of the Proposed Gathabawn Windfarm in combination with other committed, consented, and proposed developments in the surrounding area. The assessment considers developments that could interact with the same transport infrastructure during overlapping timeframes, with particular focus on:

- Temporal overlap during construction phases;
- Spatial overlap on key road corridors and junctions;
- Combined traffic generation on the local and regional road network; and
- Cumulative effects on road users and local communities.

The identification of relevant developments for cumulative assessment was undertaken through exhaustive research of planning records and databases from Kilkenny County Council, Laois County Council, Tipperary County Council, Carlow County Council, and An Coimisiún Pleanála (including the EIA Planning Portal websites) by Ecopower. The study area includes the public roads subject to road works as a result of the Whole Gathabawn Windfarm Project, or along the construction material haul routes which could be impacted upon by other projects with road works or with potential to generate significant construction or operational traffic on shared transport infrastructure.

The Other Projects which are included for cumulative evaluation in this Traffic and Transport Assessment are:

- Ballynalacken Windfarm & Grid Connection (consented)
- Seskin Wind Farm [Laois/Kilkenny] & Grid Connection (under appeal to ACP)
- Briskalagh Wind Farm Grid Connection (consented)
- Battery Energy Storage Projects in Moatpark (BESS 1 and BESS 2) (consented)
- Littleton Wind Farm Grid Connection (in planning)
- Killeshulán Wind Farm (potential)

16.7.3 Cumulative Impact Summary and Conclusions

16.7.3.1 Cumulative Construction Phase Impacts

Spatial Factors: The assessed developments are geographically separated from the proposed Gathabawn Windfarm development areas (Ballylehaun and Ballyring) and utilise distinct local road access points. Cumulative traffic effects on specific local road junctions (such as the L58141, L1806, and L18062) are avoided, with each project primarily impacting its own distinct local municipal access routes. This is subject to one identified exception: the Killeshulán Wind Farm (not yet in planning) proposes a grid connection route along the L1806, where Facilitating Works FW8 and FW9 would be adjacent to it and it would spatially cross the Ballylehaun-Ballyring Underground Cabling in the area of Ballyring. As Killeshulán has not yet entered the planning process, there is no committed cumulative effect to assess at this time; this potential interaction should be revisited if and when a Killeshulán planning application is lodged. As a result, the local priority junctions serving as Gathabawn's immediate site entrances will experience Gathabawn-generated construction traffic only. While the installation of the Ballylehaun-Ballyring Underground

Cabling will require temporary, localised lane closures, road closures and stop-go traffic management along the L5818, L5820, L5821, L18062 and L1806 local corridors, these works are short-term and sequential. They will not coincide spatially or temporally with any other local road excavations, resulting in no significant cumulative local road network disruption. The N77 National Secondary Road is the primary shared trunk infrastructure where cumulative traffic effects could occur. The N77 has proven carrying capacity and substantial reserve capacity to safely accommodate the temporary construction traffic of multiple regional developments without experiencing network stress.

Temporal Factors: The likelihood of temporal overlap varies by project. Even if overlap occurs, the probability of simultaneous peak construction periods remains low. Construction programmes sequence different activities over their respective schedules, with peak traffic generation (such as concrete foundation pours) occurring during highly specific, non-continuous phases.

Traffic Magnitude: Individual project traffic generation during peak periods is small relative to the baseline daily traffic volumes of the N77 national secondary route. Cumulative traffic from multiple projects would remain well within the carrying and design capacity of the N77 network. In quantitative terms, Gathabawn's own peak construction contribution to the R639, the one shared trunk corridor for which a background AADT is available (Table 3), is ca. 3.5% of baseline AADT in the peak assessment year (Table 12), a modest addition before any cumulative combination with other developments' traffic is even considered. On the N77 itself, while no independent baseline AADT was collected for this assessment (Section 16.4), the detailed capacity assessment undertaken at Junctions 1 and 7 (Section 16.8), both of which have an N77 arm, confirms that neither junction exceeds RFC 0.80 under the worst-case 2037 do-something scenario, well below the 0.85 practical-capacity threshold, before any allowance for other developments' traffic. This reserve capacity at the two junctions most exposed to Gathabawn's own N77 traffic supports the conclusion that the modest, temporally limited additional traffic associated with other regional developments would not be expected to push either junction toward its practical capacity threshold. Construction traffic from the various regional projects disperses at different major junctions, minimising localised bottlenecks. Furthermore, the likelihood of a simultaneous temporal overlap of intensive peak construction phases (such as concurrent foundation concrete pours) is extremely low.

The Candidate Gathabawn Grid Connection is routed within the verge of the N77, a corridor also shared by the Seskin Wind Farm, Briskalagh Wind Farm and Littleton Wind Farm grid connections, with Killoshulan Wind Farm (not yet in planning) a further potential future addition; Seskin Wind Farm also has a site entrance directly onto the N77. Given the N77's substantial reserve capacity, as confirmed by the detailed capacity assessment at Junctions 1 and 7 (Section 16.8), the temporally-limited nature of each scheme's own construction traffic, and the absence of any confirmed programme overlap between these projects, cumulative effects within the N77 verge corridor are not considered significant; this will be kept under review as the other schemes progress through planning.

In relation to the regional road network near the grid connection corridor, the potential cumulative interaction arises from the Candidate Gathabawn Grid Connection cabling works in combination with the consented Moatpark BESS 1 & 2 projects in Moatpark townland, and the Ballynalacken Grid Connection and Briskalagh Grid Connection, both of which will involve trenching within the R432. Gathabawn's cabling works within the R432 regional road corridor are highly limited, extending for a short distance of approximately 155m to the existing EirGrid Ballyragget Substation compound boundary.

The construction methodology confirms that these linear works will progress rapidly in 50m sections, with no more than 100m of trench open per crew at any one time, requiring temporary, localised lane closures rather than full, long-term road occupation. Under a robust worst-case scenario assuming simultaneous peak construction of Gathabawn's cabling works and the adjacent battery storage installations and other windfarm grid connections, cumulative HGV movements on the regional network would be minor and of short duration. When considered against baseline traffic volumes, this equates to a negligible percentage of daily traffic and is not significant in capacity terms. The carrying capacity of the R432 is more than adequate to accommodate these temporary HGV movements.

Accordingly, while short-term localized disruption may occur due to temporary traffic management measures (e.g. stop-go systems, controlled crossings, and temporary lane closures), the magnitude of the cumulative traffic increase will remain low relative to the carrying capacity of the regional road network. The overall cumulative traffic effect is therefore considered Slight to Moderate at worst, primarily due to temporary construction traffic management impacts (such as the road openings and lane closures on the L5818, L5820, L5821 and L1806 local roads to install the Ballylehaun–Ballyring Underground Cabling) rather than network capacity constraints. Over the medium to long

term, no significant cumulative operational impacts are anticipated.

Mitigation: Each development will be subject to its own Construction Traffic Management Plan (TMP) specifying exact haulage routing, restricted operating hours (07:00 to 19:00 Monday to Friday and 08:00 to 16:00 on Saturdays), traffic control measures, and monitoring procedures. To ensure open lines of communication, a dedicated Community Liaison Officer (CLO) will maintain active, daily contact with local residents regarding the scheduling of works and the local traffic arrangements.

16.7.3.2 Cumulative Operational Phase Impacts

Operational wind farms and battery energy storage systems (BESS) generate negligible levels of daily traffic. These operational movements typically comprise:

- Periodic, routine maintenance and inspection visits (averaging 2 to 4 light service vehicle visits per month per development).
- Highly infrequent heavy commercial vehicle (HGV) access for specialist component replacements (e.g., electrical plant or turbine blades over a 25 to 35-year operational lifecycle).

The cumulative operational traffic generated by all assessed regional developments will be negligible. There will be no adverse cumulative effects on the traffic capacity, operational efficiency, or safety thresholds of the surrounding public road network.

Cumulative Impact: Negligible. Operational traffic is minimal across all developments.

Conclusion

The assessment concludes that the cumulative traffic and transport impacts of the project can be safely accommodated on the existing road network without giving rise to significant adverse environmental or structural effects. The strategic national and regional routes (N77 and R639) have demonstrated substantial spare capacity to absorb the identified cumulative construction flows.

Subject to the strict implementation of individual project Construction Traffic Management Plans (TMPs) and proactive, daily co-ordination with the Roads Sections of Kilkenny County Council and Laois County Council, the cumulative traffic impacts of the development **will not be significant**.

The maps in Figures 18 and 19 overleaf show the locations of the identified committed developments, described above.

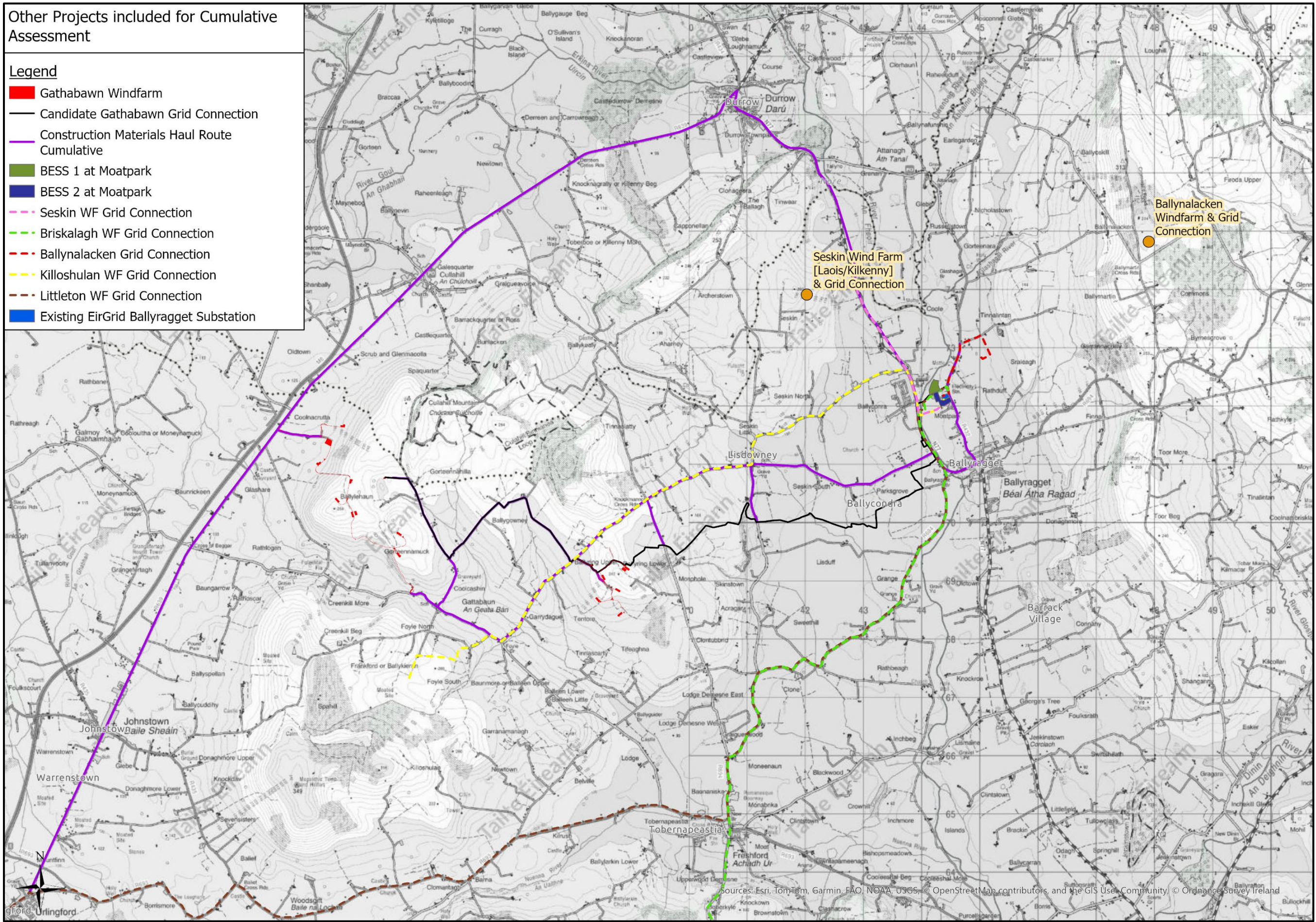


Figure 18: Other Projects Considered for Cumulative Effects

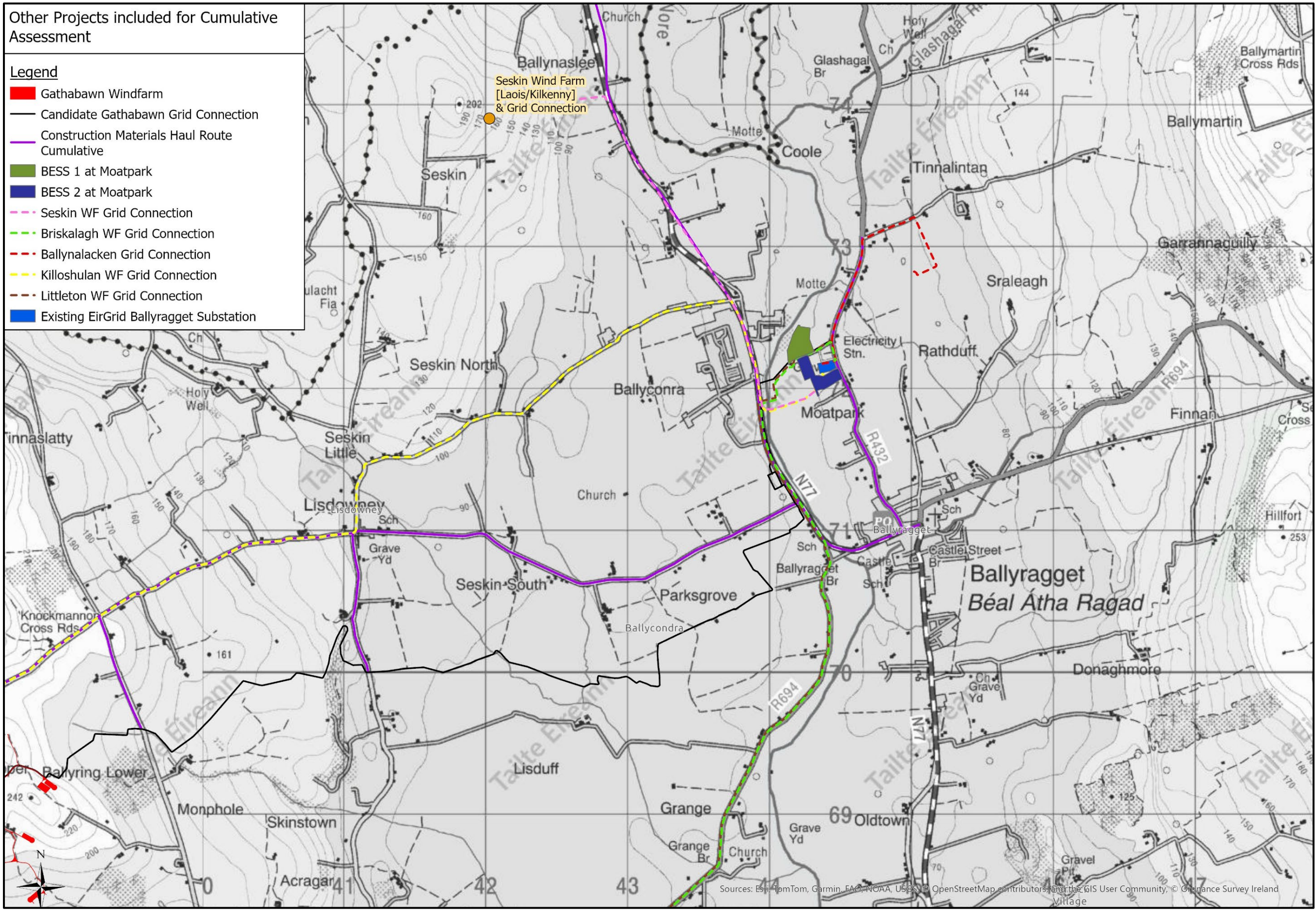


Figure 19: Other Projects Considered for Cumulative Effects (zoomed in on Moatpark area)

16.8 Capacity Analysis

16.8.1 Capacity Analysis Introduction

A capacity assessment was conducted at the specific junctions mentioned earlier in the report. The purpose of this assessment was to provide evidence that the implementation of the proposed Gathabawn Windfarm would not have a significant impact on the operational efficiency of the existing junctions and the broader road network. By evaluating the capacity of these junctions, the assessment aimed to examine if the proposed changes would cause congestion, delays, or any other adverse effects on the overall functionality of the junctions.

The performance of the junction during the AM and PM peak hours was assessed using PICADY transport modelling software for the design years:

- 2026, present scenario;
- 2027, 1st construction phase scenario; and
- 2037, 2nd construction phase scenario.

The Ratio of Flow to Capacity (RFC) values, displayed in the following sections, describe the capacity of each approach to the junction and determines if the junction will cater for the predicted level of traffic. An RFC below 0.85 (85%) implies that an approach road is operating satisfactorily well within capacity; between 0.85 to 1.0 RFC means the approach operates well within capacity but at less optimal efficiency; and an RFC above 1.0 means that demand and capacity are equal and no further traffic can progress through the junction. The queue levels are presented in Passenger Car Unit (PCU) and quantify the total number of vehicles queuing on each arm.

16.8.2 Junction Screening

Per TII Publication PE-PDV-02045 (Traffic and Transport Assessment Guidelines, Section 2.3), links and junctions where development traffic is expected to exceed 10% of existing traffic movements generally, or 5% at congested or otherwise sensitive locations including junctions with a national-road arm, are carried forward to detailed capacity assessment. That percentage test is a screening trigger, not on its own a mandate to model every junction it flags: applied mechanically, it would carry forward several very low-volume local junctions (J4, J5, J6) purely because a small existing base makes any addition look large in relative terms, while contributing little to what a reviewing authority actually needs to see. The screening below instead weighs the percentage test alongside three further criteria: the absolute existing and added volumes (not just the percentage), the classification of each junction's arms (a national-road arm attracts the more conservative 5% threshold; local-only arms attract 10%), and the existing operating and safety context - all 7 junctions currently operate without recorded congestion (Section 16.4.3) and none coincides with a collision blackspot (Section 16.3.4), and the effect being screened is in any case temporary, over a construction programme of approximately 12 months rather than a permanent change in land use.

Table 17 presents the junction screening summary, for all 7 surveyed junctions.

Table 17 – Junction Screening Summary (all 7 surveyed junctions)

Junction	Roads	Existing background (busiest period)	Added HGV/pk-hr, 2-way	% increase, worst AM/PM (2026→2037)	TII threshold	Screening outcome
J1	N77 (national) / R639 (regional) / The Square	AM 197.9 / PM 225.6 (taken from ATC1, R639 arm); junction total 2,322 (Evening)	11.5	5.7%→5.3% (AM); up to 5.0%→4.7% (PM)	5% (national arm)	Detailed modelling, busiest junction surveyed; marginally exceeds 5% on the R639 approach in 2026
J2	R639 (regional) / L58141 (local)	Same R639 link as J1 (ATC1); junction total 590 (Evening)	Same link as J1: 11.5	5.7%→5.3% (AM); up to 5.0%→4.7% (PM)	10% (no national arm)	Screened out as it is comfortably under the applicable 10% threshold
J3	L1803 / L1804 / L5818 / L5819	Junction total 111 (morning) and 117	6.8 (L1804/L5818)	6.1% (AM); up to	10% (no national/regional)	Screened out of detailed junction

Junction	Roads	Existing background (busiest period)	Added HGV/pk-hr, 2-way	% increase, worst AM/PM (2026→2037)	TII threshold	Screening outcome
	(all local)	(Evening)	arm)	5.8% (PM)	arm)	modelling: below the 10% relative threshold and Grid Connection UGC traffic through this junction remains a modest absolute addition
J4	L1806 / L1804 (all local)	Junction total 121 (morning) and 151 (Evening)	6.8 (L1806/L1804 arm; Table 10 Grid Connection - Ballylehaun-Ballyring UGC route, peak-day 1-way)	5.6% (AM); up to 4.5% (PM)	10% (no national/regional arm)	Screened out of detailed junction modelling (below the 10% threshold), same as J3
J5	L1806 / L18062 (all local)	AM 21.7 / PM 20.6 (taken from ATC4); junction total 46 (Evening)	14.5	66.8% (AM); up to 70.4% (PM)	10% (no national/regional arm)	Screened out; exceeds 10% in relative terms only; absolute addition (under 15 veh/hr) is trivial on an uncongested road with no collision history and the effect is temporary
J6	L1807 / L1811 / L1806 (all local)	AM 171 / MD 159 / EV 162 (junction total)	16.8 (L1806 7.7 Windfarm Ballyring-area + 6.8 Grid Connection UGC + L1811 2.3 Ballyring-Parksgrove UGC; Table 10)	9.8% (AM); 10.6% (MD); up to 10.4% (PM)	10% (no national/regional arm)	Converging Windfarm and Grid Connection UGC routes push the combined increase to 10.6% across the day, just above the 10% threshold. Per the same multi-criteria approach, remains screened out: the absolute addition is still modest relative to J1/J7, the junction is uncongested with no collision history, and the effect is temporary
J7	N77 (national) / L1807 (local)	AM 58.4 / PM 45.1 (ATC6 on the local road, cumulative traffic); junction total 1,611 (Evening)	28.3	47.9%→44.8% (AM); up to 61.9%→58.0% (PM) – (arm-level comparison)	5% (national arm)	Detailed modelling; largest relative increase and second-largest absolute volume; cumulative Scenario B applies

On this basis, detailed capacity modelling (PICADY/Junctions11) was carried out at J1 and J7, the two junctions with a national-road arm, the highest absolute volumes surveyed, and at J7 in particular, the largest relative increase of

any junction. J2, J3 and J4 are screened out of detailed junction modelling on reasoned materiality grounds: in each case the absolute added volume is modest, the roads are uncongested with no collision history and the effect on these roads is temporary, notwithstanding the multi-week trenching closures on the L1803/L1804 and L5818/L5820/L5821 corridors addressed separately (Section 16.3.1.7). J5 and J6 exceed the applicable 10% relative threshold once the Windfarm Ballyring-area and Grid Connection UGC traffic on the shared L1806 corridor are combined (Table 18), but remain screened out on the same reasoned-materiality basis as J2-J4: their absolute additions (14.5 and 16.8 veh/peak-hr respectively) are smaller than at the two junctions already modelled in detail (J1: 11.5; J7: 28.3 veh/peak-hr) and the peak traffic from both the Windfarm Ballyring-area and Grid Connection UGC is not expected to coincide as has been presented in Tables 6a and 6b.

The capacity assessment was conducted by modelling three different scenarios to evaluate the traffic impacts. These scenarios include:

- Base-year: Traffic flows in the year 2026 were modelled based on the traffic counts obtained for the 2No. specified junctions.
- Scenario 1: The additional traffic generated during the peak construction phase was added to the traffic counts obtained in 2026. This analysis allows for a comparison with the "Do-nothing" scenario. The traffic counts were factored up using TII's Growth Factor for the assumed construction year 2027.
- Scenario 2: Similar to the Scenario 1, the impact of the traffic generated during the peak construction phase was added to the traffic counts obtained in 2026. The traffic counts were factored up using TII's Growth Factor for the construction year 2037.

16.8.3 Junction Modelling – Junction 1 (J1) – N77 & R639 & The Square

In the following analysis of the Junction 1, the junction was assessed for the AM and PM peak period using PICADY. The peak time periods taken based on the counts are 07:30 to 08:30 in the AM (total: 1011.4 PCU) and 16:45 to 17:45 in the PM peak (total: 1058.8 PCU). The arms were labelled as follows and the traffic flows recorded at J1 on the day of the counts during peak hours is shown in Figure 20 overleaf.

- Arm A: N77 – North
- Arm B: N77 – South
- Arm C: R639
- Arm D: The Square

The peak hour turning counts at Junction 1 (07:30-08:30 AM, 16:45-17:45 PM) show traffic concentrated on two principal movements rather than a single dominant corridor: the N77 through-movement between Arm A (N77, North) and Arm B (N77, South), and the R639 movement between Arm C (R639) and Arm A. Together these two flows account for approximately 94% of total junction traffic in the AM peak and 90% in the PM peak.

The N77 through-movement is the larger of the two: 395 PCUs travel from Arm A to Arm B (movement 4) in the AM peak, easing to 339 PCUs in the PM, while the return movement from Arm B to Arm A (movement 6) carries 194 PCUs in the AM and rises to 229 PCUs in the PM. The R639 movement is comparably significant: 263 PCUs travel from Arm C to Arm A (movement 2) in the AM peak, easing to 221 PCUs in the PM, while the return movement from Arm A to Arm C (movement 3) carries 94 PCUs in the AM, rising to 159 PCUs in the PM.

Traffic to and from The Square (Arm D) is comparatively minor, accounting for roughly 2% of total junction activity in the AM peak and 5% in the PM: the movement from Arm A onto The Square (movement 8) records 5 PCUs in the AM and 11 in the PM, and the three return movements from The Square total 18 PCUs in the AM and 39 in the PM. The remaining turning movements, from Arm B and Arm C onto arms other than the dominant pairs above, are similarly modest, ranging from 4 to 32 PCUs across the two peak hours.

HGVs constitute approximately 8% of AM traffic and 4% of PM traffic at Junction 1 by vehicle count, and their concentration on the two dominant flows is complete: all HGV movements recorded in both peak hours occur on the N77 through-movement or the R639 movement, with no HGVs recorded turning to or from The Square, confirming that HGV activity at this junction is entirely strategic through-traffic rather than local access.

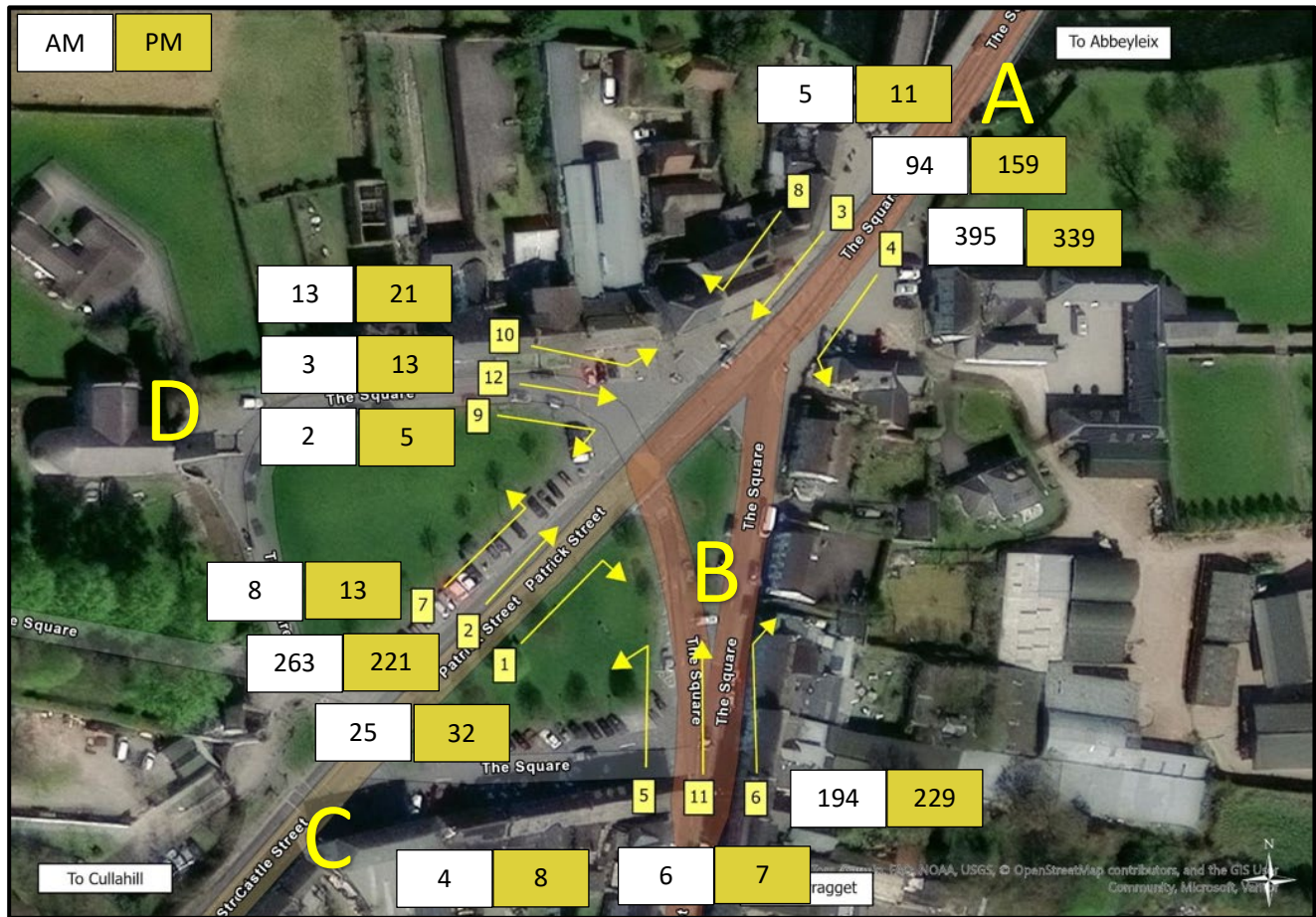


Figure 20: Junction 1 - Arm Names and May 2026 Traffic Counts During the AM and PM peak (converted to PCUs)

Table 18 presents the analysis results for Junction 1, obtained using PICADY software, for the current year 2026 as well as the construction years 2027 and 2037, taking into account the peak construction traffic activity.

Table 18 – PICADY Results for Junction 1

Scenario	Stream	AM			PM		
		Queue (PCU)	Delay (s)	RFC	Queue (PCU)	Delay (s)	RFC
1 – 2026, base year	B-ACD	1.2	19.92	0.54	2	27.51	0.67
	A-BCD	0	5.94	0.01	0	5.92	0.02
	D-ABC	0	7.73	0.04	0.1	8.92	0.10
	C-ABD	0.1	7.37	0.05	0.1	7.49	0.07
2 – 2027 – Do-nothing	B-ACD	1.3	20.47	0.55	2.1	28.79	0.68
	A-BCD	0	5.95	0.01	0	5.93	0.02
	D-ABC	0	7.76	0.04	0.1	8.98	0.10
	C-ABD	0.1	7.41	0.05	0.1	7.53	0.07
3 – 2027 – Do-something	B-ACD	1.9	27.55	0.64	3.4	43.09	0.71
	A-BCD	0	5.99	0.01	0	5.96	0.02
	D-ABC	0	7.87	0.04	0.1	9.16	0.10
	C-ABD	0.1	7.59	0.05	0.1	7.72	0.07

Scenario	Stream	AM			PM		
		Queue (PCU)	Delay (s)	RFC	Queue (PCU)	Delay (s)	RFC
4 – 2037 – Do-nothing	B-ACD	1.6	24.56	0.62	3.1	39.61	0.77
	A-BCD	0	6.04	0.01	0	6.01	0.02
	D-ABC	0	7.96	0.05	0.1	9.33	0.11
	C-ABD	0.1	7.64	0.06	0.1	7.80	0.08
5 – 2037 – Do-something	B-ACD	2.6	34.63	0.71	5.6	66.24	0.87
	A-BCD	0	6.08	0.01	0	6.05	0.02
	D-ABC	0	8.08	0.05	0.1	9.54	0.11
	C-ABD	0.1	7.83	0.06	0.1	8.00	0.08

16.8.3.1 Results - Junction 1

Based on the results obtained from the PICADY software analysis for Junction 1, the performance of each arm during different scenarios was evaluated. PICADY was run for Junction 1 across the 2026 base year, the 2027 and 2037 do-nothing scenarios, the 2027 and 2037 do-something scenarios (do-nothing plus construction traffic), each for the AM and PM peak hours identified in the traffic pattern assessment above. Results are reported by entry arm (Streams B-ACD, A-BCD, D-ABC and C-ABD, corresponding to Arms B, A, D and C respectively), in terms of ratio of flow to capacity (RFC), queue length (PCU) and delay (seconds).

The results show a clear and consistent pattern across every scenario and year: capacity constraint at Junction 1 is confined almost entirely to the Arm B (N77, South) approach, while Arms A (N77, North), C (R639) and D (The Square) operate with minimal delay throughout with the RFC never exceeding 0.11 and the Level of Service remaining at A on all three of these arms in every scenario assessed, including 2037 do-something. This is consistent with a priority-controlled layout in which the give-way movements on Arm B experience the junction's queuing, while the higher-priority movements on the other three arms pass through largely unimpeded, notwithstanding Arm C (R639) carrying some of the largest traffic volumes at the junction, as set out in the traffic pattern assessment above.

On the Arm B approach, performance degrades gradually but measurably over the assessment period. In the 2026 base year, Arm B operates at RFC 0.54 (queue 1.2 PCU, delay 19.9s) in the AM peak and RFC 0.67 (queue 2.0 PCU, delay 27.5s) in the PM peak. Background growth alone (do-nothing) takes this to RFC 0.55/0.68 by 2027 and RFC 0.62/0.77 by 2037 (AM/PM). Adding construction traffic (do-something) increases this further to RFC 0.64/0.71 in 2027 and RFC 0.71/0.87 in 2037 (AM/PM) which is the worst-case scenario assessed, with queue length rising to 5.6 PCU and delay to 66 seconds.

Despite accommodating construction activity and future traffic growth to 2037, the junction continues to operate with substantial spare capacity: across every scenario and year assessed, including the 2037 do-something case, RFC at Junction 1 slightly exceeds the 0.85 threshold commonly applied as the practical-capacity limit for a priority-controlled junction, indicating the junction continues to operate within capacity throughout the assessment period under the worst-case scenario assessed.

16.8.4 Junction Modelling – Junction 7 (J7) – N77 / L-1807

In the following analysis Junction 7 was assessed for the AM and PM peak period using PICADY software. The peak time periods taken based on the counts are 07:30 to 08:30 (total: 812.5 PCU) in the AM and 16:45 to 17:45 in the PM peak (total: 791.7 PCU). The arms were labelled as follows and the traffic flows recorded at J7 on the day of the counts during peak hours is shown in Figure 21:

- Arm A: N77 – South
- Arm B: L-1807
- Arm C: N77 – North

The peak hour turning counts at Junction 7 (07:30-08:30 AM, 16:45-17:45 PM) confirm the N77 corridor as overwhelmingly dominant: the through-movement between Arm A (N77, South) and Arm C (N77, North) accounts for approximately 93% of total traffic in the AM peak and 93% in the PM peak. Southbound movements from Arm C to Arm A (movement 2) record 363 PCUs in the AM peak, rising to 438 PCUs in the PM, while northbound movements from Arm A to Arm C record 396 PCUs in the AM, easing to 297 PCUs in the PM. Arm A recorded low turning movements onto the L1807; 13 PCUs in the AM, 20 in the PM.

Traffic on the L1807 (Arm B) is modest by comparison, accounting for roughly 4% of total junction activity in both peaks. Vehicles turning from the N77 North (Arm C) onto the L1807 (movement 1, the confirmed construction-traffic arrival route) number 6 PCUs in both the AM and PM peaks, and the return movement from the L1807 onto the N77 North (movement 5, the confirmed departure route) is similarly low, at 6 PCUs in the AM and 7 in the PM. The larger of the L1807 movements is the turn onto the N77 South (Arm A), at 29 PCUs in the AM easing to 24 in the PM.

HGVs constitute approximately 8% of AM traffic and 5% of PM traffic at Junction 7 by vehicle count, and travel almost exclusively along the N77 corridor: 59 of the 62 AM HGVs (95%) and all 34 PM HGVs (100%) use the Arm A-Arm C through-movement, with only a handful of AM HGVs (3) recorded on the L1807 turn onto Arm A, and none on the L1807 in the PM peak confirming HGV activity at this junction, as at Junction 1, as strategic N77 through-traffic.

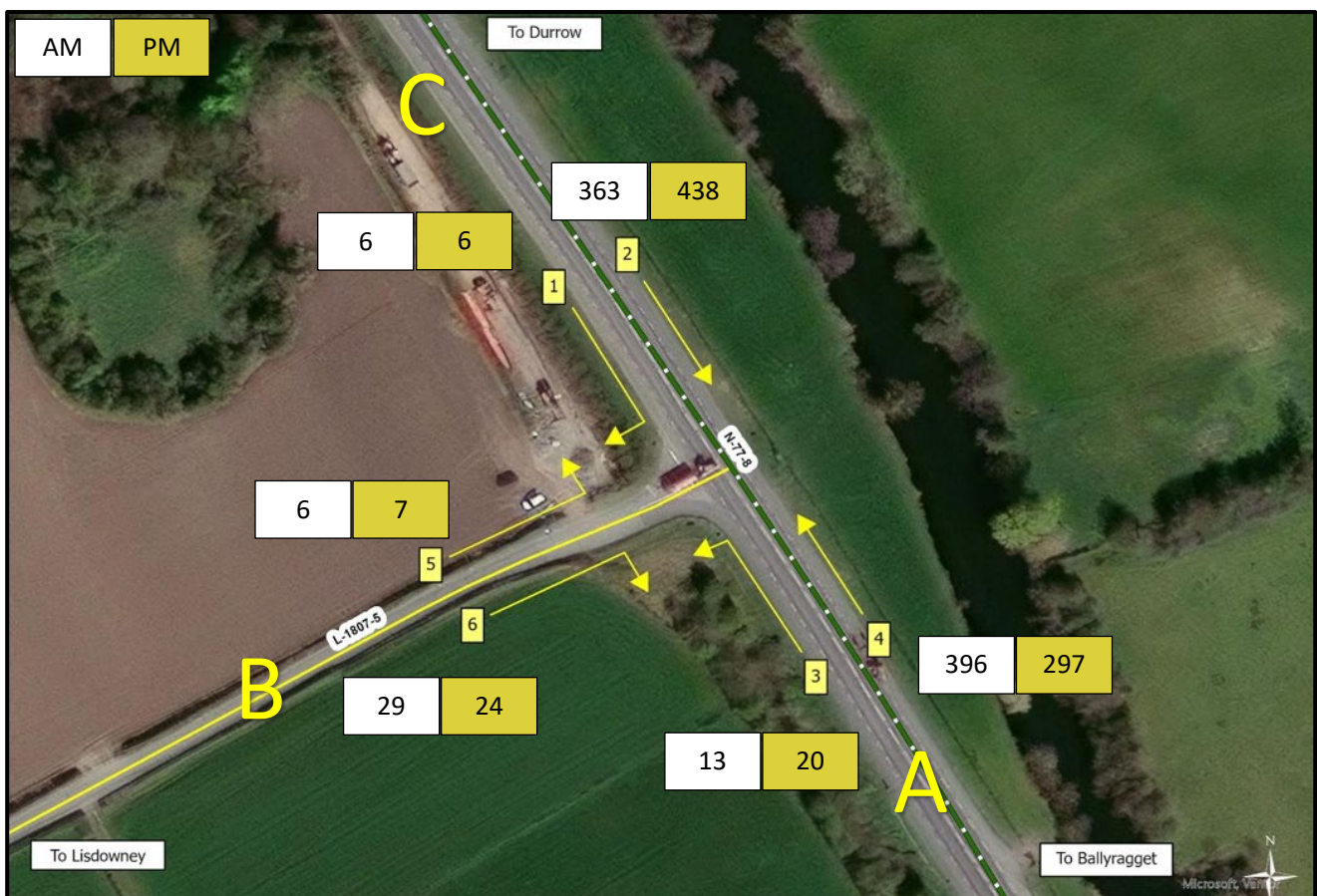


Figure 21: Junction 7 - Arm Names and May 2026 Traffic Counts During the AM and PM peak (converted to PCUs)

Table 19 overleaf presents the analysis results for Junction 7, obtained using PICADY software, for the current year 2026 as well as the construction years 2027 and 2037, taking into account the peak construction traffic activity. The table provides a comprehensive overview of the anticipated traffic at Junction 7, considering two different construction scenarios.

Table 19 – PICADY Results for Junction 7

Scenario	Arm	AM			PM		
		Queue (PCU)	Delay (s)	RFC	Queue (PCU)	Delay (s)	RFC
1 – 2026, base year	B-C	0	5.79	0.01	0	5.52	0.01
	B-A	0.1	10.59	0.08	0.1	8.97	0.06
	C-AB	0	4.87	0.02	0	4.53	0.02
2 – 2027 – Do-nothing	B-C	0	5.81	0.01	0	5.54	0.01
	B-A	0.1	10.68	0.08	0.1	9.04	0.06
	C-AB	0	4.87	0.02	0	4.52	0.02
3 – 2027 – Do-something	B-C	0.1	9.62	0.04	0.1	8.95	0.04
	B-A	0.1	10.94	0.08	0.1	9.25	0.06
	C-AB	0.1	6.56	0.06	0.1	5.96	0.06
4 – 2037 – Do-nothing	B-C	0	5.93	0.01	0	5.62	0.01
	B-A	0.1	11.24	0.09	0.1	9.44	0.07
	C-AB	0	4.82	0.02	0	4.45	0.02
5 – 2037 – Do-something	B-C	0.1	9.70	0.04	0.1	8.97	0.04
	B-A	0.1	11.54	0.09	0.1	9.69	0.07
	C-AB	0.1	6.37	0.06	0.1	5.76	0.07

16.8.4.1 Results - Junction 7

Based on the results obtained from the PICADY software analysis for Junction 7, the performance of each arm across the various scenarios was evaluated. PICADY was run for Junction 7 across the 2026 base year, the 2027 and 2037 do-nothing scenarios, the 2027 and 2037 do-something scenarios for both peak hours. As a 3-arm priority junction, only two give-way streams are reported: Stream B-AC (Arm B, L1807, the minor-road approach) and Stream C-AB (Arm C, N77 North, the major-road right-turn movement into L1807). Arm A (N77 South) does not appear as a stream, since it is the uninterrupted major-road approach and carries no give-way delay [consistent with the N77 through-movement (Arm A↔Arm C)] identified as the dominant flow at this junction in the traffic pattern assessment above.

The results show Junction 7 operating comfortably within capacity throughout the entire assessment period, with RFC never exceeding 0.09 in any scenario or year. In the 2026 base year, the L1807 approach (Stream B-A) operates at RFC 0.08 (delay 10.6s) in the AM peak and RFC 0.06 (delay 9s) in the PM peak, while the N77-North right-turn movement (Stream C-AB) operates at RFC 0.02 (delay under 5s) in both peaks.

Performance changes only marginally across the assessed years. Background growth alone (do-nothing) records slight increases through to 2037 (Stream B-A RFC 0.09 AM / 0.07 PM; Stream C-AB RFC 0.02 AM / 0.02 PM). Adding construction traffic (do-something) produces a small further increase, most visible on the L1807 approach: RFC reaches again 0.09 in the AM and 0.07 in the PM peaks by 2037 do-something which is the worst case assessed, with queue length of 0.1 PCU and delay of 12s (AM). The N77-North right-turn movement (Stream C-AB) remains at Level of Service A throughout every scenario and year, reaching only RFC 0.06 AM / 0.07 PM in the 2037 do-something peaks.

Across every scenario and year assessed, including 2037 do-something, RFC at Junction 7 remains well below the 0.85 practical-capacity threshold, and the Level of Service never falls below B. This is consistent with the traffic pattern findings above: the great majority of Junction 7's traffic (approximately 93% in both peaks) uses the unimpeded N77 through-movement, leaving only the modest L1807 minor-road flow and the N77-North right-turn movement subject to any junction delay, and both remain lightly loaded throughout the assessment period. The junction therefore continues to operate with significant spare capacity, even under combined construction and

future traffic growth conditions.

16.9 Mitigation Measures

16.9.1 Introduction

The primary mitigation for traffic and transport effects arising from the Gathabawn Windfarm is mitigation by design: the confirmed haul routing (Section 16.2.5), the site entrance layout, and the temporary facilitating works along the turbine delivery route (Section 16.2.6) have each been selected specifically to route construction traffic onto the road network best able to accommodate it and, where practicable, to avoid or bypass constrained locations altogether, for example the temporary access road connecting the L1804 to the L1806 (FW8), which removes turbine-blade delivery traffic from the L1806/L1804 junction (J4) entirely. For effects that cannot be avoided through routing and design, the mitigation measures set out below will be implemented. These measures are detailed in full in Chapter 20 (Mitigation & Monitoring Arrangements) and the Gathabawn Windfarm Project Environmental Management Plan (EMP), which includes the Traffic Management Plan (TMP) as a distinct sub-plan; this section summarises those measures specific to traffic and transport for the purposes of this chapter.

16.9.2 Mitigation Measures During Construction Stage

A Traffic Management Plan will be prepared as a key construction contract document, developed in coordination with Kilkenny County Council, and implemented for the duration of the construction phase to safely coordinate and manage construction traffic. Pre- and post-construction road condition surveys will be carried out along the routes of concentrated construction traffic between the R639/N77 and the windfarm site entrances, and along the route of the Ballylehaun–Ballyring Underground Cabling, to record baseline condition and confirm reinstatement. Construction traffic will be subject to a speed limit of 30km/hr on the local roads at the windfarm site and along the Ballylehaun–Ballyring Underground Cabling route, and 15km/hr on the on-site roads.

Road cleanliness will be managed through the use of a road sweeper and dry wheel washes at site exits, with all HGVs and delivery vehicles required to pass through the wheel wash before leaving site; public roads in the vicinity of the site will be regularly inspected and cleaned as necessary. Dust will be controlled through regular sweeping of site roads, watering during dry or windy conditions, and covering or enclosing loads with dust potential during transport (MM38). The windfarm site roads will be maintained to an even surface to reduce the potential for vibration from vehicles travelling over them.

Construction activity, including deliveries, will generally be restricted to 07:00-19:00 Monday to Friday and 08:00-13:00 on Saturdays, with limited exceptions to accommodate favourable weather windows, concrete pours, or the delivery of abnormal turbine loads. The largest traffic volumes are associated with the concrete pours for the turbine foundations, and no other material deliveries will be scheduled on concrete pour days; similarly, site entrance works, haul route works and road widening works will avoid peak delivery periods and, where feasible, will be carried out ahead of the main construction period, all under licence from Kilkenny County Council.

Where excavation or plant activity takes place close to overhead lines or existing services, goal posts will be used to indicate clearance heights and works will be supervised by a banksman). Flag-men will be deployed at any public road location subject to a single lane closure to maintain safe two-way movement, and a road safety and courtesy protocol will apply for the duration of construction, requiring vehicles to slow or stop for pedestrians and cyclists along the haulage route and appropriate signage to be maintained at junctions on the affected local roads. Roadside boundaries removed to provide a widened transport area or sightlines will be immediately replaced with a post and mesh fence; temporary roadside fencing along the turbine component haul route will be removed immediately ahead of abnormal load movements and reinstated immediately afterward (MM49), and hedgerows and roadside vegetation within visibility splays at site entrances will be trimmed and maintained throughout construction. Any damage to road pavements or structures arising from widening works, cable works or construction haulage will be reinstated to at least as good a condition as existed pre-works, and public road cabling and widening works will be carried out in coordination with Kilkenny County Council and in accordance with the Department of Transport, Tourism & Sport's Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads (2017) (MM51). Along cable routes, steel plating will be used to cover open trenches where required to maintain access to individual properties.

A comprehensive community liaison programme will be implemented to maintain communication with local residents and businesses along haul routes. A dedicated Community Liaison Officer (CLO) will be appointed as the

primary point of contact for the local community. The CLO will liaise with and keep the local community - residents and landowners, up-to-date with relevant construction work schedules, using direct contact or letter drops to nearest neighbours and through the Project website which will be kept up-to date. Local residents likely to be affected by road works, will be kept up to date on works schedules by the Community Liaison Officer.

No additional mitigation measures beyond those described above are proposed, as the assessment demonstrates that with implementation of these comprehensive measures, no significant adverse traffic and transport impacts are anticipated. The junction capacity assessment presented in Section 16.8 demonstrates that all assessed junctions will operate within acceptable capacity limits during construction, and the cumulative assessment presented in Section 16.7 confirms that cumulative impacts with other developments can be accommodated on the road network.

Overall, the successful completion of this project will rely on thorough coordination, planning, and the implementation of these comprehensive mitigation measures to minimise the effects of construction traffic on the surrounding road network while maintaining safety for all road users and minimising disruption to local communities.

16.9.3 Mitigation Measures During Operational Stage

Operational phase traffic, personnel and materials will be restricted to the windfarm site roads and hardstanding areas and the windfarm access roads will be maintained in good working order and kept free of wheel ruts throughout the operational life of the development. Given the very low traffic generation associated with routine operational maintenance visits, no further operational-phase traffic mitigation is considered necessary.

16.9.4 Mitigation Measures During Decommissioning Stage

Given the nature of the decommissioning activities, which are similar but much less than the construction activities, the impact on the traffic is anticipated to be slight and temporary. Mitigation measures implemented during the construction phase will also be applicable during the decommissioning phase.

Considering the existing measures and the expected minimal adverse impacts, no additional mitigation measures are proposed for the decommissioning phase of the Windfarm. The overall decommissioning process will be managed efficiently, with careful consideration given to minimising any potential adverse effects on the traffic and road infrastructure.

16.10 Residual Impacts

16.10.1 Introduction

This section presents the residual, post-mitigation significance of traffic and transport effects arising from the Gathabawn Windfarm, having regard to the mitigation measures set out in Section 16.9. Effects are characterised in terms of quality (negative, neutral or positive), significance (imperceptible, not significant, slight, moderate, significant or profound) and duration (temporary, short-term, medium-term, long-term or permanent), consistent with the EPA's 2022 Guidelines.

16.10.2 Residual Impacts During Construction Stage

The residual average construction traffic impact is expected to align with the potential impact outlined earlier, resulting in a **short-term slight negative effect** on the national road network. The residual construction traffic impact on the L-1806 and L-1807 will mirror the peak potential impact, leading to a **moderate adverse effect** during the period associated with the turbine foundation concrete pours (1 day per turbine foundation). However, it's important to note that this effect will be brief in duration. Negative or adverse effects on the wider local road network associated with the construction works on the Windfarm site are considered to be **short-term** in duration and **moderate** in significance following mitigation.

Regarding the turbine components delivery route, there will be a **not significant residual effect** as a result of the works undertaken to accommodate the delivery of turbine components. On the R639, where the percentage increase remains below the applicable 5% national-road threshold throughout the assessment period, the residual effect is imperceptible. During abnormal load passage, route may be temporarily constrained. However, advance notification to emergency services, immediate suspension protocols if emergency access required, Garda escort coordination, and alternative route identification ensure emergency response capability is maintained. Also, **slight negative, short-term effect** for residents in close proximity to delivery routes. Effect is slight rather than moderate due to relatively

low frequency (not every night), advance notification, temporary nature. For wider community not in immediate proximity: **Not Significant**.

The presence of road works and the increase in traffic volumes resulting from construction traffic are anticipated to have an **imperceptible effect** on the safety and passage of pedestrians along the affected roads. This expectation is based on several factors, including the low usage of the roads by walkers, as indicated by CSO data and observations during site visits. Furthermore, it should be noted that the area has negligible presence of cyclists. The limited presence of cyclists in the vicinity contributes to the assessment that the construction activities and associated traffic will have an **imperceptible effect** on cyclist safety.

It is anticipated that there may be **slight to moderate negative effects** on accidents and road safety during the construction phase, however, no pre-existing collision blackspot was identified at any of the 7No. surveyed junctions or along the local road network carrying construction traffic. The mitigation measures identified above, such as enhanced signage and traffic management plans, as well as the provision of an abnormal loads escort and delivery schedule, will reduce the magnitude of impact on accidents and road safety. Consequently, the rating for the residual effect will improve from moderate negative to slight negative. It is important to note that these negative effects are temporary in nature, as they primarily arise during the construction period. Once construction is complete, and the windfarm enters the operational phase, the traffic impact and associated road safety concerns are anticipated to return to the existing baseline conditions.

16.10.3 Residual Impacts During Operational Stage

During the operational stage of the proposed Gathabawn Windfarm, the impact on traffic is projected to be negligible and will not have any long-term negative effects. The operational phase will primarily involve the automatic operation of the wind turbines, which allows for smooth and continuous functioning without substantial traffic implications. Any traffic generated for operational and maintenance purposes will be at a low volume, with occasional heavy vehicles required for specific tasks.

Considering these factors, it can be confidently stated that the traffic impact of the proposed Gathabawn Windfarm during the operational stage will be **imperceptible** and will not result in any significant residual effects. As such, there will be no significant residual impacts on the traffic during this stage of the development.

16.10.4 Residual Impacts During Decommissioning Stage

The decommissioning process of a windfarm involves the straightforward dismantling of structures and the restoration of the land. As highlighted in **Section 16.9**, similar to the construction phase, the decommissioning phase will implement mitigation measures that will reflect best practice at the time of decommissioning, in order to minimise any potential impacts.

During the decommissioning phase, special consideration is given to the removal of turbine blades. These blades are cut into smaller, more manageable sizes, reducing their overall impact during transportation off-site. This ensures that the transportation of turbine components and materials remains efficient and poses minimal disruption to the surrounding road infrastructure.

The mitigation measures implemented during the construction phase, such as proper coordination, planning, and adherence to transportation schedules, will be continued during decommissioning to ensure minimal disruption. Therefore, it is anticipated that the residual impact on traffic will be **slight and temporary**.

16.10.5 Cumulative Residual Impacts

The cumulative case of the Windfarm and the Candidate Grid Connection developing concurrently (Scenario B) has already been incorporated directly into the Junction 7 do-something PICADY assessment (Section 16.8.4), which confirms that RFC remains well within capacity (not exceeding 0.12) under this cumulative scenario. The residual cumulative effect at J7 is therefore assessed as **imperceptible**.

16.11 Conclusions

The main conclusions of this study are summarised as follows:

- This Traffic and Transport Assessment has examined the likely significant effects of the construction, operational

and decommissioning phases of the proposed Gathabawn Windfarm (12 turbines: 7 at Ballylehaun, 5 at Ballyring) and the Candidate Gathabawn Grid Connection on the surrounding road network, in accordance with the relevant TII guidance (PE-PAG-02017 Project Appraisal Guidelines and PE-PDV-02045) and the methodology set out in Section 16.1.2.

- The existing road network serving the site comprises the N77 national secondary road, the R639 regional road, and a network of local (L-class) roads connecting the two windfarm areas and the Candidate Grid Connection route to the wider network. Baseline conditions were established from continuous automatic traffic counts at 12 locations along the confirmed haul routes and from manual turning-movement surveys at all 7 junctions identified as carrying construction traffic, converted to Annual Average Daily Traffic in accordance with TII PE-PAG-02039. The study area is characterised by low background traffic volumes, a rural and strongly car-dependent travel pattern (82.4% of the resident working population travel by private vehicle, with only 2.6% walking or cycling), and no pre-existing collision blackspot at any of the surveyed junctions or along the local roads carrying construction traffic.
- Construction traffic generation was derived directly from the Description of Development (C05), giving a total of 2,717 standard material loads (1,830 for the Windfarm, split 60:40 between the Ballylehaun and Ballyring Areas, and 887 for the Grid Connection) plus 126 abnormal loads for turbine components, cranes and the main transformer and 450 loads for removing excavations from the candidate grid connection, with 3,293 vehicle movements in total, over an approximately 12-month construction programme with a peak construction workforce of around 120 personnel (80 Windfarm, 40 Grid Connection). Operational phase traffic generation is negligible, limited to occasional maintenance visits, and no material decommissioning traffic assessment has been undertaken at this stage given the approximately 30-year horizon before decommissioning is anticipated
- During the construction phase of the project, there will be a temporary increase in traffic caused by site personnel trips and material deliveries. This traffic, which will primarily travel along regional and local access roads as detailed in this report, is short-term in nature. It is important to note that staff traffic will be scheduled outside of peak traffic hours, minimising any potential impact on the existing road network. Once the construction phase is completed, the operation and maintenance phase of the Windfarm development is anticipated to have negligible traffic effects. This means that there will be minimal additional traffic generated during the ongoing operation and maintenance activities of the Windfarm.
- During the peak construction stage (weeks 10 and 11 for the windfarm), it is anticipated that there will be a total of 192No. Windfarm HGV movements per week, with 96No. vehicles traveling to the site and 96No. vehicles leaving the site. In addition, there will be trips associated with the Candidate Gathabawn Grid Connection, with 103No. HGVs traveling to the site and 103No. leaving the site, during the peak construction stage. It is estimated that the average car occupancy for the staff trips will be 1.25 persons per vehicle.
- Applying TII PE-PAG-02017 growth factors to the 2027 and 2037 design years, and TII PE-PDV-02045's percentage-increase screening test to all 7 surveyed junctions, a comprehensive multi-criteria screening — considering absolute volumes, road classification, existing safety and congestion context, and the temporary nature of construction traffic, rather than the percentage test in isolation, confirmed Junction 1 (N77/R639/The Square) and Junction 7 (N77/L1807) as requiring detailed capacity modelling, being the two busiest junctions surveyed and the only two with a national road arm. Junctions 2, 3, 4, 5 and 6 were screened out on reasoned materiality grounds notwithstanding that two nominally exceed the applicable threshold.
- Detailed capacity assessment (PICADY) at Junctions 1 and 7, undertaken for the 2026 base year and the 2027 and 2037 do-nothing and do-something scenarios, confirms that both junctions continue to operate within or slightly above the 0.85 practical-capacity threshold (ratio of flow to capacity at J1 at 0.87 under the worst-case construction traffic scenario) throughout the assessment period. Junction 7 performs particularly robustly, with RFC not exceeding 0.09 and level of service never falling below B in any scenario assessed. At Junction 1, the level of service on the Arm B approach declines but this decline is shown to be driven predominantly by background traffic growth rather than the construction traffic itself, whose isolated contribution to RFC is low.
- The junctions were examined for peak conditions, and it was assumed that all additional traffic associated with the development will arrive and depart during the peak hour of the public network, in order to provide a robust worst-case scenario.
- From a transportation planning perspective, it is evident that the proposed development will not serve as a significant traffic generator, and it will not have any adverse impacts on the future operational capacity of the existing road network. While there will be a slight increase in traffic loading during the peak construction phase,

the available capacity on the roads will be able to accommodate this additional traffic. Overall, all junctions perform very well across all assessment years and scenarios, with low queues and low RFC values, and no capacity concerns identified.

- A comprehensive suite of mitigation measures will be implemented throughout the construction phase, including a Traffic Management Plan developed in coordination with Kilkenny County Council, construction traffic speed limits, road cleanliness and dust control measures, restrictions on working hours and the scheduling of deliveries around peak concrete-pour days, signage and traffic control at site entrances and road closures, a Community Liaison Officer, and obligations to reinstate any road damage arising from construction traffic. A reduced but analogous set of measures will apply during decommissioning, and operational phase mitigation is limited to routine maintenance of the windfarm's own access roads given the minimal traffic generated.
- Furthermore, when considering the long-term effects of the development on the local road network during the operational and decommissioning stages, they are deemed negligible. The proposed wind farm development will not significantly disrupt the normal functioning of the local roads, and any potential impacts will be effectively managed to ensure the continued convenience and safety of road users.

Overall, the transportation planning analysis concludes that the proposed development will have acceptable and temporary adverse effects on the road network in the locality, during the construction phase. It is crucial to highlight that the long-term effects of the proposed development on the local road network during the operational and decommissioning stages are considered negligible. This means that once the construction phase is completed and the windfarm is operational, the traffic impact on the roads in the locality will return to normal levels. Adequate measures will be implemented to mitigate any potential impacts and ensure smooth traffic flow and convenience for road users.

Taking into consideration the low number of cyclists using the affected roads, the modest increase in traffic volumes, the existing road capacity, and the enforcement of speed limits for construction vehicles, the impact on the safety of pedestrians and cyclists is anticipated to be minimal. Measures will be in place to ensure the safe progression and passage of these vulnerable road users.

Furthermore, although there may be a slight to moderate negative effect on accidents and road safety during the construction phase, the implementation of appropriate mitigation measures will help alleviate these risks. Proactive steps will be taken to minimise potential hazards and ensure the safety of all road users. Once the construction phase concludes and the wind farm transitions into the operational phase, the impact on road safety is considered to be not significant.

In conclusion, the transportation assessment affirms that the proposed development will have acceptable adverse effects on the road network in the locality. The planning and design of the project have been carried out in such way to minimise any potential disruptions to the existing road infrastructure. As a result, the long-term effects on traffic are projected to be negligible. Adequate measures will be implemented to mitigate any potential impacts and ensure smooth traffic flow and convenience for road users.

Annex A – Traffic Data

Traffic data available upon request.

Annex B – Junctions11 Modelling Data

Junctions 11		
PICADY 11 - Priority Intersection Module		
Version: 11.1.0.2307		
© Copyright TRL Software Limited, 2024		
For sales and distribution information, program advice and maintenance, contact TRL Software:		
+44 (0)1344 379777 software@trl.co.uk trlsoftware.com		
The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution		

Filename: Junction 1.j11

Path: C:\Users\AngelikiKalatha\OneDrive - ORS\261500 TTA and EIAR Traffic Chapter, 12-turbine Windfarm - Gathabawn, Co. Kilkenny - Documents\01_ORIS\05_Traffic\02_Engineering\03_Reports\02_TTA\2c_Traffic_Model\Junctions11\Junction 1

Report generation date: 17/09/2026 18:07:34

-
- »D1 - 2026 | Base | AM
 - »D2 - 2026 | Base | PM
 - »D3 - 2027 | Do-nothing | AM
 - »D4 - 2027 | Do-nothing | PM
 - »D5 - 2027 | Do-something | AM
 - »D6 - 2027 | Do-something | PM
 - »D7 - 2037 | Do-nothing | AM
 - »D8 - 2037 | Do-nothing | PM
 - »D9 - 2037 | Do-something | AM
 - »D10 - 2037 | Do-something | PM
 - »D11 - | Construction Traffic | AM
 - »D12 - | Construction Traffic | PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2026 - Base									
Stream B-ACD	D1	1.2	19.92	0.54	C	D2	2.0	27.51	0.67	D
Stream A-BCD		0.0	5.94	0.01	A		0.0	5.92	0.02	A
Stream D-ABC		0.0	7.73	0.04	A		0.1	8.92	0.10	A
Stream C-ABD		0.1	7.37	0.05	A		0.1	7.49	0.07	A
	2027 - Do-nothing									
Stream B-ACD	D3	1.3	20.47	0.55	C	D4	2.1	28.79	0.68	D
Stream A-BCD		0.0	5.95	0.01	A		0.0	5.93	0.02	A
Stream D-ABC		0.0	7.76	0.04	A		0.1	8.98	0.10	A
Stream C-ABD		0.1	7.41	0.05	A		0.1	7.53	0.07	A
	2027 - Do-something									
Stream B-ACD	D5	1.9	27.55	0.64	D	D6	3.4	43.09	0.78	E
Stream A-BCD		0.0	5.99	0.01	A		0.0	5.96	0.02	A
Stream D-ABC		0.0	7.87	0.04	A		0.1	9.16	0.10	A
Stream C-ABD		0.1	7.59	0.05	A		0.1	7.72	0.07	A
	2037 - Do-nothing									
Stream B-ACD	D7	1.6	24.56	0.62	C	D8	3.1	39.61	0.77	E
Stream A-BCD		0.0	6.04	0.01	A		0.0	6.01	0.02	A
Stream D-ABC		0.0	7.96	0.05	A		0.1	9.33	0.11	A
Stream C-ABD		0.1	7.64	0.06	A		0.1	7.80	0.08	A
	2037 - Do-something									
Stream B-ACD	D9	2.6	34.63	0.71	D	D10	5.6	66.24	0.87	F
Stream A-BCD		0.0	6.08	0.01	A		0.0	6.05	0.02	A
Stream D-ABC		0.0	8.08	0.05	A		0.1	9.54	0.11	A
Stream C-ABD		0.1	7.83	0.06	A		0.1	8.00	0.08	A
	- Construction Traffic									
Stream B-ACD	D11	0.1	14.20	0.06	B	D12	0.1	14.20	0.06	B
Stream A-BCD		0.0	0.00	0.00	A		0.0	0.00	0.00	A
Stream D-ABC		0.0	0.00	0.00	A		0.0	0.00	0.00	A
Stream C-ABD		0.0	0.00	0.00	A		0.0	0.00	0.00	A

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	01/09/2026
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DESKTOP-RAGALPB\Eng Joao Pioli
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

PICADY short flare model	Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Show lane queues in feet / metres	Show all PICADY stream intercepts	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)	Use simulation for HCM roundabouts	Use iterations for HCM roundabouts
JUNCTIONS 11.1	5.75						0.85	36.00	20.00		

Demand Set Summary

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D1	2026	Base	AM	ONE HOUR	07:15	08:45	15	✓		
D2	2026	Base	PM	ONE HOUR	16:30	18:00	15	✓		
D3	2027	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G1
D4	2027	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G1
D5	2027	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D3+D11
D6	2027	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D4+D12
D7	2037	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G2
D8	2037	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G2
D9	2037	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D7+D11
D10	2037	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D8+D12
D11		Construction Traffic	AM	ONE HOUR	07:15	08:45	15	✓		
D12		Construction Traffic	PM	ONE HOUR	16:30	18:00	15	✓		

Growth Factors

ID	Description	Use TEMPRO	Growth Factor
G1	COMBINED LGV & HGV		1.0145
G2	COMBINED LGV & HGV		1.1017

Growth factors are only active if a Demand Set references them in a Relationship.

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

D1 - 2026 | Base | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		4.36	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	4.36	A

Arms

Arms

Arm	Name	Description	Arm type
A	N77, N		Major
B	N77, S		Minor
C	R639		Major
D	The Square		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right-turn storage	Width for right-turn storage (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A	5.40		✓	3.00	130.0	✓	1.50
C	5.40		✓	3.00	95.0	✓	3.50

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	3.50	26	70
D	One lane	3.00	45	21

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	706	-	-	-	-	-	-	0.281	0.401	0.281	-	-	-
B-A	547	0.102	0.258	0.258	-	-	-	0.162	0.369	-	0.258	0.258	0.129
B-C	702	0.110	0.279	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	547	0.102	0.258	0.258	-	-	-	0.162	0.369	0.162	-	-	-
B-D, offside lane	547	0.102	0.258	0.258	-	-	-	0.162	0.369	0.162	-	-	-
C-B	684	0.272	0.272	0.388	-	-	-	-	-	-	-	-	-
D-A	637	-	-	-	-	-	-	0.253	-	0.100	-	-	-
D-B, nearside lane	503	0.149	0.149	0.339	-	-	-	0.237	0.237	0.094	-	-	-
D-B, offside lane	503	0.149	0.149	0.339	-	-	-	0.237	0.237	0.094	-	-	-
D-C	503	-	0.149	0.339	0.119	0.237	0.237	0.237	0.237	0.094	-	-	-

The slopes and intercepts shown above include custom intercept adjustments only.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2026	Base	AM	ONE HOUR	07:15	08:45	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	494	100.000
B		ONE HOUR	✓	204	100.000
C		ONE HOUR	✓	296	100.000
D		ONE HOUR	✓	18	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	A	B	C	D	
From	A	0	395	94	5
	B	194	0	4	6
	C	263	25	0	8
	D	13	3	2	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	11	15	0
	B	6	0	0	0
	C	15	4	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.54	19.92	1.2	C	187	280
ABCD	0.01	5.94	0.0	A	5	7
AB					362	544
AC					86	129
D-ABC	0.04	7.73	0.0	A	17	25
C-ABD	0.05	7.37	0.1	A	23	34
C-D					7	11
C-A					241	362

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	153	38	0.00	457	0.335	151	0.0	0.5	12.351	B
ABCD	4	0.94	0.00	641	0.006	4	0.0	0.0	5.647	A
AB	297	74	0.00			297				
AC	71	18	0.00			71				
D-ABC	14	3	0.00	521	0.026	13	0.0	0.0	7.088	A
C-ABD	19	5	0.00	582	0.032	19	0.0	0.0	6.642	A
C-D	6	2	0.00			6				
C-A	198	49	0.00			198				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	183	46	0.00	439	0.416	182	0.5	0.7	14.736	B
ABCD	4	1	0.00	629	0.007	4	0.0	0.0	5.767	A
AB	355	89	0.00			355				
AC	85	21	0.00			85				
D-ABC	16	4	0.00	506	0.032	16	0.0	0.0	7.341	A
C-ABD	22	6	0.00	562	0.040	22	0.0	0.0	6.932	A
C-D	7	2	0.00			7				
C-A	236	59	0.00			236				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	224	56	0.00	415	0.540	222	0.7	1.2	19.571	C
ABCD	6	1	0.00	611	0.009	6	0.0	0.0	5.940	A
AB	435	109	0.00			435				
AC	103	26	0.00			103				
D-ABC	20	5	0.00	486	0.041	20	0.0	0.0	7.725	A
C-ABD	28	7	0.00	535	0.051	27	0.0	0.1	7.373	A
C-D	9	2	0.00			9				
C-A	289	72	0.00			289				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	224	56	0.00	415	0.540	224	1.2	1.2	19.915	C
ABCD	6	1	0.00	611	0.009	6	0.0	0.0	5.941	A
AB	435	109	0.00			435				
AC	103	26	0.00			103				
D-ABC	20	5	0.00	486	0.041	20	0.0	0.0	7.726	A
C-ABD	28	7	0.00	535	0.051	28	0.1	0.1	7.373	A
C-D	9	2	0.00			9				
C-A	289	72	0.00			289				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	183	46	0.00	439	0.416	185	1.2	0.8	15.044	C
ABCD	4	1	0.00	629	0.007	5	0.0	0.0	5.770	A
AB	355	89	0.00			355				
AC	85	21	0.00			85				
D-ABC	16	4	0.00	506	0.032	16	0.0	0.0	7.343	A
C-ABD	22	6	0.00	562	0.040	23	0.1	0.0	6.933	A
C-D	7	2	0.00			7				
C-A	236	59	0.00			236				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	153	38	0.00	457	0.335	154	0.8	0.5	12.595	B
ABCD	4	0.94	0.00	641	0.006	4	0.0	0.0	5.650	A
AB	297	74	0.00			297				
AC	71	18	0.00			71				
D-ABC	14	3	0.00	521	0.026	14	0.0	0.0	7.092	A
C-ABD	19	5	0.00	582	0.032	19	0.0	0.0	6.648	A
C-D	6	2	0.00			6				
C-A	198	49	0.00			198				

D2 - 2026 | Base | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		6.97	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.97	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2026	Base	PM	ONE HOUR	16:30	18:00	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	509	100.000
B		ONE HOUR	✓	244	100.000
C		ONE HOUR	✓	266	100.000
D		ONE HOUR	✓	39	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	A	B	C	D	
From	A	0	339	159	11
	B	229	0	8	7
	C	221	32	0	13
	D	21	13	5	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	4	4	0
	B	2	0	14	0
	C	11	3	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.67	27.51	2.0	D	224	336
ABCD	0.02	5.92	0.0	A	10	15
AB					311	467
AC					146	219
D-ABC	0.10	8.92	0.1	A	36	54
C-ABD	0.07	7.49	0.1	A	29	44
C-D					12	18
C-A					203	305

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	184	46	0.00	449	0.410	181	0.0	0.7	13.613	B
ABCD	8	2	0.00	647	0.013	8	0.0	0.0	5.634	A
AB	255	64	0.00			255				
AC	120	30	0.00			120				
D-ABC	29	7	0.00	487	0.060	29	0.0	0.1	7.867	A
C-ABD	24	6	0.00	579	0.042	24	0.0	0.0	6.683	A
C-D	10	2	0.00			10				
C-A	167	42	0.00			167				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	220	55	0.00	429	0.512	218	0.7	1.0	17.335	C
ABCD	10	2	0.00	636	0.016	10	0.0	0.0	5.750	A
AB	305	76	0.00			305				
AC	143	36	0.00			143				
D-ABC	35	9	0.00	470	0.075	35	0.1	0.1	8.276	A
C-ABD	29	7	0.00	558	0.052	29	0.0	0.1	7.002	A
C-D	12	3	0.00			12				
C-A	199	50	0.00			199				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	269	67	0.00	402	0.669	265	1.0	1.9	26.327	D
ABCD	12	3	0.00	621	0.020	12	0.0	0.0	5.915	A
AB	373	93	0.00			373				
AC	175	44	0.00			175				
D-ABC	43	11	0.00	447	0.096	43	0.1	0.1	8.915	A
C-ABD	35	9	0.00	530	0.066	35	0.1	0.1	7.493	A
C-D	14	4	0.00			14				
C-A	244	61	0.00			244				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	269	67	0.00	402	0.670	269	1.9	2.0	27.513	D
ABCD	12	3	0.00	621	0.020	12	0.0	0.0	5.916	A
AB	373	93	0.00			373				
AC	175	44	0.00			175				
D-ABC	43	11	0.00	446	0.096	43	0.1	0.1	8.921	A
C-ABD	35	9	0.00	530	0.066	35	0.1	0.1	7.493	A
C-D	14	4	0.00			14				
C-A	244	61	0.00			244				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	220	55	0.00	429	0.512	223	2.0	1.1	18.168	C
ABCD	10	2	0.00	636	0.016	10	0.0	0.0	5.750	A
AB	305	76	0.00			305				
AC	143	36	0.00			143				
D-ABC	35	9	0.00	470	0.075	35	0.1	0.1	8.284	A
C-ABD	29	7	0.00	558	0.052	29	0.1	0.1	7.004	A
C-D	12	3	0.00			12				
C-A	199	50	0.00			199				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	184	46	0.00	449	0.410	185	1.1	0.7	14.064	B
ABCD	8	2	0.00	647	0.013	8	0.0	0.0	5.635	A
AB	255	64	0.00			255				
AC	120	30	0.00			120				
D-ABC	29	7	0.00	486	0.060	29	0.1	0.1	7.881	A
C-ABD	24	6	0.00	579	0.042	24	0.1	0.0	6.690	A
C-D	10	2	0.00			10				
C-A	167	42	0.00			167				

D3 - 2027 | Do-nothing | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		4.47	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	4.47	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D3	2027	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G1

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	501	100.000
B		ONE HOUR	✓	206	100.000
C		ONE HOUR	✓	300	100.000
D		ONE HOUR	✓	18	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	401	95	5
	B	196	0	4	6
	C	267	25	0	8
	D	13	3	2	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

From	To				
		A	B	C	D
	A	0	11	15	0
	B	6	0	0	0
	C	15	4	0	0
	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.55	20.47	1.3	C	189	284
ABCD	0.01	5.95	0.0	A	5	7
AB					368	552
AC					88	131
D-ABC	0.04	7.76	0.0	A	17	25
C-ABD	0.05	7.41	0.1	A	23	35
C-D					7	11
C-A					245	367

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	155	39	0.00	456	0.341	153	0.0	0.5	12.486	B
ABCD	4	0.95	0.00	640	0.006	4	0.0	0.0	5.656	A
AB	302	75	0.00			302				
AC	72	18	0.00			72				
D-ABC	14	3	0.00	520	0.026	14	0.0	0.0	7.105	A
C-ABD	19	5	0.00	581	0.033	19	0.0	0.0	6.662	A
C-D	6	2	0.00			6				
C-A	201	50	0.00			201				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	186	46	0.00	438	0.424	185	0.5	0.8	14.978	B
ABCD	5	1	0.00	628	0.007	5	0.0	0.0	5.778	A
AB	360	90	0.00			360				
AC	86	21	0.00			86				
D-ABC	16	4	0.00	505	0.033	16	0.0	0.0	7.364	A
C-ABD	23	6	0.00	561	0.041	23	0.0	0.0	6.959	A
C-D	7	2	0.00			7				
C-A	240	60	0.00			240				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	227	57	0.00	413	0.551	225	0.8	1.2	20.088	C
ABCD	6	1	0.00	610	0.009	6	0.0	0.0	5.954	A
AB	441	110	0.00			441				
AC	105	26	0.00			105				
D-ABC	20	5	0.00	484	0.042	20	0.0	0.0	7.758	A
C-ABD	28	7	0.00	533	0.052	28	0.0	0.1	7.410	A
C-D	9	2	0.00			9				
C-A	294	73	0.00			294				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	227	57	0.00	413	0.551	227	1.2	1.3	20.467	C
ABCD	6	1	0.00	610	0.009	6	0.0	0.0	5.955	A
AB	441	110	0.00			441				
AC	105	26	0.00			105				
D-ABC	20	5	0.00	484	0.042	20	0.0	0.0	7.758	A
C-ABD	28	7	0.00	533	0.052	28	0.1	0.1	7.410	A
C-D	9	2	0.00			9				
C-A	294	73	0.00			294				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	186	46	0.00	438	0.424	187	1.3	0.8	15.313	C
ABCD	5	1	0.00	628	0.007	5	0.0	0.0	5.780	A
AB	360	90	0.00			360				
AC	86	21	0.00			86				
D-ABC	16	4	0.00	505	0.033	16	0.0	0.0	7.369	A
C-ABD	23	6	0.00	561	0.041	23	0.1	0.0	6.963	A
C-D	7	2	0.00			7				
C-A	240	60	0.00			240				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	155	39	0.00	456	0.341	156	0.8	0.6	12.748	B
ABCD	4	0.95	0.00	640	0.006	4	0.0	0.0	5.658	A
AB	302	75	0.00			302				
AC	72	18	0.00			72				
D-ABC	14	3	0.00	520	0.026	14	0.0	0.0	7.110	A
C-ABD	19	5	0.00	581	0.033	19	0.0	0.0	6.666	A
C-D	6	2	0.00			6				
C-A	201	50	0.00			201				

D4 - 2027 | Do-nothing | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		7.26	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.26	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D4	2027	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G1

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	516	100.000
B		ONE HOUR	✓	248	100.000
C		ONE HOUR	✓	270	100.000
D		ONE HOUR	✓	40	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	344	161	11
	B	233	0	8	7
	C	225	32	0	13
	D	21	13	5	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	4	4	0
	B	2	0	14	0
	C	11	3	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.68	28.79	2.1	D	227	341
ABCD	0.02	5.93	0.0	A	10	15
AB					316	473
AC					148	222
D-ABC	0.10	8.98	0.1	A	36	54
C-ABD	0.07	7.53	0.1	A	30	45
C-D					12	18
C-A					206	309

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	187	47	0.00	448	0.417	184	0.0	0.7	13.818	B
ABCD	8	2	0.00	646	0.013	8	0.0	0.0	5.642	A
AB	259	65	0.00			259				
AC	121	30	0.00			121				
D-ABC	30	7	0.00	485	0.061	30	0.0	0.1	7.895	A
C-ABD	24	6	0.00	577	0.042	24	0.0	0.0	6.706	A
C-D	10	2	0.00			10				
C-A	169	42	0.00			169				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	223	56	0.00	427	0.521	221	0.7	1.1	17.743	C
ABCD	10	3	0.00	635	0.016	10	0.0	0.0	5.760	A
AB	309	77	0.00			309				
AC	145	36	0.00			145				
D-ABC	36	9	0.00	468	0.076	36	0.1	0.1	8.314	A
C-ABD	29	7	0.00	556	0.052	29	0.0	0.1	7.032	A
C-D	12	3	0.00			12				
C-A	202	50	0.00			202				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	273	68	0.00	400	0.683	269	1.1	2.0	27.413	D
ABCD	12	3	0.00	619	0.020	12	0.0	0.0	5.929	A
AB	379	95	0.00			379				
AC	178	44	0.00			178				
D-ABC	44	11	0.00	445	0.098	43	0.1	0.1	8.971	A
C-ABD	36	9	0.00	528	0.068	36	0.1	0.1	7.535	A
C-D	15	4	0.00			15				
C-A	247	62	0.00			247				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	273	68	0.00	400	0.683	273	2.0	2.1	28.787	D
ABCD	12	3	0.00	619	0.020	12	0.0	0.0	5.929	A
AB	379	95	0.00			379				
AC	178	44	0.00			178				
D-ABC	44	11	0.00	445	0.098	44	0.1	0.1	8.976	A
C-ABD	36	9	0.00	528	0.068	36	0.1	0.1	7.535	A
C-D	15	4	0.00			15				
C-A	247	62	0.00			247				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	223	56	0.00	427	0.521	227	2.1	1.2	18.673	C
ABCD	10	3	0.00	635	0.016	10	0.0	0.0	5.763	A
AB	309	77	0.00			309				
AC	145	36	0.00			145				
D-ABC	36	9	0.00	468	0.076	36	0.1	0.1	8.323	A
C-ABD	29	7	0.00	556	0.052	29	0.1	0.1	7.034	A
C-D	12	3	0.00			12				
C-A	202	50	0.00			202				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	187	47	0.00	447	0.417	188	1.2	0.8	14.300	B
ABCD	8	2	0.00	646	0.013	8	0.0	0.0	5.646	A
AB	259	65	0.00			259				
AC	121	30	0.00			121				
D-ABC	30	7	0.00	485	0.061	30	0.1	0.1	7.908	A
C-ABD	24	6	0.00	577	0.042	24	0.1	0.0	6.710	A
C-D	10	2	0.00			10				
C-A	169	42	0.00			169				

D5 - 2027 | Do-something | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		6.18	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.18	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D5	2027	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D3+D11

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	541	100.000
B		ONE HOUR	✓	235	100.000
C		ONE HOUR	✓	312	100.000
D		ONE HOUR	✓	18	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	429	107	5
	B	225	0	4	6
	C	278	25	0	8
	D	13	3	2	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	14	21	0
	B	13	0	0	0
	C	17	4	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.64	27.55	1.9	D	215	323
ABCD	0.01	5.99	0.0	A	5	7
AB					394	591
AC					98	147
D-ABC	0.04	7.87	0.0	A	17	25
C-ABD	0.05	7.59	0.1	A	23	35
C-D					7	11
C-A					255	383

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	177	44	0.00	450	0.393	174	0.0	0.7	14.480	B
ABCD	4	0.95	0.00	638	0.006	4	0.0	0.0	5.677	A
AB	323	81	0.00			323				
AC	80	20	0.00			80				
D-ABC	14	3	0.00	516	0.027	14	0.0	0.0	7.165	A
C-ABD	19	5	0.00	573	0.033	19	0.0	0.0	6.760	A
C-D	6	2	0.00			6				
C-A	209	52	0.00			209				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	211	53	0.00	431	0.490	210	0.7	1.0	18.153	C
ABCD	5	1	0.00	625	0.007	5	0.0	0.0	5.805	A
AB	386	96	0.00			386				
AC	96	24	0.00			96				
D-ABC	16	4	0.00	500	0.033	16	0.0	0.0	7.442	A
C-ABD	23	6	0.00	551	0.041	23	0.0	0.0	7.087	A
C-D	7	2	0.00			7				
C-A	250	63	0.00			250				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	258	65	0.00	404	0.640	255	1.0	1.8	26.538	D
ABCD	6	1	0.00	607	0.009	6	0.0	0.0	5.989	A
AB	472	118	0.00			472				
AC	118	29	0.00			118				
D-ABC	20	5	0.00	478	0.042	20	0.0	0.0	7.869	A
C-ABD	28	7	0.00	521	0.054	28	0.0	0.1	7.589	A
C-D	9	2	0.00			9				
C-A	306	77	0.00			306				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	258	65	0.00	404	0.640	258	1.8	1.9	27.547	D
ABCD	6	1	0.00	607	0.009	6	0.0	0.0	5.990	A
AB	472	118	0.00			472				
AC	118	29	0.00			118				
D-ABC	20	5	0.00	477	0.042	20	0.0	0.0	7.870	A
C-ABD	28	7	0.00	521	0.054	28	0.1	0.1	7.589	A
C-D	9	2	0.00			9				
C-A	306	77	0.00			306				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	211	53	0.00	430	0.490	214	1.9	1.1	18.918	C
ABCD	5	1	0.00	625	0.007	5	0.0	0.0	5.807	A
AB	386	96	0.00			386				
AC	96	24	0.00			96				
D-ABC	16	4	0.00	500	0.033	16	0.0	0.0	7.445	A
C-ABD	23	6	0.00	551	0.041	23	0.1	0.0	7.091	A
C-D	7	2	0.00			7				
C-A	250	63	0.00			250				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	177	44	0.00	450	0.393	178	1.1	0.7	14.943	B
ABCD	4	0.95	0.00	638	0.006	4	0.0	0.0	5.680	A
AB	323	81	0.00			323				
AC	80	20	0.00			80				
D-ABC	14	3	0.00	516	0.027	14	0.0	0.0	7.170	A
C-ABD	19	5	0.00	573	0.033	19	0.0	0.0	6.767	A
C-D	6	2	0.00			6				
C-A	209	52	0.00			209				

D6 - 2027 | Do-something | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		10.89	B

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	10.89	B

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D6	2027	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D4+D12

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	556	100.000
B		ONE HOUR	✓	276	100.000
C		ONE HOUR	✓	282	100.000
D		ONE HOUR	✓	40	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	372	173	11
	B	261	0	8	7
	C	237	32	0	13
	D	21	13	5	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	8	8	0
	B	8	0	14	0
	C	14	3	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.78	43.09	3.4	E	253	380
ABCD	0.02	5.96	0.0	A	10	15
AB					341	512
AC					159	239
D-ABC	0.10	9.16	0.1	A	36	54
C-ABD	0.07	7.72	0.1	A	30	45
C-D					12	18
C-A					217	326

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	208	52	0.00	441	0.471	204	0.0	0.9	16.103	C
ABCD	8	2	0.00	644	0.013	8	0.0	0.0	5.665	A
AB	280	70	0.00			280				
AC	130	33	0.00			130				
D-ABC	30	7	0.00	480	0.062	30	0.0	0.1	7.988	A
C-ABD	24	6	0.00	569	0.043	24	0.0	0.0	6.806	A
C-D	10	2	0.00			10				
C-A	178	45	0.00			178				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	248	62	0.00	420	0.591	246	0.9	1.5	21.979	C
ABCD	10	3	0.00	632	0.016	10	0.0	0.0	5.788	A
AB	334	84	0.00			334				
AC	156	39	0.00			156				
D-ABC	36	9	0.00	462	0.077	36	0.1	0.1	8.439	A
C-ABD	29	7	0.00	547	0.053	29	0.0	0.1	7.165	A
C-D	12	3	0.00			12				
C-A	213	53	0.00			213				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	304	76	0.00	390	0.778	297	1.5	3.2	38.765	E
ABCD	12	3	0.00	616	0.020	12	0.0	0.0	5.964	A
AB	409	102	0.00			409				
AC	191	48	0.00			191				
D-ABC	44	11	0.00	437	0.100	43	0.1	0.1	9.156	A
C-ABD	36	9	0.00	516	0.069	36	0.1	0.1	7.722	A
C-D	15	4	0.00			15				
C-A	261	65	0.00			261				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	304	76	0.00	390	0.778	303	3.2	3.4	43.085	E
ABCD	12	3	0.00	616	0.020	12	0.0	0.0	5.965	A
AB	409	102	0.00			409				
AC	191	48	0.00			191				
D-ABC	44	11	0.00	436	0.100	44	0.1	0.1	9.164	A
C-ABD	36	9	0.00	516	0.069	36	0.1	0.1	7.723	A
C-D	15	4	0.00			15				
C-A	261	65	0.00			261				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	248	62	0.00	420	0.591	255	3.4	1.6	24.450	C
ABCD	10	3	0.00	632	0.016	10	0.0	0.0	5.789	A
AB	334	84	0.00			334				
AC	156	39	0.00			156				
D-ABC	36	9	0.00	462	0.077	36	0.1	0.1	8.452	A
C-ABD	29	7	0.00	547	0.053	29	0.1	0.1	7.170	A
C-D	12	3	0.00			12				
C-A	213	53	0.00			213				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	208	52	0.00	441	0.471	210	1.6	1.0	16.982	C
ABCD	8	2	0.00	644	0.013	8	0.0	0.0	5.666	A
AB	280	70	0.00			280				
AC	130	33	0.00			130				
D-ABC	30	7	0.00	480	0.062	30	0.1	0.1	8.001	A
C-ABD	24	6	0.00	569	0.043	24	0.1	0.0	6.811	A
C-D	10	2	0.00			10				
C-A	178	45	0.00			178				

D7 - 2037 | Do-nothing | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		5.30	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	5.30	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D7	2037	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G2

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	544	100.000
B		ONE HOUR	✓	224	100.000
C		ONE HOUR	✓	326	100.000
D		ONE HOUR	✓	20	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	435	104	6
	B	213	0	4	7
	C	290	28	0	9
	D	14	3	2	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

From	To				
		A	B	C	D
	A	0	11	15	0
	B	6	0	0	0
	C	15	4	0	0
	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.62	24.56	1.6	C	206	309
ABCD	0.01	6.04	0.0	A	5	8
AB					399	599
AC					95	143
D-ABC	0.05	7.96	0.0	A	18	27
C-ABD	0.06	7.64	0.1	A	25	38
C-D					8	12
C-A					266	399

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	169	42	0.00	448	0.377	166	0.0	0.6	13.405	B
ABCD	4	1	0.00	635	0.007	4	0.0	0.0	5.709	A
AB	328	82	0.00			328				
AC	78	19	0.00			78				
D-ABC	15	4	0.00	514	0.029	15	0.0	0.0	7.216	A
C-ABD	21	5	0.00	572	0.036	21	0.0	0.0	6.789	A
C-D	7	2	0.00			7				
C-A	218	55	0.00			218				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	202	50	0.00	428	0.471	200	0.6	0.9	16.610	C
ABCD	5	1	0.00	621	0.008	5	0.0	0.0	5.844	A
AB	391	98	0.00			391				
AC	93	23	0.00			93				
D-ABC	18	4	0.00	497	0.036	18	0.0	0.0	7.508	A
C-ABD	25	6	0.00	550	0.045	25	0.0	0.0	7.124	A
C-D	8	2	0.00			8				
C-A	260	65	0.00			260				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	247	62	0.00	401	0.615	244	0.9	1.6	23.819	C
ABCD	6	2	0.00	602	0.010	6	0.0	0.0	6.041	A
AB	479	120	0.00			479				
AC	114	29	0.00			114				
D-ABC	22	5	0.00	474	0.046	22	0.0	0.0	7.959	A
C-ABD	30	8	0.00	520	0.058	30	0.0	0.1	7.642	A
C-D	10	2	0.00			10				
C-A	319	80	0.00			319				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	247	62	0.00	401	0.616	247	1.6	1.6	24.559	C
ABCD	6	2	0.00	602	0.010	6	0.0	0.0	6.041	A
AB	479	120	0.00			479				
AC	114	29	0.00			114				
D-ABC	22	5	0.00	474	0.046	22	0.0	0.0	7.962	A
C-ABD	30	8	0.00	520	0.058	30	0.1	0.1	7.642	A
C-D	10	2	0.00			10				
C-A	319	80	0.00			319				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	202	50	0.00	428	0.471	204	1.6	1.0	17.182	C
ABCD	5	1	0.00	621	0.008	5	0.0	0.0	5.847	A
AB	391	98	0.00			391				
AC	93	23	0.00			93				
D-ABC	18	4	0.00	497	0.036	18	0.0	0.0	7.511	A
C-ABD	25	6	0.00	550	0.045	25	0.1	0.0	7.129	A
C-D	8	2	0.00			8				
C-A	260	65	0.00			260				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	169	42	0.00	448	0.377	170	1.0	0.7	13.761	B
ABCD	4	1	0.00	635	0.007	4	0.0	0.0	5.712	A
AB	328	82	0.00			328				
AC	78	19	0.00			78				
D-ABC	15	4	0.00	513	0.029	15	0.0	0.0	7.221	A
C-ABD	21	5	0.00	572	0.036	21	0.0	0.0	6.796	A
C-D	7	2	0.00			7				
C-A	218	55	0.00			218				

D8 - 2037 | Do-nothing | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		9.78	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	9.78	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D8	2037	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G2

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	561	100.000
B		ONE HOUR	✓	269	100.000
C		ONE HOUR	✓	293	100.000
D		ONE HOUR	✓	43	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	373	175	12
	B	253	0	9	8
	C	244	35	0	14
	D	23	14	6	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	4	4	0
	B	2	0	14	0
	C	11	3	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.77	39.61	3.1	E	247	370
ABCD	0.02	6.01	0.0	A	11	17
AB					343	514
AC					161	241
D-ABC	0.11	9.33	0.1	A	39	59
C-ABD	0.08	7.80	0.1	A	32	49
C-D					13	20
C-A					224	336

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	203	51	0.00	439	0.462	199	0.0	0.9	15.176	C
ABCD	9	2	0.00	641	0.014	9	0.0	0.0	5.694	A
AB	281	70	0.00			281				
AC	132	33	0.00			132				
D-ABC	32	8	0.00	478	0.068	32	0.0	0.1	8.069	A
C-ABD	27	7	0.00	568	0.047	26	0.0	0.1	6.845	A
C-D	11	3	0.00			11				
C-A	184	46	0.00			184				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	242	60	0.00	417	0.581	240	0.9	1.3	20.585	C
ABCD	11	3	0.00	629	0.017	11	0.0	0.0	5.824	A
AB	336	84	0.00			336				
AC	157	39	0.00			157				
D-ABC	39	10	0.00	459	0.084	39	0.1	0.1	8.552	A
C-ABD	32	8	0.00	545	0.058	32	0.1	0.1	7.216	A
C-D	13	3	0.00			13				
C-A	219	55	0.00			219				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	296	74	0.00	387	0.766	290	1.3	2.9	36.007	E
ABCD	13	3	0.00	612	0.022	13	0.0	0.0	6.010	A
AB	411	103	0.00			411				
AC	193	48	0.00			193				
D-ABC	47	12	0.00	433	0.109	47	0.1	0.1	9.320	A
C-ABD	39	10	0.00	514	0.075	39	0.1	0.1	7.795	A
C-D	16	4	0.00			16				
C-A	269	67	0.00			269				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	296	74	0.00	387	0.767	296	2.9	3.1	39.614	E
ABCD	13	3	0.00	612	0.022	13	0.0	0.0	6.011	A
AB	411	103	0.00			411				
AC	193	48	0.00			193				
D-ABC	47	12	0.00	433	0.109	47	0.1	0.1	9.330	A
C-ABD	39	10	0.00	514	0.075	39	0.1	0.1	7.797	A
C-D	16	4	0.00			16				
C-A	269	67	0.00			269				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	242	60	0.00	417	0.581	248	3.1	1.5	22.621	C
ABCD	11	3	0.00	629	0.017	11	0.0	0.0	5.825	A
AB	336	84	0.00			336				
AC	157	39	0.00			157				
D-ABC	39	10	0.00	459	0.084	39	0.1	0.1	8.565	A
C-ABD	32	8	0.00	545	0.058	32	0.1	0.1	7.219	A
C-D	13	3	0.00			13				
C-A	219	55	0.00			219				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	203	51	0.00	438	0.462	205	1.5	0.9	15.924	C
ABCD	9	2	0.00	641	0.014	9	0.0	0.0	5.697	A
AB	281	70	0.00			281				
AC	132	33	0.00			132				
D-ABC	32	8	0.00	478	0.068	32	0.1	0.1	8.087	A
C-ABD	27	7	0.00	568	0.047	27	0.1	0.1	6.849	A
C-D	11	3	0.00			11				
C-A	184	46	0.00			184				

D9 - 2037 | Do-something | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		7.67	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.67	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D9	2037	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D7+D11

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	584	100.000
B		ONE HOUR	✓	252	100.000
C		ONE HOUR	✓	337	100.000
D		ONE HOUR	✓	20	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	463	115	6
	B	241	0	4	7
	C	301	28	0	9
	D	14	3	2	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	14	20	0
	B	12	0	0	0
	C	17	4	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.71	34.63	2.6	D	232	348
ABCD	0.01	6.08	0.0	A	5	8
AB					425	638
AC					106	158
D-ABC	0.05	8.08	0.0	A	18	27
C-ABD	0.06	7.83	0.1	A	25	38
C-D					8	12
C-A					276	414

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	190	48	0.00	442	0.430	187	0.0	0.8	15.564	C
ABCD	4	1	0.00	632	0.007	4	0.0	0.0	5.731	A
AB	349	87	0.00			349				
AC	87	22	0.00			87				
D-ABC	15	4	0.00	509	0.029	15	0.0	0.0	7.277	A
C-ABD	21	5	0.00	564	0.037	21	0.0	0.0	6.891	A
C-D	7	2	0.00			7				
C-A	227	57	0.00			227				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	227	57	0.00	421	0.539	225	0.8	1.2	20.335	C
ABCD	5	1	0.00	618	0.008	5	0.0	0.0	5.872	A
AB	417	104	0.00			417				
AC	103	26	0.00			103				
D-ABC	18	4	0.00	492	0.036	18	0.0	0.0	7.591	A
C-ABD	25	6	0.00	540	0.046	25	0.0	0.0	7.259	A
C-D	8	2	0.00			8				
C-A	271	68	0.00			271				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	278	70	0.00	392	0.709	273	1.2	2.4	32.490	D
ABCD	6	2	0.00	598	0.010	6	0.0	0.0	6.077	A
AB	510	128	0.00			510				
AC	127	32	0.00			127				
D-ABC	22	5	0.00	467	0.047	22	0.0	0.0	8.078	A
C-ABD	30	8	0.00	508	0.060	30	0.0	0.1	7.831	A
C-D	10	2	0.00			10				
C-A	332	83	0.00			332				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	278	70	0.00	392	0.709	278	2.4	2.6	34.632	D
ABCD	6	2	0.00	598	0.010	6	0.0	0.0	6.077	A
AB	510	128	0.00			510				
AC	127	32	0.00			127				
D-ABC	22	5	0.00	467	0.047	22	0.0	0.0	8.082	A
C-ABD	30	8	0.00	508	0.060	30	0.1	0.1	7.833	A
C-D	10	2	0.00			10				
C-A	332	83	0.00			332				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	227	57	0.00	421	0.539	232	2.6	1.4	21.731	C
ABCD	5	1	0.00	618	0.008	5	0.0	0.0	5.872	A
AB	417	104	0.00			417				
AC	103	26	0.00			103				
D-ABC	18	4	0.00	492	0.036	18	0.0	0.0	7.598	A
C-ABD	25	6	0.00	540	0.046	25	0.1	0.1	7.263	A
C-D	8	2	0.00			8				
C-A	271	68	0.00			271				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	190	48	0.00	442	0.430	192	1.4	0.9	16.220	C
ABCD	4	1	0.00	632	0.007	4	0.0	0.0	5.734	A
AB	349	87	0.00			349				
AC	87	22	0.00			87				
D-ABC	15	4	0.00	509	0.029	15	0.0	0.0	7.286	A
C-ABD	21	5	0.00	564	0.037	21	0.1	0.0	6.895	A
C-D	7	2	0.00			7				
C-A	227	57	0.00			227				

D10 - 2037 | Do-something | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		16.41	C

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	16.41	C

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D10	2037	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D8+D12

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	601	100.000
B		ONE HOUR	✓	297	100.000
C		ONE HOUR	✓	305	100.000
D		ONE HOUR	✓	43	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A	B	C	D
From	A	0	401	187	12
	B	281	0	9	8
	C	256	35	0	14
	D	23	14	6	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To				
		A	B	C	D
	A	0	8	7	0
	B	7	0	14	0
	C	13	3	0	0
From	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.87	66.24	5.6	F	273	409
ABCD	0.02	6.05	0.0	A	11	17
AB					368	553
AC					172	258
D-ABC	0.11	9.54	0.1	A	39	59
C-ABD	0.08	8.00	0.1	A	32	49
C-D					13	20
C-A					235	352

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	224	56	0.00	432	0.518	219	0.0	1.1	17.782	C
ABCD	9	2	0.00	639	0.014	9	0.0	0.0	5.716	A
AB	302	76	0.00			302				
AC	141	35	0.00			141				
D-ABC	32	8	0.00	473	0.068	32	0.0	0.1	8.166	A
C-ABD	27	7	0.00	560	0.047	26	0.0	0.1	6.950	A
C-D	11	3	0.00			11				
C-A	193	48	0.00			193				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	267	67	0.00	409	0.653	264	1.1	1.9	26.026	D
ABCD	11	3	0.00	626	0.017	11	0.0	0.0	5.852	A
AB	361	90	0.00			361				
AC	168	42	0.00			168				
D-ABC	39	10	0.00	453	0.085	39	0.1	0.1	8.687	A
C-ABD	32	8	0.00	536	0.059	32	0.1	0.1	7.356	A
C-D	13	3	0.00			13				
C-A	230	58	0.00			230				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	327	82	0.00	377	0.867	315	1.9	4.9	53.755	F
ABCD	13	3	0.00	609	0.022	13	0.0	0.0	6.047	A
AB	442	111	0.00			442				
AC	206	52	0.00			206				
D-ABC	47	12	0.00	425	0.111	47	0.1	0.1	9.525	A
C-ABD	39	10	0.00	502	0.077	39	0.1	0.1	7.997	A
C-D	16	4	0.00			16				
C-A	282	70	0.00			282				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	327	82	0.00	377	0.867	324	4.9	5.6	66.239	F
ABCD	13	3	0.00	609	0.022	13	0.0	0.0	6.047	A
AB	442	111	0.00			442				
AC	206	52	0.00			206				
D-ABC	47	12	0.00	425	0.111	47	0.1	0.1	9.538	A
C-ABD	39	10	0.00	502	0.077	39	0.1	0.1	7.998	A
C-D	16	4	0.00			16				
C-A	282	70	0.00			282				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	267	67	0.00	409	0.653	281	5.6	2.2	32.589	D
ABCD	11	3	0.00	626	0.017	11	0.0	0.0	5.853	A
AB	361	90	0.00			361				
AC	168	42	0.00			168				
D-ABC	39	10	0.00	452	0.085	39	0.1	0.1	8.703	A
C-ABD	32	8	0.00	536	0.059	32	0.1	0.1	7.359	A
C-D	13	3	0.00			13				
C-A	230	58	0.00			230				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	224	56	0.00	432	0.518	228	2.2	1.2	19.227	C
ABCD	9	2	0.00	639	0.014	9	0.0	0.0	5.720	A
AB	302	76	0.00			302				
AC	141	35	0.00			141				
D-ABC	32	8	0.00	472	0.068	32	0.1	0.1	8.185	A
C-ABD	27	7	0.00	560	0.047	27	0.1	0.1	6.955	A
C-D	11	3	0.00			11				
C-A	193	48	0.00			193				

D11 - | Construction Traffic | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		5.05	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	5.05	A

Traffic Demand

Demand Set Details

ID	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D11	Construction Traffic	AM	ONE HOUR	07:15	08:45	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	40	100.000
B		ONE HOUR	✓	28	100.000
C		ONE HOUR	✓	12	100.000
D		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	A	B	C	D	
	A	0	28	12	0
	B	28	0	0	0
	C	12	0	0	0
	D	0	0	0	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

From	To				
	A	B	C	D	
	A	0	100	100	0
	B	100	0	0	0
	C	100	0	0	0
	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.06	14.20	0.1	B	26	39
ABCD	0.00	0.00	0.0	A	0	0
AB					26	39
AC					11	16
D-ABC	0.00	0.00	0.0	A	0	0
C-ABD	0.00	0.00	0.0	A	0	0
C-D					0	0
C-A					11	16

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	21	5	0.00	541	0.039	21	0.0	0.1	13.845	B
ABCD	0	0	0.00	2110	0.000	0	0.0	0.0	0.000	A
AB	21	5	0.00			21				
AC	9	2	0.00			9				
D-ABC	0	0	0.00	525	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1689	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	9	2	0.00			9				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	25	6	0.00	540	0.047	25	0.1	0.1	14.000	B
ABCD	0	0	0.00	2109	0.000	0	0.0	0.0	0.000	A
AB	25	6	0.00			25				
AC	10	3	0.00			10				
D-ABC	0	0	0.00	524	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1685	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	10	3	0.00			10				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	31	8	0.00	538	0.058	31	0.1	0.1	14.203	B
ABCD	0	0	0.00	2107	0.000	0	0.0	0.0	0.000	A
AB	31	8	0.00			31				
AC	13	3	0.00			13				
D-ABC	0	0	0.00	522	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1680	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	13	3	0.00			13				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	31	8	0.00	538	0.058	31	0.1	0.1	14.204	B
ABCD	0	0	0.00	2107	0.000	0	0.0	0.0	0.000	A
AB	31	8	0.00			31				
AC	13	3	0.00			13				
D-ABC	0	0	0.00	522	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1680	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	13	3	0.00			13				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	25	6	0.00	540	0.047	26	0.1	0.1	14.010	B
ABCD	0	0	0.00	2109	0.000	0	0.0	0.0	0.000	A
AB	25	6	0.00			25				
AC	10	3	0.00			10				
D-ABC	0	0	0.00	524	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1685	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	10	3	0.00			10				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	21	5	0.00	541	0.039	21	0.1	0.1	13.867	B
ABCD	0	0	0.00	2110	0.000	0	0.0	0.0	0.000	A
AB	21	5	0.00			21				
AC	9	2	0.00			9				
D-ABC	0	0	0.00	525	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1689	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	9	2	0.00			9				

D12 - | Construction Traffic | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Major arm width	Arm A - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Major arm width	Arm C - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Arm D Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / R639 / The Square	Crossroads	Two-way	Two-way	Two-way	Two-way		4.97	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	4.97	A

Traffic Demand

Demand Set Details

ID	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D12	Construction Traffic	PM	ONE HOUR	16:30	18:00	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	40	100.000
B		ONE HOUR	✓	28	100.000
C		ONE HOUR	✓	12	100.000
D		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	A	B	C	D	
	A	0	28	12	0
	B	28	0	0	0
	C	12	0	0	0
	D	0	0	0	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

From	To				
	A	B	C	D	
	A	0	100	100	0
	B	100	0	0	0
	C	100	0	0	0
	D	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-ACD	0.06	14.20	0.1	B	26	39
ABCD	0.00	0.00	0.0	A	0	0
AB					26	39
AC					11	17
D-ABC	0.00	0.00	0.0	A	0	0
C-ABD	0.00	0.00	0.0	A	0	0
C-D					0	0
C-A					11	17

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	21	5	0.00	541	0.039	21	0.0	0.1	13.842	B
ABCD	0	0	0.00	2110	0.000	0	0.0	0.0	0.000	A
AB	21	5	0.00			21				
AC	9	2	0.00			9				
D-ABC	0	0	0.00	525	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1689	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	9	2	0.00			9				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	25	6	0.00	539	0.047	25	0.1	0.1	13.997	B
ABCD	0	0	0.00	2108	0.000	0	0.0	0.0	0.000	A
AB	25	6	0.00			25				
AC	11	3	0.00			11				
D-ABC	0	0	0.00	524	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1685	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	11	3	0.00			11				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	31	8	0.00	538	0.057	31	0.1	0.1	14.199	B
ABCD	0	0	0.00	2106	0.000	0	0.0	0.0	0.000	A
AB	31	8	0.00			31				
AC	13	3	0.00			13				
D-ABC	0	0	0.00	522	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1679	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	13	3	0.00			13				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	31	8	0.00	538	0.057	31	0.1	0.1	14.200	B
ABCD	0	0	0.00	2106	0.000	0	0.0	0.0	0.000	A
AB	31	8	0.00			31				
AC	13	3	0.00			13				
D-ABC	0	0	0.00	522	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1679	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	13	3	0.00			13				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	25	6	0.00	539	0.047	25	0.1	0.1	14.005	B
ABCD	0	0	0.00	2108	0.000	0	0.0	0.0	0.000	A
AB	25	6	0.00			25				
AC	11	3	0.00			11				
D-ABC	0	0	0.00	524	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1685	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	11	3	0.00			11				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	21	5	0.00	541	0.039	21	0.1	0.1	13.862	B
ABCD	0	0	0.00	2110	0.000	0	0.0	0.0	0.000	A
AB	21	5	0.00			21				
AC	9	2	0.00			9				
D-ABC	0	0	0.00	525	0.000	0	0.0	0.0	0.000	A
C-ABD	0	0	0.00	1689	0.000	0	0.0	0.0	0.000	A
C-D	0	0	0.00			0				
C-A	9	2	0.00			9				

Junctions 11		
PICADY 11 - Priority Intersection Module		
Version: 11.1.0.2307		
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Filename: Junction 7.j11

Path: C:\Users\AngelikiKalatha\OneDrive - ORS\261500 TTA and EIAR Traffic Chapter, 12-turbine Windfarm - Gathabawn, Co. Kilkenny - Documents\01_ORIS\05_Traffic\02_Engineering\03_Reports\02_TTA\2c_Traffic_Model\Junctions11\Junction 7

Report generation date: 17/09/2026 18:08:49

-
- »D1 - 2026 | Base | AM
 - »D2 - 2026 | Base | PM
 - »D3 - 2027 | Do-nothing | AM
 - »D4 - 2027 | Do-nothing | PM
 - »D5 - 2027 | Do-something | AM
 - »D6 - 2027 | Do-something | PM
 - »D7 - 2037 | Do-nothing | AM
 - »D8 - 2037 | Do-nothing | PM
 - »D9 - 2037 | Do-something | AM
 - »D10 - 2037 | Do-something | PM
 - »D11 - | Construction Traffic | AM
 - »D12 - | Construction Traffic | PM

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2026 - Base									
Stream B-C	D1	0.0	5.79	0.01	A	D2	0.0	5.52	0.01	A
Stream B-A		0.1	10.59	0.08	B		0.1	8.97	0.06	A
Stream C-AB		0.0	4.87	0.02	A		0.0	4.53	0.02	A
	2027 - Do-nothing									
Stream B-C	D3	0.0	5.81	0.01	A	D4	0.0	5.54	0.01	A
Stream B-A		0.1	10.68	0.08	B		0.1	9.04	0.06	A
Stream C-AB		0.0	4.87	0.02	A		0.0	4.52	0.02	A
	2027 - Do-something									
Stream B-C	D5	0.1	9.62	0.04	A	D6	0.1	8.95	0.04	A
Stream B-A		0.1	10.94	0.08	B		0.1	9.25	0.06	A
Stream C-AB		0.1	6.56	0.06	A		0.1	5.96	0.06	A
	2037 - Do-nothing									
Stream B-C	D7	0.0	5.93	0.01	A	D8	0.0	5.62	0.01	A
Stream B-A		0.1	11.24	0.09	B		0.1	9.44	0.07	A
Stream C-AB		0.0	4.82	0.02	A		0.0	4.45	0.02	A
	2037 - Do-something									
Stream B-C	D9	0.1	9.70	0.04	A	D10	0.1	8.97	0.04	A
Stream B-A		0.1	11.54	0.09	B		0.1	9.69	0.07	A
Stream C-AB		0.1	6.37	0.06	A		0.1	5.76	0.07	A
	- Construction Traffic									
Stream B-C	D11	0.1	9.94	0.02	A	D12	0.1	9.95	0.03	A
Stream B-A		0.0	0.00	0.00	A		0.0	0.00	0.00	A
Stream C-AB		0.1	11.13	0.03	B		0.1	11.13	0.03	B

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	01/09/2026
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DESKTOP-RAGALPB\Eng Joao Pioli
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

PICADY short flare model	Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Show lane queues in feet / metres	Show all PICADY stream intercepts	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)	Use simulation for HCM roundabouts	Use iterations for HCM roundabouts
JUNCTIONS 11.1	5.75						0.85	36.00	20.00		

Demand Set Summary

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D1	2026	Base	AM	ONE HOUR	07:15	08:45	15	✓		
D2	2026	Base	PM	ONE HOUR	16:30	18:00	15	✓		
D3	2027	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G1
D4	2027	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G1
D5	2027	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D3+D11
D6	2027	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D4+D12
D7	2037	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G2
D8	2037	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G2
D9	2037	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D7+D11
D10	2037	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D8+D12
D11		Construction Traffic	AM	ONE HOUR	07:15	08:45	15	✓		
D12		Construction Traffic	PM	ONE HOUR	16:30	18:00	15	✓		

Growth Factors

ID	Description	Use TEMPRO	Growth Factor
G1	COMBINED LGV & HGV		1.0145
G2	COMBINED LGV & HGV		1.1017

Growth factors are only active if a Demand Set references them in a Relationship.

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

D1 - 2026 | Base | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.48	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.48	A

Arms

Arms

Arm	Name	Description	Arm type
A	N77, S		Major
B	L1807		Minor
C	N77, N		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right-turn storage	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	7.00			150.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B	One lane plus flare	9.50	9.05	4.35	2.70	2.50		1.00	60	95

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	597	0.104	0.263	0.165	0.376
B-C	767	0.112	0.284	-	-
C-B	661	0.245	0.245	-	-

The slopes and intercepts shown above include custom intercept adjustments only.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2026	Base	AM	ONE HOUR	07:15	08:45	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	409	100.000
B		ONE HOUR	✓	35	100.000
C		ONE HOUR	✓	369	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	13	396
	B	29	0	6
	C	363	6	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	9
	B	12	0	0
	C	9	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.01	5.79	0.0	A	6	8
B-A	0.08	10.59	0.1	B	27	40
C-AB	0.02	4.87	0.0	A	10	14
C-A					329	493
A-B					12	18
A-C					363	544

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	673	0.007	4	0.0	0.0	5.385	A
B-A	22	5	0.00	471	0.046	22	0.0	0.1	8.966	A
C-AB	7	2	0.00	770	0.009	7	0.0	0.0	4.860	A
C-A	271	68	0.00			271				
A-B	10	2	0.00			10				
A-C	298	74	0.00			298				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	654	0.008	5	0.0	0.0	5.546	A
B-A	26	7	0.00	447	0.058	26	0.1	0.1	9.584	A
C-AB	9	2	0.00	794	0.012	9	0.0	0.0	4.739	A
C-A	323	81	0.00			323				
A-B	12	3	0.00			12				
A-C	356	89	0.00			356				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	628	0.011	7	0.0	0.0	5.788	A
B-A	32	8	0.00	413	0.077	32	0.1	0.1	10.583	B
C-AB	13	3	0.00	828	0.015	13	0.0	0.0	4.586	A
C-A	393	98	0.00			393				
A-B	14	4	0.00			14				
A-C	435	109	0.00			435				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	628	0.011	7	0.0	0.0	5.788	A
B-A	32	8	0.00	413	0.077	32	0.1	0.1	10.587	B
C-AB	13	3	0.00	828	0.015	13	0.0	0.0	4.600	A
C-A	393	98	0.00			393				
A-B	14	4	0.00			14				
A-C	435	109	0.00			435				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	654	0.008	5	0.0	0.0	5.549	A
B-A	26	7	0.00	447	0.058	26	0.1	0.1	9.593	A
C-AB	9	2	0.00	794	0.012	9	0.0	0.0	4.769	A
C-A	323	81	0.00			323				
A-B	12	3	0.00			12				
A-C	356	89	0.00			356				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	673	0.007	5	0.0	0.0	5.388	A
B-A	22	5	0.00	471	0.046	22	0.1	0.1	8.977	A
C-AB	7	2	0.00	770	0.009	7	0.0	0.0	4.874	A
C-A	271	68	0.00			271				
A-B	10	2	0.00			10				
A-C	298	74	0.00			298				

D2 - 2026 | Base | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.39	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.39	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2026	Base	PM	ONE HOUR	16:30	18:00	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	317	100.000
B		ONE HOUR	✓	31	100.000
C		ONE HOUR	✓	444	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
From		A	B	C
	A	0	20	297
	B	24	0	7
	C	438	6	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

		To		
From		A	B	C
	A	0	0	6
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.01	5.52	0.0	A	6	10
B-A	0.06	8.97	0.1	A	22	33
C-AB	0.02	4.53	0.0	A	11	16
C-A					397	595
A-B					18	28
A-C					272	408

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	694	0.008	5	0.0	0.0	5.229	A
B-A	18	5	0.00	482	0.038	18	0.0	0.0	7.760	A
C-AB	8	2	0.00	822	0.009	8	0.0	0.0	4.523	A
C-A	327	82	0.00			327				
A-B	15	4	0.00			15				
A-C	223	56	0.00			223				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	2	0.00	679	0.009	6	0.0	0.0	5.348	A
B-A	22	5	0.00	459	0.047	22	0.0	0.0	8.229	A
C-AB	10	3	0.00	856	0.012	10	0.0	0.0	4.364	A
C-A	389	97	0.00			389				
A-B	18	4	0.00			18				
A-C	267	67	0.00			267				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	2	0.00	660	0.012	8	0.0	0.0	5.522	A
B-A	26	7	0.00	428	0.062	26	0.0	0.1	8.970	A
C-AB	14	4	0.00	904	0.016	14	0.0	0.0	4.166	A
C-A	475	119	0.00			475				
A-B	22	6	0.00			22				
A-C	327	82	0.00			327				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	2	0.00	660	0.012	8	0.0	0.0	5.522	A
B-A	26	7	0.00	428	0.062	26	0.1	0.1	8.972	A
C-AB	14	4	0.00	904	0.016	14	0.0	0.0	4.175	A
C-A	475	119	0.00			475				
A-B	22	6	0.00			22				
A-C	327	82	0.00			327				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	2	0.00	679	0.009	6	0.0	0.0	5.348	A
B-A	22	5	0.00	459	0.047	22	0.1	0.0	8.234	A
C-AB	10	3	0.00	856	0.012	10	0.0	0.0	4.384	A
C-A	389	97	0.00			389				
A-B	18	4	0.00			18				
A-C	267	67	0.00			267				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	694	0.008	5	0.0	0.0	5.230	A
B-A	18	5	0.00	482	0.038	18	0.0	0.0	7.766	A
C-AB	8	2	0.00	822	0.009	8	0.0	0.0	4.534	A
C-A	327	82	0.00			327				
A-B	15	4	0.00			15				
A-C	223	56	0.00			223				

D3 - 2027 | Do-nothing | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.49	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.49	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D3	2027	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G1

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	414	100.000
B		ONE HOUR	✓	36	100.000
C		ONE HOUR	✓	374	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	13	401
	B	29	0	6
	C	368	6	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	9
	B	12	0	0
	C	9	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.01	5.81	0.0	A	6	8
B-A	0.08	10.68	0.1	B	27	40
C-AB	0.02	4.87	0.0	A	10	15
C-A					334	500
A-B					12	18
A-C					368	552

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	672	0.007	5	0.0	0.0	5.397	A
B-A	22	6	0.00	469	0.047	22	0.0	0.1	9.009	A
C-AB	7	2	0.00	772	0.009	7	0.0	0.0	4.852	A
C-A	275	69	0.00			275				
A-B	10	2	0.00			10				
A-C	302	76	0.00			302				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	653	0.008	5	0.0	0.0	5.561	A
B-A	26	7	0.00	444	0.060	26	0.1	0.1	9.643	A
C-AB	9	2	0.00	796	0.012	9	0.0	0.0	4.729	A
C-A	327	82	0.00			327				
A-B	12	3	0.00			12				
A-C	361	90	0.00			361				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	626	0.011	7	0.0	0.0	5.808	A
B-A	32	8	0.00	410	0.079	32	0.1	0.1	10.671	B
C-AB	13	3	0.00	831	0.016	13	0.0	0.0	4.575	A
C-A	399	100	0.00			399				
A-B	15	4	0.00			15				
A-C	442	110	0.00			442				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	626	0.011	7	0.0	0.0	5.808	A
B-A	32	8	0.00	410	0.079	32	0.1	0.1	10.675	B
C-AB	13	3	0.00	831	0.016	13	0.0	0.0	4.588	A
C-A	399	100	0.00			399				
A-B	15	4	0.00			15				
A-C	442	110	0.00			442				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	653	0.008	5	0.0	0.0	5.564	A
B-A	26	7	0.00	444	0.060	27	0.1	0.1	9.652	A
C-AB	9	2	0.00	796	0.012	9	0.0	0.0	4.759	A
C-A	327	82	0.00			327				
A-B	12	3	0.00			12				
A-C	361	90	0.00			361				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	671	0.007	5	0.0	0.0	5.398	A
B-A	22	6	0.00	469	0.047	22	0.1	0.1	9.019	A
C-AB	7	2	0.00	772	0.009	7	0.0	0.0	4.866	A
C-A	275	69	0.00			275				
A-B	10	2	0.00			10				
A-C	302	76	0.00			302				

D4 - 2027 | Do-nothing | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.39	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.39	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D4	2027	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G1

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	321	100.000
B		ONE HOUR	✓	31	100.000
C		ONE HOUR	✓	450	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	20	301
	B	24	0	7
	C	444	6	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	6
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.01	5.54	0.0	A	7	10
B-A	0.06	9.04	0.1	A	22	34
C-AB	0.02	4.52	0.0	A	11	16
C-A					402	604
A-B					19	28
A-C					276	414

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	693	0.008	5	0.0	0.0	5.238	A
B-A	18	5	0.00	480	0.038	18	0.0	0.0	7.793	A
C-AB	8	2	0.00	824	0.009	8	0.0	0.0	4.511	A
C-A	331	83	0.00			331				
A-B	15	4	0.00			15				
A-C	227	57	0.00			227				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	2	0.00	678	0.009	6	0.0	0.0	5.359	A
B-A	22	5	0.00	457	0.048	22	0.0	0.0	8.272	A
C-AB	10	3	0.00	859	0.012	10	0.0	0.0	4.351	A
C-A	395	99	0.00			395				
A-B	18	5	0.00			18				
A-C	271	68	0.00			271				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	2	0.00	658	0.012	8	0.0	0.0	5.536	A
B-A	27	7	0.00	425	0.063	27	0.0	0.1	9.034	A
C-AB	15	4	0.00	907	0.016	15	0.0	0.0	4.151	A
C-A	481	120	0.00			481				
A-B	22	6	0.00			22				
A-C	331	83	0.00			331				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	2	0.00	658	0.012	8	0.0	0.0	5.536	A
B-A	27	7	0.00	425	0.063	27	0.1	0.1	9.036	A
C-AB	15	4	0.00	907	0.016	15	0.0	0.0	4.159	A
C-A	481	120	0.00			481				
A-B	22	6	0.00			22				
A-C	331	83	0.00			331				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	2	0.00	678	0.009	6	0.0	0.0	5.361	A
B-A	22	5	0.00	457	0.048	22	0.1	0.1	8.276	A
C-AB	10	3	0.00	859	0.012	10	0.0	0.0	4.369	A
C-A	395	99	0.00			395				
A-B	18	5	0.00			18				
A-C	271	68	0.00			271				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	692	0.008	5	0.0	0.0	5.238	A
B-A	18	5	0.00	480	0.038	18	0.1	0.0	7.801	A
C-AB	8	2	0.00	824	0.009	8	0.0	0.0	4.521	A
C-A	331	83	0.00			331				
A-B	15	4	0.00			15				
A-C	227	57	0.00			227				

D5 - 2027 | Do-something | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.92	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.92	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D5	2027	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D3+D11

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	426	100.000
B		ONE HOUR	✓	52	100.000
C		ONE HOUR	✓	403	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	13	413
	B	29	0	23
	C	380	23	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	10
	B	12	0	58
	C	11	58	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.04	9.62	0.1	A	21	32
B-A	0.08	10.94	0.1	B	27	40
C-AB	0.06	6.56	0.1	A	38	57
C-A					332	497
A-B					12	18
A-C					379	568

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	17	4	0.00	663	0.026	17	0.0	0.0	8.801	A
B-A	22	6	0.00	465	0.048	22	0.0	0.1	9.098	A
C-AB	27	7	0.00	776	0.035	27	0.0	0.1	6.557	A
C-A	276	69	0.00			276				
A-B	10	2	0.00			10				
A-C	311	78	0.00			311				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	21	5	0.00	644	0.032	21	0.0	0.1	9.125	A
B-A	26	7	0.00	438	0.060	26	0.1	0.1	9.795	A
C-AB	36	9	0.00	801	0.045	36	0.1	0.1	6.340	A
C-A	326	81	0.00			326				
A-B	12	3	0.00			12				
A-C	371	93	0.00			371				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	25	6	0.00	617	0.041	25	0.1	0.1	9.613	A
B-A	32	8	0.00	401	0.081	32	0.1	0.1	10.936	B
C-AB	51	13	0.00	837	0.060	50	0.1	0.1	6.017	A
C-A	393	98	0.00			393				
A-B	15	4	0.00			15				
A-C	454	114	0.00			454				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	25	6	0.00	617	0.041	25	0.1	0.1	9.615	A
B-A	32	8	0.00	401	0.081	32	0.1	0.1	10.942	B
C-AB	51	13	0.00	837	0.060	51	0.1	0.1	5.951	A
C-A	393	98	0.00			393				
A-B	15	4	0.00			15				
A-C	454	114	0.00			454				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	21	5	0.00	644	0.032	21	0.1	0.1	9.130	A
B-A	26	7	0.00	438	0.060	27	0.1	0.1	9.803	A
C-AB	36	9	0.00	801	0.045	36	0.1	0.1	6.181	A
C-A	326	81	0.00			326				
A-B	12	3	0.00			12				
A-C	371	93	0.00			371				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	17	4	0.00	663	0.026	17	0.1	0.0	8.807	A
B-A	22	6	0.00	465	0.048	22	0.1	0.1	9.112	A
C-AB	27	7	0.00	776	0.035	27	0.1	0.1	6.476	A
C-A	276	69	0.00			276				
A-B	10	2	0.00			10				
A-C	311	78	0.00			311				

D6 - 2027 | Do-something | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.83	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.83	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D6	2027	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D4+D12

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	333	100.000
B		ONE HOUR	✓	48	100.000
C		ONE HOUR	✓	479	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	20	313
	B	24	0	24
	C	456	23	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	8
	B	0	0	54
	C	7	58	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.04	8.95	0.1	A	22	33
B-A	0.06	9.25	0.1	A	22	34
C-AB	0.06	5.96	0.1	A	42	63
C-A					398	597
A-B					19	28
A-C					287	431

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	18	5	0.00	684	0.027	18	0.0	0.0	8.351	A
B-A	18	5	0.00	475	0.039	18	0.0	0.0	7.870	A
C-AB	30	7	0.00	829	0.036	29	0.0	0.1	5.956	A
C-A	331	83	0.00			331				
A-B	15	4	0.00			15				
A-C	236	59	0.00			236				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	22	5	0.00	669	0.032	22	0.0	0.1	8.592	A
B-A	22	5	0.00	450	0.049	22	0.0	0.1	8.398	A
C-AB	40	10	0.00	864	0.046	40	0.1	0.1	5.697	A
C-A	391	98	0.00			391				
A-B	18	5	0.00			18				
A-C	281	70	0.00			281				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	7	0.00	648	0.041	26	0.1	0.1	8.949	A
B-A	27	7	0.00	416	0.064	27	0.1	0.1	9.250	A
C-AB	57	14	0.00	914	0.062	57	0.1	0.1	5.331	A
C-A	471	118	0.00			471				
A-B	22	6	0.00			22				
A-C	345	86	0.00			345				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	7	0.00	648	0.041	27	0.1	0.1	8.949	A
B-A	27	7	0.00	416	0.064	27	0.1	0.1	9.252	A
C-AB	57	14	0.00	914	0.062	57	0.1	0.1	5.267	A
C-A	471	118	0.00			471				
A-B	22	6	0.00			22				
A-C	345	86	0.00			345				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	22	5	0.00	669	0.032	22	0.1	0.1	8.596	A
B-A	22	5	0.00	450	0.049	22	0.1	0.1	8.406	A
C-AB	40	10	0.00	864	0.046	40	0.1	0.1	5.541	A
C-A	391	98	0.00			391				
A-B	18	5	0.00			18				
A-C	281	70	0.00			281				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	18	5	0.00	684	0.027	18	0.1	0.0	8.356	A
B-A	18	5	0.00	475	0.039	18	0.1	0.0	7.880	A
C-AB	30	7	0.00	829	0.036	30	0.1	0.1	5.873	A
C-A	331	83	0.00			331				
A-B	15	4	0.00			15				
A-C	236	59	0.00			236				

D7 - 2037 | Do-nothing | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.51	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.51	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D7	2037	Do-nothing	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D1*G2

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	450	100.000
B		ONE HOUR	✓	39	100.000
C		ONE HOUR	✓	407	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	14	436
	B	32	0	7
	C	400	7	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	9
	B	12	0	0
	C	9	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.01	5.93	0.0	A	6	9
B-A	0.09	11.24	0.1	B	29	44
C-AB	0.02	4.82	0.0	A	11	17
C-A					362	543
A-B					13	20
A-C					400	600

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	663	0.008	5	0.0	0.0	5.468	A
B-A	24	6	0.00	458	0.052	24	0.0	0.1	9.275	A
C-AB	8	2	0.00	782	0.010	8	0.0	0.0	4.802	A
C-A	298	74	0.00			298				
A-B	11	3	0.00			11				
A-C	328	82	0.00			328				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	1	0.00	643	0.009	6	0.0	0.0	5.653	A
B-A	29	7	0.00	431	0.067	29	0.1	0.1	10.013	B
C-AB	11	3	0.00	809	0.013	11	0.0	0.0	4.670	A
C-A	355	89	0.00			355				
A-B	13	3	0.00			13				
A-C	392	98	0.00			392				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	614	0.012	7	0.0	0.0	5.933	A
B-A	35	9	0.00	394	0.089	35	0.1	0.1	11.230	B
C-AB	15	4	0.00	848	0.018	15	0.0	0.0	4.504	A
C-A	432	108	0.00			432				
A-B	16	4	0.00			16				
A-C	480	120	0.00			480				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	614	0.012	7	0.0	0.0	5.933	A
B-A	35	9	0.00	394	0.089	35	0.1	0.1	11.237	B
C-AB	15	4	0.00	848	0.018	15	0.0	0.0	4.518	A
C-A	432	108	0.00			432				
A-B	16	4	0.00			16				
A-C	480	120	0.00			480				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	1	0.00	643	0.009	6	0.0	0.0	5.656	A
B-A	29	7	0.00	431	0.067	29	0.1	0.1	10.023	B
C-AB	11	3	0.00	809	0.013	11	0.0	0.0	4.701	A
C-A	355	89	0.00			355				
A-B	13	3	0.00			13				
A-C	392	98	0.00			392				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	5	1	0.00	663	0.008	5	0.0	0.0	5.469	A
B-A	24	6	0.00	458	0.052	24	0.1	0.1	9.289	A
C-AB	8	2	0.00	782	0.010	8	0.0	0.0	4.818	A
C-A	298	74	0.00			298				
A-B	11	3	0.00			11				
A-C	328	82	0.00			328				

D8 - 2037 | Do-nothing | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.41	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.41	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D8	2037	Do-nothing	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D2*G2

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	349	100.000
B		ONE HOUR	✓	34	100.000
C		ONE HOUR	✓	489	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	22	327
	B	26	0	8
	C	483	7	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	6
	B	0	0	0
	C	6	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.01	5.62	0.0	A	7	11
B-A	0.07	9.44	0.1	A	24	36
C-AB	0.02	4.45	0.0	A	13	19
C-A					436	654
A-B					20	30
A-C					300	450

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	1	0.00	686	0.008	6	0.0	0.0	5.290	A
B-A	20	5	0.00	470	0.042	20	0.0	0.0	7.999	A
C-AB	9	2	0.00	839	0.010	9	0.0	0.0	4.442	A
C-A	359	90	0.00			359				
A-B	17	4	0.00			17				
A-C	246	62	0.00			246				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	670	0.010	7	0.0	0.0	5.425	A
B-A	24	6	0.00	445	0.053	24	0.0	0.1	8.548	A
C-AB	12	3	0.00	877	0.013	12	0.0	0.0	4.273	A
C-A	428	107	0.00			428				
A-B	20	5	0.00			20				
A-C	294	73	0.00			294				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	2	0.00	648	0.013	8	0.0	0.0	5.625	A
B-A	29	7	0.00	410	0.071	29	0.1	0.1	9.440	A
C-AB	17	4	0.00	931	0.018	17	0.0	0.0	4.063	A
C-A	522	130	0.00			522				
A-B	24	6	0.00			24				
A-C	360	90	0.00			360				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	8	2	0.00	648	0.013	8	0.0	0.0	5.625	A
B-A	29	7	0.00	410	0.071	29	0.1	0.1	9.444	A
C-AB	17	4	0.00	931	0.018	17	0.0	0.0	4.072	A
C-A	522	130	0.00			522				
A-B	24	6	0.00			24				
A-C	360	90	0.00			360				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	7	2	0.00	670	0.010	7	0.0	0.0	5.425	A
B-A	24	6	0.00	445	0.053	24	0.1	0.1	8.553	A
C-AB	12	3	0.00	877	0.013	12	0.0	0.0	4.291	A
C-A	428	107	0.00			428				
A-B	20	5	0.00			20				
A-C	294	73	0.00			294				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	6	1	0.00	686	0.008	6	0.0	0.0	5.293	A
B-A	20	5	0.00	470	0.042	20	0.1	0.0	8.005	A
C-AB	9	2	0.00	839	0.010	9	0.0	0.0	4.454	A
C-A	359	90	0.00			359				
A-B	17	4	0.00			17				
A-C	246	62	0.00			246				

D9 - 2037 | Do-something | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.93	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.93	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D9	2037	Do-something	AM	ONE HOUR	07:15	08:45	15	✓	Simple	D7+D11

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	462	100.000
B		ONE HOUR	✓	55	100.000
C		ONE HOUR	✓	435	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	14	447
	B	32	0	23
	C	411	23	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	10
	B	12	0	56
	C	10	56	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.04	9.70	0.1	A	21	32
B-A	0.09	11.54	0.1	B	29	44
C-AB	0.06	6.37	0.1	A	41	62
C-A					358	537
A-B					13	20
A-C					410	616

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	18	4	0.00	655	0.027	17	0.0	0.0	8.802	A
B-A	24	6	0.00	453	0.053	24	0.0	0.1	9.379	A
C-AB	29	7	0.00	786	0.037	29	0.0	0.1	6.373	A
C-A	298	75	0.00			298				
A-B	11	3	0.00			11				
A-C	337	84	0.00			337				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	21	5	0.00	634	0.033	21	0.0	0.1	9.158	A
B-A	29	7	0.00	424	0.068	29	0.1	0.1	10.186	B
C-AB	39	10	0.00	814	0.048	39	0.1	0.1	6.154	A
C-A	352	88	0.00			352				
A-B	13	3	0.00			13				
A-C	402	101	0.00			402				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	6	0.00	604	0.043	26	0.1	0.1	9.701	A
B-A	35	9	0.00	384	0.092	35	0.1	0.1	11.536	B
C-AB	55	14	0.00	855	0.064	55	0.1	0.1	5.824	A
C-A	424	106	0.00			424				
A-B	16	4	0.00			16				
A-C	492	123	0.00			492				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	26	6	0.00	604	0.043	26	0.1	0.1	9.703	A
B-A	35	9	0.00	384	0.092	35	0.1	0.1	11.545	B
C-AB	55	14	0.00	855	0.065	55	0.1	0.1	5.760	A
C-A	424	106	0.00			424				
A-B	16	4	0.00			16				
A-C	492	123	0.00			492				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	21	5	0.00	634	0.033	21	0.1	0.1	9.163	A
B-A	29	7	0.00	424	0.068	29	0.1	0.1	10.197	B
C-AB	39	10	0.00	814	0.048	39	0.1	0.1	5.999	A
C-A	352	88	0.00			352				
A-B	13	3	0.00			13				
A-C	402	101	0.00			402				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	18	4	0.00	655	0.027	18	0.1	0.0	8.809	A
B-A	24	6	0.00	453	0.053	24	0.1	0.1	9.396	A
C-AB	29	7	0.00	787	0.037	29	0.1	0.1	6.295	A
C-A	298	75	0.00			298				
A-B	11	3	0.00			11				
A-C	337	84	0.00			337				

D10 - 2037 | Do-something | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		0.82	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.82	A

Traffic Demand

Demand Set Details

ID	Year	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D10	2037	Do-something	PM	ONE HOUR	16:30	18:00	15	✓	Simple	D8+D12

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	361	100.000
B		ONE HOUR	✓	51	100.000
C		ONE HOUR	✓	518	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		A	B	C
	A	0	22	339
	B	26	0	25
	C	495	24	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
		A	B	C
	A	0	0	8
	B	0	0	52
	C	7	56	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.04	8.97	0.1	A	23	34
B-A	0.07	9.69	0.1	A	24	36
C-AB	0.07	5.76	0.1	A	46	69
C-A					430	645
A-B					20	30
A-C					311	466

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	19	5	0.00	678	0.027	18	0.0	0.0	8.321	A
B-A	20	5	0.00	465	0.043	20	0.0	0.0	8.080	A
C-AB	32	8	0.00	844	0.038	32	0.0	0.1	5.762	A
C-A	358	90	0.00			358				
A-B	17	4	0.00			17				
A-C	255	64	0.00			255				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	22	6	0.00	661	0.034	22	0.0	0.1	8.583	A
B-A	24	6	0.00	438	0.054	24	0.0	0.1	8.690	A
C-AB	43	11	0.00	882	0.049	43	0.1	0.1	5.500	A
C-A	423	106	0.00			423				
A-B	20	5	0.00			20				
A-C	305	76	0.00			305				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	7	0.00	639	0.043	27	0.1	0.1	8.972	A
B-A	29	7	0.00	401	0.073	29	0.1	0.1	9.684	A
C-AB	62	16	0.00	938	0.066	62	0.1	0.1	5.137	A
C-A	508	127	0.00			508				
A-B	24	6	0.00			24				
A-C	373	93	0.00			373				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	27	7	0.00	639	0.043	27	0.1	0.1	8.974	A
B-A	29	7	0.00	401	0.073	29	0.1	0.1	9.689	A
C-AB	62	16	0.00	938	0.066	62	0.1	0.1	5.075	A
C-A	508	127	0.00			508				
A-B	24	6	0.00			24				
A-C	373	93	0.00			373				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	22	6	0.00	661	0.034	22	0.1	0.1	8.585	A
B-A	24	6	0.00	438	0.054	24	0.1	0.1	8.698	A
C-AB	43	11	0.00	883	0.049	43	0.1	0.1	5.348	A
C-A	423	106	0.00			423				
A-B	20	5	0.00			20				
A-C	305	76	0.00			305				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	19	5	0.00	678	0.027	19	0.1	0.0	8.328	A
B-A	20	5	0.00	465	0.043	20	0.1	0.0	8.094	A
C-AB	32	8	0.00	844	0.038	32	0.1	0.1	5.682	A
C-A	358	90	0.00			358				
A-B	17	4	0.00			17				
A-C	255	64	0.00			255				

D11 - | Construction Traffic | AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		6.31	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.31	A

Traffic Demand

Demand Set Details

ID	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D11	Construction Traffic	AM	ONE HOUR	07:15	08:45	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	12	100.000
B		ONE HOUR	✓	17	100.000
C		ONE HOUR	✓	28	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
From	A	B	C	
	0	0	12	
	0	0	17	
	12	17	0	

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
From	A	B	C	
	0	0	100	
	0	0	100	
	100	100	0	

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.02	9.94	0.1	A	15	23
B-A	0.00	0.00	0.0	A	0	0
C-AB	0.03	11.13	0.1	B	16	24
C-A					10	15
A-B					0	0
A-C					11	16

Main Results for each time segment

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	13	3	0.00	744	0.017	13	0.0	0.0	9.846	A
B-A	0	0	0.00	605	0.000	0	0.0	0.0	0.000	A
C-AB	13	3	0.00	664	0.019	13	0.0	0.0	11.048	B
C-A	8	2	0.00			8				
A-B	0	0	0.00			0				
A-C	9	2	0.00			9				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	15	4	0.00	743	0.020	15	0.0	0.0	9.887	A
B-A	0	0	0.00	603	0.000	0	0.0	0.0	0.000	A
C-AB	15	4	0.00	665	0.023	15	0.0	0.0	11.084	B
C-A	10	3	0.00			10				
A-B	0	0	0.00			0				
A-C	10	3	0.00			10				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	18	5	0.00	743	0.025	18	0.0	0.1	9.942	A
B-A	0	0	0.00	601	0.000	0	0.0	0.0	0.000	A
C-AB	19	5	0.00	666	0.028	19	0.0	0.1	11.128	B
C-A	12	3	0.00			12				
A-B	0	0	0.00			0				
A-C	13	3	0.00			13				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	18	5	0.00	743	0.025	18	0.1	0.1	9.942	A
B-A	0	0	0.00	601	0.000	0	0.0	0.0	0.000	A
C-AB	19	5	0.00	666	0.028	19	0.1	0.1	11.131	B
C-A	12	3	0.00			12				
A-B	0	0	0.00			0				
A-C	13	3	0.00			13				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	15	4	0.00	743	0.020	15	0.1	0.0	9.890	A
B-A	0	0	0.00	603	0.000	0	0.0	0.0	0.000	A
C-AB	15	4	0.00	665	0.023	15	0.1	0.0	11.085	B
C-A	10	3	0.00			10				
A-B	0	0	0.00			0				
A-C	10	3	0.00			10				

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	13	3	0.00	744	0.017	13	0.0	0.0	9.848	A
B-A	0	0	0.00	605	0.000	0	0.0	0.0	0.000	A
C-AB	13	3	0.00	664	0.019	13	0.0	0.0	11.053	B
C-A	8	2	0.00			8				
A-B	0	0	0.00			0				
A-C	9	2	0.00			9				

D12 - | Construction Traffic | PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D5 - 2027 Do-something AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	N77 / L1807	T-Junction	Two-way	Two-way	Two-way		6.23	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.23	A

Traffic Demand

Demand Set Details

ID	Scenario	Time period	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D12	Construction Traffic	PM	ONE HOUR	16:30	18:00	15	✓

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		ONE HOUR	✓	12	100.000
B		ONE HOUR	✓	17	100.000
C		ONE HOUR	✓	29	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
From		A	B	C
	A	0	0	12
	B	0	0	17
	C	12	17	0

Vehicle Mix

HV data entry mode	PCU Factor for a HV (PCU)
HV Percentages	2.00

Heavy Vehicle %

	To			
From		A	B	C
	A	0	0	100
	B	0	0	100
	C	100	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-C	0.03	9.95	0.1	A	16	23
B-A	0.00	0.00	0.0	A	0	0
C-AB	0.03	11.13	0.1	B	16	24
C-A					11	16
A-B					0	0
A-C					11	17

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	13	3	0.00	744	0.017	13	0.0	0.0	9.850	A
B-A	0	0	0.00	605	0.000	0	0.0	0.0	0.000	A
C-AB	13	3	0.00	664	0.020	13	0.0	0.0	11.048	B
C-A	9	2	0.00			9				
A-B	0	0	0.00			0				
A-C	9	2	0.00			9				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	15	4	0.00	743	0.021	15	0.0	0.0	9.891	A
B-A	0	0	0.00	603	0.000	0	0.0	0.0	0.000	A
C-AB	16	4	0.00	665	0.023	16	0.0	0.0	11.084	B
C-A	11	3	0.00			11				
A-B	0	0	0.00			0				
A-C	11	3	0.00			11				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	19	5	0.00	742	0.025	19	0.0	0.1	9.947	A
B-A	0	0	0.00	601	0.000	0	0.0	0.0	0.000	A
C-AB	19	5	0.00	666	0.029	19	0.0	0.1	11.129	B
C-A	13	3	0.00			13				
A-B	0	0	0.00			0				
A-C	13	3	0.00			13				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	19	5	0.00	742	0.025	19	0.1	0.1	9.947	A
B-A	0	0	0.00	601	0.000	0	0.0	0.0	0.000	A
C-AB	19	5	0.00	666	0.029	19	0.1	0.1	11.129	B
C-A	13	3	0.00			13				
A-B	0	0	0.00			0				
A-C	13	3	0.00			13				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	15	4	0.00	743	0.021	15	0.1	0.0	9.892	A
B-A	0	0	0.00	603	0.000	0	0.0	0.0	0.000	A
C-AB	16	4	0.00	665	0.023	16	0.1	0.0	11.088	B
C-A	11	3	0.00			11				
A-B	0	0	0.00			0				
A-C	11	3	0.00			11				

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Pedestrian demand (Ped/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-C	13	3	0.00	744	0.017	13	0.0	0.0	9.854	A
B-A	0	0	0.00	605	0.000	0	0.0	0.0	0.000	A
C-AB	13	3	0.00	664	0.020	13	0.0	0.0	11.056	B
C-A	9	2	0.00			9				
A-B	0	0	0.00			0				
A-C	9	2	0.00			9				

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Appendix 16.3

Gathabawn Wind Farm Telecommunications Impact Assessment Report

Document Number:

Author: DMG/PT

Approved for Release: Rev 3.0 KH **Date:** 25/09/26

Document Filename: *Gathabawn Wind Farm Telecommunications Impact Assessment.*

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Executive Summary

Ai Bridges was commissioned to evaluate the possible impacts that the proposed Gathabawn Wind Farm in County Kilkenny could have on existing telecommunications operator networks. The scope of work included field and desktop surveys to determine telecommunications network infrastructure that could be impacted by the proposed development. Consultations with telecom operators were also undertaken to assist in identifying network infrastructure that could be impacted by the proposed Gathabawn Wind Farm.

Telecommunications mast-sites with network infrastructure that could potentially be impacted by the development were identified and a field survey of each of these sites was carried out. During the field surveys, radio antennas with bearings in the direction of the wind farm were recorded. The findings of the field surveys are provided in Appendix A of this report.

During the consultation process, sixteen telecom operators were contacted. At the time of writing this report, fourteen of these operators have responded to the consultation requests. The responses received from each of the telecom operators can be found in Section 3 of this report.

Using the information obtained during the field survey assessments and consultation process a desktop impact analysis was carried out, and all of the telecommunication operator networks were analysed using radio planning \ modelling software. Results from the impact analysis indicate that there are six radio links in the vicinity of the proposed Gathabawn Wind Farm development. These radio links are listed below in Table 1.

The results from the impact analysis (2D and 3D) indicate the that the proposed turbine layout would impact two of the PTP microwave radio links. Mitigation measures to offset the potential impact of the proposed turbine layout on these radio links are outlined in Section 6 of this report.

Telecom Operator	Link ID	Link Description	Observations	Possible Mitigation Measure(s)
2RN	2RN_L1	Kilduff to Mt Leinster	No impacts	N.A.
Three Ireland	3IRL_L1	Tinnaslatty to Freshford	Interference Impact (Radio Link Fresnel Zone obstructed by T10)	Relay via an Existing Three Ireland Mast-site (e.g. Kyleballynamoe).
	3IRL_L2	Ballyspellan to Tinnaslatty	No impacts	N.A.
Vodafone	VF_L1	Ballyspellan to Ballyousskill	No impacts	N.A..
	VF_L2	Ballyspellan to Springfield	No impacts	N.A.
	VF_L3	Oldglass to Ballyspellan	Interference Impact (Radio Link Fresnel Zone obstructed by T02)	Relay via an Existing Vodafone Mast-site (e.g. Ballyousskill).

Table 1. Radio links in vicinity of the proposed Gathabawn Wind Farm development.

 <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Sections

Section 1 - Wind Farm Site Information	4
Section 2 - Methodology	6
Section 3 - Telecom Operator Consultations	9
Section 4 - Field Surveys	15
Section 5 - Desktop Survey Analysis	17
Section 6 - Conclusions	34

Appendix

Appendix A – Field Survey Findings	37
Appendix B – Radio Link Budget Reports	47

 <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Section 1 - Wind Farm Site Information

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

1. Introduction

In this section a brief summary of the wind farm site is provided. Details regarding the site's geographic location and the proposed wind turbine dimensions are presented.

1.1 Wind Farm Site Information

The proposed Gathabawn Wind Farm is located approximately 10 km northeast of Urlingford, Co Kilkenny. For the purpose of this study, a 12-turbine layout has been considered

The dimensions of the turbines assessed in this report are provided in Table 2. The location of the proposed Gathabawn Wind Farm is shown in Figure 1 below.

Turbine No	Hub Height	Rotor Radius	Tip Height (AGL)
1,2,3,4,5,8,10,11,12	102 m	68 m	170 m
6,7,9	82 m	68 m	150 m

Table 2. Wind Farm Turbine Details

Note: The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.

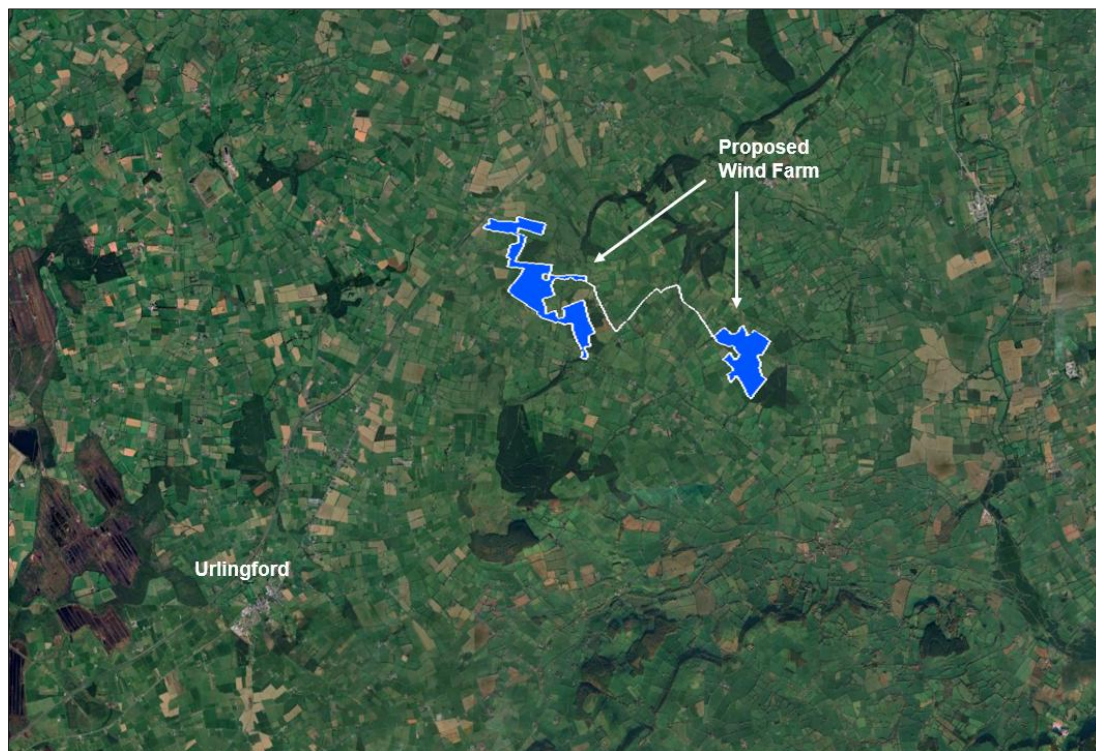


Figure 1. Study Area of the proposed Gathabawn Wind Farm development.

 <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Section 2 - Methodology

 <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

2. Introduction

In this section a brief summary of the Telecommunication Impact Study Methodology is provided.

2.1 Methodology

There are four primary stages in preparing and compiling a communication impact study:

- Telecom Operator Consultations
- Field Surveys
- Desktop Survey Network Modelling and Analysis
- Report Generation

A summary of each of these stages is provided below:

Telecom Operator Consultations

Consultations are commenced with telecom operators who are requested to raise any concerns they have regarding the impact of the proposed wind farm on their networks. The consultation process is used to assist in identifying telecoms infrastructure that could be impacted by the proposed wind farm development.

Field Surveys

Field surveys are undertaken, and the co-ordinates of communication masts are recorded. During the field surveys of the communication sites, approximations of antenna size, bearing and height are made for the antennas installed on each of the masts surveyed.

Desktop Survey and Analysis

A desktop survey is carried out to plot the wind turbines in a radio planning tool. The radio planning tool uses GIS and terrain mapping databases to enable accurate modelling. A selection of mast-site coordinates is then obtained and inputs from various operators \ service providers are converted from Irish National Grid (Easting and Northing in meters) to degrees minutes seconds format and then imported into the radio planning tool.

This provides a means of graphically showing telecommunications sites in the vicinity relative to the proposed wind farm site. Figure 2 below shows the proposed wind farm site plotted in the radio planning tool.

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

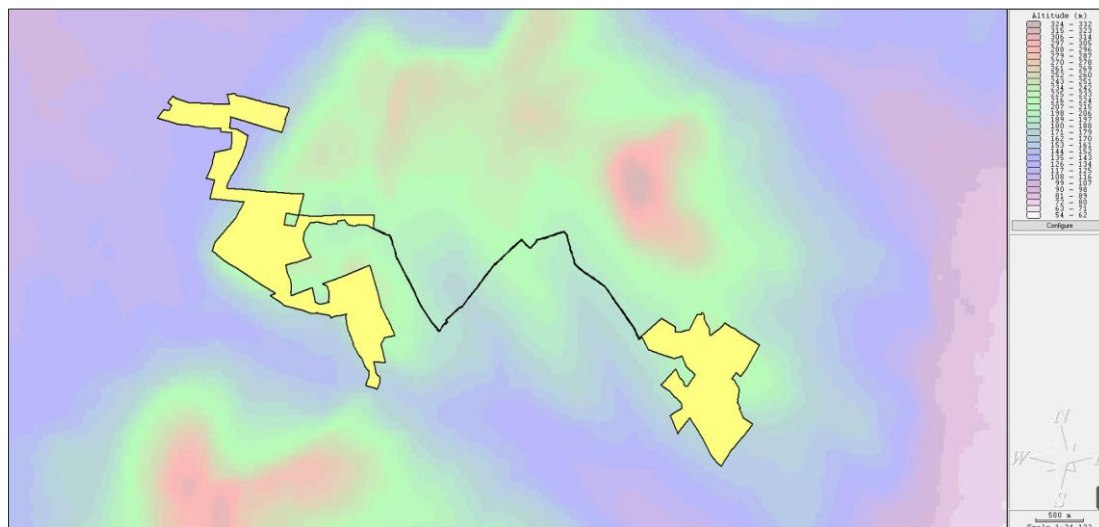


Figure 2. Proposed Gathabawn Wind Farm Site plotted in Radio Planning Software*

The findings from the consultations and field surveys are collated and the communications networks requiring further analysis are identified. Network modeling is used to assess the impact of the turbines on the communications networks.

The results from the network modeling are used to determine if mitigation measures are required. Figure 3 below shows an example of a microwave radio link that crosses over/near the wind farm site modelled in radio planning software.

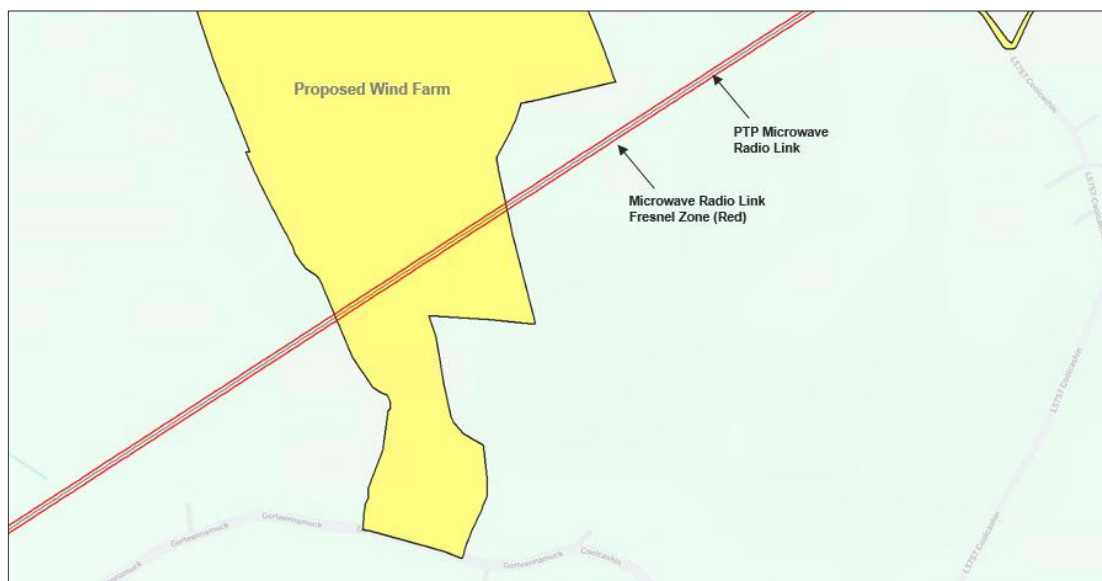


Figure 3. Example of microwave radio link crossing over/near the proposed Gathabawn Wind Farm Site modelled in radio planning software.*

Report Generation

The final stage of the communications impact study process is to collate the data and present the findings & analysis into a report for submission.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

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	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Section 3 - Telecom Operator Consultations

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

3. Introduction

In this section the consultation process undertaken with telecom operators is described. The response received from each operator is also provided.

3.1 Telecom Operator Consultations

Consultations beginning in January 2026 were undertaken with telecom network operators to assist in identifying telecommunication infrastructure that could be impacted by the proposed Gathabawn Wind Farm. The operators were requested to raise any concerns they may have regarding impacts to their networks due to the proposed development. Table 3 lists the telecom operators contacted, and the issues raised by the operators. The responses received from each of the Telecom Operators are provided in Sections 3.1.1 to 3.1.16.

ID	Operator	Response (Yes/No)	Issues raised by Operator \ Observations.
1	2RN	Yes	2RN have stated that they have one PTP UHF radio link in the vicinity of the proposed development. 2RN have also requested that a protocol document be signed should the wind farm go ahead (regarding the TV broadcast service in the area).
2	An Garda Síochána	Yes	No issues.
3	Coimisiún na Meán	Yes	No issues.
4	BT Ireland	Yes	No issues.
5	CIE/Irish Rail	Yes	CIE have stated that the proposed Gathabawn Wind Farm would be located within the “ <i>Coordination Zone</i> ” of their GSM-R network (Mobile Network for Railways).
6	Eir	Yes	No issues
7	Enet	Yes	No issues
8	ESB Networks	Yes	To date, ESB Networks have not provided the requested information regarding any radio links they may have in the vicinity of the proposed Gathabawn Wind Farm development. A response was received in Hune 2026 however the requested information for a detailed technical analysis was not provided
9	Imagine Broadband	Yes	No issues
10	Uisce Éireann	Yes	No issues.
11	Kilkenny Co. Council	No	No response. (No response expected.)
12	Tetra Ireland	Yes	No issues.
13	Three Ireland	Yes	Three Ireland raised a concern regarding two PTP microwave radio links.
14	Viatel	No	No response.
15	Virgin Media	Yes	No issues.
16	Vodafone	Yes	Vodafone raised a concern regarding three PTP microwave radio links.

Table 3. Telecom Operators Consulted

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

3.1.1 2RN Response to Consultations

2RN provided the following email response to consultations:

"We have an off air DTT path crossing to the south of your site, its far enough away from your turbines for it not to be affected."

Link Name / ID	Band MHz\GHz	Link Length	Site A			Site B		
			Lat	Long	Ant Height	Lat	Long	Ant Height
KDF-MTL UHF	554MHz	80.1km	52.835207	-7.909991	492 AMSL	52.617839	-6.779540	793 AMSL

"There is also a risk of interference to broadcast services from our site at Kilduff and possibly Mt. Leinster. We would therefore ask that a protocol be signed between the developer and 2rn should the site go ahead."

3.1.2 An Garda Síochána Response to Consultations

The Gardaí provided the following email response to consultations:

"No issues here, closest sites are ballyspellan and freshford and are over 2km away."

3.1.3 Coimisiún na Meán Response to Consultations

Coimisiún na Meán provided the following email response to consultations:

"Coimisiún na Meán does not perform an in-depth analysis of the effect of wind turbines on FM networks. However, we are not aware of any issues from existing windfarms into existing FM networks. Also, the proposed windfarms are not located close to any existing or planned FM transmission sites."

3.1.4 BT Ireland Response to Consultations

BT provided the following email response to consultations:

"BT no longer have a radio microwave network."

3.1.5 CIE Response to Consultations

CIE provided the following email response to consultations:

"The proposed site lies within the GSM-R (Mobile Network for Railways) coordination zone. Please see below::

From a study carried out by the ANFR (Agence Nationale des Frequences in France), the output calls for 2 main recommendations by defining 2 main zones as follows:

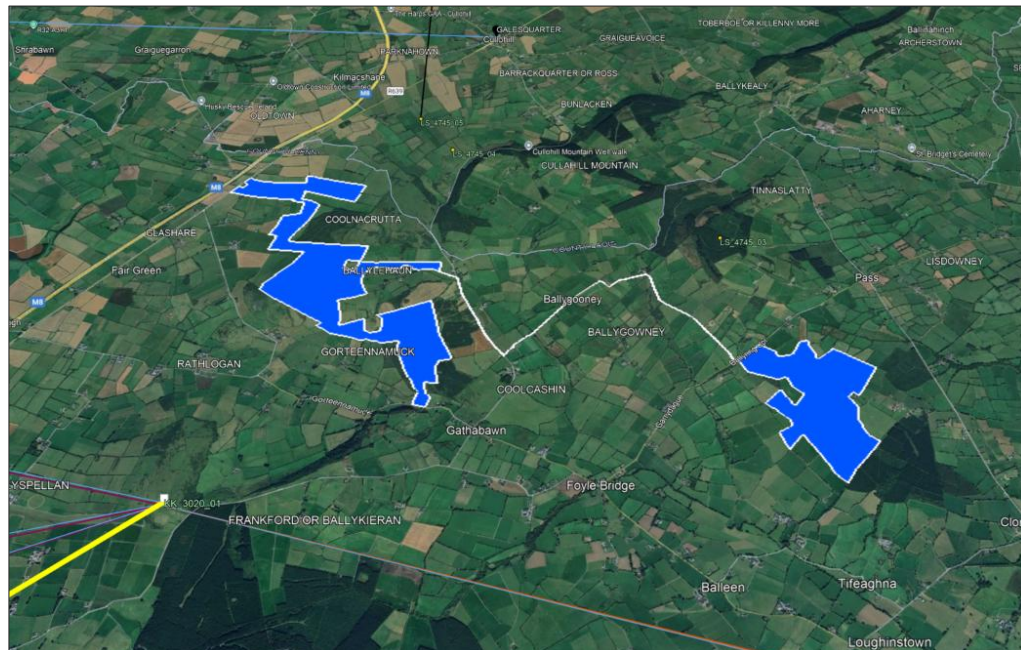
- 1 - Exclusion zone: wind farm not less than 5 Km from antenna*
- 2 - Coordination zone: 5 Km < wind farm < 30 Km: this area, coordination between operators is required to fix any issue and impact on the signal propagation."*

3.1.6 Eir Response to Consultations

Eir provided the following email response to consultations:

"We have no transmission links within the proposed area at Gathabawn and it has no risk to the network for Eir Mobile or the Eir fixed network."

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26



3.1.7 Enet Response to Consultations

Enet provided the following email response to consultations:

“This won’t affect our current network.”

3.1.8 ESB Networks Response to Consultations

ESB Networks provided the following email response to consultations:

27.01.26 - Email received from ESB Networks

“I am writing to inform you that unfortunately, we have been unable to proceed with the analysis without additional information.

To move forward, we kindly request you to complete the attached proforma and provide any available GIS data if available. This information is essential for us to carry out an accurate assessment.

Please note that if the requested information is not provided, we will proceed by defining a basic exclusion zone. This will be a more conservative zone but may be reduced upon provision of detailed turbine information.

Should you have any questions or require further clarification, please do not hesitate to get in touch.”

19.02.26 - Email response from Ai Bridges Ltd to ESB Networks

“We are following up from your email below, please find included our initial request that we have sent on 13th January 2026. This is our standard form of consultation requests that we send to all Telecoms Operators.

We would be grateful if you could provide the information of the ESB links traversing the proposed development, in tabulated format using the table below.

Ai Bridges Limited has been engaged to prepare a Preliminary Telecommunications Impact Assessment for a proposed wind farm development at Gathabawn, Co. Kilkenny. The wind farm developer is in the process of finalising a design layout for the proposed wind farm as part of an environmental impact assessment study. The proposed wind farm site is located

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

approximately 10 km northeast of Urlingford, Co Kilkenny. Refer to the attached Site Location Map and KMZ file.

Ai Bridges Ltd has been commissioned to engage with all potentially affected Telecoms Operators to identify and map the telecommunications networks traversing the proposed wind farm site. Ai Bridges will then generate a Telecommunications Infrastructure Constraints Map that will be used by the wind farm developer to assist in finalising an optimal wind farm design layout for the proposed development. We would be grateful if you could provide details of your telecommunications networks in the vicinity of the proposed wind farm study area in the tabular format below.

All telecommunications microwave network links will be modelled based on Fresnel Zone clearances with set-back safety buffers as required. It would be a condition that any proposed wind turbine would not be located inside a safety buffer zone to avoid interference on any of the telecommunications networks.

We would be grateful if you could confirm that this design layout approach, as agreed on previous wind farm studies, being taken by the wind farm developer is acceptable to you.

We would be grateful if you could provide your response to the above by close of business on January 20th 2026.”

Uisce Éireann ID	Tower Reference	Link Reference	Site A					Site B				
			Lat	Long	Easting	Northing	Ant Height	Lat	Long	Easting	Northing	Ant Height

08.06.26 - Email received from ESB Networks

“I wanted to update you on this enquiry regarding Gathabawn Wind Farm Development, Co. Kilkenny from February.

Please find attached a basic exclusion zone created for the development at Gathabawn, Kilkenny. To avoid interference to our links, the development must fall outside of this zone. Please note that this message was amended, originally naming the incorrect windfarm.

Please note that this exclusion zone represents a conservative zone because we have no turbine parameters, and this could be reduced on provision of hub height and blade size and either turbine location or development boundary.

Any proposed wind turbines within the defined exclusion zone will require further detailed coordination to avoid interference and degradation of critical ESB-operated radio links. We kindly request that you re-consult with ESB once the turbine locations and dimensions are available.”

3.1.9 Imagine Broadband Response to Consultations

Imagine Broadband provided the following email response to consultations:

“Imagine are in the process of decommissioning all our microwave links. This process should be complete within 12 months.”

3.1.10 Uisce Éireann Response to Consultations

Uisce Éireann provided the following email response to consultations:

“I can confirm that UÉ have no communication links traversing the proposed development.”

3.1.11 Kilkenny County Council Response to Consultations

To date no response has been received.

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

3.1.12 Tetra Ireland Response to Consultations

Tetra Ireland provided the following email response to consultations:

"We don't anticipate any impact from the development, can you ensure it also review by eir please."

3.1.13 Three Ireland Response to Consultations

Three Ireland provided the following email response to consultations:

"We have 2 links that pass through this area. Please see details below."

Link no.	Link Ref	Freq.	Length	Site A	X	Y	Dish Height	Site B	X	Y	Dish Height
1	ML020369	26GHz	6.7km	LX0025 - Coillte - Tinnaslatty	237,901	170,892	20	KK0135 - Freshford	240,691	164,736	20
2	ML051619	26GHz	5.6km	KK0120 - Ballyspellan	233,191	167,793	20	LX0025 - Coillte - Tinnaslatty	237,901	170,892	20

3.1.14 Viatel Response to Consultations

To date no response has been received.

3.1.15 Virgin Media Response to Consultations

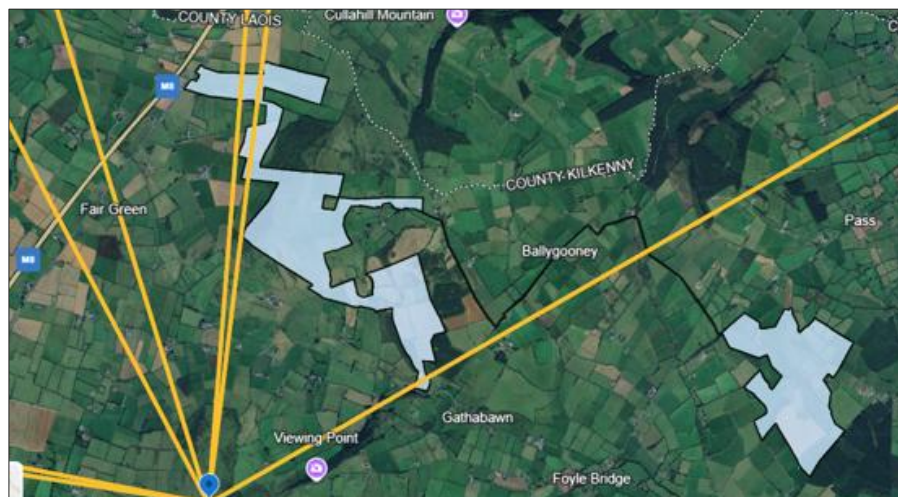
Virgin Media provided the following email response to consultations:

"Virgin Media Ireland DO NOT have any radio links in this area."

3.1.16 Vodafone Ireland Response to Consultations

Vodafone provided the following email response to consultations:

"There are three Vodafone links that pass through the proposed area. See details below. A clearance of 30m from the first Fresnel zone is desired."



Link Name / ID	Band GHz	Link Length Km	Site A			Site B		
			Northing (WGS84)	Easting (WGS84)	Ant Height m	Northing (WGS84)	Easting (WGS84)	Ant Height m
KKBAP-KK114_UG	13	16.529	52.7600598	-7.5085313	30	52.833958	-7.295978	30
KKBAP-LS560_NL	13	17.191	52.7600598	-7.5085313	30	52.914067	-7.489025	30
LS018-KKBAP_ug	18	10.693	52.8554557	-7.4897583	15	52.76006	-7.508531	15

	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Section 4 – Field Surveys

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

4. Introduction

To assess the accuracy of the network information (radio link co-ordinates, antenna heights etc.) provided by the telecom operators, field surveys of the telecom-mast sites in the vicinity of the proposed Gathabawn Wind Farm were carried out. During the field surveys, radio antennas with bearings in the direction of the wind farm were recorded.

The telecom mast-sites surveyed for this study (labelled Mast-Site A to Mast-Site H) are shown relative to the proposed Gathabawn Wind Farm site in Figure 4 below. The findings from the field surveys of the mast-sites are presented in Appendix A of this report.



Figure 4. Telecom Mast-Sites Surveyed.*

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Section 5 - Desktop Survey Analysis

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

5. Introduction

Based on the findings of the consultation process, there are three Telecom Operators with a network in the vicinity of the proposed development that requires a detailed technical analysis:

- 2RN Network
- Three Ireland Network
- Vodafone Network
- CIE Network
- ESBN Network
- Wireless Internet Service Providers

Section 5.1 to Section 5.6 below outline the desktop survey analysis findings* for the Telecom Operator Networks listed above.

5.1 2RN Network Analysis

The 2RN network in the vicinity of the proposed Gathabawn Wind Farm consists of one Point-to-Point (PTP) UHF radio link. The radio link is listed below in Table 4 and a Plan View of the 2RN network is shown in Figure 5.

Link ID	Link Description
2RN_L1	PTP UHF radio link from Kilduff to Mount Leinster

Table 4. 2RN Radio Links requiring Analysis



Figure 5. 2RN Radio Network – Plan View**

* The Desktop Survey Analysis findings are subject to accuracy of the information (GPS co-ordinates, turbine dimensions, etc.) provided to Ai Bridges by the telecommunications operators.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Figure 6 below shows a close-up view of the 2RN UHF radio link relative to the proposed wind turbines. Desktop survey analysis indicates that the PTP radio link is over 2 km from the nearest of the proposed turbines. At this distance there will be no impact to the radio link due to the wind farm development.

Table 5 below provides a brief summary of the network analysis for the 2RN network in the vicinity of the proposed Gathabawn Wind Farm.

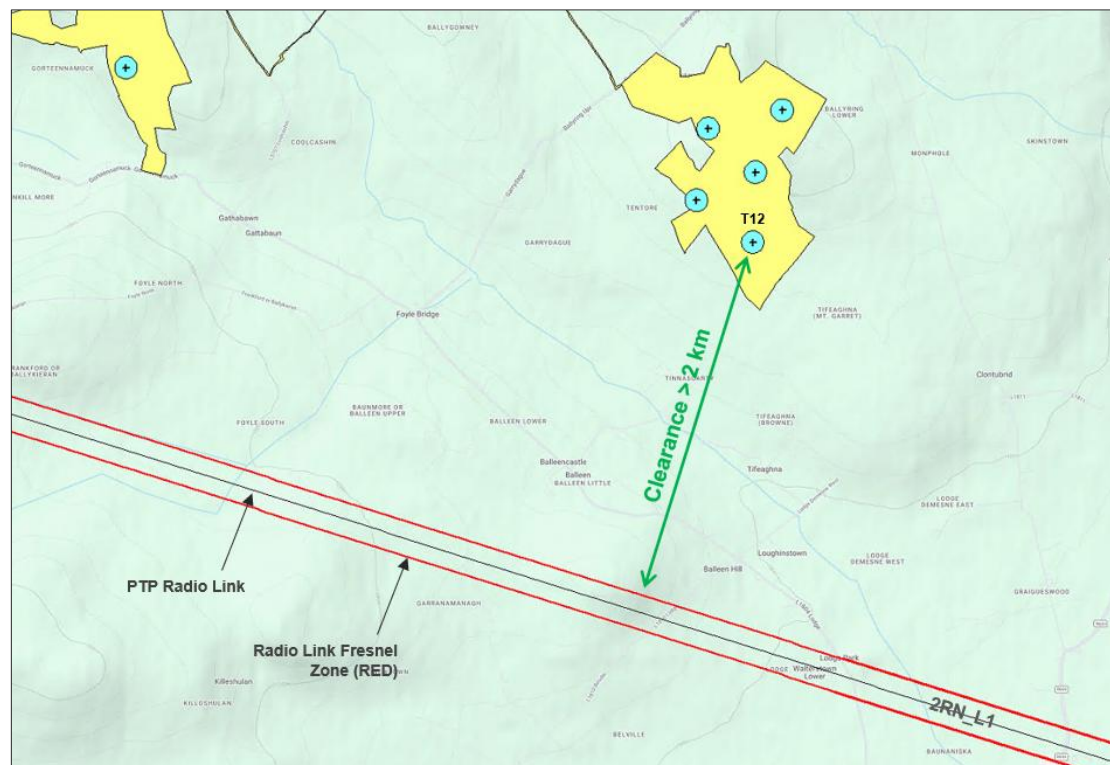


Figure 6. 2RN Network – Close-up Plan View.*

Link ID	Link Description	Nearest Turbine	Fresnel Zone (0.6F1) Clearance	Wind Farm Impacts / Observations
2RN_L1	Kilduff to Mt Leinster	T12	> 2 km	No impacts

Table 5. 2RN Network – Analysis Summary

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

5.2 Three Ireland Network Analysis

The Three Ireland network in the vicinity of the proposed Gathabawn Wind Farm consists of two Point-to-Point (PTP) microwave radio links. The radio links are listed below in Table 6 and a Plan View of the Three Ireland network is shown in Figure 7.

Link ID	Link Description
3IRL_L1	PTP microwave radio link from Tinnaslatty to Freshford
3IRL_L2	PTP microwave radio link from Ballyspellan to Tinnaslatty

Table 6. Three Ireland Radio Links requiring Analysis

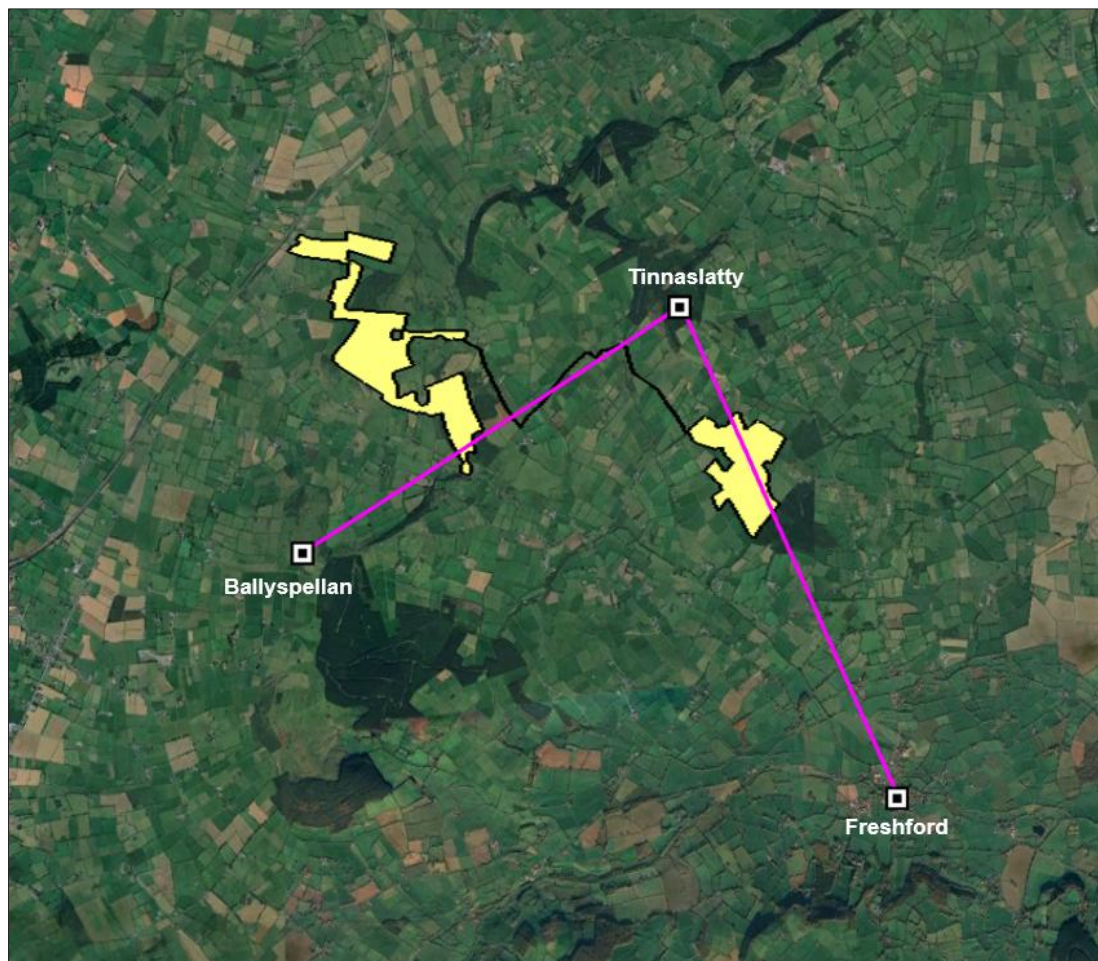


Figure 7. Three Ireland Radio Network – Plan View*

Figure 8 below shows a close-up Plan View of the Three Ireland microwave radio links relative to the proposed wind turbines. The 2D Plan View indicates that one of the radio links (3IRL_L1) could be impacted by Turbine T10.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

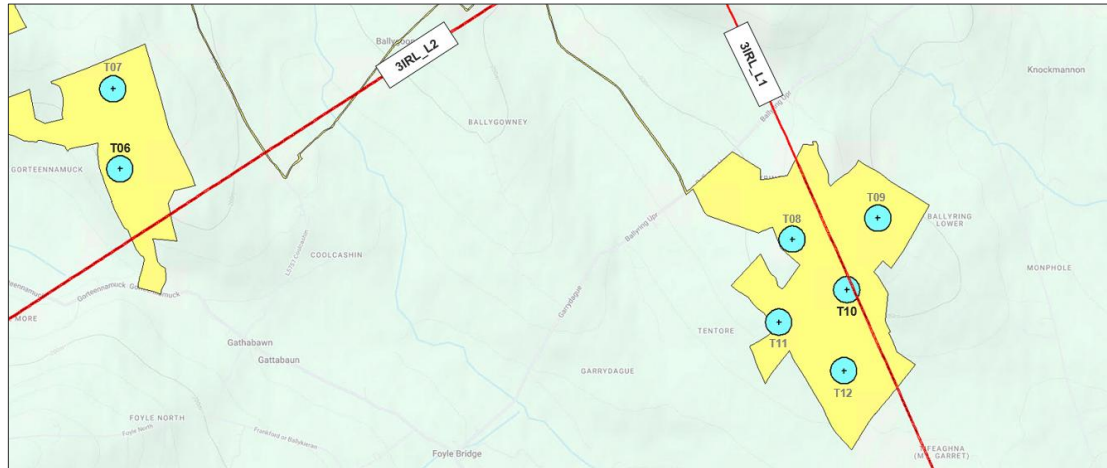


Figure 8. Three Ireland Network – Close-up Plan View.

To further assess the potential impact of the proposed development, the turbines and the radio links have been modelled in 3D, as shown below in Figure 9. The Clearance Distances between the Fresnel Zone (F1) of each radio link and the blade-tip of the nearest turbine(s) have also been calculated. The results of the 3D analysis indicate that the radio link between Tinnaslatty and Freshford (3IRL_L1) would be obstructed by Turbine T10.

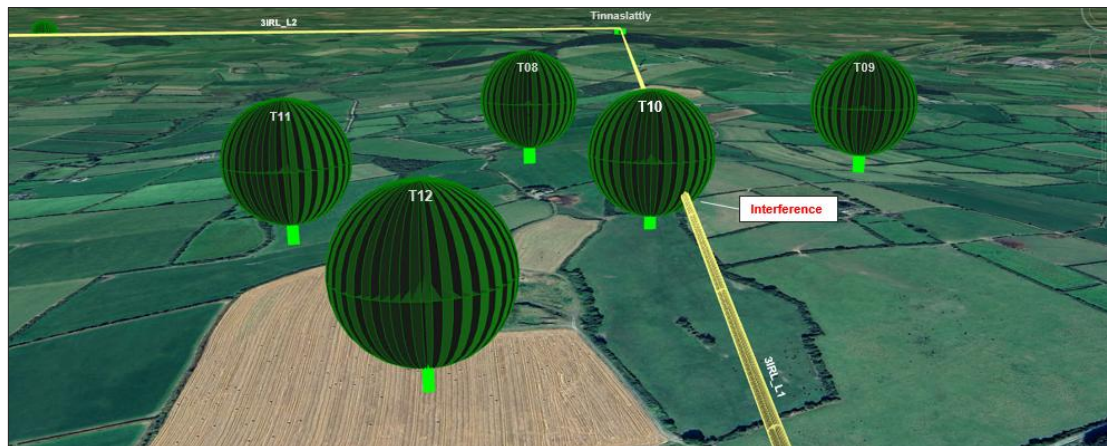


Figure 9. Three Ireland Network – 3D View.

Table 7 below provides a brief summary of the network analysis for the Three Ireland network in the vicinity of the proposed Gathabawn Wind Farm.

Radio Link ID	Link Description	Nearest Turbine	Fresnel Zone (F1) Clearance / Interference	Observations
3IRL_L1	Tinnaslatty to Freshford	T10	- 9.1 m (Infringement into Fresnel Zone)	Interference Impact (Mitigation measures required)
3IRL_L2	Ballyspellan to Tinnaslatty	T06	> 200 m	No impacts

Table 7. Three Ireland Network – Analysis Summary

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

5.3 Vodafone Network Analysis

The Vodafone network in the vicinity of the proposed Gathabawn Wind Farm consists of three Point-to-Point (PTP) microwave radio links. The radio links are listed below in Table 8 and a Plan View of the Vodafone network is shown in Figure 9.

Link ID	Link Description
VF_L1	PTP microwave radio link from Ballyspellan to Ballyouskill
VF_L2	PTP microwave radio link from Ballyspellan to Springfield
VF_L3	PTP microwave radio link from Oldglass to Ballyspellan

Table 8. Vodafone Radio Links requiring Analysis

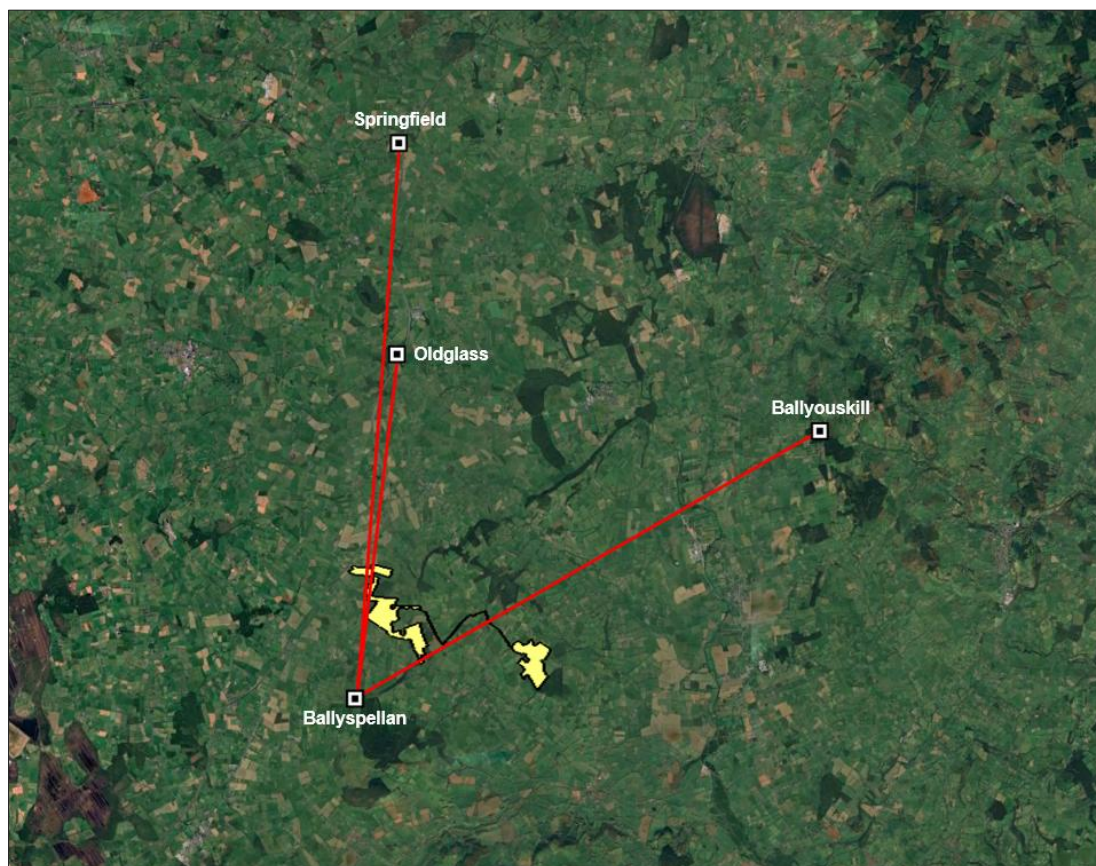


Figure 10. Vodafone Radio Network – Plan View*

Figure 11 below shows a close-up Plan View of the Vodafone microwave radio links relative to the proposed wind turbines. The 2D Plan View indicates that one of the radio links (VF_L3) could be impacted by Turbine T02.

To further assess the potential impacts, the radio link has been modelled in 3-dimensions (3D) and the Clearance Distances between the radio Fresnel Zone (F1) and the blade-tip of turbine T02 has been calculated. A 3D view of the microwave radio links relative to the proposed turbines is shown below in Figure 12.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

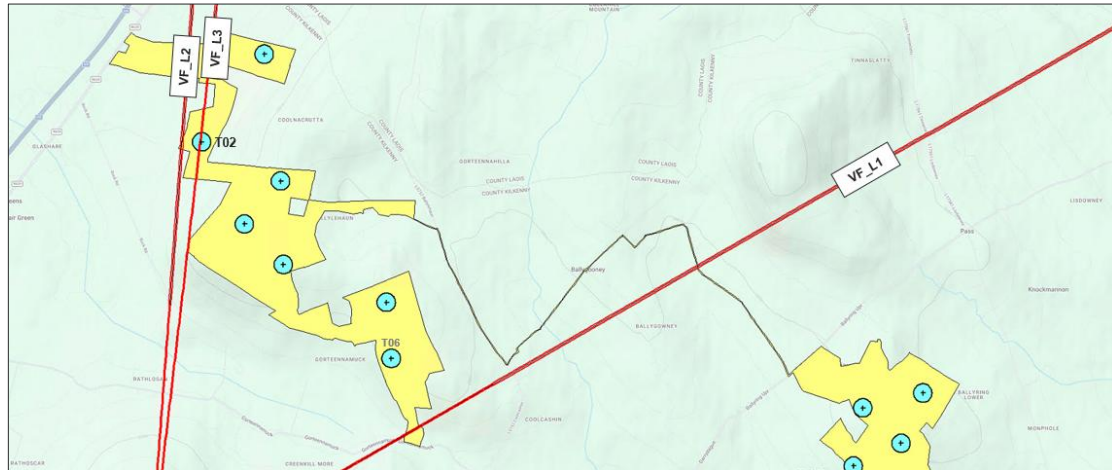


Figure 11. Vodafone Network – Close-up Plan View.*

To further assess the potential impact of the proposed development, the turbines and the radio links have been modelled in 3D, as shown below in Figure 12. The Clearance Distances between the Fresnel Zone (F1) of each radio link and the blade-tip of the nearest turbine(s) have also been calculated. The results of the 3D analysis indicate that the radio link between Oldglass and Ballyspellan (VF_L3) would be obstructed by Turbine T02.

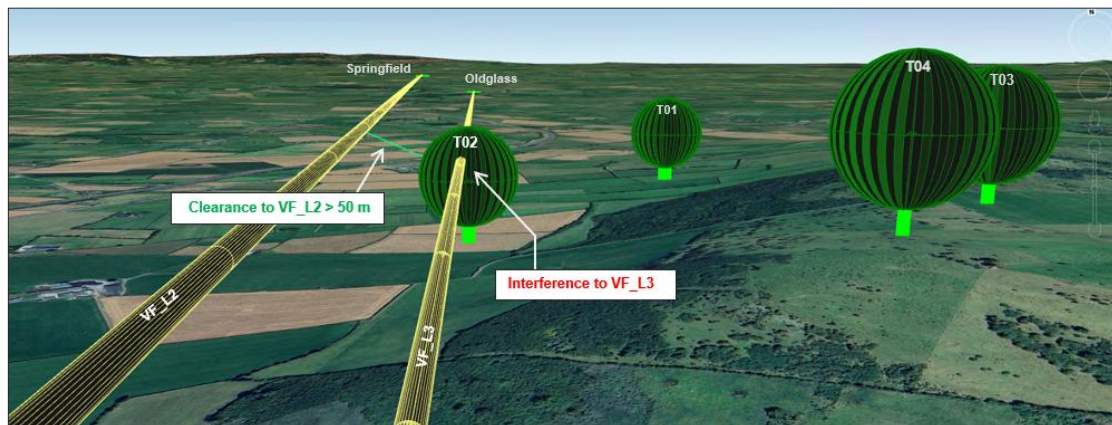


Figure 12. Vodafone Network – 3D View.*

Table 9 below provides a brief summary of the network analysis for the Vodafone network in the vicinity of the proposed Gathabawn Wind Farm.

Radio Link ID	Link Description	Nearest Turbine	Fresnel Zone (F1) Clearance / Interference	Observations
VF_L1	Ballyspellan to Ballyousskill	T06	> 400 m	No impacts
VF_L2	Ballyspellan to Springfield	T02	> 50 m	No impacts
VF_L3	Oldglass to Ballyspellan	T02	- 57.2 m (Infringement into Fresnel Zone)	Interference Impact (Mitigation measures required)

Table 9. Vodafone Network – Analysis Summary

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

5.4 CIE Network Analysis

Throughout Ireland CIE operate GSM-Rail (GSM-R) radio networks. The purpose of these GSM-R networks is to provide service coverage along CIE's rail tracks. The GSM-R network is used by rail operators for communication between trains, signalers and rail control centres.

Figure 13 below shows an example of a GSM-R Train Radio installation in which directional sector antennas are used. The antennas are aligned in the direction of the rail line to provide targeted coverage and range along the rail line.



Figure 13. Example of GSM-R Train Radio installation using Directional Sector Antennas

There is a CIE railway to the east of the proposed wind farm development, as shown below in Figure 14 (i.e. the Portlaoise to Thurles rail line). However, it should be noted that GSM-R Train Radio, which is an international standard used by rail operators, operates in the UHF band of frequencies. Obstacles generally do not interfere with radio signals in this band of

frequencies unless the obstacle (e.g. wind turbine) is very near to the transmitting antenna (e.g. less than 500m) when it can inhibit the radio signal's ability to "launch" correctly.

Commercial mobile cellular operators (Eir, Vodafone and Three Ireland) service operators do not raise any concerns regarding GSM access networks unless proposed turbines are very near their transmitters (e.g. less than 500m).

	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

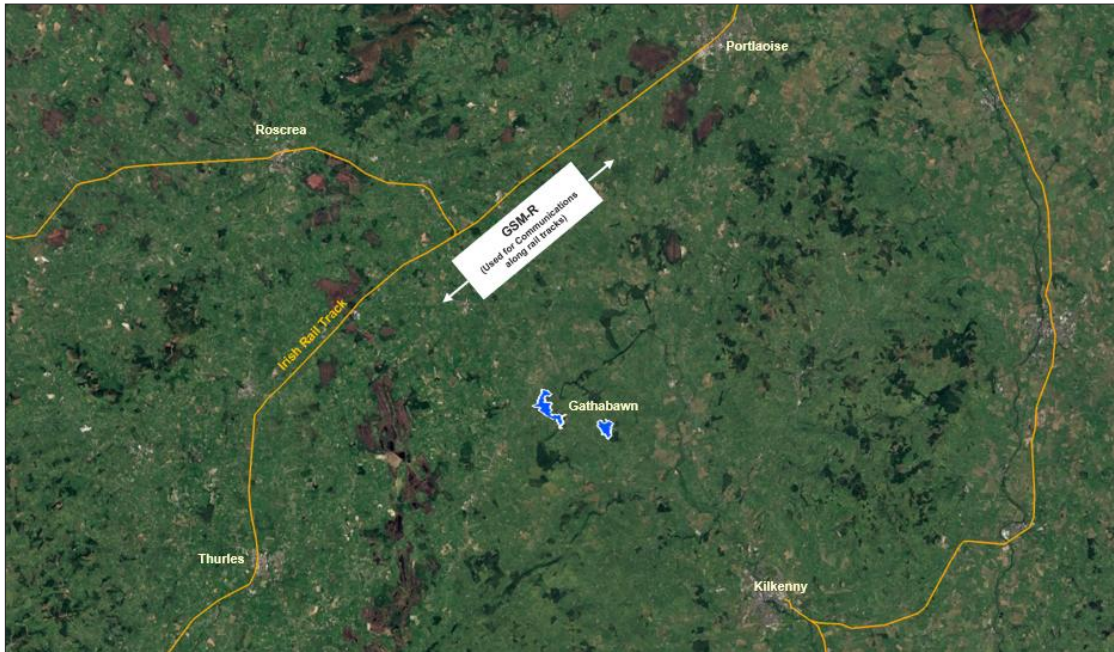


Figure 14. CIE Radio Network – Plan View

A Close-up Plan View of the Irish Rail line is shown in Figure 9. The figure illustrates that all turbines at the proposed development would be over 13 km from any GSM-R transmitter located along the rail line. At this distance it is highly unlikely that there would be any impact to the GSM-R network.



Figure 15. CIE Radio Network – Close-up Plan View

It should also be noted that there are numerous examples of existing wind farms that are less than 5 km to Irish Rail lines. These operational wind farms in the Republic of Ireland (e.g. Ballymartin, Monaincha, Richfield, Cloontooa, etc.) appear to have had no detrimental impact to the Irish Rail communications network. Figure 16 below shows wind turbines at Cloontooa wind farm which are less than 1 km from the adjacent Irish Rail track.

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26



Figure 16. Cloontooa wind turbines shown relative to Irish Rail track

Table 10 below provides a brief summary of the network analysis for the Irish Rail network in the vicinity of the proposed wind farm.

Network Type	Comments	Wind Farm Impacts
GSM-R Train Radio	Turbines at the proposed development would be over 6.5 km from any GSM-R basestation located along the nearest rail line. At this distance it is highly unlikely that there would be any discernible impact on the Irish Rail GSM-R communications network. It should also be noted that there are existing wind farms throughout Ireland with turbines that are less than 5 km from Irish rail tracks. These wind farms appear to have had no impact to the Irish Rail communications network.	No impacts.

Table 10. CIE Network – Analysis Summary

 <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

5.5 ESB Network Analysis

To date, ESB Networks have not provided any of the information requested during consultations that would be required to undertake a detailed analysis of their radio link network (A-End, B-End coordinates, frequency, antenna installation heights, etc).

Should the wind farm be permitted, the developer would engage further with ESB Networks, to ascertain all relevant details regarding their radio link(s) network, and to agree mitigation measures, should any be required.

	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

5.6 Wireless Internet Service Providers Analysis

A number of unlicensed radio link equipment were identified on mast structures, details of which were not available to the ComReg site viewer database. The equipment use case was not identifiable and no details of the mast structure operators was available at the site.

Should there be any report of any potential interference from the proposed development during an operational phase of the wind farm, the developer is committed to working with the operator of these unlicensed wireless networks to remediate any impacts caused by the proposed turbines.

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

6. Mitigation Measures

Sections 6.1 and Section 6.2 that follow, describe the mitigation measures available to the wind farm developer to offset the potential impact of the proposed turbine layout on the Three Ireland and Vodafone Networks.

6.1 Mitigation Measure Solutions – Three Ireland Network

To offset the potential impact of T10 on the Three Ireland radio link from Tinnaslatty to Freshford the following mitigation solutions are available:

Option 1 – Relay the Three Ireland radio link via an existing Telecoms Mast.

The mitigation measure is described in Sections 6.1.1 that follows.

6.1.1 Option 1 - Relay the Three Ireland radio link via an existing Telecoms Mast.

An option to mitigate potential impact of T10 on the radio link between Tinnaslatty and Freshford would be to use an existing telecoms mast to relay the radio connection. Figure 17 below illustrates how the existing telecoms mast-site at Kyleballynamoe could be used to relay a radio link between Tinnaslatty and Freshford.

Note: A lookup of telecommunications mast-site databases indicates that Three Ireland have an existing presence at the Kyleballynamoe mast-site.

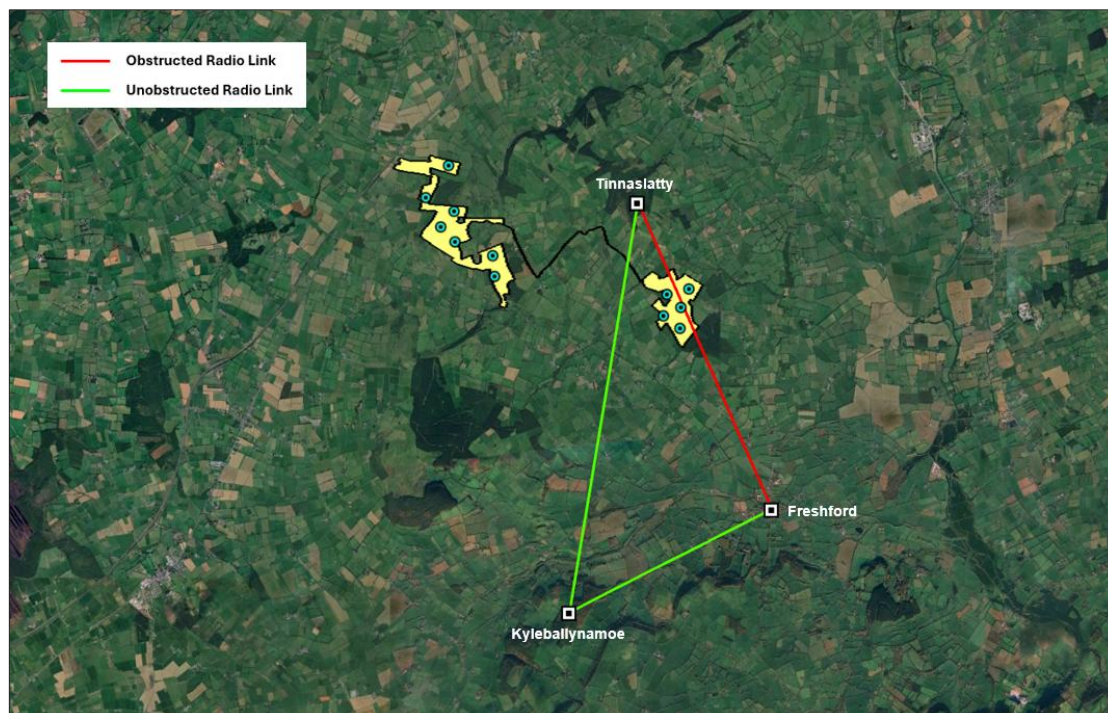


Figure 17. Example of how an existing telecoms mast could be used relay the radio link between Tinnaslatty and Freshford.*

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

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	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

To determine if the telecoms mast at Kyleballynamoe could be used to facilitate viable connection between Tinnaslatty and Freshford, radio link Path Profiles have been generated.

Radio Link Budgets were also carried out to determine if the proposed radio links would meet the Radio Link Availability Criteria required by ComReg for radio licensing. The Radio Link Path Profiles and Radio Link Budgets are based on the following ITU-R Recommendations:

- ITU-R P.525-2
- ITU-R P.526-11
- ITU-R P.676-8

The radio Path Profiles are shown below in Section 6.1.1.1 and Section 6.1.1.2. The Radio Link Budgets can be found in Appendix B.

6.1.1.1 Path Profile – Tinnaslatty to Kyleballynamoe

The radio link path profile shows clear Line-of-Sight (LOS) and the link budget results would pass the radio availability criteria. The radio link budget for this link is provided in Appendix B, Section B.1.

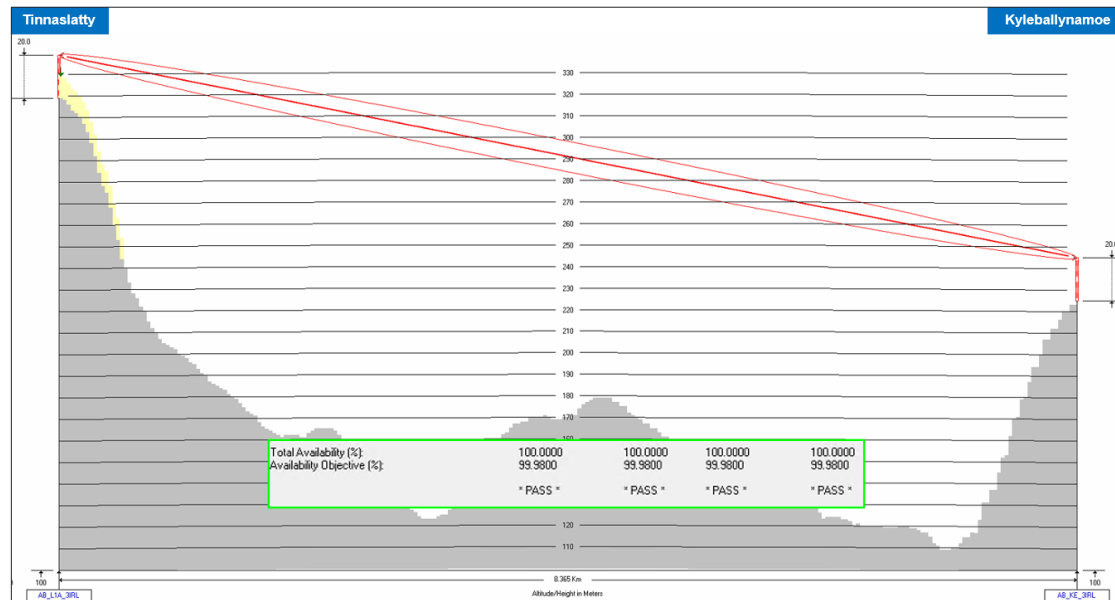


Figure 18. Path Profile - Tinnaslatty to Kyleballynamoe

6.1.1.2 Path Profile – Kyleballynamoe to Freshford

The radio link path profile shows clear Line-of-Sight (LOS) and the link budget results would pass the radio availability criteria. The radio link budget for this link is provided in Appendix B, Section B.2.

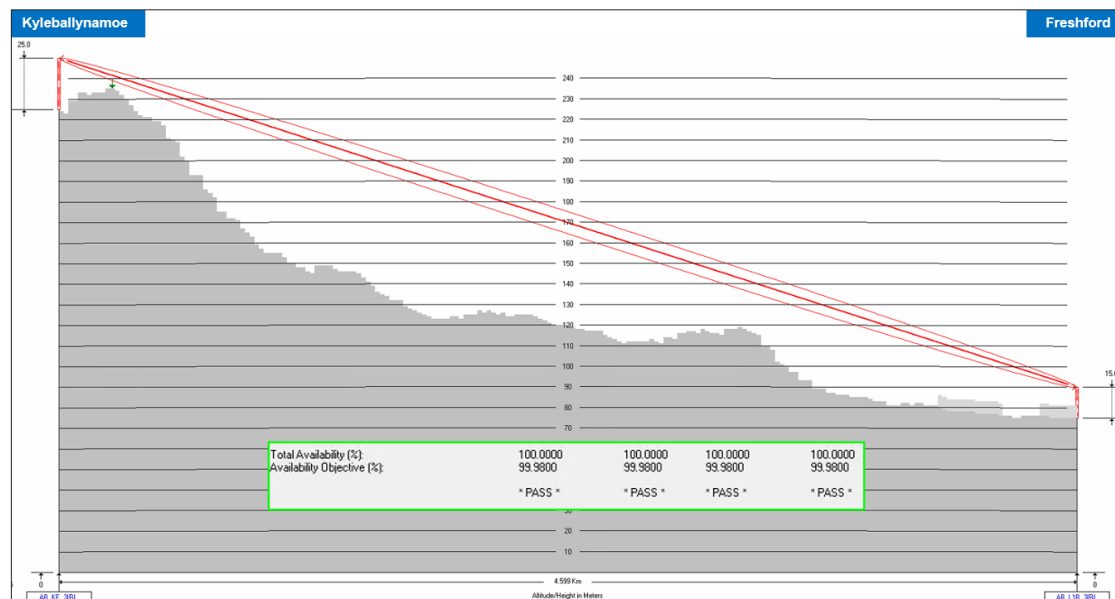


Figure 19. Path Profile - Kyleballynamoe to Freshford

	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

6.2 Mitigation Measure Solutions – Vodafone Network

To offset the potential impact of T02 on the Vodafone radio link from Oldglass to Ballyspellan, the following mitigation solutions are available:

Option 1 – Relay the Vodafone radio link via an existing Telecoms Mast.

The mitigation measure is described in Sections 6.2.1 that follows.

6.2.1 Option 1 - Relay the Vodafone radio link via an existing Telecoms Mast.

An option to mitigate the impact on the radio link between Oldglass and Ballyspellan would be to use an existing telecoms mast to relay that radio link. Figure 20 below illustrates how the existing telecoms mast-site at Ballyouskill could be used to relay a radio link between Oldglass and Ballyspellan.

Note: A lookup of telecommunications mast-site databases indicates that Vodafone have an existing presence at the Ballyouskill mast-site.

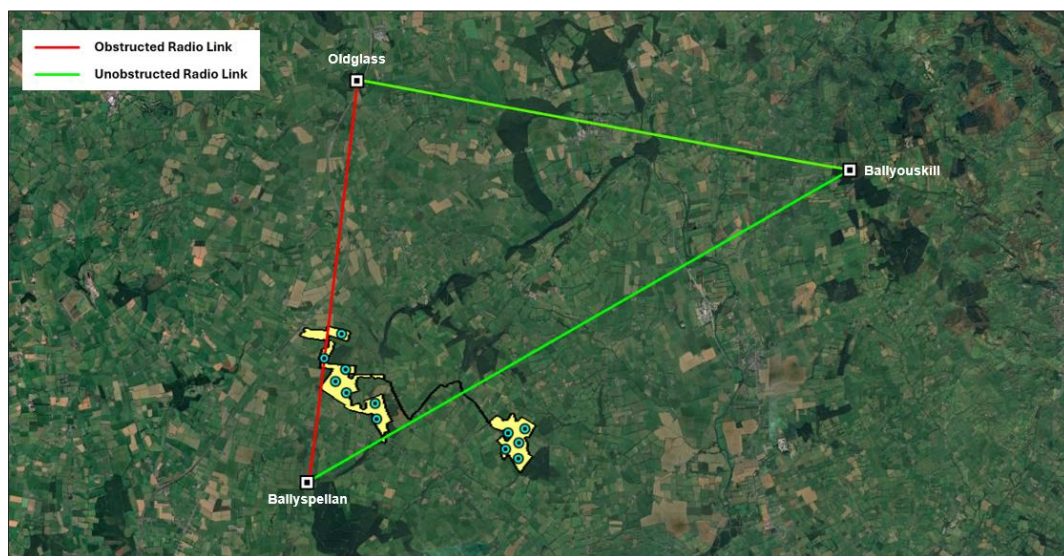


Figure 20. Example of how an existing telecoms mast could be used relay the radio link between Oldglass and Ballyspellan.*

To determine if the telecoms mast at Ballyouskill could be used to facilitate viable connection between Oldglass and Ballyspellan, radio link Path Profiles have been generated.

Radio Link Budgets were also carried out to determine if the proposed radio links would meet the Radio Link Availability Criteria required by ComReg for radio licensing. The Radio Link Path Profiles and Radio Link Budgets are based on the following ITU-R Recommendations:

- ITU-R P.525-2
- ITU-R P.526-11
- ITU-R P.676-8

The radio Path Profiles are shown below in Section 6.2.1.1 and Section 6.2.1.2. The Radio Link Budgets can be found in Appendix B.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

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	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

6.2.1.1 Path Profile – Oldglass to Ballyouskill

The radio link path profile shows clear Line-of-Sight (LOS) and the link budget results would pass the radio availability criteria. The radio link budget for this link is provided in Appendix B, Section B.3.

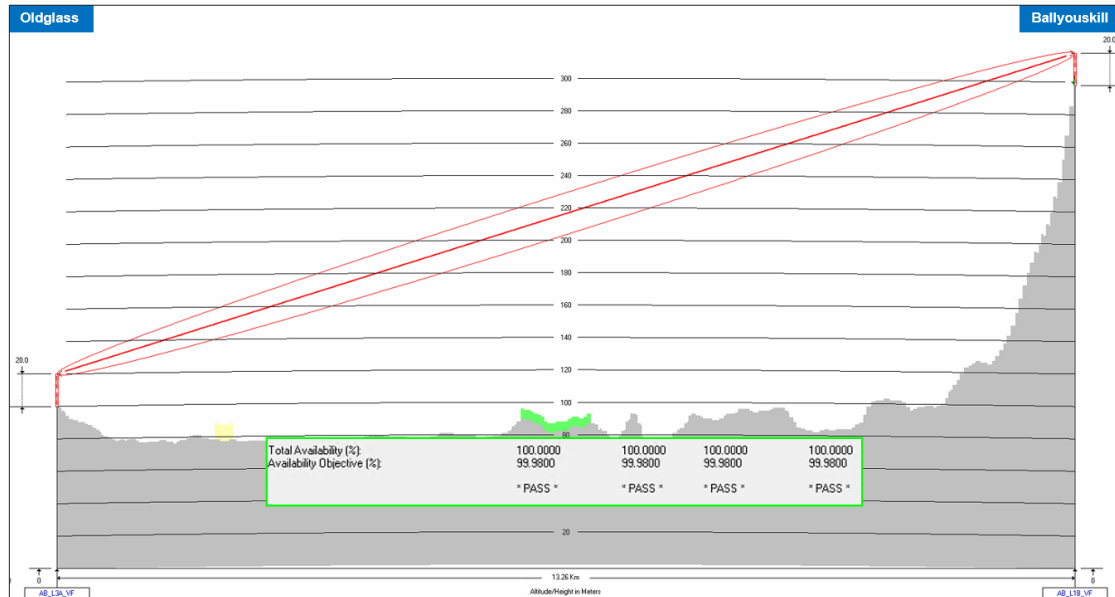


Figure 21. Path Profile - Oldglass to Ballyouskill

6.2.1.2 Path Profile – Ballyouskill to Ballyspellan

The radio link path profile shows clear Line-of-Sight (LOS) and the link budget results would pass the radio availability criteria. The radio link budget for this link is provided in Appendix B, Section B.4.

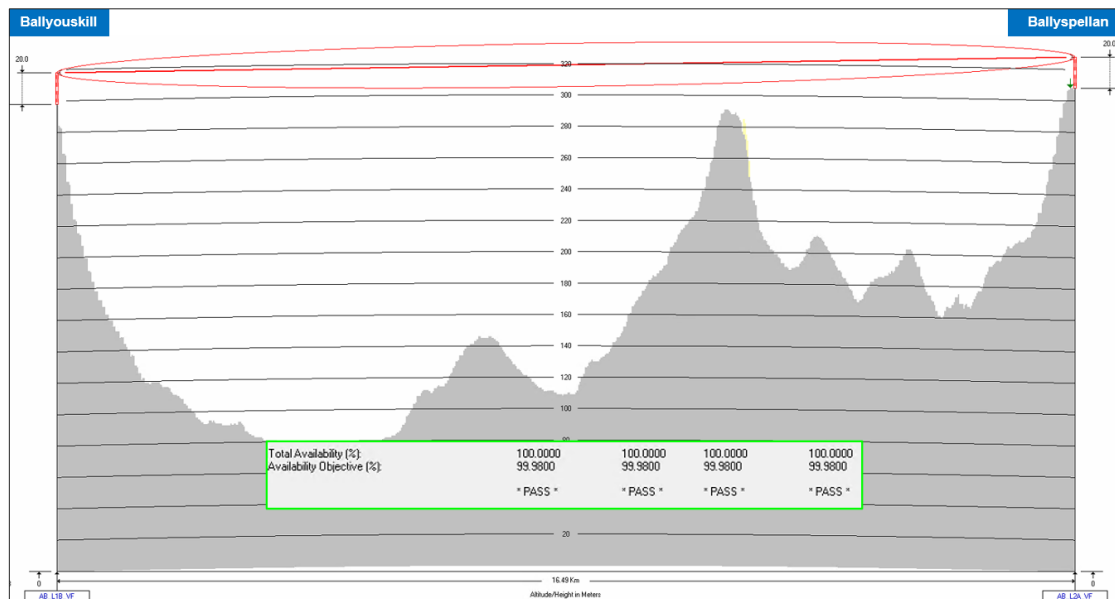


Figure 22. Path Profile - Ballyouskill to Ballyspellan

	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Section 6 - Conclusions

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

7. Conclusions

From the findings made in this report the following conclusions have been made:

- Results from the telecom operator consultations and desktop survey analysis indicate that there are six radio links in the vicinity of the proposed Gathabawn Wind Farm site. (Ref. Table 11).
- Desktop analysis (2D and 3D) indicate that Turbine T10 would obstruct the radio path of the Three Ireland PTP microwave radio link between Tinnaslatty and Freshford (3IRL_L1).
- Desktop analysis (2D and 3D) indicate that Turbine T02 would obstruct the radio path of the Vodafone PTP microwave radio link between Oldglass and Ballyspellan (VF_L3).
- Network analysis confirms that the 2RN PTP radio link between Kilduff and Mt Leinster will not be impacted by the proposed Gathabawn Wind Farm. However, 2RN have requested that if the wind farm goes ahead, a protocol document should be signed regarding the TV broadcast service in the area.

Telecom Operator	Radio Link ID	Radio Link Description	Observations	Possible Mitigation Measure(s)
2RN	2RN_L1	Kilduff to Mt Leinster	No impacts	N.A.
Three Ireland	3IRL_L1	Tinnaslatty to Freshford	Interference Impact (Radio Link Fresnel Zone obstructed by T10)	Relay via an Existing Three Ireland Mast-site (e.g. Kyleballynamoe).
	3IRL_L2	Ballyspellan to Tinnaslatty	No impacts	N.A.
Vodafone	VF_L1	Ballyspellan to Ballyouskill	No impacts	N.A..
	VF_L2	Ballyspellan to Springfield	No impacts	N.A..
	VF_L3	Oldglass to Ballyspellan	Interference Impact (Radio Link Fresnel Zone obstructed by T02)	Relay via an Existing Vodafone Mast-site (e.g. Ballyouskill).

Table 11. Radio Links in vicinity of the proposed Gathabawn Wind Farm development.

- Figure 23 has been provided to illustrate the telecommunications link(s) that cross over/near the proposed Gathabawn Wind Farm site.

	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26



Figure 23. Radio Links in vicinity of proposed Gathabawn Wind Farm development.*

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	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

APPENDIX A – Field Survey Findings

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Appendix A – Field Survey Findings

The telecom mast-sites surveyed for this Telecoms Impact Study are shown relative to the proposed wind farm site in Figure 24 below.



Figure 24. Telecom Mast-Sites shown relative to proposed Gathabawn Wind Farm.*

The findings from the field surveys of each of the mast-sites are presented below.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in January 2026. While there have been some minor changes to the proposed turbine layout and site boundary since January 2026, these changes do not have any significant impacts to the overall findings of this report.*

AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site A (Kilduff)

Telecommunications Mast-Site A is located on Kilduff Mountain, Co. Tipperary and is approximately 27 km northwest of the proposed Gathabawn Wind Farm development. A photo of the mast at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 12.



Figure 25. Mast-Site A

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast A	2RN

Table 12. Field Survey Summary – Mast-Site A

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site B (Springfield)

Telecommunications Mast-Site B is located in the townland of Springfield, Co. Laois and is approximately 13 km north of the proposed Gathabawn Wind Farm. A photo of the mast-structure at this location is shown below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 13.



Figure 26. Mast-Site B

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast B	Vodafone

Table 13. Field Survey Summary – Mast-Site B

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site C (Oldglass)

Telecommunications Mast-Site C is located in the townland of Oldglass, Co. Laois and is approximately 7 km north of the proposed Gathabawn Wind Farm. A photo of the mast-structure at this location is shown below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 14.



Figure 27. Mast-Site C

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast C	Vodafone

Table 14. Field Survey Summary – Mast-Site C

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site D (Ballyouskill)

Telecommunications Mast-Site D is located in the townland of Ballyouskill, Co. Kilkenny and is approximately 11 km northeast of the proposed Gathabawn Wind Farm. A photo of the mast-structure at this location is shown below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 15.



Figure 28. Mast-Site D

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast D	Vodafone

Table 15. Field Survey Summary – Mast-Site D

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site E (Tinnaslatty)

Telecommunications Mast-Site E is located in the townland of Tinnaslatty, Co. Kilkenny and is located within 2 km of the proposed Gathabawn Wind Farm development. Access into this mast-site was not possible on the day of survey; however, the mast-structure at this site can be seen in the aerial view shown in the figure below.

The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 16.



Figure 29. Mast-Site E

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast E	Three Ireland

Table 16. Field Survey Summary – Mast-Site E

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site F (Ballyspellan)

Telecommunications Mast-Site F is located in the townland of Ballyspellan, Co. Kilkenny and is approximately 2 km west of the proposed development site. A photo of the mast-structures at this location is shown below.

The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 17.



Figure 30. Mast-Site F

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast F1	Three Ireland
Mast F2	Vodafone

Table 17. Field Survey Summary – Mast-Site F

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Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site G (Freshford)

Telecommunications Mast-Site G is located in the town of Freshford, Co. Kilkenny and is approximately 4 km southeast of the proposed Gathabawn Wind Farm. A photo of the mast-structure at this location is shown below.

The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 18.



Figure 31. Mast-Site G

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast G	Three Ireland

Table 18. Field Survey Summary – Mast-Site G

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AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Mast-Site H (Mount Leinster)

Telecommunications Mast-Site H is located on the summit of Mount Leinster, on the border of Counties Carlow and Wexford and is approximately 47 km southwest of the proposed Gathabawn Wind Farm development. A photo of the mast at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 19.



Figure 32. Mast-Site H

Mast ID	Telecom operators with radio links in direction of proposed Gathabawn Wind Farm
Mast H	2RN

Table 19. Field Survey Summary – Mast-Site H

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	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

APPENDIX B – Radio Link Budget Reports

 <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Appendix B – Radio Link Budget Reports

B.1 Radio Link Budget Report (Tinnaslatty to Kyleballynamoe)

Link Budget Report

Site: AB_L1A_3IRL (Tinnaslatty) AB_KE_3IRL (Kyleballynamoe)
 Name:
 Type: Cell Cell
 Latitude: 52°47'17.1"N 52°42'50.4"N
 Longitude: 7°26'20.3"W 7°27'33.4"W
 Altitude (m): 319.0 225.0

UserData1: User Data

Datum: World Geodetic System 1984 (WGS 84)

Forward Link		Reverse Link			
Transmission Site:	AB_L1A_3IRL	AB_KE_3IRL			
Reception Site:	AB_KE_3IRL	AB_L1A_3IRL			
Radio Type:	NetRadio0001	NetRadio0001			
Modulation Scheme:	4-QAM	4-QAM			
Bandwidth (MHz):	2	2			
Roll-Off Factor:	0.2	0.2			
Coding Gain (dB):	0	0			
System Gains (dB):	0	0			
Channel Overhead (%):	20	20			
FEC Overhead (%):	0	0			
Reference Temperature (°K):	290	290			
Receiver Noise Figure (dB):	5	5			
Maximum Data Rate (Mbps):	2.667	2.667			
Maximum Bit Rate (Mbps):	3.333	3.333			
Required Bit Error Rate:	BER 10-3	BER 10-6	BER 10-3	BER 10-6	
Service Threshold (dBm):	-91	-90	-91	-90	
Carrier to Noise Ratio (dB):	14.965	15.965	14.965	15.965	
Cross Polarization Improvement Factor (dB):			20	20	20
Rx Equalization Sig Norm Parameter (Kn,M):			0.1	0.1	0.1
Rx Equalization Sig Norm Parameter (Kn,NM):			0.1	0.1	0.1
UserData1:	User Data	User Data			
Center Frequency (MHz):	26000	26000			
Channel Bandwidth (MHz):	28	28			
Transmission Power (dBm):	30	30			
Transmission Gains (dB):	0	0			
Transmission System Loss (dB):	0	0			
Transmission Line Loss (dB/100 m):	4	4			
Transmission Line Length (m):	10	10			
Transmission Connection Loss (dB):	0.3	0.3			
Transmission Number of Connections:	2	2			
Transmission Additional Loss (dB):	0	0			
Transmission Losses (dB):	1	1			
Transmission Antenna:	HP2-26	HP2-26			
Transmission Antenna Size (m):	0.6	0.6			
Transmission Antenna Height (m):	20	20			
Transmission Antenna Gain (dBi):	38.96	38.96			
Transmission Antenna Gain (dB):	41.1	41.1			
Transmission Power EIRP (dBm):	70.1	70.1			
Reception Gains (dB):	0	0			
Reception System Loss (dB):	0	0			
Reception Line Loss (dB/100 m):	4	4			
Reception Line Length (m):	10	10			
Reception Connection Loss (dB):	0.3	0.3			
Reception Number of Connections:	2	2			
Reception Additional Loss (dB):	0	0			
Reception Losses (dB):	1	1			

 AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Reception Antenna: HP2-26	HP2-26			
Reception Antenna Size (m):	0.6	0.6		
Reception Antenna Height (m):	20	20		
Reception Antenna Gain (dBd):	38.96	38.96		
Reception Antenna Gain (dBi):	41.1	41.1		
Link Polarization: Vertical	Vertical			
Cross Polarization Factor (dB):	30	30		
Link Distance (m):	8365.131	8365.131		
Azimuth - True (°):	189.428	9.412		
Azimuth - Magnetic (°):	190.959	10.939		
Transmission Inclination (°):	0.644	-0.644		
Reception Inclination (°):	0.644	-0.644		
ITU Recommendation:	ITU-R P.525-2			
Free Space Distance (m):	8365.659	8365.659		
Center Frequency (MHz):	26000	26000		
Free Space Loss (dB):	139.189	139.189		
Max Fresnel Radius (m):	4.912	4.912		
Max 2nd Fresnel Radius (m):	6.947	6.947		
Earth Radius Factor (K):	4/3			
Effective Radius (m):	8502056.000			
ITU Recommendation:	ITU-R P.526-11			
Diffraction Model:	Cascade Knife Edge			
Diffraction:	No LOS Diffraction	No LOS Diffraction		
Diffraction Loss (dB):	0	0		
Clearance Target (%):	60			
Minimum Clearance (m):	9.561	9.561		
Minimum Clearance Point (m):	15.665	15.665		
Terrain Reflection Dispersion (°):	0.5			
Reflection Area 1 (m):	767.6 - 830.2	767.6 - 830.2		
Reflection Area 2 (m):	1143.548	1143.548		
Reflection Area 3 (m):	1394.188	1394.188		
Reflection Area 4 (m):	1456.849	1456.849		
Reflection Area 5 (m):	1550.839	1550.839		
Reflection Area 6 (m):	1676.159	1676.159		
Reflection Area 7 (m):	4057.245	4057.245		
Reflection Area 8 (m):	5404.438	5404.438		
Reflection Area 9 (m):	5498.4 - 5592.4	5498.4 - 5592.4		
Reflection Area 10 (m):	5686.409	5686.409		
Reflection Area 11 (m):	6313.010	6313.010		
ITU Recommendation:	ITU-R P.676-8			
Atmospheric Pressure (hPa):	1013	1013		
Standard Temperature (°C):	15	15		
Water Vapor Density (g/m³):	7.5	7.5		
Atmospheric Gases Loss (dB):	1.107	1.107		
Total Path Loss (dB):	140.297	140.297		
Reception Signal Level (dBm):	-30.097	-30.097		
BER 10-3	BER 10-6	BER 10-3	BER 10-6	
Service Threshold (dBm):	-91	-90	-91	-90
Link Gross Margin (dB):	60.903	59.903	60.903	59.903
ITU Recommendation:	ITU-R F.1703-0 / ITU-T G.827			
Objective ITU Quality Grade:	Short Haul SDH Networks			
Unavailability Objective (%):	2.00E-02			
Availability Objective (%):	99.9800			
ITU Recommendation:	ITU-R F.1668-1 / ITU-T G.826			
Error Performance Objective BBER (%):	1.60E-05	1.60E-05		
Error Performance Objective BBER (s/Month):	0.42	0.42		
SESR	ESR	SESR	ESR	
Error Performance Objective (%):	1.60E-04	3.20E-03	1.60E-04	3.20E-03

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Error Performance Objective (s/Month): 4.205 84.096 4.205 84.096

ITU Recommendation: ITU-R F.1668-1 / ITU-T G.828
Error Performance Objective BBER (%): 4.00E-06 4.00E-06
Error Performance Objective BBER (s/Month): 0.105 0.105
SESr ESR SESr ESR
Error Performance Objective (%): 1.60E-04 8.00E-04 1.60E-04 8.00E-04
Error Performance Objective (s/Month): 4.205 21.024 4.205 21.024

Multipath Model: ITU-R P.530-15
Multipath Planning Type: Quick Planning
Multipath Time Frame: Average annual distribution
ITU Recommendation: ITU-R P.453-9
Point Refractivity Gradient (dN1): -76.7
Geoclimatic Factor: 4.05E-05 4.05E-05
Multipath Occurrence Factor (%): 9.50E-03 9.50E-03

Precipitation Model: ITU-R P.530-15
ITU Recommendation: ITU-R P.837-5 / ITU-R P.841-4
Precipitation Time Frame: Average annual distribution
Precipitation Rate @ 0.01% (mm/h): 22
ITU Recommendation: ITU-R P.838-3
Specific Attenuation (dB/km): 3.069514 3.069514
Rainfall Attenuation (dB): 17.649 17.649

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Fading Outage (%): 6.54E-10 8.24E-10 6.54E-10 8.24E-10
Selective Fading Outage (%): 1.08E-10 1.08E-10 1.08E-10 1.08E-10
Composite Fading Outage (%): 7.62E-10 9.32E-10 7.62E-10 9.32E-10

Fading Outage (s/Month): 0 0 0 0
Selective Fading Outage (s/Month): 0 0 0 0
Composite Fading Outage (s/Month): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Unavailability due to Rain (s/Year): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Fading (%): 7.62E-10 9.32E-10 7.62E-10 9.32E-10
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Total Unavailability (%): 7.62E-10 9.32E-10 7.62E-10 9.32E-10
Unavailability Objective (%): 2.00E-02 2.00E-02 2.00E-02 2.00E-02

Unavailability due to Fading (s/Year): 0 0 0 0
Unavailability due to Rain (s/Year): 0 0 0 0
Total Unavailability (s/Year): 0 0 0 0
Unavailability Objective (s/Year): 6307.2 6307.2 6307.2 6307.2

Total Availability (%): 100.0000 100.0000 100.0000 100.0000
Availability Objective (%): 99.9800 99.9800 99.9800 99.9800

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 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

B.2 Radio Link Budget Report (Kyleballynamoe to Freshford)

Link Budget Report

Site: AB_KE_3IRL (Kyleballynamoe) AB_L1B_3IRL (Freshford)
Name:
Type: Cell Cell
Latitude: 52°42'50.4"N 52°43'57.2"N
Longitude: 7°27'33.4"W 7°23'54.3"W
Altitude (m): 225.0 75.0

UserData1: User Data

Datum: World Geodetic System 1984 (WGS 84)

Forward Link		Reverse Link	
Transmission Site:	AB_KE_3IRL	AB_L1B_3IRL	
Reception Site:	AB_L1B_3IRL	AB_KE_3IRL	
Radio Type:	NetRadio0001	NetRadio0001	
Modulation Scheme:	4-QAM	4-QAM	
Bandwidth (MHz):	2	2	
Roll-Off Factor:	0.2	0.2	
Coding Gain (dB):	0	0	
System Gains (dB):	0	0	
Channel Overhead (%):	20	20	
FEC Overhead (%):	0	0	
Reference Temperature (°K):	290	290	
Receiver Noise Figure (dB):	5	5	
Maximum Data Rate (Mbps):	2.667	2.667	
Maximum Bit Rate (Mbps):	3.333	3.333	
Required Bit Error Rate:	BER 10-3	BER 10-6	BER 10-3
Service Threshold (dBm):	-91	-90	-91
Carrier to Noise Ratio (dB):	14.965	15.965	14.965
Cross Polarization Improvement Factor (dB):	20	20	20
Rx Equalization Sig Norm Parameter (Kn,M):	0.1	0.1	0.1
Rx Equalization Sig Norm Parameter (Kn,NM):	0.1	0.1	0.1
UserData1:	User Data	User Data	
Center Frequency (MHz):	26000	26000	
Channel Bandwidth (MHz):	28	28	
Transmission Power (dBm):	30	30	
Transmission Gains (dB):	0	0	
Transmission System Loss (dB):	0	0	0
Transmission Line Loss (dB/100 m):	4	4	4
Transmission Line Length (m):	10	10	10
Transmission Connection Loss (dB):	0.3	0.3	0.3
Transmission Number of Connections:	2	2	2
Transmission Additional Loss (dB):	0	0	0
Transmission Losses (dB):	1	1	1
Transmission Antenna:	HP2-26	HP2-26	
Transmission Antenna Size (m):	0.6	0.6	0.6
Transmission Antenna Height (m):	25	15	15
Transmission Antenna Gain (dBd):	38.96	38.96	38.96
Transmission Antenna Gain (dBi):	41.1	41.1	41.1
Transmission Power EIRP (dBm):	70.1	70.1	70.1
Reception Gains (dB):	0	0	0
Reception System Loss (dB):	0	0	0
Reception Line Loss (dB/100 m):	4	4	4
Reception Line Length (m):	10	10	10
Reception Connection Loss (dB):	0.3	0.3	0.3
Reception Number of Connections:	2	2	2
Reception Additional Loss (dB):	0	0	0
Reception Losses (dB):	1	1	1
Reception Antenna:	HP2-26	HP2-26	
Reception Antenna Size (m):	0.6	0.6	0.6
Reception Antenna Height (m):	15	25	25
Reception Antenna Gain (dBd):	38.96	38.96	38.96

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Reception Antenna Gain (dBi): 41.1 41.1
 Link Polarization: Vertical Vertical
 Cross Polarization Factor (dB): 30 30
 Link Distance (m): 4599.042 4599.042
 Azimuth - True (°): 63.25 243.299
 Azimuth - Magnetic (°): 64.777 244.805
 Transmission Inclination (°): 1.993 -1.993
 Reception Inclination (°): 1.993 -1.993
 ITU Recommendation: ITU-R P.525-2
 Free Space Distance (m): 4601.824 4601.824
 Center Frequency (MHz): 26000 26000
 Free Space Loss (dB): 133.998 133.998
 Max Fresnel Radius (m): 3.642 3.642
 Max 2nd Fresnel Radius (m): 5.151 5.151
 Earth Radius Factor (K): 4/3
 Effective Radius (m): 8502056.000
 ITU Recommendation: ITU-R P.526-11
 Diffraction Model: Cascade Knife Edge
 Diffraction: No LOS Diffraction No LOS Diffraction
 Diffraction Loss (dB): 0 0
 Clearance Target (%): 60
 Minimum Clearance (m): 5.561 5.561
 Minimum Clearance Point (m): 241.502 241.502
 Terrain Reflection Dispersion (°): 0.5
 Reflection Area 1 (m): 409.5 - 451.5 409.5 - 451.5
 Reflection Area 2 (m): 1228.511 1228.511
 Reflection Area 3 (m): 1459.513 1459.513
 Reflection Area 4 (m): 1501.514 1501.514
 Reflection Area 5 (m): 1585.5 - 1669.5 1585.5 - 1669.5
 Reflection Area 6 (m): 3496.5 - 3517.5 3496.5 - 3517.5
 Reflection Area 7 (m): 3559.5 - 3580.5 3559.5 - 3580.5
 Reflection Area 8 (m): 3643.533 3643.533
 ITU Recommendation: ITU-R P.676-8
 Atmospheric Pressure (hPa): 1013 1013
 Standard Temperature (°C): 15 15
 Water Vapor Density (g/m³): 7.5 7.5
 Atmospheric Gases Loss (dB): 0.609 0.609
 Total Path Loss (dB): 134.607 134.607
 Reception Signal Level (dBm): -24.407 -24.407
 BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Service Threshold (dBm): -91 -90 -91 -90
 Link Gross Margin (dB): 66.593 65.593 66.593 65.593
 ITU Recommendation: ITU-R F.1703-0 / ITU-T G.827
 Objective ITU Quality Grade: Short Haul SDH Networks
 Unavailability Objective (%): 2.00E-02
 Availability Objective (%): 99.9800
 ITU Recommendation: ITU-R F.1668-1 / ITU-T G.826
 Error Performance Objective BBER (%): 1.60E-05 1.60E-05
 Error Performance Objective BBER (s/Month): 0.42 0.42
 SESR ESR SESR ESR
 Error Performance Objective (%): 1.60E-04 3.20E-03 1.60E-04 3.20E-03
 Error Performance Objective (s/Month): 4.205 84.096 4.205 84.096
 ITU Recommendation: ITU-R F.1668-1 / ITU-T G.828
 Error Performance Objective BBER (%): 4.00E-06 4.00E-06
 Error Performance Objective BBER (s/Month): 0.105 0.105
 SESR ESR SESR ESR
 Error Performance Objective (%): 1.60E-04 8.00E-04 1.60E-04 8.00E-04

 AiBridges <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Error Performance Objective (s/Month): 4.205 21.024 4.205 21.024

Multipath Model: ITU-R P.530-15
 Multipath Planning Type: Quick Planning
 Multipath Time Frame: Average annual distribution
 ITU Recommendation: ITU-R P.453-9
 Point Refractivity Gradient (dN1): -76.7
 Geoclimatic Factor: 4.05E-05 4.05E-05
 Multipath Occurrence Factor (%): 5.13E-04 5.13E-04

Precipitation Model: ITU-R P.530-15
 ITU Recommendation: ITU-R P.837-5 / ITU-R P.841-4
 Precipitation Time Frame: Average annual distribution
 Precipitation Rate @ 0.01% (mm/h): 22
 ITU Recommendation: ITU-R P.838-3
 Specific Attenuation (dB/km): 3.069815 3.069815
 Rainfall Attenuation (dB): 11.688 11.688

BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Fading Outage (%): 6.76E-12 8.52E-12 6.76E-12 8.52E-12
 Selective Fading Outage (%): 2.55E-12 2.55E-12 2.55E-12 2.55E-12
 Composite Fading Outage (%): 9.32E-12 1.11E-11 9.32E-12 1.11E-11

Fading Outage (s/Month): 0 0 0 0
 Selective Fading Outage (s/Month): 0 0 0 0
 Composite Fading Outage (s/Month): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
 Unavailability due to Rain (s/Year): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Unavailability due to Fading (%): 9.32E-12 1.11E-11 9.32E-12 1.11E-11
 Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
 Total Unavailability (%): 9.32E-12 1.11E-11 9.32E-12 1.11E-11
 Unavailability Objective (%): 2.00E-02 2.00E-02 2.00E-02 2.00E-02

Unavailability due to Fading (s/Year): 0 0 0 0
 Unavailability due to Rain (s/Year): 0 0 0 0
 Total Unavailability (s/Year): 0 0 0 0
 Unavailability Objective (s/Year): 6307.2 6307.2 6307.2 6307.2

Total Availability (%): 100.0000 100.0000 100.0000 100.0000
 Availability Objective (%): 99.9800 99.9800 99.9800 99.9800

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 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

B.3 Radio Link Budget Report (Oldglass to Ballyouskill)

Link Budget Report

Site: AB_L3A_VF (Oldglass) AB_L1B_VF (Ballyouskill)

Name:

Type: Cell Cell

Latitude: 52°51'19.5"N 52°50'01.7"N

Longitude: 7°29'23.2"W 7°17'45.5"W

Altitude (m): 100.0 298.0

UserData1: User Data

Datum: World Geodetic System 1984 (WGS 84)

Forward Link		Reverse Link	
Transmission Site:	AB_L3A_VF	AB_L1B_VF	
Reception Site:	AB_L1B_VF	AB_L3A_VF	
Radio Type:	NetRadio0001	NetRadio0001	
Modulation Scheme:	4-QAM	4-QAM	
Bandwidth (MHz):	2	2	
Roll-Off Factor:	0.2	0.2	
Coding Gain (dB):	0	0	
System Gains (dB):	0	0	
Channel Overhead (%):	20	20	
FEC Overhead (%):	0	0	
Reference Temperature (°K):	290	290	
Receiver Noise Figure (dB):	5	5	
Maximum Data Rate (Mbps):	2.667	2.667	
Maximum Bit Rate (Mbps):	3.333	3.333	
Required Bit Error Rate:	BER 10-3	BER 10-3	BER 10-6
Service Threshold (dBm):	-91	-90	-91
Carrier to Noise Ratio (dB):	14.965	15.965	14.965
Cross Polarization Improvement Factor (dB):	20	20	20
Rx Equalization Sig Norm Parameter (Kn,M):	0.1	0.1	0.1
Rx Equalization Sig Norm Parameter (Kn,NM):	0.1	0.1	0.1
UserData1:	User Data	User Data	
Center Frequency (MHz):	13000	13000	
Channel Bandwidth (MHz):	28	28	
Transmission Power (dBm):	30	30	
Transmission Gains (dB):	0	0	
Transmission System Loss (dB):	0	0	0
Transmission Line Loss (dB/100 m):	4	4	4
Transmission Line Length (m):	10	10	10
Transmission Connection Loss (dB):	0.3	0.3	0.3
Transmission Number of Connections:	2	2	2
Transmission Additional Loss (dB):	0	0	0
Transmission Losses (dB):	1	1	1
Transmission Antenna:	HP2-13-NSMA	HP2-13-NSMA	
Transmission Antenna Size (m):	0.6	0.6	0.6
Transmission Antenna Height (m):	20	20	20
Transmission Antenna Gain (dBd):	33.76	33.76	33.76
Transmission Antenna Gain (dBi):	35.9	35.9	35.9
Transmission Power EIRP (dBm):	64.9	64.9	64.9
Reception Gains (dB):	0	0	0
Reception System Loss (dB):	0	0	0
Reception Line Loss (dB/100 m):	4	4	4
Reception Line Length (m):	10	10	10
Reception Connection Loss (dB):	0.3	0.3	0.3
Reception Number of Connections:	2	2	2
Reception Additional Loss (dB):	0	0	0
Reception Losses (dB):	1	1	1
Reception Antenna:	HP2-13-NSMA	HP2-13-NSMA	
Reception Antenna Size (m):	0.6	0.6	0.6
Reception Antenna Height (m):	20	20	20
Reception Antenna Gain (dBd):	33.76	33.76	33.76

AiBridges Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Reception Antenna Gain (dBi): 35.9 35.9
 Link Polarization: Vertical Vertical
 Cross Polarization Factor (dB): 30 30
 Link Distance (m): 13263.665 13263.665
 Azimuth - True (°): 100.381 280.535
 Azimuth - Magnetic (°): 101.942 282.018
 Transmission Inclination (°): -0.855 0.855
 Reception Inclination (°): -0.855 0.855
 ITU Recommendation: ITU-R P.525-2
 Free Space Distance (m): 13265.143 13265.143
 Center Frequency (MHz): 13000 13000
 Free Space Loss (dB): 137.173 137.173
 Max Fresnel Radius (m): 8.748 8.748
 Max 2nd Fresnel Radius (m): 12.371 12.371
 Earth Radius Factor (K): 4/3
 Effective Radius (m): 8502056.000
 ITU Recommendation: ITU-R P.526-11
 Diffraction Model: Cascade Knife Edge
 Diffraction: No LOS Diffraction No LOS Diffraction
 Diffraction Loss (dB): 0 0
 Clearance Target (%): 60
 Minimum Clearance (m): 19.57 19.57
 Minimum Clearance Point (m): 13254.164 13254.164
 Terrain Reflection Dispersion (°): 0.5
 Reflection Area 1 (m): 408.551 408.551
 Reflection Area 2 (m): 446.556 446.556
 Reflection Area 3 (m): 484.6 - 541.6 484.6 - 541.6
 Reflection Area 4 (m): 598.6 - 617.6 598.6 - 617.6
 Reflection Area 5 (m): 1624.7 - 1662.7 1624.7 - 1662.7
 Reflection Area 6 (m): 1795.7 - 1852.7 1795.7 - 1852.7
 Reflection Area 7 (m): 1909.7 - 1947.7 1909.7 - 1947.7
 Reflection Area 8 (m): 2004.8 - 2023.8 2004.8 - 2023.8
 Reflection Area 9 (m): 2080.8 - 2099.8 2080.8 - 2099.8
 Reflection Area 10 (m): 2156.8 - 2213.8 2156.8 - 2213.8
 Reflection Area 11 (m): 2270.785 2270.785
 Reflection Area 12 (m): 2365.8 - 2859.9 2365.8 - 2859.9
 Reflection Area 13 (m): 2916.9 - 3030.9 2916.9 - 3030.9
 Reflection Area 14 (m): 8617.6 - 8636.6 8617.6 - 8636.6
 Reflection Area 15 (m): 8712.6 - 8731.6 8712.6 - 8731.6
 Reflection Area 16 (m): 8826.6 - 8845.6 8826.6 - 8845.6
 ITU Recommendation: ITU-R P.676-8
 Atmospheric Pressure (hPa): 1013 1013
 Standard Temperature (°C): 15 15
 Water Vapor Density (g/m³): 7.5 7.5
 Atmospheric Gases Loss (dB): 0.29 0.29
 Total Path Loss (dB): 137.463 137.463
 Reception Signal Level (dBm): -37.663 -37.663
 BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Service Threshold (dBm): -91 -90 -91 -90
 Link Gross Margin (dB): 53.337 52.337 53.337 52.337
 ITU Recommendation: ITU-R F.1703-0 / ITU-T G.827
 Objective ITU Quality Grade: Short Haul SDH Networks
 Unavailability Objective (%): 2.00E-02
 Availability Objective (%): 99.9800
 ITU Recommendation: ITU-R F.1668-1 / ITU-T G.826
 Error Performance Objective BBER (%): 1.60E-05 1.60E-05
 Error Performance Objective BBER (s/Month): 0.42 0.42
 SESR ESR SESR ESR

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Error Performance Objective (%): 1.60E-04 3.20E-03 1.60E-04 3.20E-03
Error Performance Objective (s/Month): 4.205 84.096 4.205 84.096

ITU Recommendation: ITU-R F.1668-1 / ITU-T G.828
Error Performance Objective BBER (%): 4.00E-06 4.00E-06
Error Performance Objective BBER (s/Month): 0.105 0.105
SESr ESR SESr ESR
Error Performance Objective (%): 1.60E-04 8.00E-04 1.60E-04 8.00E-04
Error Performance Objective (s/Month): 4.205 21.024 4.205 21.024

Multipath Model: ITU-R P.530-15
Multipath Planning Type: Quick Planning
Multipath Time Frame: Average annual distribution
ITU Recommendation: ITU-R P.453-9
Point Refractivity Gradient (dN1): -76.7
Geoclimatic Factor: 4.05E-05 4.05E-05
Multipath Occurrence Factor (%): 2.09E-02 2.09E-02

Precipitation Model: ITU-R P.530-15
ITU Recommendation: ITU-R P.837-5 / ITU-R P.841-4
Precipitation Time Frame: Average annual distribution
Precipitation Rate @ 0.01% (mm/h): 22
ITU Recommendation: ITU-R P.838-3
Specific Attenuation (dB/km): 0.949112 0.949112
Rainfall Attenuation (dB): 8.921 8.921

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Fading Outage (%): 8.90E-09 1.12E-08 8.90E-09 1.12E-08
Selective Fading Outage (%): 6.47E-10 6.47E-10 6.47E-10 6.47E-10
Composite Fading Outage (%): 9.55E-09 1.18E-08 9.55E-09 1.18E-08

Fading Outage (s/Month): 0 0 0 0
Selective Fading Outage (s/Month): 0 0 0 0
Composite Fading Outage (s/Month): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Unavailability due to Rain (s/Year): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Fading (%): 9.55E-09 1.18E-08 9.55E-09 1.18E-08
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Total Unavailability (%): 9.55E-09 1.18E-08 9.55E-09 1.18E-08
Unavailability Objective (%): 2.00E-02 2.00E-02 2.00E-02 2.00E-02

Unavailability due to Fading (s/Year): 0.003 0.004 0.003 0.004
Unavailability due to Rain (s/Year): 0 0 0 0
Total Unavailability (s/Year): 0.003 0.004 0.003 0.004
Unavailability Objective (s/Year): 6307.2 6307.2 6307.2 6307.2

Total Availability (%): 100.0000 100.0000 100.0000 100.0000
Availability Objective (%): 99.9800 99.9800 99.9800 99.9800

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 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

B.4 Radio Link Budget Report (Ballyouskill to Ballyspellan)

Link Budget Report

Site: AB_L1A_VF (Ballyouskill) AB_L1B_VF (Ballyspellan)

Name:

Type: Cell Cell

Latitude: 52°45'36.4"N 52°50'01.7"N

Longitude: 7°30'29.4"W 7°17'45.5"W

Altitude (m): 308.0 298.0

UserData1: User Data

Datum: World Geodetic System 1984 (WGS 84)

Forward Link		Reverse Link	
Transmission Site:	AB_L1A_VF	AB_L1B_VF	
Reception Site:	AB_L1B_VF	AB_L1A_VF	
Radio Type:	NetRadio0001	NetRadio0001	
Modulation Scheme:	4-QAM	4-QAM	
Bandwidth (MHz):	2	2	
Roll-Off Factor:	0.2	0.2	
Coding Gain (dB):	0	0	
System Gains (dB):	0	0	
Channel Overhead (%):	20	20	
FEC Overhead (%):	0	0	
Reference Temperature (°K):	290	290	
Receiver Noise Figure (dB):	5	5	
Maximum Data Rate (Mbps):	2.667	2.667	
Maximum Bit Rate (Mbps):	3.333	3.333	
Required Bit Error Rate:	BER 10-3	BER 10-3	BER 10-6
Service Threshold (dBm):	-91	-90	-91
Carrier to Noise Ratio (dB):	14.965	15.965	14.965
Cross Polarization Improvement Factor (dB):	20	20	20
Rx Equalization Sig Norm Parameter (Kn,M):	0.1	0.1	0.1
Rx Equalization Sig Norm Parameter (Kn,NM):	0.1	0.1	0.1
UserData1:	User Data	User Data	
Center Frequency (MHz):	13000	13000	
Channel Bandwidth (MHz):	28	28	
Transmission Power (dBm):	30	30	
Transmission Gains (dB):	0	0	
Transmission System Loss (dB):	0	0	0
Transmission Line Loss (dB/100 m):	4	4	4
Transmission Line Length (m):	10	10	10
Transmission Connection Loss (dB):	0.3	0.3	0.3
Transmission Number of Connections:	2	2	2
Transmission Additional Loss (dB):	0	0	0
Transmission Losses (dB):	1	1	1
Transmission Antenna:	HP2-13-NSMA	HP2-13-NSMA	
Transmission Antenna Size (m):	0.6	0.6	0.6
Transmission Antenna Height (m):	30	30	30
Transmission Antenna Gain (dBd):	33.76	33.76	33.76
Transmission Antenna Gain (dBi):	35.9	35.9	35.9
Transmission Power EIRP (dBm):	64.9	64.9	64.9
Reception Gains (dB):	0	0	0
Reception System Loss (dB):	0	0	0
Reception Line Loss (dB/100 m):	4	4	4
Reception Line Length (m):	10	10	10
Reception Connection Loss (dB):	0.3	0.3	0.3
Reception Number of Connections:	2	2	2
Reception Additional Loss (dB):	0	0	0
Reception Losses (dB):	1	1	1
Reception Antenna:	HP2-13-NSMA	HP2-13-NSMA	
Reception Antenna Size (m):	0.6	0.6	0.6
Reception Antenna Height (m):	30	30	30
Reception Antenna Gain (dBd):	33.76	33.76	33.76

 <i>Total Broadband Solutions</i>	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Reception Antenna Gain (dBi):	35.9	35.9	
Link Polarization: Vertical	Vertical		
Cross Polarization Factor (dB):	30	30	
Link Distance (m):	16485.922	16485.922	
Azimuth - True (°):	60.043	240.212	
Azimuth - Magnetic (°):	61.596	241.694	
Transmission Inclination (°):	0.035	-0.035	
Reception Inclination (°):	0.035	-0.035	
ITU Recommendation:	ITU-R P.525-2		
Free Space Distance (m):	16485.926	16485.926	
Center Frequency (MHz):	13000	13000	
Free Space Loss (dB):	139.061	139.061	
Max Fresnel Radius (m):	9.752	9.752	
Max 2nd Fresnel Radius (m):	13.792	13.792	
Earth Radius Factor (K):	4/3		
Effective Radius (m):	8502056.000		
ITU Recommendation:	ITU-R P.526-11		
Diffraction Model:	Cascade Knife Edge		
Diffraction:	No LOS Diffraction	No LOS Diffraction	
Diffraction Loss (dB):	0	0	
Clearance Target (%):	60		
Minimum Clearance (m):	29.091	29.091	
Minimum Clearance Point (m):	75.525	75.525	
Terrain Reflection Dispersion (°):	0.5		
Reflection Area 1 (m):	1305.5 - 1327	1305.5 - 1327	
Reflection Area 2 (m):	1521.279	1521.279	
Reflection Area 3 (m):	2880.721	2880.721	
Reflection Area 4 (m):	2967 - 3010.2	2967 - 3010.2	
Reflection Area 5 (m):	3074.9 - 3096.5	3074.9 - 3096.5	
Reflection Area 6 (m):	3182.8 - 3204.4	3182.8 - 3204.4	
Reflection Area 7 (m):	5534.868	5534.868	
Reflection Area 8 (m):	5642.76	5642.76	
Reflection Area 9 (m):	7735.9 - 7779	7735.9 - 7779	
Reflection Area 10 (m):	7822.181	7822.181	
Reflection Area 11 (m):	8124.3 - 8145.9	8124.3 - 8145.9	
Reflection Area 12 (m):	8253.75	8253.75	
Reflection Area 13 (m):	8296.907	8296.907	
Reflection Area 14 (m):	8340 - 8361.6	8340 - 8361.6	
Reflection Area 15 (m):	8469.5 - 8577.4	8469.5 - 8577.4	
Reflection Area 16 (m):	8663.74	8663.74	
ITU Recommendation:	ITU-R P.676-8		
Atmospheric Pressure (hPa):	1013	1013	
Standard Temperature (°C):	15	15	
Water Vapor Density (g/m³):	7.5	7.5	
Atmospheric Gases Loss (dB):	0.36	0.36	
Total Path Loss (dB):	139.421	139.421	
Reception Signal Level (dBm):	-39.621	-39.621	
BER 10-3 BER 10-6 BER 10-3 BER 10-6			
Service Threshold (dBm):	-91	-90	-91
Link Gross Margin (dB):	51.379	50.379	51.379
ITU Recommendation:	ITU-R F.1703-0 / ITU-T G.827		
Objective ITU Quality Grade:	Short Haul SDH Networks		
Unavailability Objective (%):	2.00E-02		
Availability Objective (%):	99.9800		
ITU Recommendation:	ITU-R F.1668-1 / ITU-T G.826		
Error Performance Objective BBER (%):	1.60E-05	1.60E-05	
Error Performance Objective BBER (s/Month):	0.42	0.42	
SESR ESR SESR ESR			

 Total Broadband Solutions	Procedure: 001	Rev: 3.0
Title: Gathabawn Telecommunications Impact Assessment	Approved: KH	Date: 25/09/26

Error Performance Objective (%): 1.60E-04 3.20E-03 1.60E-04 3.20E-03
Error Performance Objective (s/Month): 4.205 84.096 4.205 84.096

ITU Recommendation: ITU-R F.1668-1 / ITU-T G.828
Error Performance Objective BBER (%): 4.00E-06 4.00E-06
Error Performance Objective BBER (s/Month): 0.105 0.105
SESR ESR SESR ESR
Error Performance Objective (%): 1.60E-04 8.00E-04 1.60E-04 8.00E-04
Error Performance Objective (s/Month): 4.205 21.024 4.205 21.024

Multipath Model: ITU-R P.530-15
Multipath Planning Type: Quick Planning
Multipath Time Frame: Average annual distribution
ITU Recommendation: ITU-R P.453-9
Point Refractivity Gradient (dN1): -76.7
Geoclimatic Factor: 4.05E-05 4.05E-05
Multipath Occurrence Factor (%): 5.17E-01 5.17E-01

Precipitation Model: ITU-R P.530-15
ITU Recommendation: ITU-R P.837-5 / ITU-R P.841-4
Precipitation Time Frame: Average annual distribution
Precipitation Rate @ 0.01% (mm/h): 22
ITU Recommendation: ITU-R P.838-3
Specific Attenuation (dB/km): 0.949099 0.949099
Rainfall Attenuation (dB): 10.626 10.626

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Fading Outage (%): 5.41E-07 6.81E-07 5.41E-07 6.81E-07
Selective Fading Outage (%): 1.26E-08 1.26E-08 1.26E-08 1.26E-08
Composite Fading Outage (%): 5.54E-07 6.94E-07 5.54E-07 6.94E-07

Fading Outage (s/Month): 0.014 0.018 0.014 0.018
Selective Fading Outage (s/Month): 0 0 0 0
Composite Fading Outage (s/Month): 0.015 0.018 0.015 0.018

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Unavailability due to Rain (s/Year): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Fading (%): 5.54E-07 6.94E-07 5.54E-07 6.94E-07
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Total Unavailability (%): 5.54E-07 6.94E-07 5.54E-07 6.94E-07
Unavailability Objective (%): 2.00E-02 2.00E-02 2.00E-02 2.00E-02

Unavailability due to Fading (s/Year): 0.175 0.219 0.175 0.219
Unavailability due to Rain (s/Year): 0 0 0 0
Total Unavailability (s/Year): 0.175 0.219 0.175 0.219
Unavailability Objective (s/Year): 6307.2 6307.2 6307.2 6307.2

Total Availability (%): 100.0000 100.0000 100.0000 100.0000
Availability Objective (%): 99.9800 99.9800 99.9800 99.9800

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AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

APPENDIX 16.4

Gathabawn Wind Farm Aviation Review Statement

Document Number: 001/GN/0826

Author: PT\DG

Approved for Release: Rev 6.0 KH **Date:** 17/09/2026

Document Filename: *Gathabawn Wind Farm - Aviation Review Statement*

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AiBridges <i>Total Communications Solutions</i>	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

Executive Summary

Ai Bridges Ltd have been commissioned to review the possible impacts of the proposed wind farm on aviation systems in the vicinity of the proposed wind farm development at Gathabawn. As part of the review, the following subjects were considered:

- Annex 14 – Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Building Restricted Areas (BRAs)
- Minimum Sector Altitudes (MSAs)
- Instrument Flight Procedures
- Existing Wind Farms in vicinity of Proposed Wind Farm
- Communications and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Lighting Scheme
- Private Airfield / Helipads (VFR Flying)
- Irish Air Corps / DoD Safeguarding
- Garda Air Support Unit (GASU)
- Emergency Aeromedical Service (EAS)

The nearest significant aviation installations to the proposed Gathabawn Windfarm are Shannon Airport, and Waterford Airport. The proposed development is located 96 km from Shannon Airport and 68 km from Waterford Airport. At these distances it is highly unlikely that there would be any impact on the aviation activities at these airports.

Annex 14 - Obstacles Limitation Surfaces (OLS)

A review shows that the proposed wind farm would be located outside the Outer Horizontal Surface of the Shannon and Waterford Airport Runway Obstacles Limitation Surfaces, as defined in ICAO (International Civil Aviation Organization) Annex 14.

As the proposed wind farm is situated outside the Outer Horizontal Surfaces and there is no penetration of the take-off or approach surfaces, it is unlikely that there will be any impacts to the OLS surfaces for Shannon or Waterford Airports.

Annex 15 - Aerodrome Surfaces

Following a review of "Terrain and obstacle requirements Area 1" as defined in ICAO Annex 15, wind turbines need to be registered if they are more than 100 meters above terrain. From the centre point (ARP – Airport Reference Point) of an Airport to the boundary of the Area 1 of the Annex 15 Aerodrome Surface is 45km. This area encloses the TMA area i.e. Total Maneuvering Area and this is used for circling and maneuvering by aircraft.

 Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

Should the proposed wind farm be permitted, the turbines would be outside 45km of Shannon and Waterford Airport ARPs but would be greater than 100m in height. Therefore, the turbines would be required to be included in the IAA Electronic Air Navigation Obstacle Dataset.

Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities. A review shows that the proposed wind farm is over 50 km from the BRA surfaces at Shannon and Waterford Airports. At this distance there will be no impact on the BRAs due to the proposed Gathabawn Windfarm turbines.

Minimum Sector Altitudes (MSA)

The Minimum Sector Altitudes (MSA) is the lowest altitude which may be used to provide a minimum obstacle clearance of 1000 ft above all obstacles within a sector of 25 nautical miles (46 km) from the VOR/DME at Shannon Airport and the NDB at Waterford Airport. As the proposed wind farm is located outside the MSA Sectors for Shannon and Waterford Airports, there should be no impact on the published MSA altitudes.

Instrument Flight Procedures

There are 13 published Instrument Flight Procedures for flights to/from Shannon and Waterford Airports. Due to the distance of the proposed wind farm from the airports, and as there are existing obstacles nearer to the airports than the proposed development, there should be no impact on these flight procedures.

Communications and Navigation System

As the proposed wind farm is more than 65 km from the Localizer and transmitting antenna at Shannon and Waterford Airports, it is very unlikely that the proposed wind farm will have any impact on these ATS communications and radio navigational aids.

Radar Surveillance Sensors

For Radar Surveillance Systems, EUROCONTROL Guidelines require a 16 km safe distance from the surveillance radar system (SSR), for a “Zone 4 - No Assessment” condition. It has been highlighted in the analysis that turbines located at the proposed Gathabawn Windfarm would be located at a minimum distance of 81 km from the radar stations at Shannon Airport and Woodcock Hill and in Assessment Zone 4 of the EUROCONTROL Guidelines.

As turbines at the proposed Gathabawn Windfarm would be located in Assessment Zone 4, a detailed impact assessment on Radar Surveillance Systems will not be required by AirNav Ireland.

Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an IAA approved

 Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Shannon and Waterford Airports for calibration of instrument landing systems.

A desk-top analysis review indicates that the bi-annual Flight Inspection and Calibration Procedures will not be impacted by the proposed wind farm development.

Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA/AirNav Ireland are likely to request lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development would be considered as an en-route obstacle.

Irish Air Corps / Department of Defence (DoD) Safeguarding

The Irish Air Corps (IAC) position on wind farms / tall structures are outlined in the paper which was published in 2014: “*Air Corps Wind Farm/ Tall Structures Position Paper*”. In the position paper the Irish Air Corps outlines their statement position in relation to restricted areas where they oppose wind turbines /tall structures. The areas defined by the Air Corps have been mapped and analysis shows that the proposed wind farm site is partially located within a critical low level flying route (i.e. within 3 NM of the M8 motorway).

Although a section of the proposed wind farm site is located within 3 NM of the M8 motorway, it should be noted that low-level flights along the M8 are likely to avoid the proposed wind farm site, due to high terrain to the east of the motorway and due to the existing wind farm at Lisdowney. However, a further technical assessment may be requested by the Irish Air Corps. Regarding Military Aviation Lightning, the recommendation is to engage at the early stage in a consented development, to agree on the details relating to the lighting requirements for the IAC.

Garda Air Support Unit (GASU)

The standard concerns that are being raised in recent consultations with the Irish Air Corps also highlight the potential for obstacles that could impact the operations of the Garda Air Support Unit (GASU). A review of the GASU operations indicates that they are unlikely to be impacted by the proposed wind farm development, as the proposed Gathabawn Windfarm site is located in an area that is relatively sparsely populated, and on agricultural land which is likely to be hazardous for helicopter landings.

In the unlikely event of GASU operations in the general area, it should be noted that all modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farm be permitted the associated turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly.

Emergency Aeromedical Service (EAS)

The EAS service in Ireland is operated from two air ambulance bases. One EAS base is located at Custume Barracks in Athlone, the other is located at Rathcoole Flying Club, Rathcoole, Co Cork. A review of the EAS operations from Custume Barracks and from Rathcoole Flying Club indicates that they are unlikely to be impacted by the proposed wind farm development, as EAS

	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

helicopters would be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines).

In addition, the footprint of the proposed wind farm development is relatively small and any flight diversions for EAS operations would have negligible time impacts. For these reasons, turbines at the proposed wind farm should have no impact on EAS flights from Athlone or Rathcoole.

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

Sections

1. Introduction	7
1.1 Wind Farm Site Information	7
1.2 Shannon Airport	8
1.3 Waterford Airport	9
2. Aviation Review	10
2.1 Annex 14 Obstacle Limitation Surfaces (OLS)	11
2.2 Annex 15 Aerodrome Surfaces	12
2.3 Building Restricted Areas (BRA)	14
2.4 Minimum Sector Altitudes (MSAs)	15
2.5 Instrument Flight Procedures	16
2.6 Existing Wind Farms in vicinity of Proposed Wind Farm	18
2.7 Communication and Navigation Systems	19
2.8 Radar Surveillance Sensors	20
2.9 Flight Inspection and Calibration	24
2.10 Aeronautical Obstacle Warning Lighting Scheme	27
2.11 Private Airfields (VFR Flying)	28
2.12 Irish Air Corps / DoD Safeguarding	34
2.13 The Garda Air Support Unit (GASU)	40
2.14 The Emergency Aeromedical Service (EAS)	42
3. Summary	44

Appendices

Appendix A – ICAO Annex 15 Area 1 and Area 2 Surfaces	46
Appendix B – ICAO Building Restricted Areas	47
Appendix C – Air Corps Wind Farm / Tall Structures Position Paper	48
Appendix D – Rate of Turn Calculations	56

AiBridges <i>Total Communications Solutions</i>	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

1. Introduction

This section provides a brief summary of the proposed Gathabawn Windfarm, in North County Kilkenny and of the nearest significant aviation installations at Shannon and Waterford Airports.

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Kilkenny approximately 5 km northeast of Johnstown. The proposed turbine dimensions are shown in Table 1.

Turbine No	Hub Height	Rotor Radius	Tip Height (AGL)
1,2,3,4,5,8,10,11,12	102 m	68 m	170 m
6,7,9	82 m	68 m	150 m

Table 1. Wind Farm Turbine Dimensions

Figure 1 shows the proposed wind farm site with respect to Shannon Airport, Waterford Airport and the AirNav Ireland radar stations at Woodcock Hill and Shannon.

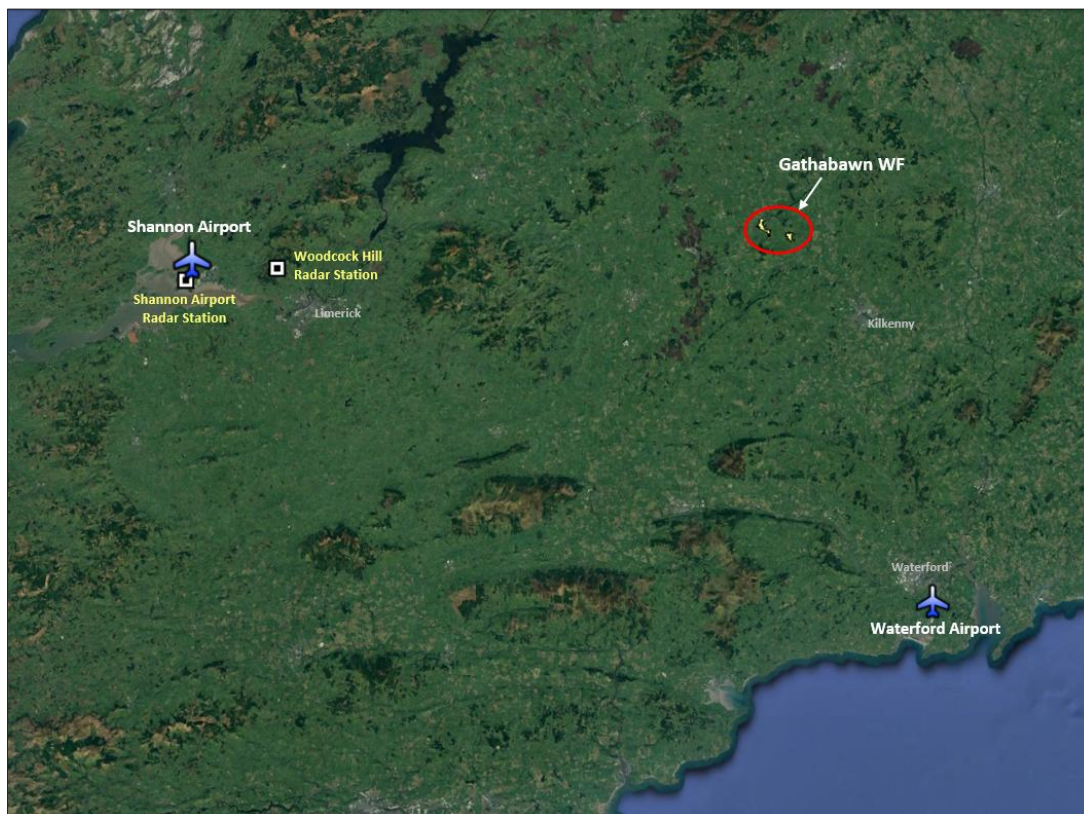


Figure 1. Location of proposed wind farm at Gathabawn

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

1.2 Shannon Airport

Table 2 below shows the co-ordinates of Shannon Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Shannon Airport operates in Class C controlled airspace with Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) Flight rules.

Location	Installation	Description	Airport Ref. Point ARP	ARP Distance to Proposed Wind Farm
Shannon, Co Clare	International Airport	Single Asphalt Runway Airspace: Class C	52 42 07 N 008 55 29 W (Mid-point of Runway 06/24).	96 km

Table 2. Shannon Airport Details

The aeronautical navigation aids at the aerodrome include DVOR/DME, NDB, ILS LOC and ILS GP.

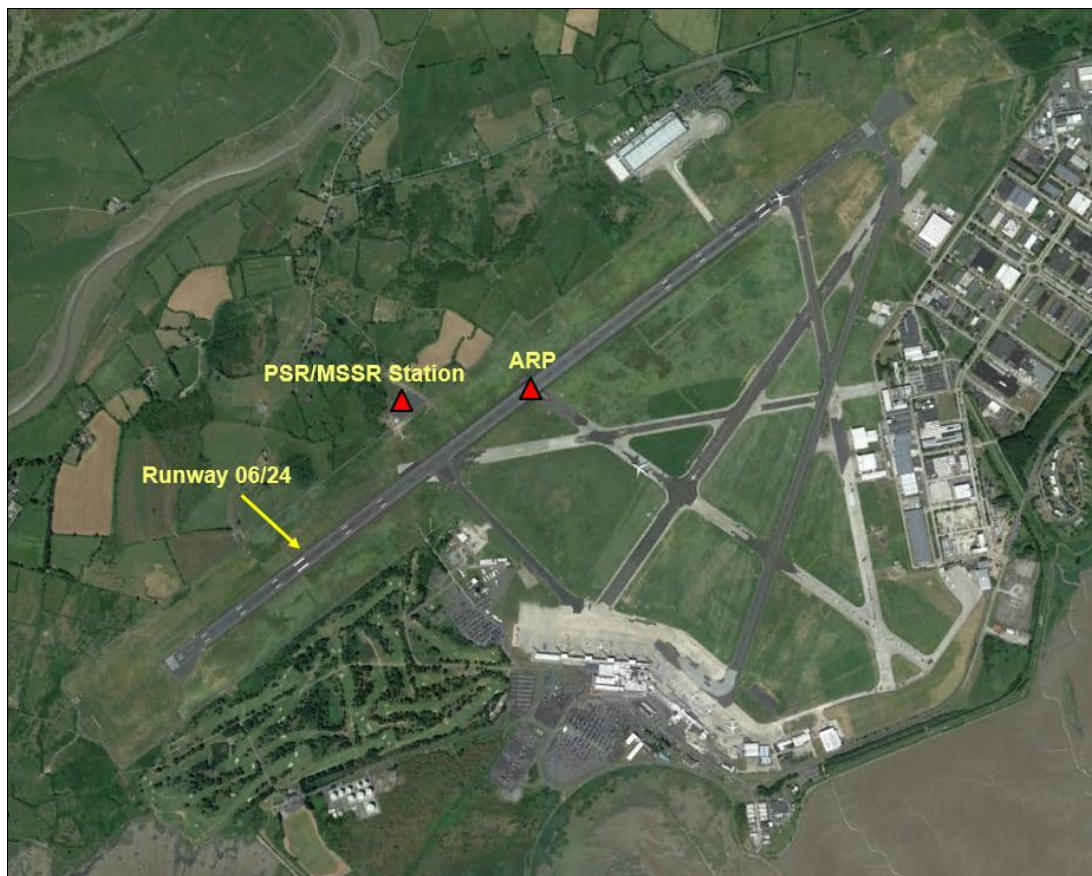


Figure 2. Shannon International Airport

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

1.3 Waterford Airport

Table 3 below shows the co-ordinates of Waterford Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Waterford Airport operates in Class C controlled airspace during operating hours, with Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) Flight rules.

Location	Installation	Description	Airport Ref. Point ARP	ARP Distance to Proposed Wind Farm
Kilowen, Co Waterford	Regional Airport	Single Asphalt Runway Airspace: Class C	52 11 14 N 07 05 13 W (Mid-point of Runway 03/21).	68 km

Table 3. Waterford Airport Details

The aeronautical navigation aids at the aerodrome include DME, NDB, ILS LOC and ILS GP.

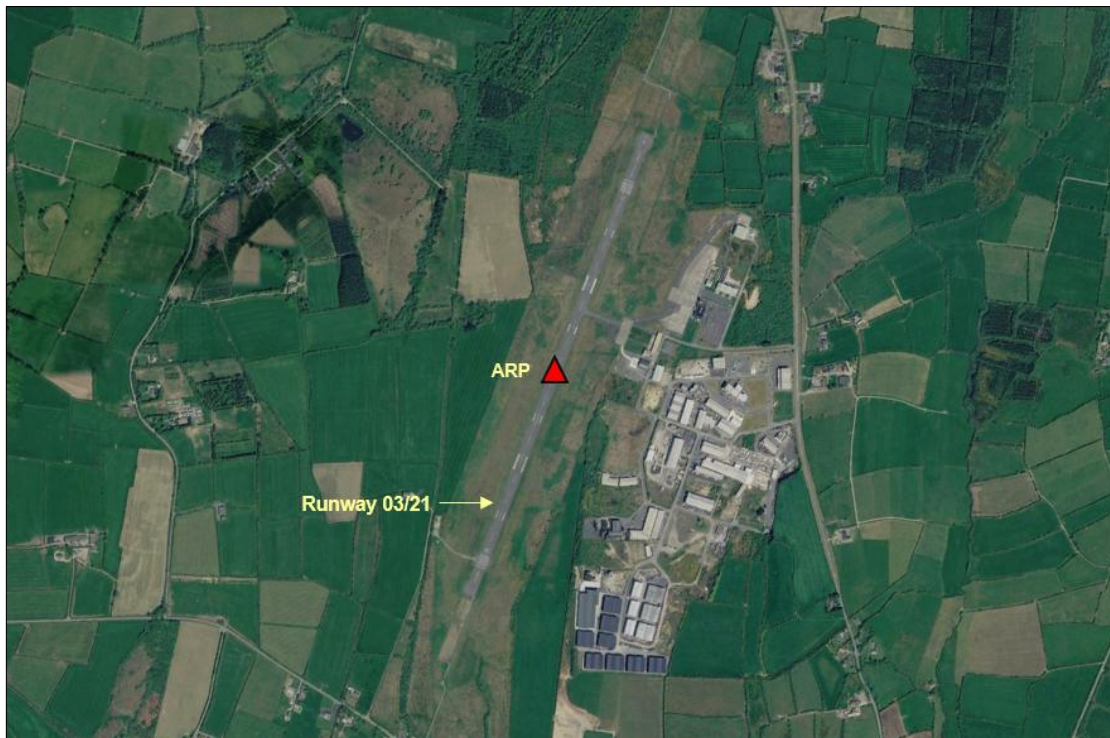


Figure 3. Waterford International Airport

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2. Aviation Review

In this section a review of the following Aviation topics is provided.

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 - Aerodrome Surfaces
- Building Restricted Areas (BRA)
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of Proposed Wind Farm
- Communications and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Lighting Scheme
- Private Airfields (VFR Flying)
- Irish Air Corps / DoD Safeguarding
- Garda Air Support Unit (GASU)
- Emergency Aeromedical Service (EAS)

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.1 Annex 14 Obstacle Limitation Surfaces (OLS)

A review of the Annex 14 Obstacles Limitation Surfaces (OLS) was carried out by first plotting the proposed wind farm location and the airport obstacle surfaces. The obstacle limitation surfaces for Shannon Airport are plotted based on the following:

- *Annex 14 to the Convention on International Civil Aviation Aerodromes Volume I - Aerodrome Design and Operations Seventh Edition July 2016*
- *Certification Specifications and Guidance Material for Aerodromes Design CS-ADR-DSN Issue 4, 8th of December 2017*

Figure 4 below shows the Shannon and Waterford OLS surfaces in relation to the proposed wind farm. The distance from the ARP at Shannon and Waterford Airports to the nearest point of the proposed wind farm is greater than 65 km.

The analysis of the OLS plots indicates that turbines at the proposed wind farm would not penetrate the Outer Horizontal Surfaces for these Airports which extend to 15 km from the Airport Reference Points (ARPs).

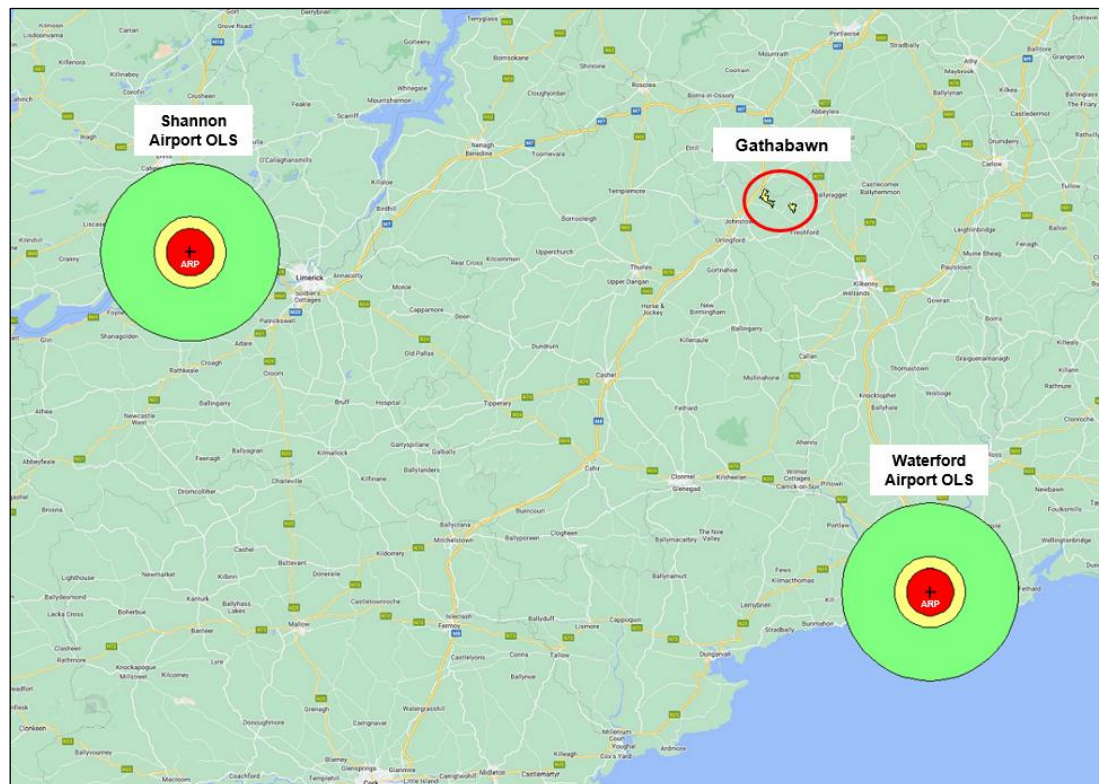


Figure 4. Gathabawn Wind Farm in relation to Shannon Airport and Waterford Airport OLS Surfaces.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 14 Obstacle Limitation Surfaces	No action	None

Table 4. Aviation Impact Review - Annex 14 Obstacle Limitation Surfaces

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.2 Annex 15 Aerodrome Surfaces

Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface as shown in Figure 5. The “*Terrain and Obstacle Requirements Area*” is defined in ICAO Annex 15 as an area of up to 45 km from the Aerodrome ARP. (An illustration of ICAO Annex 15 Area 1 and Area 2 Surface is provided in Appendix A).

As the nearest turbine at the proposed wind farm would be more than 65 km from the ARP at Shannon and Waterford Airports, there will be no penetration of the Annex 15 surface for the Aerodromes.

All obstacles, if they are more than 100 meters above terrain for a distance of up to 45 km from the ARP, need to be registered in the IAA Air Navigation Obstacle Data Set. This area is known as the TMA area i.e. Terminal Maneuvering Area and is used for en-route circling and maneuvering and is shown in Figure 5.

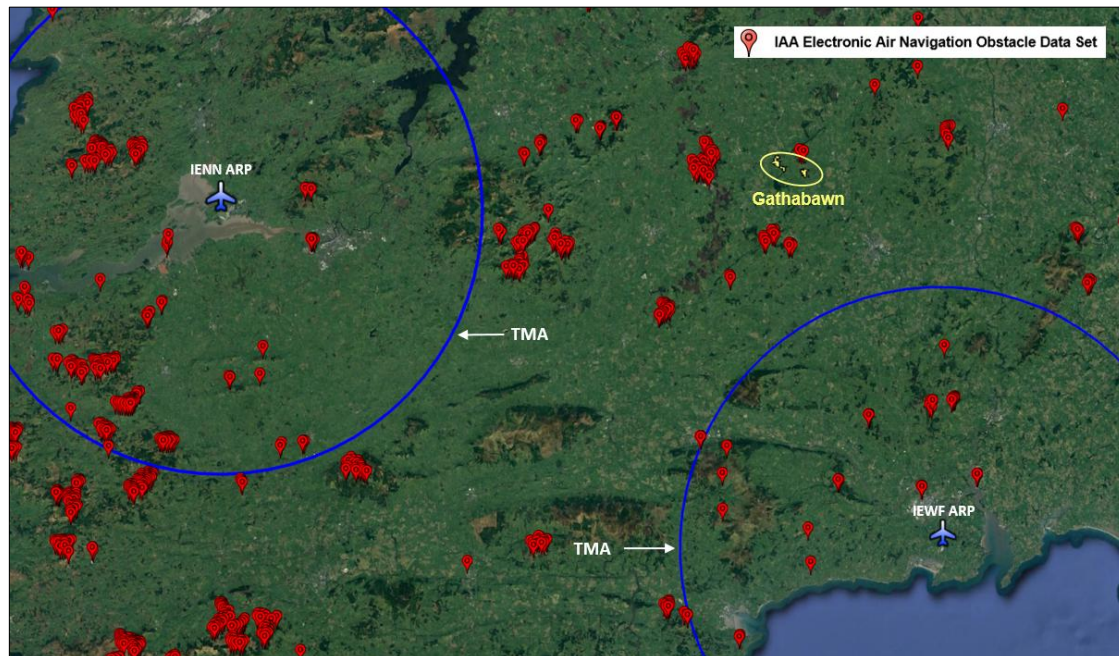


Figure 5. Annex 15 Aerodrome Surface and IAA Electronic Air Navigation Obstacle Data Set

It should also be noted that there are other existing tall structures (obstacles) nearer to the airports, e.g. the existing wind farms at Ballybay, Foyle, An Cnoc, Lisheen and Bruckana.

These existing obstacles would shield any potential impacts from the Proposed Gathabawn Windfarm. The IAA Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 6.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026



Figure 6. Existing Obstacles in vicinity of Gathabawn Wind Farm

Although there are other obstacles closer to the airport than the proposed wind farm, all new obstacles must be assessed to see if they cause a “hazard to air navigation” and all Terrain Obstacle Data (including man-made obstacles) have to be considered by the relevant Aviation Authorities.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 15 Aerodrome Surfaces	The proposed wind turbines would be required to be included in the IAA Obstacle Data Set.	None

Table 5. Aviation Impact Review - Annex 15 Aerodrome Surfaces

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.3 Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities.

The navigation facilities to be considered at Shannon and Waterford Airports are the ILS Localisers, Glidepaths and DMEs that provide guidance for aircraft landing. The minimum safeguarded areas for these facilities are defined by the International Civil Aviation Organisation (ICAO) in the document ICAO EUR DOC 015, Section 7. The BRA parameters as specified by the ICAO are provided in Appendix B of this report.

Figure 7 below illustrates that the Proposed Gathabawn Windfarm is over 50 km from the BRAs at Shannon and Waterford Airports. At this distance turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Shannon or Waterford Airports.



Figure 7. Proposed Wind Farm relative to Shannon and Waterford Airport BRAs

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Building Restricted Areas	No action.	None

Table 6. Aviation Impact Review - Building Restricted Areas

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.4 Minimum Sector Altitudes (MSAs)

A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is not within 25 nautical miles of the VOR/DME at Shannon, or 25 nautical miles of the NDB at Waterford. The MSA provides a minimum obstacle clearance of 1000 ft above the highest obstacle within specified quadrants

The proposed wind farm site is located more than 25 NM from the VOR/DME/NDBs as shown in Figure 8. Therefore, the MSAs will not be affected and there will be no impact on the published MSA altitude figures.

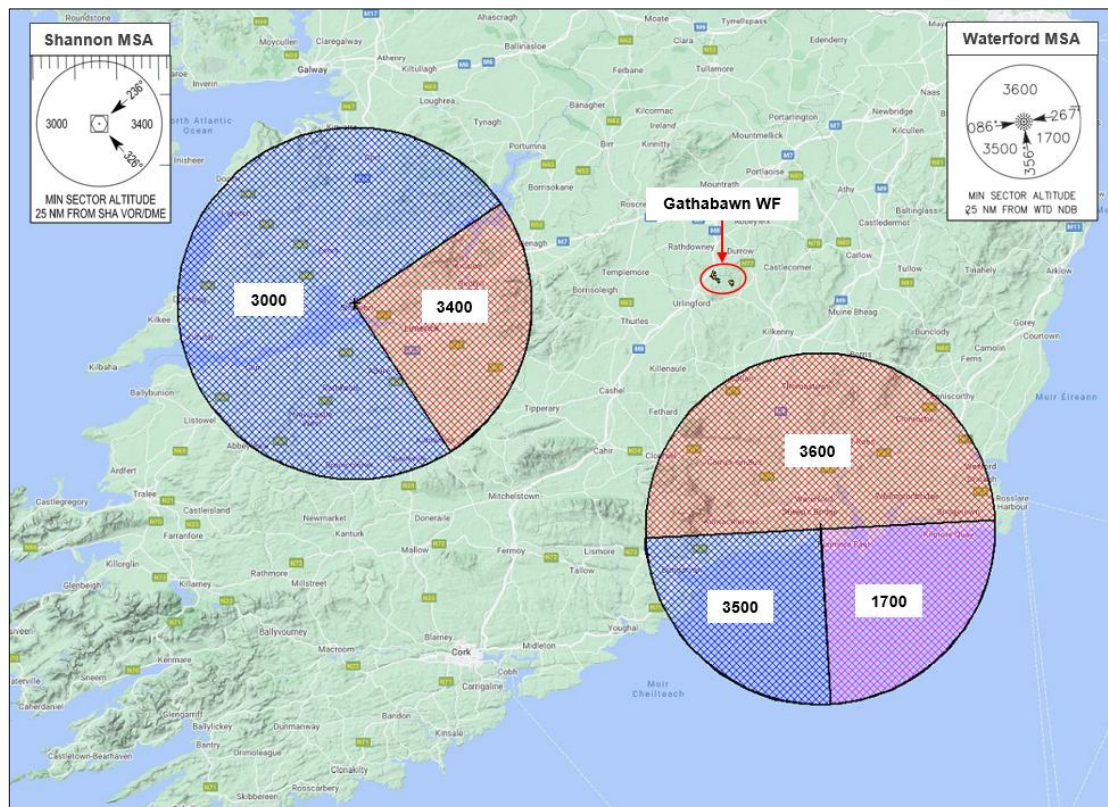


Figure 8. Minimum Sector Altitudes – Shannon, and Waterford Airports

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Minimum Sector Altitudes	No action	None

Table 7. Aviation Impact Review - Minimum Sector Altitudes

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.5 Instrument Flight Procedures

There are 13 published Instrument and Visual Flight Procedures/Charts for arrivals to and departures from Shannon and Waterford Airports. These Instrument Flight Procedures/Charts are listed below in Table 8.

An initial review of the Instrument Flight Procedures (IFPs) indicates that they are unlikely to be impacted by the proposed development, as none of the turbines at the proposed Gathabawn Windfarm would be located in Controlled Airspace (Class C) for flights to/from Shannon or Waterford Airports.

Aerodrome	Aerodrome Procedure	Chart ID	Observations
Shannon	RNAV Standard Instrument Departure Chart RWY 06	EINN AD 2.24-5	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	RNAV Standard Instrument Departure Chart RWY 24	EINN AD 2.24-6	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	RNAV Standard Arrival Chart RWY 06	EINN AD 2.24-7	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	RNAV Standard Arrival Chart RWY 24	EINN AD 2.24-8	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	Instrument Approach Chart ILS or LOC RWY 06	EINN AD 2.24-10	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	Instrument Approach Chart VOR RWY 06	EINN AD 2.24-11	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	Instrument Approach Chart ILS CAT I & II or LOC 24	EINN AD 2.24-13	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	Instrument Approach Chart VOR RWY 24	EINN AD 2.24-14	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Shannon	Visual Approach Chart – ICAO	EINN AD 2.24-15	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Waterford	Instrument Approach Chart ILS/NDB/DME RWY 21 – ICAO	EIWF AD 2.24-3.1	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Waterford	Instrument Approach Chart NDB/DME RWY 21 – ICAO	EIWF AD 2.24-5	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Waterford	Instrument Approach Chart NDB/DME RWY 03 – ICAO	EIWF AD 2.24-6.1	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).
Waterford	Visual Approach Chart – ICAO	EIWF AD 2.24-6.7	No Impacts. (Proposed turbines would be in Class G Uncontrolled Airspace).

Table 8. Instrument and Visual Flight Procedures – Shannon and Waterford Airports

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

The figure below has been provided to illustrate that the proposed development would be located in Class G Uncontrolled Airspace and therefore would not impact the IFPs for flights to/from Shannon or Waterford Airports.

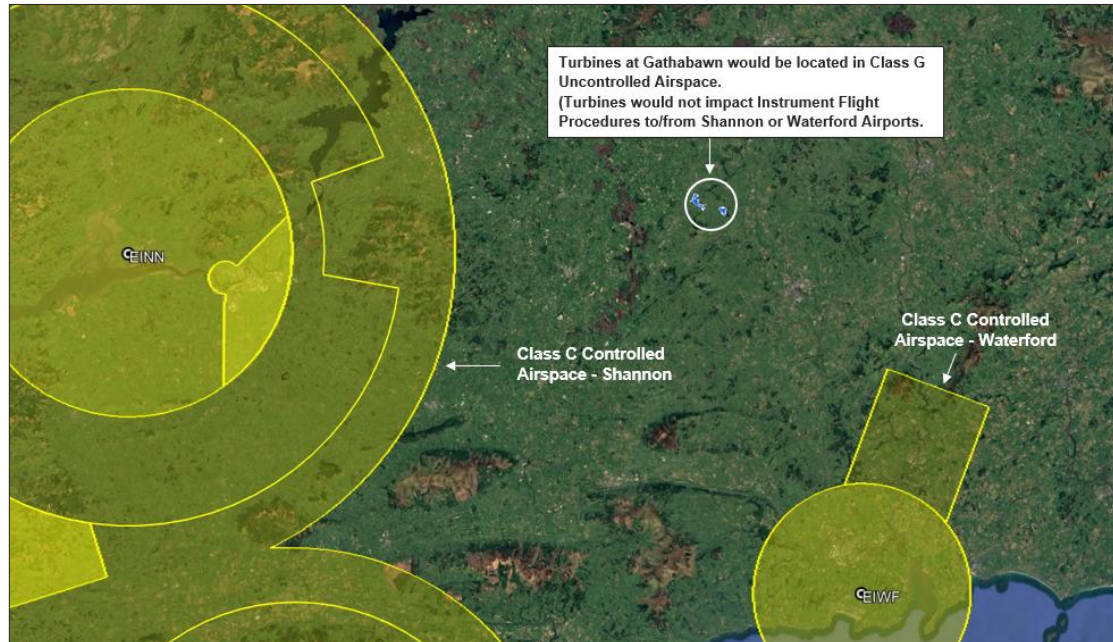


Figure 9. Proposed wind farm located in Class G (Uncontrolled Airspace)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Instrument Flight Procedures	None	None

Table 9. Aviation Impact Review - Instrument Flight Procedures

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.6 Existing Wind Farms in vicinity of Proposed Wind Farm

The existing wind farms in the vicinity of the proposed wind farm development are shown below in Table 10.

Wind Farm	County	Planning Reference	Description
Lisdowney	Kilkenny	12113 12172	Operational Wind Farm
Lisheen I, II, III	Tipperary, Kilkenny	06510773, 09510100, 10145, 15629, 19787, 20459 and others	Operational Wind Farm
Bruckana	Tipperary, Kilkenny, Laois	10145. 14202, 15629, 14139	Operational Wind Farm
Farranrory	Tipperary, Kilkenny	20972,	Operational Wind Farm
Foyle	Kilkenny	139, 12378	Operational Wind Farm
Ballybay	Kilkenny	12533	Operational Wind Farm
An Cnoc	Kilkenny	09781	Operational Wind Farm
Monaincha	Tipperary		Operational Wind Farm

Table 10. Permitted Wind Farms in vicinity of Proposed Wind Farm

All of the above wind farms are operational and do not impact the instrument flight procedures/charts for flights to/from Shannon or Waterford Airports.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.7 Communication and Navigation Systems

The AIP documents EINN AD 2-18/19 and EIWF AD 2-18/19 provide the information for communication and navigation facilities for Shannon and Waterford Airports respectively.

The table below shows the channel frequencies for the ATS communications Facilities and the Radio Navigation and Landing Aids for each airport.

Aerodrome	ATS communications Facilities Channel Frequency	Radio Navigation and Landing Aids Channel Frequency	Approximate Distance to Localizer and Transmitting antennas	Impacts of wind farm
Shannon	118MHz –130MHz	339KHz – 330MHz	96 km	No impacts
Waterford	121MHz -130MHz	110KHz – 331MHz	68 km	No impacts

Table 11. Impacts on Communications and Navigation Systems

As the proposed wind farm is over 65 km from the Localizers and transmitting antennas, it is very unlikely that turbines at the proposed wind farm will have any impact on these ATS communications and radio navigational aids. Typically, interference to VHF communications systems will only occur when obstacles are in close proximity to the VHF transmitter e.g. less than 500m.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Communication and Navigation Systems	No action	None

Table 12. Aviation Impact Review - Communication and Navigation Systems

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.8 Radar Surveillance Sensors

The tables below show the EUROCONTROL Guidelines Assessment Zone arrangement for the two types of aviation radar surveillance systems; Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR).

Zone	Description	Assessment Requirements
Zone 1	0 - 500m	Safeguarding
Zone 2	500m – 15 km and in radar line of sight	Detailed Assessment
Zone 3	Further than 15 km and in radar line of sight	Simple Assessment
Zone 4	Not in radar line of sight	No Assessment

Table 13. PSR Zone Arrangements

Zone	Description	Assessment Requirements
Zone 1	0 - 500m	Safeguarding
Zone 2	500m – 16 km but within maximum instrumented range and in radar line of sight	Detailed Assessment
Zone 4	Further than 16 km or not in radar line of sight	No Assessment

Table 14. SSR Zone Arrangements

The EUROCONTROL Guidelines require a 16 km safe distance for a “Zone 4 - No Assessment” condition and detailed assessments are required for any proposed wind within 16km of a secondary surveillance radar.

It should be noted that in the UK, NATS (Air Traffic Control) safeguards SSR to a distance of 10km. The guidelines used by NATS (*CAP 764: Chapter 2: Impact of wind turbines on aviation*) state that:

“Wind turbine effects on SSR are traditionally less than those on PSRs but can be caused due to the physical blanking and diffracting effects of the turbine towers, depending on the size of the turbines and the wind farm. These effects are typically only a consideration when the turbines are located very close to the SSR i.e. less than 10 km.”

A review of the potential impact of the proposed wind farm on Radar Surveillance Sensors is presented below in Section 2.8.1. The review shows that AirNav Ireland should not require a radar assessment, as turbines at the proposed development would be located in Assessment Zone 4 for all of their radar installations (PSR and SSR).

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Radar Surveillance Sensors	No action	None.

Table 15. Aviation Impact Review - Radar Surveillance Sensors

AiBridges <i>Total Communications Solutions</i>	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.8.1 AirNav Ireland Radar Surveillance Sensors

To determine which Assessment Zones are applicable to the proposed wind farm a desktop assessment was carried out. The nearest radar surveillance installations to the proposed Gathabawn Windfarm are at Shannon Airport and Woodcock Hill.

An assessment of the potential impact due to the proposed wind farm on these radar installations is provided in Section 2.8.1.1 and Section 2.8.1.2.

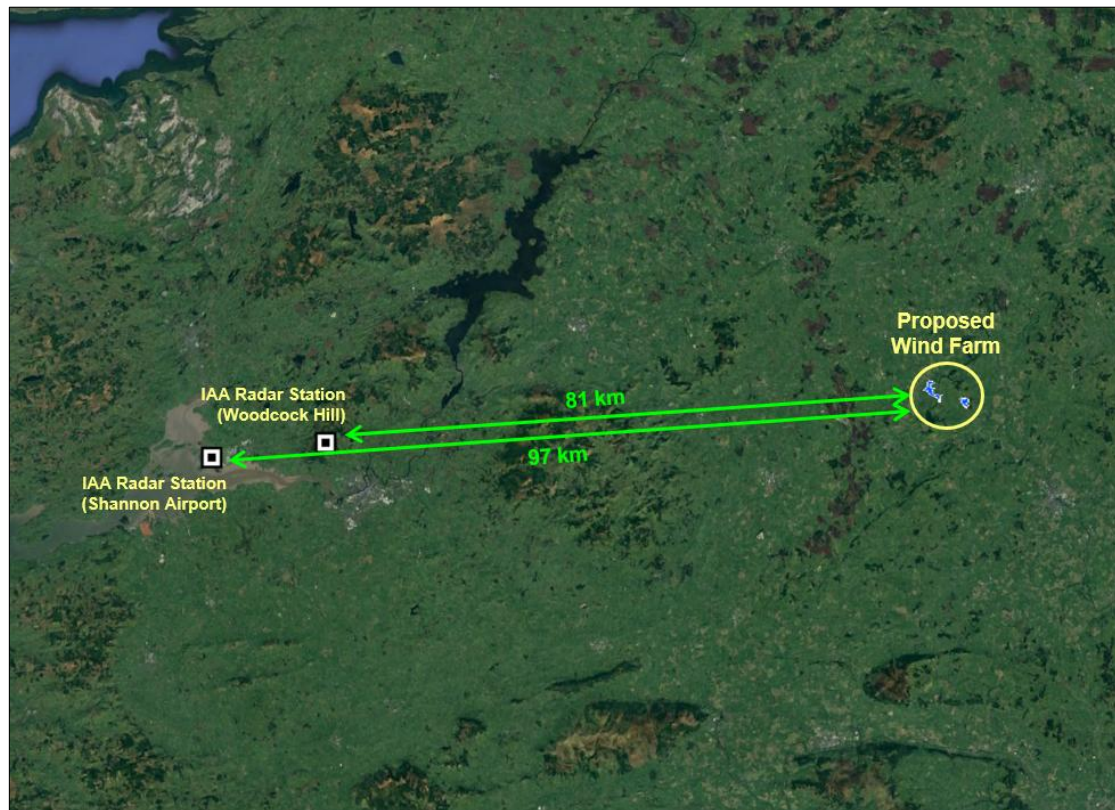


Figure 10. Radar Surveillance Sites relative to Gathabawn Wind Farm.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.8.1.1 Shannon Airport Radar Assessment

The radar surveillance site at Shannon Airport consists of a PSR and an SSR. The PSR and the SSR antennas are co-located on the same structure at Shannon Airport (Figure 11).



Figure 11. Shannon Airport Radar Station

Table 16 below shows the (EuroControl) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight (RLOS) condition exists.

Wind Farm ID	Distance to PSR/SSR	RLOS	Radar Assessment Zone (EuroControl Guidelines)	Radar Assessment Requirement (EuroControl Guidelines)
Gathabawn	97 km	No	Zone 4	Detailed Assessment Not Required

Table 16. EuroControl Safeguarding Guidelines – Shannon Airport Radar Station

As the table above shows, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the PSR/SSR radar station at Shannon Airport.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.8.1.2 Woodcock Hill Radar Assessment

The radar surveillance site at Woodcock Hill consists of an SSR system housed in the dome-shaped structure shown in Figure 12.



Figure 12. Woodcock Hill Radar Station

Table 17 below shows the (EuroControl) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight (RLOS) condition exists.

Wind Farm ID	Distance to PSR/SSR	RLOS	Radar Assessment Zone (EuroControl Guidelines)	Radar Assessment Reequipment (EuroControl Guidelines)
Gathabawn	81 km	No	Zone 4	Detailed Assessment Not Required

Table 17. EuroControl Safeguarding Guidelines – Woodcock Hill Radar Station

As the table above shows, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which indicate that a detailed technical assessment would not be required for the impact on the SSR radar station at Woodcock Hill.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.9 Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an AirNav Ireland approved Flight Inspection Service Provider (FCSL).

The checks are carried out during annual inspections consisting of radial and orbital test flights around Shannon and Waterford Airports for calibration of instrument landing systems (ILS). Test flights are done for inspection and calibration of the ILS Localizer Lateral Coverage Sectors and the ILS Glide Path Sectors.

2.9.1 ILS Localizer Lateral Coverage Sector

Figure 13 shows the ILS Localizer Lateral Coverage Sector, as defined in ICAO Annex 10. The figure shows that the coverage sector extends to 25 NM from the localizer antenna system.

As the proposed Gathabawn Windfarm is over 35 NM from the localizer antenna system at Waterford, and over 50 NM from the localizer antenna system at Shannon, there would be no impact on the ILS Localizer Lateral Coverage Sectors for these airports.

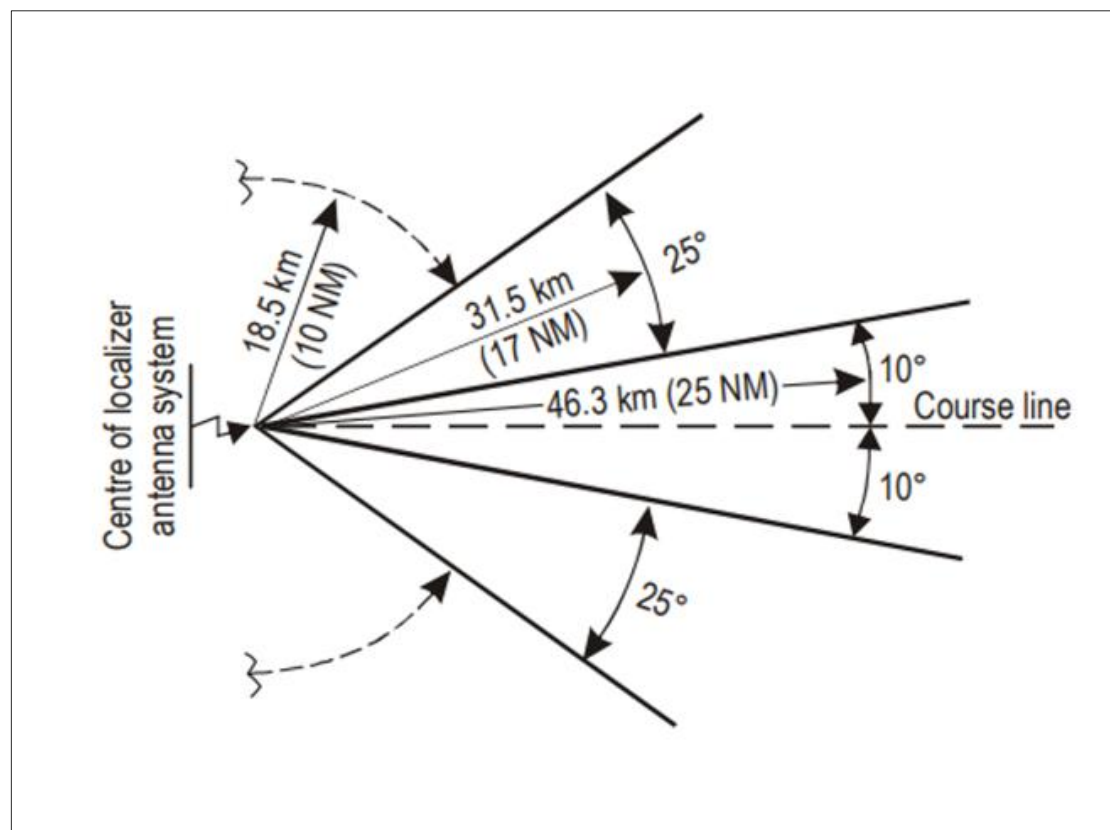


Figure 13. ILS Localizer Lateral Coverage Sector (as defined in ICAO Annex 10)

The flight paths of the latest publicly available FCSL Inspection/Calibration flights for Shannon and Waterford Airports are shown below in Figure 14 and Figure 15.

As can be seen from the figures, the Inspection/Calibration flights do not fly over/near the proposed wind farm development, and it is highly unlikely that there would be any impact to the test flight procedures due to the proposed turbines.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026



Figure 14. FCSL Flight Route – Shannon Airport 19th March 2026



Figure 15. FCSL Flight Route – Waterford Airport 08th May 2024

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.9.2 ILS Glide Path Sector

Glide Path flight inspection procedures include checks below the sector to assure a safe flight path area between any obstacles on the approach path and the bottom edge of the Glide Path Sector.

Figure 16 shows the ILS Glide Path Coverage Sector, as defined in ICAO Annex 10. The figure shows that the coverage sector extends to 10 NM from the runway.

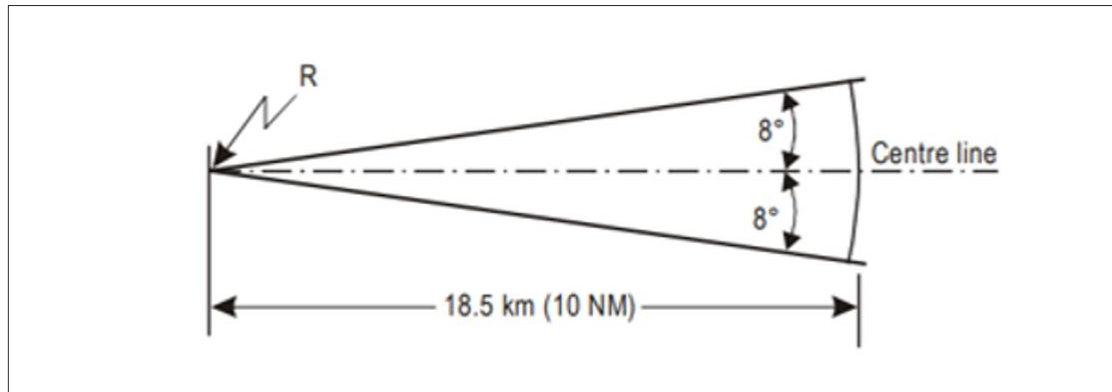


Figure 16. ILS Glide Path Coverage Sector (as defined in ICAO Annex 10)

As the proposed wind farm is over 35 NM from the runway at Waterford, and over 50 NM from the runway at Shannon, there would be no impact on the ILS Glide Path Coverage Sectors for these airports.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Flight Inspection and Calibration	None.	None.

Table 18. Aviation Impact Review - Flight Inspection and Calibration

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.10 Aeronautical Obstacle Warning Lighting Scheme

In the event of a grant of planning consent the IAA-ANSP would require the lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development may be considered as an en-route obstacle. The developers of the proposed turbines intend to install aeronautical obstacle warning lights on selected turbines as agreed with the IAA.

It is recommended that lighting requirements should be in accordance with Chapter Q – Visual Aids for denoting Obstacles; CS ADR.DSN.Q.851 and GM.ADR.DSN.Q.851 (Pages 729/730) of the EASA Easy Access Rules for Aerodromes (Reg (EU) No. 139/2014) where it states that

“Applicability: When considered as an obstacle a wind turbine should be marked and/or lighted.”

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Aeronautical Obstacle Warning Light Scheme	In the event of planning consent being granted, the applicant should be conditioned to contact the IAA to agree to an Aeronautical Obstacle Warning Light Scheme.	None

Table 19. Aviation Impact Review - Aeronautical Obstacle Warning Light Scheme

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.11 Private Airfields (VFR Flying)

For due diligence purposes, private airfields and heliports in the vicinity of Gathabawn have been considered and it was found that there are four private airfields / helipads within 20 km of the proposed wind farm site: Kilkenny Airfield, Moyne Aerodrome, Midlands Heliport and Abbeyleix Airfield.

These aviation installations operate in un-controlled Class G airspace and flights in and out of these airfields are required by law to fly by Visual Flight Rules (VFR) and in accordance with the IAA *Rules of The Air*.

ID	Location	Installation Type	Description
Kilkenny Airfield	Holdensrath, Co. Kilkenny.	Private Airfield.	Airfield with single grass-strip runway.
Moyne Aerodrome	Manselstown, Co Tipperary	Private Airfield.	Airfield has not been operational since 2016
Midlands Heliport	Aghnacross, Co Laois.	Private Helipad.	Grass helipad located in private agricultural land.
Abbeyleix Airfield	Abbeyleix, Co Laois	Private Airfield.	Airfield with single grass-strip runway.

Table 20. Private Airfield / Heliport Details

A review of the possible impacts of the proposed wind farm on each Airfield/Heliport is provided in Sections 12.11.1 to 12.11.4 that follow. The findings of the review indicate that the proposed wind farm would have no impacts on these Airfields/Heliports.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Private Airfields (VFR Flying)	No action.	None

Table 21. Aviation Impact Review - Private Airfields (VFR Flying)

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.11.1 Kilkenny Airfield

This airfield is located on the outskirts of Kilkenny City and is 15 km from the proposed Gathabawn Windfarm. The location of the airfield relative to the proposed development is shown below in Figure 17 and a close-up aerial view of the airfield is shown in Figure 18. The aerodrome is used for light aircraft only (i.e. small airplanes, helicopters, microlights, etc.) and flights in and out of this airfield are required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

The Rules of the Air state, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield in question. This can be achieved by prudent flight planning by the VFR pilot prior to flight.



Figure 17. Location of Kilkenny Airfield



Figure 18. Close-up Aerial View – Kilkenny Airfield

As the proposed development is 15 km from the airfield and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to Kilkenny Airfield due to the proposed Gathabawn Windfarm.

Airfield / Helipad	Description	Wind Farm Impacts
Kilkenny Airfield	Private grass-strip airfield, 15 km southeast of the proposed Gathabawn windfarm.	No Impacts.

Table 22. Impacts of proposed Gathabawn Windfarm on Kilkenny Airfield.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.11.2 Moyne Airfield

This airfield is located in the townland of Moyne, Co Tipperary and is 16 km from the proposed Gathabawn Windfarm. The location of the airfield relative to the proposed development is shown below in Figure 19 and a close-up aerial view of the airfield is shown in Figure 20.

Although the airfield is listed in some aeronautical material, investigations indicate that the airfield has not been operational since 2016. The aerial view of the site also indicates there is no existing runway at Moyne.

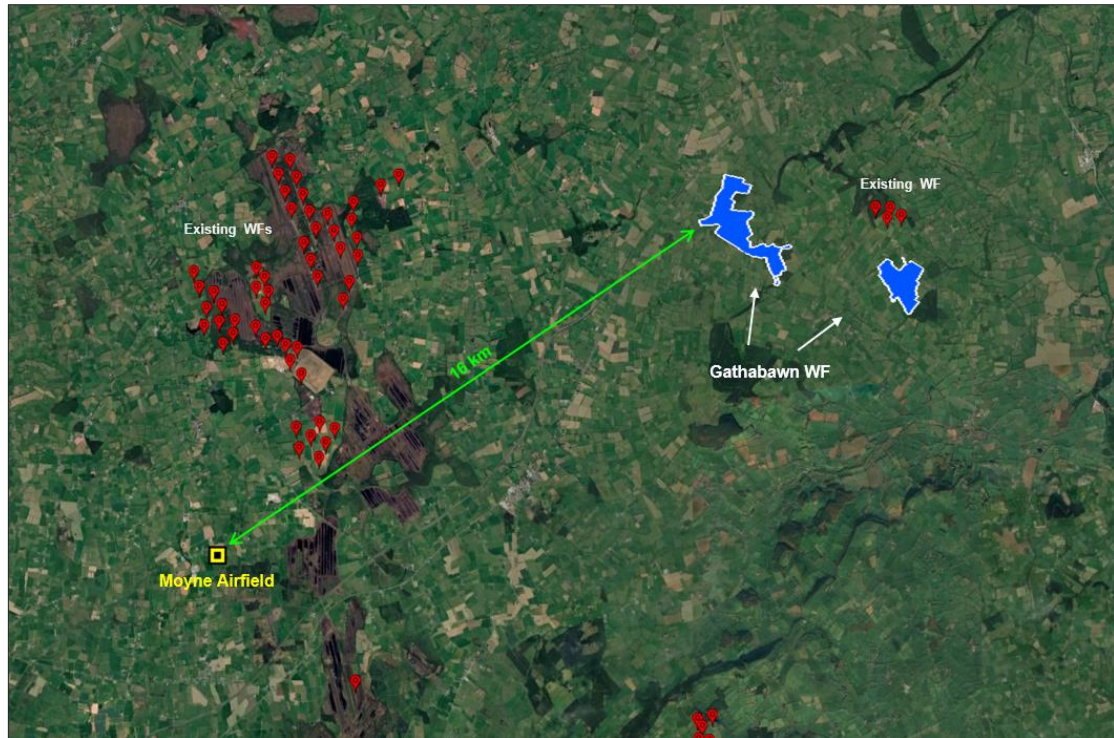


Figure 19. Location of Moyne Airfield



Figure 20. Close-up Aerial View – Moyne Airfield

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

The airfield would have previously been used for light aircraft only (i.e. small airplanes, helicopters, microlights, etc.) and any flights in and out of the airfield would have been required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

The Rules of the Air state, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield in question. This can be achieved by prudent flight planning by the VFR pilot prior to flight.

As the proposed development is 16 km from the airfield and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to Moyne Airfield due to the proposed Gathabawn Windfarm.

Airfield / Helipad	Description	Wind Farm Impacts
Moyne Airfield	Private grass-strip airfield, 16 km southwest of proposed Gathabawn Windfarm. (Airfield has not been operational since 2016)	No Impacts.

Table 23. Impacts of proposed Gathabawn Windfarm on Moyne Airfield

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.11.3 Midlands Heliport

The Midlands Heliport is located in agricultural land and is 17 km northeast of the proposed Gathabawn Windfarm. The location of the grass helipad relative to the proposed development is shown below in Figure 21 and a close-up aerial view of the helipad is shown in Figure 22. The survey findings indicate that aviation activity at the helipad site is low. All helicopter flights to/from this helipad would be required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*. It should also be noted that there is a permitted wind farm (i.e. Pinewood Wind Farm) that is located less than 2 km from the Midlands Heliport site.

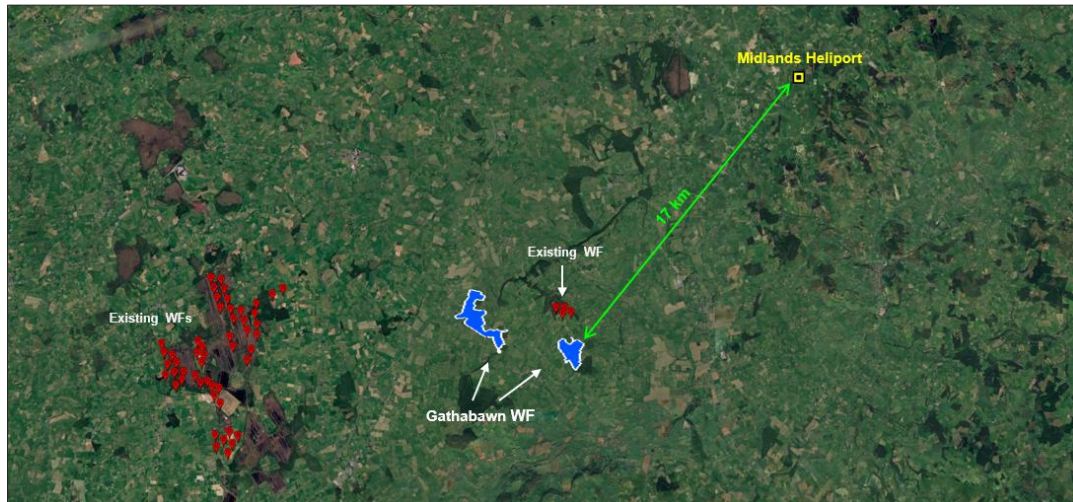


Figure 21. Location of Midlands Heliport



Figure 22. Close-up Aerial View – Midlands Heliport

As the proposed development is 17 km from the helipad site and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to the Midlands Heliport due to the proposed Gathabawn Windfarm.

Airfield / Helipad	Description	Wind Farm Impacts
Midlands Heliport	Private grass helipad, 17 km northeast of the proposed Gathabawn Windfarm.	No Impacts.

Table 24. Impacts of proposed Gathabawn Windfarm on Midland Heliport.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.11.4 Abbeyleix Airfield

This airfield is located on the outskirts of Abbeyleix and is 14 km from the proposed Gathabawn Windfarm. The location of the airfield relative to the proposed development is shown below in Figure 23 and a close-up aerial view of the airfield is shown in Figure 24. The aerodrome is used for light aircraft only (i.e. small airplanes, helicopters, microlights, etc.) and flights in and out of this airfield are required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

The Rules of the Air state, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield in question. This can be achieved by prudent flight planning by the VFR pilot prior to flight.

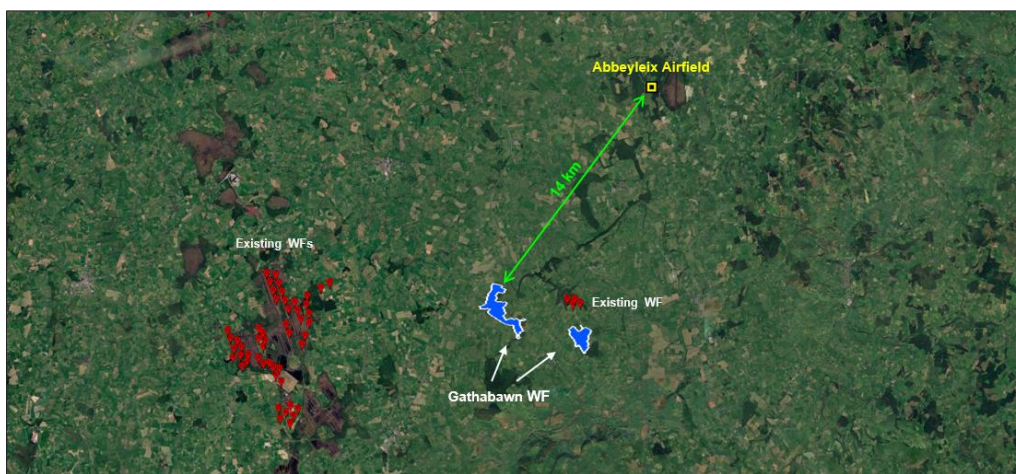


Figure 23. Location of Abbeyleix Airfield



Figure 24. Close-up Aerial View – Abbeyleix Airfield

As the proposed development is 14 km from the airfield and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to Abbeyleix Airfield due to the proposed Gathabawn Windfarm.

Airfield / Helipad	Description	Wind Farm Impacts
Abbeyleix Airfield	Private grass-strip airfield, 14 km northeast of proposed Gathabawn Windfarm.	No Impacts.

Table 25. Impacts of Gathabawn Windfarm on Abbeyleix Airfield

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.12 Irish Air Corps / DoD Safeguarding

The Irish Air Corps Position Paper “*Air Corps Wind Farm/ Tall Structures Position Paper*” published on 08th August 2014 (Appendix C) states, in the Statement of Position, that the Air Corps is opposed to any wind farms or tall structures in the following areas :

- Lands underlying military airspace for flying activity. (Areas contained in Danger Areas EI-D1, EI-D5, EI-D6, EI-D13, EI-D14, Restricted Areas EI-R15, EI-R16 within 20 NM of Baldonnel, MOAs 3 and 4 within 20 NM of Baldonnel.
- Low Flying Training Areas within MOA 4 in the areas of; Blessington, Edenderry/Allenwood/Rathangan, Kilmeague/Newbridge.
- Low Flying Training Area West – LFTA WEST.
- A distance of 5 NM or less from military installations.
- Critical low level flying routes in support of Air Corps operation requirements as described in Figure 25 below.

c. The following routes are identified as critical low level routes in support of Air Corps operational requirements and the Air Corps is opposed to the erection of wind farms or tall structures within 3NM of the route centerline which could affect Air Corps’ ability to access regional areas.

- (a) N/M1
- (b) N/M2
- (c) N/M3
- (d) N/M4
- (e) N/M6
- (f) N/M7
- (g) N/M8**
- (h) N/M9
- (i) N/M11
- (j) N25
- (k) N17 between Sligo and Knock
- (l) N15/N13 between Sligo and Letterkenny
- (m) N14 from Lifford to Letterkenny and R245 and R247 from Letterkenny to Fanad Head.

Applications or proposals for structures in these areas of a height greater than 45m above ground level at the site of the object must be referred to Irish Air Corps for assessment of potential impact on flight operations.

Figure 25. Irish Air Corps – Critical Low Level Routes

In addition to the restricted areas, as outlined above, the IAC have specific aviation lighting requirements for wind farm developments. In Section 2.11.1 and Section 2.11.2, reviews of the IAC Restricted Areas, and the Military Aviation Lighting requirements are provided.

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.12.1 IAC Restricted Areas

The nearest of the Air Corps restricted areas to the proposed Gathabawn Windfarm is the low level flight route around the M8 motorway. The proposed wind farm site is partially located within the restricted area (3NM) around the M8, as shown in Figure 26 below. As some of the proposed turbines at Gathabawn would be located inside the restricted area, the Irish Air Corps may raise concerns in relation to the proposed development.

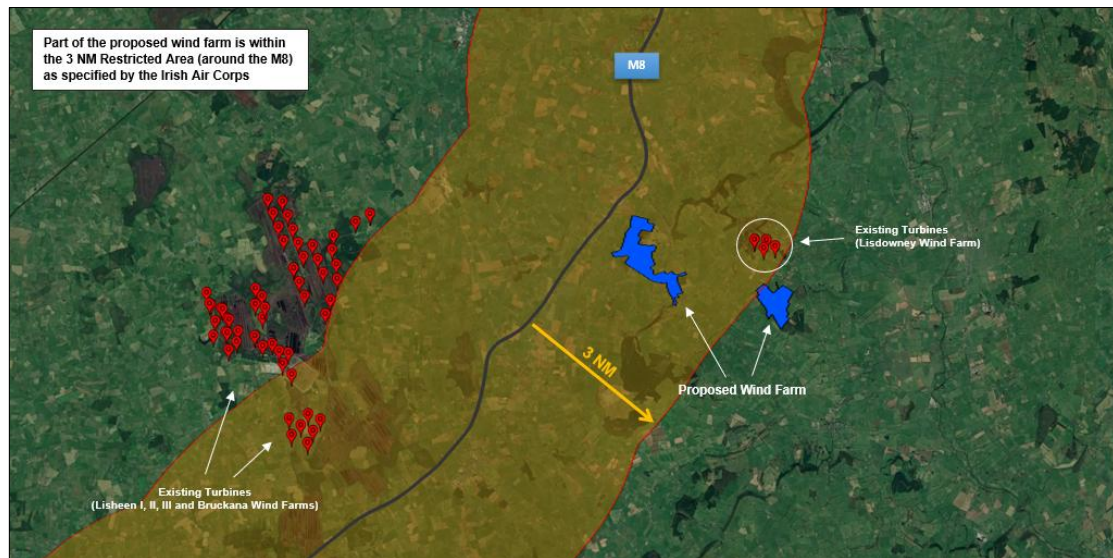


Figure 26. Irish Air Corps - Critical Low Level Route (M8)

Although the proposed wind farm is partially located within the restricted area around the M8, it should be noted that there are other existing wind farms that are located within 3NM of the M7 and M8 motorways (e.g., Monaincha, Lisheen II, Lisdowney and Kill Hill wind farms) as shown below in Figure 27.

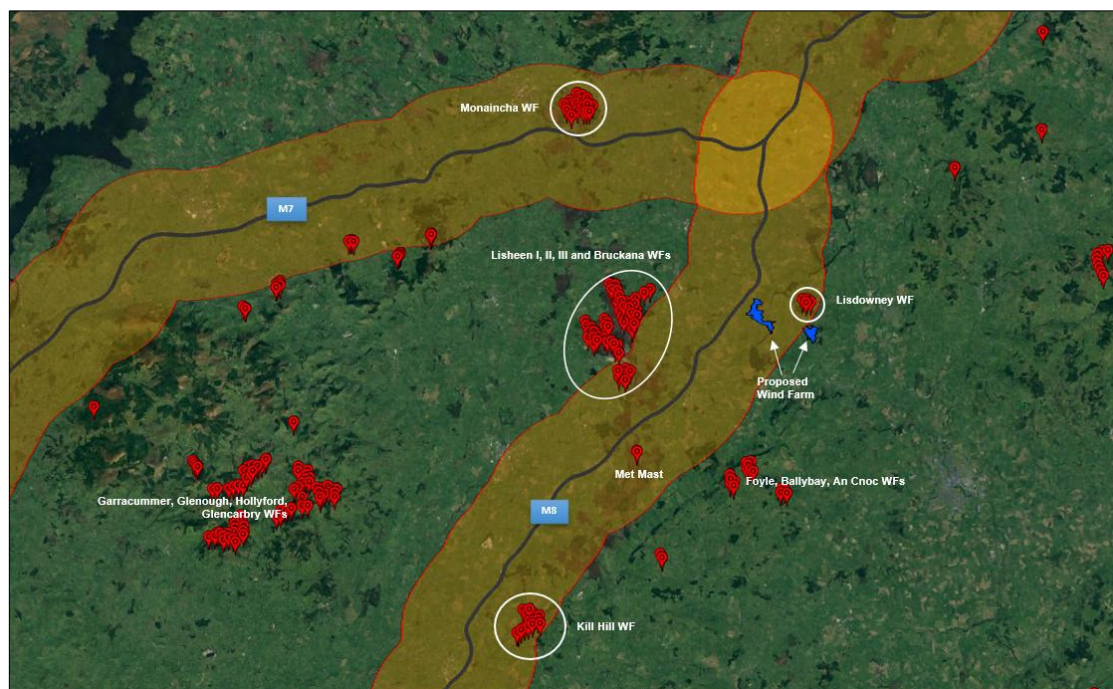


Figure 27. Existing Wind Farms located within 3 NM of Low-Level Route Restricted Areas

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.12.1.1 Desktop Analysis of Navigational Flight Aids:

- The proposed Gathabawn Windfarm site is not located in a direct flight path from Baldonnel to any of the regional airports (e.g. Kerry, Cork, Waterford) or major cities (e.g. Cork, Limerick, Waterford).
- The area to the east of the M8 motorway where Gathabawn Windfarm is situated, is unsuitable for aircraft maneuvering due to the close proximity of high terrain i.e. Clomnatagh Hill, Spa Hill and Cullahill Mountain. There are also hills west of the M8 but they are further from the motorway and are not as high as Clomnatagh Hill or Spa Hill.
- In poor weather conditions it is unlikely that low-level flights would pass over the Gathabawn Windfarm area, as any flights along the M8 would avoid the high terrain to the east of the motorway. The hills to the east of the motorway would also contribute to lower visibility and lower cloud base cover. Flying west of the motorway would be a better option.
- In good weather conditions, the Gathabawn Windfarm turbines could potentially be used as a visual landmark to aid Visual Flight Rules (VFR) navigation. There are existing wind farms in the area (e.g. Lisdowney) and the addition of new turbines at Gathabawn could make it easier for pilots to identify their flight position.
- In the rare event where a pilot decides to undertake a reverse course manoeuvre by performing a 180° turn, it is unlikely that this would be initiated near Gathabawn. The existing wind farms at Lisdowney and Lisheen II are marked as obstacles on existing aviation charts and Aer Corps flight rules and procedures would account for these. Any reverse course manoeuvre would likely commence before the flight reaches Lisdowney wind farm or after flying past Lisheen II wind farm. The proposed Gathabawn Windfarm turbines would not have any further impact on Aer Corps flight rules and procedures.
- In a worst-case scenario of deteriorating visibility and/or reducing cloud base where a pilot is forced to undertake a reverse course manoeuvre in the vicinity of Gathabawn. The turn radius for an aircraft with a true airspeed of 80 knots in a 25° bank turn (as per ICAO recommendations) would be 0.2 NM*. A worst-case scenario, where the pilot decides to commence a reverse-course manoeuvre as they are flying south along the M8 adjacent to Gathabawn (0.05 NM to the right of the road, as per the Rules of the Air), would result in the aircraft being 0.15 NM east of the motorway. This would be 0.35 NM /2127 ft clear of the nearest of the proposed Gathabawn Windfarm turbines.

If a worst-case westerly crosswind of 25kts is also considered, the radius of turn would be 0.33 NM putting the aircraft 0.28 NM east of the motorway. This would result in the aircraft being 0.22 NM 1337ft clear of the nearest of the proposed Gathabawn Windfarm turbines. (The formula used in these calculations has been taken from the *“Pilot’s Handbook of Aeronautical Knowledge – Federal Aviation Administration – 2016”* and is provided in Appendix D of this report.)

- All modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farm at Gathabawn be permitted the turbine location would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

- For the reasons outlined above any impacts on Air Corps operations in the area are expected to be negligible, subject to a further assessment by Air Corp technical specialists.

As previously described, low-level flights along the M8 are unlikely to pass over the proposed Gathabawn Windfarm site. A more likely low-level flight route is illustrated in Figure 28 which would avoid the high terrain to the east of the motorway and the existing wind farm at Lisdowney.

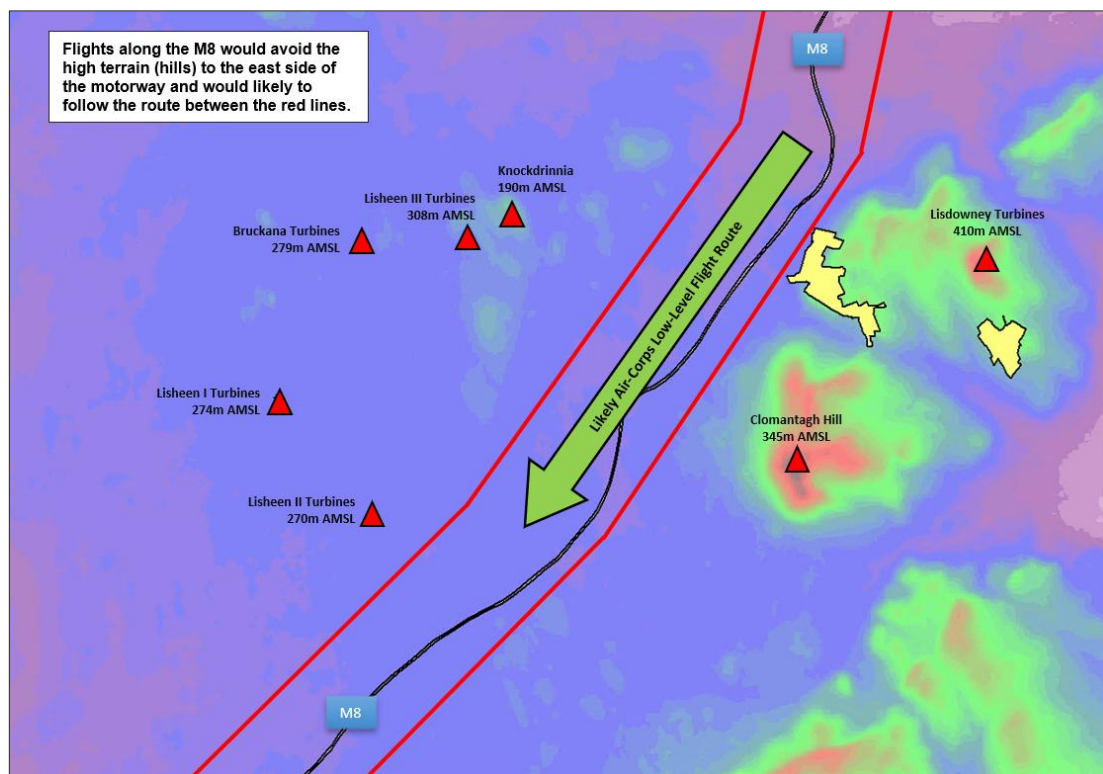


Figure 28. Topography showing that flights are likely to avoid Gathabawn due to terrain.

To further illustrate that low-level flights are likely to avoid the proposed wind farm site, a cross-sectional analysis of the area was carried out. Two cross sections in the vicinity of the proposed wind farm were assessed;

- A1 – A2 : Terrain Profile Perpendicular to the M8 Motorway
- B1 – B2: Terrain Profile parallel to the M8 Motorway

The results of both cross sections (Figure 29) show that low-level flights are likely to avoid the proposed Gathabawn Windfarm site area due to the existence of high terrain to the east of the motorway.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

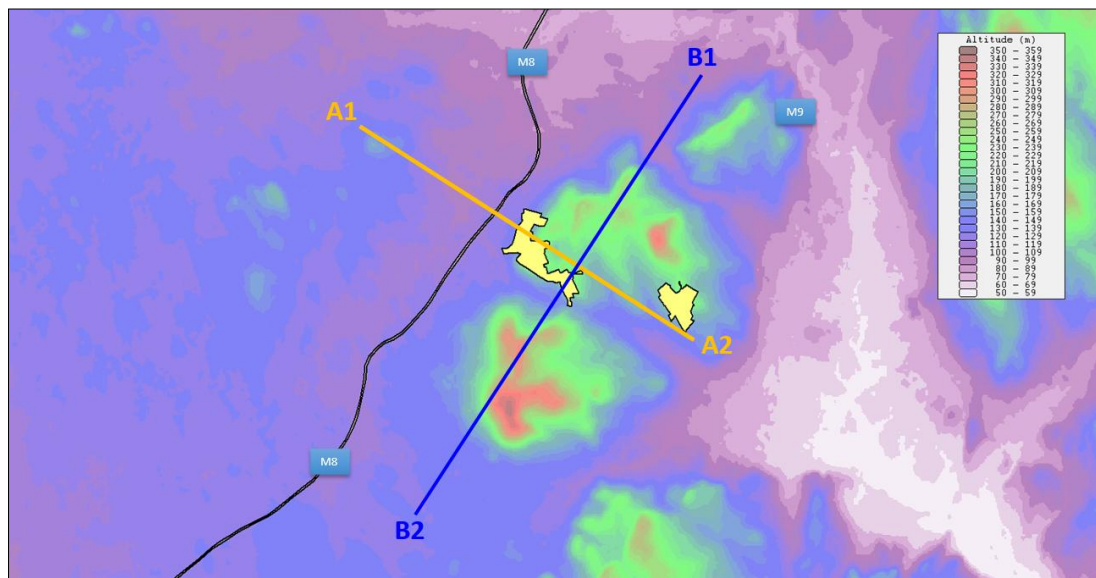


Figure 29. Gathabawn Wind Farm - Cross Section Analysis Map

Cross Section A1-A2 is shown below in Figure 30 and shows the high terrain to the east of the M8 Motorway (Red Area). Low-level flights would avoid this terrain and fly to the west of the M8 Motorway (Green Area).

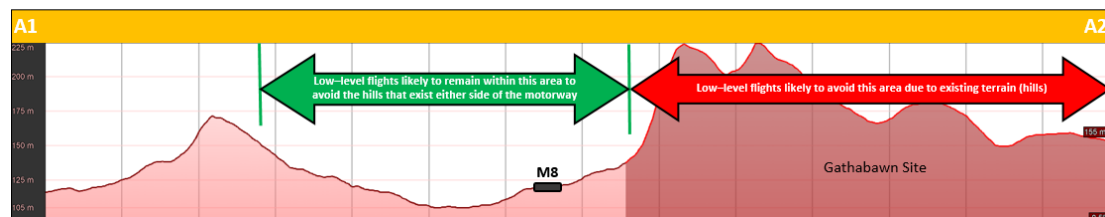


Figure 30. Cross Section A1-A2 (Terrain Profile Perpendicular to the M8 Motorway)

Cross Section B1-B2 is shown below in Figure 31 and shows the Gathabawn Site Terrain Profile parallel to the M8 Motorway. Low-level flights would avoid this area due to the high terrain in the area (e.g. Clomantagh Hill).

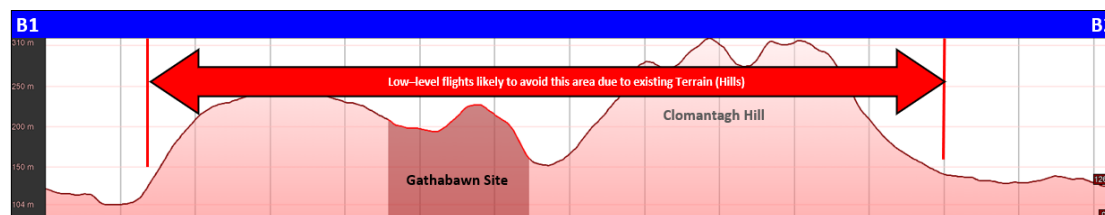


Figure 31. Cross Section B1-B2 (Terrain Profile Parallel to the M8 Motorway)

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.12.2 Military Aviation Lighting

For Military Aviation Lighting, it is recommended is to engage at the early stage in a consented development (subject to planning conditions), to agree on the details relating to the lighting requirements for the DoD/IAC.

Aviation Impact Review	Observations
Irish Air Corps / Department of Defence Safeguarding	The desktop screening indicates that the proposed wind farm is partially located within an Irish Air Corps Restricted Area, and the IAC may raise concerns in relation to the proposed wind farm development. However, it should be noted that low-level flights along the M8 motorway are likely to avoid the proposed wind farm site, due to high terrain to the east of the motorway and due to the existing wind turbines at Lisdowney Regarding Military Aviation Lighting, the recommendation is to engage at the early stage in a consented development (subject to planning conditions), to agree on the details relating to the lighting requirements for the DoD/IAC.

Table 26. Aviation Impact Review - Irish Air Corps / Department of Defence Safeguarding

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.13 The Garda Air Support Unit (GASU)

The Garda Air Support Unit is based at Casement Aerodrome, Baldonnell and is typically deployed to incidents in the following cases:

- Immediate threat to life
- Incidents of a criminal, terrorist or other nationally important nature
- Immediate threat of serious public disorder
- Tasks leading to the prevention or detection of crime
- Evidence gathering
- Intelligence gathering
- Photographic tasks
- Traffic Management/Monitoring

The unit consists of one fixed-wing aircraft (a de Havilland Canada-6 Twin Otter Guardian 400 aircraft) and two helicopters (Eurocopter EC 135 T2).



Figure 32. GASU - de Havilland Canada-6 Twin Otter Guardian 400 aircraft



Figure 33. GASU - Eurocopter EC135 T2

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

The proposed Gathabawn Windfarm is located in an area that is relatively sparsely populated and on agricultural terrain. For these reasons, it is highly unlikely that the proposed wind farm development would have any significant impacts on GASU operations.

In the unlikely event of GASU operations in the general area, it should be noted that all modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farms be permitted the associated turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly.

GASU Aircraft	Potential Impact of proposed wind farm
Fixed-wing Airplane (Pilatus Britten-Norman BN 2T-4S Defender 4000)	No Likely Impact – Fixed-wing aircraft are unlikely to be deployed in low level activity in the subject areas. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.
Helicopter (Eurocopter EC135 T2)	No Likely Impact – Helicopter landings in the subject area would not are unlikely to occur as the proposed wind farm site is located on agricultural terrain, which can be hazardous due to uneven/soft ground and loose debris. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.

Table 27. Impact of proposed wind farm on GASU Operations

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

2.14 The Emergency Aeromedical Service (EAS)

The air ambulance service in Ireland is known as the Emergency Aeromedical Service (EAS). The EAS crew (which include National Ambulance Service (NAS) paramedics) deal with time-critical emergency callouts to major emergencies such as road collisions and urgent medical events. The EAS currently operate two air ambulance helicopters operating from two bases:

- Custume Barracks, Athlone, Co Westmeath.
- Rathcoole Aerodrome, Rathcoole, Mallow, Co Cork.

The two helicopter borne emergency air ambulances consist of an Air Corps operated aircraft based at Custume Barracks in Athlone, and an aircraft located at Rathcoole Aerodrome in North County Cork. The nearest EAS base to the Proposed Wind Farm is the base in Athlone. The flight times from the EAS base at Athlone are shown in Figure 34.

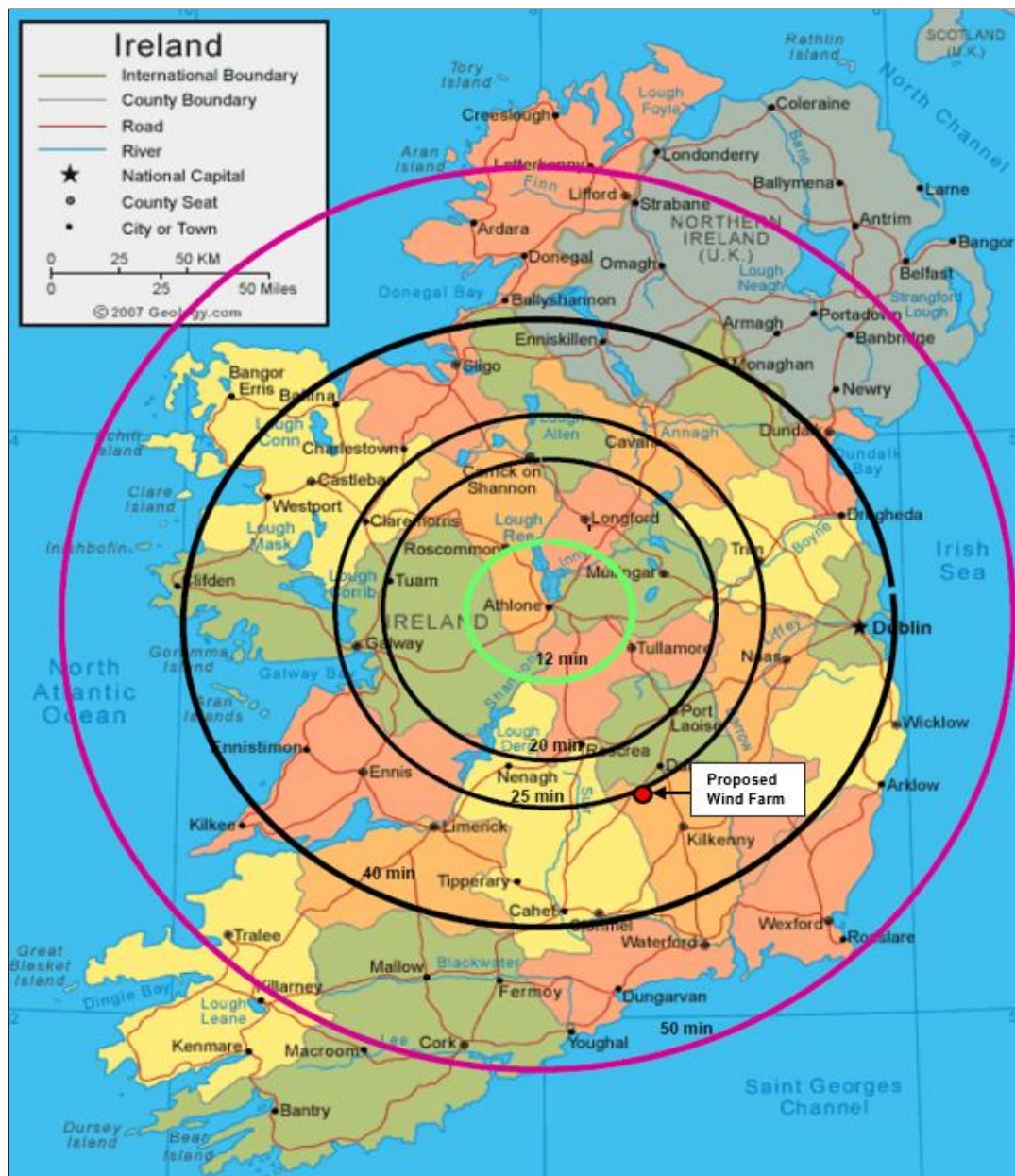


Figure 34. EAS – Flying Times from Athlone

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

EAS Helicopter landings are highly unlikely to occur in the subject area due to the agricultural terrain of the proposed site. Should the proposed Gathabawn Windfarm be permitted, the associated turbine locations would also be submitted to the IAA, and aviation charts and GNSS databases would be updated accordingly.

EAS helicopters would also be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines).

In addition, the footprint of the proposed wind farm development is relatively small and any flight diversions for EAS operations would have negligible time impacts. For these reasons, turbines at the proposed wind farm should have no impact on EAS flights from Athlone or Rathcoole.

EAS Aircraft	Potential Impact of proposed wind farm
Helicopter (Eurocopter EC135)	No likely impact – Helicopter landings at the subject area are highly unlikely to occur as the proposed wind farm site is located on agricultural terrain. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.

Table 28. Impact of proposed wind farm on EAS

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

3. Summary

A summary of the aviation review for the proposed wind farm is provided in Table 29 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	Turbines at the proposed wind farm site would be located outside the OLS Surfaces for Shannon and Waterford Airports.
Annex 15 - Aerodrome Surfaces	None	All obstacles, if more than 100 meters above terrain for a distance of 45 km from center point of Shannon and Waterford Airports, need to be registered in the IAA Air Navigation Obstacle Data Set. Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface for Shannon or Waterford Airports. However, the IAA may request that the turbines be included in the IAA Aeronautical Electronic Obstacle Data Sets.
Building Restricted Areas (BRAs)	None	A review shows that Gathabawn Windfarm would be more than 50 km from the BRAs at Shannon and Waterford Airports. At this distance there would be no impact due to the proposed wind farm.
Minimum Sector Altitudes (MSA)	None	A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is outside 25 nautical miles from the VOR/DME at Shannon and Waterford Airports. Therefore, the MSA of the relevant sectors will not be affected and there will be no impact on the published MSA altitude figures.
Instrument Flight Procedures	None	A review shows that the instrument flight procedures for Shannon and Waterford Airports are unlikely to be impacted.
Communication and Navigation Systems	None	As the proposed wind farm is over 65 km from the Localizers and transmitting antennas at Shannon and Waterford Airports, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Sensors	None	Turbines at the proposed wind turbines would be located in Assessment Zone 4 (EuroControl guidelines) for SSR and PSR instruments and a detailed Radar Impact Assessment should not be required by AirNav Ireland.
Flight Inspection and Calibration	None	A review of the Flight Inspection and Calibration Procedures indicates that there will be no impact due to the proposed wind farm development.
Aeronautical Obstacle Warning Light Scheme	Observation	In the event of planning consent being granted, the applicant will contact the IAA to agree to an Aeronautical Obstacle Warning Light Scheme.
Private Airfields / Helipads	None	An assessment of private airfields / helipads in the vicinity of the proposed Gathabawn Windfarm indicates that there will be no impact due to the proposed development.
Irish Air Corps Policy on Wind Farms	Observation	The proposed wind farm is partially located within the IAC Restricted Area along the low-level flight route around the M8 motorway, and the IAC may raise concerns in relation to the proposed wind farm development. However, it should be noted that low-level flights along the M8 motorway are likely to avoid the proposed wind farm site, due to high terrain of Spahill/Clonmanagh Hill and Cullahill Mountain to the east of the motorway and due to the existing wind turbines at Lisdowney. Regarding Military Aviation Lightning, the recommendation is to engage at the early stage in a consented development (subject to planning conditions), to agree on the details relating to the lighting requirements for the IAC.

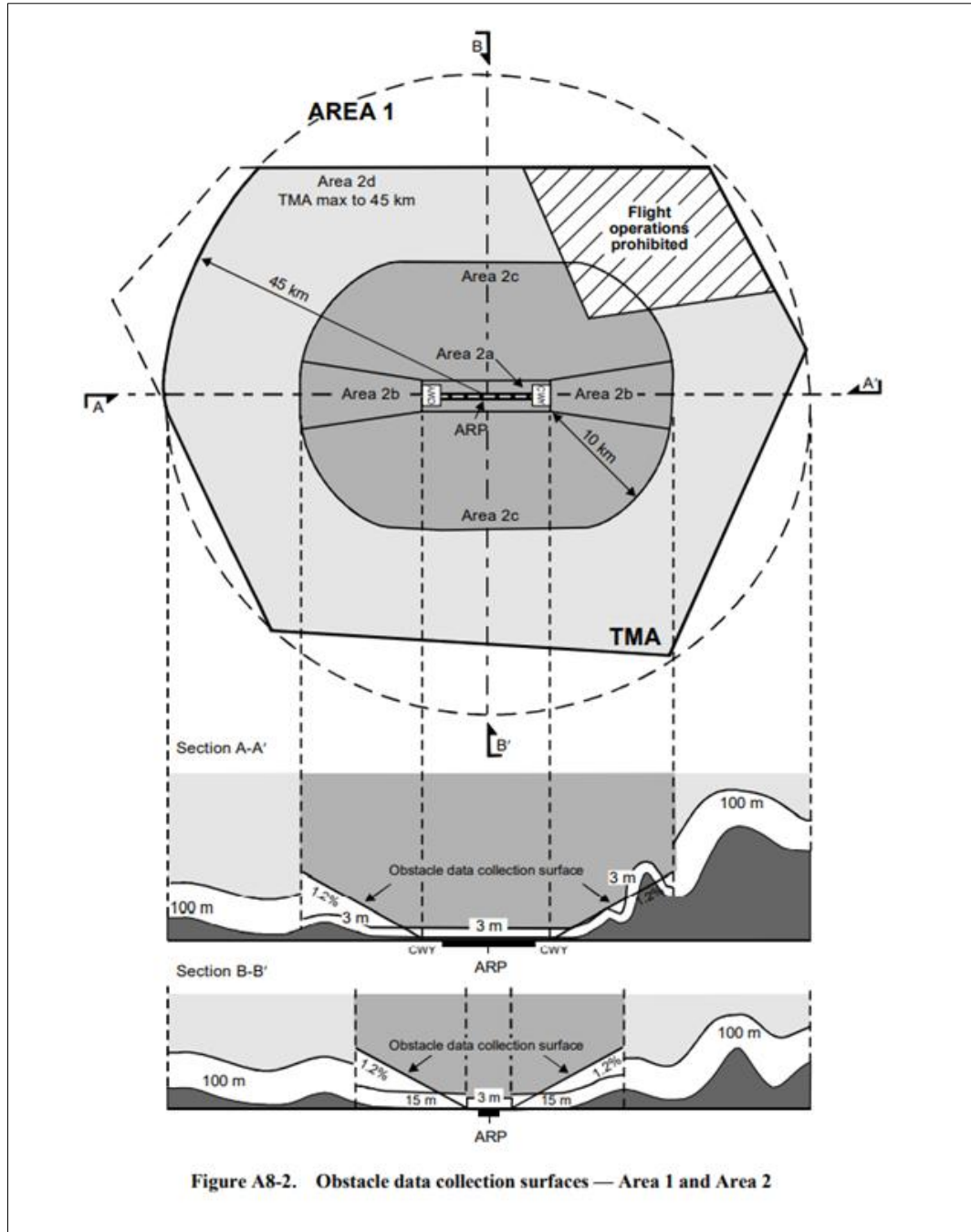
 Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

Garda Air Support Unit	None	A review of GASU operations indicates that they are unlikely to be impacted by the proposed wind farm development.
Emergency Aeromedical Service	None	A review of EAS operations indicates that they are unlikely to be impacted by the proposed wind farm development.

Table 29. Gathabawn Wind Farm – Aviation Review Summary

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

APPENDIX A - ICAO Annex 15 Area 1 and Area 2 Surfaces.



ICAO Annex 15 Area 1 and Area 2 Surfaces.

AiBridges Total Communications Solutions	Procedure: 001	Rev: 6.0
Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

APPENDIX B - ICAO Building Restricted Areas

Figure B1 below shows an example BRA shape for directional facilities. Table B1 provides harmonized guidance figures for the directional navigational facilities in accordance with Figure B1.

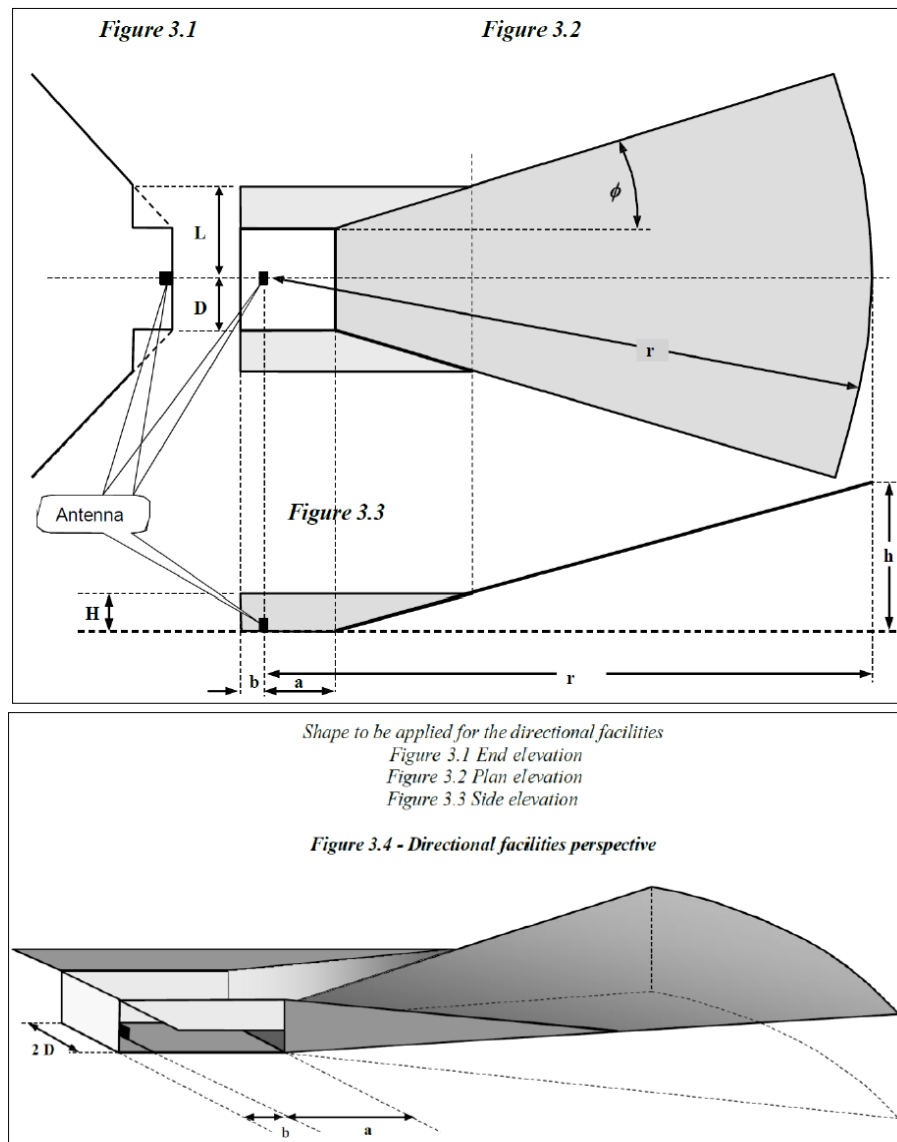


Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

Type of navigation facilities	A (m)	b (m)	h(m)	r (m)	D (m)	H (m)	L (m)	ϕ (°)
ILS LLZ (medium aperture single frequency)	Distance to threshold	500	70	a+6000	500	10	2300	30
ILS LLZ (medium aperture dual frequency)	Distance to threshold	500	70	a+6000	500	20	1500	20
ILS GP M-Type (dual frequency)		800	50	6000	250	5	325	10
MLS AZ	Distance to threshold	20	70	a+6000	600	20	1500	40
MLS EL		300	20	6000	200	20	1500	40
DME (directional antennas)	Distance to threshold	20	70	a+6000	600	20	1500	40

Table B1 - Harmonized guidance figures for the directional navigational facilities (ICAO EUR DOC 015 Table 2)

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

APPENDIX C – Air Corps Wind Farm / Tall Structures Position Paper, August 2014

 Óglaigh na hÉireann DEFENCE FORCES IRELAND	Ceanncheatru an Aer Chór <i>Air Corps Headquarters</i> 08 August 14
GOC AC  <u>Air Corps Wind Farm/Tall Structures Position Paper</u>	
Sir, 1. The attached is the draft Air Corps Position Paper agreed and developed in concert with the flying units under the auspices of CAS Ops. 2. It is recommended that it be forwarded to the Directorate of Operations for transmission to the Department of Defence. 3. The AC position contained within this paper should be notified to planning authorities including An Bord Pleanála. It should also be forwarded to the Department of the Environment, Heritage and Local Government to inform its policies and guidance in respect of wind farms.	
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Ceanncheatru an Aer Chór
Air Corps Headquarters

Air Corps Wind farm/Tall Structures Position Paper.

1. Objective:

This position paper is intended to ensure that

- a. Air Corps operations and training may be accomplished in a safe and economical manner;
- b. Baldonnel remains a viable aerodrome for IFR and VFR traffic;
- c. The ability to train military flying skills is protected;
- d. Vital navigation routes to and from the regions to Baldonnel and the Dublin area are protected to safeguard the ability of the Air Corps to fulfill its role.

2. Statement of position.

- a. The Air Corps is opposed the erection of wind farms or other obstacles which will affect its ability to train and operate in a safe and economic manner.
- b. The Air Corps is opposed to any wind farms or tall structures in the following areas:

(1) Lands underlying military airspace used for flying activity

- (a) The area contained in Danger Area EI-D1.
- (b) The area contained in Danger Area EI-D5.
- (c) The area contained within Danger Area EI-D6.
- (d) The area contained within Danger Area EI-D13.
- (e) The area contained within Danger Area EI-D14.
- (f) The area contained within Restricted Area EI-R15.
- (g) The area contained within Restricted Area EI-R16 within 20NM of Baldonnel.
- (h) The area contained within Military Operating Areas, MOAs 3 and 4 within 20NM of Baldonnel.

(2) Areas wherein military flying occurs at low level as identified in the annexes listed below.

- (a) Annex A: Low flying training areas within MOA 4 in the areas of
 - a. Blessington
 - b. Edenderry/Allenwood/Rathangan
 - c. Kilmeague/Newbridge
- (b) Annex B: low flying training area West (LFTA WEST).

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(3) A distance of 5NM or less from military installations.

- c. The following routes are identified as critical low level routes in support of Air Corps operational requirements and the Air Corps is opposed to the erection of wind farms or tall structures within 3NM of the route centerline which could affect Air Corps' ability to access regional areas.

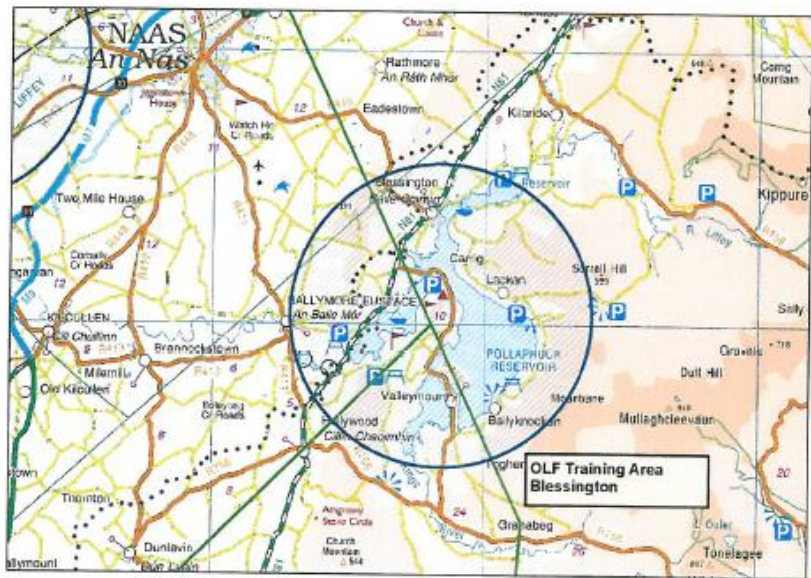
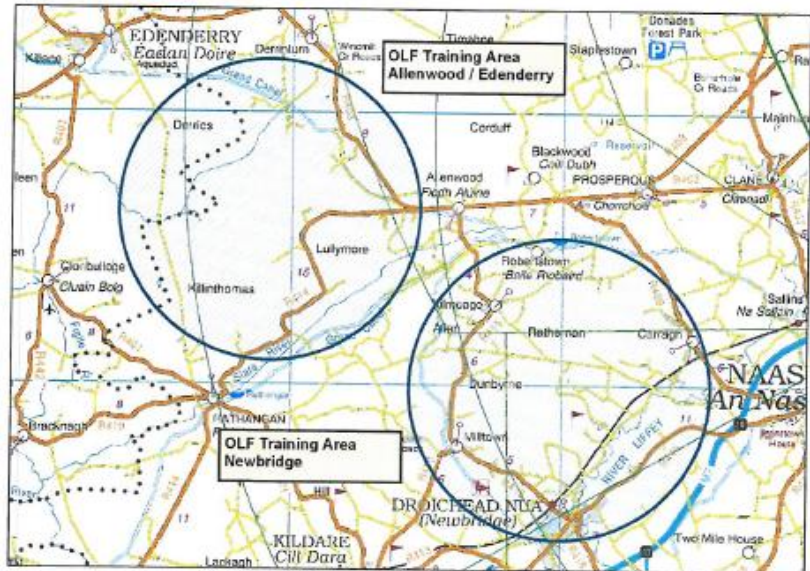
- (a) N/M1
- (b) N/M2
- (c) N/M3
- (d) N/M4
- (e) N/M6
- (f) N/M7
- (g) N/M8
- (h) N/M9
- (i) N/M11
- (j) N25
- (k) N17 between Sligo and Knock
- (l) N15/N13 between Sligo and Letterkenny
- (m) N14 from Lifford to Letterkenny and R245 and R247 from Letterkenny to Fanad Head.

Applications or proposals for structures in these areas of a height greater than 45m above ground level at the site of the object must be referred to Irish Air Corps for assessment of potential impact on flight operations.

- d. In MOA 4 outside of the areas identified in b.(1) (2) and (3), and in MOA 5, applications or proposals for objects of a height greater than 45m above ground level at the site of the object must be referred to the Irish Air Corps for assessment of potential impact on flight operations.
- e. In all locations where wind farms or masts are permitted it should be a condition that they meet the following lighting requirements
- (1) Single turbines or structures, or turbines delineating corners of a wind farm, should be illuminated by high intensity strobe lights (Red).
 - (2) Obstruction lighting elsewhere in a wind farm will be of a pattern that will allow the hazard be identified and avoided by aircraft in flight.
 - (3) Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

Annex A
Low Flying Areas - MOA 4



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Gathabawn Wind Farm – Aviation Review Statement	Approved: KH	Date: 04/09/2026

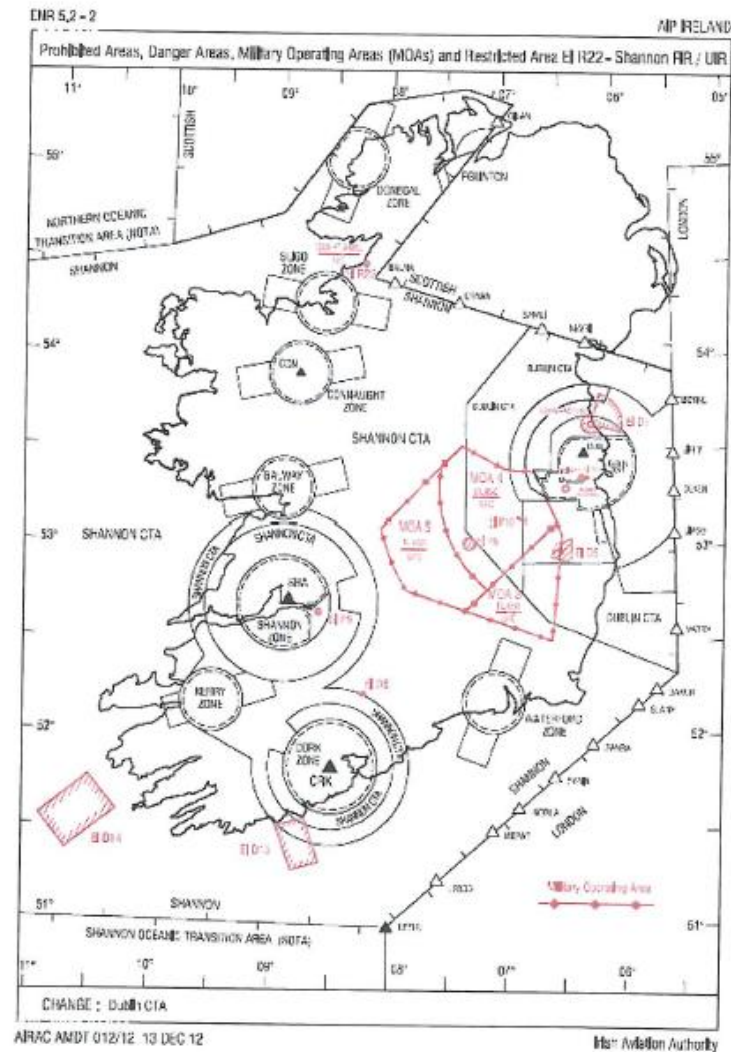
Annex B

Low Flying Area – LFTA WEST

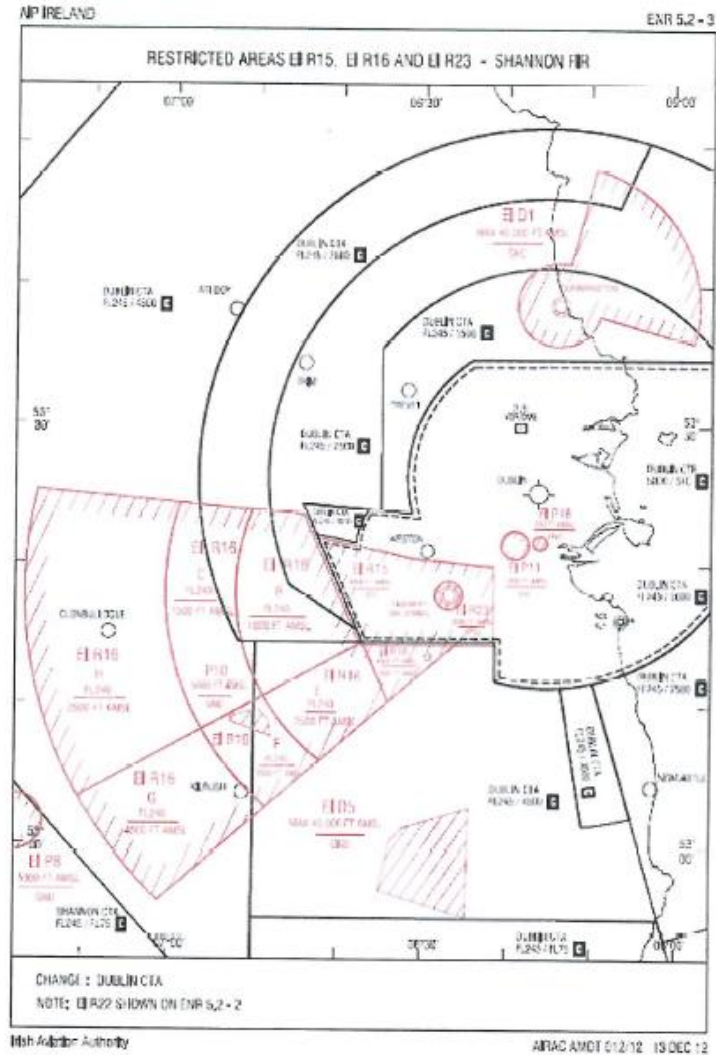
1. Area contained within the following grid L6972; L6945; M0745; M0772
2. Routes are primarily within valley areas.
3. Applications for wind farms/masts should be referred to Air Corps Operations for assessment against low flying routes.

Annex C

Designated Airspace Restricted Areas, Danger Areas and Military Operating Areas



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APPENDIX D – Radius of Turn Calculations

The Radius of Turn calculations are based on the following formula which was taken from the “*Pilot’s Handbook of Aeronautical Knowledge – Federal Aviation Administration - 2016*”

$$\textbf{Radius of Turn:} \quad R = V^2 / 11.26 \tan \theta$$

V = Velocity

Tan θ = Tangent of Bank Angle

Sample Calculation:

An aircraft travelling at a velocity of 80 KTs (V) turning with a bank angle of 25° (Tan θ).

$$\text{Radius of Turn} = 6400 / 11.26 \times 0.47 = 1209 \text{ feet (0.2 NM)}$$