14. MATERIAL ASSETS

Material Assets are defined in the '*Advice Notes for Preparing Environmental Impact Statements'* (EPA, Draft 2015) as '*resources that are valued and that are intrinsic to specific places'*. They may be either of human or natural origin. The cultural assets of Archaeology and Cultural Heritage are addressed in Chapter 13 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: Water, and Chapter 10: Air and 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 14.1 Traffic and Transport) and on Telecommunications and Aviation (Section 14.2), which are economic assets of human origin.

14.1 Traffic and Transport

14.1.1 Introduction

14.1.1.1 Background and Objectives

The purpose of this section is to assess the effects, on roads and traffic, of the additional traffic movements that will be generated during the construction, operational and decommissioning phases of the proposed Curraglass Renewable Energy Development (Curraglass RED).

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 wind turbine plant. The requirements of the additional traffic and abnormal sized loads generated during the construction stage were assessed on both the external highway network and at the proposed 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 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 Regulations and therefore the loadings from construction traffic will not exceed the relevant standards. Notwithstanding the need to use some 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.

The magnitude of the increase in traffic volumes experienced on the surrounding network is identified during the various construction stages of the proposed development. Preliminary traffic management measures are also provided in Sections 14.1.7 and 14.1.10.6 aimed at minimising the traffic impact on the local highway network.

14.1.1.2 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 NUI 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, Knocknamork, Shehy More, Cloncreen, Derrykillew, Coole, Ballyhorgan, Cahermurphy, Lettergull, Barnadivane, Cleanrath and Knocknalough.

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.

14.1.1.3 Guidance and Legislation

This section of the EIAR has been completed in accordance with the 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.

14.1.1.4 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 Section 2.5 of Chapter 2 of the EIAR, and summarised below.

Transport Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to Scoping on the 19th December 2019 in which it provided a list of recommendations to be followed when preparing the EIAR.

All relevant TII guidelines and policies have been taken into account in the preparation of this assessment, including the following;

- 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, May 2019
- DN-GEO-03060, *Geometric Design of junctions,* Transport Infrastructure Ireland, April 2017
- TII Automatic Traffic Count Data, N22 Ballyvourney.

Cork County Council

A pre-planning meeting was held on the 17th February 2020 with the Planning Department of Cork County Council in relation to the Proposed Development prior to the submission of the current planning application on this site. The meetings were attended by representatives of the Planning Department, MKO and Wingleaf Ltd.

At the meeting, the proposed haul route and site entrance were outlined by MKO and Wingleaf Ltd. Any issues raised by Cork County Council in respect to the proposals were considered in the design of the Proposed Development.

14.1.1.5 Methodology and Section Structure

The traffic and transport assessment takes cognisance of 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 Traffic and Transport Section of this chapter is set out as follows:

- A review of the existing and future transport infrastructure in the vicinity of the Proposed Development, including an assessment of available traffic counts and traffic forecasts during an assumed construction year of 2024 (Sections 14.1.2 - Receiving Environment and 14.1.3 – 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 14.1.4 – Proposed Development and Traffic Generation).
- A description of the abnormally sized large loads and vehicles that will require access to the site (Section 14.1.5 – Construction Traffic Design Vehicles).
- A review of the effects of development generated traffic on links and junctions during construction and when the facility is operational (Section 14.1.6 –Traffic effects during construction and during operation).
- Identification of traffic management for large deliveries during construction (Section 14.1.7 – Traffic Management for Large Deliveries).
- A geometric assessment of the route and its capacity to accommodate the abnormal-sized loads associated with the development (Section 14.1.8 – 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 14.1.9 – Provision for Sustainable Modes of Travel).

The description of likely significant effects is provided in Section 14.1.10.

14.1.2 Receiving Environment

14.1.2.1 Site Location

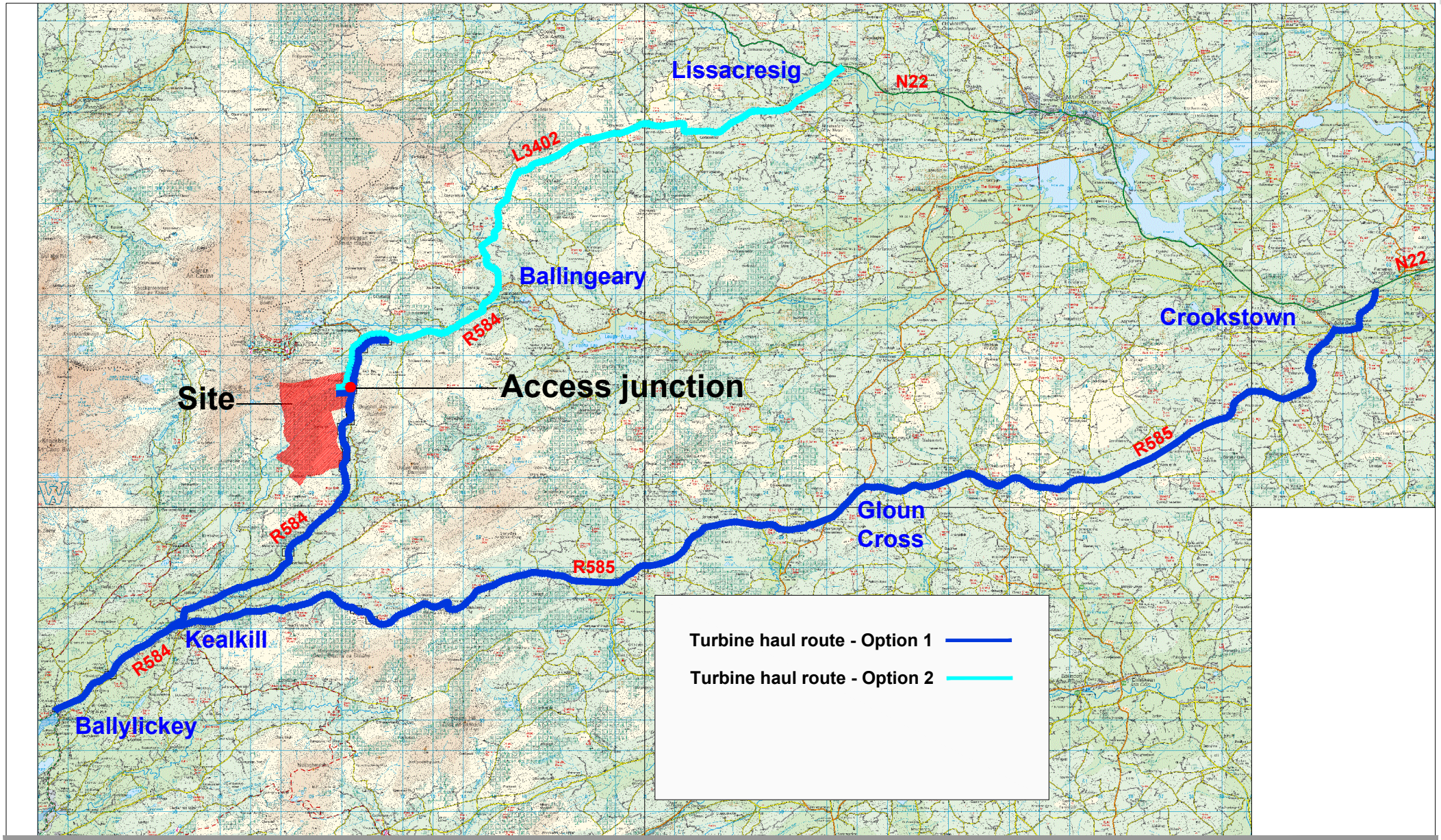
The proposed Curraglass Renewable Energy Development will be located in the townlands of Derreendonee, Curraglass and Cappaboy Beg in County Cork. The site is situated on the west of the Regional R584 Road, approximately 5.6 kms northeast of Kealkill and 5.5kms southwest of Ballingeary. The full project description is detailed in Chapter 1, Section 1.4. The site location is shown on Figure 14-1.

14.1.2.2 Proposed Abnormal Size Load Delivery Route

A detailed assessment of the proposed haul route for the abnormally sized loads was made from a point at which the route turns off the N22 to the north of Crookstown. The routes considered are shown in Figure 14-1 with the preferred option discussed in detail in Section 14.1.8.

Option 1 is the preferred delivery route for abnormal sized loads. The route assessment is confined to the haul route commencing with the left turn from the N22 onto the R585 to the northeast of Crookstown. The route then passes through the village of Crookstown and turns sharp left out of the village following the R585 in a southern direction. The route then heads west on the R585 for approximately 42 kms to the village of Kealkill, passing through the villages/settlements of Bealnablath, Cappeen, Gloun, Shanlaragh on the way. From Kealkill the route heads southwest on the R584 for approximately 5.5 kms, crossing Pearson's Bridge over the River Owvane to the reach the coast at the village of Ballylickey. The abnormally large loads will undertake a reversing maneuver to the east of the village at the junction of the R584 and the N71, before heading back up the R584 to Kealkill. At Kealkill the route then forks left travelling northeast on the R584 for approximately 11kms crossing the bridge at Carriganass Castle towards the site access on the R584. The abnormally sized loads will then continue on the R584 past the proposed access for approximately 2 kms, before making a reversing manoeuvre onto an existing track. The vehicles will then travel in a southwest direction back towards the existing Coillte site entrance, where they will turn right into the site. The locations of the potential pinch points on the haul route, together with the location of the proposed access junction, are discussed in Section 14.1.8, and shown in Figure 14-2a.

A second route, Option 2, also shown in Figure 14-1, was also considered for delivery of abnormal sized loads. This route turns off the N22 at Lisacressig and travels southwest on the L3402 for approximately 17 kms to the village of Ballingeary. At the northern end of the village the route turns onto the R584



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-1 Site location and delivery routes

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: NTS
PROJECT NO: 8010	DATE: 05.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

crossing 2 bridges while passing through the village. The route then continues in a southwestern direction for approximately 7km towards the existing site entrance.

As noted in Chapter 4, the turbine delivery route option chosen for the delivery of turbine components will be determined by the specialist transport haulier that is chosen by the turbine manufacturer. All deliveries of turbine components to the site of the Proposed Development will only be by way of the chosen transport route option. Depending on the route selected a detailed delivery assessment and program will be carried out by the turbine delivery company and a similar methodology will be adopted as set out here to ensure the findings of this assessment remain valid for whatever model of turbine is selected.

14.1.2.3 Proposed Construction Traffic Haul Route

The delivery route for general HGV construction traffic may vary depending on the location of the suppliers of concrete and other general construction materials required to construct the Proposed Development.

Based on the cement and other suppliers in the vicinity of the Proposed Development it is estimated that the following proportion of concrete and general construction traffic will travel on the following links;

- R584 from the north – up to 100%,
- R584 from the south – up to 100%
- R585 from the east – up to 100%
- N22 – up to 100%

For the purpose of this assessment it is assumed that deliveries of smaller component parts for the wind turbines, will travel to the site via the N22 turning off at Lisacressig and travelling to the site via Ballingeary as per Option 2 shown in Figure 14-1, as this is the shortest and more direct route. In practice, the delivery route for these component parts could change but as the associated traffic volumes are low, as established in Section 14.1.4 of this EIAR, the impacts will be minimal regardless of the route selected.

The assessment presented in this section of the EIAR is based on these worst-case assumptions.

14.1.2.4 Site Entrance

The site will be accessed from one access junction located on the western side of the R584 with the location shown in Figure 14-2a. The proposed junction is at the location of an existing forestry access and will provide for all traffic movements generated during the construction of the Proposed Development and for maintenance staff when operational. Works will be required at this location in order to accommodate access and egress of turbine vehicles and general construction traffic, with the proposed layout discussed in Section 14.1.8.

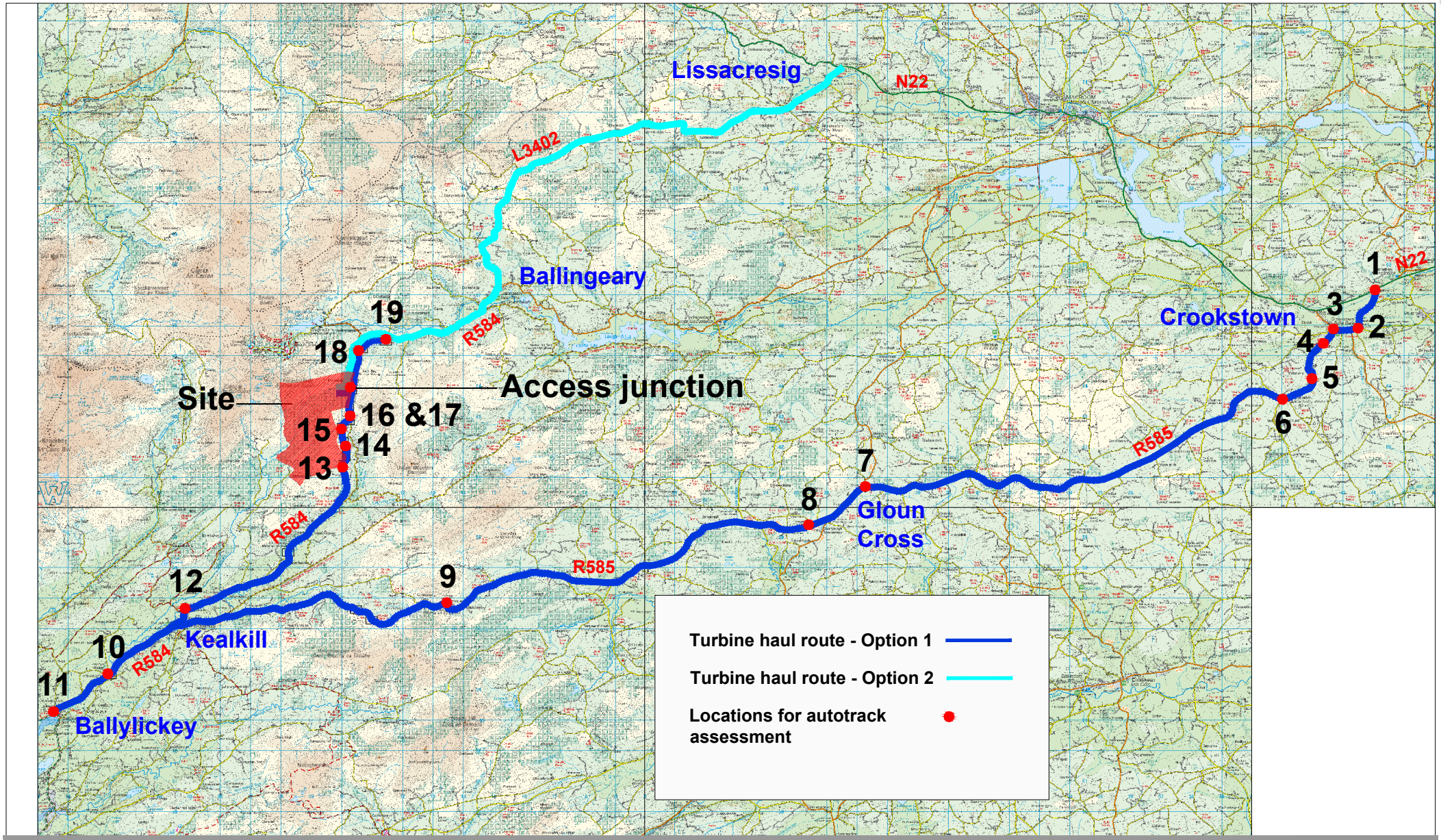
14.1.3 Existing Traffic Volumes

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. For example, an articulated HGV was 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 wind turbine equipment was assigned a value of 10.

14.1.3.1 Background Traffic Flows

The link count locations included in the assessment are shown in Figure 14-2b.

It is noted from the outset that due to travel restrictions in place for the Covid-19 virus, the collection of year 2020 traffic counts was not possible. Where available, historic traffic count data available on the delivery route from previous assessments were used (from 2013). This applies to data used for the N22,



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-2a Route assessment location plan

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	NTS
PROJECT NO: 8010	DATE: 05.06.20	DRAWN BY:	AL

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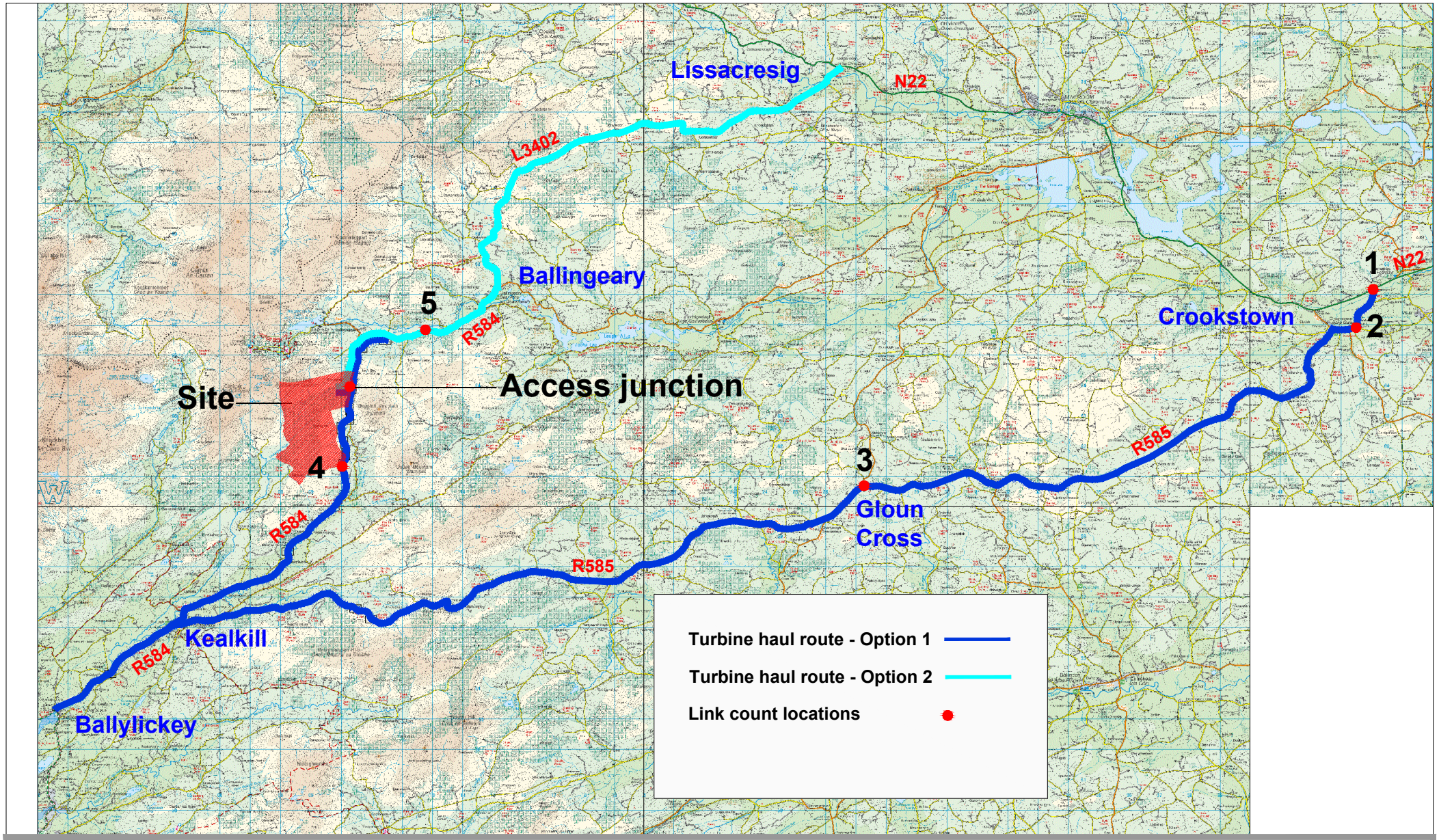

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-2b Link count locations

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	NTS
PROJECT NO: 8010	DATE: 05.06.20	DRAWN BY:	AL

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TRAFFIC & TRANSPORT CONSULTANTS

at Castlemore and the R585 at Crookstown and Gloun. There was no data available for the R584 leading towards the site, so a figure similar to that observed on the R585 at Gloun was assumed.

A continuous traffic counter is maintained by TII on the N22 at Ballyvourney. Traffic data from this site together with short period traffic counts undertaken in 2013 at various locations on the haul route (locations 1, 2 and 3 shown in Figure 14-2b) were used to provide background traffic volumes on the local public road network.

The short period counts were factored to all day using daily flow profiles established from the continuous traffic counter site on the N22. The short period counts, daily factors and all day flows for 2013 are set out in Table 14-1.

Base year 2013 traffic volumes for the 3 link locations shown in Figure 14-2b range from 2,950 on the R585 at Gloun, to 14,163 on the N22 at Castlemore.

Table 14-1 Observed hourly flow, all day factor, Average all day flows, year 2013 (2-way vehicles)

Link	2-way flow	hour	All day factor	All day flow
1 N22 at Castlemore	861	11:00 – 12:00	16.45	14,163
2 R585 north of Crookstown	201	11:00 – 12:00	16.45	3,306
3 R585 at Gloun	198	14:00 – 15:00	14.90	2,950

14.1.3.2 Future Background Traffic Volumes

This section describes the process adopted to produce background traffic forecasts for an assumed construction year of 2024.

The first step involved factoring the 2013 daily flows to 2019, which was done using the observed data from the N22 traffic counter site, from which it was established that traffic increased by 10.3% between the years 2013 and 2019.

Revised guidelines for forecasting annual growth in traffic volumes were produced by TII in May 2019, as set out by county in the '*Project Appraisal Guidelines for National Roads* (Unit 5.3)'. The annual growth rates for light vehicles for the County, and factors for the years relevant to this study, are shown in Table 14-2 and Table 14-3. Traffic volumes are forecast to increase during the period from 2019 to 2024 by 9.8%, assuming a medium growth scenario. All day traffic flows, for the years 2013, 2019 and 2024, on the study area network are compared in Table 14-4.

It should be noted that while the assumed construction year of 2024 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 1.9% (as shown in Table 14-2) and the traffic volumes generated by the Proposed Development will remain unchanged regardless of construction year, as presented subsequently in Section 14.1.4.

Table 14-2 TII Traffic Growth Annual Factors and Indices for County Cork

Year	Lights – Annual Factor			Lights – Cumulative Index		
	Low	Medium	High	Low	Medium	High
2019	1.0173	1.0189	1.0223	1.000	1.000	1.000
2020	1.0173	1.0189	1.0223	1.017	1.019	1.022

Year	Lights – Annual Factor			Lights – Cumulative Index		
	Low	Medium	High	Low	Medium	High
2021	1.0173	1.0189	1.0223	1.035	1.038	1.045
2022	1.0173	1.0189	1.0223	1.053	1.058	1.068
2023	1.0173	1.0189	1.0223	1.071	1.078	1.092
2024	1.0173	1.0189	1.0223	1.090	1.098	1.117

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

Table 14-3 TII traffic growth rates by growth scenario

Period	New Factors		
	Low	Medium	High
2019 – 2024	1.090	1.098	1.117

Table 14-4 Average all day flows by location and year (2-way vehicles)

Link	2013	2019	2024
1 N22 at Castlemore	14,163	15,622	17,153
2 R585 north of Crookstown	3,306	3,647	4,004
3 R585 at Gloun	1,425	1,572	1,726
4 R584 south of site	1,500	1,655	1,817
5 R584 north of site	1,500	1,655	1,817

The TII traffic count data recorded on the N22 was also used to determine the existing percentage of HGVs on the study area network which was observed to be 5.3%. Traffic volumes forecast on the study network for the year 2024 are shown by vehicle type in Table 14-5.

Table 14-5 All day flows, percentage HGVs and flows by vehicle type, year 2024

Link	All day flow (vehs)	% HGV's	Vehicles		PCUs		
			HGVs	Cars / lgvs	HGVs	Cars / lgvs	Total
1 N22 at Castlemore	17,153	5.3%	909	16,244	2,182	16,244	18,426
2 R585 north of Crookstown	4,004	5.3%	212	3,792	509	3,792	4,302
3 R585 at Gloun	1,726	5.3%	91	1,634	220	1,634	1,854
4 R584 south of site	1,817	5.3%	96	1,720	231	1,720	1,951

Link	All day flow (vehs)	% HGV's	Vehicles		PCUs		
			HGVs	Cars / lgvs	HGVs	Cars / lgvs	Total
5 R584 north of site	1,817	5.3%	96	1,720	231	1,720	1,951

14.1.4 Proposed Development and Traffic Generation

14.1.4.1 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, and,
- Stage 2 – Turbine component delivery.

For the purpose of the traffic impact assessment, assumptions based on typical wind farm construction projects regarding the length of the construction phases and work periods etc. must be made to inform the assessment. These assumptions allow for a worst-case scenario 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 CEMP, which is submitted as Appendix 4-3 of this EIAR. The CEMP will be agreed with the Local Authority prior to construction commencing.

14.1.4.1.1 *Stage 1 – Site Preparation and Ground Works*

The construction phase of the Proposed Development is expected to last between 12 to 18 months. A period of 12 months was assumed for the purpose of this assessment in order to test the worst-case scenario in terms of traffic volumes per day. For assessment purposes a standard 255 working days per annum was adopted for the site preparation and ground works stage with the total numbers of deliveries made to the site during that period shown in Table 14-6.

During this construction phase, there will be two distinct types of days with respect to trip generation. A total of 7 days will be used to pour the 7 concrete wind turbine foundations. Foundations will likely be poured one per day, with an estimated 60 concrete loads required for each turbine foundation delivered to the site over a 12-hour period. This will result in 5 HGV trips to and from the site per hour. On the remaining 248 working days for this stage, other general materials will be delivered to the site.

During all of Stage 1, based on trip rates typical of wind farm projects, it is estimated that 2,056 two-way trips will be made to the site by trucks and large articulated HGVs, as set out in Table 14-6, with the daily effect on the local road network shown in Tables 14-7 and 14-8. The figures show that on the 7 days that concrete will be delivered to the site an additional 288 two-way PCUs will travel on the network (comprising 60 two-way HGV trips or 120 movements, with 2.4 PCUs per movement), as shown in Table 14-7. Similarly, on the 248 days when other materials will be delivered to the site, traffic volumes on the local network are forecast to increase by an average of 32 PCUs, as set out in Table 14-8.

Table 14-6 Stage 1 – Site preparation and groundworks – total movements

Material	Total no. Truck Loads	Truck type
Concrete	420	Trucks
Delivery of plant	49	Large artic
Fencing and gates	2	Large artic

Compound setup	28	Large artic
Steel	18	Large artic
Ducting and cabling (internal)	167	Large artic
Tree felling	413	Large artic
Crane (to lift steel)	1	Large artic
Road construction	536	Truck
Substation	90	Large artic
Cranes for turbine	12	Large artic
Re-fueling for plant	145	Large artic
Site maintenance	105	Large artic
Miscellaneous	70	Large artic
Total	**2,056**	

Table 14-7 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	420	Truck	2.4	1,008	144.0	288.0
* Estimation based on 7 concrete pouring days						

Table 14-8 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	49	Large artic	2.4	118	0.5	0.9
Fencing and gates	2	Large artic	2.4	5	0.0	0.0
Compound setup	28	Large artic	2.4	67	0.3	0.5
Steel	18	Large artic	2.4	42	0.2	0.3

Material	Total Truck Loads	Truck type	PCU Value	Total PCUs	PCU Movements /day*	2- way PCUs/day
Ducting and cabling (internal)	167	Large artic	2.4	402	1.6	3.2
Tree felling	413	Large artic	2.4	991	4.0	8.0
Crane (to lift steel)	1	Large artic	2.4	3	0	0.0
Road construction	536	Truck	2.4	1,287	5.2	10.4
Substation	90	Large artic	2.4	216	0.9	1.7
Cranes for turbine	12	Large artic	2.4	29	0.1	0.2
Re-fueling for plant	145	Large artic	2.4	348	1.4	2.8
Site maintenance	105	Large artic	2.4	252	1.0	2.0
Miscellaneous	70	Large artic	2.4	168	0.7	1.4
Total	**1,636**			**3,926**	**15.8**	**31.7**

** Estimation based on groundwork period of 248 working days*

14.1.4.1.2 *Stage 2 – Turbine Construction*

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 14-9, which summarises that a total of 56 trips will be made to and from the site by extended artics, with a further 28 trips made by conventional large articulated HGVs.

Table 14-9 Stage 2 – Wind turbine plant – total movements

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Nacelle	7	1	7	1	7	Extended Artic
Blades	7	3	21	1	21	Extended Artic
Towers	7	4	28	1	28	Extended Artic
Sub total					***56***	

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Transformer	7	1	7	1	7	Large Artic
Drive train and blade hub	7	1	7	1	7	Large Artic
Base and other deliveries	7	2	14	1	14	Large Artic
Sub total					*28*	
Total					84	

For the purposes of this assessment an assumed delivery period is provided although this may be subject to change. It is assumed that the turbine delivery element will progress at the rate of 3 extended artic trips made by convoy to the site on 2 days per week, resulting in this stage taking approximately 19 days/nights spread over an assumed 10-week period. On a further two days per week, lasting for approximately 4 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 Tables 14-10 and Table 14-11. In Table 14-10, a PCU equivalent value of 10 was allocated to each extended artic movement, resulting in an additional 60 PCUs on the study network on these 2 days per week, while an additional 19 PCUs are forecast to be on the network on two other days per week, as shown in Table 14-11, during the turbine construction phase.

Table 14-10 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	3			30.0	60.0
*Estimation based on 3 abnormal sized loads being delivered per day on 2 days per week (total 56 loads will take 19 nights spread over 10 weeks)					

Table 14-11 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	3		19.2

**Estimation based on equipment for 2 turbines being moved per week spread over 2 days*

14.1.4.1.3 *Construction Employee Traffic*

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 45 staff at any one time during the turbine construction stage. If a worst case is assumed that all staff will travel to / from the site by car, at an average of 2 persons per car, then a total of 70 PCU movements (each trip is two way) will be added to the network during the groundworks stage of the development, reducing to 45 pcu trips during the turbine construction stage.

14.1.4.2 Development Trip Generation – During Operation

It is assumed that the Proposed Development will be unmanned once operational and will be remotely monitored. Traffic associated with the operational phase of the wind farm will be from the wind farm developers, ESB personnel visiting the substation, and maintenance personnel who will visit individual turbines.

It is estimated that the traffic volumes that will be generated by the development once it is operational will be minimal. The site will be unmanned but will generate maintenance trips, with approximately two maintenance staff travelling to site at any one time. The impact on the network of these trips during the operational stage is discussed in Section 14.1.6.

14.1.5 Construction Traffic Design Vehicles

14.1.5.1 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 58.5m long have been considered for the purpose of this assessment.

The actual turbine to be installed on the site will be the subject of a competitive tender process, and could include turbines not amongst those originally considered as part of this assessment because they are not yet available on the market. Regardless of the make or model of the turbine eventually selected for installation on site, a detailed delivery assessment and program will be carried out by the turbine delivery company and a similar methodology will be adopted as set out here to ensure the findings of this assessment remain valid for whatever model of turbine is selected. Any references to the turbine dimensions in the text below must be considered in the context of the above and should not be construed as meaning it predetermines the dimensions of any wind turbine that could be used on the site.

The key dimensions are as follows:

Transport of Blades – Super Wing Carrier with blade

Total length	64.0 m
Length of blade	58.5 m
Inner radius	28.0 m

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

Total length (with load)	46.7 m
Length of load	30.0 m
Inner radius	25.0 m

The critical vehicles in terms of size and turning geometry requirements, and used in the detailed route assessment discussed in Section 14.1.8, are the blade and tower transporters. The geometry of the design vehicles are included as Figures 14-4 and 14-5.

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

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

14.1.6 Traffic Effects During Construction and During Operation

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

Effect on Link Flows – During Construction

Background traffic volumes, as established previously and set out in Table 14-5, and development generated traffic volumes, are shown for the typical construction day scenarios discussed in Section 14.1.4 and are set out in Table 14-12 to 14-15, with the traffic effects summarised in Table 14-16 to 14-19. The actual figures presented in the tables will be subject to change, however they are considered to represent a robust estimation of the likely effects.

In terms of daily traffic flows the potential effects may be summarised as follows:

During Stage 1 – Concrete Pouring

For these 7 days an additional 358 PCUs will travel on the study network. On these days, the percentage increase in traffic volumes experienced on the study network will be between +1.8% on the N22, to +19.3% on the R585 and +18.3% on the R584 approaching the site.

During Stage 1 - Site Preparation and Groundworks

On average an additional 102 PCUs will travel on the local highway network during these 248 days. This will result in a percentage increase in traffic volumes on the study network of between +0.6% on the N22, to +5.5% on the N585, and +5.2% on the R584 approaching the site.

During Stage 2 - Turbine Construction Stage – Delivery of large equipment using extended articulated vehicles

The additional 105 PCUs (made up of cars and large extended artics) will appear on the study network for 19 nights. On the nights this impact occurs, volumes will increase by +0.6% on the N22, +5.7% on the R585 and +5.4% on the R584 leading to the site.

The most significant traffic impact may be experienced during these days 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 set out in Sections 14.1.7 and

14.1.10.6 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

For 7 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 be +0.3% on the N22, +3.5% on the R585 and +3.3% on the R584.

Table 14-12 Effects of development traffic during concrete pouring

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 at Castlemore	16,244	2,182	18,426	70	288	358	16,314	2,470	18,784
2 R585 north of Crookstown	3,792	509	4,302	70	288	358	3,862	797	4,660
3 R585 at Gloun	1,634	220	1,854	70	288	358	1,704	508	2,212
4 R584 south of site	1,720	231	1,951	70	288	358	1,790	519	2,309
5 R584 north of site	1,720	231	1,951	70	288	358	1,790	519	2,309

Table 14-13 Development traffic during site preparation and groundworks

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 at Castlemore	16,244	2,182	18,426	70	32	102	16,314	2,214	18,528
2 R585 north of Crookstown	3,792	509	4,302	70	32	102	3,862	541	4,404
3 R585 at Gloun	1,634	220	1,854	70	32	102	1,704	252	1,956
4 R584 south of site	1,720	231	1,951	70	32	102	1,790	263	2,053
5 R585 north of site	1,720	231	1,951	70	32	102	1,790	263	2,053

Table 14-14 Development traffic during turbine construction - extended artics (large turbine components)

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 N22 at Castlemore	16,244	2,182	18,426	45	60	105	16,289	2,242	18,531
2 R585 north of Crookstown	3,792	509	4,302	45	60	105	3,837	569	4,407
3 R585 at Gloun	1,634	220	1,854	45	60	105	1,679	280	1,959
4 R584 south of site	1,720	231	1,951	45	60	105	1,765	291	2,056
5 R585 north of site	1,720	231	1,951	45	60	105	1,765	291	2,056

Table 14-15 Effect of development traffic during turbine construction – other deliveries (small turbine components)

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 at Castlemore	16,244	2,182	18,426	45	19	64	16,289	2,201	18,490
2 R585 north of Crookstown	3,792	509	4,302	45	19	64	3,837	528	4,366
3 R585 at Gloun	1,634	220	1,854	45	19	64	1,679	239	1,918
4 R584 south of site	1,720	231	1,951	45	19	64	1,765	250	2,015
5 R585 north of site	1,720	231	1,951	45	19	64	1,765	250	2,015

Table 14-16 Summary effect of development traffic during concrete pouring

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 at Castlemore	18,426	358	18,784	1.9%	7
2 R585 north of Crookstown	4,302	358	4,660	8.3%	7
3 R585 at Gloun	1,854	358	2,212	19.3%	7
4 R584 south of site	1,951	358	2,309	18.3%	7
5 R584 north of site	1,951	358	2,309	18.3%	7

Table 14-17 Summary effect of development traffic during site preparation and ground works

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 at Castlemore	18,426	102	18,528	0.6%	248
2 R585 north of Crookstown	4,302	102	4,404	2.4%	248
3 R585 at Gloun	1,854	102	1,956	5.5%	248
4 R584 south of site	1,951	102	2,053	5.2%	248
5 R584 north of site	1,951	102	2,053	5.2%	248

Table 14-18 Summary effect of development traffic during turbine construction – extended artics (large turbine components)

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 at Castlemore	18,426	105	18,531	0.6%	19
2 R585 north of Crookstown	4,302	105	4,407	2.4%	19
3 R585 at Gloun	1,854	105	1,959	5.7%	19
4 R584 south of site	1,951	105	2,056	5.4%	19
5 R584 north of site	1,951	105	2,056	5.4%	19

Table 14-19 Summary effect of development traffic during turbine construction – other deliveries (small turbine components)

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 at Castlemore	18,426	64	18,490	0.3%	7
2 R585 north of Crookstown	4,302	64	4,366	1.5%	7
3 R585 at Gloun	1,854	64	1,918	3.5%	7
4 R584 south of site	1,951	64	2,015	3.3%	7
5 R584 north of site	1,951	64	2,015	3.3%	0

An assessment of the impact on link capacities in the study area was undertaken for the various construction stages as set out in Table 14-20, Table 14-21 and Table 14-22. The capacity for each link in

the study area is shown in Table 14-20. The capacities range from a daily flow of 11,600 vehicles on the N22 in the direction of Birr down to 5,000 on the R585 and R584, and are based on road widths and capacities set out in the TII Standards document DN-GEO-03031 Road Link Design, Table 6/1.

Background, or do-nothing traffic flows, are compared to flows forecast for the various construction delivery stages in Table 14-21 with the percentage capacity reached for each link and stage shown in Table 14-22. Based on this assessment the following points are noted;

- On the external network the N22 is the busiest road with the link capacity forecast to operate at 159% for the do-nothing scenario, increasing to a maximum of 162% during the 7 days that the concrete foundations will be poured. During the construction period, although it is likely that concrete deliveries to the site will come from facilities closer to the site, deliveries may also make use of the N22. All these options have been included in the assessment.
- All other sections of the haul routes are forecast to operate within capacity for the duration of the construction period.

Table 14-20 Carriageway widths, link type and link capacity

Link	Width (m)	Link type	Link capacity
1 N22 at Castlemore	7.0	Type 1 single	11,600
2 R585 north of Crookstown	6.0	Type 3 single	5,000
3 R585 at Gloun	6.0	Type 3 single	5,000
4 R584 south of site	6.0	Type 3 single	5,000
5 R584 north of site	6.0	Type 3 single	5,000

Table 14-21 Link capacity and summary of link flows by construction delivery stage

Link	Link capacity	Construction delivery stage				
		Background traffic	Concrete pour	Other site works	Turbine plant	Turbine equipment
1 N22 at Castlemore	11,600	18,426	18,784	18,528	18,531	18,490
2 R585 north of Crookstown	5,000	4,302	4,660	4,404	4,407	4,366
3 R585 at Gloun	5,000	1,854	2,212	1,956	1,959	1,918
4 R584 south of site	5,000	1,951	2,309	2,053	2,056	2,015
5 R585 north of site	5,000	1,951	2,309	2,053	2,056	2,015

Table 14-22 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 N22 at Castlemore	11,600	159%	162%	160%	160%	159%
2 R585 north of Crookstown	5,000	86%	93%	88%	88%	87%
3 R585 at Gloun	5,000	37%	44%	39%	39%	38%
4 R584 south of site	5,000	39%	46%	41%	41%	40%
5 R584 north of site	5,000	39%	46%	41%	41%	40%

Substation Construction

It is assumed that the construction of the substation will take place at the same time as the site preparation and groundworks stage, as set out in Table 14-6 and Table 14-7, with traffic effects included in the assessment for that construction period.

Effect on Link Flows – During Operation

Once the Proposed Development is operational, it is estimated that there will be approximately two maintenance staff will access the site at any particular time, to carry out operational maintenance, with a similar number of vehicle trips. It is considered that the traffic impact during this phase will be imperceptible.

Effect on Junctions – During Construction

The capacity of the proposed access junction on the R584 was assessed using the industry standard junction simulation software PICADY, which permits the capacity of any 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 and as set out in Table 14-16 to 14-20 above, 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.

R584 access junction Capacity Test Results

The AM and PM peak hour traffic flows through the R584 access junction are shown for the year 2024 in Figure 14-3a with traffic flows generated by the Proposed Development during the AM and PM peak hours set out in Figure 14-3b. Year 2024 traffic flows with development generated traffic are shown in Figure 14-3c.

The results of the capacity assessment, as set out in Table 14-23, show that additional car trips passing through the junction will have a slight effect on existing traffic at this location, with a maximum ratio of flow to capacity (RFC) at the junction forecast to be 3.6% for traffic turning into the site during the AM peak hour, and 7.8% during the PM peak hour for traffic exiting the site. These are within the acceptable limit of 85%.

Table 14-23 Junction capacity test results, R584 /development access junction, AM and PM peak hours, with construction staff, year 2024

Year	Location	AM peak hour			PM peak hour		
2024		RFC	Queue (vehicles)	Delay (minutes)	RFC	Queue (vehicles)	Delay (minutes)
	From Proposed Development	0.0%	0.0	0.0	7.8%	0.08	0.13
	Right turn into Proposed Development	3.6%	0.04	0.04	0.0%	0.00	0.00

Effect on Junctions – During Operation

As discussed in Section 14.1.6 it is forecast that once operational, the Proposed Development will generate approximately 2 trips per day for maintenance purposes. It is therefore concluded that the Proposed Development will not have a significant effect on the local network once constructed.

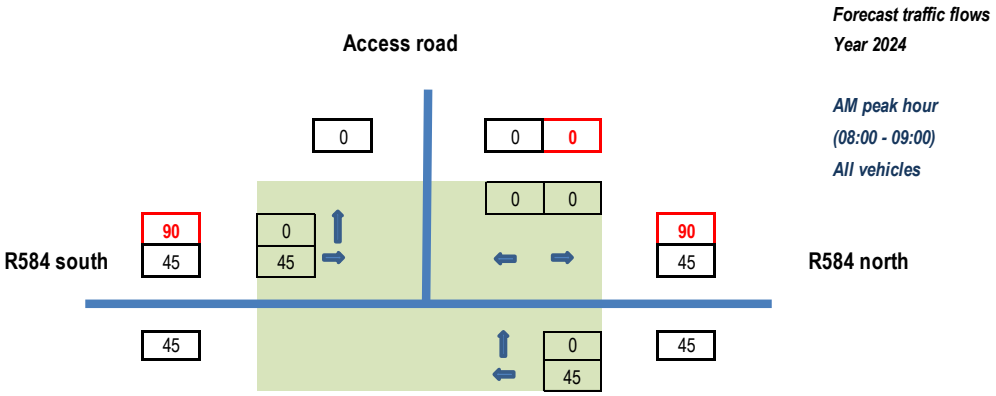
14.1.7 Traffic Management of Large Deliveries

The greatest effect on the road network will likely be experienced on the approximately 19 days/nights during which the 3 large loads comprising the tower sections, the blades and the nacelles are delivered to the site.

Traffic management measures are included in Section 14.1.10.6 and include the following:

- Identification of a delivery schedule,
- Details of the alterations required to the infrastructure identified in Section 14.1.8 of this report and any other minor alteration identified (hedge rows etc),
- 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 often transported at night when traffic is lightest and this is done in consultation with the roads authorities / An Garda Síochána and special permits are generally required.



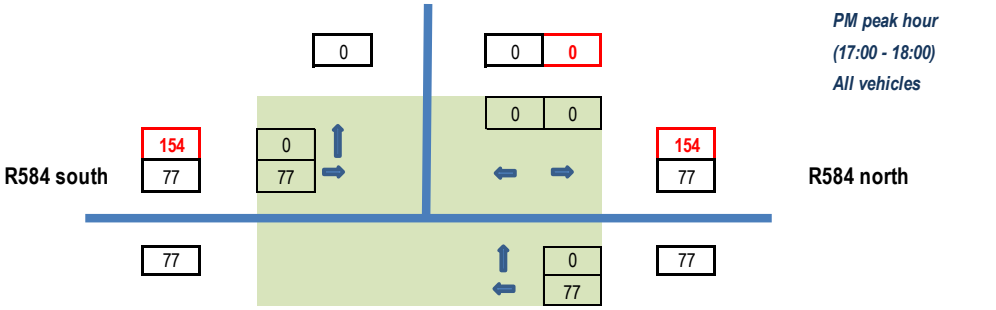


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Figure 14-3a Forecast background traffic flows, AM & PM peak hours, Access junction on R584, Yesr 2024 - All vehicles

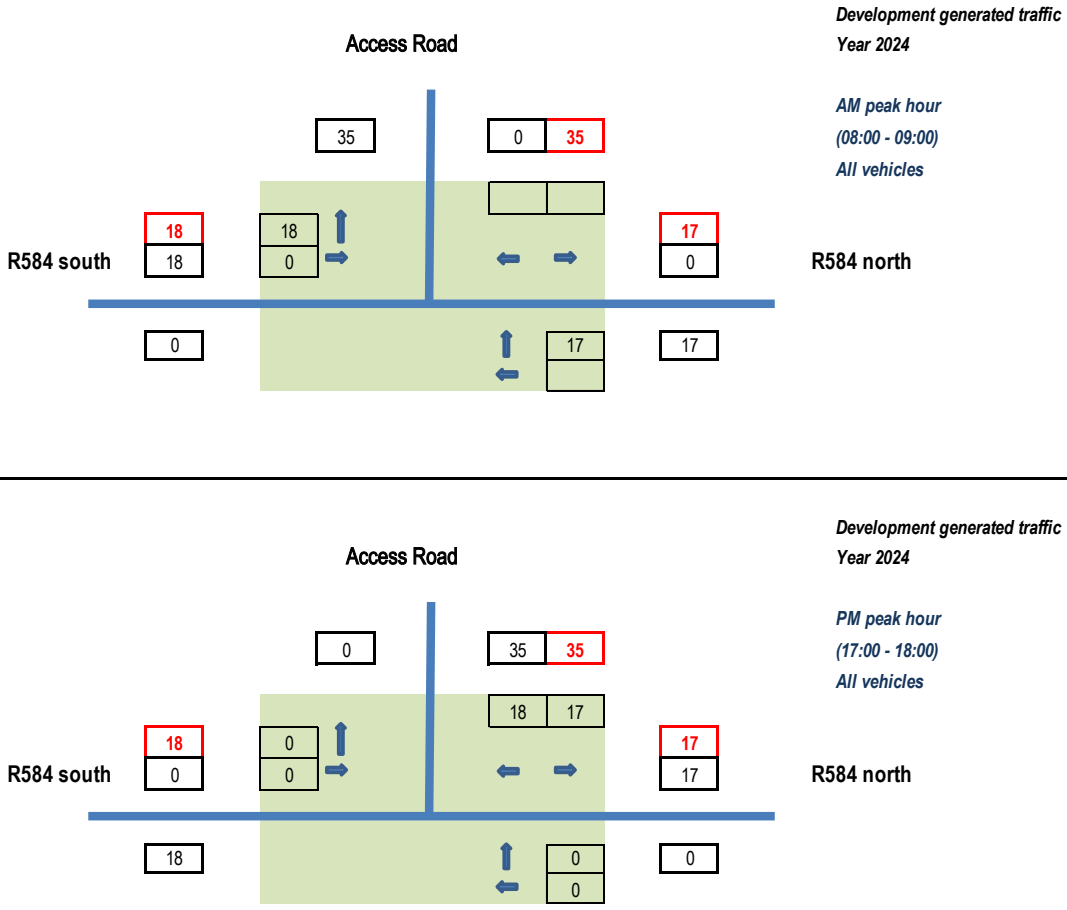

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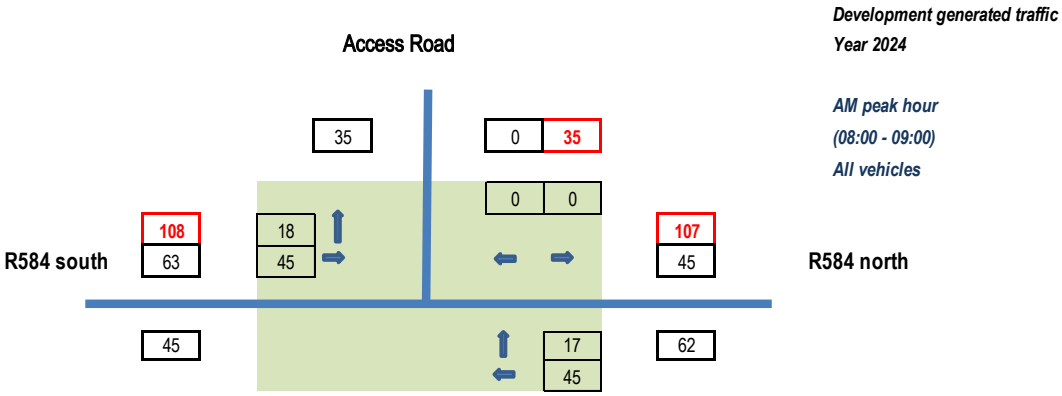
Figure 14-3b Forecast background traffic flows, AM & PM peak hours, Access junction on R584, Yesr 2024 - All vehicles



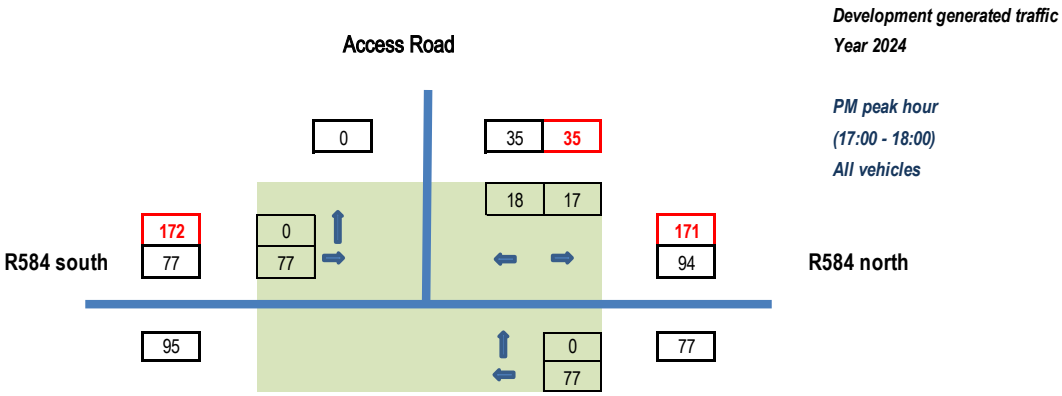


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Figure 14-3c With development traffic flows, AM & PM peak hours, Access junction on R584, Yesr 2024 - All vehicles

In some cases, temporary accommodation works are required along the turbine delivery route (TDR) such as hedge or tree cutting, temporary relocation of powerlines/poles, lampposts, signage and minor road verge works. Any updates to the road will be carried out in advance of turbine deliveries and following consultation and agreement with the appropriate local authorities.

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. During these periods, it may be appropriate to operate local diversions for through traffic. The effect of this stage may be minimised by the deliveries of the abnormally sized large loads taking place during the night. It is noted that it is proposed that all deliveries of abnormally sized loads will be made during night time hours, as is the norm for such deliveries.

14.1.8 Route Assessment

Two turbine delivery routes were considered for the Proposed Development as detailed in Section 14.1.2.2. The following assessment relates to the preferred route Option 1.

14.1.8.1 Route Option 1

A route assessment was undertaken covering the proposed delivery route for the abnormal loads, with the route and assessment locations shown in Figure 14-2a. For these locations, preliminary road and junction alignments, based on OS mapping, were supplied by the project team. A preliminary swept path analysis was then undertaken using Autotrack in order to establish the locations where the wind turbine transport vehicles will be accommodated, and the locations where some form of remedial measure may be required. In line with best practice, it is recommended to carry out a dry-run assessment prior to construction.

The assessment also presents the preliminary design of the proposed site access junction off the R584, and the autotrack assessment for the appropriate vehicle types relevant to each access.

The locations discussed are as follows;

- Location 1 – N22 / R585 junction at Castlemore
- Location 2 – Right turn on R585 at Crookstown
- Location 3 – Left turn at R585 / R590 junction at Crookstown
- Location 4 – Bend on R585
- Location 5 – Series of bend on R585
- Location 6 – R585 through Bealnablath
- Location 7 – Bend on R585 at Gloun Cross
- Location 8 – Bend on R585 at Shanlaragh
- Location 9 – Bend on R585 at Cousane Gap
- Location 10 – Bend on R584 at Pearson's Bridge
- Location 11 – Turn on R584 at Ballylickey Bridge
- Location 12 – Bridge on R584 at Carriganass Castle
- Locations 13, 14, 15, 16, 17 and 18 – bends on R584
- Location 19 – Reverse turn on R584
- Location 20 – Access Junction on R584

Location 1 – N22 / R585 junction

See Figures 14-6 and 14-7

The swept path analysis undertaken for this location indicates that the large turbine vehicles will be able to negotiate this junction.

Location 2 – Right turn R585 in Crookstown

See Figures 14-8 and 14-9

The swept path analysis undertaken for this location shows that the blade tail will need to over-sail the field to the northeast of the junction in order for the blade transporter to negotiate the bend.

Location 3 – Left turn at R585 / R590 junction at Crookstown

See Figures 14-10 and 14-11

The figures show that a section of the site on the south-eastern corner of the junction will be required for oversail for the blade transport vehicle to make this turn. An over-sail of the blade tip on the northern side of the road will also be required.

Location 4 – Bend on R585

See Figures 14-12 and 14-13

The preliminary swept path analysis indicates that the wind farm turbine vehicles will be able to negotiate this bend.

Location 5 – Series of bends on R585

See Figures 14-14a, 14-14b, 14-15a and 14-15b

The analyses shown in these figures indicate that temporary local road widening will be required at this series of bends in order to accommodate the wind turbine vehicles. It is noted that at the time of preparing this section of the EIAR local road works and tree felling along the verge have being undertaken for the purpose of the delivery of similar sized turbine component for a wind farm under construction.

Location 6 – R585 through Bealnablath

See Figures 14-16 and 14-17

The figures show that over-sail of the blade will be required into the field on the southern side of the R585.

Location 7 – Bend on R585 at Gloun Cross

See Figures 14-18 and 14-19

The figures show that over-sail of the blade will be required into the field on the northern side of the R585.

Location 8 – Bend on R585 at Shanlaragh

See Figures 14-20 and 14-21

The figures show that over-sail of the blade will be required into the field on the northern side of the R585.

Location 9 – Bends on R585 at Cousane Gap

See Figures 14-22a, 14-22b, 14-23a and 14-23b

The analysis shown in these figures indicates that temporary local road margin strengthening will likely be required at this series of bends in order to accommodate the wind turbine vehicles.

Location 10 – Bends on R585 at Pearson's Bridge

See Figures 14-24a, 14-24b, 14-25a and 14-25b

On-site observations together with the swept path analysis suggest that the geometry of the bridge will accommodate the wind farm turbine vehicles. Temporary traffic management measures will be required in order to ensure that parked cars do not cause an obstruction. An autotrack assessment is included for the southbound direction on-route to Ballylickey Bridge and for the northbound direction heading back up towards the site.

Location 11 – Turn on R584 / N71 junction at Ballylickey Bridge

See Figures 14-26 and 14-27

It is proposed that the extended turbine artics will make a 3-point turn at this location in order to head back up the R584 in a north eastern direction. In order to do this the escorted convoy will travel southwest on the R584 and travel straight through the junction to head southwest on the N71. The vehicles will then reverse onto the N71 Ballylickey Bridge before driving forward and right back onto the R584.

The swept path assessment shows that the proposed manoeuvres should be possible. The assessment for the blade transporter shown in Figure 14-26 is based on a trailer with a shortened wheelbase and an extended blade overhang to 18m (approximately 10m is the norm) to navigate the corner.

Location 12 – Bridge on R584 at Carriganass Castle

See Figures 14-28 and 14-29

The swept path assessment undertaken illustrates that the space available for the vehicle tracks to negotiate the bridge is constrained, but a proposed manoeuvre should be possible at this location, subject to the completion of the dry-run assessment. Alternative methods that could be explored will include blade adapters (to lift blades at an angle) and temporary modifications to the bridge / road network. As noted on Chapter 13, impacts on Carriganass Castle Bawn wall will be avoided during the delivery of the turbines to the Proposed Development site and where there is a requirement, a super wing carrier can be used to lift the blade so it avoids structures within the surrounding area. As occurred during the previous wind farm development at the site, bridge walls were removed and rebuilt. If walls need to be temporarily removed during the turbine delivery phase, this will be discussed with Cork County Council prior to turbine delivery.

Location 13 – Bend on R584

See Figures 14-30 and 14-31

The preliminary swept path analysis indicates that the wind farm turbine vehicles will be able to negotiate this bend.

Location 14 – Bends on R584

See Figures 14-32 and 14-33

The analysis shown in these figures indicate that temporary local road widening will be required at this series of bends in order to accommodate the wind turbine vehicles.

Location 15 – Bend on R584

See Figures 14-34 and 14-35

The preliminary swept path analysis indicates that the wind farm turbine vehicles will be able to negotiate this bend.

Location 16 – Bends on R584

See Figures 14-36 and 14-37

The analysis shown in these figures indicate that temporary local road widening will be required at this series of bends in order to accommodate the wind turbine vehicles.

Location 17 – Bend on R584

See Figures 14-38 and 14-39

The preliminary swept path analysis indicates that the wind farm turbine vehicles will be able to negotiate this bend with over-sail of the blade required to the east and west.

Location 18 – Bend on R584

See Figures 14-40 and 14-41

On-site observations together with the swept path analysis indicates that the wind farm turbine vehicles will be able to negotiate this bend with over-sail of the blade required to the west. It is noted that the autotrack assessment shown is for the northbound direction, when the vehicles are travelling towards the turning point on the R584, and the conclusions are the same for the southbound direction when the vehicles have turned and are travelling southbound back towards the site access.

Location 19 – Reverse turn on R584 and local access

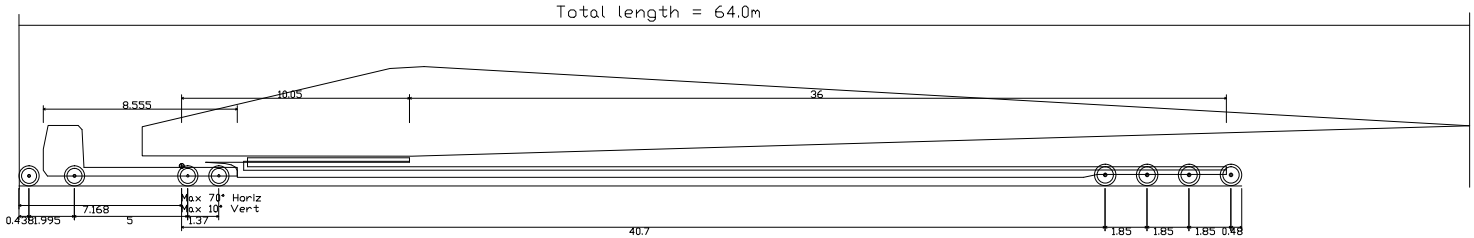
See Figures 14-42 and 14-43

It is proposed that the extended turbine transporters will travel east along the R584, before reversing back into an existing access road. The vehicles will then turn left onto the R584 travelling in a southwest direction towards the access junction. The figures show the extent of local widening required at the existing access in order to accommodate the abnormally sized turbine vehicles.

Site access junction off the R584

See Figures 14-44 to 14-48

The proposed junction layout, including the temporary run-over areas required for the delivery of the abnormally sized turbine vehicles, is shown in Figure 14-44. The proposed junction design is based on the HGV access guidance set out by TII, and includes 13m junction radii. Visibility splays of 3m x 160m appropriate for the 80 km/h speed limit are shown in Figure 14-45. These visibility splay must be kept clear of all obstruction above 1.05m during both the construction and operation of the Proposed Development. The swept path analysis set out in Figures 14-46 to 14-48 shows that the proposed layout will accommodate all vehicles requiring access to the site.



58.5m blade

Overall Length	53.897m
Overall Width	2.550m
Overall Body Height	2.661m
Min Body Ground Clearance	0.375m
Track Width	2.500m
Lock to Lock Time	6.00s
Wall to Wall Turning Radius	9.800m

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-4 Design blade extended artic profile

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: NTS
PROJECT NO: 8010	DATE: 22.05.20		DRAWN BY: AL

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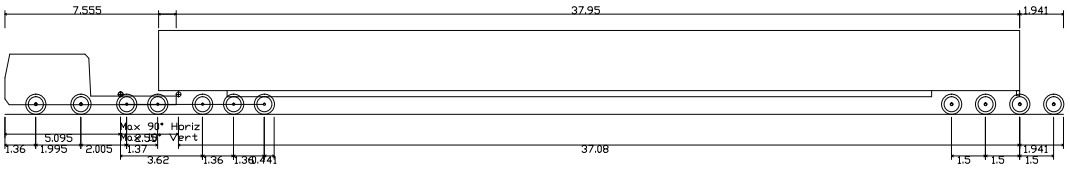

Tower	
Overall Length	46.666m
Overall Width	2.550m
Overall Body Height	3.695m
Min Body Ground Clearance	0.427m
Max Track Width	2.520m
Lock to Lock Time	6.00s
Wall to Wall Turning Radius	9.800m

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-5 Design tower extended artic profile

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: NTS
PROJECT NO: 8010	DATE: 20.05.20		DRAWN BY: AL

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NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-6 Location 1 - N22 / R585 junction at Castlemore, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

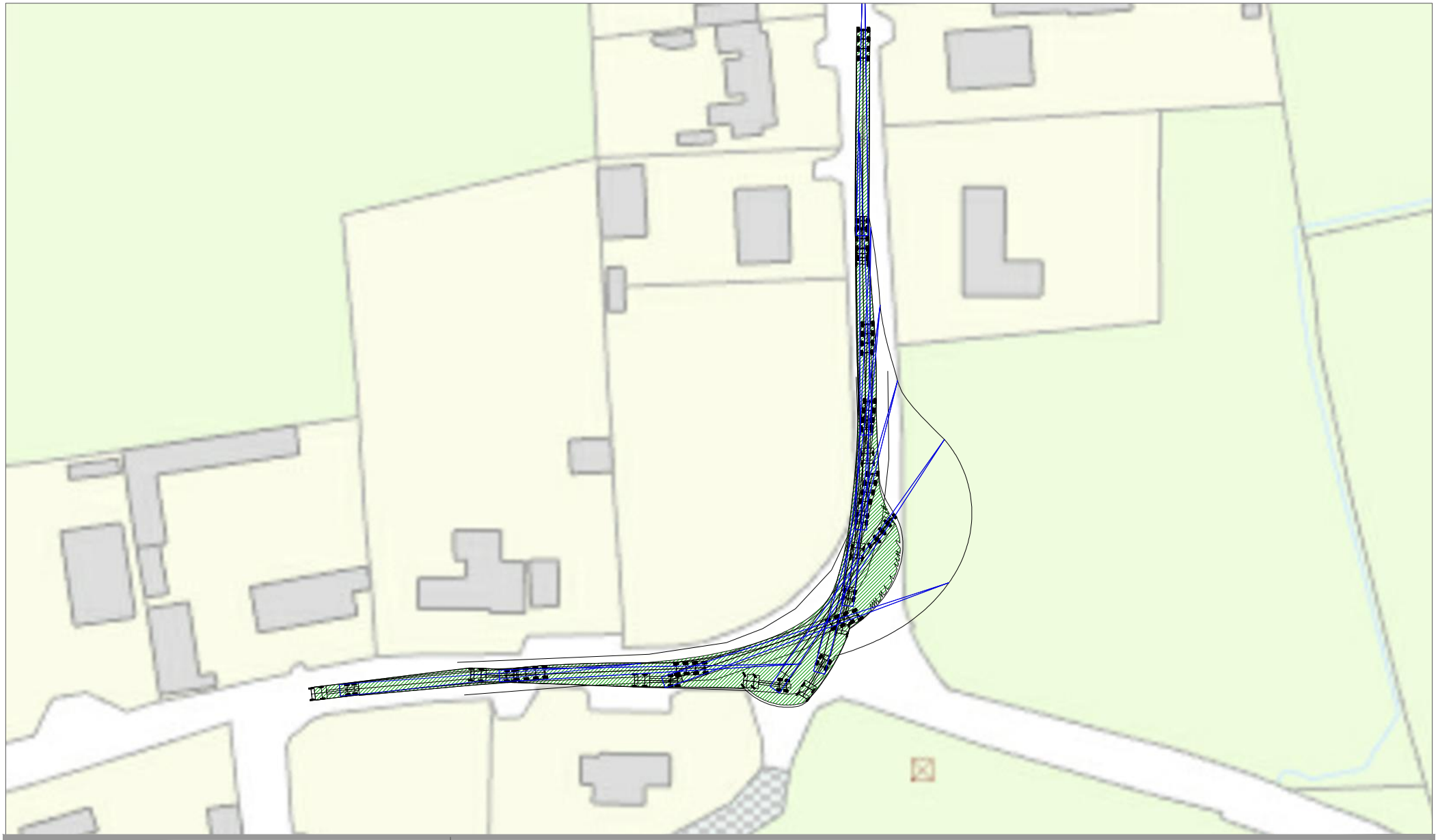
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-7 Location 1 - N22 / R585 junction at Castlemore, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

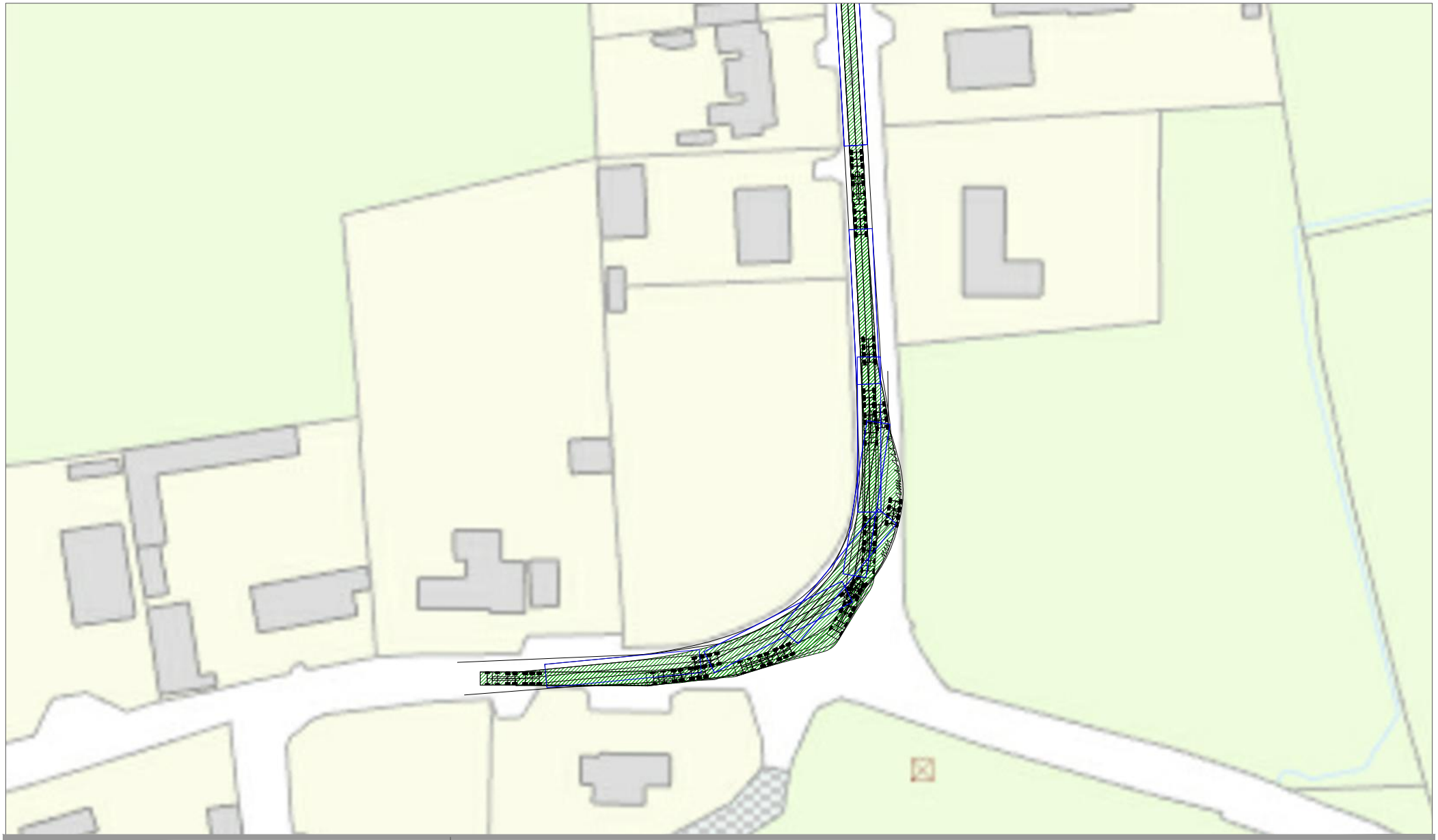
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-8 Location 2 - Right turn on R585 Crookstown, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-9 Location 2 - Right turn on R585 Crookstown, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

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TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-10 Location 3 - Left turn at R585 / R590 junction at Crookstown, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-11 Location 3 - Left turn at R585 / R590 junction at Crookstown, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

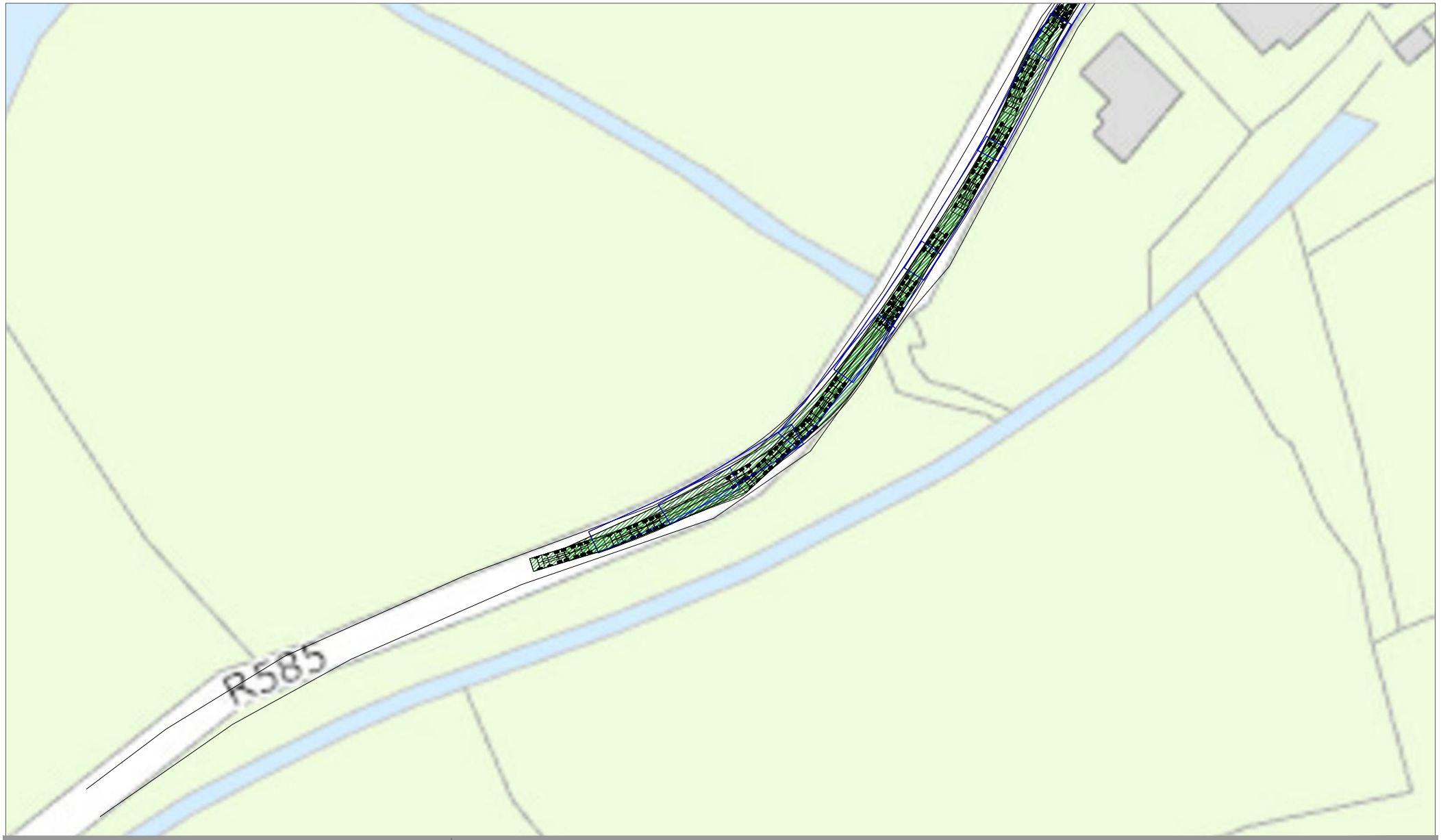
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-12 Location 4 - Bend on R585, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-13 Location 4 - Bend on R585, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-14a Location 5 - Series of bends on R585, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-14b Location 5 - Series of bends on R585, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-15a Location 5 - Series of bends on R585, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-15b Location 5 - Series of bends on R585, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-16 Location 6 - R585 through Bealnablath, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

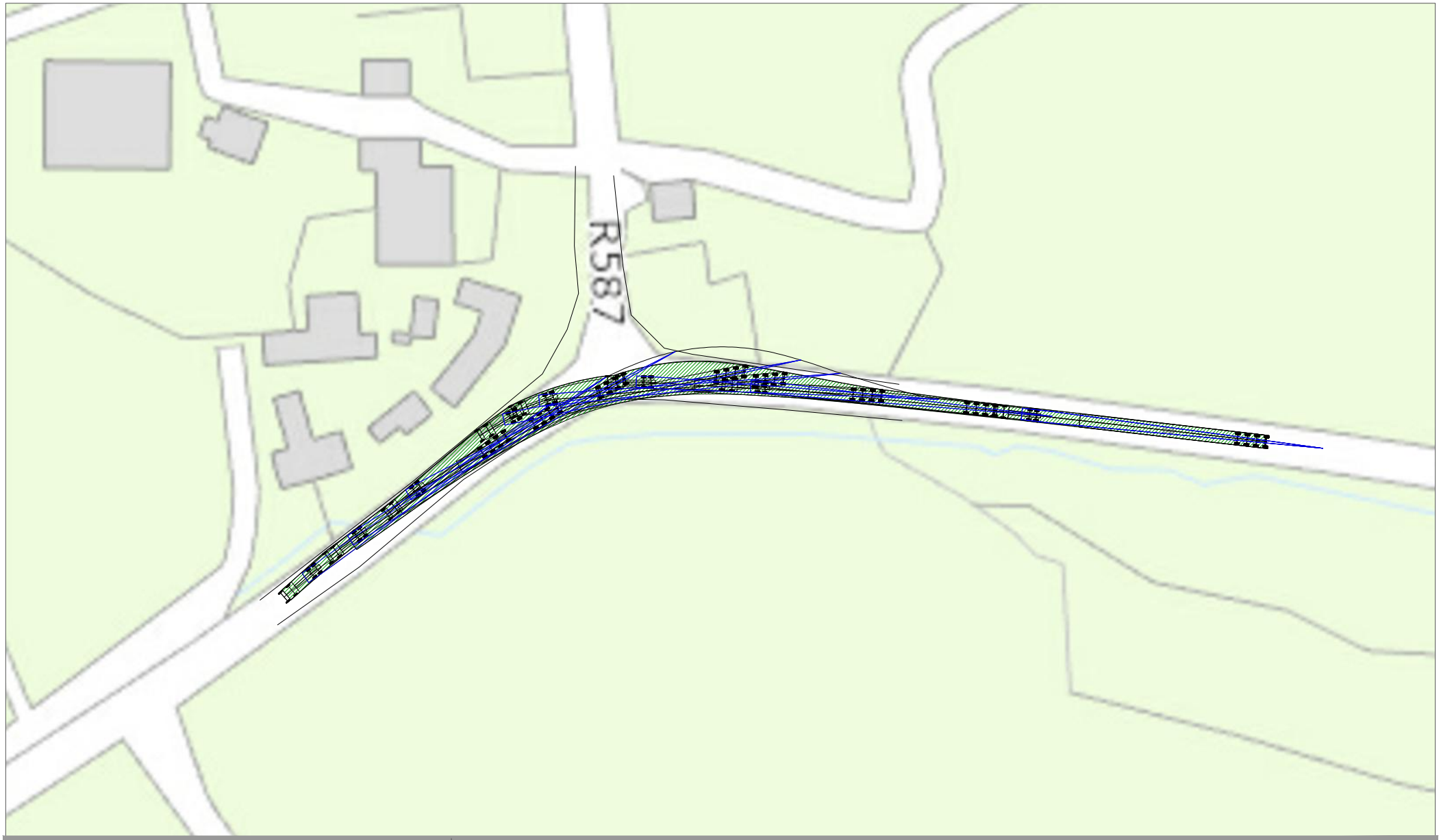
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-17 Location 6 - R585 through Bealnablath, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

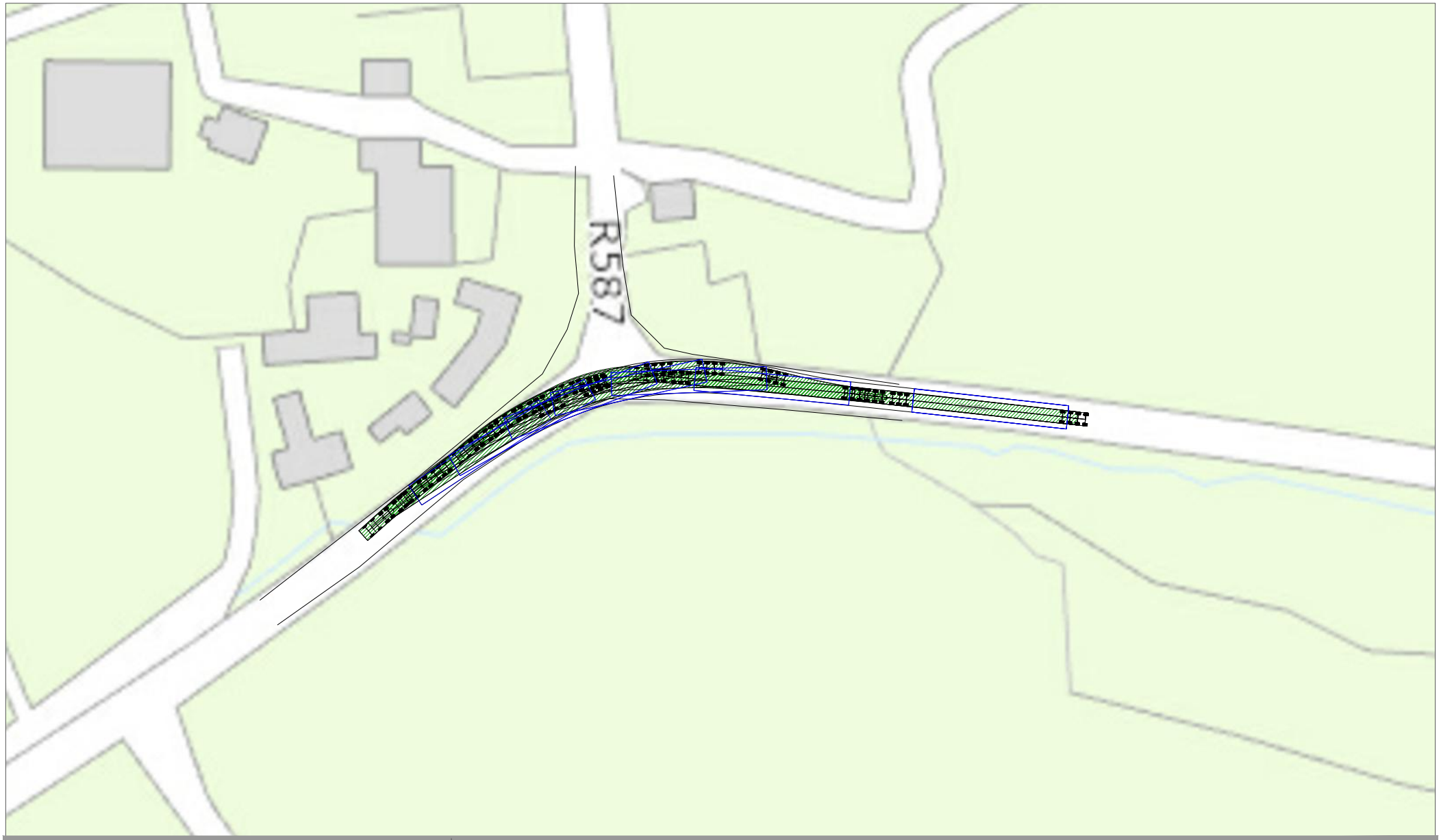
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-18 Location 7 - Bend on R585 at Gloun Cross, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

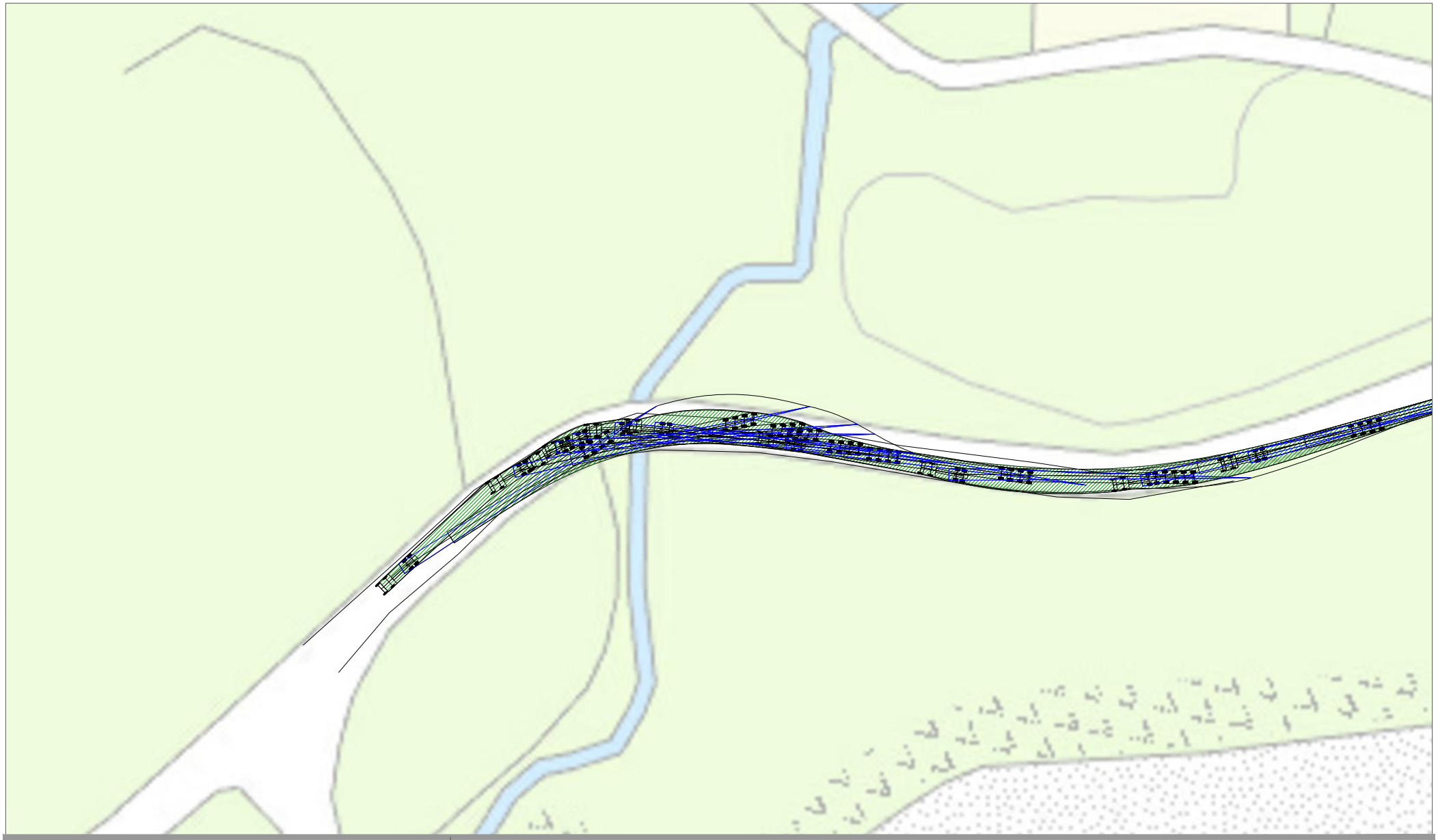
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-19 Location 7 - Bend on R585 at Gloun Cross, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

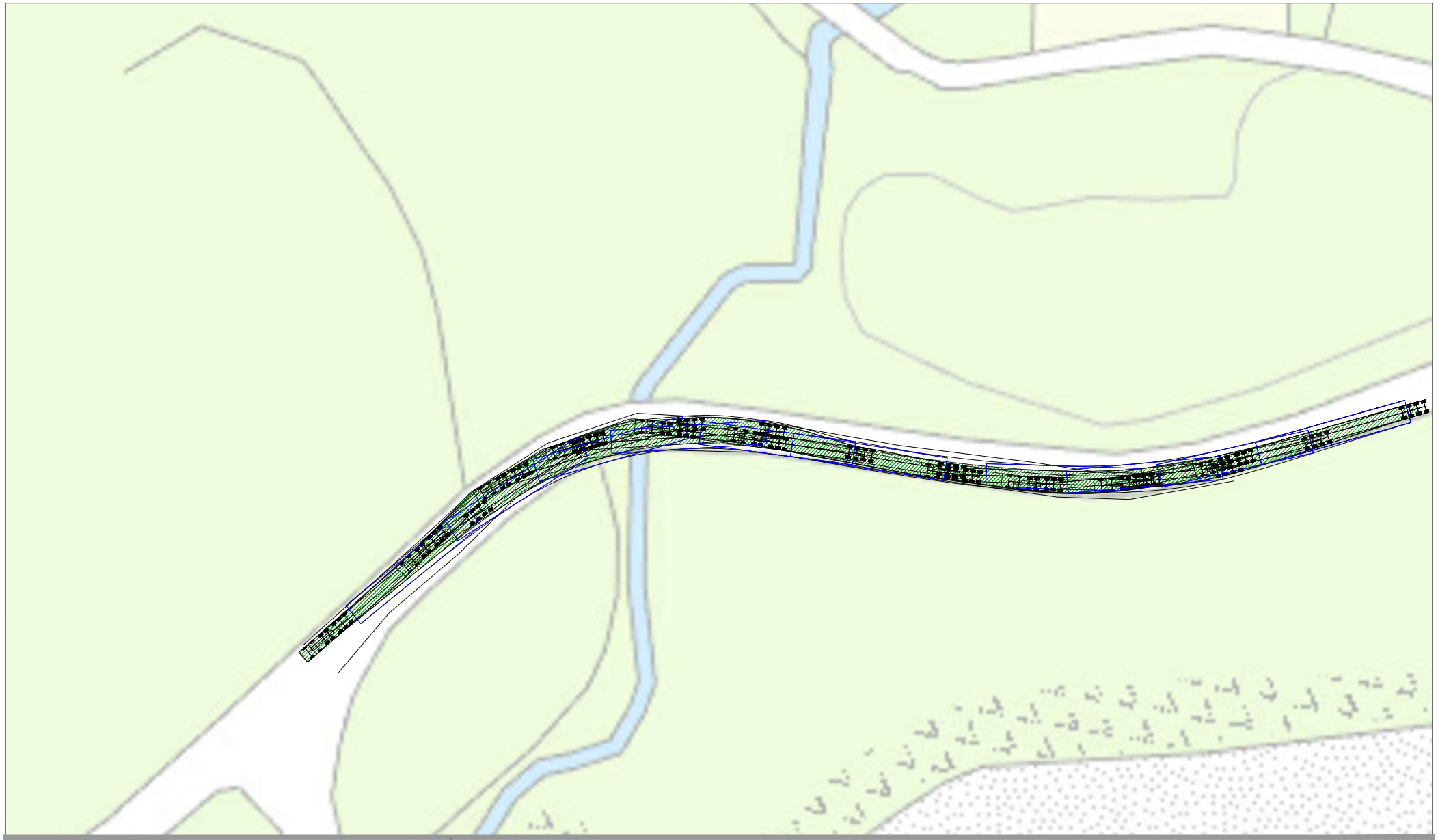
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-20 Location 8 - Bend on R585 at Shanlaragh, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-21 Location 8 - Bend on R585 at Shanlaragh,tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-22a Location 9 - Bend on R585 at Cousane Gap, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	1:1000
PROJECT NO: 8010	DATE: 04.06.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-22b Location 9 - Bend on R585 at Cousane Gap, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

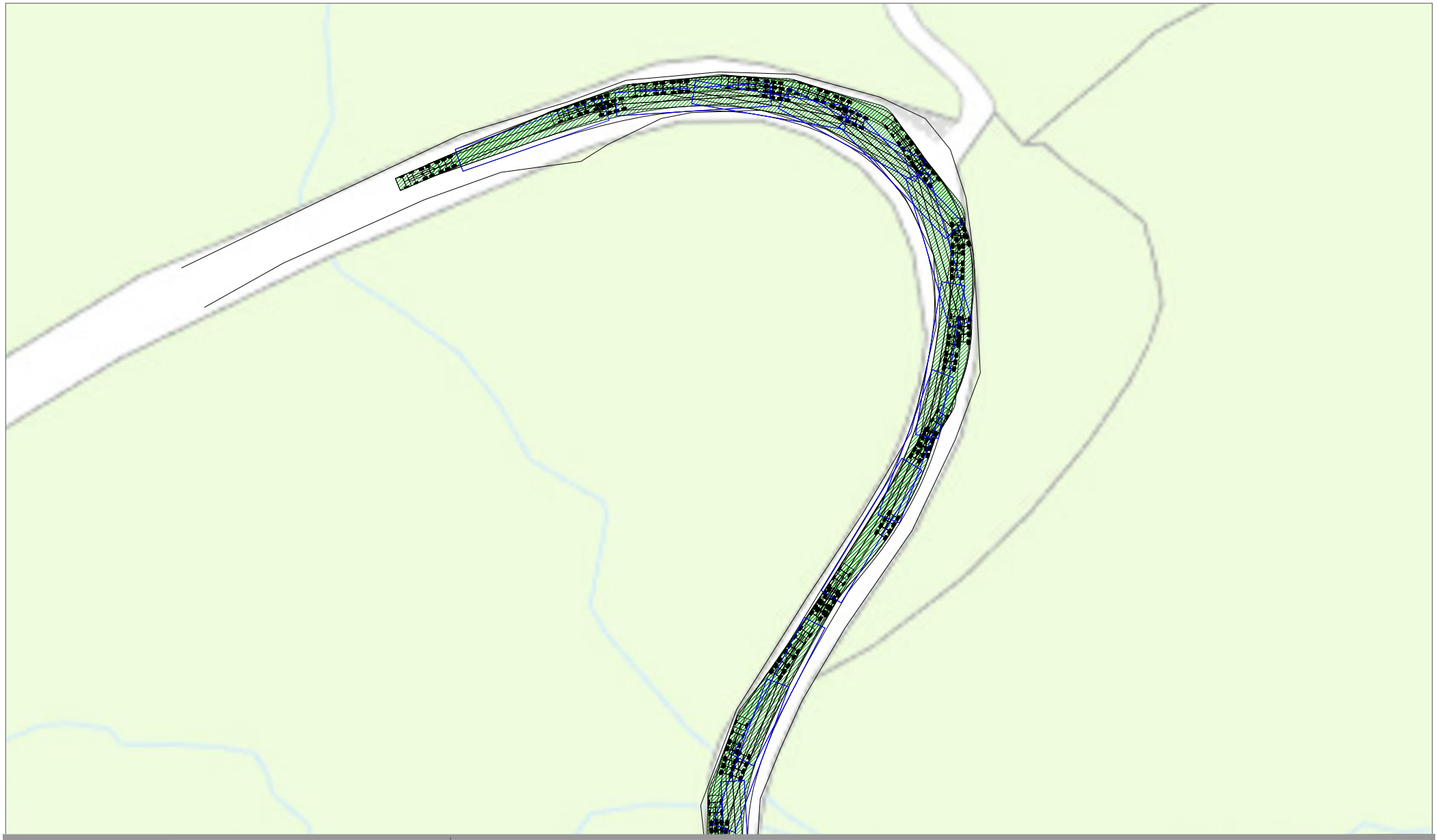
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-23a Location 9 - Bend on R585 at Cousane Gap, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-23b Location 9 - Bend on R585 at Cousane Gap, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	1:1000
PROJECT NO: 8010	DATE: 04.06.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-24a Location 10 - Bend on R584 at Pearsons Bridge southbound, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

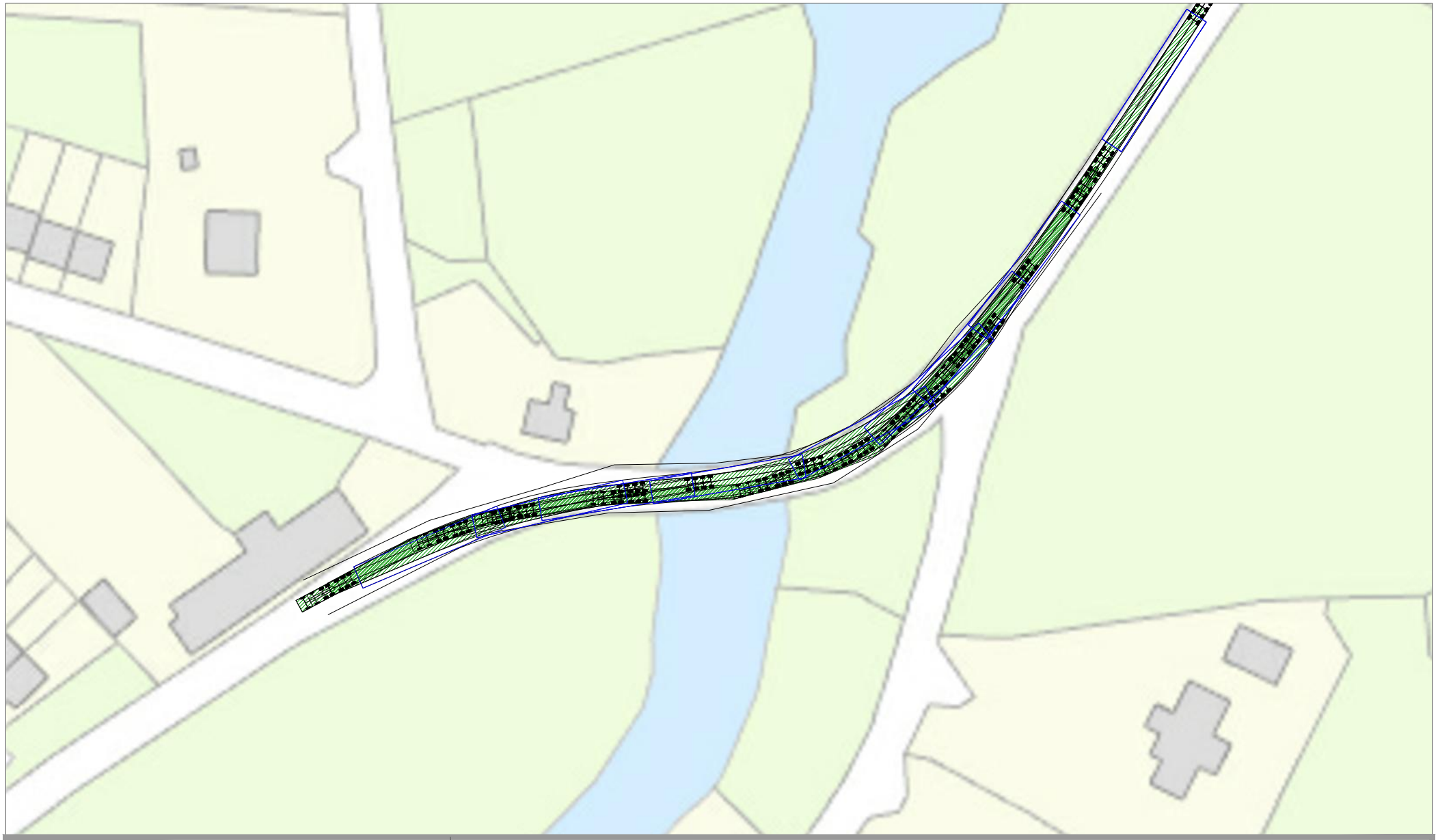
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-24b Location 10 - Bend on R584 at Pearsons Bridge northbound, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-25a Location 10 - Bend on R584 at Pearsons Bridge southbound, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-25b Location 10 - Bend on R584 at Pearsons Bridge northbound, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-26 Location 11 - Turn on R584 at Ballylickey Bridge, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-27 Location 11 - Turn on R584 at Ballylickey Bridge, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-28 Location 12 - Bridge on R584 at Carriganass Castle, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-29 Location 12 - Bridge on R584 at Carriganass Castle, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-30 Location 13 - Bend on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-31 Location 13 - Bend on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	1:1000
PROJECT NO: 8010	DATE: 04.06.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-32 Location 14 - Bend on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

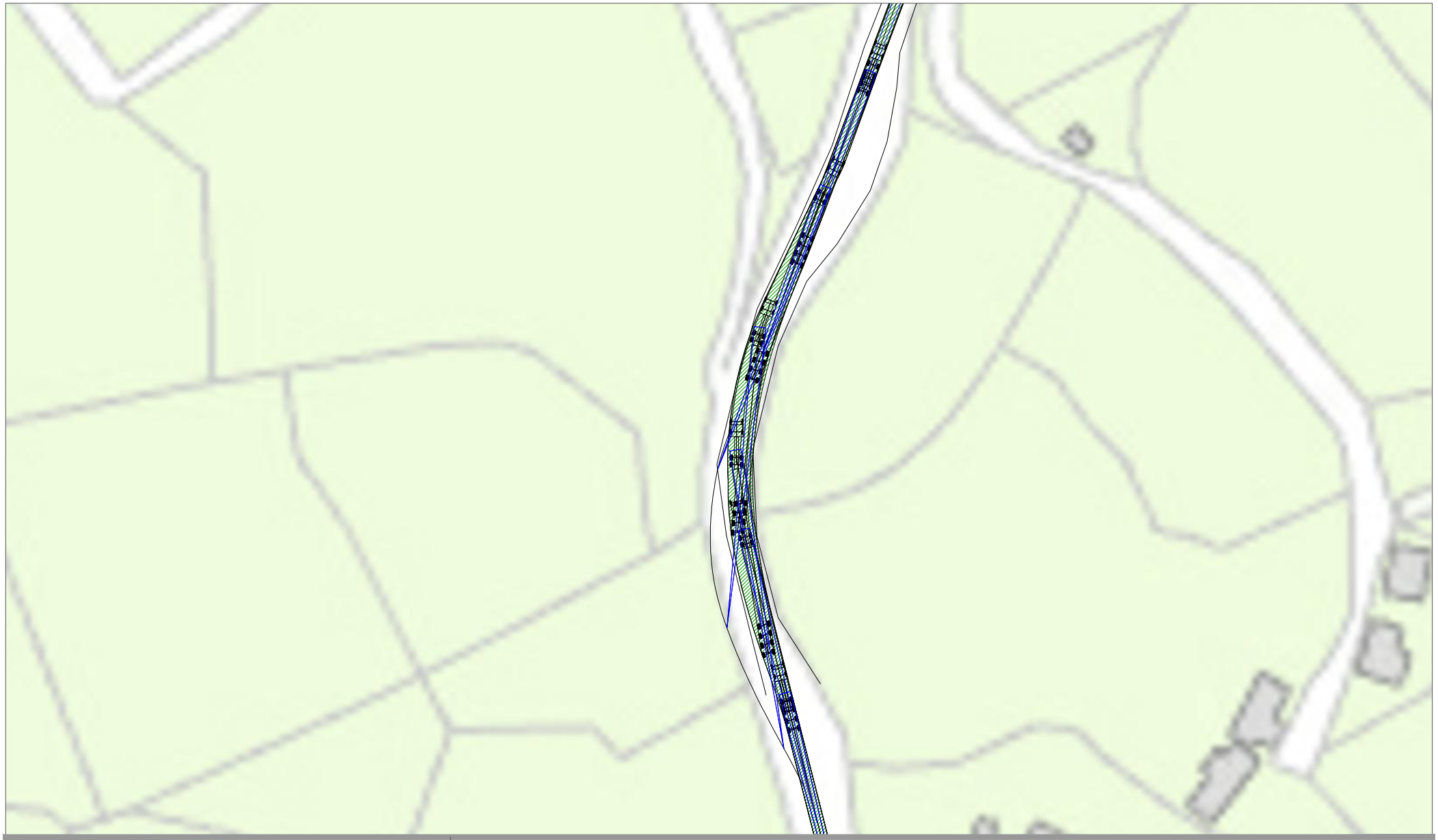
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-33 Location 14 - Bend on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-34 Location 15 - Bend on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

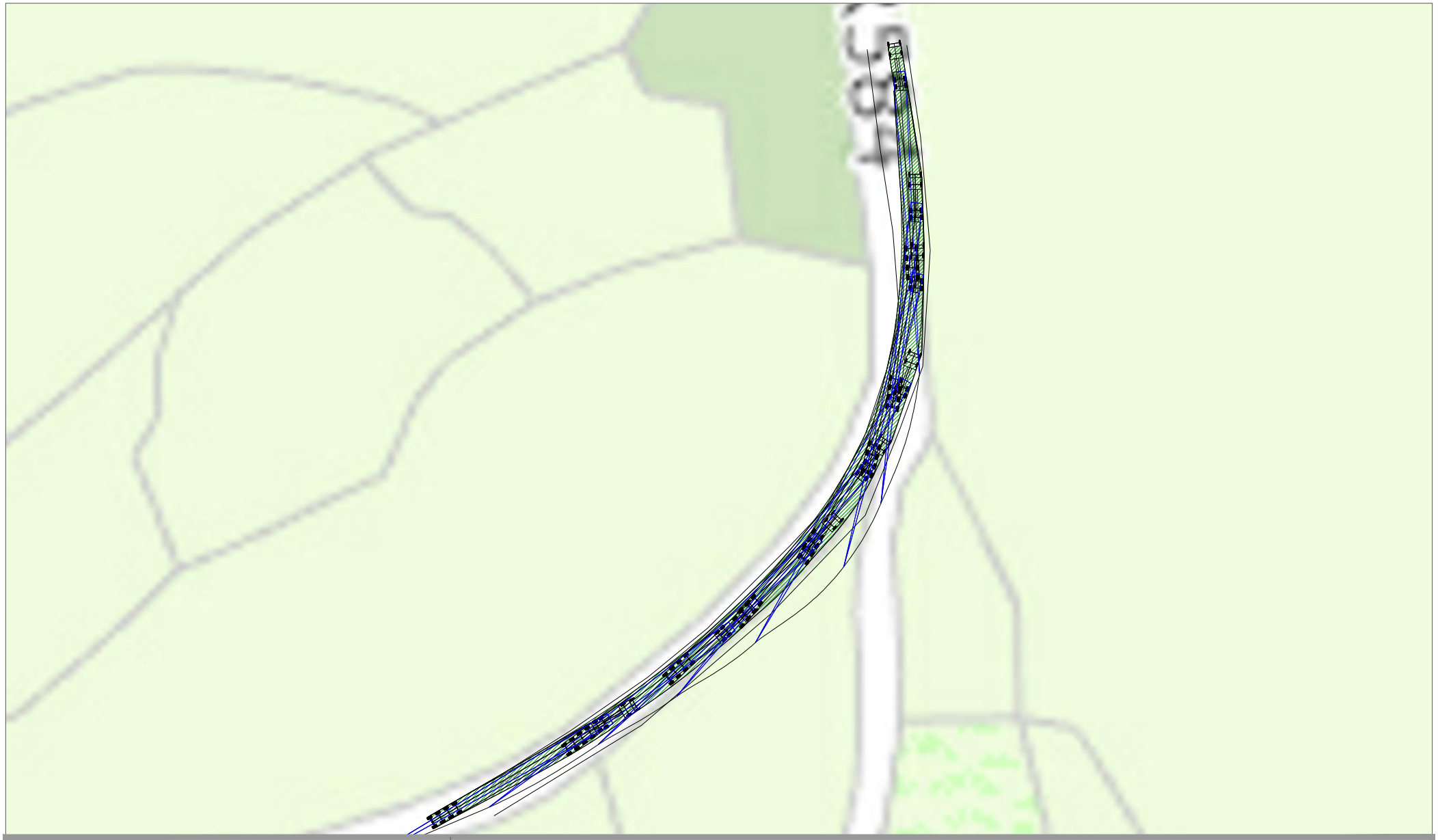
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-35 Location 15 - Bend on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

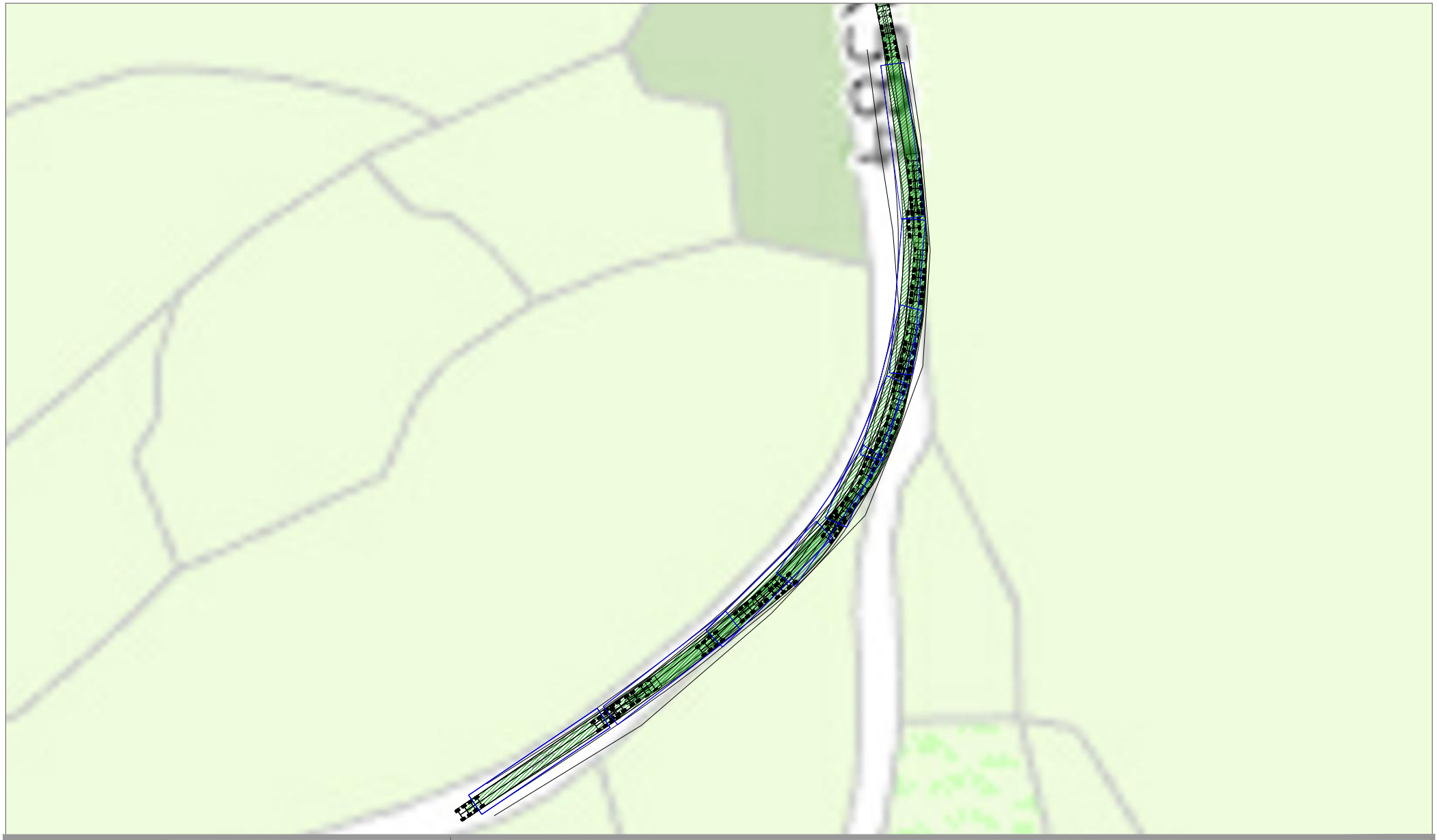
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-36 Location 16 - Bend on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	1:1000
PROJECT NO: 8010	DATE: 04.06.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-37 Location 16 - Bend on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

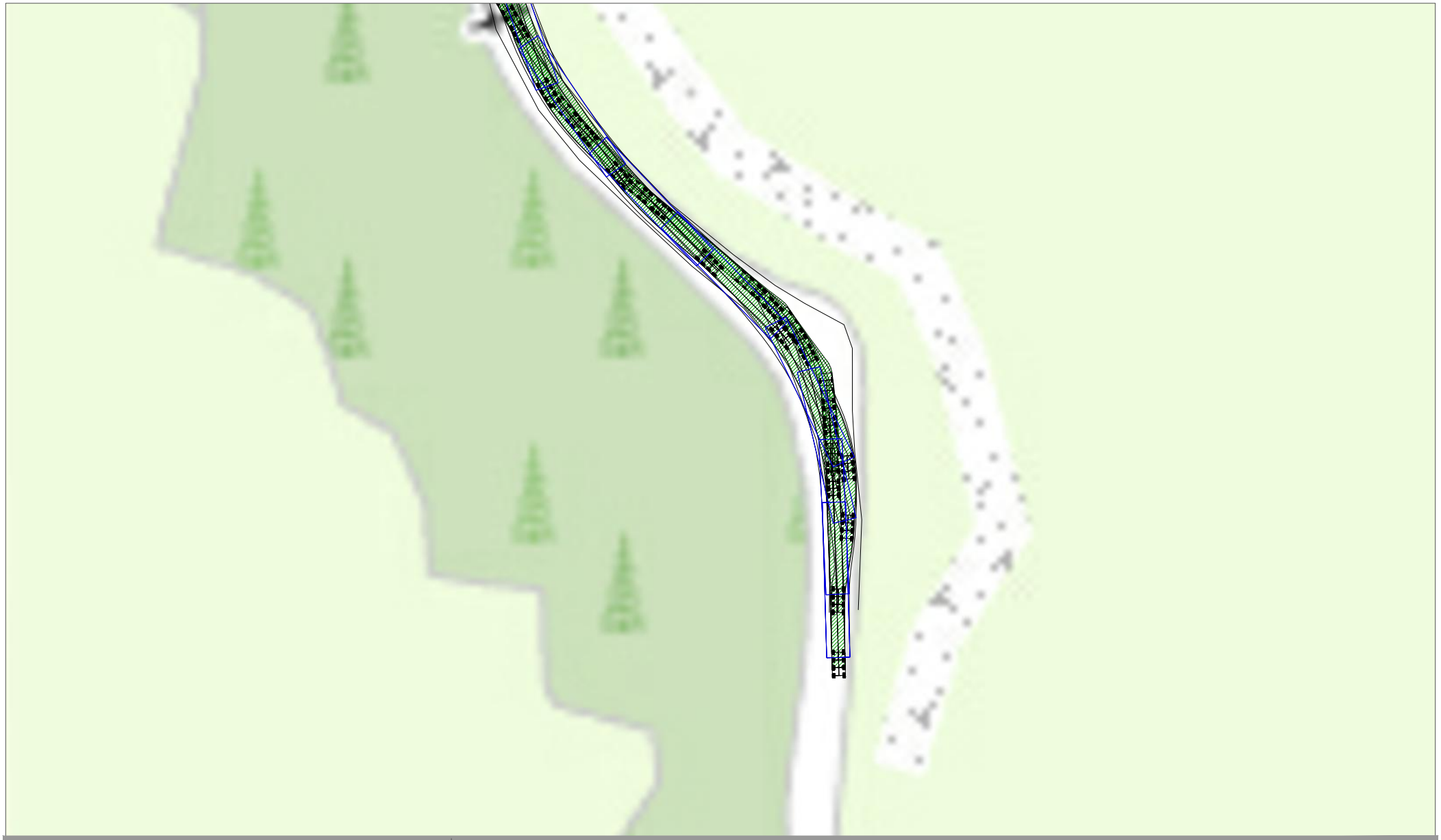
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-38 Location 17 - Bend on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-39 Location 17 - Bend on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-40 Location 18 - Bend on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

NOTES:

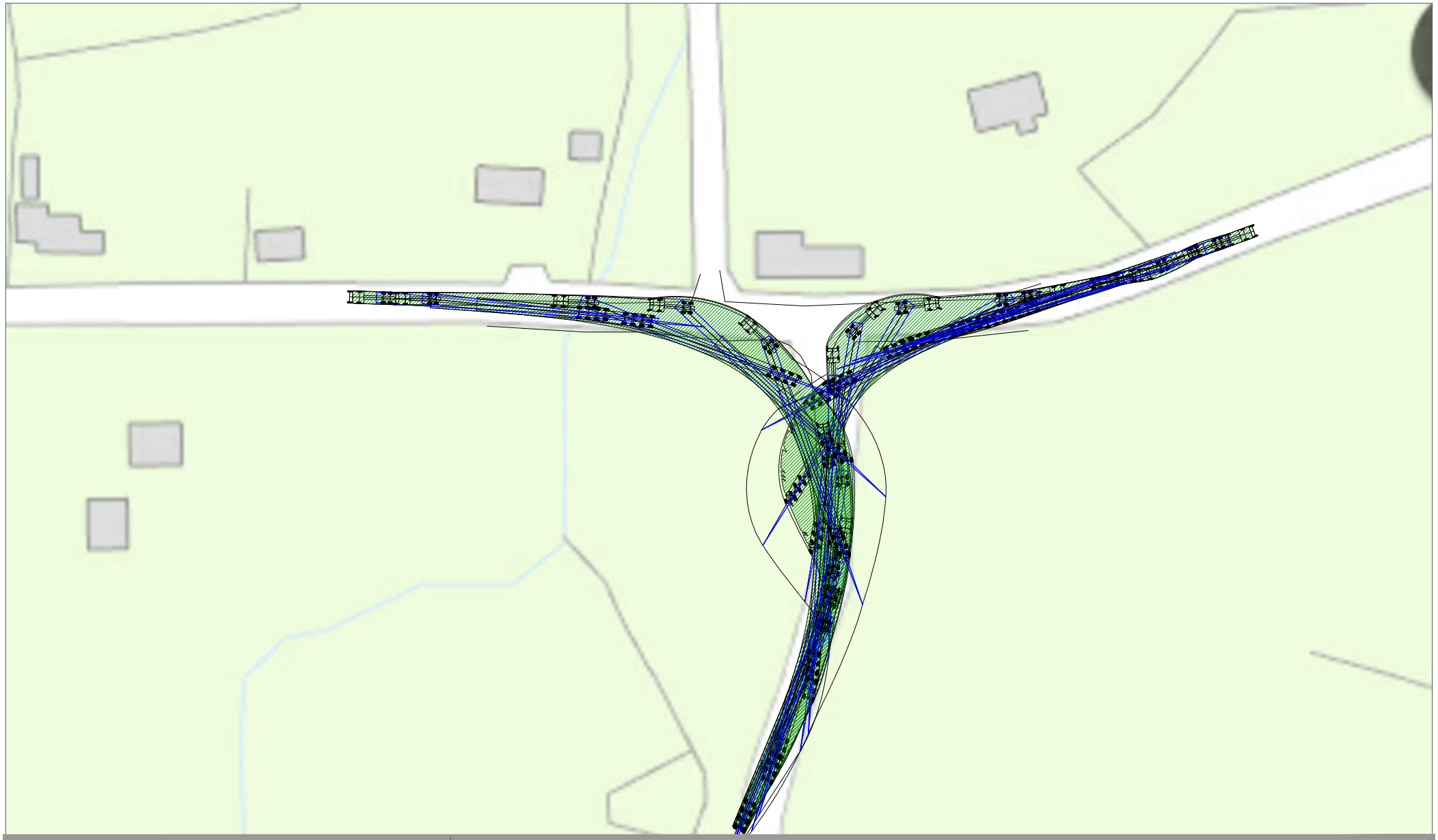
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-41 Location 18 - Bend on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

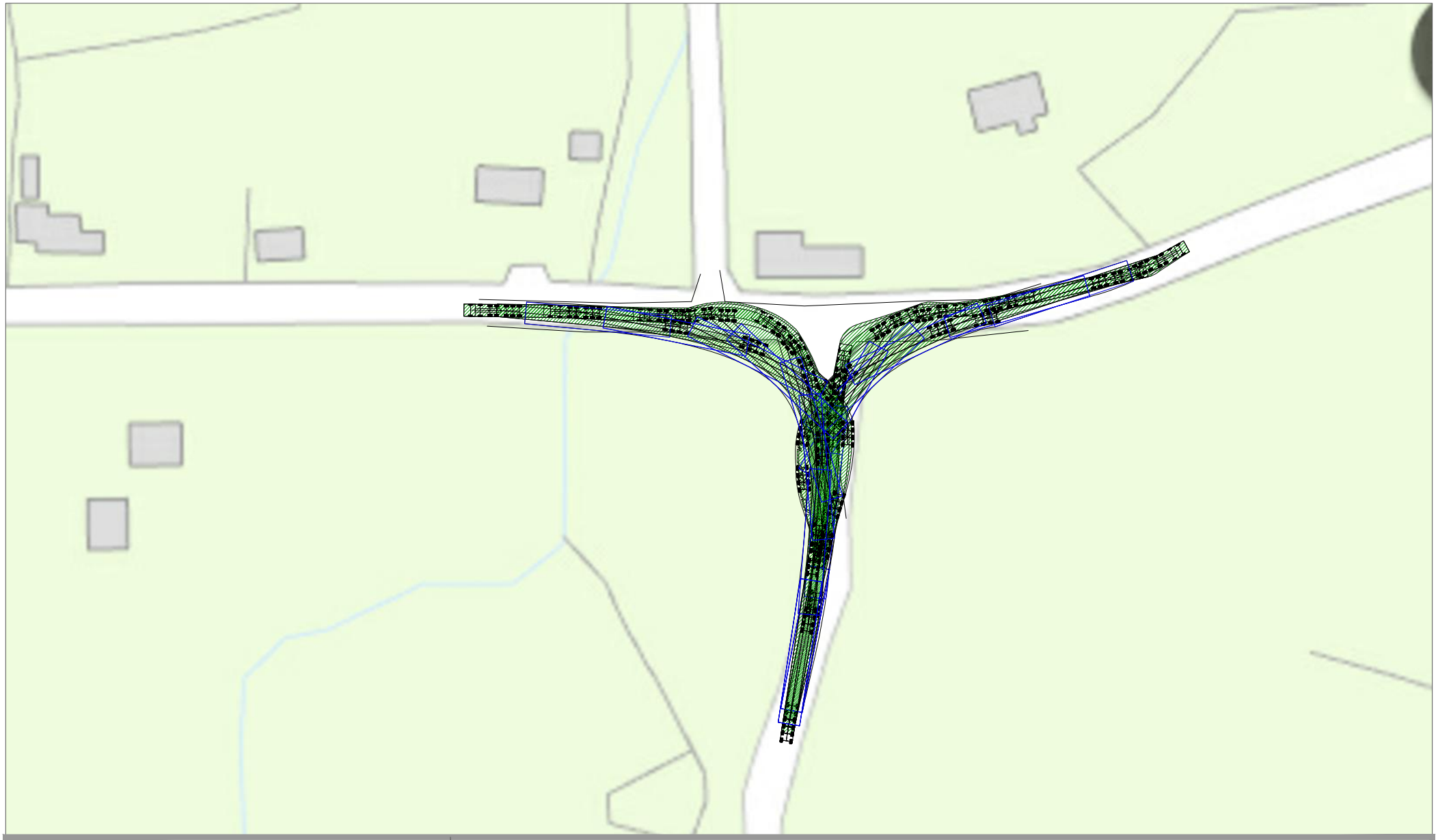
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-42 Location 19 - Reverse turn on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Base mapping provided by MKO

Figure 14-43 Location 19 - Reverse turn on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

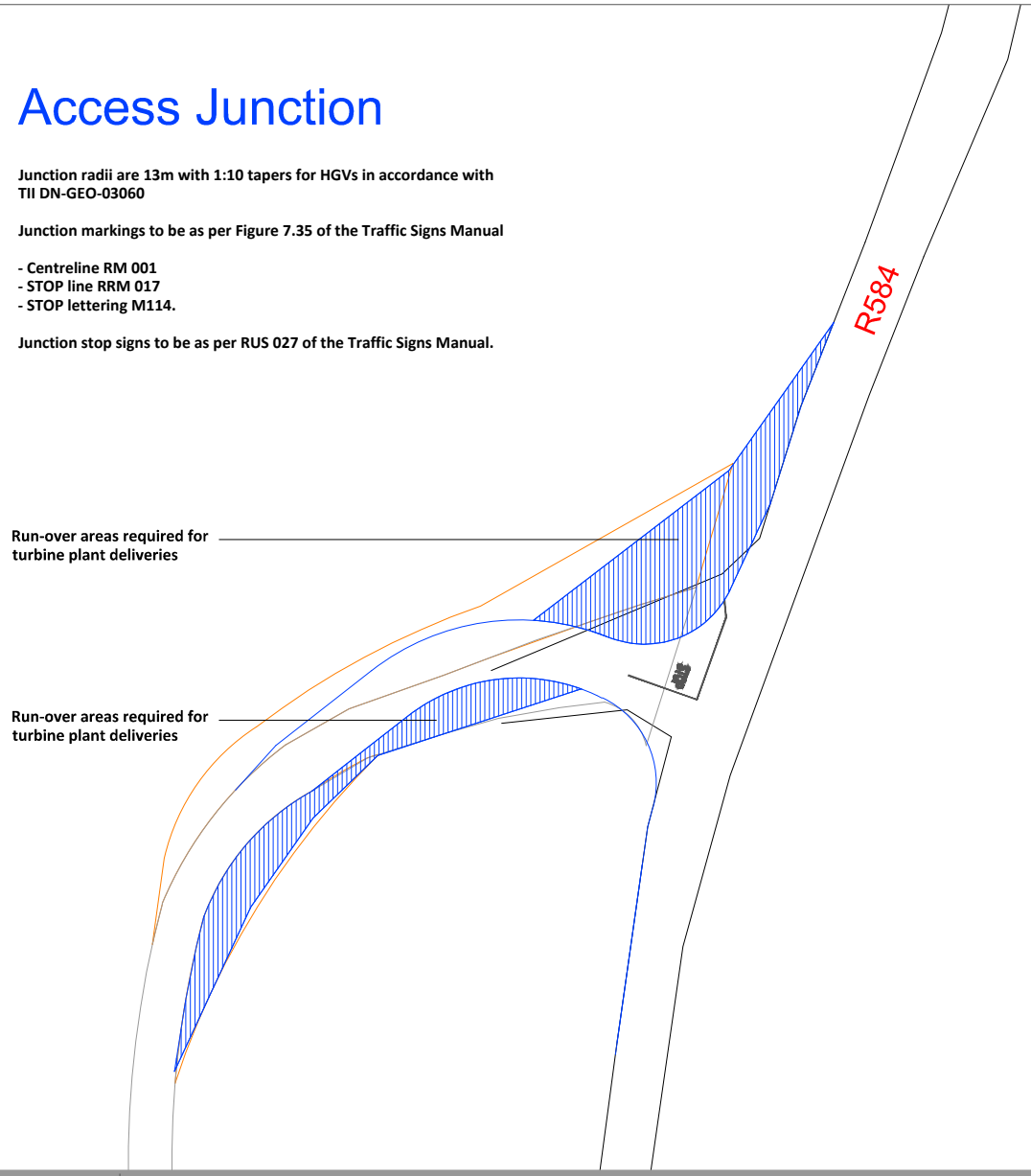
Access Junction

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

Base mapping provided by MKO

Figure 14-44 Access Junction on R584, proposed layout

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	1:1000
PROJECT NO: 8010	DATE: 04.06.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

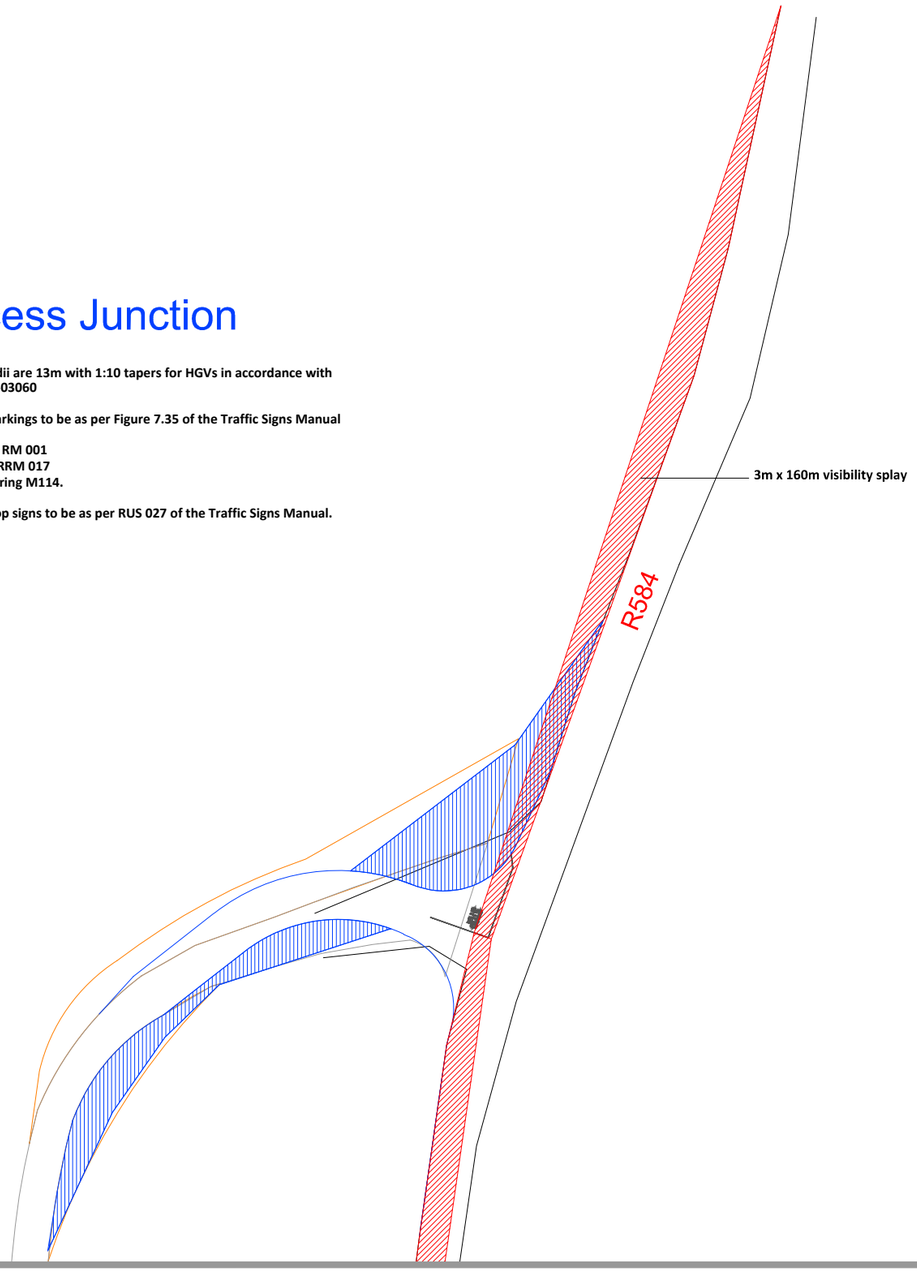
Access Junction

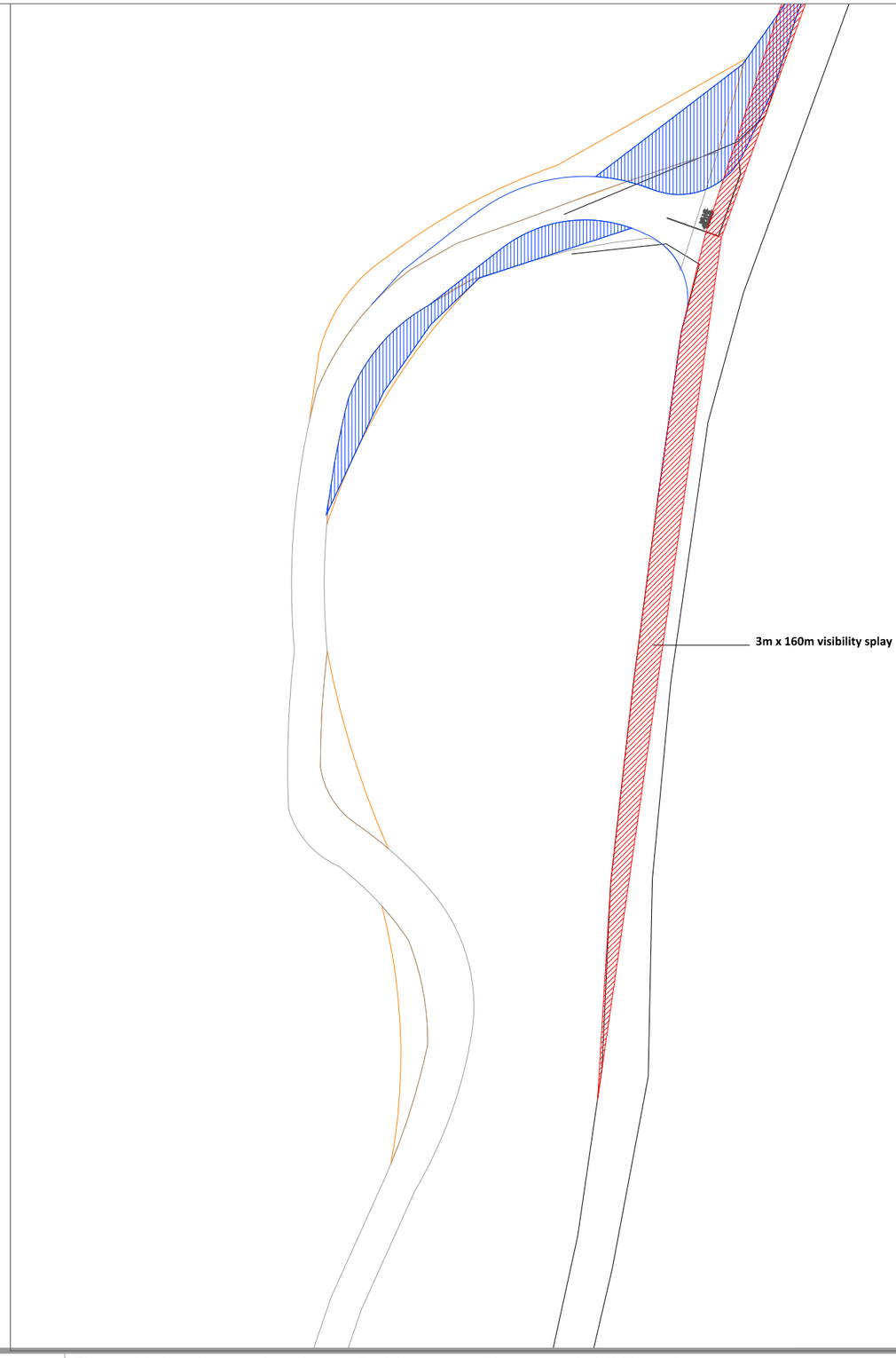
Junction radii are 13m with 1:10 tapers for HGVs in accordance with TII DN-GEO-03060

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

Base mapping provided by MKO

Figure 14-45 Access Junction on R584, proposed layout and visibility splays

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	1:1000
PROJECT NO:	8010	DATE: 05.04.20	DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

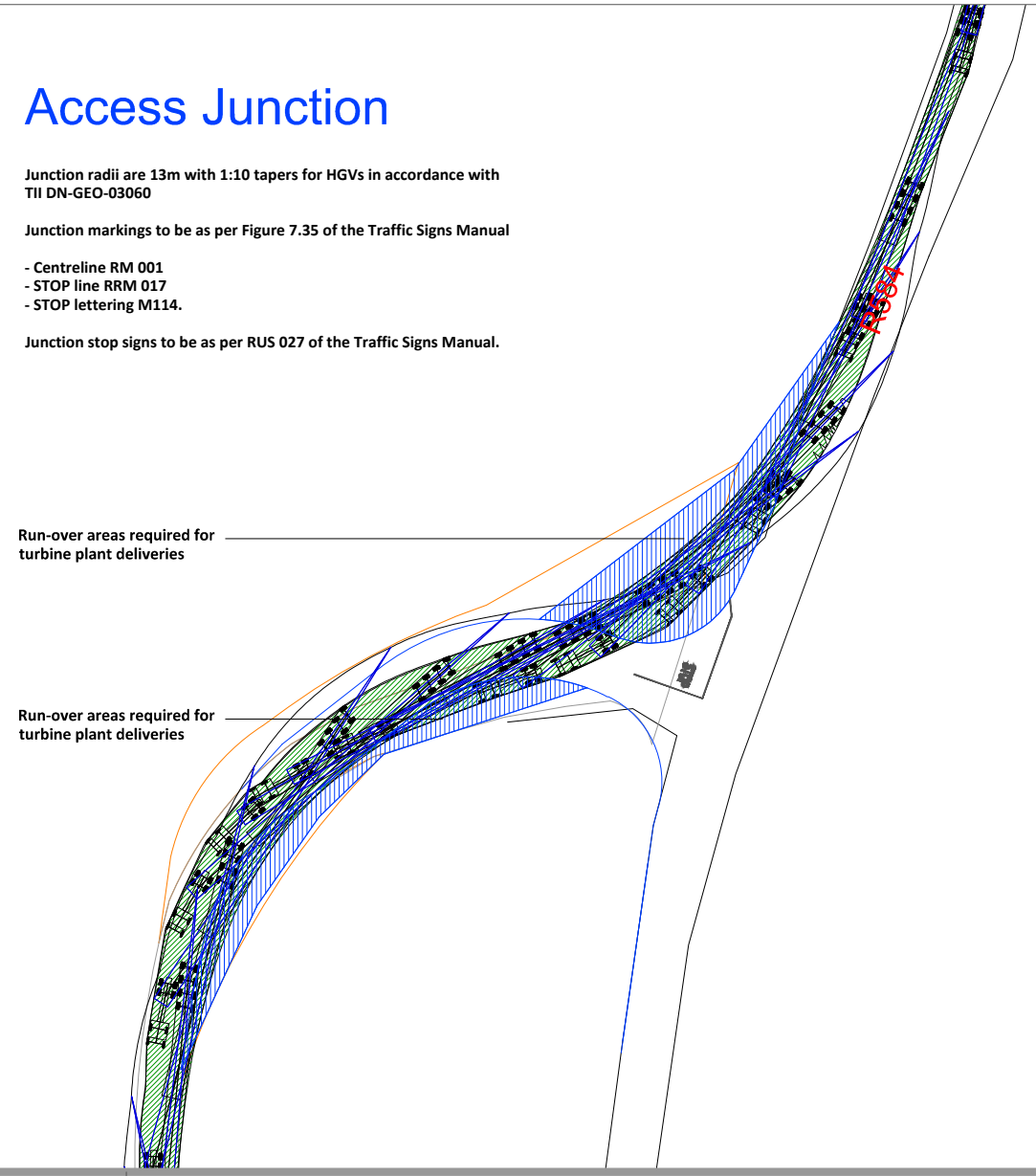
Access Junction

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

Base mapping provided by MKO

Figure 14-46 Access Junction on R584, blade extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

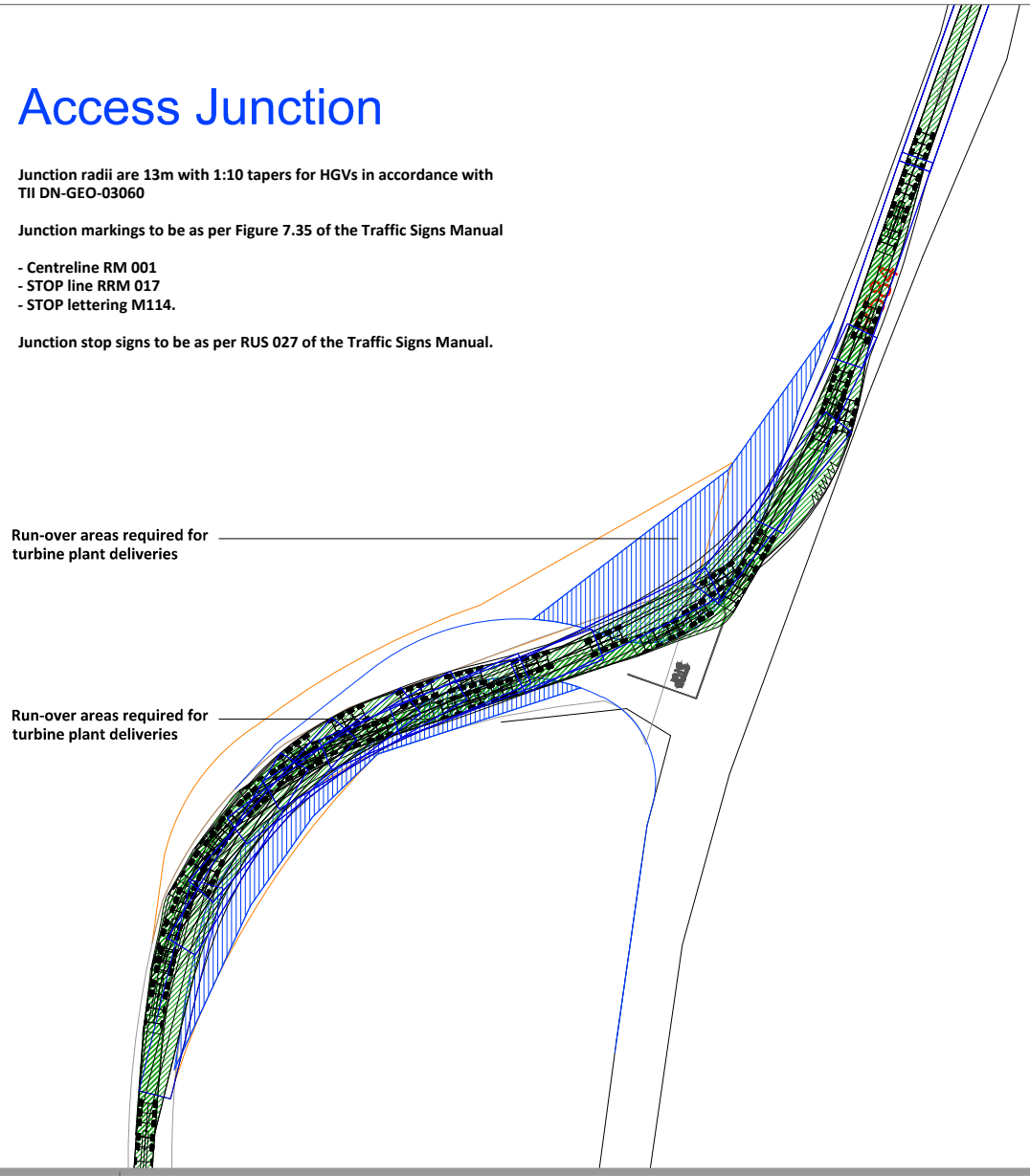
Access Junction

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

Base mapping provided by MKO

Figure 14-47 Access Junction on R584, tower extended artic

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd		SCALE: 1:1000
PROJECT NO: 8010	DATE: 04.06.20		DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

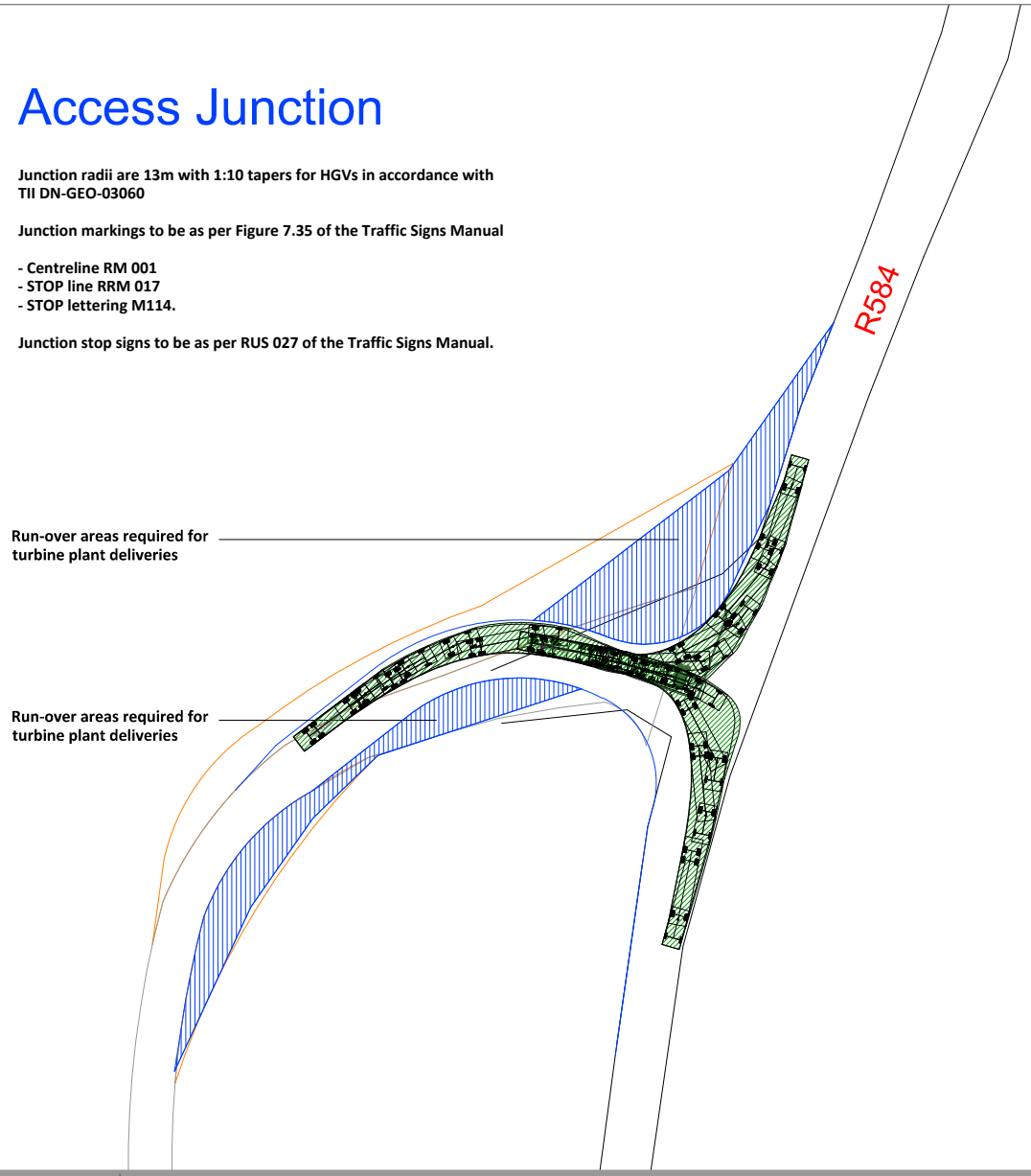
Access Junction

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

Base mapping provided by MKO

Figure 14-48 Access Junction on R584, large artic HGV

PROJECT:	Curraglass Renewable Energy Development		
CLIENT:	Wingleaf Ltd	SCALE:	1:1000
PROJECT NO: 8010	DATE: 04.06.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

14.1.8.2 Route Option 2

It is noted that while route Option 1 discussed above is the current preferred delivery route for the abnormally sized loads, an alternative route Option 2, does exist via Lisacressig on the N22, followed by the L3402 to Ballingeary and southbound towards the site, as described in Section 14.1.2.2 and shown in Figure 14-1.

Although autotracks have not been completed for this route option, the L3402 from Lisacressig to Ballingeary has been used successfully for other wind farm developments in the surrounding locality. However, it is noted that further survey work would likely be required at locations to the north and south of Ballingeary in order to accommodate the abnormally sized turbine vehicles. The option to make use of blade adapters would allow for the turbines to travel through the village of Ballingeary to allow access to the site.

If the proposed route Option 2 is deemed as the most favorable route for turbine delivery, a detailed assessment of the route will be completed.

14.1.9 Provision for Sustainable Modes of Travel

14.1.9.1 Walking and Cycling

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

14.1.9.2 Public Transport

There are no public transport services that currently pass the site although mini-buses may be considered for transporting construction staff to and from the site in order to minimise traffic generation and parking demand on site.

14.1.10 Likely and Significant Effects and Associated Mitigation Measures

14.1.10.1 "Do Nothing" Scenario

If the Proposed Development were not to proceed, no changes would be made to the current land-use practice of forestry and the site would continue to be managed under the existing commercial forestry arrangements.

There would also 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.

14.1.10.2 Construction Phase

During the 7 days when the concrete foundations are poured the effect on the surrounding road network will be negative, resulting in an increase in traffic levels ranging from +1.8% on the N22 to an increase of +19.3% on the R585, and +18.3% on the R584 leading to the site. The direct effect will be temporary, and will be slight.

During the remaining 248 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 +0.6% on the N22 to an increase of +5.5% on the R585, and +5.2% on the R584 leading to the site. On these days, the direct effect will be temporary and will be slight.

During the 7 days of the turbine construction stage when general materials are delivered to the site, the delivery of construction materials will result in a negative impact on the surrounding road network, increasing traffic levels, ranging from +0.3% on the N22 to an increase of +3.5% on the R585, and +3.3% on the R584 leading to the site. The direct effect during this period will be temporary and will be slight.

During the 19 days when the various component parts of the wind turbine plant are delivered to the site using extended articulated HGVs, the effect of the additional traffic on these days will be moderate due to the size of vehicles involved, resulting in increased traffic volumes of between 0.6% on the N22, 5.7% on the R585 to 5.2% on the R584 leading to the site, but will be temporary. The direct effect may be reduced to slight if the delivery of the large plant is done at night, as is proposed.

14.1.10.3 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 two maintenance staff travelling to site at any one time, resulting in typically two visits to the site on any one day made by a car or light goods vehicle.

14.1.10.4 Decommissioning Phase

The design life of the wind farm is 30 years. If the site is decommissioned, cranes will disassemble each turbine tower and all equipment.

All turbine infrastructure including turbine components will be separated and removed off-site for re-use, recycling and waste disposal. Turbine foundations would remain in place underground and would be covered with earth and reseeded as appropriate. It is proposed to leave the access roads and hardstanding areas in situ at the decommissioning stage. Leaving the turbine foundations, access tracks and hardstanding areas in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts.

14.1.10.5 Cumulative Effects

The developments considered as part of the cumulative effect assessment are described in Section 2.7 of this EIAR. In this regard in order to assess overall cumulative effects on water the Proposed Development is considered in the context of other developments as detailed below:

- Other Wind Farms
- Forestry and Replanting
- Existing site infrastructure

The development or activities that were considered to have potential cumulative impacts with the proposed wind farm development in terms of traffic impacts are summarised in Table 14-24.

14.1.10.5.1 *Other Wind Farms*

A detailed assessment of other wind farm developments at varying stages in the planning process (from pre-planning to operational), is set out in Section 2.7 of this EIAR, with an assessment of the potential cumulative traffic effects with the proposed subject wind farm assessed on the following;

- Project status (proposed to operational)
- Degree of overlap with the Proposed Development delivery highway network (low to high)
- Traffic volumes (low to high)

The development or activities that were considered to have potential cumulative impacts with the Proposed Development in terms of traffic impacts are summarised in Table 14-24.

All other wind farm developments located within a 20km radius and shown in Chapter 2, Figure 2-5 are also listed in Table 14-24.

The majority of the wind farm developments listed are either already constructed, or are being constructed, and will therefore not have cumulative impacts with the construction phase of the Proposed Development. For the 2 permitted wind farm developments, based on the extent of the overlap of the haul routes with the Proposed Development, it is considered that the potential for cumulative traffic related effects are slight in relation to Derreenacrinnig West Wind Farm, and imperceptible with the Knocknamork Wind Farm. The potential for cumulative impacts will be avoided by ensuring that the construction phases for all 3 developments do not overlap through careful scheduling of deliveries to each site. It is worth noting that An Garda Síochána will only allow one development at a time for oversized loads.

Reference was also made in the preparation of this assessment to other planning applications as set out in Chapter 2.

Table 14-24 Summary of projects considered in cumulative assessment and potential for cumulative traffic effects with proposed Curraglass Renewable Energy Development

No.	Project	Status	Degree of overlap of highway network (low / medium / high)	Traffic volumes (low / medium / high)	Potential cumulative traffic effects
1	Cleanrath Wind Farm (11 turbines, 9 constructed)	Existing	Not relevant	Not relevant	Included in background traffic levels
2	Coomaghearlahy Wind Farm (15 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
3	Currabwee Wind Farm (7 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
4	Derragh Wind Farm (6 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
5	Grousemount Wind Farm (38 turbines)	Existing	Low	Medium	None, will be constructed
6	Inchincoosh Wind Farm (6 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
7	Killaveenogue Wind Farm (10 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
8	Knockeenboy Wind Farm (6 turbines)	Permitted	Not relevant	Not relevant	Included in background traffic levels

No.	Project	Status	Degree of overlap of highway network (low / medium / high)	Traffic volumes (low / medium / high)	Potential cumulative traffic effects
9	Lettercannon Wind Farm (7 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
10	Midas Wind Farm (23 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
11	Millane Hill Wind Farm (9 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
12	Sillahertane Wind Farm (10 turbines)	Existing	Not relevant	Not relevant	Included in background traffic levels
13.	Derreenacrinnig West Wind Farm (7 turbines)	Permitted	Medium	Medium	Slight
14	Carrigarierk Wind Farm (5 turbines)	Permitted (Under Construction)	Medium	Medium	None, will be constructed
15	Glanta Commons Wind Farm (21 turbines)	Existing	Low	Medium	None, will be constructed
16	Knocknamork Wind Farm (7 turbines)	Permitted	Low	Medium	Imperceptible
17	Shehy More Wind Farm (11 turbines)	Permitted (Under Construction)	Medium	Medium	None, will be constructed

14.1.10.5.2 *Forestry and Replanting*

The Proposed Development site is used for commercial forestry. Regular felling operations will continue in conjunction with the Proposed Development. It is noted that traffic movements relating to this activity did possibly contribute to background traffic levels, but there may be cumulative traffic effects between forestry operations locally and the Proposed Development during time periods that tree felling takes place and in particular if this occurs during the construction phase. During the operational phase, which is when most of the forestry operations will be occurring i.e. over the 30-year life of the project, the effects will be imperceptible as the Proposed Development generates very low traffic numbers for the majority of its lifetime.

If it is assumed that tree felling takes place in coups of 20 hectares at a time, generating approximately 200 HGV movements over 10 working days (or 20 HGV movements daily) the cumulative impact on these days is forecast to be slight even if it occurs during the construction phase of the Proposed Development.

14.1.10.5.3 *Existing Site Infrastructure*

At present there is an existing substation at the Proposed Development site. The existing substation on site will be subject to decommissioning under the provisions of the previously granted permission.

If the decommissioning were to occur at the same time as the construction phase of the Proposed Development, the volume of traffic generated will likely be very low and therefore, the overall cumulative impact will be temporary and slight.

Furthermore, there is an overhead line connection to the Ballylickey Substation, approximately 12km southwest of the site. ESB may from time to time require access to the site to perform maintenance works to the electrical infrastructure where relevant.

Maintenance works for the overhead line would generate approximately two additional staff on site. In combination with the Proposed Development, the additional volume of traffic generated will be low and the overall cumulative impact will be temporary and slight.

14.1.10.6 Mitigation Measures

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

Mitigation by Design

Mitigation by design measures includes 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 14.1.8.
- Construction of temporary improvements to the local highway network at locations identified in Section 14.1.8.
- Use of on-site borrow pits to produce materials to minimise deliveries to site during construction,
- Use of existing overhead grid connection to alleviate requirement for construction works along regional road.

Mitigation Measures During the Construction Stage

The successful completion of this development will require significant coordination and planning and it is therefore recommended that 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.

Delivery of abnormal sized loads

The following are the main points to note for these deliveries which 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 56 abnormal sized loads will be delivered to the site, comprising 19 convoys of 3, undertaken over 19 separate nights.
- These nights will be spread out over an approximate period of 10 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 3 vehicles.
- There will also be two escort vehicles provided by the haulage company for each convoy.

Other traffic management measures

A detailed **Traffic Management Plan (TMP)**, will be provided specifying details relating to traffic management and included in the CEMP prior to the commencement of the construction phase of the Proposed Development. The TMP will be agreed with the local authority and An Garda Síochána prior to construction works commencing on site. The detailed TMP will include 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 County Council in advance of deliveries of turbine components to site. Liaison with the relevant 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.
- **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 authority, a pre-condition survey of roads associated with the Proposed Development can 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. Where required 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 Council 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 Roads section will be informed of the relevant 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 junctions** – at locations highlighted in section 14.1.8. 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 Council 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 and identification of an area for parking.
- **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. These are set out in the CEMP which is contained in Appendix 4-3.

- **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.

Mitigation Measures During Decommissioning Stage

In the event that the Proposed Development is decommissioned after the 30 years of operation, a decommissioning plan, including material recycling / disposal and traffic management plan will be prepared for agreement with the local authority. This plan will contain similar mitigation measures to those implemented during the construction phase.

14.1.10.7 Residual Impacts

Construction Stage

During the 12 month construction stage of the Proposed Development, it is forecast that the additional traffic that will appear on the delivery route indicated in Figure 14-2a will have a slight, negative and temporary impact on existing road users, which will be minimised with the implementation of the mitigation measures included in the proposed traffic management plan.

Operational Stage

As the traffic impact of the optimised development will be imperceptible during the operational stage, there will be no residual impacts during this stage.

Decommissioning Stage

As stated above, in the event that the wind farm is decommissioned a decommissioning plan will be prepared and implemented in order to minimise the residual impacts during this stage.

14.1.10.8 Summary

An assessment of the traffic related effects of the proposed Curraglass Renewable Energy Development, consisting of up to 7 turbines and associated infrastructure, located off the R584 in County Cork, was undertaken for the construction, operational and decommissioning stages of the development. The assessment considered the impact that the traffic generated by the Proposed Development would have on the local highway network, and also an assessment of the route geometry with respect to being able to accommodate the abnormally large vehicles required to deliver the turbine plant to the site.

Traffic Route & Study Area

An assessment of the preferred route Option 1 was undertaken with a swept path analysis undertaken at all potential pinch points on the route. The preferred route travels to the site via the N22, followed by the R585 to the northeast of Crookstown. The route then travels west passing through the villages of Crookstown, Bealnablath, Cappeen, Gloun, Shanlaragh on the way to Kealkill. The route then heads southwest on the R584 and after a turning manoeuvre near Ballylickey village, the site is approached heading north on the R584 past Kealkill village.

Vehicle types and network geometry

The types of vehicles that will be required to negotiate the local network will be up to 64.0 metres long with a blade length of 58.5 metres.

Traffic impact on local network

In terms of daily traffic flows it is estimated that the impact of the development traffic on the preferred delivery route will be as follows will be as follows:

- During the 7 days when the concrete foundations are poured the effect on the surrounding road network will be negative, resulting in an increase in traffic levels ranging from +1.8% on the N22 to an increase of +19.3% on the R585, and +18.3% on the R584 leading to the site. The direct effect will be temporary, and will be slight.
- During the remaining 248 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 +0.6% on the N22 to an increase of +5.5% on the R585, and +5.2% on the R584 leading to the site. On these days, the direct effect will be temporary and will be slight.
- During the 7 days of the turbine construction stage when general materials are delivered to the site, the delivery of construction materials will result in a negative impact on the surrounding road network, increasing traffic levels, ranging from +0.3% on the N22 to an increase of +3.5% on the R585, and +3.3% on the R584 leading to the site. The direct effect during this period will be temporary and will be slight.
- During the 19 days when the various component parts of the wind turbine plant are delivered to the site using extended articulated HGVs, the effect of the additional traffic on these days will be moderate due to the size of vehicles involved, resulting in increased traffic volumes of between 0.6% on the N22, 5.7% on the R585 to 5.2% on the R584 leading to the site, but will be temporary. The direct effect may be reduced to slight if the delivery of the large plant is done at night, as is proposed.

Once the facility is operational the traffic impact created by the 2 permanent employees will be negligible.

14.2 Telecommunications and Aviation

14.2.1 Introduction

This section of the EIAR addresses the potential impact of the Proposed Development with regards to telecommunications and aviation. Section 14.2.2 below provides details regarding the way in which wind turbines can potentially interfere with telecommunications or aviation signals. Section 14.2.3 presents details regarding the way in which such impacts will be avoided.

This section of the report focuses solely on the proposed wind turbines as, based on industry experience, it is not anticipated that that any interference with telecommunications or aviation signals will be caused by other elements of the Proposed Development such as the electricity substation, battery storage or grid connection cabling.

14.2.1.1 Methodology and Guidance

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

- *'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements'* (EPA, 2003)
- *'Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2002)
- *'Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* (EPA, 2017)

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 above EPA guidelines, 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 2.5 of this EIAR.

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 this EIAR. The full project description, including proposed turbine locations and elevations, is provided in Chapter 4.

14.2.1.2 Statement of Authority

This section of the EIAR has been prepared by Órla Murphy and reviewed by Michael Watson, of MKO. Órla is a Project Environmental Scientist with over 4 years' experience in the environmental sector where she has acted as Project Manager for a number of EIAR applications for wind energy developments and compiled numerous chapters, including the assessment of likely significant effects on Material Assets. She has coordinated the scoping and consultation exercise with telecommunications operators and aviation authorities for numerous renewable energy developments, and prepared the relevant sections of the EIARs.

14.2.2 Background

14.2.2.1 Broadcast Communications

Wind turbines, like all large structures, have the potential to interfere with television or radio signals by acting as a physical barrier to microwave links. The alternating current electrical generating and transformer equipment associated with wind turbines, like all electrical equipment, also generates its own

electromagnetic fields, and this can interfere with broadcast communications, i.e. television and radio signals. The most significant effect however, at a domestic level, relates to a possible flicker effect caused by the moving rotor, particularly on television signals. The most significant potential effect occurs where the wind turbine(s) is directly in line with the transmitter radio path.

14.2.2.2 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 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 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.

14.2.2.3 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 systems. Interference with radar systems occurs when wind turbines are located close to an airport or directly in line with the instrument landing approach. These effects are generally easily dealt with by detailed micro-siting of turbines in order to avoid alignment with signal paths or by the use of divertor relay links out of line with the wind farm.

14.2.3 Preventing Electromagnetic Interference

14.2.3.1 National Guidelines

Both the adopted 2006 and the Draft Revised 2019 '*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.

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 below; full details are provided in Section 2.5 in Chapter 2 of this EIAR.

The layout and design of the Proposed Development has taken into account nearby telecommunications links.

14.2.3.2 Scoping and Consultation

As part of the scoping and consultation exercise, MKO contacted the relevant national and regional broadcasters, fixed and mobile telephone operators, aviation authorities and other relevant parties. Consultation was also carried out with ComReg, in May 2019, in order identify any other additional licensed operators in the vicinity of the site to be contacted, who may not have been on the list of main operators, although no response was received. The telecommunications and aviation consultees are presented below in Table 14-25.

Table 14-25 Telecommunications and Aviation Scoping Responses

Consultee	Response	Potential for Interference Following Consultation Exercise	Action Required
Airspeed Communications	None received	No response	N/A
BT Communications Ireland	5th May 2019	No impacts noted therefore no potential for adverse impacts to arise.	N/A
Commission for Communications Regulation	None received	No response	N/A
Cork Airport	None received	No response	N/A
Department of Defence	10th December 2019	DoD noted no issues with the Proposed Development and issued observations as discussed below in Section 14.2.4.2.3	N/A
Eir	2nd May 2019	No links in the area therefore no potential for adverse impacts to arise.	N/A
ESB Telecoms	7th May 2019 and 2nd March 2020	ESB initially noted no issues and confirmed that the Proposed Development did not affect any of their current microwave links as well as noting satellite infrastructure on the existing substation within the site. ESB were provided with coordinates for the Proposed Development in February 2020. At this stage, it was noted that there could be a potential impact on this satellite and a future proposed radio link from Kealkill 38kV to Nowen Hill. The applicant discussed a telecommunications solution for the above noted infrastructure with EMR Solutions. Further details can be found in Section 14.2.3.2.2.	Yes - Further details can be found in Section 14.2.4.2.2.
Imagine Group	5th May 2019	No links in the area therefore no potential for adverse impacts to arise.	N/A
Irish Aviation Authority (IAA)	23rd December 2019 and 8th May 2020	IAA noted no issues with the Proposed Development. Upon sending through turbine locations, observations were provided as discussed below in Section 14.2.4.2.3	N/A
Imagine Group	5th May 2019	No links in the area therefore no potential for adverse impacts to arise.	N/A
Ripplecom	3rd May 2019	No impacts noted therefore no potential for adverse impacts to arise.	N/A

Consultee	Response	Potential for Interference Following Consultation Exercise	Action Required
RTE Transmission Network Ltd	2nd May 2019 and 4th March 2020	RTE 2rn initially noted no issues with the Proposed Development. On providing RTE with an initial turbine layout, turbines were noted as being directly in the pathway of the Mullaganish and Bantry sites. Further discussions with RTE resulted in a movement of T7. Further details can be found below Potential impacts on television viewers to the southwest of the site was also noted. This is a standard requirement, and should a favourable planning decision be made, the relevant protocol agreement will be provided. A protocol agreement was also requested, and the signed agreement can be found in Appendix 14-1.	Yes - Further details can be found in Section 14.2.3.2.1 and 14.2.4.2.2.
Tetra Ireland Communications Ltd.	9th May 2020	No impacts noted therefore no potential for adverse impacts to arise.	N/A
Three Ireland	1st May 2019	No links in the area therefore no potential for adverse impacts to arise.	N/A
Towercom	7th May 2019	No significant impact anticipated therefore no potential for adverse impacts to arise.	N/A
Viatel Ireland Ltd	2nd May 2019	No links in the area therefore no potential for adverse impacts to arise.	N/A
Virgin Ireland Ltd	None received	No response	N/A
Vodafone Ireland Ltd	None received	No response	N/A
MP&E Trading Company Ltd	2nd May 2019	No links in the area therefore no potential for adverse impacts to arise.	N/A

The scoping responses from the telecommunications and aviation consultees are summarised below. Copies of formal scoping responses are provided in Appendix 2-2.

14.2.3.2.1 *Broadcasters*

RTE Television Network Radio Telefís Éireann Transmission Network Ltd., now 2RN, responded by email on the 2nd May 2019. Having reviewed the location of the Proposed Development, 2rn noted a potential impact on television viewers to the southwest of the site. As a standard requirement, a protocol agreement was requested, and the signed agreement can be found in Appendix 14-1.

14.2.3.2.2 *Telephone and Broadband Operators*

BT Communications Ireland responded on the 5th May 2019 confirming that the Proposed Development will have no impact on their network.

Eir Mobile (formerly Meteor) responded by email on the 2nd May 2019 confirming that that they have no transmission or radio services in the vicinity of the Proposed Development site with the nearest link over 1.3km away, which does not pose any risk to the Eir Mobile (formerly Meteor) network.

ESB Networks responded by email on the 7th May 2019 confirming the Proposed Development did not affect any of their current microwave links and noted satellite infrastructure on the existing substation within the site. ESB were then provided with coordinates for the Proposed Development in February 2020. At this stage, it was noted that there could be a potential impact on this satellite and a future proposed radio link from Kealkill 38kV to Nowen Hill. Discussions were had with ESB which involved looking at potential new turbine locations or including appropriate buffers around the link and satellite infrastructure as detailed in correspondence in Appendix 2-2. As a means of resolving the issue, the applicant agreed a telecommunications solution for the above noted infrastructure with EMR Solutions that was forwarded to ESB. These telecommunications solutions involved:

- Primary link: 20Mbps Microwave radio from met mast to Nowen Hill high site with a fibre connection from met mast to substation.
- Secondary (Resilient/Failover) link: Satellite broadband from existing substation.

As a result, the applicant was able to confirm that no turbine, with the potential to impact on the existing communications signal to the existing substation, will be built before the alternative solution outlined by EMR is in place.

Imagine Group responded on the 1st May 2019 noting that they have reviewed all sites that they are planning to deliver in the area and can confirm that no microwave links will be using the area within or surrounding the Proposed Development site, therefore having no impact on their network.

Ripplecom responded on the 3rd May 2019 noted no impacts, therefore no potential for adverse impacts to arise.

RTE Transmission Network Ltd responded on the 2nd May 2019 noting no issues with the Proposed Development. On the 4th March 2020, on providing RTE with a proposed turbine layout, there were issues with the location of T7 which was directly in the pathway of their Mullaganish and Bantry sites. Further discussions with RTE resulted in a movement of T7 out of the 200m Fresnel Zone associated with that link and therefore no impact on their network is anticipated.

Three Ireland responded on the 1st May 2019. They confirmed that Proposed Development will not impact the 3 Transmission Network. They noted that they have no microwave links that traverse the development area. Their closest link is approximately 1.32km south west of the development area and is itself directed south-east and therefore no impact on their network is anticipated.

Towercom responded by email on the 7th May 2019 and confirmed that the Proposed Development would not appear to have a significant impact on their sites. Turbine coordinates were sent to the operator with no response. No significant impact anticipated therefore no potential for adverse impacts to arise

Viatel Ireland Ltd responded on the 2nd May 2019. No links were identified in the area, therefore no potential for adverse impacts to arise.

MP&E Trading Company Ltd. responded on the 2nd May 2019 confirming they had no links within the Proposed Development area, therefore identifying no potential for adverse impacts.

14.2.3.2.3 *Aviation*

Irish Aviation Authority (IAA)

The Irish Aviation Authority (IAA) issued a response during the consultation exercise on the 23rd December 2019 and the 8th May 2020 which noted the following observations:

- Agree an aeronautical obstacle warning light scheme for the wind farm development.

- Provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location.
- Notify the Authority of intention to commence crane operations with a minimum of 30 days prior notification of their erection

Department of Defence

The Department of Defence also issued a response during the consultation exercise on the 19th December 2019, which requested that the applicant be conditioned to:

> *"In all locations where wind farms are permitted it should be a condition that they meet the following lighting requirements -*
>
> 1. *Single turbines or turbines delineating corners of a windfarm should be illuminated by high intensity strobe lights (Red).*
> 2. *Obstruction lighting elsewhere in a windfarm will be of a pattern that will allow the hazard to be identified and avoided by aircraft in flight.*
> 3. *Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light. Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment."*

14.2.3.2.4 *Other Consultees*

Tetra Ireland Communications Ltd. responded on the 9th May 2019 and confirmed that they anticipated no impact from the Proposed Development.

The Broadcasting Authority of Ireland (BAI) responded on the 3rd December 2019 confirming that they do not perform an in-depth analysis of the effect of wind turbines on FM networks, but are not aware of any issues from existing wind farm sites on existing FM networks. They also noted that the Proposed Development was not located close to any existing or planned FM transmission sites.

14.2.4 Likely Significant Effects and Associated Mitigation Measures

14.2.4.1 'Do-Nothing' Scenario

If the Proposed Development were not to proceed, no changes would be made to the current land-use practice of forestry and the site would continue to be managed under the existing commercial forestry arrangements. There would be no potential for direct or indirect effects on telecommunications or aviation.

14.2.4.2 Construction Phase

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. There will be no direct or indirect effects on telecommunications or aviation.

14.2.4.3 Operational Phase

14.2.4.3.1 *Telecommunications*

Pre-Mitigation Impact

Consultation regarding the potential for electromagnetic interference from the Proposed Development was carried out with the relevant national and regional broadcasters, fixed line and mobile telephone operators and aviation authorities.

As detailed above in Section 14.2.3.2.2, there was a potential impact associated with the Proposed Development with both ESB and RTE infrastructure within the EIAR site boundary.

Mitigation Measures

It is standard practice of 2RN to produce a Protocol Document for wind farm developments, which will be signed by the developer. The Protocol Document ensures that in the event of any interference occurring to television or radio reception due to operation of the 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 unanticipated broadcast interference arising to television or radio reception as a result of the Proposed Development.

Mitigation by avoidance has been the main mitigation measure to ensure there are no impacts on communication links in the vicinity of the site. As detailed in Section 14.2.3.2.2, on agreement with the operator, the layout was amended including the movement of T7 to avoid the pathway of RTE's Mullaganish and Bantry sites.

Where avoidance is not possible, the developer has committed to resolving technically any potential interference with links which will be in place subject to planning consent being achieved. This is the mitigation measure proposed for the above noted ESB satellite and link situated on the existing substation within the site. Telecommunication solutions such as the use of a divertor to relay links, can be deployed to ensure no residual impacts occur on any telecommunications links.

In the event of further scoping responses being received from the EIA consultees, the comments of the consultees and any proposed mitigation measures will be considered in the construction and operation of the Proposed Development, subject to a grant of planning permission.

Residual Impact

The Proposed Development will have no residual impact on any identified telecommunication links or infrastructure once the above mitigation measures have been implemented.

Significance of Effects

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

14.2.4.3.2 *Aviation*

Pre-Mitigation Impact

The scoping response of the Irish Aviation Authority and Department of Defence has requested that standard lighting requirements be used at the Proposed Development, in line with policy on tall structures.

Mitigation Measures

The scoping response from the Department of Defence and IAA 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 Department of Defence, Air Corps and the Irish Aviation Authority (IAA). 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 requirement will be met by the applicant.

Significance of Effects

There will be no significant direct or indirect effects on aviation operations due to the Proposed Development.

14.2.5 Cumulative Impact Assessment

Section 2.7 of this EIAR describes the methodology used in compiling the list of projects considered in the assessment of cumulative effects, and provides a description of each project, including current status. Although there are a number of existing and permitted wind farms within 20 kilometres of the Proposed Development, there will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to Telecommunications or Aviation.

During the development of any large project that holds the potential to effect telecoms or aviation, the Developer is responsible for engaging with all relevant Telecoms Operators and the relevant the Aviation Authorities to ensure that the proposal will not interfere with television or radio signals by acting as a physical barrier. In the event of any potential impact, the Developer for each individual project is responsible for ensuring that the necessary mitigatory measures are in place. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise.

14.2.6 Conclusion

A comprehensive scoping and consultation exercise was carried out with the main telecommunications operators and aviation bodies in relation to the Proposed Development site.

As detailed in Section 14.2.4.3.1, mitigation by avoidance and telecommunication solutions have been implemented.

The obstacle warning light scheme required for tall structures by the Irish Air Corps and the Irish Aviation Authority will be agreed ahead of turbine construction, as detailed in Section 14.2.4.3.2, as is standard for permitted wind farms.

As a result, there will no impact from the Proposed Development in respect to aviation or telecommunication The Proposed Development will have no significant effects