15. MATERIAL ASSETS

Material Assets are defined in the *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* (EPA, 2022) *"*as '*built services and infrastructure. Traffic is included because in effect traffic consumes transport infrastructure'.* They may be either of human or natural origin. The cultural assets of Archaeology and Cultural Heritage are addressed in Chapter 14 of this Environmental Impact Assessment Report (EIAR). Economic assets of natural heritage include non-renewable resources such as minerals or soils, and renewable resources such as wind and water. These assets are addressed in Chapter 8: Land, Soils and Geology, Chapter 9: Hydrology & Hydrogeology, Chapter 10: Air and Chapter 11: Climate. Tourism and amenity resources, which are also considered material assets, are addressed in Chapter 5 on Population and Human Health. The Population and Human Health chapter also addresses existing land-uses (economic assets), including forestry and agriculture.

This chapter of the EIAR addresses the likely significant effects of the Proposed Development on transportation infrastructure (Section 15.1 Traffic and Transport), on Telecommunications and Aviation and Other Material Assets ((Section 15.2), which are economic assets of human origin. Waste Management is also considered within the EPA 2022 Guidelines as part of Material Assets. EPA Waste Management pertaining to the construction, operation and decommissioning of the Proposed Development is summarised in Section 4.4.2.7 of Chapter 4 of the EIAR. Traffic volumes generated by the removal of waste from the Proposed Development to fully authorised waste facilities, is considered in Section 15.1 below.

This chapter of the EIAR has been prepared in accordance with the requirements of the EIA legislation and guidance outlined in Chapter 1: Introduction.

15.1 Traffic and Transport

15.1.1 Introduction

15.1.1.1 Background and Objectives

The purpose of this section is to assess the effects, on roads and traffic, of the traffic movements that will be generated during the construction, operational and decommissioning phases of the Proposed Development.

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Development', 'the Site', 'Wind Farm Site' and 'Grid Connection'.

For developments of this nature, the construction phase is the critical period with respect to the traffic effects experienced on the surrounding road network, in terms of both the additional traffic volumes that will be generated on the road network, and the geometric requirements of the abnormally large loads associated with the delivery of wind turbine components. The requirements of the additional traffic and abnormal sized loads generated during the construction stage are assessed on both the external road network and at the junctions that will provide access to the Site.

It should be noted that abnormal weight loads are not a feature of the turbine delivery vehicles, they are of abnormal in size only. All construction and delivery vehicles for the Proposed Development will be subject to the standard axle weight requirements set out under Road Traffic (Construction and Use of Vehicles) Regulations 2003 (S.I. No. 5 of 2003) and therefore the loadings from construction traffic will not exceed the relevant standards. Notwithstanding the need to use specialist vehicles to facilitate turbine delivery, it should be noted that the number of load-bearing axles for any specialist vehicles

carrying large loads are designed to ensure that the load on any one axle does not exceed acceptable load bearing statutory limits. Therefore, the structural integrity of the national and regional road network used during the construction of the Proposed Development is adequate to provide for these accepted loads.

The magnitude of the increase in traffic volumes experienced on the surrounding network is identified during the various construction stages of the Proposed Development. Traffic management measures are also provided in Section 15.1.11.6 aimed at minimising the traffic impact on the local highway network. Refer also to Appendix 15-2 for the Traffic Management Plan (TMP).

15.1.1.2 Statement of Authority

This section of the EIAR has been prepared by Alan Lipscombe of Alan Lipscombe Traffic and Transport Consultants Ltd. Alan is a competent expert in traffic and transport assessments. In 2007 Alan set up a traffic and transportation consultancy providing advice for a range of clients in the private and public sectors. Prior to this Alan was a founding member of Colin Buchanan's Galway office having moved there as the senior transportation engineer for the Galway Land Use and Transportation Study. Since the completion of that study in 1999, Alan has worked throughout the West of Ireland on a range of projects including: major development schemes, the Galway City Outer Bypass, Limerick Planning Land-Use and Transportation Study, Limerick Southern Ring Road Phase II, cost benefit analyses (COBA) and various studies for the University of Galway. Before moving to Galway in 1997, Alan was involved in a wide variety of traffic and transport studies for CBP throughout the UK, Malta and Indonesia. He has particular expertise in the assessment of development related traffic, including many wind farm developments including the following; Ardderoo, Derryadd, Derrinlough, Knocknamork, Shehy More, Cloncreen, Derrykillew, Coole, Ballyhorgan, Cahermurphy, Lettergull, Barnadivane, Cleanrath and Knockalough.

Alan has a BEng (hons) Degree in Transportation Engineering (Napier University, Edinburgh, 1989), is a member of Engineers Ireland and of the Institute of Highways and Transportation and is a TII accredited Road Safety Audit Team Member.

Traffic counts were undertaken by Traffinomics Ltd, which is an Irish traffic survey company with a comprehensive knowledge of traffic data collection methods. The company, which is 10 years old, is headed by Simon Wheeler, who has been in the traffic survey data collection business for 35 years. Previously Simon worked with Count On Us Ltd, followed by Abacus Transportation Surveys Limited, Ireland's first lens based traffic data collection business. Clients of Traffinomics Ltd. include TII, Local Authorities and many leading retailers.

15.1.1.3 Guidance and Legislation

This section of the EIAR has been completed in accordance with the EIA guidance set out in Chapter 1. The assessment uses standard terminology to describe the likely significant effects associated with the Proposed Development. Further information on the classification of effects used in this assessment is presented in Section 1.7 of this EIAR.

15.1.1.4 Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as outlined in Sections 2.6 of Chapter 2 of the EIAR and summarised below. The following consultees made reference to traffic and transport matters in their responses:

Transport Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to Scoping on the 24th October 2023, in which it provided a list of recommendations to be followed when preparing the EIAR. All relevant TII guidelines and policies have been adopted in the preparation of this assessment as follows;

- PE-PDV-02045, Transport Assessment Guidelines, Transport Infrastructure Ireland, May 2014
- PE-PAG-02017, Project Appraisal Guidelines, Unit 5.3, Travel Demand Projections, Transport Infrastructure Ireland, October 2021
- DN-GEO-03060, Geometric Design of junctions, Transport Infrastructure Ireland, May 2023.
- GE-STY-01024, Road Safety Audit, December 2017.
- DN-GEO-03030, Design Phase Procedure for Road Safety Improvement Schemes, Urban Renewal Schemes and Local Improvement Schemes, April 2021.

Specific issues raised by TII comprised the following;

- Consultations should be had with relevant Local Authority / National Roads Design Offices with regards to locations of existing and future national roads schemes.
  - **Response:** It is confirmed that extensive consultation has been undertaken with the Local Authorities as set out below.
- TII is specifically concerned as to the potential significant impacts that the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development, including the potential haul route.
  - **Response:** The impacts of the Proposed Development in terms of link flows on the delivery routes are set out is Section 15.1.6.1 and 15.1.6.2 of the EIAR, while an assessment of the capacity of the access junction on the R465 and the R465 / R466 junction is set out in Section 15.1.6.4. A swept path analysis undertaken for the abnormally sized loads on the Turbine Delivery Route, including the N69 from Foynes, is discussed in Section 15.1.8 of the EIAR. The assessment sets out the temporary local measures that will be required on the national, regional and local road networks during the construction of the Proposed Development.
- Visual impacts should be assessed from existing national roads.
  - **Response:** This is addressed in Chapter 13 Landscape & Visual of the EIAR.
- The developer should have regards to any EA/ EIS and all conditions and /or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should in particular have regard to any potential cumulative impacts.
  - **Response:** The traffic related cumulative impacts are addressed in Section 15.1.1.5 of this EIAR.
- The developer, in preparing an EIAR, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works).
  - **Response:** It is confirmed that the design of access junctions is in accordance with TII guidelines.
- The developer, in preparing EIAR, should have regard to TII's Environmental Assessment and Construction Guidelines, including the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (National Roads Authority, 2006).
  - **Response:** This is addressed in Chapter 10 Air of the EIAR.
- The EIAR should consider the Environmental Noise Regulations 2006 (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see *Guidelines for the Treatment of Noise*

and Vibration in National Road Schemes (1st Rev., National Roads Authority, 2004)).

- **Response:** This is addressed in Chapter 12 Noise & Vibration of the EIAR.

- It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site with reference to impacts on the national road network and junctions of lower category roads with national roads. In relation to national roads, the Authority's Traffic and Transport Assessment Guidelines (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the NRA/TII TTA Guidelines which addresses requirements for sub-threshold TTA. Any improvements required to facilitate development should be identified. It will be the responsibility of the developer to pay for the costs of any improvements to national roads to facilitate the private development proposed as TII will not be responsible for such costs.
  - **Response:** It is confirmed that the assessment presented in Chapter 15 of the EIAR is undertaken in accordance with Traffic and Transport Assessment Guidelines, TII (2014).
- The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required. It is noted that a new access junctions is proposed on the regional road network.
  - **Response:** A Road Safety Audit has been undertaken for the Proposed Development.
- In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network.
  - **Response:** All construction will be undertaken in accordance with current guidelines including the "Traffic Signs Manual, Section 8 – Temporary Traffic Measures and Signs for Road Works" (DoT now DoTT&S) and "Guidance for the Control and Management of Traffic at Roadworks" (DoTT&S).
- TII recommends that the applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed.
  - **Response:** The proposed haul routes are identified in this Chapter 15 of the EIAR. While it is proposed that the delivery stage of the Proposed Development will involve abnormally sized loads, the axle loadings will not exceed accepted limits. A program of pre delivery condition and structural assessment of the route is however proposed, as set out in the Traffic Management Measures, included as Appendix 15-2.
- In addition, the haul route should be assessed to confirm capacity to accommodate abnormal 'length' loads and any temporary works required.
  - **Response:** It is confirmed that a geometric assessment was undertaken, as set out in Section 15.1.8.
- The applicant/developer should also consult with all PPP Companies, MMaRC Contractors and road authorities over which the haul route traverses to ascertain any operational requirements, including delivery timetabling, etc. to ensure that the strategic function of the national road network is safeguarded.
  - **Response:** The applicant agrees with this condition.
- Where temporary works within any MMaRC Contract Boundary are required to facilitate the transport of turbine components to site, the applicant/developer shall contact thirdpartyworks@tii.ie in advance, as a works specific Deed of Indemnity will be needed by TII before the works can take place.
  - **Response:** The applicant agrees with this condition.
- Additionally, any damage caused to the pavement on the existing national road arising from any temporary works due to the turning movement of abnormal loads

(e.g. tearing of the surface course, etc.) shall be rectified in accordance with TII Pavement Standards and details in this regard shall be agreed with the Road Authority prior to the commencement of any development on site.
    - **Response:** The applicant agrees with this condition.
- It is noted that the Grid Connection proposals outlined in the EIAR Scoping Report identifies 2 potential grid route options, one a dedicated 110kV looped connection into Ardnacrusha 110kV electrical substation and the second a dedicated 110kV connection to Drumline 110kV electrical substation. TII note that the Drumline 110kV electrical substation is located in close proximity to the N18 and state that any potential impacts to the national road network should be considered.
    - **Response:** It is confirmed, as discussed in Chapter 1 Introduction of this EIAR, that the option to connect into the Ardnacrusha 110 kV electrical substation was selected. Extensive detail of the route selection and construction methodology are provided in Chapter 4 Description of the Proposed Development, while an assessment of the likely traffic related impacts is set out in Section 15.1.6 of this EIAR.

A further scoping request was issued by MKO to TII on 9th April, 2024 in relation to the proposed temporary transition zone (TCC) proposed on the N69. A response was received from TII on the 15th April 2024. The main issue raised by TII is in relation to the location of the proposed TCC being within the 100 kph zone and that the proposal does not adhere to the guidelines set out in Section 2.5 of the Spatial Planning and National Roads Guidelines for Planning Authorities' (DoECLG, 2012), which are also reflected in the current Limerick Development Plan. The response to this is therefore as for the scoping undertaken with Limerick City & County Council, which is set out below.

While there are no permanent measures proposed on the N69 a TII DN-GEO-03030 Design Report has been prepared for this element of the Proposed Development, which is included as Appendix 15-4 of this EIAR and will be uploaded to the TII Departures Portal.

Department of Transport

A response to scoping was received from the Department of Transport on the 1st February 2023. The response primarily refers to issues relating to Grid Connection works within the public road network and recommends that alternative route options to the public road network should be considered. Alternative Grid Connection route options were considered in Chapter 3 Consideration of Reasonable Alternatives of this EIAR.

Clare County Council

A response to the scoping request was received from Clare County Council on the 27th of February 2023. with a request to provide information relation to;

- **Response:** The delivery routes for the Proposed Development, as set out in Sections 15.1.2.3 and 15.1.2.4 of the EIAR, and,
- **Response:** The development trip generation during the construction, operational and decommissioning phases of the Proposed Development, addressed in Section 15.1.4 of the EIAR.

Limerick City and County Council

A meeting was held with Limerick City & County Council (LC&CC) on 9th April 2024 to discuss the proposed TTC. The traffic and transport related issues discussed at the meeting and included in the meeting note prepared by LC&CC are discussed below.

The Planning Department of LC&CC notes that the proposed TTC includes a new/intensified access onto a national road in a 100kph zone and is therefore in conflict with the Spatial Planning and National Roads Guidelines for Planning Authorities and also in conflict with the Limerick Development Plan 2022 – 2028 with particular reference to Objective TR O39 National Roads which states:

It is an objective of Council to:

a) Prevent, except in exceptional circumstances and subject to a plan-led evidence-based approach, in consultation with Transport Infrastructure Ireland, in accordance with the Section 28 Ministerial Guidelines Spatial Planning and National Roads Guidelines for Planning Authorities (DoECLG, 2012), development on lands adjacent to the existing national road network, which would adversely affect the safety, current and future capacity and function of national roads and having regard to reservation corridors, to cater for possible future upgrades of the national roads and junctions;

b) Avoid the creation of any new direct access points from development, or the generation of increased traffic from existing direct access/egress points to the national road network, to which speed limits greater than 60km/h apply;

c) Facilitate a limited level of new accesses, or the intensified use of existing accesses, to the national road network on the approaches to, or exit from, urban centres that are subject to a speed limit of between 50km/h and 60km/h. Such accesses will be considered where they facilitate orderly urban development and would not result in a proliferation of such entrances.

LC&CC notes that based on the above, TII will not be favourable to the proposed TTC.

- **Response:** The Applicant acknowledges the guidelines for new access junctions at locations on the national road network as set out in the Spatial Planning and National Roads Guidelines for Planning Authorities and those set out in Objective TR039 of the Limerick Development Plan 2022 – 2022. In response it is noted that the proposed TTC is temporary and will be used for the purpose of the transfer of turbine blades from standard superwing carrier trailers, that will leave Foynes Port, onto blade adapters, that will negotiate the route through Limerick City, in order to minimise the impacts on the TDR. All movements made into and out of the site by abnormally sized loads will be made during the night with transient traffic management measures provided by a Garda escort. This will be done for 27 blades that will travel in convoys of 5 vehicles, with one convoy accessing and leaving the transition zone on 6 separate nights.
- During the construction of the TTC it is proposed that there will be approximately 27 truck movements accessing and exiting the site per day (approximately 3 in and 3 out per hour) for 85 days. These movements will be managed on site by means of temporary traffic management measures, including signs and flagmen, as set out in Section 15.1.11.6 of this EIAR.
- During the construction period access to the TTC will be closed at all times outside the hours of construction or nighttime operation. On the completion of the construction of the Proposed Development the TTC will be closed permanently and the existing boundary re-instated.
- The access to the proposed TTC has been the subject of Design Phase Procedure for Road Safety Improvement Schemes, Urban Renewal Schemes and Local Improvement Schemes, and an independent Stage 1 Road Safety Audit, both in accordance with TII Guidelines.

LC&CC also questioned the reason for selecting the site of the proposed TTC, and enquired of the availability of a site within a 50 or 60 km/h zone.

- **Response:** The longest components are the turbine blades which are usually the most onerous for delivery. For the first part of the delivery route between Foynes Port to

the TTC, it is proposed that the turbine blades will be delivered using the standard method of delivery, where the blade is horizontal on a Super Wing Carrier. The Super Wing Carrier is the critical vehicle in terms of turning requirements, as it is significantly longer than the tower transport vehicle. In order to minimise the impact on the built environment a blade adaptor trailer is required to deliver the turbine components from the TTC to the Wind Farm Site. It is necessary to locate the TTC to the west of Limerick City in order to minimise impact on the built environment of Limerick City, to manoeuvre the 90º junctions in Limerick City and to pass through the city safely and quickly.

- Due to the nature of the blade delivery vehicles/carriers, a long straight stretch of road is a prerequisite for visibility and safety and enables the vehicle carriers to exit and re-enter the road with minimal turning movements. The study area for the transition compound was thus limited to focussed on a 2.5km straight stretch along the N69 National Secondary Road. Engagement with local landowners in this study area with sufficient land size requirements (i.e. 200m x 60m) yielded a viable site.

15.1.1.5 Methodology and Section Structure

The traffic and transport assessment follows guidance for such assessments set out by Transport Infrastructure Ireland (TII), in the document PE-PDV-02045 '*Traffic and Transport Assessment Guidelines'*, (TII, 2014). The geometric requirements of the turbine delivery vehicles were assessed using Autocad and Autotrack.

The Traffic and Transport Section of this chapter is set out as follows:

- A review of the haul route, access junctions and transport infrastructure in the vicinity of the Proposed Development, including an assessment of 2023 traffic flows and traffic forecasts during an assumed construction year of 2028 (Sections 15.1.2 - Receiving Environment and 15.1.3 – Existing Traffic Volumes).
- A description of the nature of the Proposed Development and the traffic volumes that it will generate during the different construction stages and when it is operational (Section 15.1.4 – Proposed Development and Traffic Generation).
- A description of the abnormally sized loads and vehicles that will require access to the site (Section 15.1.5 – Construction Traffic Design Vehicles).
- A review of the increases in traffic volumes due to development generated traffic on links and junctions (Section 15.1.6 – Expected Traffic During Construction, During Operation and During Decommissioning.
- Identification of traffic management measures for large deliveries during construction (Section 15.1.7 – Traffic Management for Large Deliveries).
- A geometric assessment of the route and its capacity to accommodate the largest abnormal-sized loads associated with the development (Section 15.1.8 – Abnormal Load Route Assessment).
- An assessment of the provision for sustainable modes of travel (in this case primarily with respect to the transport of construction staff) (Section 15.1.10 – Provision for Sustainable Modes of Travel).
- An assessment of the effects of the Proposed Development (Section 15.1.11 – Likely and Significant Effects and Associated Mitigation Measures, including Traffic Management Plan and Cumulative Impacts).

15.1.2 Receiving Environment

15.1.2.1 Site Location

The Proposed Development is located in Co. Clare, in the townlands listed in Table 1-1 of Chapter 1.

The Proposed Development site is located approximately 3 km south of Broadford, 3.5 km southeast of Kilkishen, and 4 km northeast of Sixmilebridge, Co. Clare. The site location is shown in Figure 15-1a.

15.1.2.2 Proposed Turbine Delivery Route

A detailed assessment was undertaken of all potential pinch-points for the abnormally large turbine plant transporter vehicles between the proposed port of arrival in Foynes, and the proposed site access junction located on the R465 to the north of Carmody's Cross in County Clare.

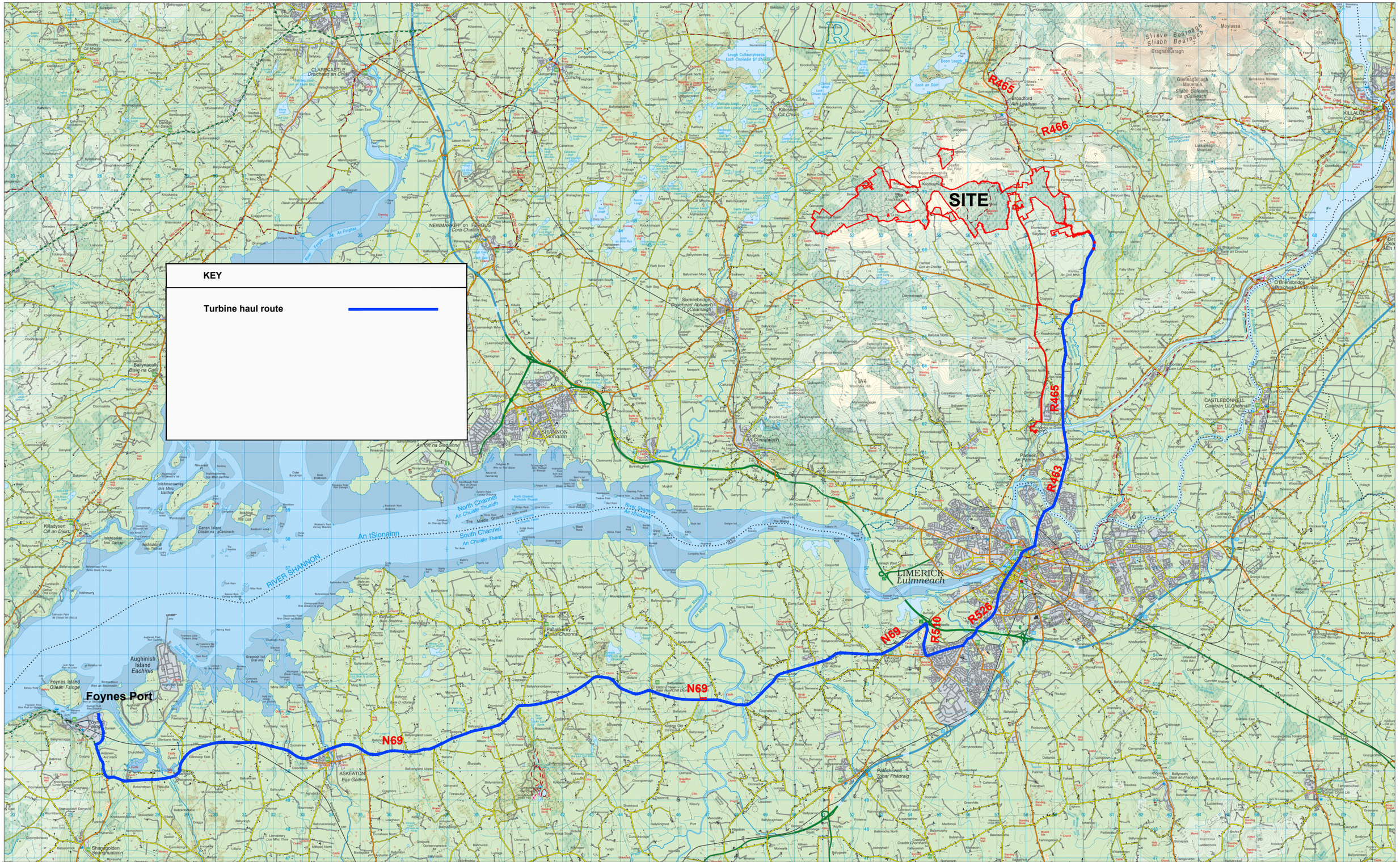
The route assessment was undertaken by Digital Land Surveyors Ltd and is included as Appendix 15-3 of this EIAR. The assessment investigated a total of 51 locations on the delivery route, of which 28 are addressed in the EIAR, with the locations shown in Figure 15-1b. The remaining locations were found to comfortably accommodate the wind farm turbine vehicles. While the results of the assessment are addressed in Section 15-1-8, a summary of the route is as follows.

- From the access road serving Foynes Port the route turns left (south) onto the N69 National Secondary Road at the existing priority junction (Location 1).
- From this point the route heads east on the N69 for approximately 32kms, passing through various bends on the route indicated at Locations 2 to 9.
- At a location on the northern side of N69 just to the east of the village of Kildimo, it is proposed that there will be a TTC constructed, where the turbine blades will be transferred from a standard method of transportation to vehicles with specialised adaptors that lift the blade to 60º in order to minimise the length of the vehicle in plan. This location of the proposed TTC is between Locations 7 and 8 as shown in Figure 15-1b.
- The route then turns right at the N69 / R510 roundabout (Location 10) to head south for approximately 1.1kms, passing through Ard Aulin roundabout (Location 11) to reach the roundabout of the R510 and Father Russell Road (Location 12).
- From here the route turns left heading northeast on Father Rusell Road for approximately 1.3kms passing through the Oakfield Roundabout (Location 13) to reach the roundabout that connects with the R526 (Location 14),
- The route continues northeast on the R526 for approximately 1.5 kms passing through the roundabout with Dooradoyle Road (Location 15) to the traffic signals at Ballinacurra Road.
- From this point the route travels northeast through Limerick City Centre for approximately 2.9 kms via O'Connell Avenue, O'Connell Street (contra-flow), Bridge Street and Athlunkard Street (Locations 16 to 17) to the roundabout of R463 Corbally Road / Pa Healy Road (Locations 18 & 19).
- The route then heads north on the R463 for approximately 4.3 kms crossing the River Shannon, which forms the County Limerick and County Clare border, onto the river crossing at Ardnacrusha (Location 20).
- From here the route continues on the R465 for approximately 7.2 kms, passing through various bends on the route (Locations 21 to 27) to the location of the proposed Wind Farm access junction on the R465 (Location 28).

The total length of the Turbine Delivery Route from Foynes Port to the access junction off the R465 is approximately 50 kms. All deliveries of abnormally sized loads will be made using Garda Siochana escorts and local transient traffic management measures put in place by the haulage company.

15.1.2.3 Site Access Junctions

While the design of the proposed site access junctions is addressed in Section 15.1.8 the following text provides an overview of the various junctions that will provide access to the Proposed Development.



NOTES:

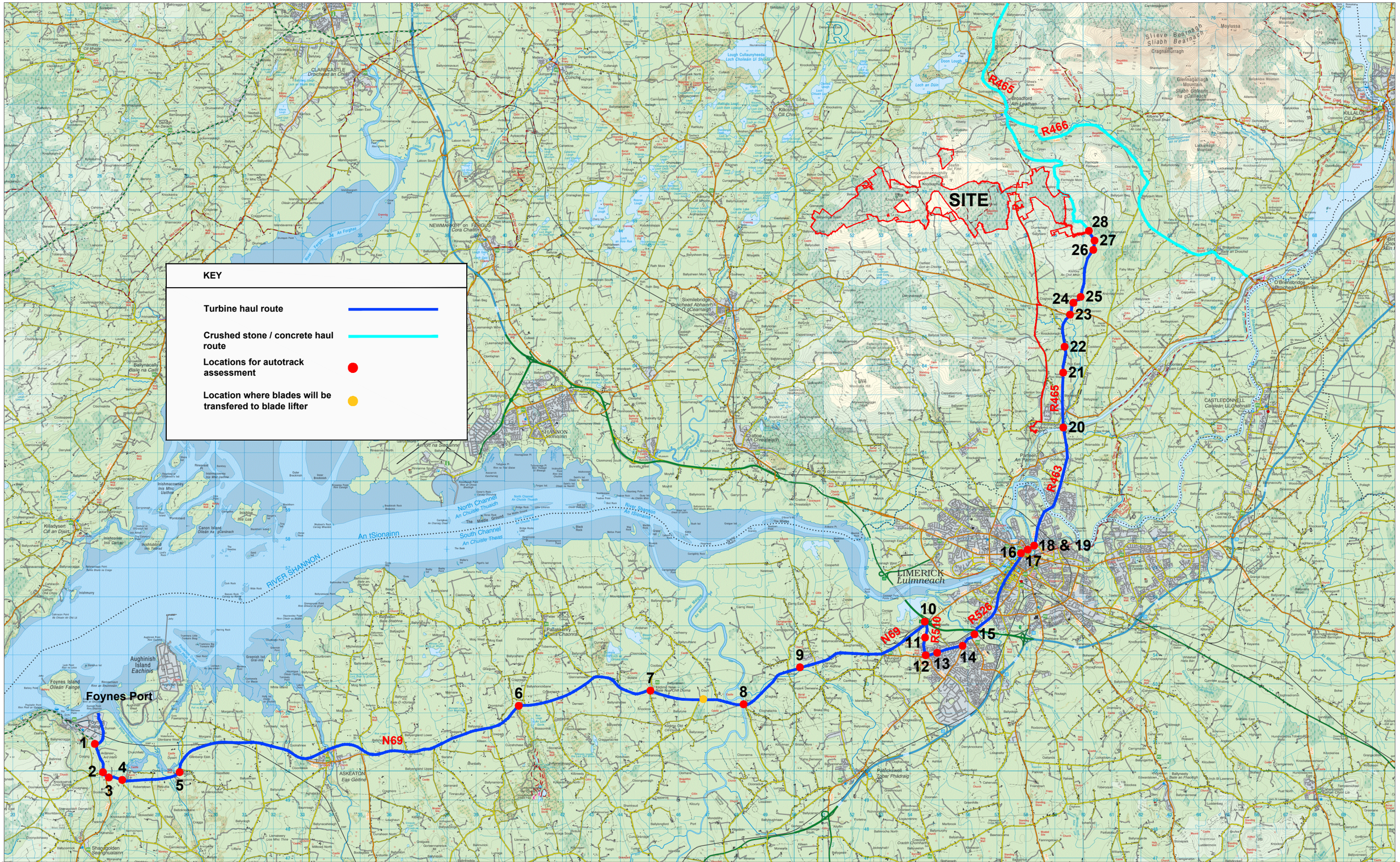
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-1a Site location and turbine delivery route

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	NTS
PROJECT NO: 8880	DATE: 07.08.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

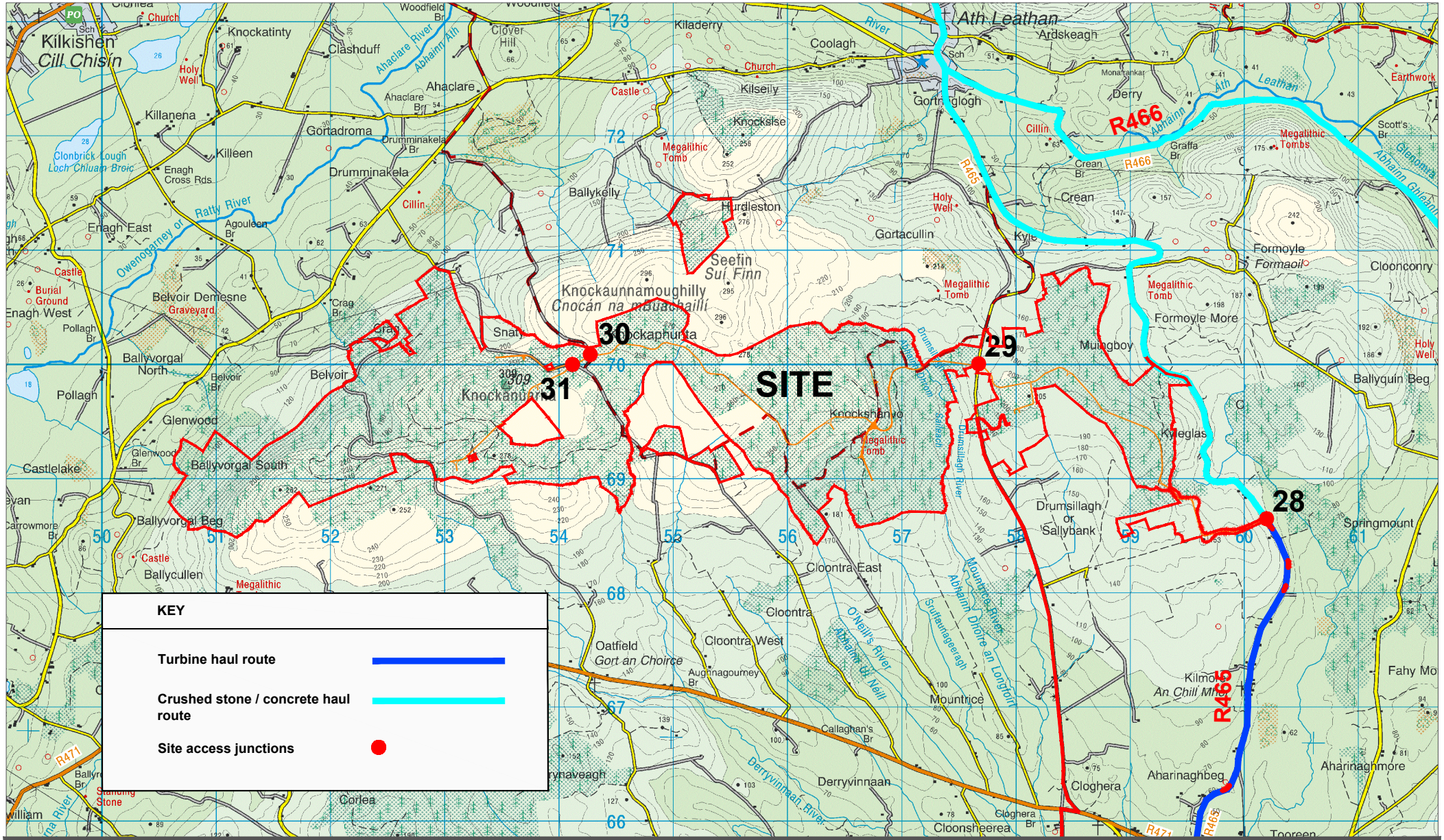
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-1b Turbine delivery route autotrack assessment location plan

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	NTS
PROJECT NO: 8880	DATE: 07.08.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-1c Location of site access junctions

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

The locations of all site access junctions that connect the Proposed Development with the existing public road network are shown as locations 28, 29, 30 and 31 in Figure 15-1c. There is one primary site entrance proposed for the construction, operational and decommissioning phases of the Proposed Development (location 28), with 3 additional junctions provided at locations where the internal development access roads cross the existing local road network.

Location 28 - Proposed access junction on R465

The proposed primary access junction for all vehicle trips during both the construction, operational and decommissioning phases of the Proposed Development is located on the R465 approximately 5km south of Broadford, as indicated as Location 28 in Figure 15-1c. The proposed junction takes the form of a priority type junction with the R465 forming the priority route. At this location the R465 has a speed limit of 80 km/h. During the construction stage the junction will be required to accommodate the abnormally sized turbine delivery vehicles turning left in and right out of the site, all standard HGVs of various types (standard articulated HGVs, trucks and cement mixers) arriving and departing to / from both the south and the north, and all construction staff trips. The junction is designed in accordance with TII design guidelines and is discussed further in Section 15-1-8.

Location 29 - Proposed access junction on L-3042, Sallybank

As construction, operational and decommissioning traffic travels through the internal layout all traffic requiring to access turbines Nos 1 to 7 will require to cross the L-3042 at Location 29 indicated in Figure 15-1c. As the junction will take the form of a crossroads traffic management measures will be required during both the construction, decommissioning and operational stages of the Proposed Development. The default for the junction will be that general traffic flow on the L-3042 will be permitted, while access to the proposed Wind Farm site to the west and east will be closed by means of gates.

During the construction phase when general deliveries and construction staff is required to cross the L-3042 the gates on the site accesses will be opened and construction traffic movements will be managed by site staff. During times when the abnormally sized loads are required to cross the L-3042, the gates to the site accesses will be opened during the times of the deliveries only and the movements will be managed by An Garda Siochana.

Once operational, access to the site at this location will be required for occasional maintenance trips only. During this period the gates will remain closed and will be opened by the maintenance staff for the duration of their visit. The junction is designed in accordance with TII design guidelines and is discussed in Section 15-1-8.

Locations 30 and 31 - Proposed access junctions on local roads, Snaty (L-30144-0 and L-30426-23)

Similarly, all traffic requiring access to turbines Nos 1 to 3 will require to pass through the junctions with the local roads at Locations 30 and 31.

The site access junctions, including proposed junction designs are discussed further in Section 15-1-8.

Transition Zone on N69

As discussed previously, It is proposed that a TTC will be constructed on the N69 to the east of the village of Kildimo, to facilitate the transfer of turbine blades from a standard method of transportation onto vehicles with specialised adaptors.

During the construction of the proposed TTC access to and from the site off the N69 will be controlled by traffic management measures, including temporary signage in accordance with the *"Traffic Signs Manual, Section 8 – Temporary Traffic Measures and Signs for Road Works"* (DoT now DoTT&S) and "Guidance for the Control and Management of Traffic at Roadworks" (DoTT&S). Construction staff (flagman) will be present at this location during all times that deliveries are made to and from the site. The site will be closed to all traffic means of fencing at all other times.

15.1.2.4 Proposed Construction Traffic Haul Route

The delivery route for general construction traffic including site staff and heavy goods vehicles (HGVs) delivering general construction materials to the site may vary depending on the location of the suppliers used for concrete and other materials required to construct the Proposed Development. Based on the location of suppliers in the vicinity of the Proposed Development (as described below), it is estimated that concrete and general construction traffic will all travel on one of the following routes as shown in Figure 15-2a.

Concrete / Rock / Stone

- At this stage it is not confirmed where the concrete required for the turbine foundations, or the finer crushed stone required during the construction phase will be transported from. There are quarries located to the south of the Proposed Development (R465 Limerick and south), from the north and northwest (R465 from Broadford) and from the southeast (via R466 and R465 from Broadford) that may be used to provide concrete, rock and stone. While it is proposed that quarries situated closest to the site will be used in order to minimise the traffic effects of the Proposed Development, in order to test a robust traffic scenario, it is assumed that all concrete, rock and stone may be delivered from any one of these directions.

General construction materials, felled timber, other miscellaneous items and waste

- Similarly, it is not confirmed at this stage where general construction materials, felled timber, miscellaneous items and waste will be transported from or to. Again, in order to test a robust traffic scenario, it was assumed that all general construction traffic may be delivered from the same directions as described above. Potential quarries that will be considered for the delivery of materials to the Site include; Jim Bolton Sand & Gravel Ltd, Faheymore, Bridgetown, Co Clare: Dereen Sand & Gravel Ltd, O'Brien's Bridge, Montpelier, Limerick and Bobby O'Connell & Sons Ltd, Ballycar, Ardnacrusha, Co Clare. Timber is likely to be diverted to different sawmill customers based on species and size. Heavier sawlog may go to larger sawmills like Murray Timber Products, Ballygar, Co. Galway; Glennon Bros. in Fermoy, Co. Cork or ECC Timber Products, Cornamona, Co. Galway. These may also take the smaller palletwood material which may also be diverted to pallet/fencing producers like Coolrain Timber or Laois Sawmills, both located close to Portlaoise, Co. Laois. Poor quality pulp material will be diverted to pulpmills consisting of either Medite [MDF production] in Clonmel, Co. Tipperary or SmartPly [OSB production] in Belview, Co. Waterford. Depending on total volume available, merchantable timber may be sold in its entirety to a smaller, local sawmill like Glenmorgan Wood Supplies, Hollyford, Co. Tipperary.

Other wind turbine component deliveries (components delivered using standard HGVs)

- All other wind turbine components delivered by standard HGVs will arrive at Foynes Port and will be delivered by via the same haul route as for the abnormally sized loads as set out in 15.1.2.2 above.

KEY

Turbine haul route

Crushed stone / concrete haul route

SITE

R465

R466

R463

R526

R510

N69

Foynes Port

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-2a Site location and delivery routes for general construction traffic

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	NTS
PROJECT NO: 8880	DATE: 07.08.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

KEY

Turbine haul route

Crushed stone / concrete haul route

Junction count locations (A to C)

Link count locations (1 to 7)

Junction C

Junction B

Junction A

SITE

1

2

3

4

5

6

7

Foynes Port

N69

R465

R466

R463

R526

R510

RIVER SHANNON

An tSionainn

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-2b Junction and link count locations

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	NTS
PROJECT NO: 8880	DATE: 07.08.24	DRAWN BY:	AL

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The assessment presented in this chapter of the EIAR is based on these conservative scenarios.

15.1.3 Existing Traffic Volumes

It should be noted that traffic volumes are discussed in terms of vehicles and passenger car units, or PCUs, where each vehicle is expressed in terms of its demand on the network relative to the equivalent number of cars or light goods vehicles (LGV). For example, an articulated HGV is given a factor of 2.4 passenger car units (as per TII Project Appraisal Guidelines for National Roads Unit 5.2), while one of the extended loaders required to transport the large wind turbine components is assigned a value of 10 PCUs.

15.1.3.1 Background Traffic Flows

All day (24 hour) classified turning count were undertaken by Traffinomics Ltd on Tuesday 5th September, 2023 at the following 3 junctions. The junction counts were carried out at these 3 locations to cover all possible main routes that could be used to access the site, as shown in Figure 15-2b;

- Junction A - R463 Athlukard Street / R463 Corbally Road / Pa Healy Road Roundabout,
- Junction B - R465 / R471 Carmody's Cross junction, and,
- Junction C R465 / R466 junction in Broadford.

The link counts from these traffic surveys were used to provide background year 2023 traffic volumes on the local study road network. Data from a continuous traffic counter maintained by TII on the N69 just to the east of Foynes, was also used for the purposed of the traffic assessment. The 7 link count locations on roads included in the assessment are shown in Figure 15-2b.

The traffic count data for these locations is included as Appendix 15-1.

Data from a continuous traffic counter maintained by TII on the R445 between Castletroy and Annacotty in Limerick, which is the closest source of continuous traffic data on a regional road to the site, was used to determine the seasonal variation in traffic volumes in the proximity of the proposed delivery routes. Traffic count data for this site from the year 2022 reveals that the survey month of September was observed to have the highest average traffic flows. No seasonal adjustment was therefore required to be applied to the September 2023 traffic counts.

The 24 hour traffic volumes observed on the delivery routes in 2023 are set out in Table 15-1. Daily traffic flows on the route vary from 6,374 on the N69 to the east of Foynes to 13,032 vehicles on the R463 Athlunkard Street in Limerick, to a maximum of 17,023 vehicles per day observed on the R463 Corbally Road, to 1,538 vehicles per day on the R465 north of Carmody's Cross leading to the site. Traffic flows on the links radiating from Broadford to the north of the site are 1,243 vehicles on the R466 from the east, 2,827 vehicles on the R465 from the north, and 1,700 vehicles on the R465 to the south of Broadford leading to the site.

While link capacities are discussed in further detail in Section 15.1.6.2, it is worth noting that background link flows on the R463 in the north of Limerick City were observed to be particularly high in 2023, as set out in Table 15-1 and summarized below.

- Link 2 – R463 – Athlunkard Street - All day traffic flow = 13,032 vehicles
- Link 3 – R463 – Corbally Road - All day traffic flow = 17,023 vehicles

As they leave the urban area the link capacity for each link may be estimated based on road types and widths as set out in the TII Standards document DN-GEO-03031 Road Link Design, Table 6/1. For each of these roads it is considered that the road type is Type 3 single with a daily capacity of 5,000

vehicles. Based on this capacity and the flows above, it may be determined that Links 2 and 3 on the R463 are currently operating in the year 2023, at 260% and 340% of capacity respectively.

While the traffic flows observed on these links are high it is important to consider that the link flows were established from an all-day classified turning count undertaken at the R463 Athlunkard Street / R463 Corbally Road roundabout which is close to a residential development, a supermarket, a school and other town centre uses. Many trips observed on these links are therefore short in nature, with flows on the links as they approach the urban boundary of Limerick City significantly lower, as shown for traffic flows on the R465 at Carmody's Cross (Link 4), where an all-day traffic flow of 1,538 vehicles was observed.

Based on the above, when assessing the impact of the Proposed Development-generated traffic on link flows on the delivery route, it is important to consider the relative increase due to the Proposed Development. This issue is discussed further in Section 15.1.6.2.

Table 15-1 Observed All day flows, year 2023 (2-way vehicles)

Link	2023	Source
1 N69 – East of Foynes	6,374	TII ATC
2 R463 – Athlunkard Street	13,032	Classified turning count
3 R463 – Corbally Road	17,023	Classified turning count
4 R465 – North of Carmody's Cross	1,538	Classified turning count
5 R466 – East of Broadford	1,243	Classified turning count
6 R465 – North of Broadford	2,827	Classified turning count
7 R465 – South of Broadford	1,700	Classified turning count

15.1.3.2 Background Traffic Volumes for Assumed Construction Year 2028

This section describes the process adopted to produce background traffic forecasts for an assumed construction year of 2028.

Revised guidelines for forecasting annual growth in traffic volumes were produced by TII in October 2021, as set out by county in the 'Project Appraisal Guidelines for National Roads (Unit 5.3)'. The annual growth rates for light vehicles for Co. Clare, and factors for the years relevant to this study, are shown in Table 15-2 and Table 15-3. Traffic volumes are forecast to increase during the period from 2023 (the observed traffic count year) to 2028 (the assumed construction year) by 8.0%, assuming a medium growth scenario. All day traffic flows on the study area network are compared for the years 2023 and 2028 in Table 15-4.

It should be noted that while the assumed construction year of 2028 may vary slightly, this will not alter the forecast outcomes and effects presented in this section of the EIAR. This is due to the annual growth rate for background traffic being just 1.56% (as shown in Table 15-2 as 1.0156) and the traffic volumes generated by the Proposed Development will remain unchanged regardless of construction year, as presented subsequently in Section 15.1.4.

The classified counts undertaken on the delivery routes were used to determine the existing percentage of HGVs on the study area network. The observed percentage of HGVs was observed to vary on the

turbine delivery route from 2.0% on the R463 Athlunkard Street, to 5.5% on the R465 north and south of the proposed access junction, to 6.9% on the R466 to the east of Broadford, to a maximum of 8.4% on the N69 to the east of Foynes. Traffic volumes forecast on the study network for the year 2028 are shown by vehicle type in Table 15-5.

Table 15-2 TII Traffic Growth Annual Factors and Indices for County Clare

Year	Lights – Annual Factor			Lights (Cars and LGVs) – Cumulative Index		
	Low	Medium	High	Low	Medium	High
2023	1.0139	1.0156	1.0191	1.000	1.000	1.000
2024	1.0139	1.0156	1.0191	1.014	1.016	1.019
2025	1.0139	1.0156	1.0191	1.028	1.031	1.039
2026	1.0139	1.0156	1.0191	1.042	1.048	1.058
2027	1.0139	1.0156	1.0191	1.057	1.064	1.079
2028	1.0139	1.0156	1.0191	1.071	1.080	1.099

Source: TII Project Appraisal Guidelines – Unit 5.3, May 2019

Table 15-3 TII traffic growth rates by growth scenario

Period	New Factors		
	Low	Medium	High
2023 – 2028	1.071	1.080	1.099

Table 15-4 Observed all day flows by year (2-way vehicles)

Link	2023	2028
1 N69 – East of Foynes	6,374	6,884
2 R463 – Athlunkard Street	13,032	14,075
3 R463 – Corbally Road	17,023	18,385
4 R465 – North of Carmody's Cross	1,538	1,661
5 R466 – East of Broadford	1,243	1,342
6 R465 – North of Broadford	2,827	3,053
7 R465 – South of Broadford	1,700	1,836

Table 15-5 All day flows, percentage HGVs and flows by vehicle type, year 2028

Link	All day flow (vehs)	% HGV's	Vehicles		PCUs		
			HGVs	Cars / LGVs	HGVs	Cars / LGVs	Total
1 N69 – East of Foynes	6,884	8.4%	578	6,306	1,388	6,306	7,693
2 R463 – Athlunkard Street	14,075	2.0%	281	13,793	676	13,793	14,469
3 R463 – Corbally Road	18,385	2.2%	404	17,980	971	17,980	18,951
4 R465 – North of Carmody's Cross	1,661	5.5%	91	1,570	219	1,570	1,789
5 R466 – East of Broadford	1,342	6.9%	93	1,250	222	1,250	1,472
6 R465 – North of Broadford	3,053	6.0%	183	2,870	440	2,870	3,310
7 R465 – South of Broadford	1,836	5.5%	101	1,735	242	1,735	1,977

15.1.4 Proposed Development and Traffic Generation

15.1.4.1 Development Trip Generation – During Construction

The assessment of the effects of traffic generated during the construction of the Proposed Development is considered in two stages.

- Stage 1 – Site preparation and groundworks including construction of internal roads, turbine foundations, cabling, met mast foundations, Grid Connection underground electrical cabling route laying, substation construction, construction of compound and tree felling, and,
- Stage 2 – Turbine component delivery and construction.

For the purpose of the traffic impact assessment, projections based on trip generation data collected from other wind farm construction projects regarding the numbers of trips per quantum of material, the number of turbine component parts based on 9 turbines, the length of the construction phase and work periods etc. were made to inform the assessment. These projections allow for a robust assessment but should not be inferred as prescriptive limitations to the construction phase. There are numerous variables which can affect a construction project programme such as weather for example. The construction phase of the Proposed Development will be carried out in accordance with the Construction and Environmental Management Plan (CEMP), which is submitted as Appendix 4-3 of this EIAR.

The construction phase of the Proposed Development is expected to last approximately 18 months (1.5 years). While this could increase to 24 months, 18 months was assumed for the purpose of this assessment in order to test a robust scenario. The shortest construction period will give rise to higher volumes of construction traffic using the public road network at any one time.

For assessment purposes a standard 255 working days per annum was adopted for the 12 months, with a total of 383 working days for the 18 month construction period. As set out below following number of delivery days is allocated to each element of the construction phase.

- Stage 1 – Site Preparation and groundworks including cable laying – A total of 359 days is allocated to this phase of which 9 days are reserved solely for concrete deliveries for turbine foundations and 350 days for all other deliveries.
- Stage 2 – Turbine delivery (abnormally sized loads)– A total of 15 days will be required when convoys of up to 3 abnormally sized loads deliver the large turbine components to the Wind Farm Site. These deliveries will be made during nighttime hours.
- Stage 2 – Turbine delivery (standard HGVs) – A total of 9 days will be required for the delivery of smaller turbine components to the site using standard HGVs.

The above equates to a total of 383 days, or 18 months.

15.1.4.1.1 *Stage 1 – Site Preparation and Ground Works including Cable Laying*

The total numbers of deliveries made to the site during the site preparation and ground works stage (stage 1) are shown in Table 15-6.

During all of Stage 1, it is estimated that 6,592 two-way HGV trips will be made to the site by trucks and large articulated HGVs, as set out in Table 15-6, with the daily effect on the local road network shown in Table 15-7 and 15-8.

During this construction phase, there will be two distinct types of days with respect to trip generation. A total of 9 days will be used to pour the 9 concrete wind turbine foundations. Foundations will likely be poured one per day, with an estimated 75 concrete loads required for each turbine foundation delivered to the site over a 12-hour period. This will result in just over 6 HGV trips to and from the site per hour. On the remaining 350 working days for this stage, other general materials will be delivered to the site.

The figures in Table 15-7 show that on the 9 days that concrete will be delivered to the site an additional 360 two-way PCUs will be added to the network (comprising 75 two-way HGV trips or 150 movements, with 2.4 PCUs per movement). Similarly, on the 350 days when other materials will be delivered to the site, traffic volumes on the local network are forecast to increase by an average 81 two-way PCUs, as set out in Table 15-8.

Table 15-6 Stage 1 – Site preparation and groundworks – total movements

Material	Total no. Truck Loads	Truck type
Concrete	675	Trucks
Delivery of plant	35	Large artic
Fencing & gates	3	Large artic
Compound setup	36	Large artic
Steel	25	Large artic
Ducting and cabling (internal)	264	Large artic
Grid connection cable laying	1,000	Large artic

Material	Total no. Truck Loads	Truck type
Tree felling	1,030	Truck
Crane (to lift steel)	1	Large artic
Road construction	3,000	Truck
Substation	100	Large artic
Crane for turbines	12	Large artic
Refuelling for plant	186	Large artic
Site maintenance	135	Large artic
Miscellaneous	90	Large artic
Total	6,592	

Table 15-7 Stage 1 – Concrete foundation pouring – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Concrete	675	Truck	2.4	1,620	180.0	360.0
* Estimation based on 9 concrete pouring days						

Table 15-8 Stage 1 – Site preparation and groundworks – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Delivery of plant	35	Large artic	2.4	84.0	0.24	0.48
Fencing & gates	3	Large artic	2.4	7.2	0.02	0.04
Compound setup	36	Large artic	2.4	86.4	0.25	0.49
Steel	25	Large artic	2.4	60.0	0.17	0.34
Ducting and cabling (internal)	264	Large artic	2.4	633.6	1.81	3.62

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Grid connection cable laying	1,000	Large artic	2.4	2,400.0	6.86	13.71
Tree felling	1,030	Truck	2.4	2,472.0	7.06	14.13
Crane (to lift steel)	1	Large artic	2.4	2.4	0.01	0.01
Road construction	3,000	Truck	2.4	7,200.0	20.57	41.14
Substation	100	Large artic	2.4	240.0	0.69	1.37
Crane for turbines	12	Large artic	2.4	28.8	0.08	0.16
Refuelling for plant	186	Large artic	2.4	446.4	1.28	2.55
Site maintenance	135	Large artic	2.4	324.0	0.93	1.85
Miscellaneous	90	Large artic	2.4	216.0	0.62	1.23
Total	5,917			14,200.8	40.57	81.1
* Estimation based on groundwork period of 350 working days						

15.1.4.1.2 *Stage 1 – Construction of Temporary Transition Compound on N69*

It is estimated that the construction of the TTC a total of 2,280 loads of material will require to be delivered to the site located on the northern side of the N69 just to the east of the village of Kildimo. It is estimated that the construction of the TTC will take place over a 4 month period, or 85 days, with the 27 deliveries on each of these days resulting in an additional 129 pcus on the section of the road network impacted, as shown in Table 15-9.

It is noted that the materials for the TTC will be provided by a quarry located at Ballylin close to Foynes on the N69, with this section of the N69 on the only part of the network impacted during the construction of this element of the Proposed Development. The construction of the TTC may therefore be constructed concurrently to the Stage 1 - Site preparation and groundworks, including cable laying stage, as they impact on separate parts of the road network, as discussed further in Section 15.1.6.1.

Table 15-9 Stage 1 – Construction of Temporary Transition Compound – total movements and volumes per delivery day

Material	Total Truck Loads	Truck loads / day	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Delivery of stone / aggregate	2,280	27	Large truck	2.4	5,472	64.38	128.75

15.1.4.1.3 *Stage 2 – Turbine Delivery*

During the turbine construction stage, including delivery and assembly, some deliveries to the site will be made by abnormally large vehicles, referred to in this section as extended artics, transporting the component parts of the turbines (nacelles, blades and towers). There will also be deliveries made by normal large HGVs, transporting cables, tools and smaller component parts. The types of load and associated numbers of trips made to the site during the turbine construction period are shown in Table 15-10, which summarises that a total of 72 trips will be made to and from the site by extended artics, with a further 36 trips made by conventional large articulated HGVs.

Table 15-10 Stage 2 – Wind turbine plant – total movements

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Nacelle	9	1	9	1	9	Extended Artic
Blades	9	3	27	1	27	Extended Artic
Towers	9	4	36	1	36	Extended Artic
Sub total					***72***	
Transformer	9	1	9	1	9	Large Artic
Drive train and blade hub	9	1	9	1	9	Large Artic
Base and other deliveries	9	2	18	1	18	Large Artic
Sub total					***36***	
Total					108	

For the purpose of this assessment a delivery period based on previously constructed wind farm sites already constructed, is provided although this may be subject to change. It is assumed that the turbine delivery element will progress at the rate of 5 extended artic trips made by convoy to the site on 2 days per week, resulting in this stage taking approximately 15 days/nights spread over a 3 week period. On a further 9 days at 2 days per week, lasting for approximately 5 weeks, the remaining equipment required

during this phase will be delivered to the site. The additional traffic movements for these 2 types of days are summarised in Table 15-11 and Table 15-12. In Table 15-11, a PCU equivalent value of 10 was allocated to each extended artic movement, resulting in an additional 100 PCUs on the study network on these 2 days per week, while an additional 19.2 PCUs are forecast to be on the network on two other days per week during the turbine construction phase, as shown in Table 15-12.

Table 15-11 Stage 2 – Wind turbine plant, extended artics – total movements and volumes per delivery day

Material	Units	Truck Type	PCU Value	Total PCUs	2-way PCUs/ day
Nacelle	1	Extended Artic	10	10.0	20.0
Blades	3	Extended Artic	10	30.0	60.0
Towers	4	Extended Artic	10	40.0	80.0
Total per turbine	8			80.0	160.0
Total per delivery day	5			50.0	100.0
* Based on 5 abnormal sized loads being delivered per day on 2 days per week (total 72 loads will take 15 nights spread over 3 weeks)					

Table 15-12 Stage 2 - Wind turbine plant, normal artic HGVs - total movements and volumes per delivery day

Material	Quantity per Unit	PCU Value	2-way PCUs / day
Transformer	1	2.4	4.8
Drive train and blade hub	1	2.4	4.8
Base & other deliveries	2	2.4	9.6
Total	4		19.2
* Based on equipment for 2 turbines being moved per week spread over 2 days for 5 weeks			

15.1.4.1.4 Construction Employee Traffic

It is estimated that a total of 90 construction jobs will be created during the construction, operation and maintenance phases of the Proposed Development of which it is estimated that a maximum of 70 staff members will be employed on the site at any one time during the site preparation and groundworks stage of construction, reducing to a maximum of 40 staff at any one time during the turbine erection stage. Based on a robust traffic scenario where all staff will travel to / from the site by car, at an average of 2 persons per car, a total of 70 PCU movements (each trip is two way) will travel on the local road network. This will reduce to 40 PCUs during the turbine construction stage. These volumes are included in the traffic impact assessment set out in this EIAR. It is noted that all staff trips will access

the site via the main access junction off the R465 and will park in the staff parking area situated within the site compound.

15.1.4.2 Development Trip Generation – During Operation

The Proposed Development will be unmanned once operational and will be remotely monitored. Traffic associated with the operational phase of the Proposed Development will be from the wind farm developers, Eirgrid personnel visiting the substation, and maintenance personnel who will visit individual turbines. It is anticipated that these trips will account for approximately two to three maintenance staff trips per week. The impact on the network of these trips during the operational stage is discussed in Section 15.1.11.3. There will also be occasions when plant will require to be replaced which may include large turbine component parts, although it is noted that these occasions will be rare.

15.1.4.3 Development Trip Generation – During Decommissioning

Traffic generation during decommissioning will be similar but significantly less than the trip generation estimates presented for the construction phase presented in 15.1.4.1. This is because much of the materials brought into Site during construction will be left in-situ during the decommissioning stage and large turbine components will be broken down and removed from site using standard HGVs.

15.1.5 Construction Traffic Vehicle Types

The delivery of turbine components including blades, tower sections and nacelles is a specialist operation due to the oversized loads involved. The blades are the longest turbine component and in the case of the Proposed Development blades up to 81.5m long have been considered for the purpose of this assessment.

For the purpose of this assessment set out in this EIAR, it is assumed that the blades, which are the largest turbine components, will be transported using a combination of a standard Super Wing Carrier, which transports the blade on a horizontal position, and by means of blade lifter, that transports the blade at an angle of 60 degrees, resulting in the effective blade length in plan reducing by 50%. The tower sections, which are significantly shorter that the blade sections, will be transported using standard low deck trailers.

The critical vehicles in terms of size and turning geometry requirements and used in the detailed route assessment discussed in Section 15.1.8 are the blade, using both the Super Wing carrier and the blade lifter, and the tower transporters. The geometry of the design vehicles is included in Appendix 15-3.

The key dimensions of the vehicles tested are as follows:

Transport of Blades – Super Wing Carrier with blade

Total length	87.3 m
Length of blade	81.5 m

Transport of Blades – Blade lifter and truck with blade

Total length	58.4 m
Length of blade (in plan)	40.8 m

Transport of Tower – Using low-bed or drop deck trailers

Total length (with load)	62.8 m
Length of load 34.5 m Inner radius	25.0 m

The vehicles used to transport the nacelles will be shorter in length compared to the blade and tower transporters.

While the swept path analysis presented in Section 15.1.8 of the EIAR is based on the turning requirements of the maximum sized turbine components, the requirements of the minimum sized turbine components were also considered and tested as part of the assessment.

All other vehicles requiring access to the site will be standard HGVs and will be significantly smaller than the design test vehicles.

15.1.6 Expected Traffic During Construction, Operation and Decommissioning

As detailed below, the transportation of large turbine components will be carried out at night when traffic is at its lightest and in consultation with the relevant Roads Authorities and An Garda Síochána, with deliveries accompanied by Garda escort.

15.1.6.1 Expected Traffic on Link Flows – During Construction

Background traffic volumes, as established previously and set out in Table 15-5.

Development generated traffic volumes are shown for the typical construction day scenarios discussed in Section 15.1.4, are set out in Table 15-13 to 15-17 below. The resultant traffic effects are summarised in Table 15-18 to 15-22.

The actual figures presented in the tables may vary slightly, however, they are considered to represent a robust assessment of the likely increases in traffic volumes. For the purpose of assessing the maximum increases in traffic volumes on links during Stage 1 of construction, it is assumed that all traffic will travel along each of the traffic routes identified in Figure 15-2a.

In terms of daily traffic flows the potential increase, which is concluded in Tables 15-18 to 15-22, may be summarised as follows:

During Stage 1 – Concrete Pouring (See Table 15-18)

For these 9 days an additional 430 PCUs will travel on the study network.

If solely delivered from the south in the direction of Limerick the percentage increase in traffic volumes experienced on the study network will be between +3.0% on the R463 Athlunkard Street to +2.3% on the Corbally Road. As the route travels north on the R465 and background traffic flows reduce significantly, the percentage increase becomes more pronounced, with +24.0% forecast on the R465 between Carmody's Cross and the site access. In the event that the concrete is delivered from the north, it is forecast that there will be a 29.5% increase on the R466, or +13.0 if delivered from the R465 just north of Broadford. Between Broadford and the site access it is forecast that there will be a 21.7% increase in traffic volumes on the R465.

During Stage 1 - Site Preparation and Groundworks (See Tables 15-19 and 15-20)

For these 350 days an additional 151 PCUs will travel on the study network.

Again, if all materials are delivered from the south the percentage increase in traffic volumes will be between +1.0% on the R463 Athlunkard Street and +0.8% on the Corbally Road. As the route travels north on the R465, the percentage increase is forecast to be +8.4% on the R465 between Carmody's Cross and the site access. If all materials for this stage are delivered from the north, it is forecast that there will be a 10.3% increase on the R466, or +4.6 if delivered from the R465 just north of Broadford. Between Broadford and the site access it is forecast that there will be a 7.6% increase in traffic volume on these days on the R465.

For the 85 days that materials will be delivered from a quarry close to Foynes to the proposed TTC on the N69 to the east of Kildimo, it is forecast that there will be a 1.9% increase in traffic volumes on these days.

During Stage 2 - Turbine Erection Stage – Delivery of large equipment using extended articulated vehicles (See Table 15-21

For these 15 days an additional 145 PCUs will travel on the study network.

As stated previously, all of the deliveries for this stage will approach the site from the direction of Foynes Port. On these 15 nights it is forecast that the percentage increase in traffic volumes will range from +1.9% on the N69 east of Foynes, to +1.0% on the R463 Athlunkard Street and +0.8% on the Corbally Road. As the route travels north on the R465, the percentage increase is forecast to be +8.1 on the R465 between Carmody's Cross and the site access.

The most significant traffic impact may be experienced during these delivery periods primarily due to the slow speeds, size and geometric requirements of these vehicles. The provision of traffic management measures, including ensuring that these deliveries are made at night as is proposed, (as set out in Sections 15.1.7 and 15.1.11.6 and included in the CEMP), will be required to minimise the impact of development traffic on the study network on these days.

During Stage 2 - Turbine Construction Stage – Other deliveries using conventional articulated HGVs (See Table 15-22)

For these 9 days an additional 64 PCUs will travel on the study network.

It is likely that these deliveries will also travel from Foynes Port. For 9 days on the delivery route 64 additional PCUs (made up of cars and standard articulated HGV movements to the site and back) will travel on the study network. On these days, the percentage increase on the study network will range from +0.8% on the N69 east of Foynes to +0.4% on the R463 Athlunkard Street and +0.3% on the Corbally Road. As the route travels north on the R465, the percentage increase is forecast to be +3.6 on the R465 between Carmody's Cross and the site access.

Table 15-13 Effects of development traffic during turbine 9 days concrete pouring – Stage 1

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
2 R463 – Athlunkard Street	13,793	676	14,469	70	360	430	13,863	1,036	14,899

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
3 R463 – Corbally Road	17,980	971	18,951	70	360	430	18,050	1,331	19,381
4 R465 – North of Carmody's Cross	1,570	219	1,789	70	360	430	1,640	579	2,219
5 R466 – East of Broadford	1,250	222	1,472	70	360	430	1,320	582	1,902
6 R465 – North of Broadford	2,870	440	3,310	70	360	430	2,940	800	3,740
7 R465 – South of Broadford	1,735	242	1,977	70	360	430	1,805	602	2,407

Table 15-14 Development traffic during site preparation and groundworks 350 days – Stage 1

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
2 R463 – Athlunkard Street	13,793	676	14,469	70	81	151	13,863	757	14,620
3 R463 – Corbally Road	17,980	971	18,951	70	81	151	18,050	1,052	19,102
4 R465 – North of Carmody's Cross	1,570	219	1,789	70	81	151	1,640	300	1,940
5 R466 – East of Broadford	1,250	222	1,472	70	81	151	1,320	303	1,623
6 R465 – North of Broadford	2,870	440	3,310	70	81	151	2,940	521	3,461
7 R465 – South of Broadford	1,735	242	1,977	70	81	151	1,805	323	2,128

Table 15-15 Development traffic during construction of the temporary transition compound 85 days – Stage 1

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
1 N69 – East of Foynes	6,306	1,388	7,693	20	129	149	6,376	1,517	7,842

Table 15-16 Development traffic during turbine erection - extended articulated vehicles(large turbine components) – Stage 2

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N69 – East of Foynes	6,306	1,388	7,693	45	100	145	6,351	1,488	7,838
2 R463 – Athlunkard Street	13,793	676	14,469	45	100	145	13,838	776	14,614
3 R463 – Corbally Road	17,980	971	18,951	45	100	145	18,025	1,071	19,096
4 R465 – North of Carmody's Cross	1,570	219	1,789	45	100	145	1,615	319	1,934

Table 15-17 Effect of development traffic during turbine construction – other deliveries (small turbine components) – Stage 2

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N69 – East of Foynes	6,306	1,388	7,693	45	19	64	6,351	1,407	7,757
2 R463 – Athlunkard Street	13,793	676	14,469	45	19	64	13,838	695	14,533
3 R463 – Corbally Road	17,980	971	18,951	45	19	64	18,025	990	19,015
4 R465 – North of Carmody's Cross	1,570	219	1,789	45	19	64	1,615	238	1,853

Table 15-18 Summary effect of development traffic during turbine concrete pouring (9 days)– Stage 1

Link	Background	Development	Total	% increase	Estimated No. of days
2 R463 – Athlunkard Street	14,469	430	14,899	3.0%	9
3 R463 – Corbally Road	18,951	430	19,381	2.3%	9
4 R465 – North of Carmody's Cross	1,789	430	2,219	24.0%	9
5 R466 – East of Broadford	1,472	430	1,902	29.2%	9
6 R465 – North of Broadford	3,310	430	3,740	13.0%	9
7 R465 – South of Broadford	1,977	430	2,407	21.7%	9

Table 15-19 Summary effect of development traffic during site preparation and ground works (350 days) – Stage 1

Link	Background	Development	Total	% increase	Estimated No. of days
2 R463 – Athlunkard Street	14,469	151	14,620	1.0%	350
3 R463 – Corbally Road	18,951	151	19,102	0.8%	350
4 R465 – North of Carmody's Cross	1,789	151	1,940	8.4%	350
5 R466 – East of Broadford	1,472	151	1,623	10.3%	350
6 R465 – North of Broadford	3,310	151	3,461	4.6%	350
7 R465 – South of Broadford	1,977	151	2,128	7.6%	350

Table 15-20 Summary effect of development traffic during site preparation and ground works (350 days) – Stage 1

Link	Background	Development	Total	% increase	Estimated No. of days
1 N69 – East of Foynes	7,693	149	7,842	1.9%	85

Table 15-21 Summary effect of development traffic during turbine construction – extended artics (large turbine components) (15 days) – Stage 2

Link	Background	Development	Total	% increase	Estimated No. of days
1 N69 – East of Foynes	7,693	145	7,838	1.9%	15
2 R463 – Athlunkard Street	14,469	145	14,614	1.0%	15
3 R463 – Corbally Road	18,951	145	19,096	0.8%	15
4 R465 – North of Carmody's Cross	1,789	145	1,934	8.1%	15

Table 15-22 Summary effect of development traffic during turbine construction – other deliveries (small turbine components) (9 days)– Stage 2

Link	Background	Development	Total	% increase	Estimated No. of days
1 N69 – East of Foynes	7,693	64	7,757	0.8%	9
2 R463 – Athlunkard Street	14,469	64	14,533	0.4%	9
3 R463 – Corbally Road	18,951	64	19,015	0.3%	9
4 R465 – North of Carmody's Cross	1,789	64	1,853	3.6%	9

15.1.6.2 Link Capacity Assessment

An assessment of the impact on link capacity (in terms of 2-way vehicles in a 24hr period) on the delivery route was undertaken for the various construction stages as set out in Tables 15-23 to 15-25 with the capacity of the links on the route options, as shown in Table 15-23, generally being 5,000 vehicles per day for the sections of the R463, R465 and R466 on the delivery routes.

Link capacities are based on road types and widths as set out in the TII Standards document DN-GEO-03031 Road Link Design, Table 6/1, and refer to the 2-way traffic flow within a 24 hour period. It is noted that the link capacities adopted from the TII guidelines correspond to a Level of Service D, which the guidelines describe as being the level where;

"Speeds begin to decline slightly with a slight increase of flows and density begins to increase somewhat more quickly. Freedom to manoeuvre within the traffic streams is more noticeably limited, and the driver experiences reduced comfort levels".

Background, or Do-Nothing Scenario traffic flows for the construction year of 2028, are compared to flows forecast for the various construction delivery stages, in Table 15-24, with the percentage capacity reached for each stage shown in Table 15-25.

As was set out previously in Section 15.1.3.2, it was determined that Link 2 (R463 Athlunkard Street) and Link 3 (R463 Corbally Road) are currently operating (year 2023), at 260% and 340% of capacity respectively, and that when assessing the impact of the Proposed Development-generated traffic on link flows on the delivery route, it is important to consider the relative increase due to the Proposed Development. It is noted that sections of the R463 on the delivery route just north of Limerick City (Links 2 and 3) are forecast to operate significantly over capacity for the Do Nothing Scenario, with the busiest being Corbally Road (Link 3) which is forecast to operate at 379% of capacity for the Do Nothing Scenario, increasing to a maximum of 388% during construction.

Based on the results in Tables 15-24 and 15-25, it is forecast that the delivery route in close proximity to the Proposed Development will operate well within link capacity, with the R465 approaching the site from the south (Link 4) forecast to operate at a maximum of 36% of capacity for the Do Nothing Scenario, increasing to a maximum of 44% during the construction period. Similarly, the R465 approaching the site from the north (Link 6) is forecast to operate at 66% for the Do Nothing Scenario, increasing to a maximum of 75% during construction period.

Table 15-23 Carriageway widths, link type and link capacity

Link	Width (m)	Link type	Link capacity
1 N69 – East of Foynes	7.5	Type 1 single	11,600
2 R463 – Athlunkard Street	6.0	Type 3 single	5,000
3 R463 – Corbally Road	6.0	Type 3 single	5,000
4 R465 – North of Carmody's Cross	6.0	Type 3 single	5,000
5 R466 – East of Broadford	6.0	Type 3 single	5,000
6 R465 – North of Broadford	6.0	Type 3 single	5,000
7 R465 – South of Broadford	6.0	Type 3 single	5,000

Table 15-24 Link capacity and summary of link flows by construction delivery stage

Link	Link capacity	Construction delivery stage				
		Background traffic / Do Nothing Scenario (See Table 15-18)	Concrete pour (Stage 1 – 9 days: See Table 15-18)	Other site works (Stage 1 – 350 days See Table 15-19 and 15-20)	Turbine plant (Stage 2 – 15 days See Table 15-21)	Turbine equipment (Stage 2 – 9 days See Table 15-22)

Link	Link capacity	Construction delivery stage				
1 N69 – East of Foynes	11,600	7,693	8,123	7,842	7,838	7,757
2 R463 – Athlunkard Street	5,000	14,469	14,899	14,620	14,614	14,533
3 R463 – Corbally Road	5,000	18,951	19,381	19,102	19,096	19,015
4 R465 – North of Carmody's Cross	5,000	1,789	2,219	1,940	1,934	1,853
5 R466 – East of Broadford	5,000	1,472	1,902	1,623	NA	NA
6 R465 – North of Broadford	5,000	3,310	3,740	3,461	NA	NA
7 R465 – South of Broadford	5,000	1,977	2,407	2,128	NA	NA

Table 15-25 Link capacity and % of link capacity by construction delivery stage

Link	Link capacity	Construction delivery stage				
		Background traffic	Concrete pour	Other site works	Turbine plant	Turbine equipment
1 N69 – East of Foynes	11,600	66%	70%	68%	68%	67%
2 R463 – Athlunkard Street	5,000	289%	298%	292%	292%	291%
3 R463 – Corbally Road	5,000	379%	388%	382%	382%	380%
4 R465 – North of Carmody's Cross	5,000	36%	44%	39%	39%	37%
5 R466 – East of Broadford	5,000	29%	38%	32%	NA	NA

Link	Link capacity	Construction delivery stage				
6 R465 – North of Broadford	5,000	66%	75%	69%	NA	NA
7 R465 – South of Broadford	5,000	40%	48%	43%	NA	NA

15.1.6.3 Expected Traffic on Link Flows – During Operation

Once the Proposed Development is operational it is estimated that approximately two operational and maintenance staff will access the site at any particular time in order to carry out operational maintenance, with 2 - 3 vehicle trips forecast per week. It is considered that the traffic impact during this phase will be imperceptible. While there will be the requirement to replace plant, this will be a rare occurrence.

15.1.6.4 Junction Capacity Assessment – During Construction

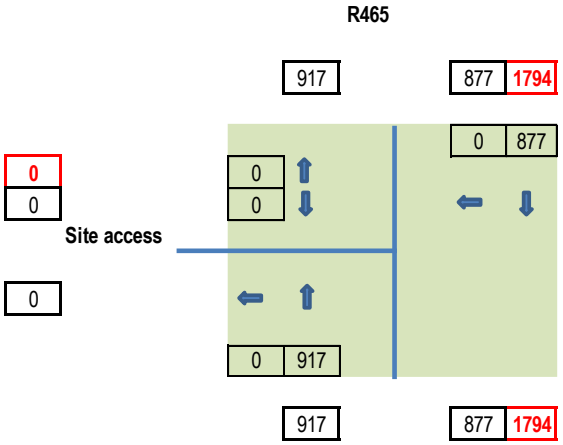
Guidance relating to the requirement to undertake a detailed junction capacity assessment at junctions in the proximity of a proposed development is set out in Document PE-PDV-02045 Traffic and Transport Assessment Guidelines, TII, May 2014. The guidance states that a capacity assessment should be undertaken where the proposed development results in an increase in traffic volumes of 10% or greater, in situations where the network is not currently congested. As the traffic volumes at the R465 / R466 junction in Broadford to the north of the Proposed Development are forecast to increase by greater than this threshold during the construction of the Proposed Development, a detailed capacity assessment was undertaken for this junction. In addition, capacity tests were also undertaken for the proposed access junction on the R465. As the impact at other locations are below this threshold it is considered that no further junctions were required to be the subject of a detailed capacity assessment.

The capacity of the junctions (please refer to Figure 15-2b) was assessed using the industry standard junction simulation software PICADY, which permits the capacity of a priority junction to be assessed with respect to existing or forecast traffic movements and volumes for a given period. The capacity for each movement possible at the junction being assessed is determined from geometric data input into the program with the output used in the assessment as follows:

- Queue – This is the average queue forecast for each movement and is useful to ensure that queues will not interfere with adjacent junctions.
- Degree of Saturation or Ratio of Flow to Capacity (% Sat or RFC) – As suggested, this offers a measure of the amount of available capacity being utilised for each movement. Ideally each movement should operate at a level of no greater than 85% of capacity.
- Delay – Output in minutes, this gives an indication of the forecast average delay during the time period modelled for each movement.

Scenarios Modelled

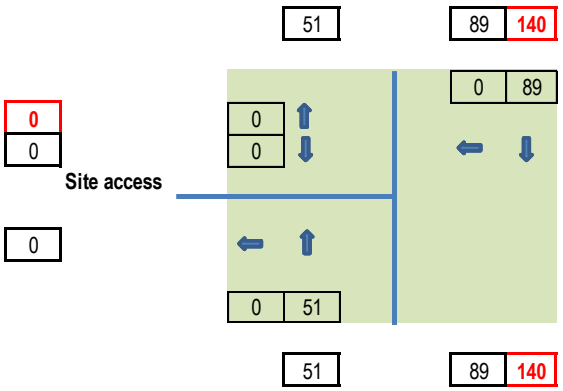
While other junctions and links on the network will experience an increase in traffic volumes passing through them, as discussed previously, the worst-case effect will be experienced during peak hours when, during peak construction periods, up to 70 workers (35 cars) will pass through it. It is noted that deliveries of materials to the site will take place during the day after the workers have arrived on site, and before they leave at the end of the day and will therefore not occur at the same time.



Observed traffic flows
Tuesday September 5th 2023
24 hour
All flows in pcus

R465

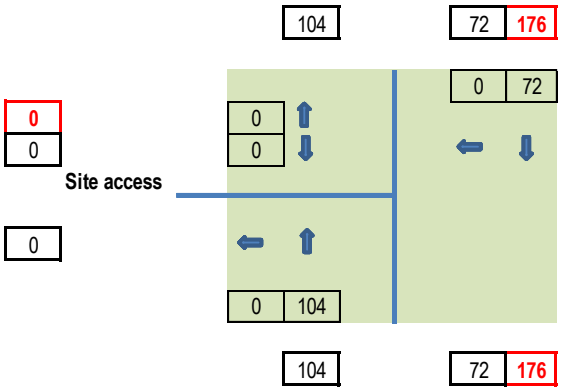
Site access on R465



Observed traffic flows
Tuesday September 5th 2023
AM peak hour (08:00 - 09:00)
All flows in pcus

R465

Site access on R465



Observed traffic flows
Tuesday September 5th 2023
PM peak hour (17:00 - 18:00)
All flows in pcus

R465

Site access on R465

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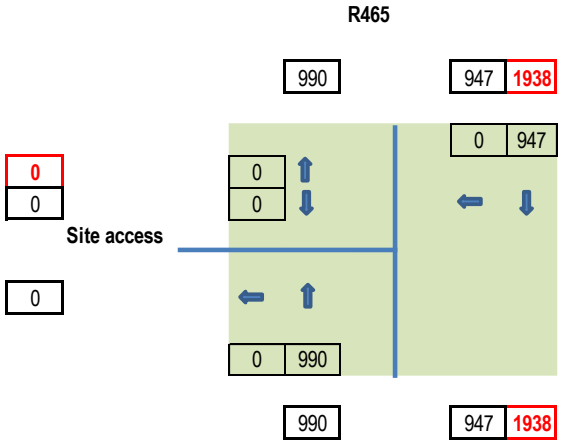
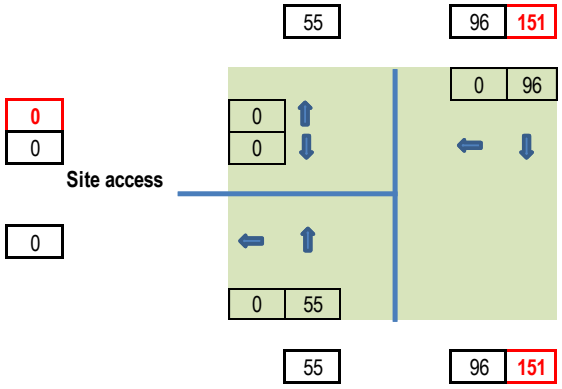
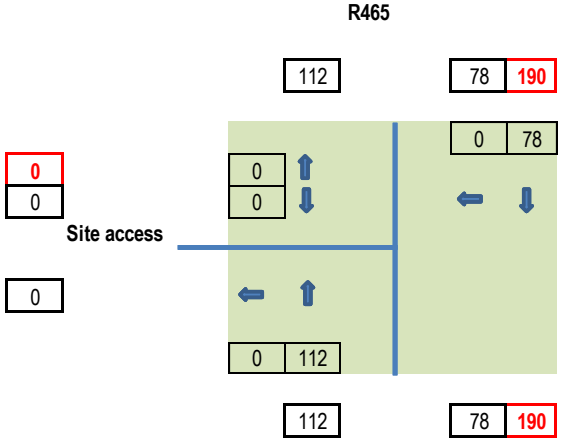
Figure 15-3a Observed traffic flows, R465 access junction
Year 2023 - pcus



Forecast background traffic flows
Year 2028 R465
24 hour Site access on R465
All flows in pcus



Forecast background traffic flows
Year 2028 R465
AM peak hour (08:00 to 09:00) Site access on R465
All flows in pcus



Forecast background traffic flows
Year 2028 R465
PM peak hour (18:00 to 19:00) Site access on R465
All flows in pcus

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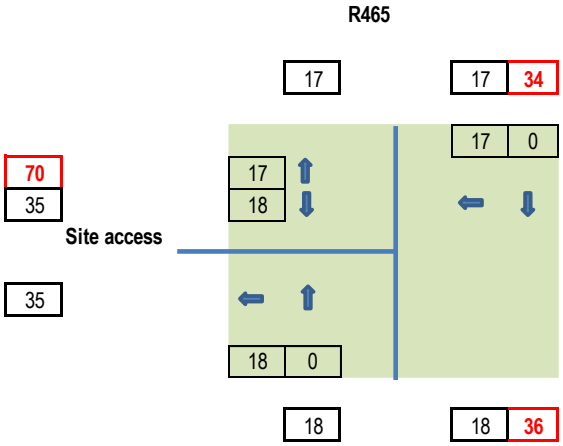
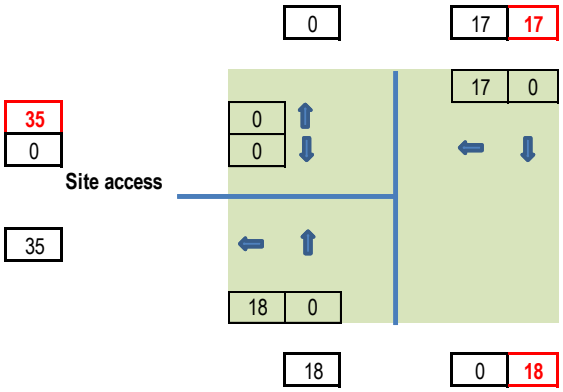
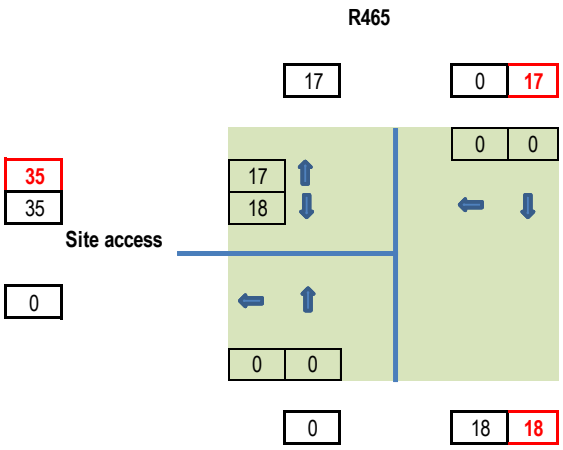
Figure 15-3b Background traffic flows, R465 access junction
Year 2028 - pcus



Construction traffic
Year 2028 R465
24 hour Site access on R465
PCUs



Construction traffic
Year 2028 R465
AM peak hour (08:00 to 09:00) Site access on R465
PCUs



Construction traffic
Year 2028 R465
PM peak hour (18:00 to 19:00) Site access on R465
PCUs

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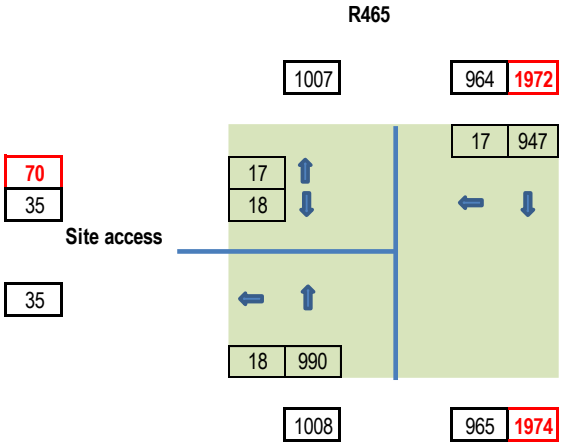
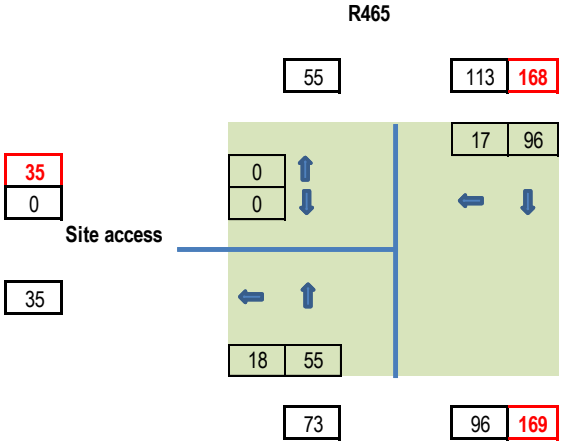
Figure 15-3c Construction traffic flows, R465 access junction
pcus





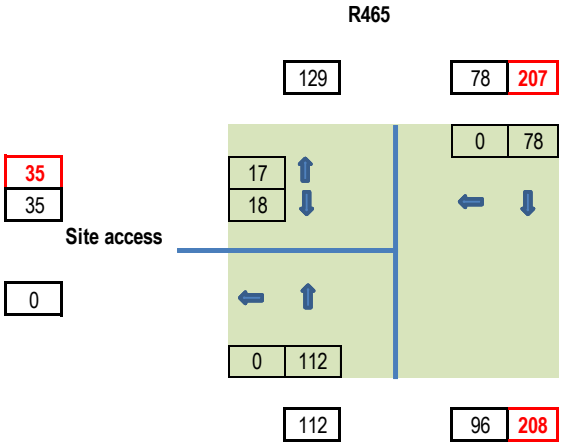


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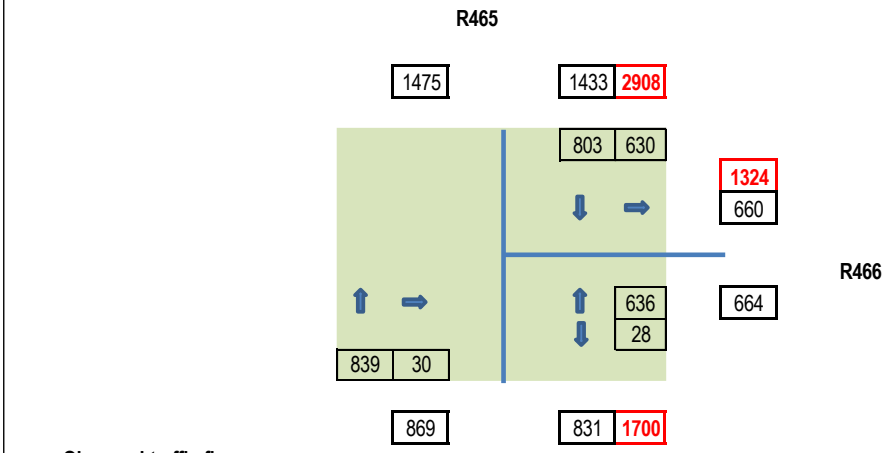
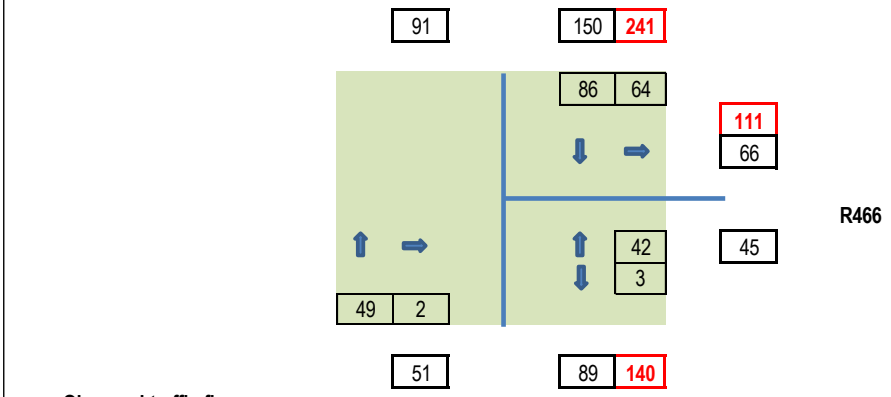
Figure 15-3d With construction traffic flows, R465 access junction
Year 2028 - pcus



Observed traffic flows
Tuesday September 5th 2023
24 hour
All flows in pcus

R465

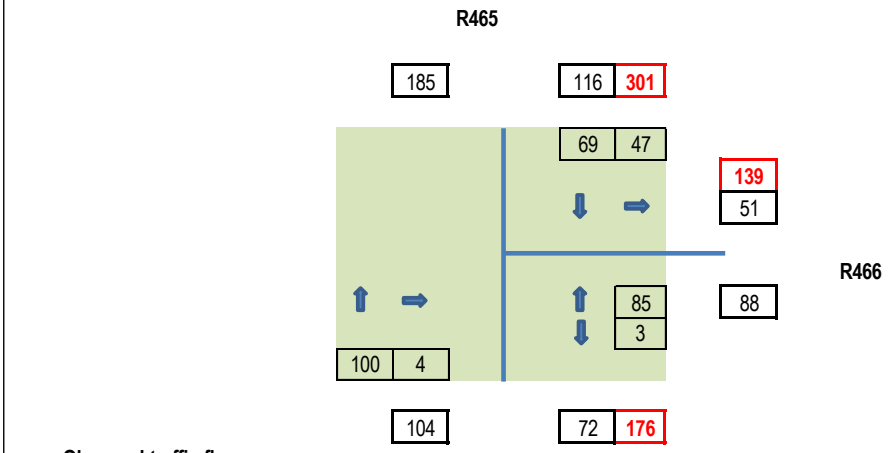
R465 / R466 junction



Observed traffic flows
Tuesday September 5th 2023
AM peak hour (08:00 - 09:00)
All flows in pcus

R465

R465 / R466 junction



Observed traffic flows
Tuesday September 5th 2023
PM peak hour (17:00 - 18:00)
All flows in pcus

R465

R465 / R466 junction

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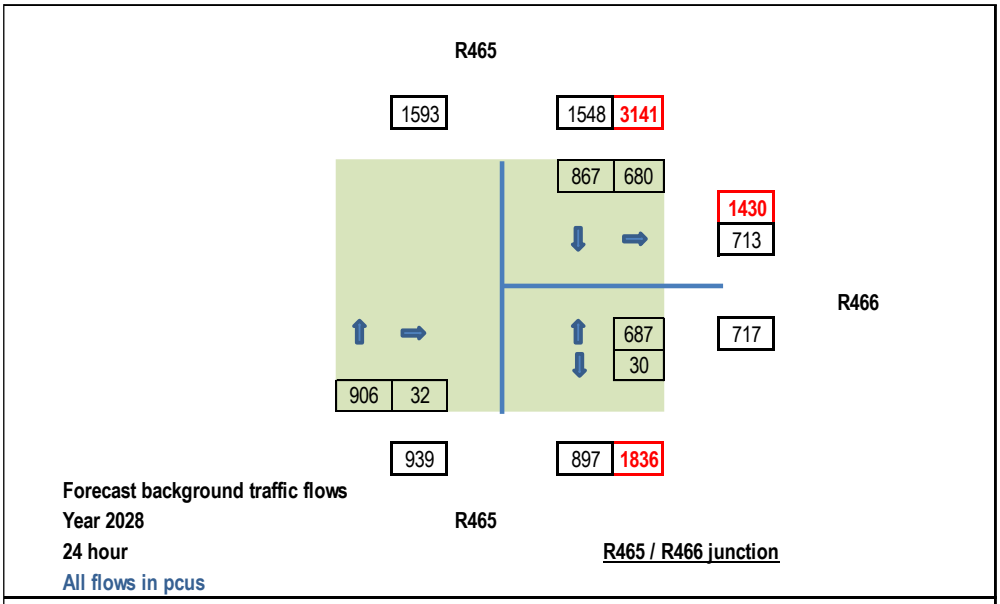
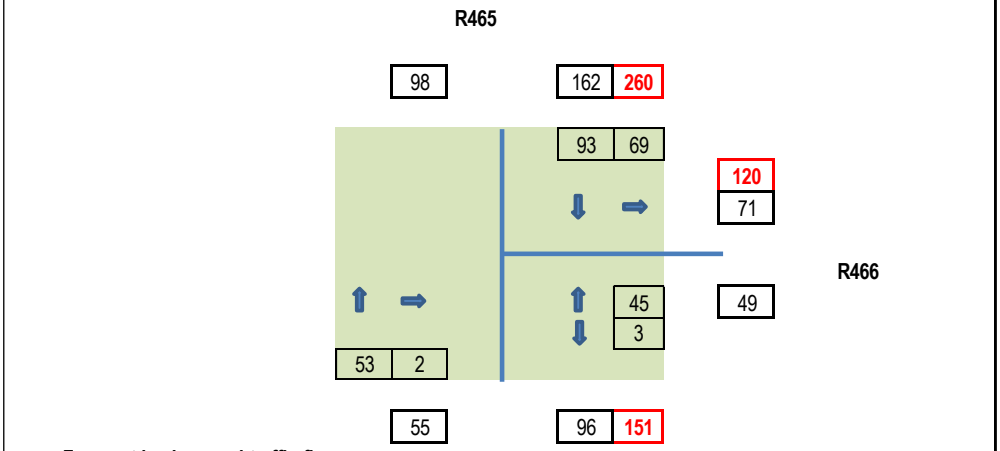
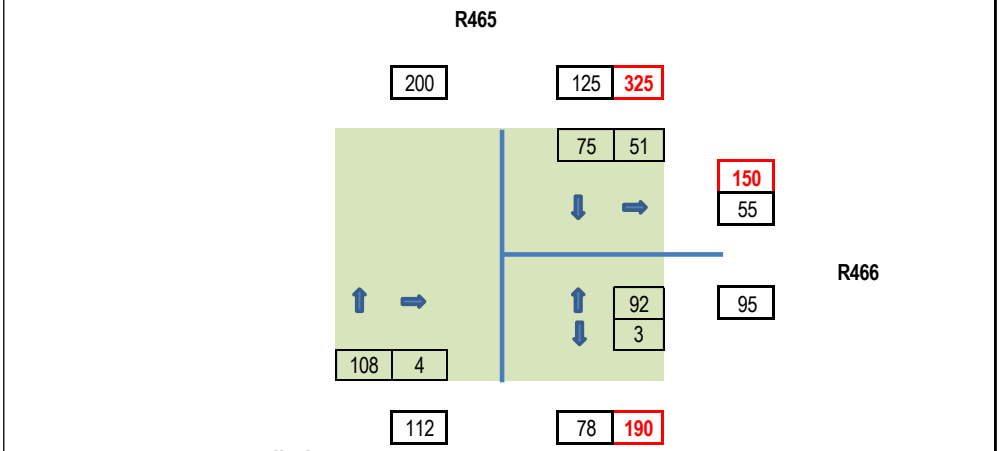
Figure 15-3e Observed traffic flows, R465 / R466 junction
Year 2023 - pcus



Forecast background traffic flows
Year 2028 R465
24 hour R465 / R466 junction
All flows in pcus



Forecast background traffic flows
Year 2028 R465
AM peak hour (08:00 to 09:00) R465 / R466 junction
All flows in pcus



Forecast background traffic flows
Year 2028 R465
PM peak hour (17:00 to 18:00) R465 / R466 junction
All flows in pcus

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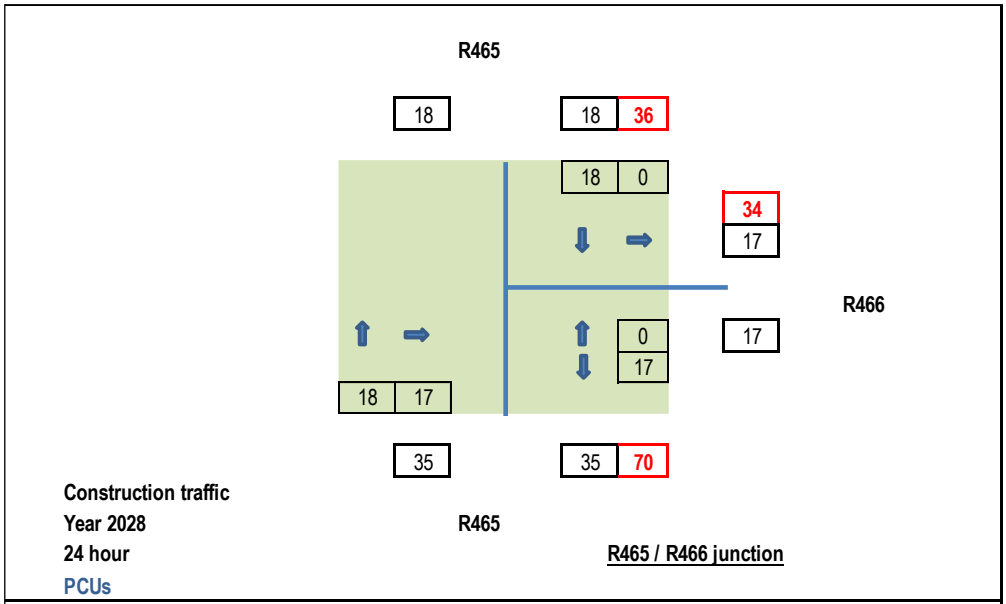
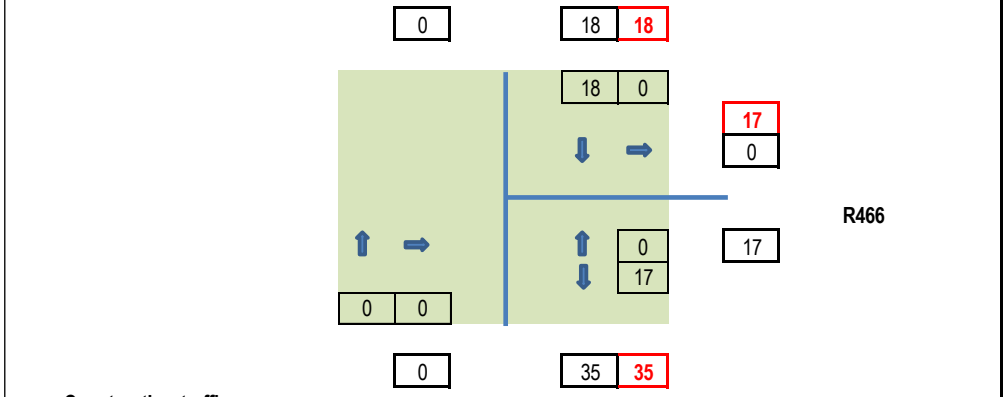
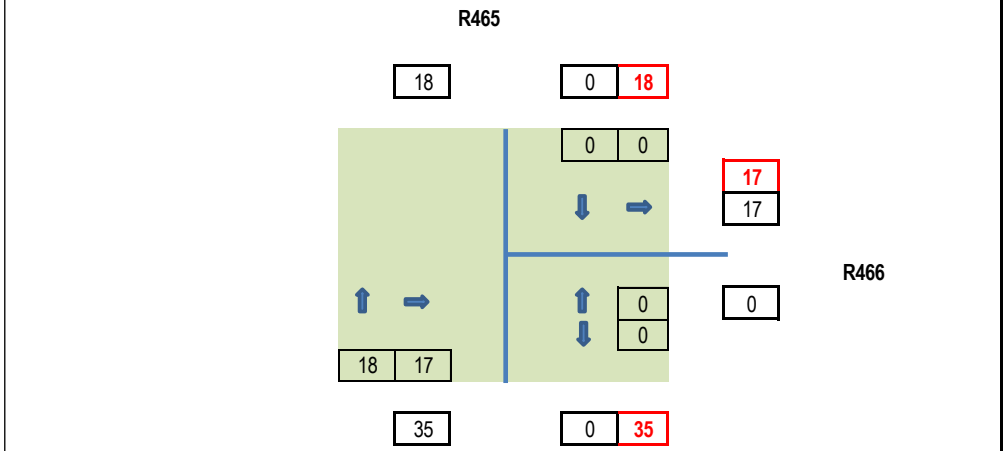
Figure 15-3f Background traffic flows, R465 / R466 junction
Year 2028 - pcus



Construction traffic
Year 2028 R465
24 hour R465 / R466 junction
PCUs



Construction traffic
Year 2028 R465
AM peak hour (08:00 to 09:00) R465 / R466 junction
PCUs



Construction traffic
Year 2028 R465
PM peak hour (17:00 to 18:00) R465 / R466 junction
PCUs

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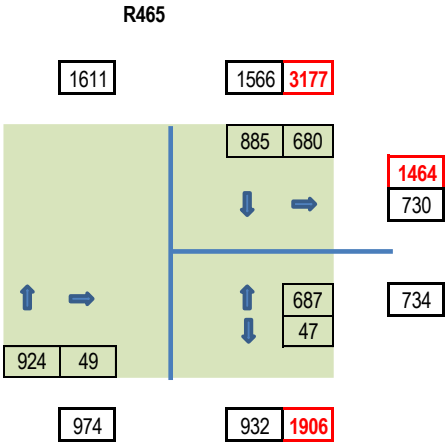
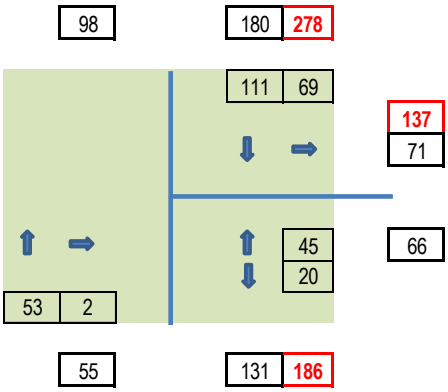
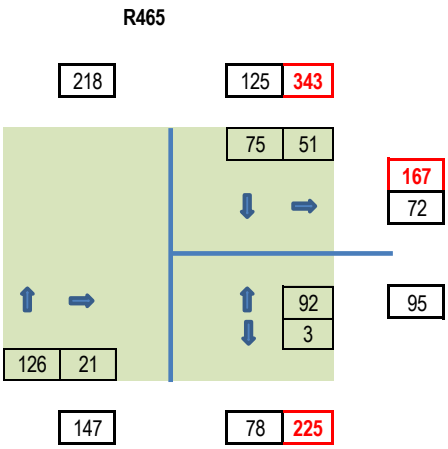
Figure 15-3g Construction traffic flows, R465 / R466 junction
pcus



With construction traffic flows
Year 2028 R465
24 hour R465 / R466 junction
All flows in pcus



With construction traffic flows
Year 2028 R465
AM peak hour (08:00 to 09:00) R465 / R466 junction
All flows in pcus



With construction traffic flows
Year 2028 R465
PM peak hour (17:00 to 18:00) R465 / R466 junction
All flows in pcus

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Figure 15-3h With construction traffic flows, R465 / R466 junction
Year 2028 - pcus

The tests were undertaken for the AM and PM peak hours for the construction year 2028.

R465 / Proposed Development access junction Capacity Test Results

The AM and PM peak hour traffic flows through the R465 / development access junction were established from the classified turning counts and are shown for the year 2028 in Figure 15-3a, with background traffic flows for the assumed construction year of 2028 shown in Figure 15-3b. Traffic flows generated by the Proposed Development during the AM and PM peak hours are shown in Figure 15-3c while the year 2028 traffic flows with development generated traffic are shown in Figure 15-3d.

The results of the capacity assessment are set out in Tables 15-26 and 15-27. For the no development scenario (i.e. without construction traffic) there are no delays as for this scenario there are no opposing turning movements. During the construction of the Proposed Development the results show that the additional traffic negotiating the junction will be accommodated by the proposed layout with a maximum ratio of flow to capacity (RFC) of 3.8% forecast for the AM peak hour and 4.4% during the PM peak hour. It is noted that for the critical right turn movement from the R465 into the site there is no queuing forecast on the R465. The junction is therefore forecast to operate well within the acceptable limits of 85% suggested in TII guidelines for Traffic and Transport Assessments (PE-PDV-02045, TII, May2014).

Table 15-26 Junction capacity test results, R465 development access junction, without and with construction staff, year 2028, AM peak

Period	Location	Without construction traffic			With construction traffic		
AM		Ratio of flow to Capacity	Queue (vehicles)	Delay (minutes)	Ratio of Flow to Capacity	Queue (vehicles)	Delay (minutes)
	Right turn from dev	NA	NA	NA	0.0%	0.00	0.00
	Left turn from dev	NA	NA	NA	0.0%	0.00	0.00
	Right turn into dev	NA	NA	NA	3.8%	0.05	0.10

Table 15-27 Junction capacity test results, R465 development access junction, without and with construction staff, year 2028, PM peak

Period	Location	Without construction traffic			With construction traffic		
PM		Ratio of Flow to Capacity	Queue (vehicles)	Delay (minutes)	Ratio of Flow to Capacity	Queue (vehicles)	Delay (minutes)
	Right turn from dev	NA	NA	NA	4.4%	0.05	0.14
	Left turn from dev	NA	NA	NA	3.2%	0.03	0.11

Period	Location	Without construction traffic			With construction traffic		
	Right turn into dev	NA	NA	NA	0.0%	0.00	0.00

R466 / R465 Junction Capacity Test Results

The AM and PM peak hour traffic flows through the R466 / R465 junction were established from the classified turning counts and are shown for the year 2028 in Figure 15-3e, with background traffic flows for the assumed construction year of 2028 shown in Figure 15-3f. Traffic flows generated by the Proposed Development during the AM and PM peak hours are shown in Figure 15-3g while the year 2028 traffic flows with development generated traffic are shown in Figure 15-3h.

The results of the capacity assessment for this junction are shown in Tables 15-28 and 15-29. It is forecast that during the AM peak hour a maximum RFC of 12.5% is forecast for the exit from the R466 which is forecast to increase to 16.1% with the construction development in place. Similarly for the PM peak hour the maximum RFC for the same movement is forecast to increase from 25.1% to 25.6% with the additional construction traffic. This junction is also therefore forecast to operate well within capacity for all scenarios.

Table 15-28 Junction capacity test results, R465 / R466 junction, without and with construction staff, year 2028, AM peak

Period	Location	Without construction traffic			With construction traffic		
AM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	From R466	12.5%	0.14	0.16	16.1%	0.19	0.16
	Right turn from R465	0.5%	0.00	0.11	0.5%	0.00	0.11

Table 15-29 Junction capacity test results, R465 / R466 junction, without and with construction staff, year 2028, PM peak

Period	Location	Without construction traffic			With construction traffic		
PM		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	From R466	25.1%	0.33	0.19	25.6%	0.34	0.20
	Right turn from R465	0.9%	0.01	0.10	4.9%	0.07	0.10

15.1.6.5 Junctions Capacity Assessment – During Operation

As discussed in Section 15.1.6 it is forecast that once operational, the development will generate approximately 2 - 3 trips per week for maintenance purposes. It is noted that there will be occasions when parts of the turbines will require to be replaced, although these occasions will be rare and short in duration, and will involve lower traffic volumes than those included in the capacity tests set out in

Section 15.1.6.1. Given the nature and usage of the road network in the area it is therefore concluded that the development will not have a significant effect on the local network once constructed.

15.1.6.6 Expected Traffic on Link Flows – During Decommissioning

The traffic volumes that will be generated during decommissioning will be significantly less compared to those generated during the construction of the Proposed Development as set out in Section 15.1.6.1.

15.1.6.7 Impact on Traffic during Construction of Grid Connection

A detailed description of the Grid Connection is provided in Section 4.3 of this EIAR.

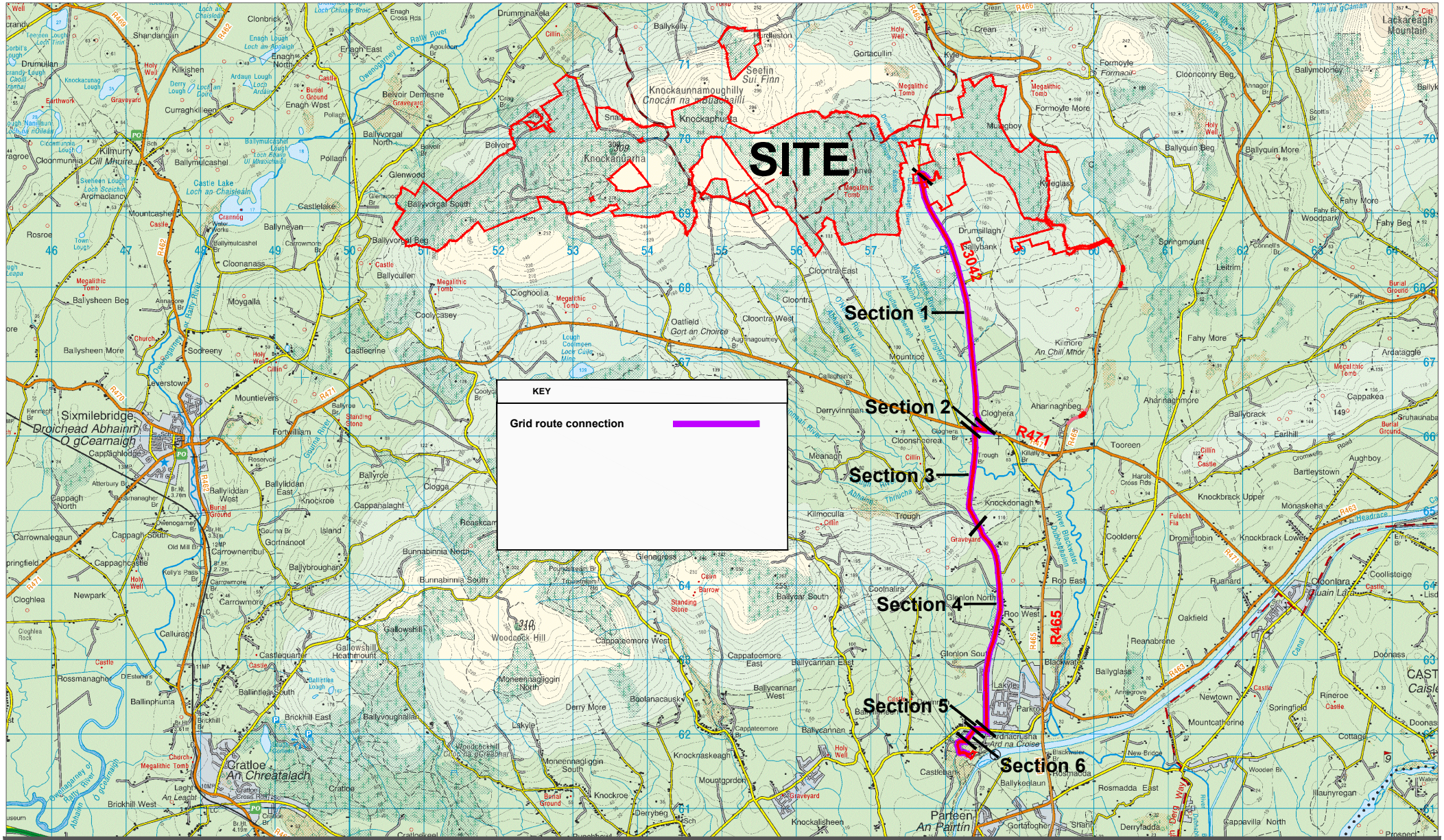
It is proposed that the 110kV on-site electrical substation in the townland of Drumsillagh is connected by means of an underground 110kV electrical cable to the existing 110kV Ardnacrusha electrical substation located in the townlands of Castlebank and Ballykeelaun, Co. Clare. The proposed underground electrical cabling route is approximately 9.2km in length and is located predominately within the public road corridor. For the extent of the underground electrical cabling route that will impact on the public road network the Grid Connection is considered in 6 sections, as indicated in Figure 15-4 of the EIAR.

Table 15-30 Grid connection link summary, link length (km), construction duration (days) and diversion during construction

Grid route section	Length (kms)	Construction Duration (days)	Diversion during construction (kms)
Off road connection to on-site substation	0.4	1	0.0
Section 1 – L-3042	3.5	23	8.1
Section 2 – R471	0.3	2	9.7
Section 3 – Track (L70661)	1.2	8	1.4
Section 4 – L-7066 / L-3054	2.8	19	1.5
Section 5 – L-3056	0.2	1	0.5
Section 6 – Castlebank Road	0.2	1	0.4
Off road connection to Ardnacrusha Substation	0.6	3	0.0
Total	**9.2kms**	**70**	**NA**

The 6 sections of the route on the public road network and the likely impact on general traffic during the construction of the Grid Connection are summarised in Table 15-30 and are as follows;

Section 1 – (length 3.5 kms) – The proposed onsite 110kV electrical substation will be situated within the Proposed Development site with the cable route linking into the L-3042. From this point the electrical cabling route will continue south along the L-3042 for approximately 3.5km before joining the R471.



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-4 Proposed cable grid connection route

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

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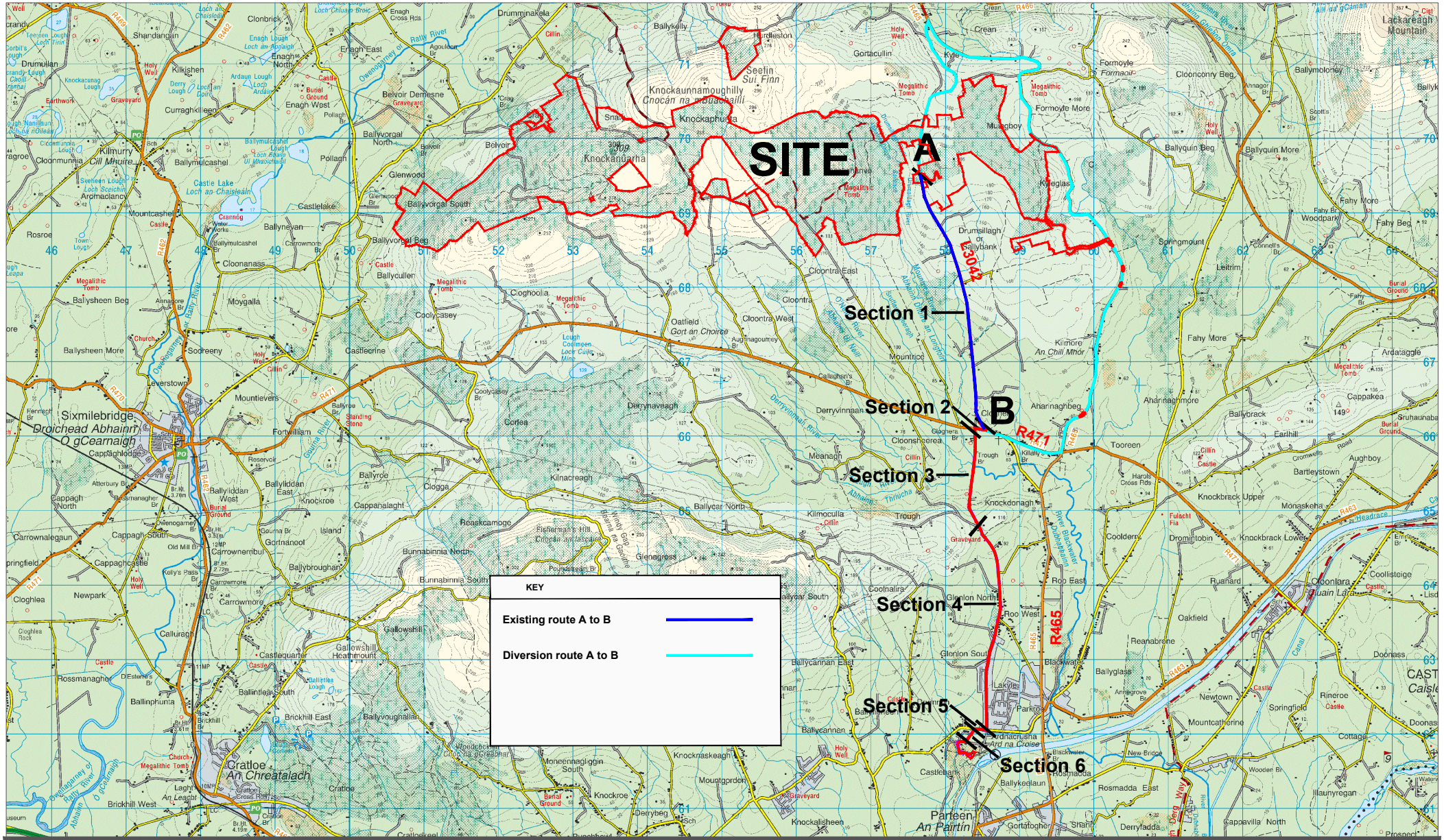

NOTES:

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Base mapping provided by MKO

Figure 15-5a Diversion route during closure of cable grid route Section 1

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

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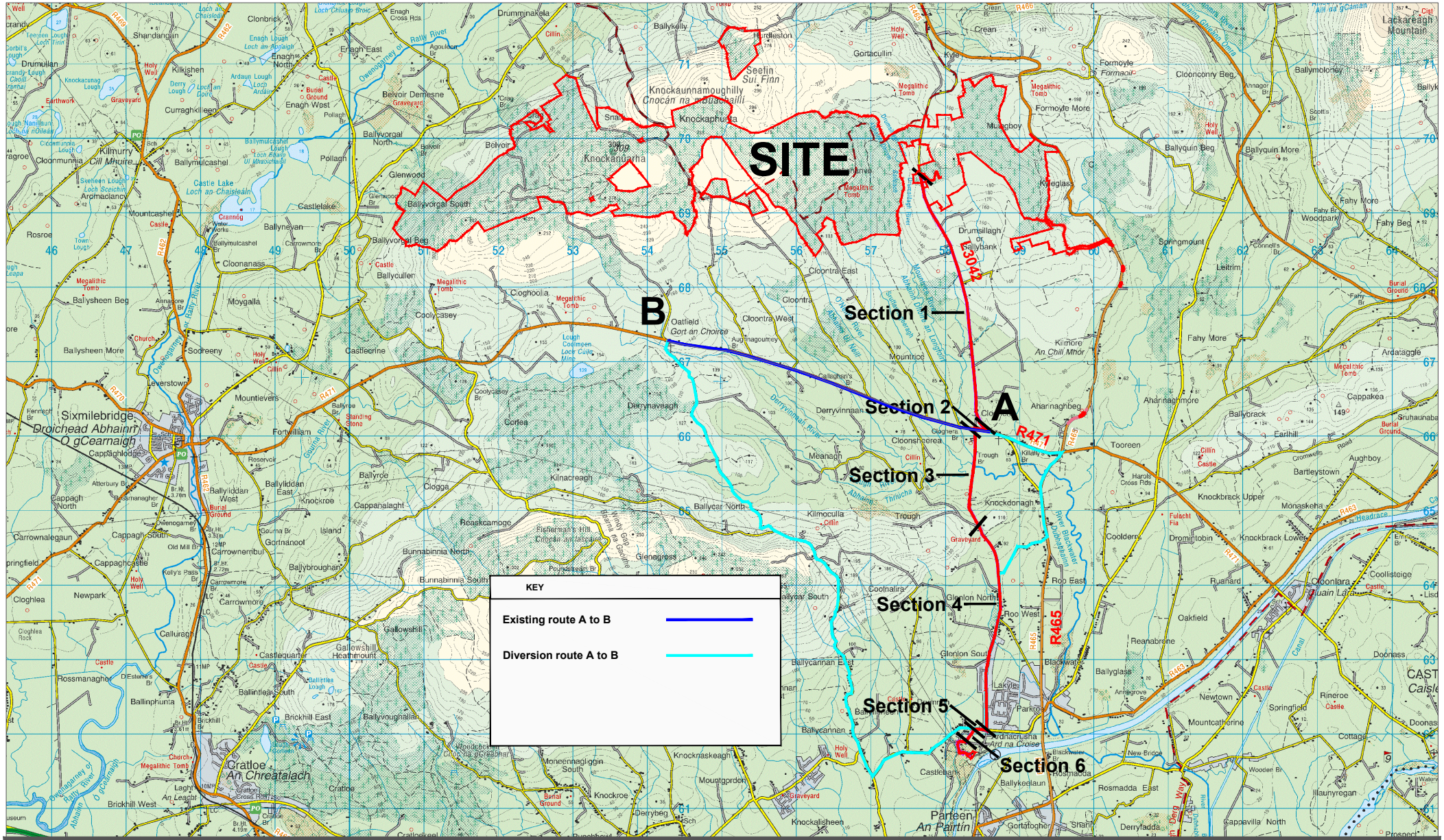

NOTES:

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Base mapping provided by MKO

Figure 15-5b Diversion route during closure of cable grid route Section 2

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

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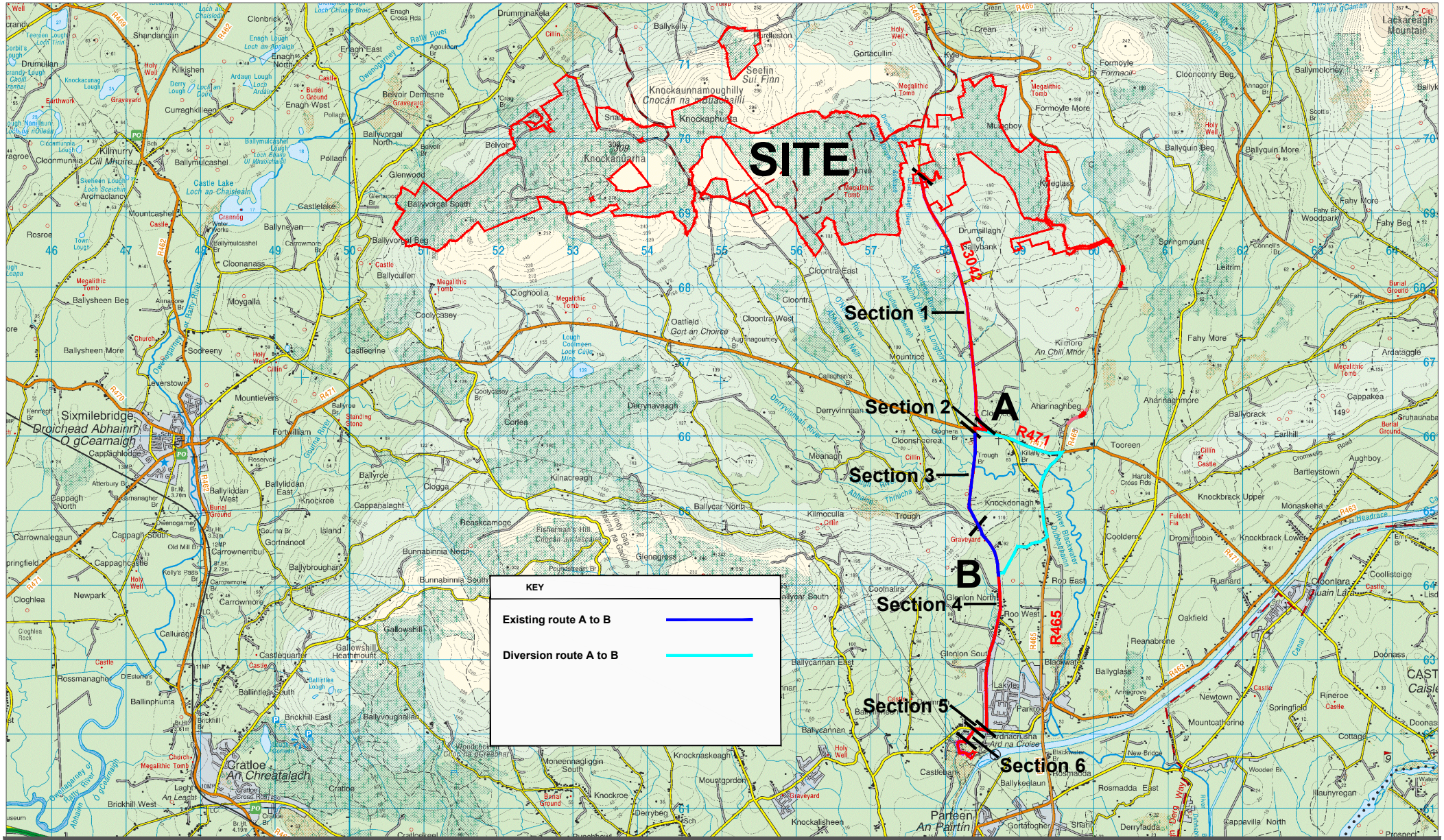

NOTES:

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Base mapping provided by MKO

Figure 15-5c Diversion route during closure of cable grid route Section 3

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

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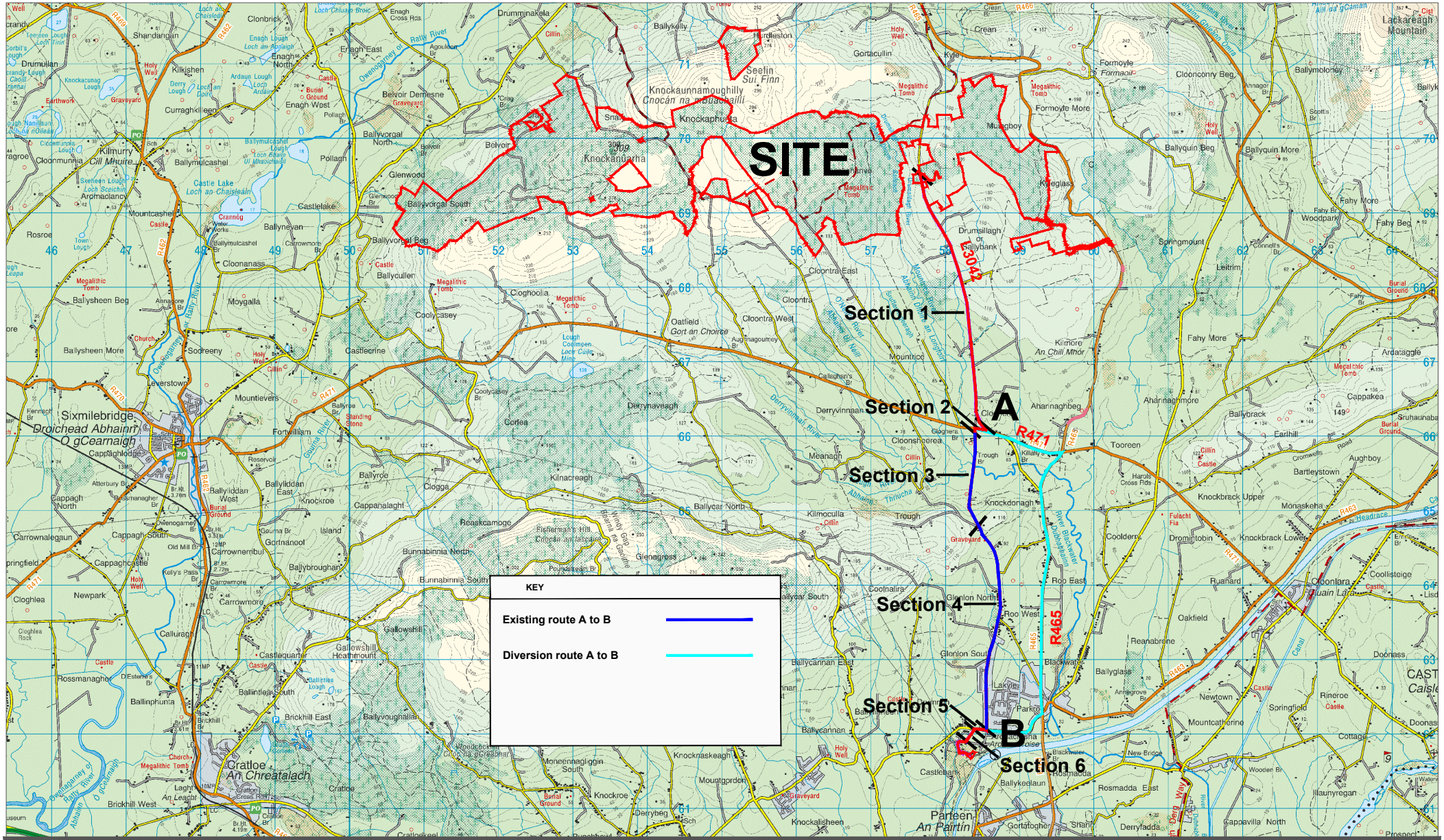

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-5d Diversion route during closure of cable grid route Section 4

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

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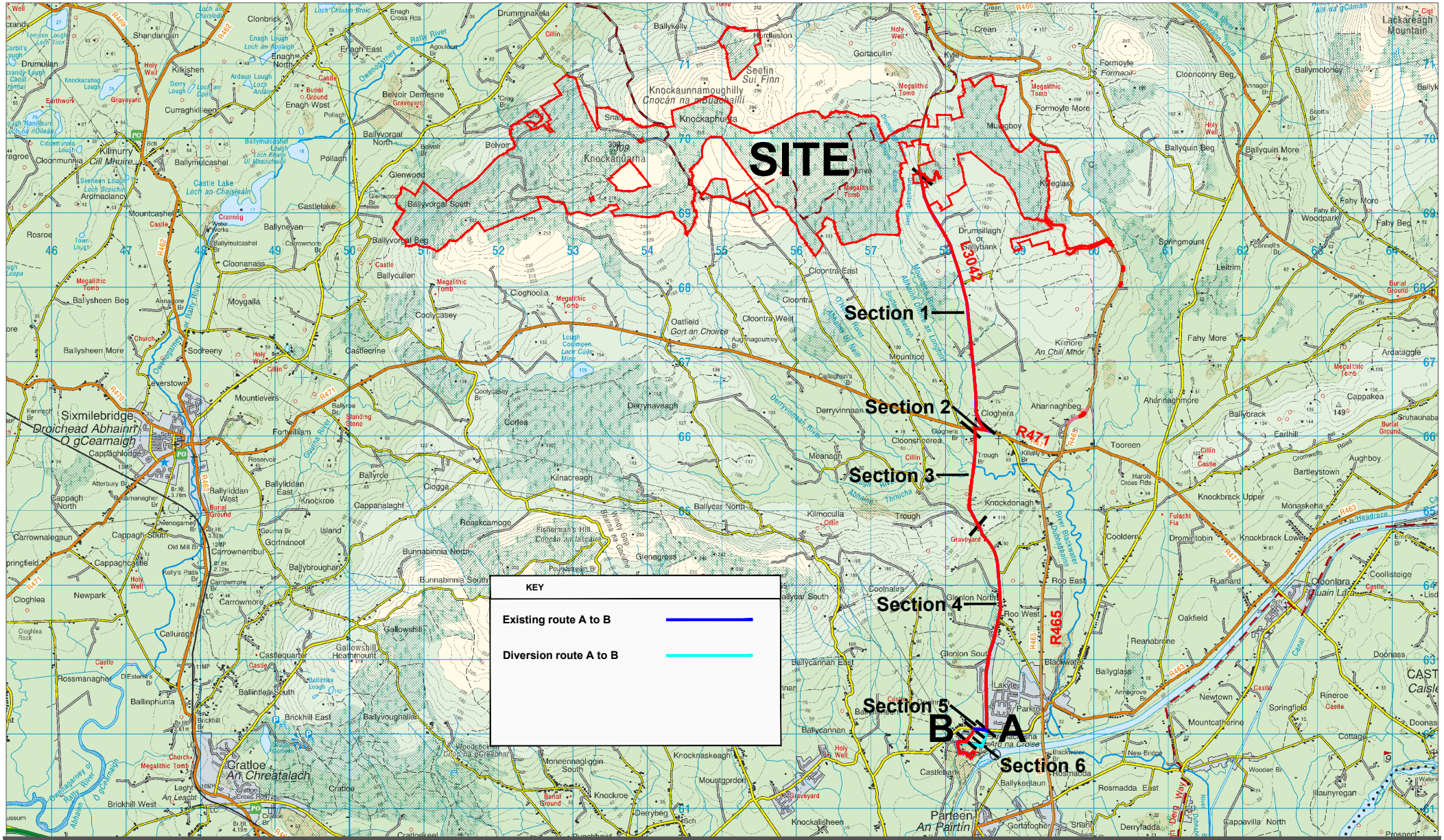

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-5e Diversion route during closure of cable grid route Section 5

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

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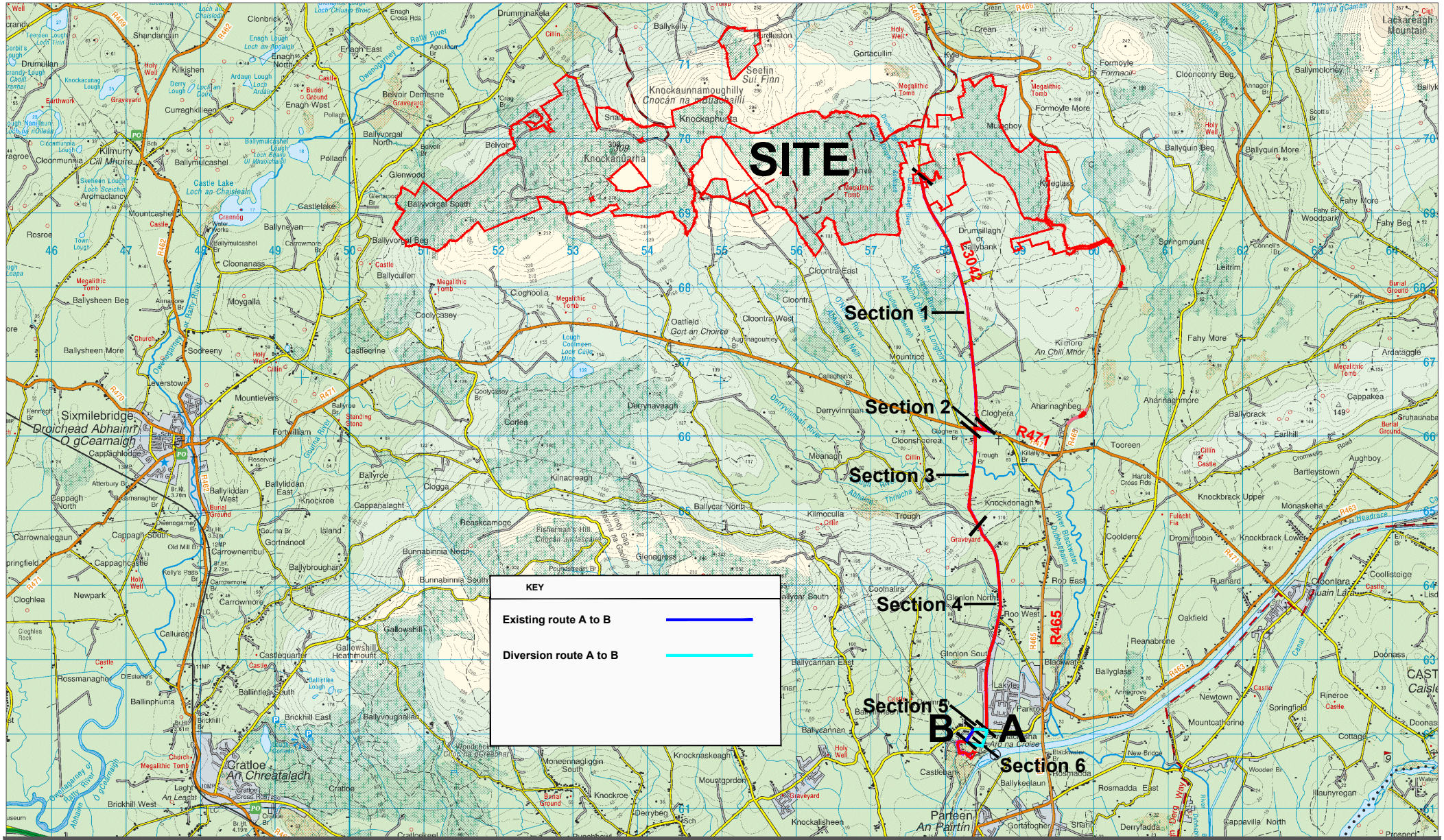

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-5f Diversion route during closure of cable grid route Section 6

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland		SCALE: NTS
AL PROJECT NO: 8880	DATE: 07.08.24		DRAWN BY: AL

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For this section of the underground electrical cabling route the carriageway width of the local road is narrow and a local road closure at the location where the section of the underground electrical cabling route is being constructed will be required. Based on an average rate of 150m of cable being constructed in one day, it is estimated that this section of the underground electrical cabling route will take up to 23 days to complete. The location of the construction will be transient in nature with the extent of the section of road closed kept to a minimum. Local diversions will be put in place during the construction of this section with potential detour route indicated in Figure 15-5a. It is estimated that the diversion incurred by local traffic during the construction of this section of the cable route will be a maximum of 8.1 kms.

Section 2 – (length 0.3kms) – The underground electrical cabling route then continues west along the R471 for approximately 0.3 kms. The carriageway is narrow and will require a full road closure during the approximately 2 days required for construction. The potential diversion route shown in Figure 15-5b will result in a diversion of 9.7kms for local trips.

Section 3 – (length 1.2kms) – This section of the route heads south on the L-70661 for 1.2kms to link into the L-70661. The carriageway is narrow and will require a full road closure during the approximately 8 days required for construction. The potential diversion route shown in Figure 15-5c will result in a diversion of 1.4km for local traffic.

Section 4 – (length 2.8kms) – This section of the route continues south on the L-7066 and L-3054 for 2.8kms to link into the L-3056 in Ardnacrusha. A full road closure will be required during the approximately 19 days required for construction. The potential diversion route shown in Figure 15-5d will result in an addition length of up to 1.5kms for local trips.

Section 5 – (length 0.2kms kms) – This section continues west on the L-3056. A full road closure will be required during the construction of this short section of the underground electrical cabling route. The local diversion to local traffic, as shown in Figure 15-5e, will be approximately 0.5 kms.

Section 6 – (0.2km) – The final section of the route heads southwest from the L-3056 on Castlebank Road to the access of the existing 110kV Ardnacrusha Substation. This section of the Castlebank Road is narrow and will require to be closed during the approximate 1 to 2 days required for construction. The potential diversion route is shown in Figure 15-5f which will result in a diversion of approximately 0.4kms to local traffic.

The existing traffic volumes on the local roads on which the underground electrical cabling route is proposed are low. This will result in low numbers of trips being impacted by the proposed diversions during the construction of the cable route.

It is estimated that the underground electrical cabling route will take 3 to 4 months to construct based on 1 construction team laying approximately 150 metres of cable per day (will this take place consecutively as construction for the Wind Farm). The construction period could be reduced to approximately 35 days should 2 construction teams operate at either end of the Grid Connection route. With respect to the traffic volumes that will be generated during the construction of the underground electrical cabling route, it is estimated that there will be approximately 14 daily return trips made by a truck transporting materials, and 4 made by a car to transport 10 construction staff to and from the Site.

The proposed Grid Connection construction methodology is set out on Appendix 4-5 of this EIAR.

The construction methodology of providing a cable route under and along local road networks is well established and accepted nationwide. There are in excess of 300 wind farms currently operational in Ireland and the majority of these are connected to the national grid via underground cable connections predominantly along the public road networks.

The additional traffic volumes that are forecast to be generated during the construction of the Grid Connection cable route are included in the assessment presented in Section 15.1.4. This is based on materials travelling to the site via the delivery routes previously discussed (Figure 15-2a) and accessing the site via the main access junction.

15.1.7 Traffic Management of Large Deliveries

The greatest effect on the road network will likely be experienced on the approximately 15 days during which the 5 large loads comprising the tower sections, the blades and the nacelles are delivered to the site.

Traffic management measures include the following:

- Identification of a delivery schedule,
- Details of the alterations required to the infrastructure identified in Section 15.1.8 (below), of this report and any other minor alteration identified,
- A dry run of the route using vehicles with similar dimensions.

The transport of large components is challenging and can only be done following extensive route selection, route proofing and consultation with An Garda Síochána and the various local authorities. Turbine components are generally transported at night when traffic is lightest and this is done in consultation with the roads authorities and An Garda Síochána, and special permits are required.

In some cases, hedge or tree cutting, temporary relocation of services, removal of lampposts and signage will be required and will be agreed with the appropriate local authorities prior to the delivery of turbine components. It is not anticipated that any sections of the local road network will be closed, although there may be delays to local traffic at various locations if the deliveries are made during daylight hours. It is noted it is proposed that all deliveries of abnormally sized loads will be made during nighttime hours, as is the norm for such deliveries. A dry run using a vehicle with the dimensions of the blade delivery vehicle will be undertaken by the haulage company prior to the construction phase.

15.1.8 Abnormal Load Route Assessment

A route assessment was undertaken covering the proposed delivery route for the abnormal loads, with the route and assessment locations shown in Figure 15-1b. The route assessment discussed in this section includes all locations on the proposed delivery route from the Port of Foynes to the proposed access junction on the R465. The assessment was undertaken by Digital Land Surveyors Ltd and is based on topographical survey data.

The route/autotrack assessment establishes the locations where the wind turbine transport vehicles will be accommodated, and identifies locations where some form of remedial measure, such as temporary removal of poles and sign, or local road widening, may be required.

With reference to the turbine delivery vehicles set out in Section 15.1.5 and the assessment locations shown in Figure 15-1b, the following points are noted;

- For the first part of the delivery route between Foynes Port to a point just to the east of the village of Kildimo, as shown as locations 1 to 7 in Figure 15-1b, it is proposed that the turbine blades will be delivered using the standard method of delivery, where the blade is horizontal on a Super Wing Carrier. For locations 1 to 7 included in this section of the TDR the blade transport vehicle (i.e. Super Wing Carrier) is the critical vehicle in terms of turning requirements, as it is significantly longer than the tower transport vehicle.

- At a location just to the east of Kildimo, as shown in Figure 15-1b, it is proposed that the blades are unloaded at a temporary transition compound and attached to vehicles with the capability to lift the tip of the blades to an angle of 60° in order to significantly shorten the length of the vehicle in the horizontal plane. It is noted that details of the temporary transition compound are included in Chapter 4.
- For locations 8 to 28 where it is proposed that the blade will be lifted, the turning envelopes of the blade and tower transport vehicles are similar.

The report prepared by Digital Land Solutions is included as Appendix 15-3.

For locations 1 to 7 shown in Figure 15-1b where the blade transporter vehicle is clearly the critical vehicle in terms of geometry in plan, a summary of the results of the swept path analyses is set out in Table 15-31.

For locations 8 to 28 where blade lifters are used and the profile in plan is similar to the tower transporters a summary of the results of the swept path analyses for both vehicles is provided in Tables 15-32 and 15-33.

Table 15-31 Summary of autotrack assessment for locations 1 to 7 – Blade transporter = super wing carrier

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
			No / minor impacts	Temporary removal of street furniture, poles/posts, signs, cabinets, overhead cables, removal / trimming of trees.	Oversail of blade required outside carriageway edge	Temporary over run areas required outside carriageway edge but within curtilage of road	Impacts on Third Party Lands	Potential impacts on carriageway vertical alignment
1 - Left turn onto N69	2	B2310		Yes, including removal of trees	Yes	No	Over-sail, potentially	No
2 - S-Bend on N69	3	B2310		Yes	Yes	No	No	No
3 - Bends on N69	4 & 5	B2310	Yes					
4 - Left bend on N69	6	B2310	Yes					
5 - Left bend on N69	7	B2310		Yes	Yes	No	No	No

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
6 - Right bend on N69	10	B2310		Yes	Yes	No	Over-sail, potentially	No
7 - Right bend on N69 – Kildimo	11	B2310		Yes, including temporary parking restrictions	Yes	No	Over-sail, potentially	No

Table 15-32 Summary of autotrack assessment for locations 8 to 28 – Tower transporter

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
			No / minor impacts	Temporary removal of street furniture, poles/posts, signs, cabinets, overhead cables, removal / trimming of trees.	Oversail of tower required outside carriageway edge	Temporary over run areas required outside carriageway edge but within curtilage of road	Impacts on Third Party Lands	Potential impacts on carriageway vertical alignment
8 - N60 Ferrybridge	12	B2310		No	No	No	No	Load to be fully raised to avoid contact with road
9 - Roundabout on N69 – Clarina	13	B2310		Yes	No	Yes, temporary over-run through roundabout centre island required	No	No
10 -N69/N18 east/R510 roundabout	14	B2310		Yes	Minor oversail of grass verge	Yes, potential minor temporary over-run through splitter islands required	No	No
11- R510 roundabout	15	B2310		Yes, including	Yes, over-sail of	No	No	No

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
				pruning of trees	roundabout centre island			
12 & 13 - R510/Father Russell Road roundabout	16 & 17	B2310		Yes	Yes, slight oversail	Yes, temporary over-run through roundabout centre island and splitter island required	No	No
14 - Father Russell Road/R526 roundabout	18	B2310		Yes, including the removal of EIR box and cycle lane separation bollards	Yes, slight oversail	No	No	No
15 - R526/R926 roundabout	19	B2310		Yes	Yes, slight oversail	No	No	No
16 & 17 - Right bend and crest on R463	24 & 25	B2310		No	No	No	No	Load to be fully raised to avoid contact with road
18 & 19 - Crest on bridge and R463 roundabout	26 & 27	B2310		Yes	Yes, slight oversail	No	No	Load to be fully raised to avoid contact with road
20 - Crest on bridge on R463	35	B2310		No	No	No	No	Load to be fully raised to avoid contact with road
21 - Dip in road on R463	36	B2310		No	No	No	No	Load to be fully raised to avoid contact with road

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
22- Crest on R463	37	B2310		No	No	No	No	Load to be fully raised to avoid contact with road
23	2			Yes, trees and vegetation to be trimmed. Poles to be removed	No	Road verges to be strengthened	No	No
24 & 25	3			Yes, trees and vegetation to be trimmed. Poles to be removed	Yes, oversail outside carriageway edge	Road verges to be strengthened	Yes	No
26	11			Yes, trees and vegetation to be trimmed	Minor oversail outside carriageway edge	Road verges to be strengthened	Yes	No
27	12			Yes, trees and vegetation to be trimmed	Minor oversail outside carriageway edge	Road verges to be strengthened	Yes	No

Table 15-33 Summary of autotrack assessment for locations 8 to 28 – Blade lifter

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
			No / minor impacts	Temporary removal of street furniture, poles/posts, signs, cabinets, overhead cables, removal / trimming of trees.	Oversail of blade required outside carriageway edge	Temporary over run areas required outside carriageway edge but within curtilage of road	Impacts on Third Party Lands	Potential impacts on carriageway vertical alignment

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
8 - N60 Ferrybridge	12	Not tested		NA	NA	NA	NA	NA
9 - Roundabout on N69 – Clarina	13	Not tested		NA	NA	NA	NA	NA
10 -N69/N18 east/R510 roundabout	14	B2310	No issues	No	No	No	No	No
11- R510 roundabout	15	B2310		Yes	Yes, over-sail of blade will occur northeast of roundabout	Yes, slight over-run of centre island required	No	No
12 & 13 - R510/Father Russell Road roundabout	16 & 17	B2310		Yes	Yes, over-sail of blade will occur west of roundabout	Yes, slight over-run of centre island required	No	No
14 - Father Russell Road/R526 roundabout	18	B2310		Yes, including the removal of electric cables	Yes, slight oversail	No	No	No
15 - R526/R926 roundabout	19	B2310	No issues	No	No[1]	No	No	No
16 & 17 - Right bend and crest on R463	24 & 25	B2310		No	No	No	No	Load to be fully raised to avoid contact with road
18 & 19 - Crest on bridge and R463 roundabout	26 & 27	B2310		Yes, including the removal of overhead cables	Yes, slight oversail	No	No	No

Location shown in Figure 15-1b	Location number (DLS report)	DLS Drawing No	Summary of autotrack assessment					
20 - Crest on bridge on R463	35	Not tested		NA	NA	NA	NA	NA
21 - Dip in road on R463	36	Not tested		NA	NA	NA	NA	NA
22- Crest on R463	37	Not tested		NA	NA	NA	NA	NA
23	2			Yes, trees and vegetation to be trimmed. Poles to be removed.	Minor oversail outside carriageway edge	Road verges to be strengthened	No	No
24 & 25	3			Yes, trees and vegetation to be trimmed. Poles to be removed	Minor oversail outside carriageway edge	Road verges to be strengthened	Yes	No
26	11			Yes, trees and vegetation to be trimmed	Minor oversail outside carriageway edge	Road verges to be strengthened	Yes	No
27	12			Yes, trees and vegetation to be trimmed	Minor oversail outside carriageway edge	Road verges to be strengthened	Yes	No

Location 28 – Proposed access junction A on R465

Figures 15-6 to 15-7

A new junction will provide access to the site from the R465 for all vehicle types. The nature and extent of the proposed works at this location are described in Chapter 4 Description of the Proposed Development.

The proposed junction on the R465 will provide access to the Proposed Development for all traffic during the construction phase, including abnormally sized loads, standard HGV deliveries and

construction staff. When the Proposed Development is operational the junction will provide for all maintenance trips.

The junction design includes 13m junction radii and 1:10 tapers in accordance with TII Junction Design Guidelines (TII DN-GEO-03060) for junctions with HGV turning movements. The junction design also includes a temporary run-over area required to accommodate the abnormally sized loads.

The proposed junction design is shown in Figure 15-6.

The designated speed limit of the R465 in the proximity of the proposed access junction is 80 km/h. Visibility splay requirements are set out in the current Clare County Development Plan 2023 – 2028, with splays of 160m required for an 80 km/h design speed. The visibility splays that will be provided are in accordance with requirements (3m x 160m) and are shown in Figure 15-7.

Location 29 – Proposed access junction B on L-3042, Sallybank

Figures 15-8 to 15-10 (location shown on Figure 15-1c)

As construction, operational and decommissioning traffic travels through the internal layout all traffic requiring to access turbines Nos 1 to 7 will require to cross the L-3042 at the proposed junction set out in Figure 15-8. The junction takes the form of a crossroads with traffic management measures required during both the construction, operational and decommissioning stages of the Proposed Development to ensure a safe environment for existing and development generated traffic.

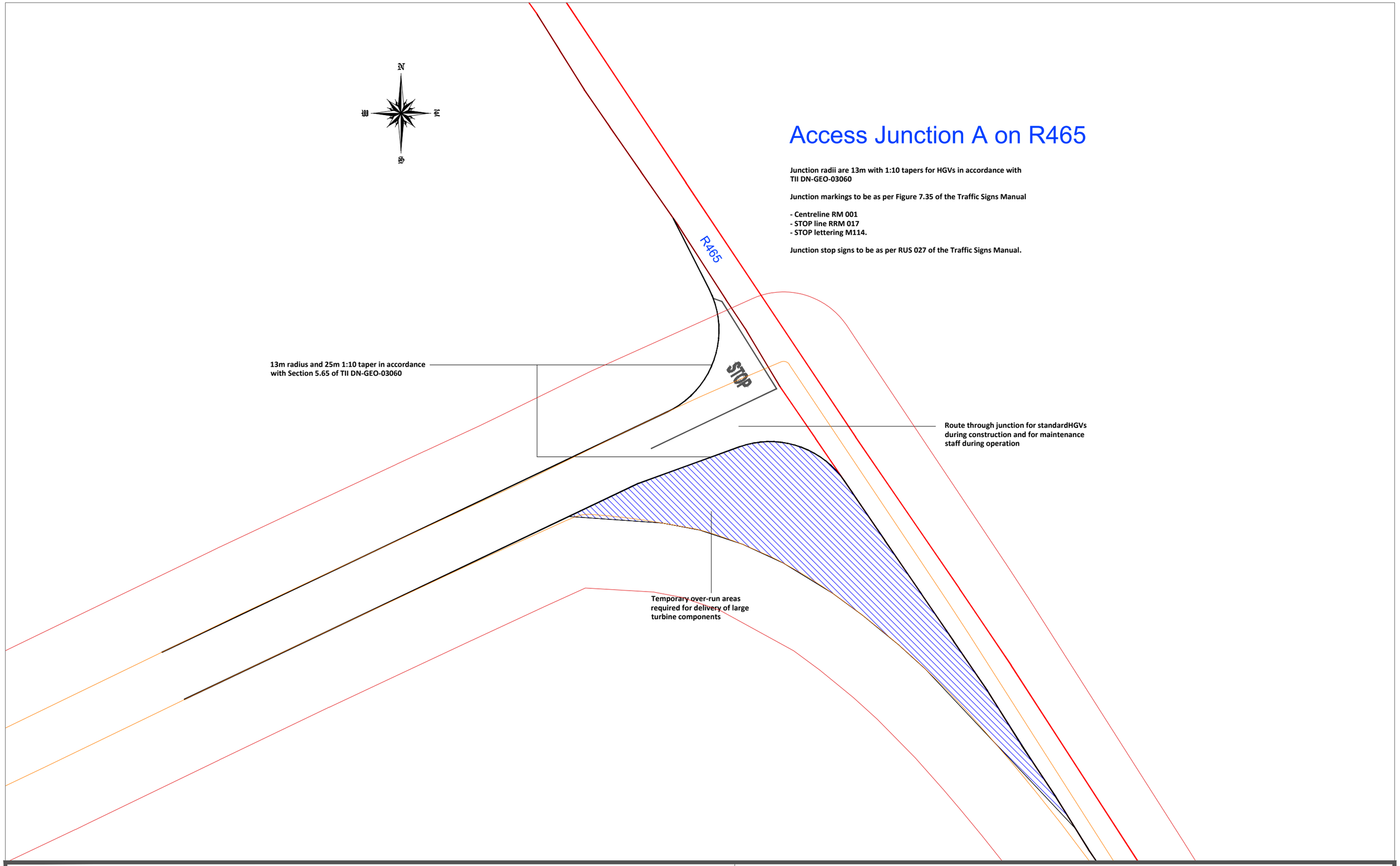
At present there is an existing agricultural/forest access that links into the L-3042 from the west. It is proposed to retain this access, improved to provide 13m junction radii appropriate for existing vehicle types. The western arm then continues west, which will accommodate all development generated traffic. Outside construction periods, this arm will be gated just to the west of the existing agricultural / forestry access. During the operational stage the gate will be opened by maintenance staff to gain access.

A new access is proposed on the east side of the L-3042. This access is for the purpose of all development generated traffic to cross the L-3042, with no turning movements permitted between the new access and the existing L-3042. For this reason, nominal junction radii of 3m are proposed. Similarly, once construction of the Proposed Development is complete this access will be gated and opened when required by staff for access during maintenance visits.

The L-3042 is a single tracked road and traffic speeds are generally low. For the assessment of visibility splays a design speed of 60 km/h is adopted, with 2.4m x 90m visibility splays in accordance with Clare County Council Development Plan 2023 – 2029 guidelines shown in Figure 15-9.

The proposed crossing is located on a crest on the L-3042 with the vertical profile shown in Figure 15-10. The figure shows that 90m visibility splays are clear in the vertical plane in both directions along the L-3042 taken from a driver height of 1.05m to an object height of 1.05m, in accordance with TII guidelines. Forward visibility through the crest along the L-3042 is also shown in Figure 15-10. Again, taken from 1.05m above ground level the figure indicates that forward visibility is marginally constrained by the vertical alignment on the L-3042. It is proposed that during the construction of this junction the L-3042 is re-aligned to flatten the existing crest (-0.10m) over a short distance as part of the works in order that forward visibility requirements are provided for.

This junction will be managed by site staff during the construction of the Proposed Development.



Access Junction A on R465

Junction radii are 13m with 1:10 tapers for HGVs in accordance with TII DN-GEO-03060

Junction markings to be as per Figure 7.35 of the Traffic Signs Manual

- Centreline RM 001
- STOP line RRM 017
- STOP lettering M114.

Junction stop signs to be as per RUS 027 of the Traffic Signs Manual.

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15-6 Location 28 - Access junction A on R465, proposed junction layout

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	1:500
PROJECT NO: 8880	DATE: 23.10.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

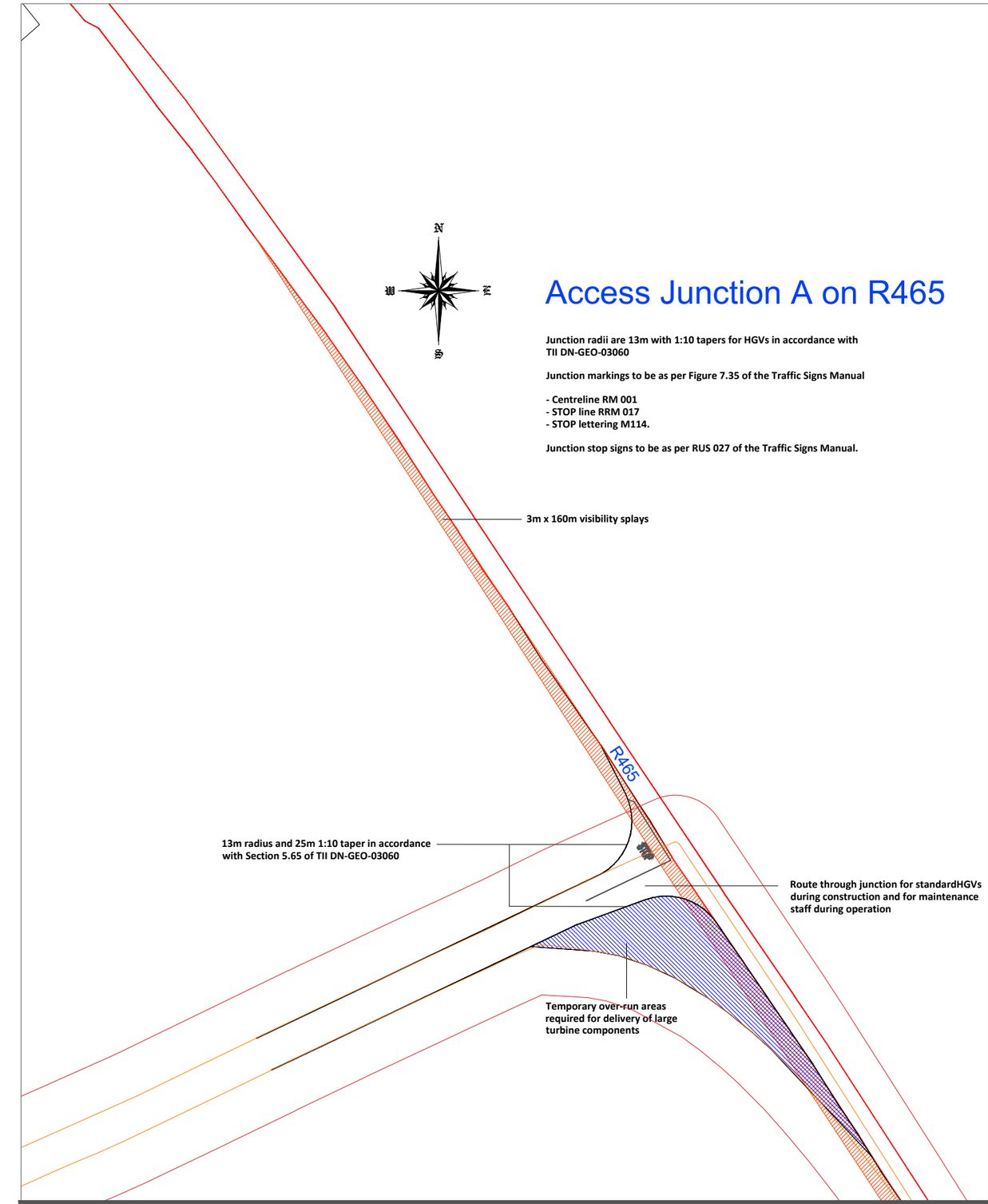
Access Junction A on R465

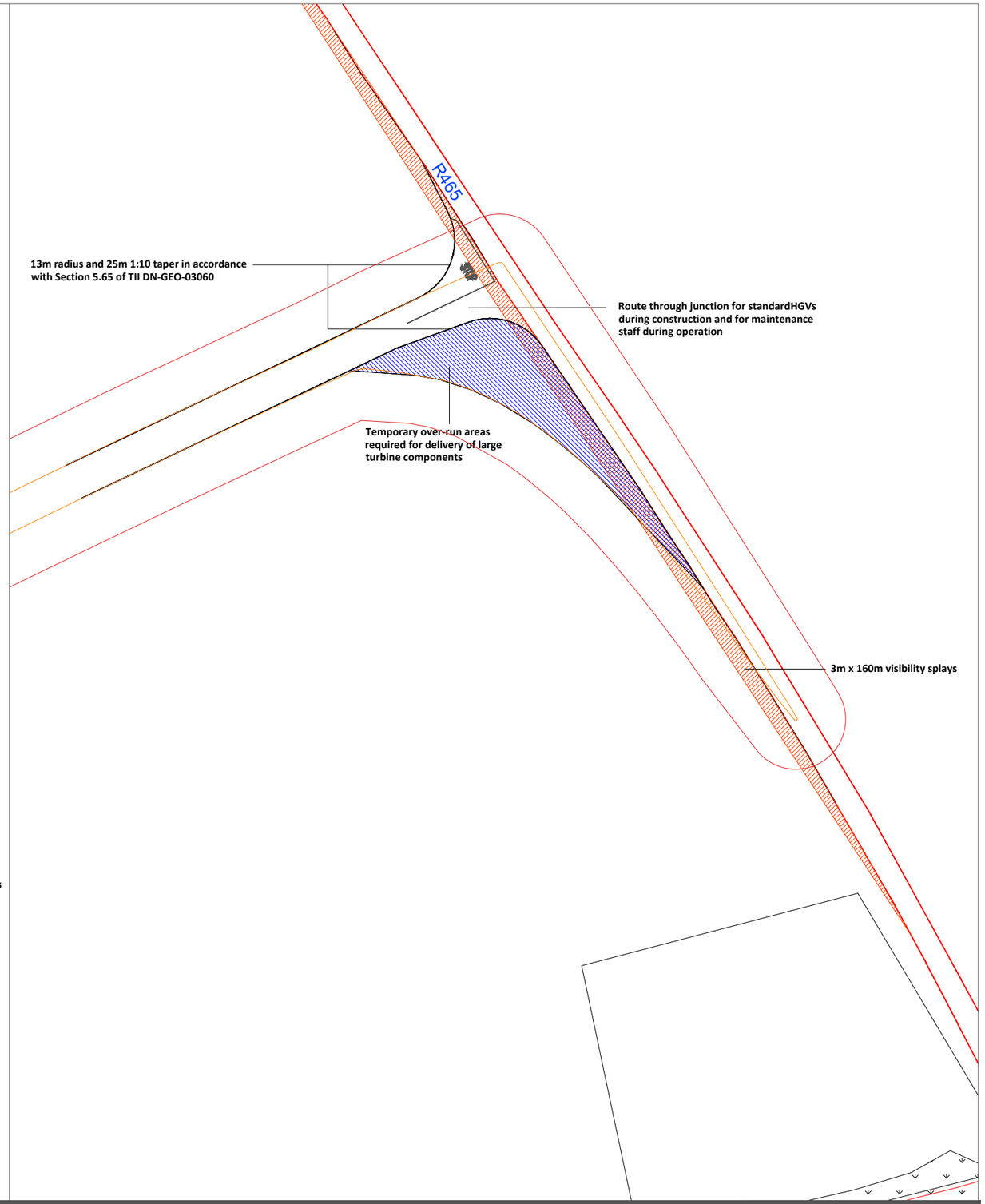
Junction radii are 13m with 1:10 tapers for HGVs in accordance with TII DN-GEO-03060

Junction markings to be as per Figure 7.35 of the Traffic Signs Manual

- Centreline RM 001
- STOP line RRM 017
- STOP lettering M114.

Junction stop signs to be as per RUS 027 of the Traffic Signs Manual.





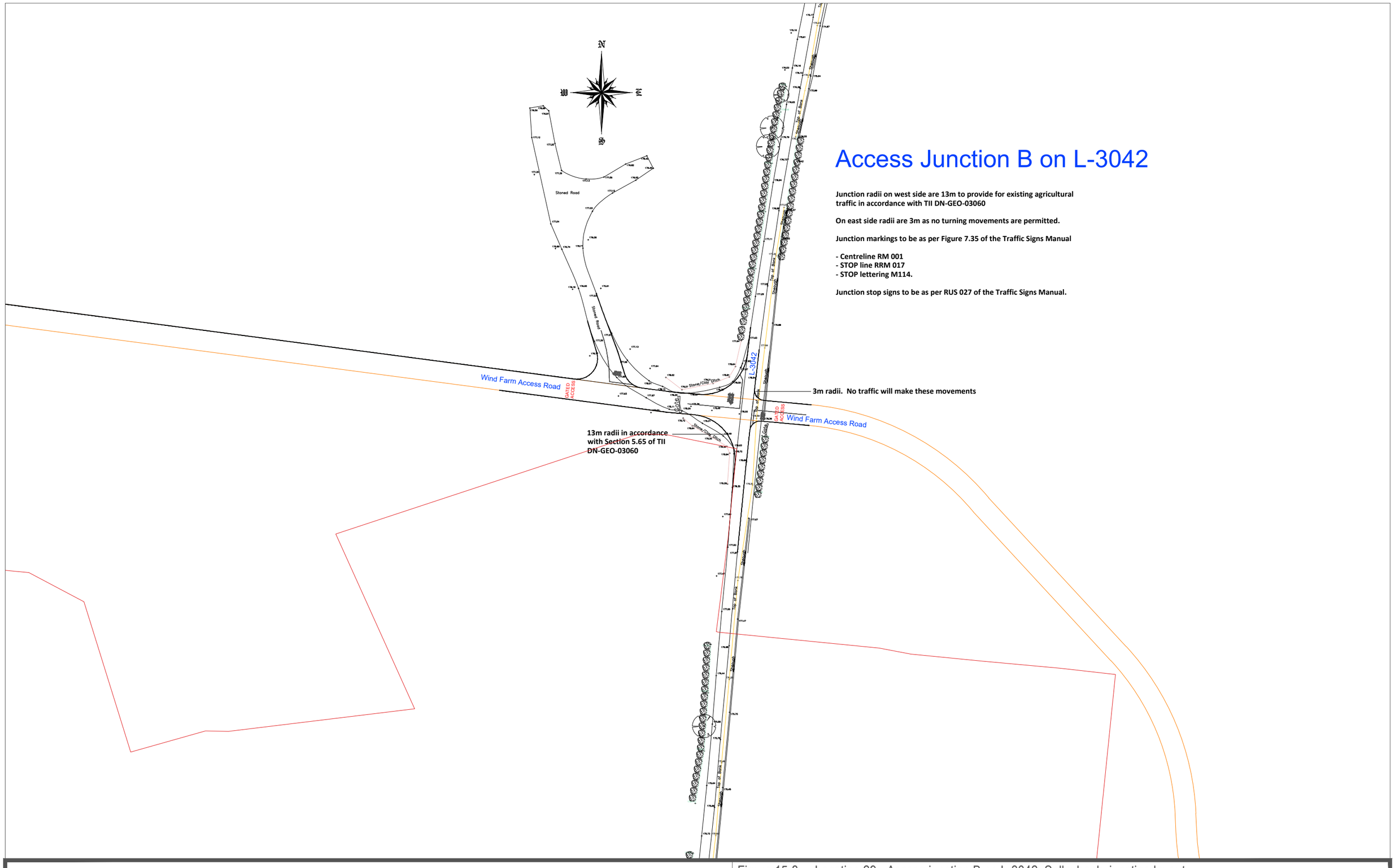
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15-7 Location 28 - Access junction A on R465, proposed junction layout and visibility splays

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	1:1000
PROJECT NO: 8880	DATE: 23.10.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15-8 Location 29 - Access junction B on L-3042, Sallaybank, junction layout

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	1:1000
PROJECT NO: 8880	DATE: 14.06.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

Access Junction B on L-3042

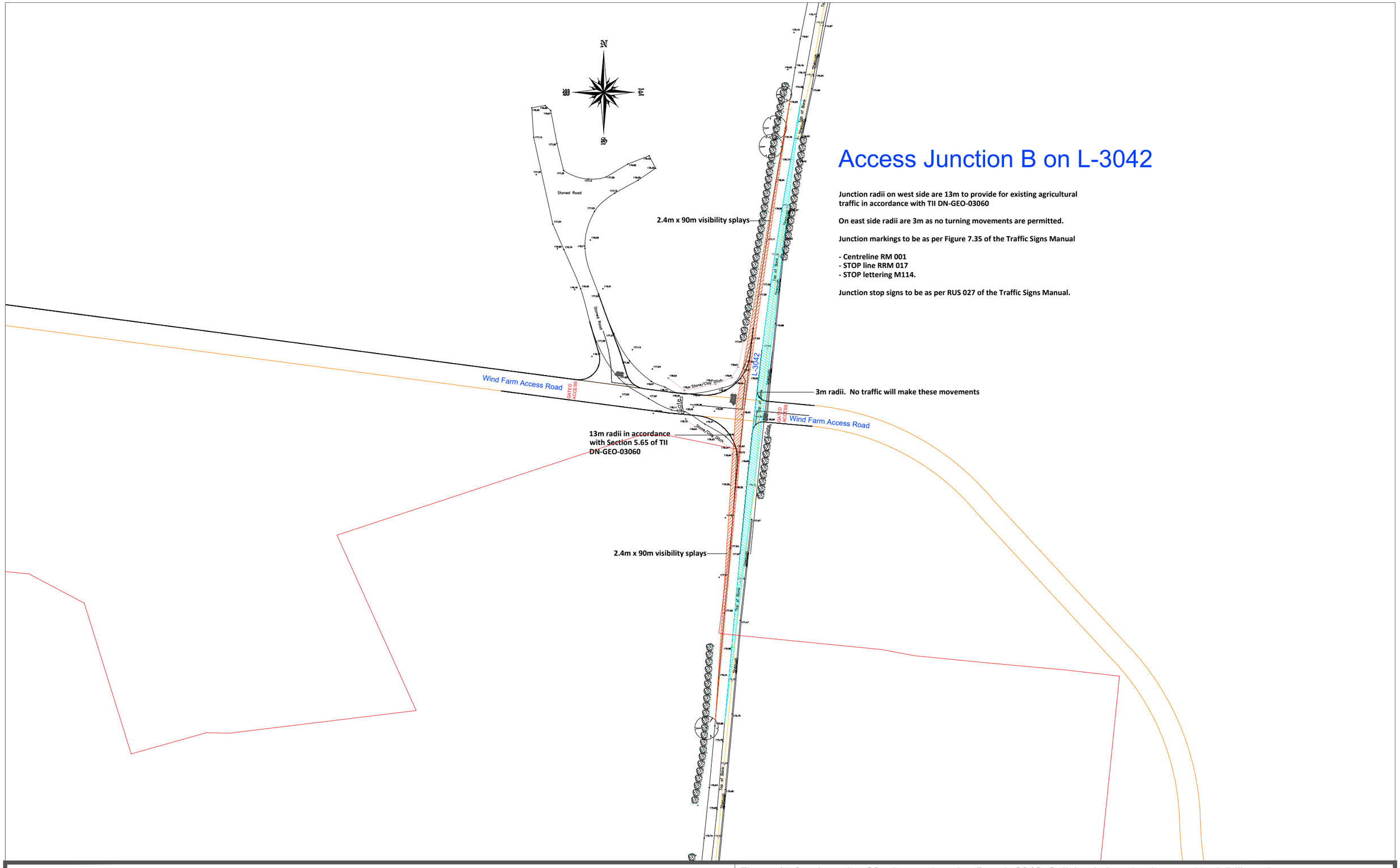
Junction radii on west side are 13m to provide for existing agricultural traffic in accordance with TII DN-GEO-03060

On east side radii are 3m as no turning movements are permitted.

Junction markings to be as per Figure 7.35 of the Traffic Signs Manual

- Centreline RM 001
- STOP line RRM 017
- STOP lettering M114.

Junction stop signs to be as per RUS 027 of the Traffic Signs Manual.



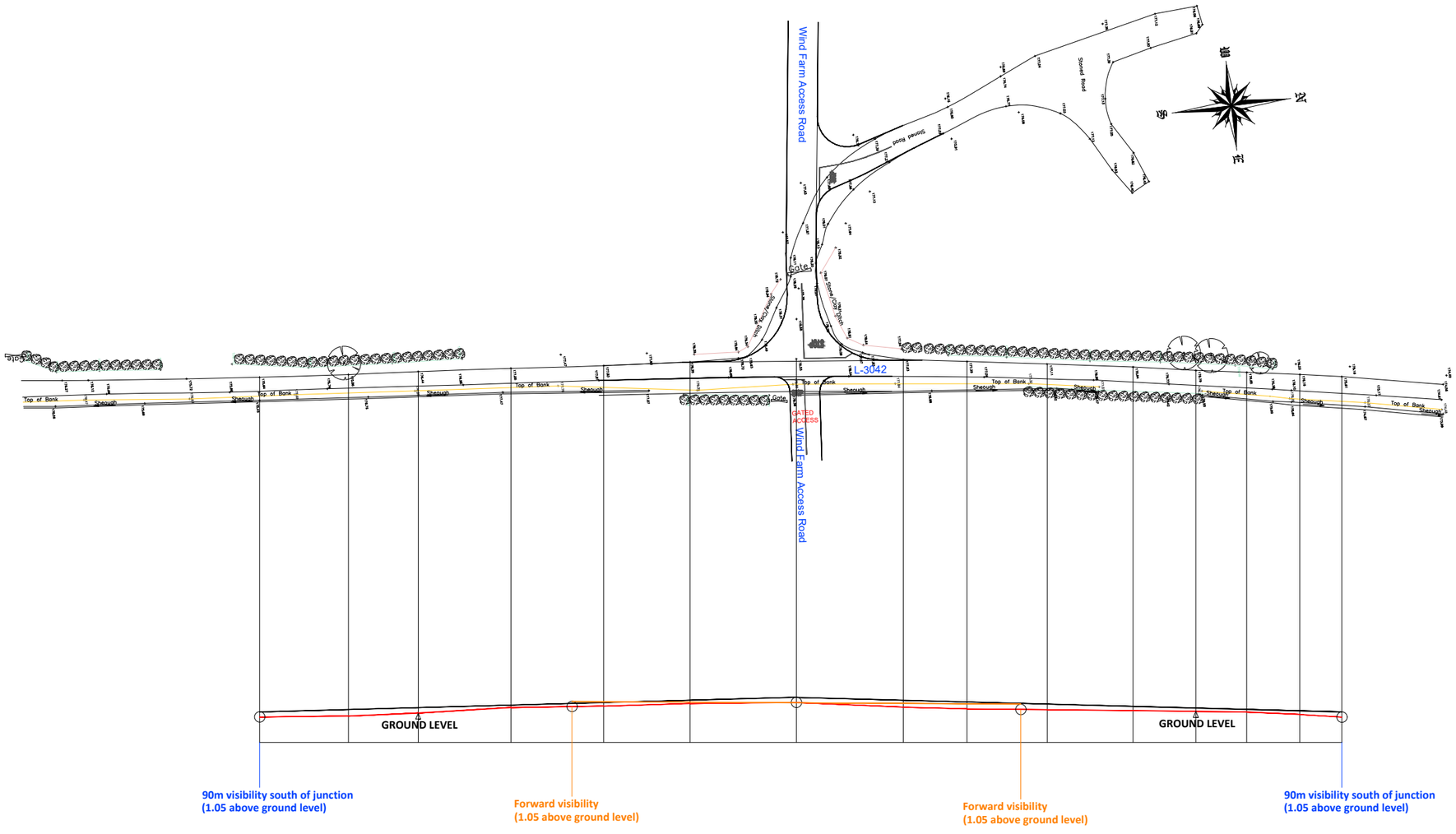
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15-9 Location 29 - Access junction B on L-3042, Sallybank, junction layout with visibility splays

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	1:1000
PROJECT NO: 8880	DATE: 14.06.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



Note: 90m visibility splays along L-3042 are clear in the vertical plane
90 forward visibility will require a minor lowering of crest on L-3042 -(0.05m) at location of proposed junctions

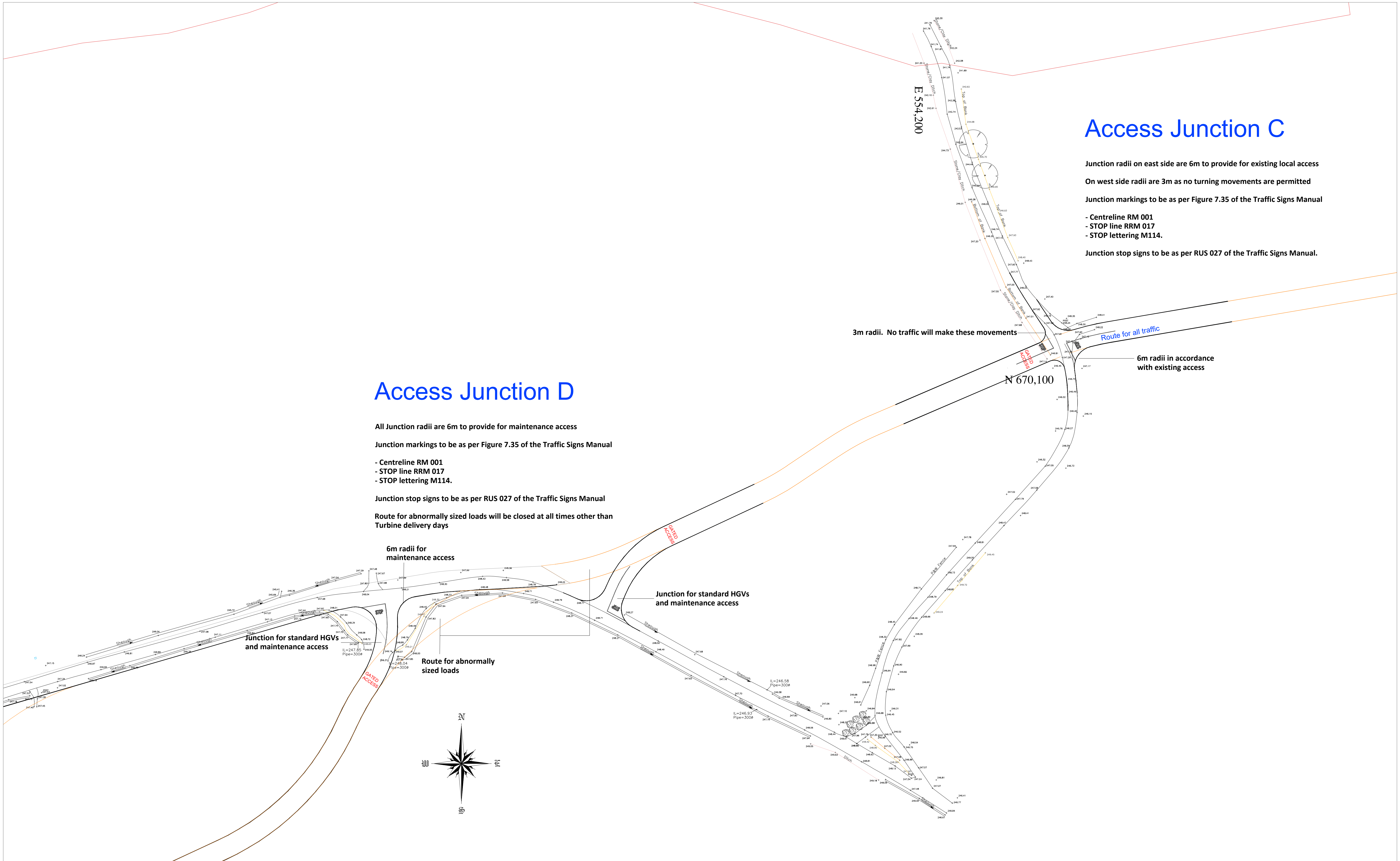
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15-10 Location 29 - Access junction B on L-3042, Sallybank, vertical profile

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	1:1000
PROJECT NO: 8880	DATE: 25.10.23	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15-11 Location 30 & 31 - Access junctions C and D, Snaty, junction layout

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	1:1000
PROJECT NO: 8880	DATE: 14.06.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

Access Junction C

Junction radii on east side are 6m to provide for existing local access

On west side radii are 3m as no turning movements are permitted

Junction markings to be as per Figure 7.35 of the Traffic Signs Manual

- Centreline RM 001
- STOP line RRM 017
- STOP lettering M114.

Junction stop signs to be as per RUS 027 of the Traffic Signs Manual.

Access Junction D

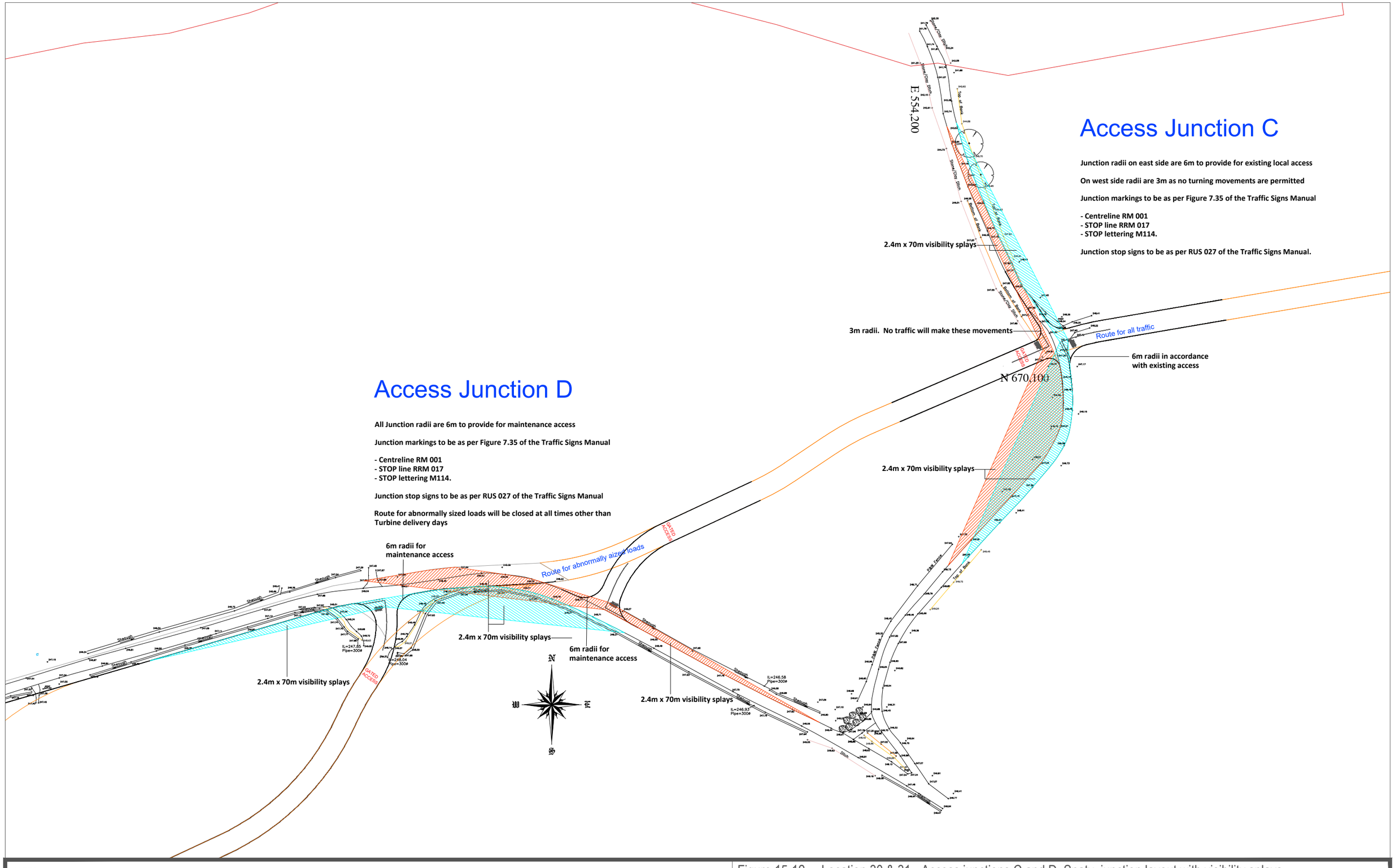
All Junction radii are 6m to provide for maintenance access

Junction markings to be as per Figure 7.35 of the Traffic Signs Manual

- Centreline RM 001
- STOP line RRM 017
- STOP lettering M114.

Junction stop signs to be as per RUS 027 of the Traffic Signs Manual

Route for abnormally sized loads will be closed at all times other than Turbine delivery days



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 15-12 Location 30 & 31 - Access junctions C and D, Snaty, junction layout with visibility splays

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	1:1000
PROJECT NO: 8880	DATE: 14.06.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

Locations 30 and 31 – Proposed access junctions C (L-30144-0) and D (L-30426-23), Snaty

Figures 15-11 to 15-12 (locations shown on Figure 15-1c)

All construction, operational and decommissioning traffic requiring access to turbines Nos 1 to 3 will require to cross the L-30144-0 local road at Access Junction C, with the proposed junction layout shown in Figure 15-11.

At present there is an existing agricultural/forest access that links into the L-30144-0 local road from the east. It is proposed to retain this access, with 6m junction radii proposed in accordance with the existing access.

A new access is proposed on the west side of the L-30144-0 local road. This access is for the purpose of development generated traffic only, with no turning movements permitted. Nominal junction radii of 3m proposed at this location. It is proposed that the access on the western side is gated and opened during construction periods and for maintenance visits only.

The junction layout proposed at Access Junction D, also shown in Figure 15-11, takes the form of 2 staggered priority junctions with the L-30426-23 local road that will be in place permanently during the operational phase, with temporary routes through the junction to be used during the construction phase only.

The gravel track nature of the un-named, together with alignment of the existing road, speeds are low. For the assessment of visibility splays a design speed of 50 km/h is adopted at this location, with 2.4m x 70m visibility splays shown in Figure 15-12.

Both of these junctions will be managed by site staff during the construction of the Proposed Development.

The autotrack assessments undertaken for the blade and turbine extended artics undertaken by Digital Land Surveyors Ltd demonstrates that these vehicles will be accommodated at proposed access junctions A to D.

15.1.9 Road Safety Audit

At the Applicants request, Traffico Road Safety Engineering Consultants Ltd were commissioned to undertake a Stage 1 Road Safety Audit for the access arrangements for the Proposed Wind Farm site, in accordance with GE-STY-01024 Road Safety Audit Guidelines, TII, December 2017. The Stage 1 Road Safety Audit Report is included as Appendix 15-5 of this EIAR.

As documented in the Audit Report, the Audit Team identified 4 potential Problems. For each Problem identified the Design Team are required to provide a response, as documented in Appendix A, Road Safety Audit Feedback Form of the Stage 1 Road Safety Audit Report. The 4 problems identified, together with the Design Teams response and whether the response was accepted by the Audit Team are set out below.

Problem 2.1 – Sightlines partially obscured by field boundary, Temporary Transition Compound, field boundary flanking accesses – The Audit Teams notes sightlines to the left appear to be partially obscured by the existing field boundary, which includes a ditch foliage and some trees. This could lead to side impact type collisions within the access junction's conflict zone.

The Audit Team recommends that the ditch and boundary should be modified to ensure that an appropriate sightline is provided at the location.

The Design Team Response is as follows - It is acknowledged that visibility splays are constrained at the location of the proposed Temporary Transition Compound. Appropriate traffic management measures are set out in Section 15.1.2.3 of the EIAR. During the construction of the proposed TTC access to and from the site off the N69 will be controlled by traffic management measures, including temporary signage in accordance with the *"Traffic Signs Manual, Section 8 – Temporary Traffic Measures and Signs for Road Works"* (DoT now DoTT&S) and "Guidance for the Control and Management of Traffic at Roadworks" (DoTT&S). Construction staff (flagman) will be present at this location during all times that deliveries are made to and from the site. The site will be closed to all traffic by means of fencing at all other times.

The Design Team response was accepted in in the Road Safety Audit Feedback Form included as Appendix A of the Audit Report.

Problem 2.2 – Sightlines partially obscured by field boundary, Location 28 Access Junction A, field boundary flanking access - The Audit Team state that the access sightlines appear to be obscured by the existing field boundary, which includes a ditch, foliage and some trees. This could lead to side impact type collisions within the access junction's conflict zone.

The Audit Team recommends that the ditch and foliage should be modified to ensure that appropriate sightlines are provided at the location described.

The Design Team Response is as follows - All vegetation and foliage will be cleared in order to provide the 3m x 160m visibility splays along the R465, as shown in Figure 15-7 of the EIAR.

The Design Team response was accepted in in the Road Safety Audit Feedback Form included as Appendix A of the Audit Report.

Problem 2.3 – Location 29 – Access junction B - The Audit Team state no significant road safety issues have been identified for Location 29. No Design Team response is therefore required.

Problem 2.4 – Constrained Geometry of Access Roads – Locations 30 and 31- Access junctions Cand D, narrow forestry roads - The Audit Team notes that the forestry access roads were constrained in terms of cross section, horizontal alignment and also vertical alignment. This could lead to loss of control type collisions and opposition type conflicts (where opposing vehicles have difficulty passing each other) for wind farm construction traffic, including abnormal loads.

The Audit Team recommends that the geometry of the roads should be improved to accommodate the anticipated wind farm construction traffic. The road improvements should be supported by suitable temporary traffic management interventions to further mitigate the risks described.

The Design Team Response is as follows - All construction, operational and decommissioning traffic requiring access to turbines Nos 1 to 3 will require to cross the L-30144-0 local road at Access Junction C, with the proposed junction layout shown in Figure 15-11 of the EIAR. At present there is an existing agricultural/forest access that links into the L-30144-0 local road from the east. It is proposed to retain this access, with 6m junction radii proposed in accordance with the existing access. A new access is proposed on the west side of the L-30144-0 local road. This access is for the purpose of development generated traffic only, with no turning movements permitted. Nominal junction radii of 3m proposed at this location. It is proposed that the access on the western side is gated and opened during construction periods and for maintenance visits only. The junction layout proposed at Access Junction D, also shown in Figure 15-11, takes the form of 2 staggered priority junctions with the L-30426-23 local road that will be in place permanently during the operational phase, with temporary routes through the junction to be used during the construction phase only.

The Design Team response was accepted in in the Road Safety Audit Feedback Form included as Appendix A of the Audit Report.

Summary of Stage 1 Road Safety Audit - The Audit Team raised 4 potential road safety problems. The Design Team agreed with each problem and each recommendation suggested by the Audit Team and provided a detailed solution describing each mitigation measure proposed. It is confirmed that each solution was to the satisfaction of the RSA Team.

15.1.10 Provision for Sustainable Modes of Travel

15.1.10.1 Walking and Cycling

The provision for these modes is not relevant during the construction stage of the development as travel distances will likely exclude any employees walking or cycling to work.

15.1.10.2 Public Transport

There are no public transport services that currently pass the Wind Farm site although mini-buses may be considered for transporting staff to and from the Wind Farm site in order to minimise traffic generation and parking demand on the Wind Farm site. It is noted that the traffic impacts assessment above is based all staff travelling by car in order to ensure a robust case scenario.

As the Grid Connection underground electrical cabling route is located along the public road network there are a number of public transport services that service this aspect of the Site. However, due to the transient nature of construction works along the underground electrical cabling route, use of these public transport services will be limited to short durations along the underground electrical cabling route, with staff typically transported to the Grid Connection by mini-bus.

15.1.11 Likely and Significant Effects and Associated Mitigation Measures

15.1.11.1 "Do Nothing" Scenario

If the Proposed Development does not proceed, there will be no additional traffic generated or accommodation works carried out on the local road network and therefore no direct or indirect effects on roads and traffic due to the Proposed Development.

15.1.11.2 Construction Phase

During the 9 days when the concrete foundations are poured the effect on the surrounding road network will be negative, resulting in an increase in traffic volumes ranging from 3.0% on the R463 Athlunkard Street to +2.3% on the Corbally Road. As the route travels north on the R465 and background traffic flows reduce significantly, the percentage increase becomes more pronounced, with +24.0% forecast on the R465 between Carmody's Cross and the site access. In the event that the concrete is delivered from the north, it is forecast that there will be a 29.5% increase on the R466, or +13.0% if delivered from the R465 just north of Broadford. Between Broadford and the site access it is forecast that there will be a 21.7% increase in traffic volumes. The effect on all these roads will be negative, temporary and will be slight.

During the remaining 350 days for the site preparation and ground works when deliveries to the site will take place, the effect on the surrounding road network will be negative, resulting in an increase in traffic levels ranging from +1.0% on the R463 Athlunkard Street and +0.8% on the Corbally Road. As the route travels north on the R465, the percentage increase is forecast to be +8.4% on the R465 between Carmody's Cross and the site access. In the event that all materials for this stage are delivered from the north, it is forecast that there will be a 10.3% increase on the R466, or +4.6 if delivered from the R465 just north of Broadford. Between Broadford and the site access it is forecast that there will be

a 7.6% increase in traffic volume on these days. On these days, the direct effect will be temporary and will be slight.

For the 85 days that will occur consecutively to the site preparation and ground works but on a different part of the road network materials will be delivered from a quarry close to Foynes to the proposed TTC on the N69 to the east of Kildimo. On these days effect on this section of the N69 will be negative, temporary and will be slight.

During the 15 days when the various component parts of the wind turbine plant are delivered to the site using extended articulated HGVs, the increase in traffic volumes will range from +1.9% on the N69 east of Foynes, to +1.0% on the R463 Athlunkard Street and +0.8% on the Corbally Road. As the route travels north on the R465, the percentage increase is forecast to be +8.1 on the R465 between Carmody's Cross and the site access. The provision of traffic management measures, including ensuring that these deliveries are made at night, as is proposed, (as set out in Sections 15.1.7 and 15.1.11.6 and included in the CEMP), will be required to minimise the impact of development traffic on the study network on these days.

For 9 days on the delivery route 64 additional PCUs (made up of cars and standard articulated HGV movements to the site and back) will travel on the study network. On these days, the percentage increase on the study network will range from +0.8% on the N69 east of Foynes to +0.4% on the R463 Athlunkard Street and +0.3% on the Corbally Road. As the route travels north on the R465, the percentage increase is forecast to be +3.6 on the R465 between Carmody's Cross and the site access. The direct effect during this period will be temporary and will be slight.

It is noted that the proposed access junction on the R465 and the existing R465 / R466 junction located in Broadford are forecast to operate well within capacity during the construction period, with maximum forecast RFCs of 4.4% and 25.6% respectively.

During the construction of the Grid Connection there will be closures along the route for a total of 70 days. As traffic volumes are very low, the direct effect will be negative, temporary and slight.

15.1.11.3 Operational Phase

During the operational phase the direct effect on the surrounding local highway network will be neutral and long term given that there will be approximately 2 – 3 maintenance staff travelling to site at any one time, resulting in typically 2 – 3 visits to the site on any one day made by a car or light goods vehicle. While there will be the requirement to replace plant during the life of the Proposed Development, this will be a rare occurrence.

15.1.11.4 Decommissioning Phase

Following the end of their useful life the site may be decommissioned fully or the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained.

Any impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during part of the construction phase when turbines were being erected. The impacts and associated effects will be materially less than during the construction phase as significant ground works are not required to decommission a wind farm.

Following decommissioning of the Wind Farm site, turbine foundations, hardstanding areas and site tracks will be rehabilitated, i.e. left in place and allowed to re-vegetate naturally. The internal site access tracks may be left in place, as they may serve as useful access to the agricultural and forestry land. It is considered that leaving these areas in-situ will cause less environmental damage than removing and recycling them.

While the actual number of loads that will require to be removed from the site in the event that the Proposed Development is decommissioned has not been determined at this stage, the impact in terms of traffic volumes will be significantly less than during the construction stage.

The underground electrical cabling connecting the turbines to the on-site substation will be removed from the cable ducts. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The Grid Connection underground electrical cabling route and onsite substation will remain in place as it will be under the ownership and operation of the ESB and Eirgrid. There are no impacts associated with this.

The works required during the decommissioning phase are described in Section 4.6 in Chapter 4: Description of the Proposed Development and the accompanying Decommissioning Plan included as Appendix 4-6 of this EIAR.

15.1.11.5 Cumulative Effects

The extent of the study area to be included in the traffic related cumulative impact assessment was based on the guidance set out in the Traffic and Transport Assessment Guidelines, PE-PDV-02045, May 2014, TII, which states that the assessment should include "*developments granted planning permission, but which are yet to become operational as well as any planning applications that have been submitted but have yet to be determined".*

The same guidelines are referenced to determine which of the developments that fit the above criteria will have a cumulative impact with the Proposed Development, which is a function of the level of increase on traffic volumes that may be experienced on a common road network.

An assessment of all developments at varying stages in the planning process (from proposed to operational), were assessed for the potential for cumulative traffic effects with the Proposed Development based on the following criteria;

- Project status (proposed to operational)
- Degree of overlap on the highway network (low to high)
- Traffic volumes (low to high).

The developments included in the cumulative impact assessment are considered under the following groups;

- Proposed developments in the planning system,
- Other wind farm developments.

Other wind farms

The other wind farm developments within the geographical boundary as defined in Chapter 2 that were considered to have potential traffic related cumulative impacts are set out below in Table 15-34. Of the 4 wind farm developments listed, Knockballynameath Wind Farm is at a location where there would be little overlap between their construction delivery routes and the delivery routes for the Proposed Development. In addition, Knockballynameath Wind Farm is for a single turbine so traffic generation levels will be low. The potential for cumulative impacts with these wind farms is therefore low, or slight.

For the remaining wind farms included in the assessment, Oatfield Wind Farm (11 turbines) is located adjacent to the Proposed Development site and will share the same delivery routes. It is a similar size of development (11 turbines) as the Proposed Development (9 turbines) and the potential for cumulative impacts during the construction phases of both developments is therefore high. Due to the

close proximity of the proposed Oatfield Wind Farm, the potential cumulative impacts for this development is addressed separately below.

The remaining 2 wind farms, Lackareagh (7 turbines) and Fahy Beg (8 turbines) are both located off the R466 O'Briensbridge to Broadford Road, which may also be used for general construction traffic for the Proposed Development. These wind farms are also considered further below.

Summary of the proposed Oatfield Wind Farm

The site of the proposed Oatfield Wind Farm is situated to the north and south of the proposed Wind Farm and therefore has the potential to have cumulative impacts with the Proposed Development. A review of the Traffic and Transportation Section of the Oatfield Wind Farm EIAR was undertaken with information relevant to assessing the potential for cumulative impacts with the Proposed Development set out below.

Scale and location - The proposed Oatfield Wind Farm Development comprises of 11 turbines with 4 situated to the north of the proposed Wind Farm, with the remaining 7 located to the south. The proposed Oatfield Wind Farm proposal also includes an underground grid connection

Construction year and programme – It is estimated that the construction period will last 18 months and will be complete by the year 2030. It is noted that these are similar to the Proposed Development and there is therefore the potential for cumulative impacts based on construction year and programme.

Delivery of large turbine components – It is noted that the TDR for the proposed Oatfield Wind Farm is via the port of Foynes to Limerick City, followed by the M7 to the south and east of Limerick City, followed by the R494 to the Killaloe Bypass, followed by the R471. The southern part of the site will then be accessed off the R471 while the northern part of the site will be accessed via the L-3042. Based on this while both TDRs share the route from Foynes to the south of Limerick City the proposed TDR for the Oatfield Wind Farm does not impact on any of the external local delivery routes for the Proposed Development. It is noted that the TDR for the Oatfield Wind Farm overlaps with the Grid Connection for the Proposed Development. It will require to be ensured that construction phase for these 2 elements do not overlap.

Grid Connection – The proposed grid connection for the Oatfield Wind Farm travels along a short section of the R471 and does not impact on the any delivery route or the Grid Connection route of the Proposed Development.

Delivery during general construction period – It is estimated that the total number of daily traffic movements for general construction (excluding the abnormally sized loads will range from 1 vehicle trip per day to a maximum of 74 vehicle trips per day. For the Proposed Development it is forecast that a maximum of 110 vehicle trips (75 HGV trips + 35 car trips) will be generated for the busiest 9 days reducing to 62 trips (27 HGVs and 35 cars) for the remainder of the general construction period.

Based on the assessment of traffic flows presented in Section 15.1.6.1 for the Proposed Development for the Site Preparation and Groundworks phase if it is assumed that the additional traffic doubles should the construction of both developments be undertaken at the same time the percentage increase in traffic volumes increase from:

- From +1.4% for the Proposed Development to +2.8% with both developments on the R463 Athlunkard Street,
- from +1.0% to 2% on the Corbally Road,
- from +11.1% to + 22.2% on the R465 north of Carmody's Cross,
- from +13.4% to 26.8% on the R466,
- from +6.0 to +12.0% if delivered from the R465 just north of Broadford and,
- from 10.0 to + 20% on the increase R465 south of Broadfrord.

Based on the above assessment it is considered that the potential for cumulative impacts between the Proposed Development and the proposed Oatfield Wind farm is relatively high, with the severity of the effects being slight to moderate with the effects being temporary.

Summary of the Proposed Lackareagh Wind Farm and Fahy Beg Wind Farm

The proposed Lackareagh Wind Farm is located approximately 5 km east of the proposed Wind Farm and therefore also has a medium risk of the potential to have cumulative impacts with the Proposed Development. A review of the Traffic and Transportation Section of the Lackareagh Wind Farm EIAR was undertaken with information relevant to assessing the potential for cumulative impacts with the Proposed Development set out below.

Scale and location - The proposed Lackareagh is accessed from the R466 between Broadford and O'Briensbridge, followed by the L-3022 to the village of Kilbane and the L-7080 that leads to the site.

Construction year and programme – It is estimated that the construction period will last 18 months and will be complete by the year 2030. It is noted that these are similar to the Proposed Development and there is therefore the potential for cumulative impacts based on construction year and programme.

Delivery of large turbine components – It is noted that the TDR for the proposed Lackereagh Wind Farm is via the port of Foynes to Limerick City, followed by the M7 to the south and east of Limerick City, followed by the R494 to the Killaloe Bypass, followed by the R463 and R466. The site is then accessed from the L-3022 and the L-7080.

Based on this while both TDRs share the route from Foynes to the south of Limerick City, the proposed TDR for the Lackareagh Wind Farm does not impact on the external delivery route for the Proposed Development in close proximity of the site.

Grid Connection – The proposed Lackareagh Wind Farm proposal also includes an underground grid connection that connects into the existing Ardnacrusha Substation. It is noted that only a short 0.2 km section on the L-3056 on the public road network is common to both grid routes.

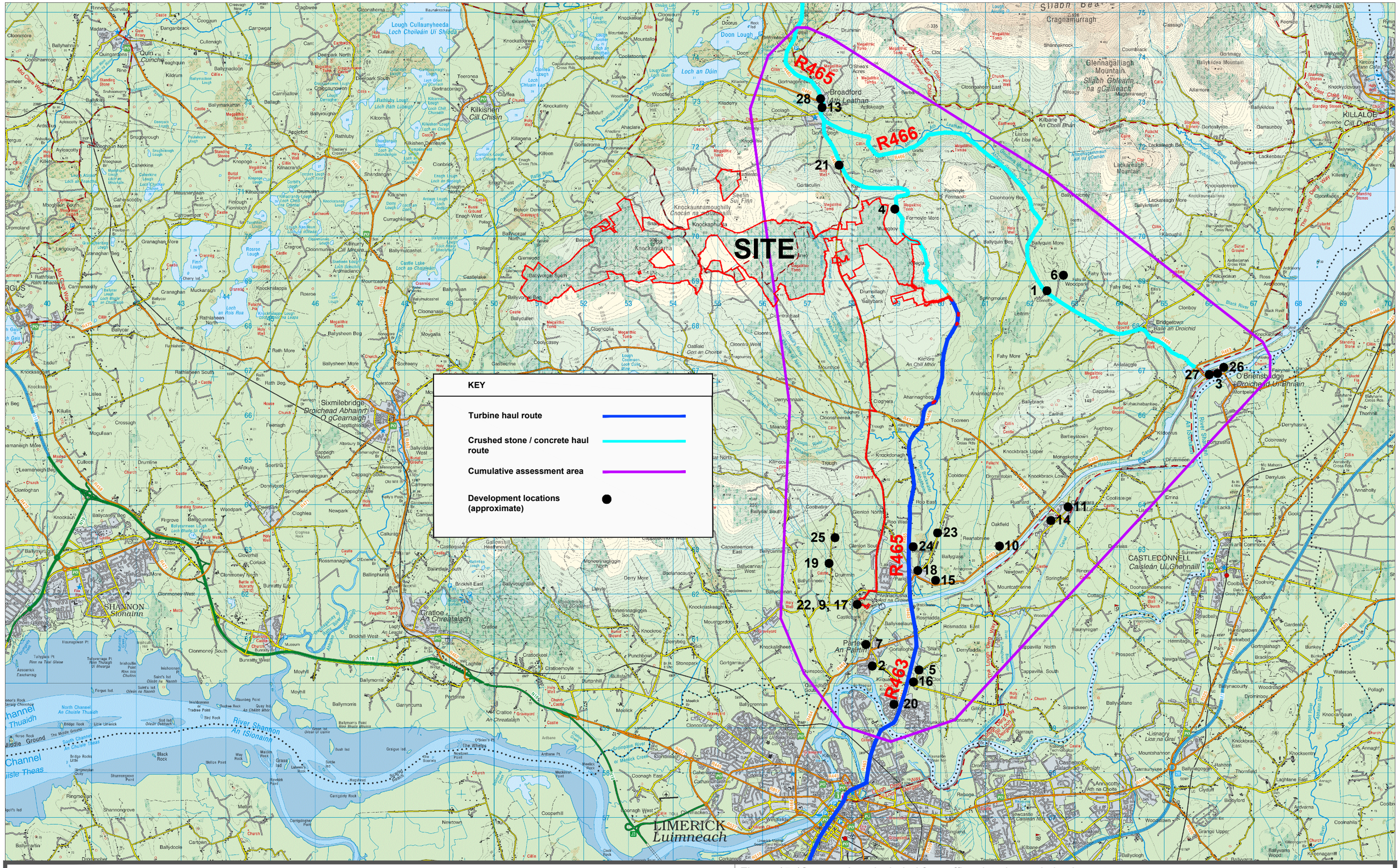
Delivery during general construction period – A review of the delivery routes for the Lackareagh Wind Farm and the Proposed Development indicates that the section of the R466 to the south of Broadford is on the potential delivery routes for both developments for the delivery of concrete and stone.

Based on the assessment of traffic flows presented in Section 15.1.6.1 for the Proposed Development for the Site Preparation and Groundworks phase if it is assumed that the additional traffic doubles should the construction of both developments be undertaken at the same time the percentage increase in traffic volumes increase from:

- +10.3% for the Proposed Development on the R466, to +19.0% if both developments are constructed at the same time

Based on the above assessment it is considered that the potential for cumulative impacts between the Proposed Development and the proposed Lackareagh Wind farm is relatively high, with the severity of the effects being slight with the effects being temporary.

The proposed Fahy Beg Wind Farm is located to the south of Lackareagh Wind Farm and will be directly accessed off the R466 via an existing quarry access. The Fahy Beg Wind Farm is a similar scale to the Lackareagh Wind Farm and has similar parts of the delivery route and grid connection route in common with the Proposed Development. It is therefore considered that the potential for cumulative impacts between the Proposed Development and the proposed Fahy Beg Wind farm is also relatively high, with the severity of the effects being slight and temporary.



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 15-13 Area included for traffic related cumulative impact assessment

PROJECT:	Knockshanvo Wind Farm Development		
CLIENT:	Futurenergy Ireland	SCALE:	NTS
PROJECT NO: 8880	DATE: 07.08.24	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

Table 15-34 Summary of other wind farms considered in cumulative assessment and risk for cumulative impacts

Project	Status	Degree of overlap of highway network (low / medium / high)	Traffic volumes (low / medium / high)	Potential cumulative traffic effects
1 - Fahy Beg Wind Farm (8 turbines)	Under appeal	Medium	Medium	Medium
2 – Lackareagh Wind Farm (7 turbines)	Proposed	Medium	Medium	Medium
3 - Oatfield Wind Farm (11 turbines)	Proposed	High	Medium	High
4 - Knockballynameath Wind Farm (1 turbine)	Operational	Low	Low	Low

Other development applications in the planning system

A planning search undertaken by MKO established that there were 210 planning applications within the cumulative area of influence shown in Figure 15-13.

Of these development, all relating to small developments including single dwelling were excluded from the assessment on the basis of scale, leaving 28 developments. All of these developments are set out in the cumulative assessment table included as Appendix 2-2, with those developments established to have a medium or above potential for cumulative impact with the Proposed Development extracted into Table 15-35. All 4 of these proposed developments were established to have a high degree of overlap with the Proposed Development with respect to the road network, but all are considered to generate relatively modest volumes of traffic. While it is considered that there is a greater risk for the potential of cumulative impacts between these developments and the Proposed Development, it is determined that the effects will be slight.

Table 15-35 Summary of other developments in Clare County Council planning process considered in cumulative assessment and potential risk for cumulative traffic effects with Proposed Development

Project	Status	Degree of overlap of highway network (low / medium / high)	Traffic volumes (low / medium / high)	Potential cumulative traffic effects
4 – Development to complete existing landfill	Conditional	High	Low	Medium
13 – For change of use of part of existing community hall in Broadford	Conditional	High	Low	Medium

Project	Status	Degree of overlap of highway network (low / medium / high)	Traffic volumes (low / medium / high)	Potential cumulative traffic effects
into a full day care early years' service				
21 – Relocation of the existing Ardnacrusha to Tulla 38kV line	Conditional	High	Low	Medium
28 - Construction of an all-weather astro turf training pitch with flood lighting and associated works	Conditional	High	Low	Medium

15.1.11.6 Mitigation Measures

This section summarises the mitigation measures to minimise the effects of the Proposed Development during both the construction, operational and decommissioning stages.

Mitigation by Design

Mitigation by design measures include the following;

- Selection of the most appropriate delivery route to transport the wind turbine components, requiring the minimum remedial works to accommodate the vehicles as set out in Section 15.1.8.
- Implementation of temporary alterations to the highway network at locations identified in Section 15.1.8.

Mitigation Measures During the Construction Stage

The construction of this development will require significant coordination and the following comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the proposed Wind Farm and Grid Connection.

Delivery of abnormal sized loads

The following are the main points to note for these deliveries. These will take place after peak evening traffic:

- The delivery of turbine components is a specialist transport operation with the transportation of components carried out at night when traffic is at its lightest and the impact minimised.
- The deliveries will be made in consultation with the Local Authority and An Garda Síochána.
- It is estimated that 72 abnormal sized loads will be delivered to the site, comprising 15 convoys of 5, undertaken over 15 separate nights.
- These nights will be spread out over an approximate period of 3 weeks and will be agreed in advance with the relevant authorities

- In order to manage each of the travelling convoys, for each convoy there will be two police escort vehicles that will stop traffic at the front and rear of the convoy of 5 vehicles.
- There will also be two escort vehicles provided by the haulage company for each convoy.

Other traffic management measures

A **Traffic Management Plan (TMP)** is provided specifying details relating to traffic management and is included as Appendix 15-2 this EIAR. Prior to the commencement of the construction phase of the Proposed Development a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána. In the event An Bord Pleanála decides to grant consent for the Proposed Development, the final TMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board. The TMP prescribes the following:

- **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.
- **Delivery Programme** – a programme of deliveries will be submitted to the relevant County Councils (Clare and Limerick) in advance of deliveries of turbine components to site. Liaison with the Local Authorities and Transport Infrastructure Ireland (TII) will be carried out where required regarding requirements such as delivery timetabling. The programme will ensure that deliveries are scheduled in order to minimise the demand on the local network and minimise the pressure on the access to the site.
- **Temporary traffic management measures during construction of Wind Farm Site at access junctions during construction –** Temporary measures including signage at access Junctions B at Sallybank, C and D at Snaty.
- **Temporary traffic management measures during construction of Grid Connection –** Including signage and implementation of temporary traffic diversions.
- **Temporary traffic signs and traffic management measures for the construction phase of the proposed temporary transition compound on the N69** – As part of the traffic management measures temporary traffic signs will be put in place at the access points for the transition zone located on the N69. All measures will be in accordance with the *"Traffic Signs Manual, Section 8 – Temporary Traffic Measures and Signs for Road Works"* (DoT now DoTT&S) and "Guidance for the Control and Management of Traffic at Roadworks" (DoTT&S). Construction staff (flagman) will be present at key junctions during peak delivery times. This will include a request to TII / LC&CC for a temporary speed reduction for the 85 day construction period.
- **Information to locals** – Locals in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (where required) or delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.
- **A Pre and Post Construction Condition Survey** – Where required by the Local Authorities, a pre-condition survey of roads associated with the Proposed Development will be carried out immediately prior to construction commencement to record an accurate condition of the road at the time. A post construction survey will be carried out after works are completed to ensure that any remediation works are carried out to a satisfactory standard. The timing of these surveys will be agreed with the local authority. All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the Local Authority Engineers.
- **Liaison with the relevant local authority** - Liaison with the County Councils and An Garda Síochána will be carried out during the delivery phase of the large turbine

vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and "prior to commencement" status of the relevant roads established, (in compliance with the provisions of the CEMP), the relevant Roads Sections will be informed of the names and contact numbers for the Project Developer/Contractor Site Manager as well as the Site Environmental Manager.

- **Implementation of temporary alterations to road network at critical locations** – at locations highlighted in section 15.1.8. In addition, in order to minimise the impact on the existing environment during turbine component deliveries the option of blade adaptor trailers will also be used where deemed practicable.
- **Identification of delivery routes** – These routes will be agreed with the County Councils and adhered to by all contractors.
- **Delivery times of large turbine components** - The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.
- **Travel plan for construction workers** – While the assessment above has assumed the worst case in that construction workers will drive to the site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site.
- **Additional measures** - Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on site and sweeping / cleaning of local roads as required.
- **Re-instatement works** - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.

Mitigation Measures During Operational Stage

Due to the very low volumes of traffic forecast to be generated during this stage no mitigation measures are required. In the event that large component parts are required to be replaced during the life of the Proposed development, appropriate traffic management measures will be implemented on a temporary basis.

Mitigation Measures During Decommissioning Stage

When the Proposed Development is decommissioned after the 35 years of operation, a decommissioning plan will be prepared for agreement with the local authority, as described in Section 4.6 of Chapter 4. This plan will include a material recycling / disposal plan and traffic management plan and other similar mitigation measures to those implemented during the construction phase. In terms of traffic effects, the decommissioning stage will generally mirror the constructions stage although the effects will be significantly reduced as the volumes of materials removed from the site will be less. Mitigation measures for the decommissioning stage will be similar to those proposed for the construction stage of the Proposed Development, as set out in this section above.

15.1.11.7 Residual Impacts

Construction Stage

During the 18 – 24 -month construction stage of the Proposed Development, it is forecast that the additional traffic that will appear on the delivery routes indicated in Figure 15-2a will have a negative and temporary effect on existing road users, which will be minimised with the implementation of the mitigation measures included in the proposed traffic management plan. The effects will be slight to imperceptible during all of the construction stage, with the exception of the delivery of the abnormal loads, which will reduce from moderate to slight if these deliveries are undertaken during the night, as proposed.

Operational Stage

As the traffic impact of the Proposed Development will be imperceptible during the operational stage, no mitigation is required, and the residual effects will also be imperceptible.

Decommissioning Stage

As stated above, a decommissioning plan will be prepared and implemented in order to minimise the residual impacts during this stage. The residual effect will be less than for the construction stage as set out above and will be slight to imperceptible.

15.2 Telecommunications and Aviation and Other Material Assets

15.2.1 Introduction

This section of the EIAR assesses the likely significant effects of the Proposed Development on telecommunications, aviation and other material assets.

15.2.1.1 Statement of Authority

This section of the EIAR has been prepared by Eoin O'Sullivan and reviewed by Michael Watson, both of MKO. Eoin is an experienced geo-environmental scientist and has over fifteen years' experience in the design, implementation and interpretation of all phases of geo-environmental and geotechnical site investigations. Eoin has also got extensive experience in the preparation of material assets assessments and reports for EIAs, particularly relating to wind energy. Eoin has also experience in completing PPC Permit Applications and in the preparation of Environmental Impact Statements/Environmental Impact Assessment Reports for renewable energy projects, quarries and a number of non-hazardous landfill sites and anaerobic digesters for both public and private clients. Eoin is also proficient in undertaking detailed quantitative risk assessments for the protection of controlled waters and human health. Eoin holds an MSc in Environmental Engineering and is a Chartered Member of the Chartered Institute of Water and Environmental Management (CWEM) and Chartered Environmentalist (CEnv) with the Society of Environment. Michael has over 20 years' experience in the environmental sector and had worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael completed an MA in Environmental Management at NUI, Maynooth in 1999. Michael is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv).

15.2.1.2 Methodology and Guidance

This section of the EIAR has been prepared in line with the guidance set out by:

- *Best Practice Guidelines for the Irish Wind Energy Industry* (Irish Wind Energy Association, 2012
- *Advice Notes for Preparing Environmental Impact Statements – Draft September 2015* (EPA, 2015).
- *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (EPA, 2022).

The assessment of likely significant effects on material assets uses the standard methodology and classification of effects, as presented in Section 1.7.2 of Chapter 1 Introduction. A full description of the Proposed Development is provided in Chapter 4 Description of the Proposed Development

15.2.1.3 Scoping and Consultation

This section of the assessment focuses particularly on the scoping and consultation exercise conducted with telecommunications operators and aviation authorities. Scoping was carried out in line with the *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* (EPA, 2022) and the '*Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2012), which provides a recommended list of telecommunications operators for consultation. A full description of the scoping and consultation exercise is provided in Section 2.6 of Chapter 2 of this EIAR.

As part of the EIAR scoping and consultation exercise, MKO contacted the relevant national and regional broadcasters, fixed and mobile telephone operators, aviation authorities and other relevant consultees. Consultation was also carried out with ComReg (Commission for Communications Regulation) in order to identify any other additional licensed operators in the vicinity of the Proposed Development to be contacted. The responses received by MKO from the telecommunications and aviation consultees are summarised below in Table 15-36.

In addition to the scoping and consultation exercise, the Applicant commissioned Ai Bridges to carry out a Telecommunications Impact Assessment (TIA) to evaluate the possible impacts of the proposed Wind Farm on existing telecommunications operator networks. This is presented in Appendix 15-7. In addition Ai Bridges and Cyrrus Ltd were commissioned to carry out an Aviation Impact Assessment to address the specific Irish Aviation Authority (IAA) requests for further technical analysis (Appendix 15-6).

Table 15-36 Telecommunications and Aviation Scoping Responses

Consultee	Response	Potential for Interference Following Consultation Exercise
2rn (formerly RTÉ Transmission Network Ltd.)	Received 23rd October 2020	See Section 15.2.2.3
BBnet	No response received	No
Broadcasting Authority of Ireland	Received 23rd January 2023	No
BT Communications Ireland	Received 23rd October 2020	No
Commission for Communications Regulation (ComReg)	Received 4th November 2020	No
Department of Defence	Received 15th February 2023	See Section 15.2.2.4
Eir	Received 13th November 2020	No
Enet	Received 23rd October 2020	See Section 15.2.2.3
ESB Telecoms	Received 27th October 2020	See Section 15.2.2.3
Imagine Group	Received 23rd October 2020	No
Irish Aviation Authority (IAA)	Received 3rd February 2023	See Section 15.2.2.4

Consultee	Response	Potential for Interference Following Consultation Exercise
Irish Telecoms Services	No response received	No
Lighthouse Networks Limited	Received 23rd October 2020	No
Ripplecom	Received 9th November 2020	No
Shannon Airport	No response received	N/A
Tetra Ireland Communications Ltd.	Received 27th October 2020	No
Three Ireland Ltd	Received 30th October 2020	No
Towercom Ltd.	Received 28th October 2020	No
Treaty Radio Ltd	Received 10th November 2020	No
Viatel Ireland Ltd	Received 9th November 2020	No
Virgin Media Ireland Ltd	Received 23rd October 2020	No
Vodafone Ireland Ltd	Received 27th October 2020	See Section 15.2.2.3

The scoping responses from the telecommunications and aviation consultees are described below. Relevant copies of scoping responses are provided in Appendix 2-1.

15.2.2 Receiving Environment

15.2.2.1 Gas

No gas pipelines interact with the Wind Farm Site. The nearest gas pipeline to the Wind Farm Site is a medium pressure Gas Networks Ireland (GNI) pipeline located approximately 3.2 km to the southwest, in Sixmilebridge.

A medium pressure GNI pipeline exists within the Lackyle Heights Local Road, where the Grid Connection reaches the town of Ardnacrusha. The Grid Connection and gas pipeline will share the road network for approximately 1.9 km the Grid Connection route.

15.2.2.2 Electricity

15.2.2.2.1 *Infrastructure*

A 38kV overhead line crosses the Wind Farm Site in a southeast to northwest direction, from Limerick City to Tulla. One 400kV overhead line intersects the northwestern boundary of the Wind Farm Site, travelling from Moneypoint in the direction of Dublin. A scoping request was issued to EirGrid in January 2023. A response has not been received to date. There are existing underground electricity cables present on the site of the Proposed Development and in the vicinity of the site. Damage of underground electricity cables during construction operations could potentially result in serious injury or death of site staff. The Proposed Development has been designed to avoid existing underground

electricity cables and the appropriate separation distances in accordance with ESB requirements have been maintained.

15.2.2.2.2 Supply

Ireland faces significant challenges in its efforts to meet European Union (EU) targets for renewable energy by 2030 and its commitment to transition to a low carbon economy by 2050. The need to decarbonise the economy and reduce emissions has always been imperative, however in recent years the urgency involved has become clearer to all stakeholders. The primary driver behind the Proposed Development is the need to provide additional renewable energy to offset the use of fossil fuels within the electricity generating sector.

The Proposed Development comprises the provision of 9 no. wind turbines, which is capable of generating and providing a significant amount of renewable energy onto the national grid and capture an additional part of County Clare's valuable renewable energy resource. Assuming an installed capacity of 64.8 MW, the Proposed Development therefore has the potential to produce up to 204,353 MWh (megawatt hours) of electricity per year. The 204,353 MWh of electricity produced by the Proposed Development would be sufficient to supply 48,656 Irish households with electricity per year, based on the average Irish household using 4.2 MWh[1] of electricity.

15.2.2.3 Telecommunications and Aviation

15.2.2.3.1 Broadcast Communications

Wind turbines, like all large structures, have the potential to interfere with broadcast signals, by acting as a physical barrier or causing a degree of scattering to microwave links. The most significant effect at a domestic level relates to a possible flicker effect caused by the moving rotor, affecting, for example, radio signals. The most significant potential effect occurs where the wind farm is directly in line with the transmitter radio path.

15.2.2.3.2 Domestic Receivers

Depending on local topography, a domestic receiver may receive broadcast signals from more than one location. The strength of the signals varies with distance from the transmitter, and the receiver's antenna is generally always directed towards the most local, and usually strongest, broadcasting station.

There are two types of potential electromagnetic interference to domestic receivers, depending on the location of the receiver in relation to a wind farm. 'Shadowed' houses are located directly behind a wind farm, relative to the location from where the signal is being received. In this case, the main signal passes through the wind farm and the rotating blades can create a degree of signal scattering. In the case of viewers located beside the wind farm (relative to the broadcast signal direction), the effects are likely to be due to periodic reflections from the blade, giving rise to a delayed signal.

In both cases, i.e., shadowed houses located behind the wind farm and those located to the side of it, the effects of electromagnetic interference may depend to some degree on the wind direction, since the plane of rotation of the rotor will affect both the line-of-sight blockage to viewers located behind the wind farm and the degree of reflection to receivers located to the side.

15.2.2.3.3 Other Signal Types

Wind turbines have the potential to affect other signal types used for communication and navigational systems, for example tower-to-tower microwave communication links, and airborne and ground radar

1 March 2017 CER (CRU) Review of Typical Consumption Figures Decision https://www.cru.ie/document_group/review-of-typical-consumption-figures-decision-paper/

systems. Interference with radar systems occurs when wind turbines are located close to an airport or directly in line with the instrument landing approach.

The nearest airport to the Proposed Development site is Shannon Airport, County Clare, located approximately 13 kilometres southwest of the Proposed Development.

Potential effects on broadcast communications are generally easily dealt with by the use of repeater relay links out of line with the wind farm (i.e., diverting the telecommunications signal path).

15.2.2.3.4 Preventing Electromagnetic Interference

National Guidelines

The *'Wind Energy Development Guidelines for Planning Authorities'* (Department of the Environment, Heritage and Local Government, 2006) state that interference with broadcast communications can be overcome by the installation of deflectors or repeaters where required. Developers are advised to contact individual local and national broadcasters and mobile phone operators to inform them of proposals to develop wind farms. This consultation has been carried out by MKO as part of the assessment of the Proposed Development as summarised in section below; full details are provided in Section 2.6 in Chapter 2 of this EIAR. Both the adopted 2006 and the 2019 draft *'Wind Energy Development Guidelines for Planning Authorities'* produced by the Department of the Environment, Heritage and Local Government (DOEHLG) state that interference with broadcast communications can be overcome by the installation of deflectors or repeaters where required.

Broadcasters

2rn (formerly RTÉ Transmission Network Ltd.), replied on the 23rd of October 2020 to a scoping request from MKO stating that there are two paths carrying several services on and near the area highlighted by MKO. As mentioned in Section 15.2.1.2 above, the Applicant commissioned Ai Bridges to carry out a TIA to evaluate the possible impacts of the proposed Wind Farm on existing telecommunications operator networks. The findings of TIA indicates that the Wind Farm will not impact any of the telecom operator radio networks in the area.

2rn also stated that there is also a definite risk of interference to the reception of a Digital Terrestrial Television (DTT) and frequency modulation (FM) services from Maghera and Woodcock Hill. To mitigate against interference on viewers' television sets and/or broadcast radio receivers, 2rn has recommended that a protocol agreement be put in place for the Wind Farm. The Protocol Document ensures that in the event of any interference occurring to 2rn television or radio reception due to operation of a wind farm, the required measures as set out in the document, will be carried out by the developer to rectify this. The Protocol Document ensures that the appropriate mitigation is carried out in the event of any unanticipated broadcast interference arising to RTÉ television or radio reception as a result of the proposed Wind Farm.

Virgin Media replied on the 23rd of October 2020 to scoping requests from MKO stating that they do not have any microwave links in the area.

15.2.2.3.5 Other Operators

Of the scoping responses received from telephone, broadband and other telecommunications operators, those who highlighted an initial potential interference risk are addressed below. The final proposed turbine layout does not overlap with any of the telecoms links or clearance zones requested by these operators. The remaining consultees who responded to scoping, operate links either outside the Wind Farm Site, and therefore are not subject to any interference risk, or do not operate any links in the area.

Enet

Enet replied to MKO's scoping request on the 23rd of October 2020 stating that they have three links that could possibly be affected. The findings of the TIA concluded that the Wind Farm will not impact any of the telecom operator radio networks in the area.

ESB

ESB Telecoms replied on the 27th of October 2020 to a scoping request from MKO stating that ESB Telecoms has significant amount of point to multipoint and point to point radio links in the area. The findings of the TIA concluded that the Wind Farm will not impact any of the telecom operator radio networks in the area.

Vodafone

Vodafone Ireland Ltd responded on the 27th of October 2020 to scoping requests from MKO by identifying links within the area and setting a standard buffer of 100m. The findings of the TIA concludes that the Wind Farm will not impact any of the telecom operator radio networks in the area.

15.2.2.4 Aviation

As noted in Table 15-36 above, in terms of aviation consultees, a scoping response was received from the Department of Defence and the Irish Aviation Authority. No response was received from Shannon Airport directly.

15.2.2.4.1 *Department of Defence*

The Department of Defence replied to a scoping request from MKO Ireland on the 15th of February 2023

1. *Single turbines, structures, or turbines delineating the windfarm should be illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth and to be operational H24/7 days a week. Obstacle lighting should be incandescent or of a type visible to Night Vision equipment. Obstacle lighting must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.*
2. *Any Irish Air Corps (IAC) requirements are separate to Irish Aviation Authority (IAA) requirements.*

In response to the lighting requirements requested by the Department of Defence (Items 1 to 2 above), the turbines will be included on mapping, fitted with obstruction lighting and entered into aircraft navigation databases to ensure they will be avoided during flight.

15.2.2.4.2 *Irish Aviation Authority*

The IAA replied to a scoping request on the 3rd of February 2023. The IAA stated that:

1. *From an IAA Air Navigation Service Provider (ANSP) perspective, more analysis would need to be conducted. They note that, in the area around Knockshanvo, there are a range of grid values from 361m to 401m. Given that the proposed blade-tip heights are c.170m, this equates to a c.370m AMSL elevation based on a general site elevation of 200m. Added to this any potential cranage used during construction will need a full IFP Assessment.*
2. *Woodcock Hill Radar: Surveillance effect (IAA ANSP Surveillance Domain copied). Generally, any significant obstacle within 16km of this facility may have impact. In the*

case of this proposed Windfarm, this is highly likely and will need to be assessed with mitigations proposed. Please note that previous experience has shown that mitigations suggested for similar developments have been prohibitively costly for the ANSP and ultimately don't guarantee that the surveillance service is not affected. Third attachment is the EUROCNTROL Guidelines on How to Assess the Potential Impact of Wind Turbines Surveillance Sensors.

3. *Navigation Aids (NAVAIDS): This will need to be considered by my NAVAID colleagues (copied), although generally there should not be an impact. There is however another aspect to this. On a 6-monthly basis, these NAVAIDs have to be flight calibrated. The calibration aircraft flies in this area at low altitudes to achieve this and a report from this company (FCSL) may be required also.*

The nearest operational airport to the Proposed Development site is Shannon Airport, which is located approximately 13km southwest of the Wind Farm Site.

Due to the Wind Farm Site's proximity to Shannon Airport, and in consideration of the IAA's scoping response, an Aviation Impact Assessment has been undertaken by Ai Bridges and Cyrrus Ltd (Appendix 15-6). This is discussed in detail in Section 15.2.3.3 below.

15.2.2.5 Existing Waste Management Services

There are no EPA-licensed or local authority-authorised waste facilities or activities located within the site boundary. The closest, authorised municipal waste facility is located approximately 9.2km south of the Proposed Development site, in Limerick City, Co. Limerick.

15.2.3 Likely Significant Effects and Associated Mitigation Measures

15.2.3.1 'Do-Nothing' Scenario

If the Proposed Development were not to proceed, there would be no change to existing built services, telecommunications and aviation operations in the area.

15.2.3.2 Construction Phase

15.2.3.2.1 *Services*

There are existing underground and overhead electricity cables and other services present on the site of the Proposed Development and in the vicinity of the site, the damage of which has the potential to result in serious injury or death. This has a short-term potential significant negative effect.

Mitigation Measures

Specific measures are incorporated into the CEMP, included as Appendix 4-3 of this EIAR, to ensure that the construction of the Proposed Development will not have effect on underground and overhead electrical cables or other services. The mitigation measures include the following:

- Any area where excavations are planned will be surveyed and all existing services will be identified prior to commencement of any works.
- Liaison will be had with the relevant sections of the Local Authority including all the relevant area engineers to ensure all services are identified.
- Excavation permits will be completed, and all plant operators and general operatives will be inducted and informed as to the location of any services.

- The contractor must comply with and standard construction codes of practice in relation to working around electricity, gas, water, sewage and telecommunications networks.

Residual Effects

Following the implementation of the above mitigation measures, there will be a short-term slight negative residual effect during the construction phase of the Proposed Development.

Significance of Effects

Based on the assessment above there will be no significant effects.

15.2.3.2.2 *Waste Generation*

The construction phase will have the potential to produce municipal waste (site office, canteen) and construction/demolition waste (wood, rubble, metal, etc.) which will need to be processed at local waste processing facilities. These are largely composed of metal and other recyclable materials which would be brought to specialised facilities for processing/recycling such items.

Waste materials will be required to be temporarily stored on site pending collection by a waste contractor. Dedicated areas for waste skips and bins will be identified across the site. These areas will need to be easily accessible to waste collection vehicles. If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the site.

The Waste Management Act 1996 (Act) and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity must have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The use of non-permitted waste contractors or unauthorised waste facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. Poor waste management has the potential to cause a short-term moderate negative effect.

Mitigation Measures

A Waste Management Plan (WMP) has been prepared and forms part of the Construction and Environmental Management Plan (CEMP) in Appendix 4-3 of the EIAR.

The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Development. Disposal of waste will be a last resort.

The following mitigation measures will be implemented:

- All waste generated on site will be contained in waste skips at a waste storage area on site. This waste storage area will be kept tidy with skips clearly labelled to indicate the allowable material to be disposed of therein. The expected waste volumes generated on

site are unlikely to be large enough to warrant source segregation at the Proposed Development site. Therefore, all wastes streams generated on site will be deposited into a single waste skip. This waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal. The closest, authorised municipal waste facility is located approximately 9.2km south of the Proposed Development site, at Limerick City, Co. Limerick.

- Extensive waste categorisation will be in place to ensure the highest possible quality of recycling of the respective categories and to prevent an accumulation of pollutants in the material cycle – it is anticipated that the following waste types, at a minimum, will be segregated:
    - Electrical Waste
    - Plastics;
    - Oils;
    - Metals;
    - Glass; and
    - Timber.
- To minimise the generation of waste and waste disposed to landfill, wastes will be managed in accordance with the waste hierarchy and relevant regulatory controls.
- Waste will be clearly labelled and segregated on site. Measures will be taken to ensure that wastes cannot blow away.
- Housekeeping measures will be followed for the storage of materials to ensure that materials are protected as much as possible.
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site.
- Any hazardous wastes generated (such as chemicals, fuels and oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required).
- A waste manager will be appointed by the main contractor(s) to ensure effective management of waste during the construction works.
- All staff will be provided with training regarding the waste management procedures;
- All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal.
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained. As a minimum, the following waste management data will be provided:
    - Quantity of materials and waste removed from site by type in volume and weight.
    - Outcome of the materials and waste on and off site.
    - Waste transfer notes.
    - Hazardous waste consignment notes.

Residual Effects

Following implementation of the mitigation measures above, residual impacts of non-hazardous waste emissions for the construction phase will have a short-term, slight, negative effect.

15.2.3.2.3 *Telecommunications and Aviation*

The potential for electromagnetic interference from wind turbines occurs only during the operational phase of the development. There are no electromagnetic interference impacts associated with the construction phase of the Proposed Development, and therefore no mitigation required.

15.2.3.3 Operational Phase

15.2.3.3.1 *Telecommunications*

Pre-Mitigation Impact

The findings of TIA concludes that the Wind Farm will not impact any of the telecom operator radio networks in the area.

Mitigation

In the event of interference occurring to telecommunications, the Department of the Environment, Heritage and Local Government 'Wind Farm Planning Guidelines' (2006) acknowledge that 'electromagnetic interference can be overcome' by the use of divertor relay links out of line with the wind farm.

The Applicant will sign a Protocol Document with RTÉ Transmission Network (operating as 2rn), which is a standard requirement for all wind farm developers. This document will ensure that the developer is responsible for rectifying any unanticipated broadcast interference arising to RTÉ television or radio reception as a result of the proposed Wind Farm.

Residual Impact

The Proposed Development will have no residual impact on the telecommunications signals of operators in the area.

Significance of Effects

There will be no significant effect on telecommunications from the Proposed Development.

15.2.3.3.2 *Aviation*

Lighting Requirements

Pre-Mitigation Impact

The scoping response of the DoD has requested that standard lighting requirements be used at the Proposed Development site. Pre-mitigation this has a permanent potential significant negative effect.

Mitigation Measures

The scoping response from the DoD set out lighting requirements for turbines as detailed above. These requirements will be complied with for the Proposed Development and any further details will be agreed in advance of construction with the DoD. The coordinates and elevations for built turbines will be supplied to the IAA, as is standard practice for wind farm developments.

Residual Impact

The Proposed Development will have no residual impact on aviation as all lighting requirements will be met by the applicant.

Significance of Effects

There will be no significant effect on aviation operations due to the Proposed Development.

Navigation Requirements

Pre-Mitigation Impact

The IAA replied to a scoping request on the 3rd of February 2023 as set out in section 15.2.2.4.2 above. The IAA stated in their response that the following area would need more analysis:

- Instrument Flight Procedures (IFPs) Shannon Airport
- Woodcock Hill Radar
- Navigation Aids (NAVAIDS)

Pre-mitigation these have a permanent potential significant negative effect.

Mitigation Measures

An AIA has been undertaken by Ai Bridges and Cyrrus Ltd (Appendix 15-6). The AIA was informed by engagement and consultation with the IAA. The AIA in Appendix 15-6 should be consulted for detailed information on the assessments, however a brief summary of the potential impacts and mitigation measures to minimise or eliminate the impacts are summarised below.

- Impact on Instrument Flight Procedures (IFPs) Shannon Airport.
    - IFPs - The impacted IFP's will be withdrawn in line with the State Performance Based Navigation (PBN) Plan for Ireland on 06 June 2030 after which time there will no longer be an impact to the impacted IFP's.

      Applicant Comment

      The implementation of the State PBN Plan by 06th June 2030 is welcomed. What this means in the context of building out the proposed Wind Farm is that several of the potential issues identified in the detailed assessments noted earlier will no longer be relevant. As such, proposed turbines T01, T02 and T03 of the proposed Wind Farm currently noted as penetrating the departure and approach obstacle protection areas at Shannon Airport. Under the new navigation measures, proposed turbines T01, T02 and T03 could be erected, albeit not until the 07th June 2030 when the new measures are rolled out.

      As such, the Applicant confirms that should An Bord Pleanála deem it appropriate, a planning condition attached to any grant of planning permission issued requiring that turbines T01, T02 and T03 will not be erected until the measures are in force, is acceptable. Suggested wording is set out below:

      Turbines T01, T02 and T03 as identified on the plans and particulars accompanying the planning application shall not be erected until such time as the IFP measures relating to Shannon Airport are in force.

      Reason: in the interests of aviation safeguarding

- The IAA agreed in principle that increasing the Procedure Design Gradient for the Standard Instrument Departure (SID) departure would be incorporated in updated IFP designs by late 2022.

- The IAA recommends withdrawal of the VOR IAP on the basis that this would be in line with the State PBN plan and that RNP IAPs are planned for Shannon during 2022. Also as referenced in the State PBN Plan (section 11 in Appendix 14) the Shannon Airport currently has approach runways are in line for Required Navigation Performance (RNP) approaches by 25 January 2024.

- ATCSMAC Chart - The IFP Assessment shows that there are four mitigation options that allows for safe vectoring onto the Instrument Approach Procedures (IAP), which includes an option for a shortened Instrument Landing System (ILS) on an RNP approach. The ATCSMAC can be re-designed on the basis of an Airspace Redesign Concept i.e. a RNP Instrument Approach Procedure (IAP) on a shortened ILS as a possible mitigation, and which would be operationally feasible for Shannon Air Traffic Control (ATC).

  Applicant Comment

  The ATCSMAC at Shannon Airport consists of four sectors. The impact of the turbines on the ATCSMAC Chart on Sector 1 and Sector 2 can be addressed by four proposed redesign options which enable an evaluation of the potential ways to remove the impact to the ATCSMAC. These redesign options would need to be evaluated by Shannon Airport and the IAA to determine of the proposed designs would allow for safe and effective vectoring of aircraft.

  The applicant would be willing to contribute its share of the costs associated with any implementable and viable mitigation measure solution, as required, on a pro-rata basis with any of the listed projects that are granted a planning consent. During the engagements with the IAA in 2022 they stated

  " Aside for the costs in production of further assessments as referenced, system upgrades for filtering, flight procedures changes, ATC changes to support the mitigate for the new obstacles, as well as continuing additional costs associated with more flight check activity on an bi-annual basis, has the potential to cost the ANSP in the region of €200,000.00+, should planning be granted as proposed.

- Impact on Woodcock Hill Radar

  - Reflections - The Thales RSM970 MSSR Sited at Woodcock Hill is 5.6 km from the nearest wind turbine. The Thales radar utilizes a two-stage system to prevent both temporary (Dynamic) and permanent (Static) reflections being displayed. It also has inbuilt adaptive reflection processing. This is referenced in The Thales RSM970 MSSR Technical Description Document (Appendix 11.2).To prevent possible reflection issues, some minor optimisations may be required. This is usually carried out as part of the scheduled maintenance of the equipment.

  - The IAA\AirNav have scheduled an upgrade in the next two to five years of all the radar surveillance equipment in the state and these upgrades will likely include updates to the two-stage system within MSSR to prevent

reflections being displayed. This would be conformed as part of an asset conductions survey by the Radar Manufacturer (Thales).

- Deflections - The Thales RSM970 MSSR uses a well-established processing system to remove any False Replies Unsynchronised In Time (FRUIT). This process removes the issue of deflections from the system. No additional optimisation is required as a DEFRUITER is part of the standard MSSR processing on the Thales system.

- Shadowing - Due to the close proximity of the Turbines to the Woodcock Hill radar, some shadowing will occur. A detailed previous assessment was completed by Cyrrus on the previous 18-turbine design. It was considered any shadowing would be minimal and be operationally tolerable. With the reduction in turbines to 9, it is assumed the shadowing would be no worse than the previous assessment and so remain operationally tolerable.

- Impact on Navigation Aids (NAVAIDS)

  - The Proposed Development will have no adverse effect on the Flight Inspection Procedures and procedures associated with the Runway 24 Instrument Landing Systems at Shannon Airport.

Residual Impact

The findings of the AIA concludes that with the assessment outcomes and mitigation measures, the residual effects are not significant.

Significance of Effects

Based on the assessment above there will be no significant effects.

15.2.3.4 Cumulative Effect

The potential cumulative impact of the Proposed Development and other relevant developments has been carried out with the purpose of identifying what influence the Proposed Development will have on the surrounding environment when considered cumulatively and in combination with relevant existing, permitted or proposed projects and plans in the area, in the vicinity of the Proposed Development site, as set out in Section 2.7 in Chapter 2 of this EIAR and Appendix 2-2.

The potential for cumulative effects with these nearby developments are not significant from the perspective of built services and waste management. On the basis of the assessment above, the Proposed Development will have no impact on built services and waste management. It is on this basis that it can be concluded that there would be a short-term imperceptible cumulative impact on built services and waste management from the Proposed Development and permitted or proposed projects and plans in the area as set out in Section 2.7 in Chapter 2 of this EIAR and Appendix 2-2.

The wind farms which are included in the aviation cumulative assessment are the proposed Oatfield Wind Farm, permitted Fahy Beg Wind Farm, permitted Carrownagowan Wind Farm, proposed Lackeragh Wind Farm and proposed Ballycar Wind Farm. Please refer to Section 3 of the AIA in Appendix 15-6 for further detail.

For Carrownagowan Wind Farm and Fahy Beg Wind Farm the Radar Safeguarding Assessments that were undertaken for these projects were conducted according to Eurocontrol guidelines. The IAA deemed there to be no adverse impact to the Woodcock Hill Radar. An IFP Safeguarding Assessment for both wind farms also showed no adverse impacts minimum surveillance vectoring altitudes.

For Lackareagh Wind Farm, no impacts on Instrument Flight Procedures or ATCSMAC Charts for Shannon Airport were reported and there are no adverse impacts to En-route Secondary Surveillance Radar facilities at Woodcock Hill.

For Ballycar Wind Farm, the IAA\AirNav did not raise any concerns in relation to Instrument Flight Procedures. While the IAA did raise a concern in relation to En-route Radar facilities at Woodcock Hill for Ballycar Wind Farm, it was concluded that there would be no cumulative effect on En-route Radar facilities.

On the basis of the assessment in the AIA, it is concluded that there will not be a cumulative effect on aviation from the Proposed Development and other permitted or proposed wind farms.