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 12 of this Remedial Environmental Impact Assessment Report (rEIAR). 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 rEIAR addresses the likely significant effects of the Cleanrath wind farm 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 were generated during the construction and are forecast to be generated during the operational and decommissioning phases of the Cleanrath wind farm development.

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 are assessed on both the external highway network and at the junctions of the local road network that 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 used for the construction of the development were subject to the standard axle weight requirements set out under Road Traffic Regulations and therefore the loadings from construction traffic did not exceed the relevant standards. Notwithstanding the need to use specialist vehicles to facilitate turbine delivery, it should be noted that the number of load-bearing axles for any specialist vehicles carrying large loads were designed to ensure that the load on any one axle did not exceed acceptable load bearing statutory limits.

The magnitude of the increase in traffic volumes experienced during the various phases of the Cleanrath wind farm development on the surrounding network is identified during the various construction, operation and decommissioning phases. The traffic management measures that were undertaken during the delivery stage in order to minimise the traffic impacts on the local highway network are provided in Appendix 4-5 of this rEIAR .

14.1.1.2 Statement of Authority

This section of the rEIAR 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 and Knocknalough. Co. Galway,
- Knocknamork, Shehy More, Barnadivane and Cleanrath Co. Cork
- Ballyhorgan Co. Kerry
- Meenbog Co. Donegal

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 Transport Infrastructure Ireland (TII) accredited Road Safety Audit Team Member.

14.1.1.3 Guidance and Legislation

This section of the rEIAR 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 Cleanrath wind farm development. Further information on the classification of effects used in this assessment is presented in Section 1.8 of this rEIAR.

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 2.4 of Chapter 2 of the rEIAR.

Transport Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to Scoping on the 26th May 2020 in which it provided a list of recommendations to be followed when preparing the rEIAR. 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.

At the time of finalising this document, no other scoping responses relating to traffic were received.

14.1.1.5 Methodology and Section Structure

The report adopts the guidance for such assessments set out by TII in the document *'Guidelines for Traffic and Transport Assessments'*. The geometric requirements of the transporter vehicles were assessed using Autocad and Autotrack.

The Traffic and Transport Section of the rEIAR is set out as follows:

- A review of the existing and future transport infrastructure in the vicinity of the development, including an assessment of 2015 traffic flows and traffic estimates for the construction years of 2018 / 2019. For the purpose of assessing impacts the worst case of 2019 is referred to in the remainder of this section. *(Section 14.1.2 - Receiving Environment)*,
- A description of the nature of the Cleanrath wind farm development and the traffic volumes that were generated during the different construction stages, during operation of the Cleanrath wind farm development to date and forecasts for when it is operational *(Section 14.1.3 – Cleanrath wind farm development and Traffic Generation)*,
- A description of the abnormally large loads and vehicles that accessed the site *(Section 14.1.4 – Construction Traffic Design Vehicles)*,
- A review of the impact of development generated traffic on links and junctions during construction, during operation of the Cleanrath wind farm development to date and when the facility is operational *(Section 14.1.5 –Traffic impact during construction and during operation)*,
- A geometric assessment of the route and its capacity to accommodate the abnormal loads associated with the development *(Section 14.1.6 – Route Assessment)* was undertaken prior to construction and has been updated to demonstrate how turbine deliveries accessed the site during the deliveries and will do in the future should similar access be required in the future such as turbine component replacement or decommissioning and removal of the turbines off site,
- An assessment of the provision for sustainable modes of travel (in this case primarily with respect to the transport of construction staff) *(Section 14.1.7 – Provision for Sustainable Modes of Travel)*,

14.1.2 Receiving Environment

14.1.2.1 Site location

The location of the Cleanrath wind farm development in Cleanrath, County Cork, is shown in the context of the national and local highway networks in Figure 14-1.

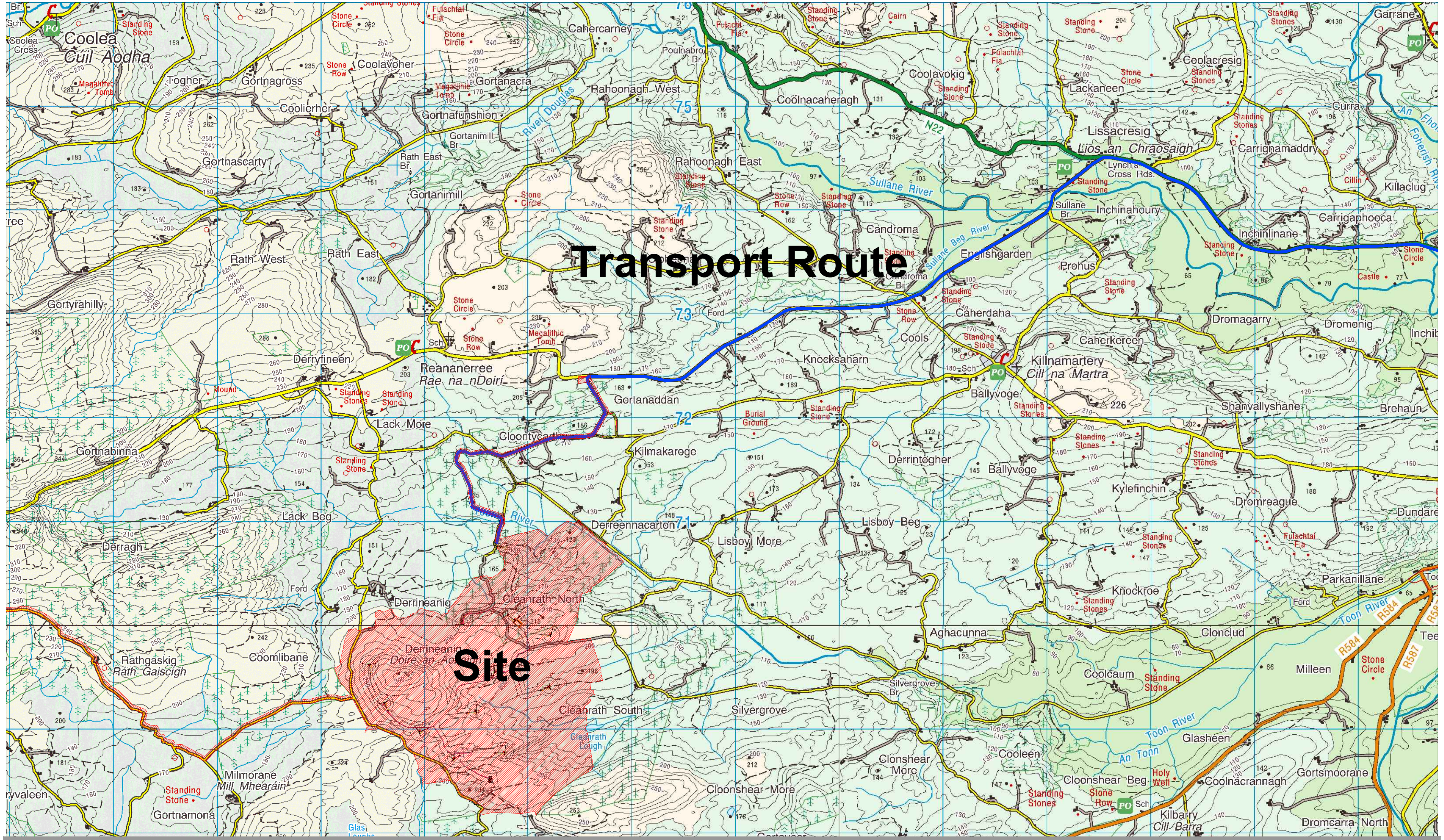
14.1.2.2 Turbine and Materials Transport Route

The point of arrival for the wind farm plant was the port at Ringaskiddy in Cork. A detailed assessment of the transport route is provided from a point at which the route turns off the N22 national secondary road at Lynch's Cross roads, also shown in Figure 14-1, while an assessment of the route between the port at Ringaskiddy to the N22 is also included. The route is discussed in detail in Section 14.1.6 with locations included in the route assessment shown in Figure 14-5, and the assessment of the route between the port at Ringaskiddy and the N22 included as Appendix 14-1.

14.1.2.3 Study Area

The extent of the route assessment discussed in the remainder of this section is confined to the access route and the locations identified in Figure 14-5 as follows;

- Location 1 – The left turn from the N22 at Lynch's Cross Roads (Mons Bar),
- Location 2 - The left turn at woodmill at Gortanaddan
- Location 3 – Junction A
- Location 4 – Junction B
- Location 5 – Junction C
- Location 6 – Junction D
- Location 7 – Junction E



NOTES:	Figure 14-1 Site location			
PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES	PROJECT: Cleanrath Wind Farm			ALAN LIPSCOMBE TRAFFIC & TRANSPORT CONSULTANTS
	CLIENT: Cleanrath Wind Farm Ltd		SCALE: NTS	
	PROJECT NO: 2681	DATE: 17.05.20	DRAWN BY: AL	

14.1.2.4 Background Traffic Flows

It should be noted that traffic volumes are discussed in terms of 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, a typical articulated HGV was given a factor of 2.4 passenger car units, while one of the extended loaders required to transport the wind turbine equipment, was assigned a value of 10.

Sample short term traffic counts were undertaken at various locations on the study area network on Thursday 3rd December 2015 and daily flow profiles were established from a continuous traffic counter site maintained by the National Roads Authority, (now TII) on the N22. The counts are shown in terms of 2-way vehicle flows in Table 14-1. Observed counts were obtained at 4 locations along the route.

Hourly traffic volumes observed in 2015 were factored to annual average daily traffic volumes using the continuous traffic count data collected by the TII, as shown in Table 14-1. The TII counter site selected is located on the N22 in Baile Bhuirne, which was also used to estimate the existing percentage of HGV's. Based on this profile, the average daily traffic flow, or AADT, was determined to be 16.45 times the flow observed during the hours of 11:00 – 12:00 on an average week day, and 15.09 times the flow observed during the hours of 12:00 to 13:00.

Based on this information it was determined that the traffic volumes in 2015 on the delivery route ranged from 6,613 pcus per day on the N22 at Lynch's Cross Roads, to less than 300 pcus on the local road approaching the site to the south of the existing wood mill.

Table 14-1 Weekday inter-peak hour link flows, 2015 (2-way vehicles)

Link	2-way flow	Hour	All day factor	All day flow
1 N22 east of Gortanaddan (at Mors Bar)	402	11:00 – 12:00	16.45	6,613
2 L3402 Gortanaddan Road (at Mors Bar)	85	11:00 – 12:00	16.45	1,398
3 Local road east of woodmill	72	12:00 – 13:00	15.09	1,086
4 Local road south of wood mill	18	12:00 – 13:00	15.09	272

14.1.2.5 Future Background Traffic Volumes

Data from the TII automatic traffic counter located on the N22 at Baile Bhuirne was also used to determine the traffic volumes on the local road network during the construction year of 2019. For the purpose of the assessment presented the worst case of 2019 is presented. A review of traffic flows for these years shows that traffic volumes on the N22 increased by 11.6% during the period from 2015 to 2019. Observed year 2015 traffic flows together with those estimated for the construction year of 2019 based on an 11.6% increase are compared in Table 14-2.

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

Link	2015	2019
1 N22 east of Gortanaddan (at Mors Bar)	6,613	7,382
2 L3402 Gortanaddan Road (at Mors Bar)	1,398	1,561
3 Local road east of woodmill	1,086	1,213
4 Local road south of wood mill	272	303

The percentage of HGV's on the study network is shown in Table 14-3, with 6.5% of traffic volumes on the network comprising of HGVs.

Table 14-3 All day flows, percentage HGVs and flows by vehicle type, year 2019

Link	All day flow (vehs)	% HGV's	Vehicles		PCUs		
			HGVs	Cars / lgvs	HGVs	Cars / lgvs	Total
1 N22 east of Gortanaddan (at Mors Bar)	7,382	6.5%	480	6,903	1,152	6,903	8,054
2 L3402 Gortanaddan Road (at Mors Bar)	1,943	6.5%	101	1,459	244	1,459	1,703
3 Local road east of woodmill	319	6.5%	79	1,134	189	1,134	1,323
4 Local road south of wood mill	210	6.5%	20	284	47	284	331

14.1.3 Cleanrath Wind Farm Development and Traffic Generation

14.1.3.1 Development Content

The Cleanrath wind farm development comprises of a wind farm consisting of 9 No. turbines, associated infrastructure including a grid connection cable and turbine delivery route accommodation works to facilitate turbine deliveries.

14.1.3.2 Development Trip Generation – During Construction

Development Trip Generation – During Construction

For the purpose of assessing the effects of traffic generated during the construction of the Cleanrath wind farm development, which lasted a total of 16 months or 340 working days, the construction phase is considered in two stages.

- Stage 1 - Site preparation and groundworks (303 days), and,
- Stage 2 - Turbine construction (37 days).

Stage 1 - Site preparation and ground works

The site preparation and groundworks stage was undertaken over 303 working days with the total numbers of deliveries made to the site during that period shown in Table 14-4.

During this period there were three distinct types of days with respect to trip generation. Firstly, 9 days were used to pour the 9 concrete wind turbine foundations. Foundations were constructed one per day, with 66 loads of concrete and associated equipment and materials required for each delivered to the site over a 12 hour period, resulting in just over 5 to 6 HGV trips to and from the site per hour.

The second type of day for this phase lasted 191 days when on average 2 to 3 loads of concrete were delivered along the cable route.

For the remaining 103 days of this stage all other materials/ plant were delivered for the site preparation and groundwork stage when a total of 1,204 deliveries, or 10 to 11 per day were made to the site.

During all of Stage 1 it is recorded that 2,312 two-way trips were made to the site by trucks and large articulated HGVs, as set out in Table 14-4, with the daily impact on the local road network shown in Tables 14-5, Table 14-6 and Table 14-7. The figures show that on the 9 days that concrete were delivered to the site an additional 316 two-way pcus were added to the network (comprising 66 two-way HGV trips with 2.4 PCUs per movement, as shown in Table 14-5.) Similarly, on the 191 days that 2 to 3 concrete deliveries were made to the cable route resulting in an additional 13 pcus on the local road network, as shown in Table 14-6. On the 103 days when other materials were delivered to the site, traffic volumes on the local network increased by an average of 56 PCUs, as set out in Table 14-7.

Table 14-4 Stage 1 – Site preparation and groundworks – total movements

Material	Total no. Truck Loads	Truck type
Concrete (inc grid & pumps)	1,108	Concrete trucks
Steel	29	Large artic
Sand / binding/stone	575	Truck
Spoil / excavated material from cabling trench	286	Large artic
Ducting	24	Large artic
Cabling	17	Large artic
Coms / ducting	32	Large artic

Tree felling	123	Large artic
Additional misc	118	Large artic
Total	2,312	

Table 14-5 Stage 1 – Concrete foundation pouring – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	Vehs per day	Total PCUs	PCU Movements /day*	2- way PCUs/day
Concrete	592	Truck	65.8	1,421	157.9	315.7

** Estimation based on 9 concrete pouring days*

Table 14-6 Stage 1 – Concrete pour for cable route – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	Vehs per day	Total PCUs	PCU Movements /day*	2- way PCUs/day
Concrete	516	Truck	2.5	1,238	6.5	13.0

** Estimation based on 191 concrete pouring days*

Table 14-7 Stage 1 – Site preparation and groundworks – total movements and volumes per delivery day

Material	Total Truck Loads	Truck type	Vehs per day	Total PCUs	PCU Movements /day*	2- way PCUs/day
Steel	29	Large artic	0.3	69.6	0.7	1.4
Sand / binding/stone	575	Truck	5.6	1,380	13.4	26.8
Spoil / excavated material from cabling trench	286	Large artic	2.8	686	6.7	13.3
Ducting	24	Large artic	0.2	58	0.6	1.1
Cabling	17	Large artic	0.2	41	0.4	0.8

Material	Total Truck Loads	Truck type	Vehs per day	Total PCUs	PCU Movements /day*	2- way PCUs/day
Coms / ducting	32	Large artic	0.3	77	0.8	1.5
Tree felling	123	Large artic	1.2	295	2.9	5.7
Additional misc	118	Large artic	1.1	283	2.8	5.5
Total	1,204	-	11.7	2,889	28.05	56.11

** Estimation based on ground work period of 103 working days*

Stage 2 - Turbine Construction

During the turbine construction stage, including delivery and assembly, there were deliveries to the site made by abnormally large vehicles, referred to in this section as *extended artics*, transporting the component parts of the turbines (nacelles, blades and towers) and there were also deliveries made by normal large HGVs, transporting tools, ladders, cranes and other component parts. The types of load and associated numbers of trips made to the site during the turbine construction period are shown in Table 14-8, which summarises that a total of 86 trips were made to and from the site by extended artics, with a further 39 trips made by conventional large articulated HGVs.

Table 14-8 Stage 2 – Wind turbine plant – total movements

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Blades	9	3	27	1	27	Extended Artic
Nacelles and other components	9	3	27	1	27	Extended Artic
Towers	9	3.5	32	1	32	Extended Artic
Sub total					86	

Material	Units	Quantity per Unit	Total Quantity	Quantity per Truck	Total Truck Loads	Truck type
Tools, ladders, and generators	23	1	23	1	23	Large Artic
Misc (inc cranes)	16	1	16	1	16	Large Artic
Sub total					39	

The turbine construction delivery phase progressed at an average rate of 3 abnormal loads per night over 28 separate nights, over an 11 week period. During this period a further 9 days were spent transporting the remaining equipment required during this phase, as summarised in Tables 14-9 and 14-10 respectively. In Table 14-9, a PCU equivalent value of 10 was allocated to each extended artic movement, resulting in an additional 60 PCUs per week on the study network on these 28 days, while an additional 21 PCUs travelled on the network on the 9 days (within the 28 day period) as shown in Table 14-10, during the turbine construction phase.

Table 14-9 Stage 2 – Wind turbine plant, extended artics – total movements and volumes per delivery day

Material	Units	Truck Type	PCU Value	Total PCUs/day	2-way PCUs/ day
Blades, towers, nacelles, per delivery day	3	Extended Artic	10	30.0	60.0

** Estimation based on 3 abnormal sized loads being delivered for 28 nights over a period of 11 weeks (total 86 loads)*

Table 14-10 Stage 2 - Wind turbine plant, standard artic HGVs - total movements and volumes per delivery day (9 day period)

Material	Quantity per Unit	PCU Value	PCUs / day	2-way PCUs / day
Tools, ladders, and generators	23	2.4	6.1	12.3
Misc (inc cranes)	16	2.4	4.3	8.5
Total	39		10.4	20.8

Construction Employee Traffic

Up to 80 staff members were employed on the site at any one time during the 16 month long site preparation and groundworks stage of construction. Staff travelled to / from the site by car/ van, at an average of 2 persons per car, resulting in up to 80 pcu movements (each trip is two way) added to the network during the construction phase of the development. While there were stages of the construction stage that there were significantly less than 80 construction staff on site, this number is adopted for the full construction period (excluding the cable laying phase) in order to present the worst case scenario.

14.1.3.3 Development Trip Generation – During Operation

The site has been operational for a short-term period with the turbines currently in Sleep Mode. The impact assessment within this rEIAR considers all the initial operational period and the Sleep Mode period and any future operation of the Cleanrath wind farm development as a collective operational phase. It is estimated that the traffic volumes that will be generated by the development once it is operational will be minimal, with a maximum of three staff employed on site at any one time relating to the maintenance and control of the Cleanrath wind farm development. The plant and equipment involved in the peatland habitat restoration works during the operational phase are presented in table 14-11. This does not include for any large scale timber extraction and haulage off site as the area that will be felled for this habitat restoration will be chipped on site as the trees are not mature and are therefore of little value with regards timber production. It is expected that the Cleanrath wind farm development will generate a modest amount of visitor trips to the site. The impact on the access junction of these trips during the operational stage is discussed in Section 14.1.5.

Table 14-11 Plant Deliveries and collection during operation for Peatland Habitat Restoration works (2 day period)

Material	Quantity per Unit	PCU Value	PCUs / day	2-way PCUs / day
Plant equipment and excavator delivery to site	3	2.4	7.2	14.4

14.1.3.4 Development Trip Generation – During Decommissioning

The decommissioning of the Cleanrath wind farm development will be completed after the 25 year lifespan or at an earlier date if early decommissioning is required. Decommissioning will comprise the dismantling and removal of turbines from site using the same plant and equipment as the turbine installation phase. The traffic movement and volumes associated turbine removal are included in Tables 14-12 – 14.15

The traffic movements associated with the removal of the wind turbine component parts by both extended artic and standard HGVs are a mirror image of the deliveries made during the construction stage and are set out in Tables 14.12 and 14.13.

To accommodate the transport of turbines off-site, the temporary delivery accommodation areas which have been secured with soil berms will have to be temporarily removed for access using an excavator. The foundations will be covered with soil material as summarised in Chapter 2. These works will be completed by the import of soil using HGVs and an excavator to complete reinstatement. The traffic movements and volumes associated with the reopening of temporary delivery accommodation areas and turbine foundation backfilling and reinstatement are included in Table 14-14 with an estimation that an additional 112 pcus will travel on the local road network for a 5 day period.

The electrical cabling connecting the Cleanrath wind farm development to the Derragh substation in the townland of Rathgaskig will be removed from the underground cable ducting. Although not intended to remove the cable between the substation in Rathgaskig and Coomataggart it is assessed here in the event that it is to be removed. The traffic movement and volumes associated with the cable removal along the grid connection route are set out in Table 14-15 with an estimation that and additional 6 pcus will travel on the local highway network over a 15 day period.

Table 14-12 Stage 1 – Wind turbine plant, extended artics – total movements and volumes per delivery day

Material	Units	Truck Type	PCU Value	Total PCUs/day	2-way PCUs/ day
Blades, towers, nacelles, per delivery day	3	Extended Artic	10	30.0	60.0

** Estimation based on 3 abnormal sized loads being delivered for 28 nights over a period of 11 weeks (total 86 loads)*

Table 14-13 Stage 1 - Wind turbine plant, standard artic HGVs - total movements and volumes over a 9 day period

Material	Quantity per Unit	PCU Value	PCUs / day	2-way PCUs / day
Tools, ladders, and generators	23	2.4	6.1	12.3
Misc (inc cranes)	16	2.4	4.3	8.5
Total	39		10.4	20.8

Table 14-14 Stage 2 – Temporary Accommodation Areas and Foundation Backfilling, standard artic HGVs - total movements and volumes over a 5 day period

Material	Quantity per Unit	PCU Value	PCUs / day	2-way PCUs / day
Imported Soil	116	2.4	55.7	111.4
Excavator delivery to site	1	2.4	0.5	1
Total	117		56.2	112.4

Table 14-15 Stage 3 – Cable removal from ducting, standard artic HGVs - total movements and volumes over a 15 day period

Material	Quantity per Unit	PCU Value	PCUs / day	2-way PCUs / day
Cabling	17	2.4	2.7	5.4
HGV with a winch for cable pulling	1	2.4	0.2	0.4
Total	18		2.9	5.8

14.1.4 Construction Traffic Design Vehicles

14.1.4.1 Construction Traffic Vehicle Types

The turbine type that has been constructed is the Nordex N117 with a blade length of 57.3m. It should be noted that the transportation of the blades and the mid-section of the steel tower were the critical elements in terms of dimensions and were therefore adopted for the assessment.

The key dimensions are as follows:

Transport of Blades – Articulated HGV with blade

- Total length 64.0m
- Length of blade 57.3 m

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

- Total length (with load) 50.0 m
- Length of load 29 m
- Inner radius 25.0 m

The critical vehicles in terms of size and turning geometry requirements used to transport the abnormally large loads to site, and adopted for the detailed route assessment discussed in Section 14.1.6, were the transporters for the blades and the towers, with the geometry of each shown in Figures 14-2 and 14-3 respectively.

The vehicles used to transport the nacelles were similar to the tower transporter although they were shorter in length.

All other vehicles that required access to the site were significantly smaller than the design test vehicles.

14.1.5 Traffic Effects During Construction, During Operation and During Decommissioning

14.1.5.1 Traffic Effect During Construction – Link Flows

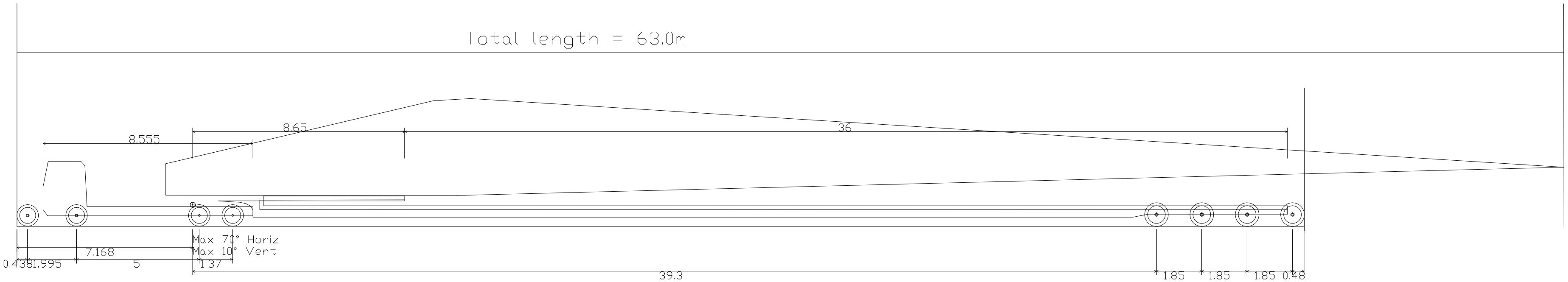
Effect on Link Flows – During Construction

Background traffic volumes and development generated traffic volumes for the construction stage are shown for the five typical construction days discussed in Section 14.1.3 in Tables 14.16 to 14.20 and are summarised in Tables 14.21 to 14.25.

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

During Stage 1 – Concrete pouring foundations

For 9 weekdays on the delivery route an additional 396 pcus travelled on the study network. On these days, 5 to 6 concrete mixers drove to and from the site per hour for approximately 12 hours. The percentage increase in traffic volumes experienced on the study network was between 4.9% on the N22 and 119.7% on the local road south of the wood mill leading to the site).



57.3 Blade

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 14-2 Design blade extended artic profile

PROJECT: Cleanrath Wind Farm

CLIENT: Cleanrath Wind Farm Ltd

SCALE: NTS

PROJECT NO: 2681

DATE: 17.05.20

DRAWN BY: AL

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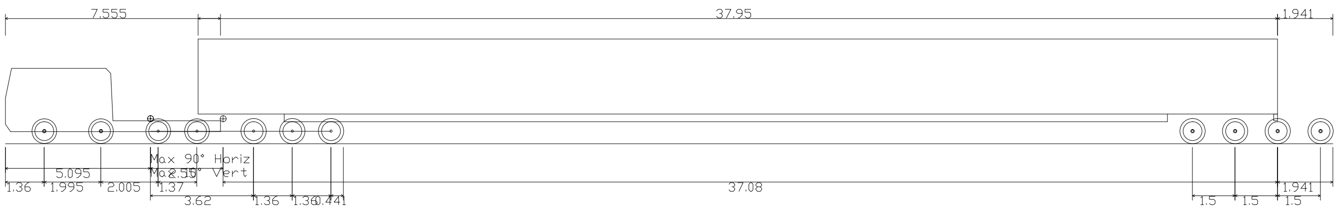


Tower 46.75m)	
□verall Length	46.666m
□verall Width	2.550m
□verall Body Height	3.695m
Min Body Ground Clearance	0.427m
Max Track Width	2.520m
Lock to Lock Time	6.00s
Wall to Wall Turning Radius	9.800m

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-3 Design tower extended artic profile

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	NTS
PROJECT NO: 2681	DATE: 17.05.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

During Stage 1 – Grid connection works including concrete pouring

For 191 weekdays on the delivery route an additional 13 pcus travelled on the study network. On these days 2 to 3 concrete mixers drove to and from the site over a period of 12 hours. The percentage increase in traffic volumes experienced on the study network was between 0.2%on the N22, and 3.9% (on the local road south of the wood mill leading to the site). It is noted that there were other roads on and in proximity of the cable route that provided for construction traffic although the number of loads was not significant i.e. 286 loads of spoil / excavated material from cabling trench as set out in Table 14-4 over 191 days, which translates to a maximum of is 1.5 HGVs per day.

During Stage 1 - Site Preparation and Groundworks

For 103 weekdays an additional 136 pcus travelled on the study network. On these days, the percentage increase in traffic volumes experienced on the study network was between 1.7% on the N22, and 41.1% on the local road leading to the site.

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

For 28 weekdays nights over an 11 week period an additional 140 pcus (made up of cars and 3 large extended artics) travelled on the study network. On these days the percentage increase on the study network was between 1.7% on the N22 and 42.3% on the local road south of the wood mill leading to the site. The provision of traffic management measures, addressed in Section 14.1.5, including undertaking these deliveries at night with a Garda escort, minimised the impact of development traffic on the study network on these days.

During Stage 2 - Turbine Construction Stage – Other deliveries using conventional articulated HGV's

For 9 week days approximately 2 days per week for 5 weeks, an additional 101 pcus (made up of cars and standard articulated HGV movements to the site and back) travelled on the study network. On these days the percentage increase on the study network increased by between 1.3%on the N22, and 30.5% on the local road leading up to the site.

Table 14-16 Effects of development traffic during concrete pouring for foundations

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	80	316	396	6,943	1,468	8,450
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	80	316	396	1,499	560	2,099
3 Local road east of woodmill	1,134	189	1,323	80	316	396	1,174	505	1,719

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
4 Local road south of wood mill	284	47	331	80	316	396	324	363	727

Table 14-17 Effects of development traffic during concrete pouring for cable

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	0	13	13	6,903	1,165	8,067
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	0	13	13	1,459	257	1,716
3 Local road east of woodmill	1,134	189	1,323	0	13	13	1,134	202	1,336
4 Local road south of wood mill	284	47	331	0	13	13	284	60	344

Table 14-18 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 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	80	56	136	6,983	1,208	8,190
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	80	56	136	1,539	300	1,8393
3 Local road east of woodmill	1,134	189	1,323	80	56	136	1,214	245	1,459
4 Local road south of wood mill	284	47	331	80	56	136	364	103	467

Table 14-19 Development traffic during turbine construction - extended artics

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	80	60	140	6,983	1,212	8,194
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	80	60	140	1,539	304	1,843
3 Local road east of woodmill	1,134	189	1,323	80	60	140	1,214	249	1,463
4 Local road south of wood mill	284	47	331	80	60	140	364	107	471

Table 14-20 Effect of development traffic during turbine construction – other deliveries

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	80	21	101	6,983	1,173	8,155
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	80	21	101	1,539	265	1,804
3 Local road east of woodmill	1,134	189	1,323	80	21	101	1,214	210	1,424
4 Local road south of wood mill	284	47	331	80	21	101	364	68	432

Table 14-21 Summary effect of development traffic during concrete pouring for foundations

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	396	8,450	4.9%	9

Link	Background	Development	Total	% increase	Estimated No. of days
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	396	2,099	23.3%	9
3 Local road east of woodmill	1,323	396	1,719	29.9%	9
4 Local road south of wood mill	331	396	727	119.7%	9

Table 14-22 Summary effect of development traffic during concrete pouring for cable

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	13	8,067	0.2%	191
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	13	1,716	0.8%	191
3 Local road east of woodmill	1,323	13	1,336	1.0%	191
4 Local road south of wood mill	331	13	344	3.9%	191

Table 14-23 Summary effect of development traffic during site preparation and ground works

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	136	8,190	1.7%	103
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	136	1,839	8.0%	103
3 Local road east of woodmill	1,323	136	1,459	10.3%	103

Link	Background	Development	Total	% increase	Estimated No. of days
4 Local road south of wood mill	331	136	467	41.1%	103

Table 14-24 Summary effect of development traffic during turbine construction – extended artics

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	140	8,194	1.7%	28
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	140	1,843	8.2%	28
3 Local road east of woodmill	1,323	140	1,463	10.6%	28
4 Local road south of wood mill	331	140	471	42.3%	28

Table 14-25 Summary effect of development traffic during turbine construction – other deliveries

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	101	8,155	1.3%	9
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	101	1,804	5.9%	9
3 Local road east of woodmill	1,323	101	1,424	7.6%	9
4 Local road south of wood mill	331	101	432	30.5%	9

An assessment of the impact on link capacities in the study area was undertaken for the various construction stages as set out in Table 14-26, Table 14-27, and Table 14-28. The capacity for each link in the study area is shown in Table 14-26. **Error! Reference source not found.** The capacities range from a daily flow of 8,600 vehicles on the N22 down to 2,200 on the local road south of the woodmill approaching the site, 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 actual traffic flows for the various construction delivery stages in Table 14-27 with the percentage capacity reached for each link and stage shown in Table 14-28. Based on this assessment the following points are noted;

- On the external network the N22 to the east of Gortanaddan (at Mors Bar) is the busiest road with the link capacity forecast to operate at 94% prior to construction and increased to a maximum of 98% during the 9 days that the concrete foundations were poured. For the rest of the construction period it is estimated that the N22 operated at a maximum of 95% capacity.
- All other roads leading to the site operated well within link capacity for all scenarios.

Table 14-26 Carriageway widths, link type and link capacity

Link	Width (m)	Link type	Link capacity
1 N22 east of Gortanaddan (at Mors Bar)	6.0m - 7.0m	Type 2 single	8,600
2 L3402 Gortanaddan Road (at Mors Bar)	5.0m – 6.0m	Type 3 single	5,000
3 Local road east of woodmill	5.0 – 2-way	Type 3 single	5,000
4 Local road south of wood mill	<5.0 – 1-way with passing locations	NA	2,200

Table 14-27 Link capacity and summary of link flows by construction delivery stage

Link	Construction delivery stage					
	Background traffic	Concrete pour - foundations	Concrete pour – cable	Construction and site works	Turbine extended artics	Other turbine equipment
1 N22 east of Gortanaddan (at Mors Bar)	8,054	8,410	8,067	8,144	8,154	8,115
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	2,059	1,716	1,793	1,803	1,764
3 Local road east of woodmill	1,323	1,679	1,336	1,413	1,423	1,384
4 Local road south of wood mill	331	687	344	421	431	392

Table 14-28 Link capacity and % of link capacity by construction delivery stage

Link	Construction delivery stage					
	Background traffic	Concrete pour - foundations	Concrete pour – cable	Construction and site works	Turbine extended artics	Other turbine equipment
1 N22 east of Gortanaddan (at Mors Bar)	94%	98%	94%	95%	95%	94%
2 L3402 Gortanaddan Road (at Mors Bar)	34%	41%	34%	36%	36%	35%
3 Local road east of woodmill	26%	34%	27%	28%	28%	28%
4 Local road south of wood mill	15%	31%	16%	19%	20%	18%

14.1.5.2 Traffic Effect During Operation – Link Flows

During the initial first 3 month period of operation from January to March 2020 there were up to 10 cars / vans visiting the site per day. Following that initial period during the operation of the Cleanrath wind farm development, there has been and it is estimated that there will continue to be a maximum of three maintenance staff members employed on site with a similar number of vehicle trips to and from the site. It The scenario where the traffic effects on the surrounding road network will be greatest during the operational stage will be if the 3 maintenance staff car trips coincides with the arrival / departure of the site plant for the peatland habitat restoration work set out in Table 14-11. Background traffic volumes and development generated traffic volumes are shown for this scenario in Table 14-29 with the effects summarised in Table 14-30.

The tables show that for 2 worst case days during the operational stage an additional 21 pcus (made up of cars and standard articulated HGV movements) will travel on the study network. On these days the percentage increase on the study network is forecast to be between 0.3% on the N22 and 6.4% on the local road leading up to the site.

For the remaining days in the 25 year operational stage it is forecast that a maximum of 6 additional pcus will travel on the study network in one day when the impacts will be imperceptible.

Table 14-29 Effect of development traffic during operation (Peatland Restoration Works)

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	6	15	21	6,909	1,167	8,075

2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	6	15	21	1,465	259	1,724
3 Local road east of woodmill	1,134	189	1,323	6	15	21	1,140	204	1,344
4 Local road south of wood mill	284	47	331	6	15	21	290	62	352

Table 14-30 Summary effect of development traffic during operation

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	21	8,075	0.3%	2
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	21	1,724	1.2%	2
3 Local road east of woodmill	1,323	21	1,344	1.6%	2
4 Local road south of wood mill	331	21	352	6.4%	2

Background traffic flows are compared to flows forecast for the busiest operational day in Table 14-31 with the percentage capacity reached for each link shown in Table 14-32. Based on this assessment the following points are noted;

- On the external network the N22 to the east of Gortanaddan (at Mors Bar) was forecast to operate at 94% prior to construction and has returned to operating at this level for the busiest day during the operational stage of the development.
- All other roads leading to the site are forecast to operate well within link capacity for all days during the operational stage of the Cleanrath wind farm development.

Table 14-31 Link capacity and summary of link flows during operational stage

Link	Operational stage	
	Background traffic	During operation (busiest day)
1 N22 east of Gortanaddan (at Mors Bar)	8,054	8,075
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	1,724

Link	Operational stage	
3 Local road east of woodmill	1,323	1,344
4 Local road south of wood mill	331	352

Table 14-32 Link capacity and % of link capacity, operational stage

Link	Operational stage	
	Background traffic	During operation (busiest day)
1 N22 east of Gortanaddan (at Mors Bar)	94%	94%
2 L3402 Gortanaddan Road (at Mors Bar)	34%	34%
3 Local road east of woodmill	26%	27%
4 Local road south of wood mill	15%	16%

In the unlikely event of having to swap out a blade or any turbine component during the operational phase, the traffic volumes associated with this will be similar to that outlined in Section 14.1.3.2 above but at much reduced volume which will be determined by the scale of the component swap out. Should this be required the boundary treatments and roadside berm at the temporary junction accommodation works and the turbine delivery accommodation roadway will also need to be removed but will not result in any additional traffic volumes other than the provision of an excavator to complete these works.

14.1.5.3 Traffic Effect During Decommissioning – Link Flows

Background traffic volumes and development generated traffic volumes during decommissioning are shown for the four typical days discussed in Section 14.1.3 in Tables 14.33 to 14.36 and are summarised in Tables 14.37 to 14.40.

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

During the extraction of wind turbine plant using extended articulated vehicles

For 28 weekday nights over an 11 week period an additional 70 pcus (made up of cars and 3 large extended artics) will travel on the study network. On these days the percentage increase on the study network is forecast to be between 0.9% on the N22 and 21.2% on the local road south of the wood mill leading to the site. The provision of traffic management measures, addressed at a in Section 14.1.5, including undertaking these deliveries at night with a Garda escort, will minimise the impact of development traffic on the study network on these days.

During the extraction of wind turbine plant using standard artic HGVs

For 9 weekdays on the delivery route an additional 31 pcus will travel on the study network. On these days the percentage increase in traffic volumes on the study network will increase by between 0.4% on the N22 and 9.4% on the local road south of the wood mill leading to the site.

During the preparation of temporary accommodation areas and foundation backfill

For 5 weekdays an additional 122 pcus travelled on the study network. On these days, the percentage increase in traffic volumes experienced on the study network will be between 1.5% on the N22, and 36.9 on the local road leading to the site.

During the removal of cables from ducts

For 15 weekdays an additional 16 pcus will travel on the study network. On these days the percentage increase on the study network will be between 0.2% on the N22 and 4.8% on the local road south of the wood mill leading to the site. It is noted that there will be other roads on and in proximity of the cable route that will provide for traffic associated with cable removal although they were loads were low in not significant i.e. 18 loads as set out in Table 14-15 over 15 days, which translates to a maximum of is 1.2 HGVs per day.

Table 14-33 Effects of development traffic during extraction of wind turbine plant, extended artics

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	10	60	70	6,913	1,212	8,124
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	10	60	70	1,469	304	1,773
3 Local road east of woodmill	1,134	189	1,323	10	60	70	1,144	249	1,393
4 Local road south of wood mill	284	47	331	10	60	70	294	107	401

Table 14-34 Effects of development traffic during extraction of wind turbine plant, standard artic HGVs

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	10	21	31	6,913	1,173	8,085

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	10	21	31	1,469	265	1,734
3 Local road east of woodmill	1,134	189	1,323	10	21	31	1,144	210	1,354
4 Local road south of wood mill	284	47	331	10	21	31	294	68	362

Table 14-35 Development traffic during preparation of temporary accommodation areas and foundation backfill

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	10	112	122	6,913	1,264	8,176
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	10	112	122	1,469	356	1,825
3 Local road east of woodmill	1,134	189	1,323	10	112	122	1,114	301	1,445
4 Local road south of wood mill	284	47	331	10	112	122	294	159	453

Table 14-36 Development traffic during cable removal from ducting

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
	Car	HGV	Total	Car	HGV	Total	Car	HGV	Total
1 N22 east of Gortanaddan (at Mors Bar)	6,903	1,152	8,054	10	6	16	6,913	1,158	8,070
2 L3402 Gortanaddan Road (at Mors Bar)	1,459	244	1,703	10	6	16	1,469	250	1,719

Link	Background PCUs			Development PCUs			Total PCUs (Background + Development)		
3 Local road east of woodmill	1,134	189	1,323	10	6	16	1,144	195	1,339
4 Local road south of wood mill	284	47	331	10	6	16	294	53	347

Table 14-37 Summary effect of development traffic during extraction of wind turbine plant, extended artics

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	70	8,124	0.9%	28
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	70	1,773	4.1%	28
3 Local road east of woodmill	1,323	70	1,393	5.3%	28
4 Local road south of wood mill	331	70	401	21.1%	28

Table 14-38 Summary effect of development traffic during extraction of wind turbine plant, standard artic HGVs

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	31	8,085	0.4%	9
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	31	1,734	1.8%	9
3 Local road east of woodmill	1,323	31	1,354	2.3%	9
4 Local road south of wood mill	331	31	362	9.4%	9

Table 14-39 Summary effect of development traffic during preparation of temporary accommodation areas and foundation backfill

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	122	8,176	1.5%	5
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	122	1,825	7.2%	5
3 Local road east of woodmill	1,323	122	1,445	9.2%	5
4 Local road south of wood mill	331	122	453	36.9%	5

Table 14-40 Summary effect of development traffic during removal of cable from ducting

Link	Background	Development	Total	% increase	Estimated No. of days
1 N22 east of Gortanaddan (at Mors Bar)	8,054	16	8,070	0.2%	15
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	16	1,719	0.9%	15
3 Local road east of woodmill	1,323	16	1,339	1.2%	15
4 Local road south of wood mill	331	16	347	4.8%	15

Background traffic flows are compared to flows forecast for the various decommissioning stages in Table 14-41 with the percentage capacity reached for each link and stage shown in Table 14-42. Based on this assessment the following points are noted;

- On the external network the N22 to the east of Gortanaddan (at Mors Bar) is forecast to operate at 94% prior to decommissioning in the operational phase , increasing to a maximum of 95% during the 5 days that the temporary accommodation works will be undertaken and foundations backfilled. For the rest of the decommissioning period it is estimated that the N22 will operate at a maximum of 94% capacity.
- All other roads leading to the site are forecast to operate well within link capacity for all days during the decommissioning of the site.

Table 14-41 Link capacity and summary of link flows by decommissioning stage

Link	Decommissioning stage				
	Background traffic	Temporary accommodation works and foundation backfill	Cable removal	Turbine extended artics	Other turbine equipment
1 N22 east of Gortanaddan (at Mors Bar)	8,054	8,176	8,070	8,124	8,085
2 L3402 Gortanaddan Road (at Mors Bar)	1,703	1,825	1,719	1,773	1,734
3 Local road east of woodmill	1,323	1,445	1,339	1,393	1,354
4 Local road south of wood mill	331	453	347	401	362

Table 14-42 Link capacity and % of link capacity by construction delivery stage

Link	Decommissioning stage				
	Background traffic	Temporary accommodation works and foundation backfill	Cable removal	Turbine extended artics	Other turbine equipment
1 N22 east of Gortanaddan (at Mors Bar)	94%	95%	94%	94%	94%
2 L3402 Gortanaddan Road (at Mors Bar)	34%	36%	34%	35%	35%
3 Local road east of woodmill	26%	29%	27%	28%	27%
4 Local road south of wood mill	15%	21%	16%	18%	16%

14.1.5.4 Traffic Effect on N22 / L3402 Gortanaddan Road Junction

Effects During Construction

Method

The capacity of the N22 / L3402 Gortanaddan Road priority junction, which is the key junction on the study route, 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 for a given time 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 seconds, this gives an indication of the forecast average delay during the time period modelled for each movement.

Scenario Modelled

The main junction in the study area that was impacted during the traditional AM peak hour was the junction between the N22 and local L3402 Gortanaddan Road at Lynch's Cross due to the increased numbers of cars passing through it due to staff accessing the site.

N22 / L3402 Gortanaddan Road Capacity Test Results

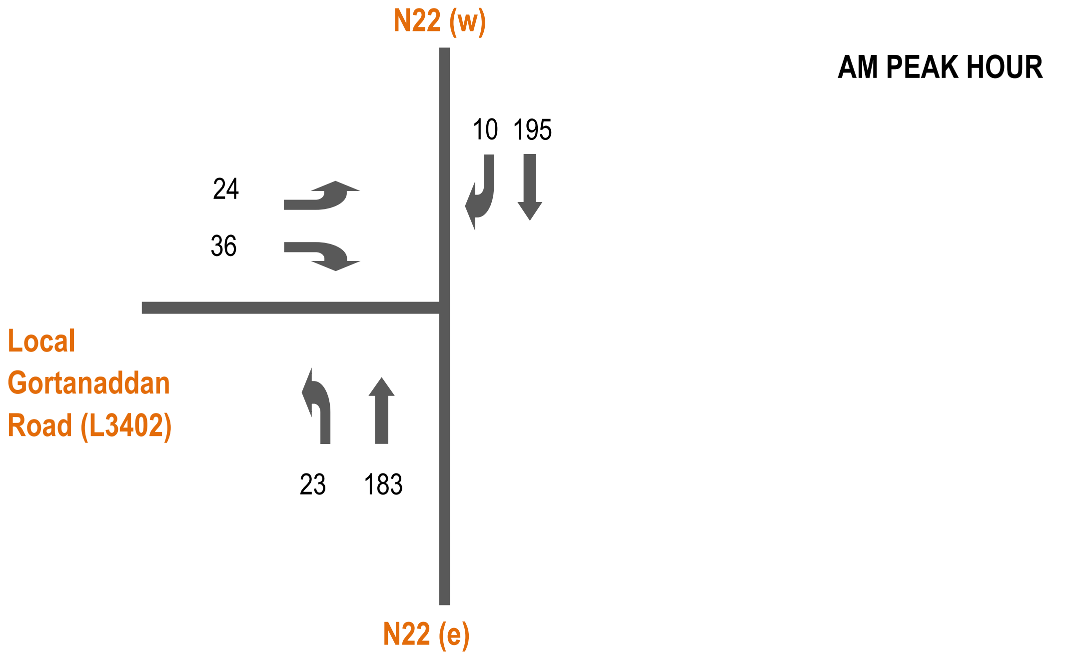
The AM peak hour traffic flows for the year of construction, year 2019, without and with construction work traffic passing through it, are shown in Figure 14-4 with the capacity results shown in Table 14-43. The results show that additional 40 car trips (based on 2 site staff per car) passing through the junction will have an imperceptible impact, increasing the maximum ratio of flow to capacity (RFC) at the junction from 13.5% to 13.8% for traffic turning onto the N22, and from 1.9% to 5.8% for traffic turning right from the N22 heading towards the site. It is noted that all movements are well within the acceptable 85% threshold.

Table 14-43 Junction capacity test results, N22 / L3402 Gortanaddan Road junction, AM peak, without and with construction staff, year 2019

Year		Without Construction Traffic			With Construction Traffic		
2019	From local road	13.5%	0.16	0.14	13.8%	0.16	0.14
	Right turn from N22	1.9%	0.02	0.11	5.8%	0.06	0.11

Effects During Operation

As discussed in Section 14.1.3, the operational phase to date and any future operation of the Cleanrath wind farm development will generate significantly less traffic (maximum of 3 car trips during peak hour) than the worst case for the construction phase set out above (40 car trips during peak hour). It is



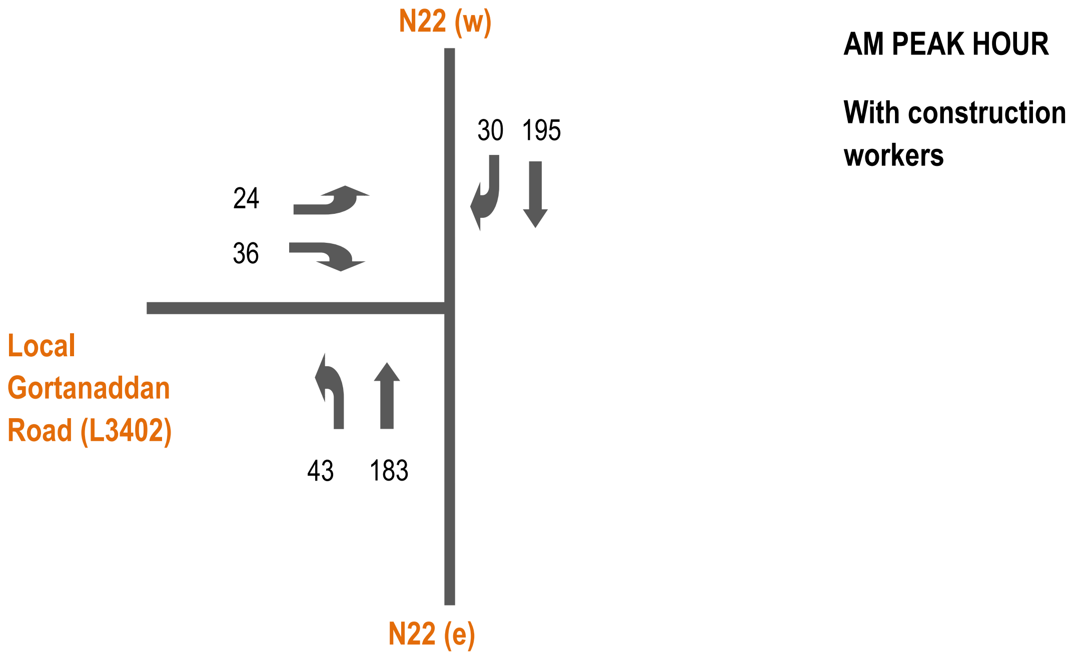


FIGURE 14-4 N22 / L3402 Gortanaddan Road junction turning counts, AM Peak hour, without and with construction workers, Year 2019

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TRAFFIC & TRANSPORT CONSULTANTS

Project:	Cleanrath Wind Farm	Date:	15.07.20
		Drawn by:	AL
Client:	Cleanrath Wind Farm Ltd	Project No.:	2681

therefore concluded that the development will have an imperceptible impact on the N22 / L3402 Gortanaddan Road junction at Lynch's Cross Roads when the development is operational.

Effects During Decommissioning

Similarly, it is forecast that during the decommissioning process the development will generate significantly less traffic (maximum of 5 car trips during peak hour) than the worst case for the construction phase tested above (40 car trips during peak hour). It is therefore concluded that the development will have an imperceptible impact on the N22 / L3402 Gortanaddan Road junction at Lynch's Cross Roads during the decommissioning stage of the development.

14.1.5.5 Impact on network due to Grid Connection

The Cleanrath wind farm development is connected to the national grid via the existing Electricity Substation located at Grousemount in County Kerry, as shown in Figure 4-4 of the rEIAR. Where possible the grid connection cable between the site and the substation was installed in a trench to the side of the road along the route which comprises approximately 9 kms of local road, with the remaining 4 kms being off the public highway. At locations where no verge existed, which comprised the majority of the route, the cable was installed below the existing carriageway.

The connection was installed by 2 teams, one working from the west and one from the east, with each team laying approximately 150 metres of cable per day, equating to a total of 300 metres per day. It therefore took approximately 30 working days to lay the entire cable on the public highway network. On the majority of these days traffic was controlled by means of a local "stop – go" system to permit all roads to remain open at all times. There was one section of local road with a total length of 2.89 kms (shown as Sections 4 and 5 in Figure 2.1 of Appendix 2 with the CEMP (Appendix 4-4)), which required to be closed. For this section of road, the closure was in place for a total of 77 days with a maximum diversion of 6.63kms incurred by the low volumes of traffic on the local highway network during this time.

At locations where the grid connection crosses rivers/local steams by means of culverts/small bridges, the cable was laid in a trench over the bridge or culvert crossing and at one location the cable ducting was attached to the side of an existing bridge. One way traffic flow was maintained by means of a stop and go system during the construction of the water crossings.

It is noted that the effects of the additional traffic generated during the construction of the cable route are included in the assessment set out previously in this Section 14.1.5.

14.1.5.6 Impact on network of Local Road improvement

During the period when a section of local road was being upgraded (from the location at the woodmill south for 1.6km, see Figure 4-7 of this rEIAR) one way traffic flow was maintained by means of a stop and go system. The works were undertaken under Road Opening Licence (ROL) issued by Cor County Council (2019CO0648). A traffic management plan for these works was prepared and include with the ROL application which is included in Appendix 4-4.

14.1.6 Traffic Management of Large Deliveries

The greatest impact on the road network was experienced on the 28 days during which an average of 3 abnormally large loads comprising the tower sections, the blades and the nacelles were delivered to the site.

Prior to the construction stage a detailed traffic management plan was prepared by the haulage company and submitted to relevant authorities for approval. The plan included:

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

Deliveries were made to the site in convoys of 3 vehicles at a time with escorts at the front and rear operating a "stop and go" system. All of the deliveries comprising abnormally large loads were made at night outside the normal peak traffic periods in order to avoid disruption to work and school related traffic.

14.1.7 Route Assessment

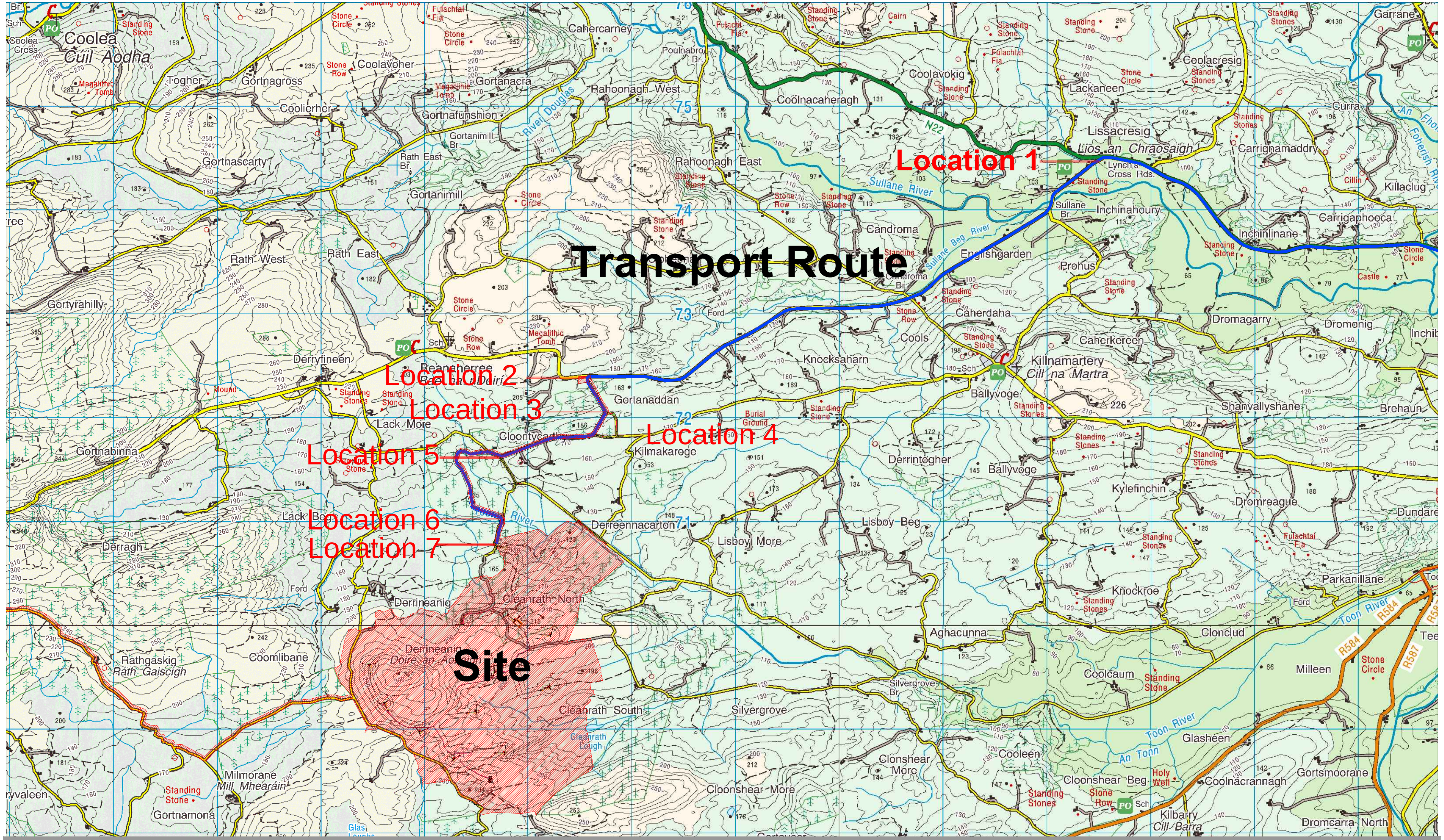
This transport route used during the construction of the development together with all locations discussed in this section of the rEIAR are indicated in Figure 14-5. All commentary in this section refers to the route in the direction that vehicles accessing the site travelled. Detailed assessment is confined to locations that were originally considered as presenting issues for the abnormal loads, as identified from site visits. For these locations a swept path analysis was then undertaken using Autotrack in order to establish the locations where the wind farm transporter vehicles would be accommodated, and the locations where some form of remedial measure would have been be required.

The locations discussed are as follows;

- Location 1 – The left turn from the N22 at Lynch's Cross Roads (Mons Bar),
- Location 2 - The left turn at woodmill at Cloontycarthy
- Location 3 – Junction A
- Location 4 – Junction B
- Location 5 – Junction C
- Location 6 – Junction D
- Location 7 – Junction E

Location 1 N22 / Local Road junction at Lynch's Cross Roads

The junction between the N22 and the L3402 Gortanaddan Road, adjacent to Mons Bar (known locally as Lunch's Cross) takes the form of a priority junction with the N22 comprising the major arm. The swept path assessment for the design vehicles negotiating the junction are shown in Figures 14-6 and 14-7 for the blade and tower sections respectively. The figures show that both vehicles would be accommodated by the current junction layout.



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-5 Route assessment location map

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	NTS
PROJECT NO: 2681	DATE: 14.05.20	DRAWN BY:	AL

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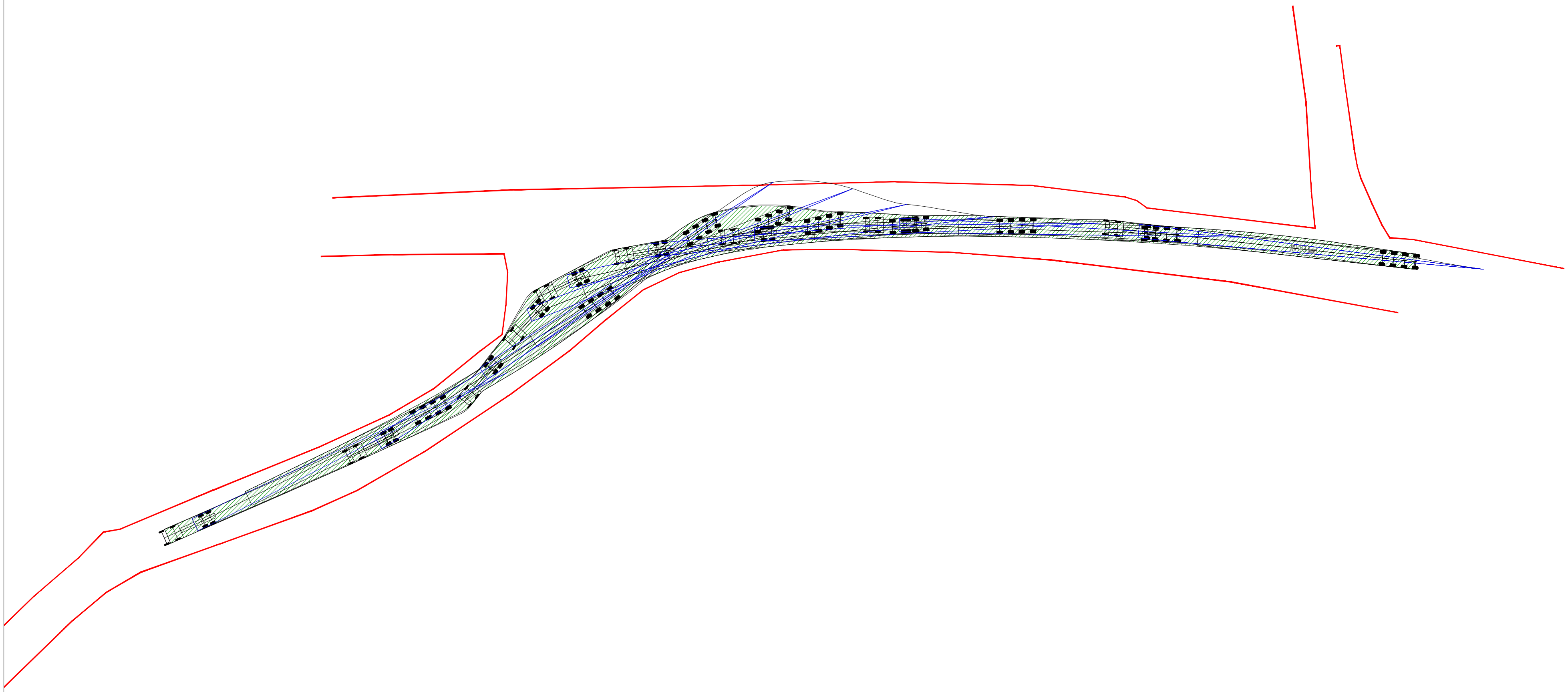

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-6 Location 1 - N22 / L3402 junction, blade extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 18.05.20	DRAWN BY:	AL

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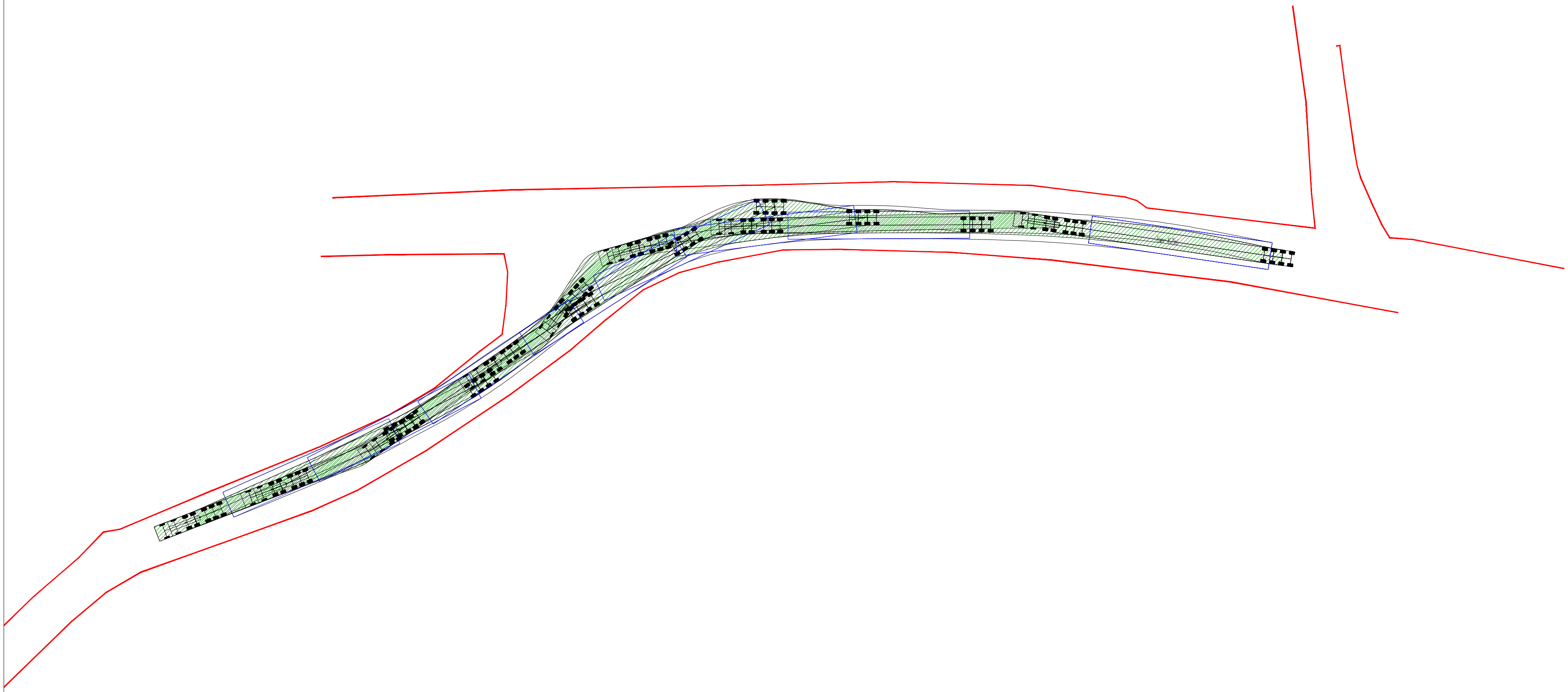
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-7 Location 1 - N22 / L3402 junction, tower extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 18.05.20	DRAWN BY:	AL

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TRAFFIC & TRANSPORT CONSULTANTS

Plate 14-1 Location 1 - Junction between N22 and Gortanaddan Local Road Pre-Construction

Plate 14-2 Location 1 - Junction between N22 and Gortanaddan Local Road Post Construction

The local road between the N22 and the wood mill at Gortanaddan, varies in width, road markings and quality. The route is however relatively straight and this stretch of road accommodated the geometric requirements of all delivery vehicles.

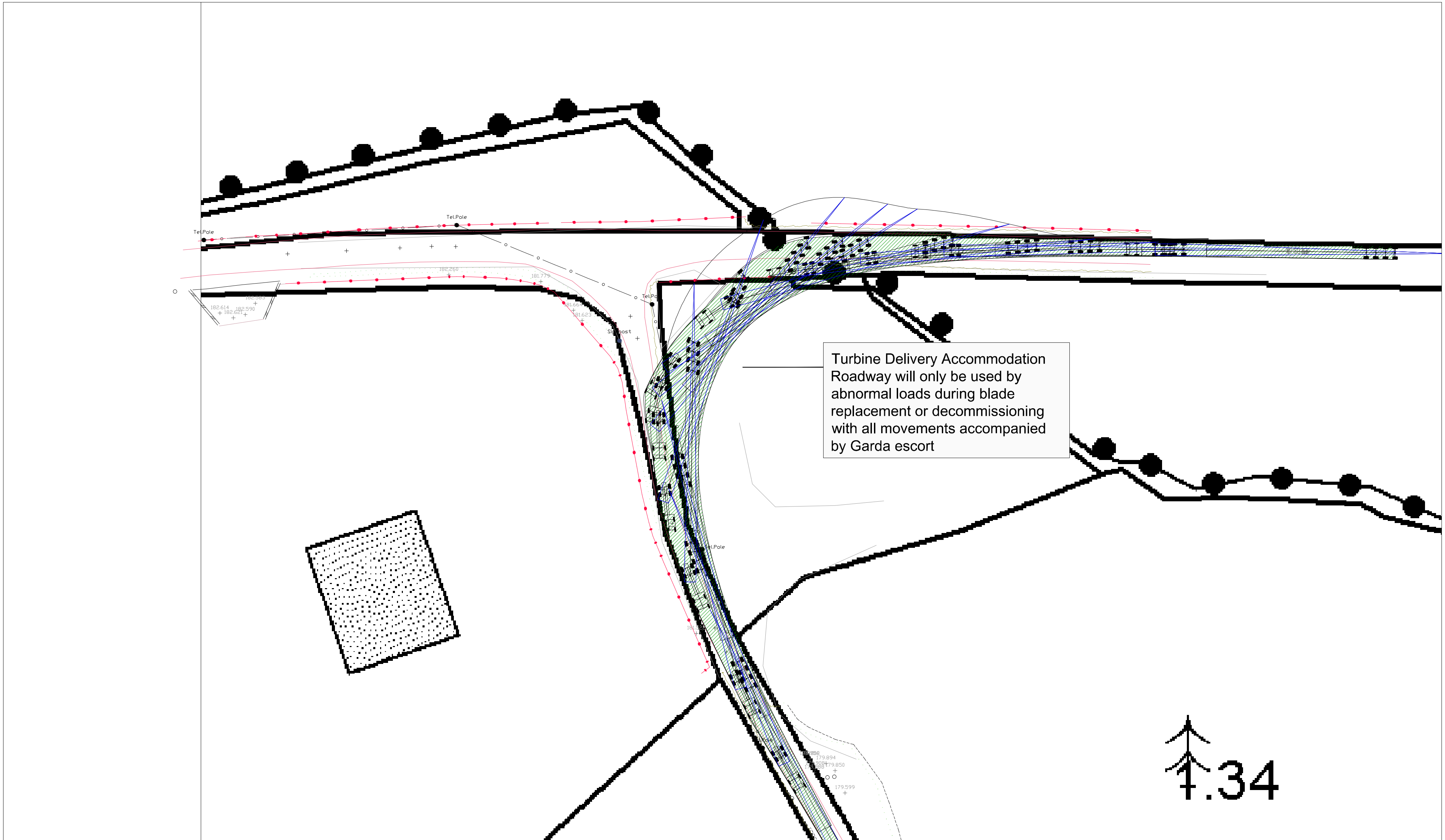
Plate 14-3 Location 5 – L3402 Gortanaddan Road Pre-Construction

Plate 14-4 Location 5 - L3402 Gortanaddan Road Post Construction

Location 2 – Left turn at wood mill

The left turn at the priority junction just to the east of the wood mill is relatively acute with the carriageway width relatively narrow. In order to negotiate this a temporary accommodation area for the delivery of the large turbine plant vehicles, as shown in Figures 14-8 and 14-9 was provided.

Plate 14-5 Location 2 - Junction at timber yard Pre-Construction



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-8a Location 2 - Junction at woodmill, blade extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 10.08.20	DRAWN BY:	AL

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NOTES:

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Figure 14-8b Location 2 - Junction at woodmill, blade extended artic, with aerial background to show the as constructed temporary junction for the delivery of abnormal loads

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 10.08.20	DRAWN BY:	AL

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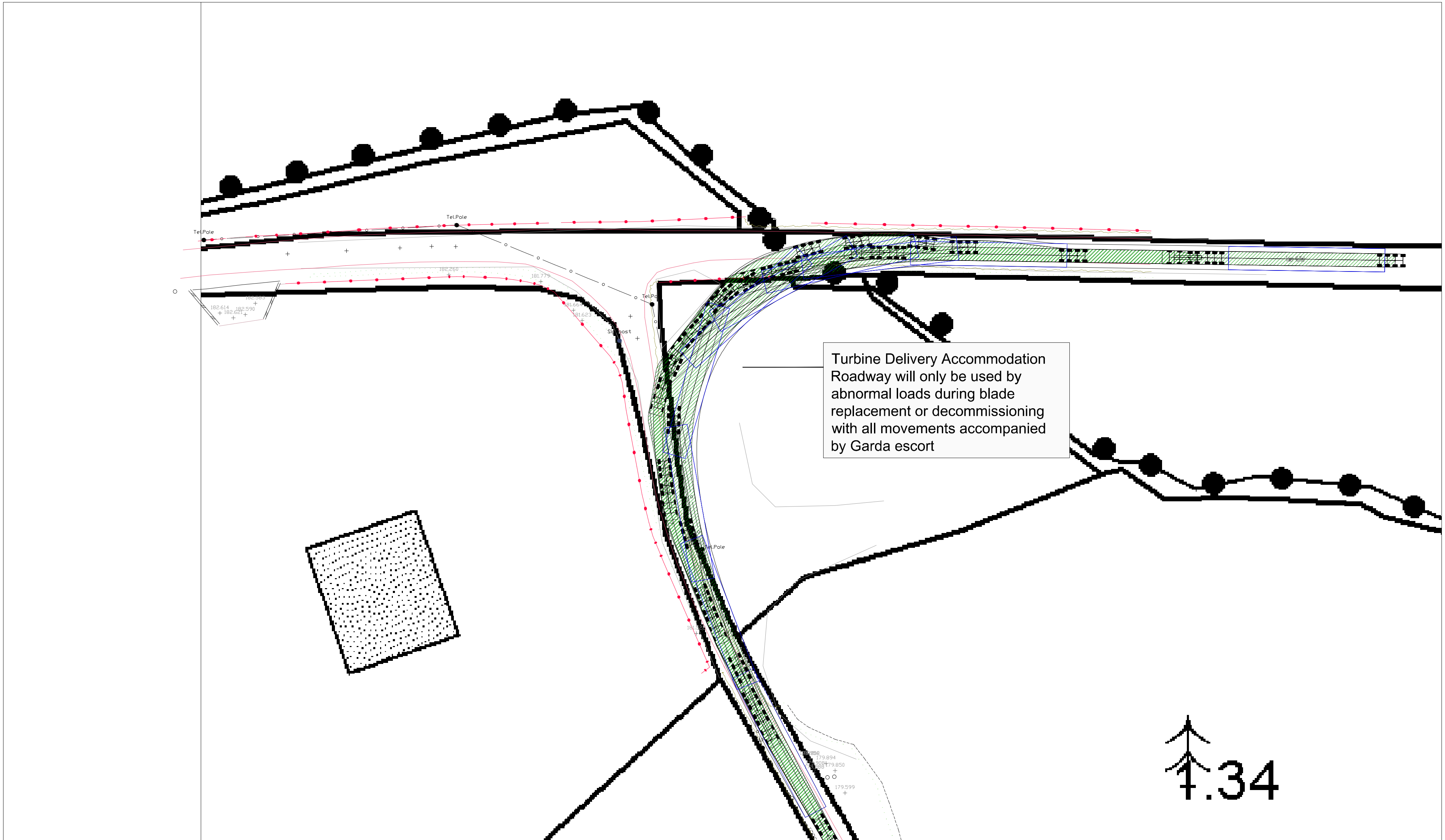

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-9a Location 2 - Junction at woodmill, tower extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 10.08.20	DRAWN BY:	AL

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NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-9b Location 2 - Junction at woodmill, tower extended artic, with aerial background to show the as constructed temporary junction for the delivery of abnormal loads

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 10.08.20	DRAWN BY:	AL

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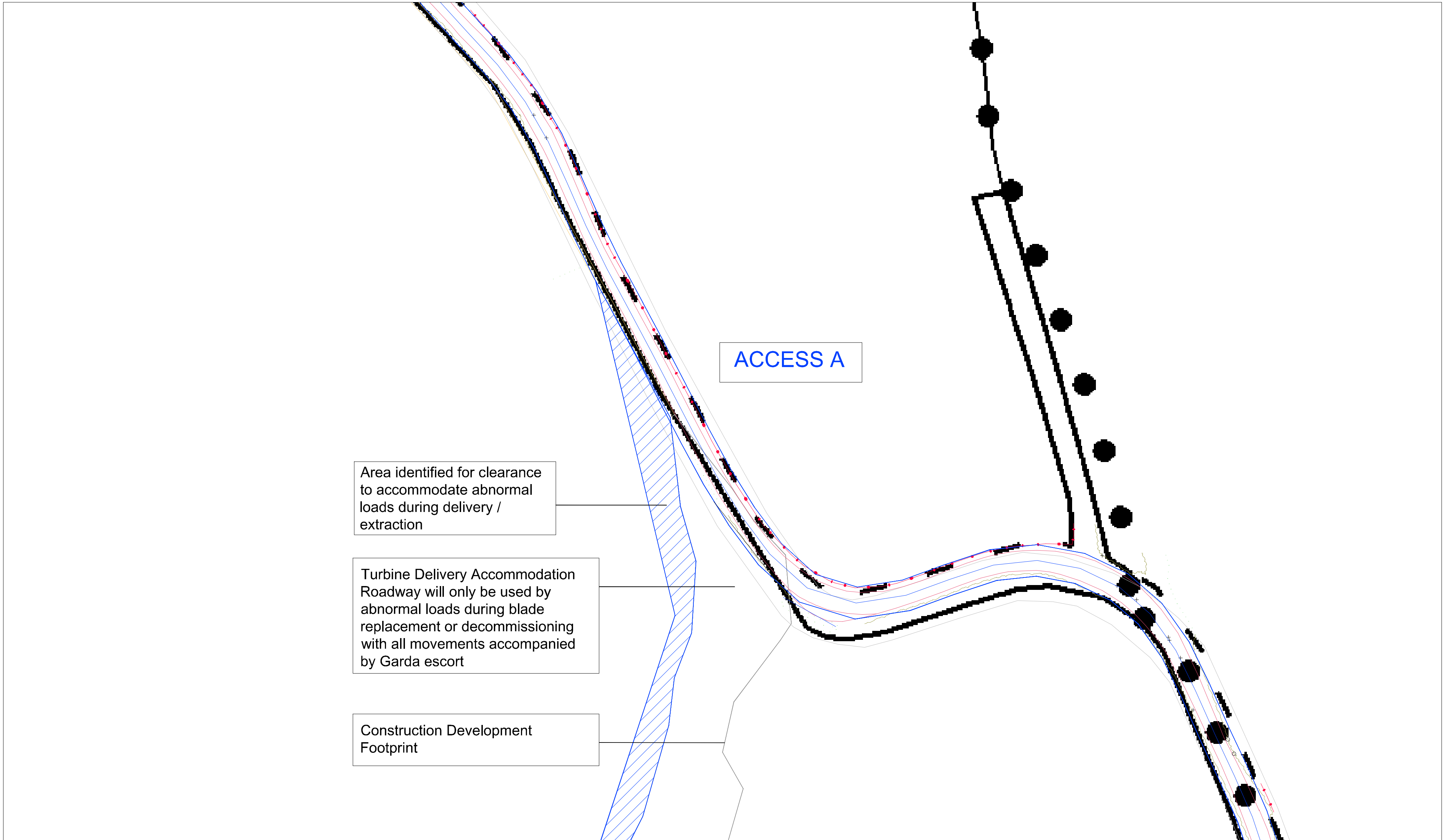
Plate 14-6 Location 2 - Junction at timber yard Post Construction

Locations 3 and 4 – Northern (A) and southern (B) junctions of new link road

These locations are the northern and southern priority junctions of a new link road that was constructed to facilitate the delivery of the large wind turbine plant in the short term. The junction layouts (including temporary over-run areas and long tern junction layouts), and the autotrack assessments demonstrating that the large turbine vehicles were accommodated, are included in Figures 14-10 to 14-15.

Locations 5 to 7 – Access junctions C, D and E

These are the priority junctions linking the local highway network and the internal access road network, which were required to accommodate the large turbine plant vehicles. The junction layouts and the autotrack assessments for the large turbine vehicles are included in Figures 14-16 to 14-24.



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-10 Location 3 - Access junction A, layout and sightlines

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 05.08.20	DRAWN BY:	AL

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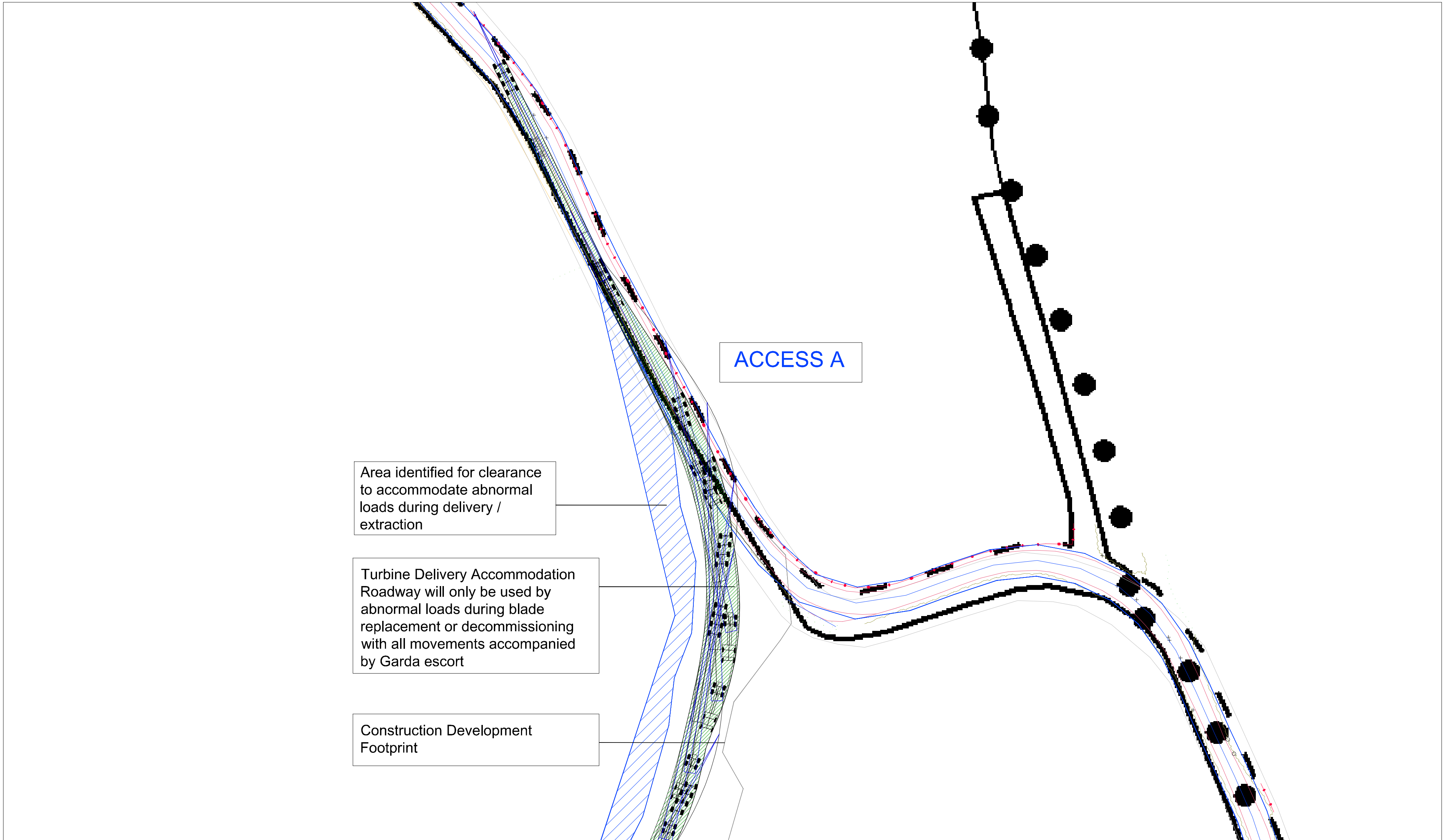
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-11 Location 3 - Access junction A, blade extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 06.08.20	DRAWN BY:	AL

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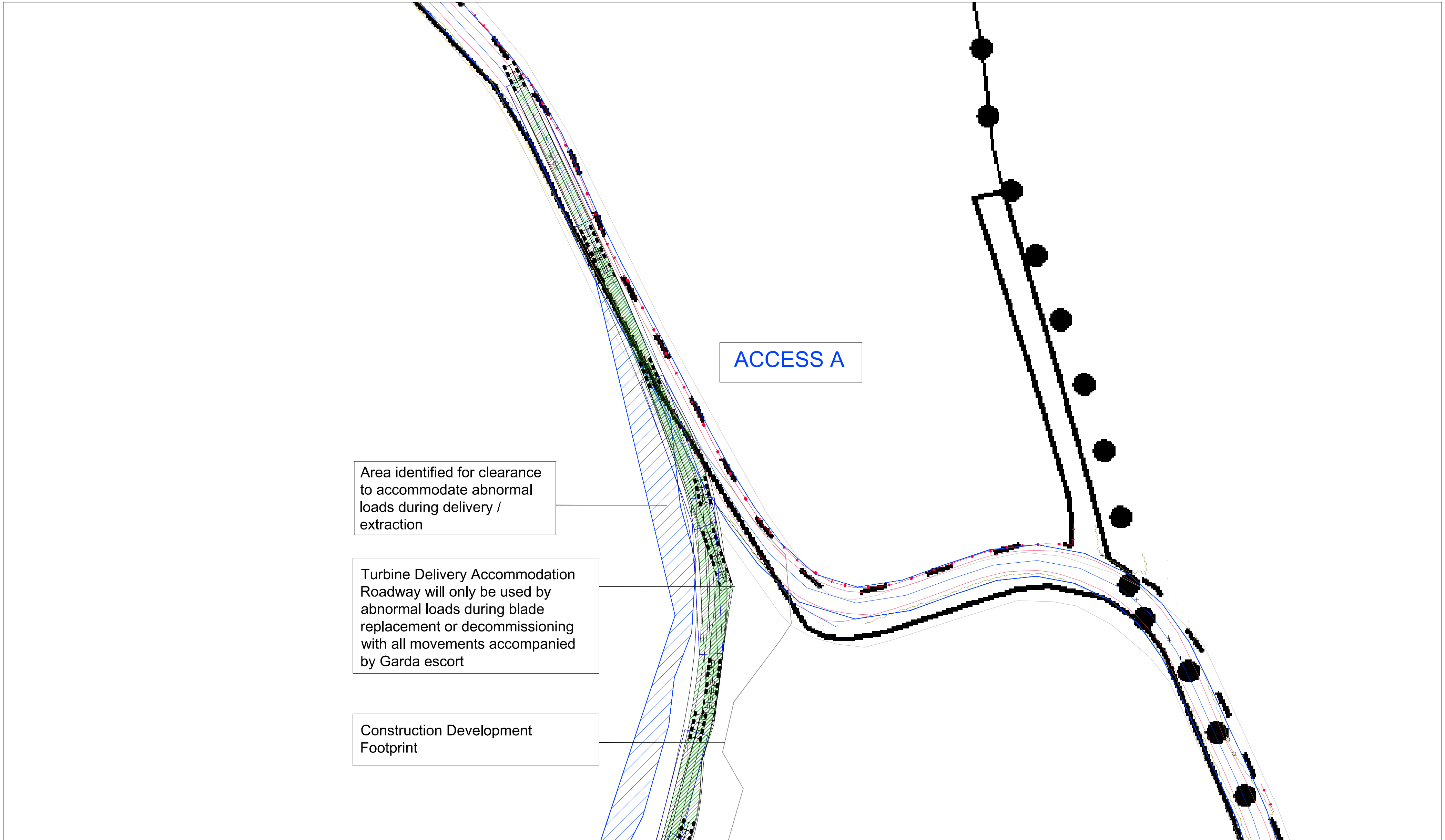

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-12 Location 3 - Access junction A, tower extended artic

PROJECT: Cleanrath Wind Farm			
CLIENT: Cleanrath Wind Farm Ltd		SCALE: 1:1000	
PROJECT NO: 2681	DATE: 06.08.20	DRAWN BY: AL	

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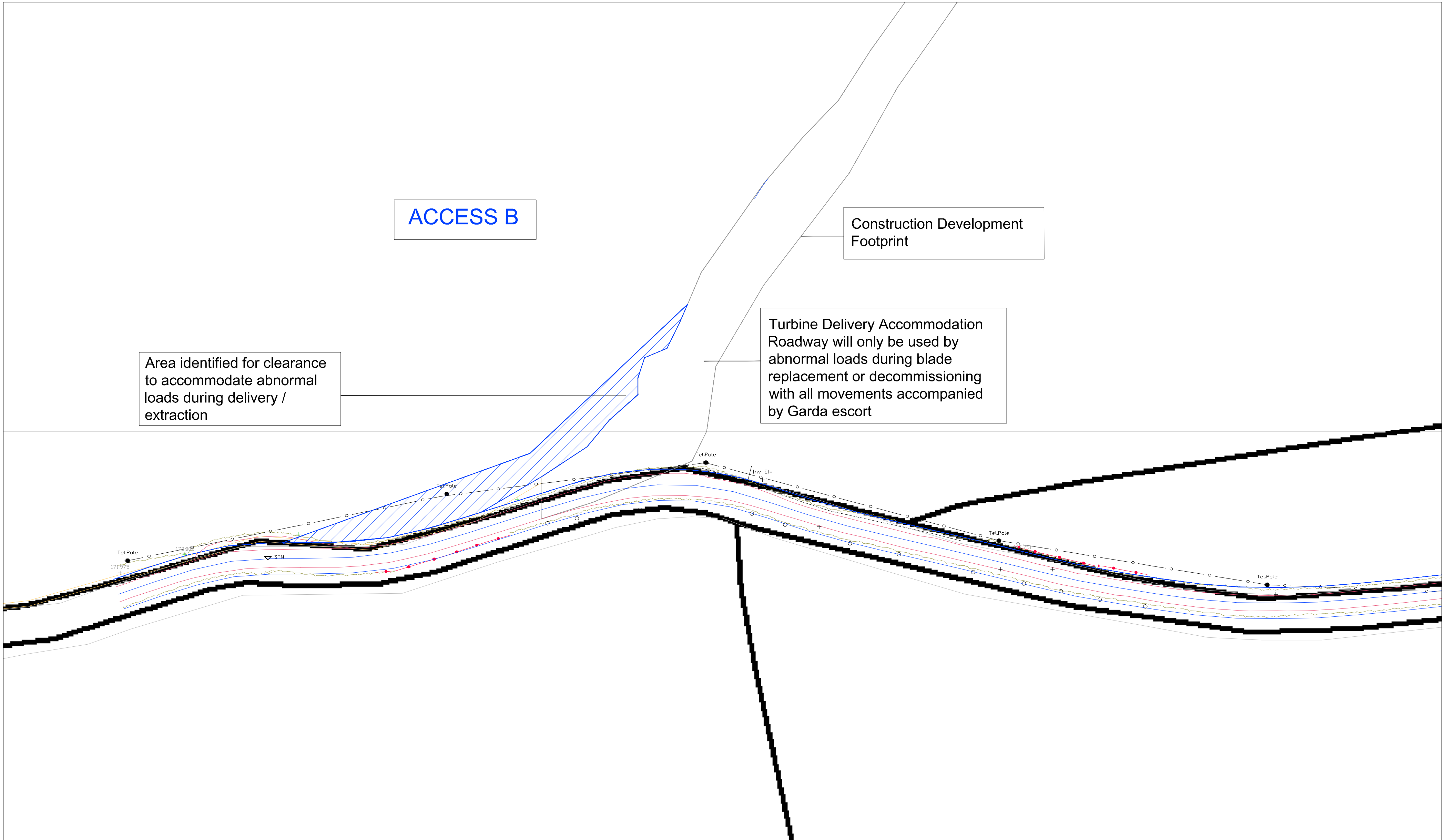
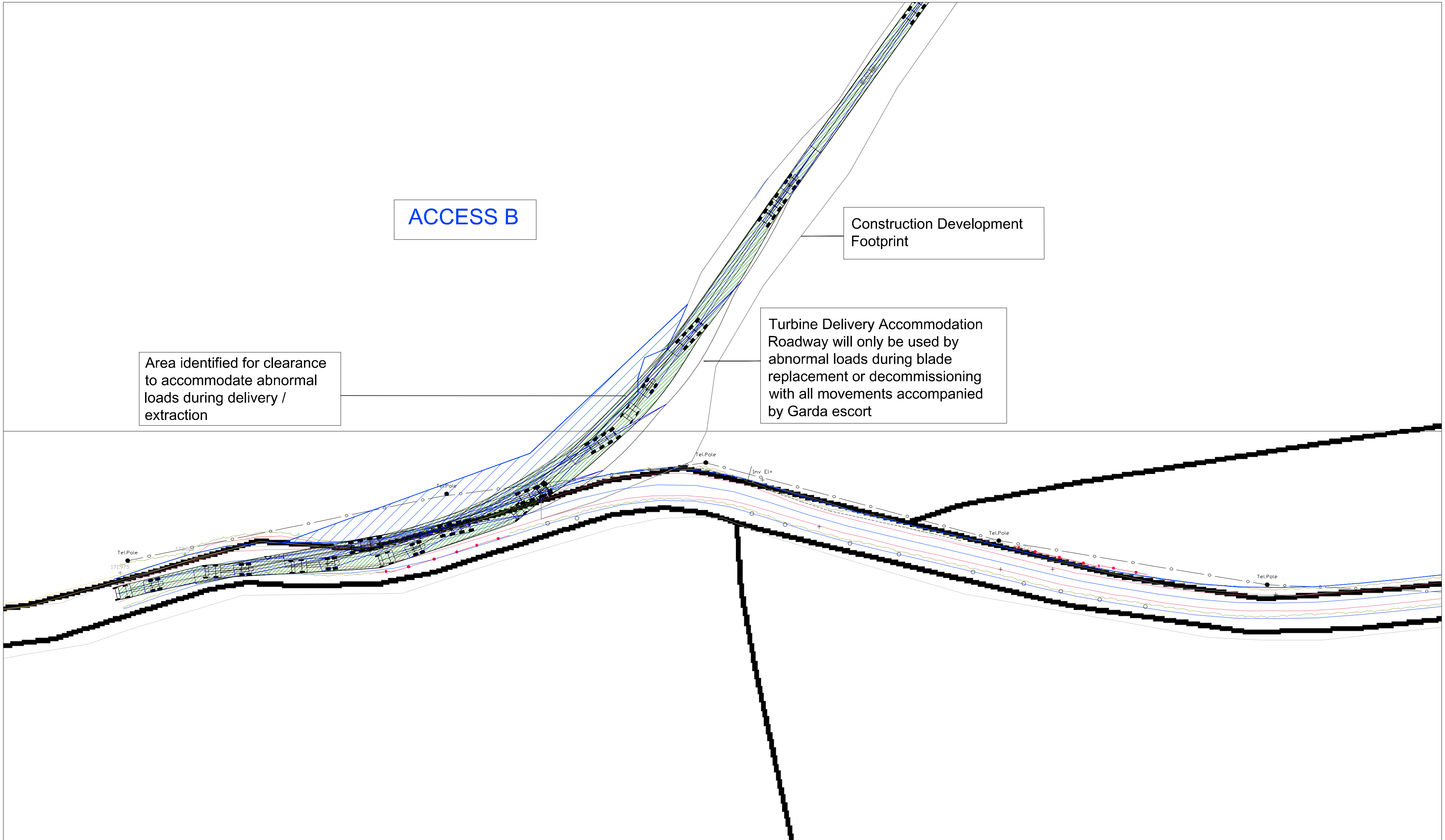


NOTES: PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES	Figure 14-13 Location 4 - Access junction B, layout and sightlines			
	PROJECT: Cleanrath Wind Farm			ALAN LIPSCOMBE TRAFFIC & TRANSPORT CONSULTANTS
	CLIENT: Cleanrath Wind Farm Ltd		SCALE: 1:1000	
	PROJECT NO: 2681	DATE: 05.08.20	DRAWN BY: AL	



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-14 Location 4 - Access junction B, blade extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 06.08.20	DRAWN BY:	AL

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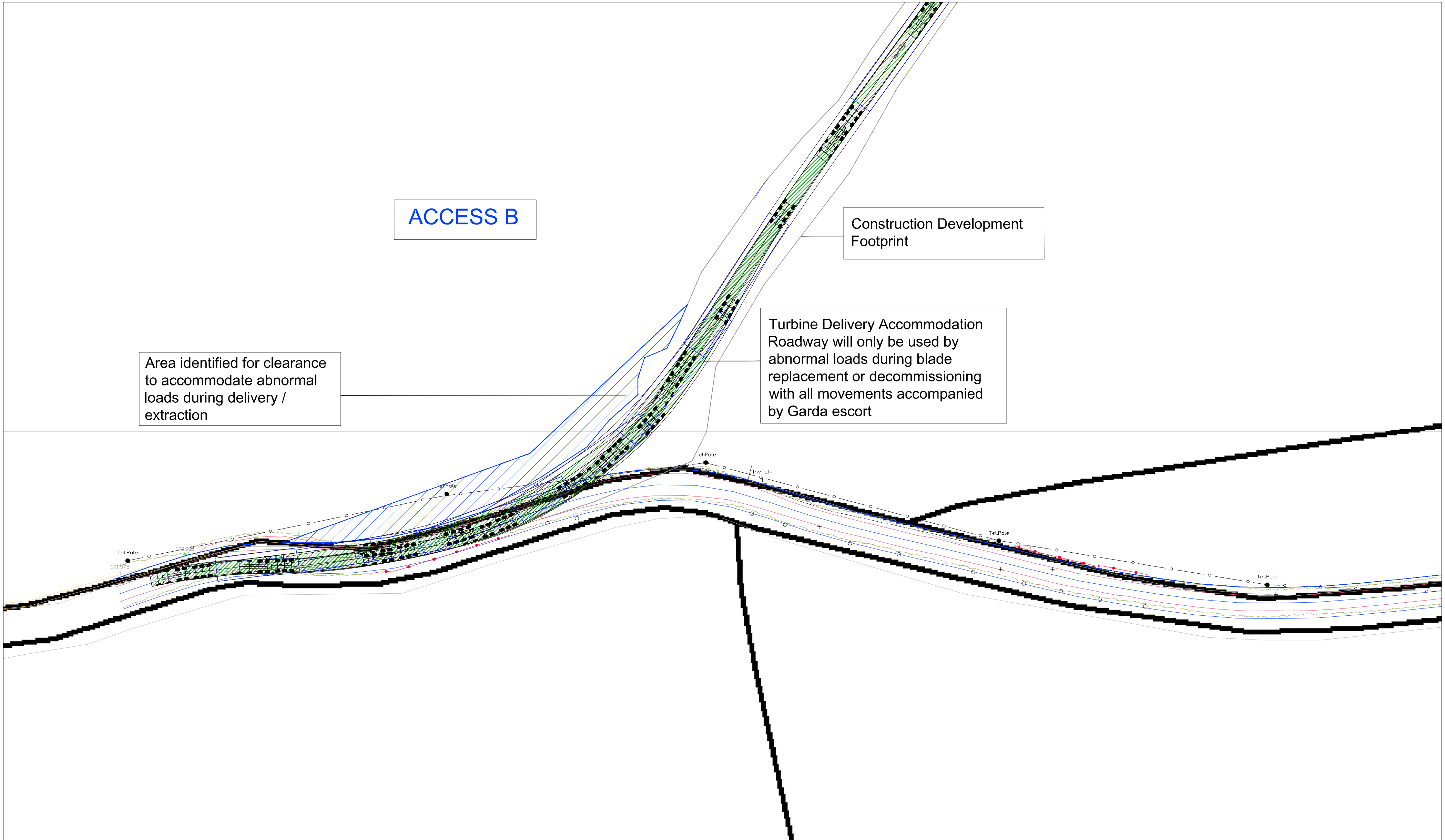


NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-15 Location 4 - Access junction B, tower extended artic

PROJECT: Cleanrath Wind Farm

CLIENT: Cleanrath Wind Farm Ltd

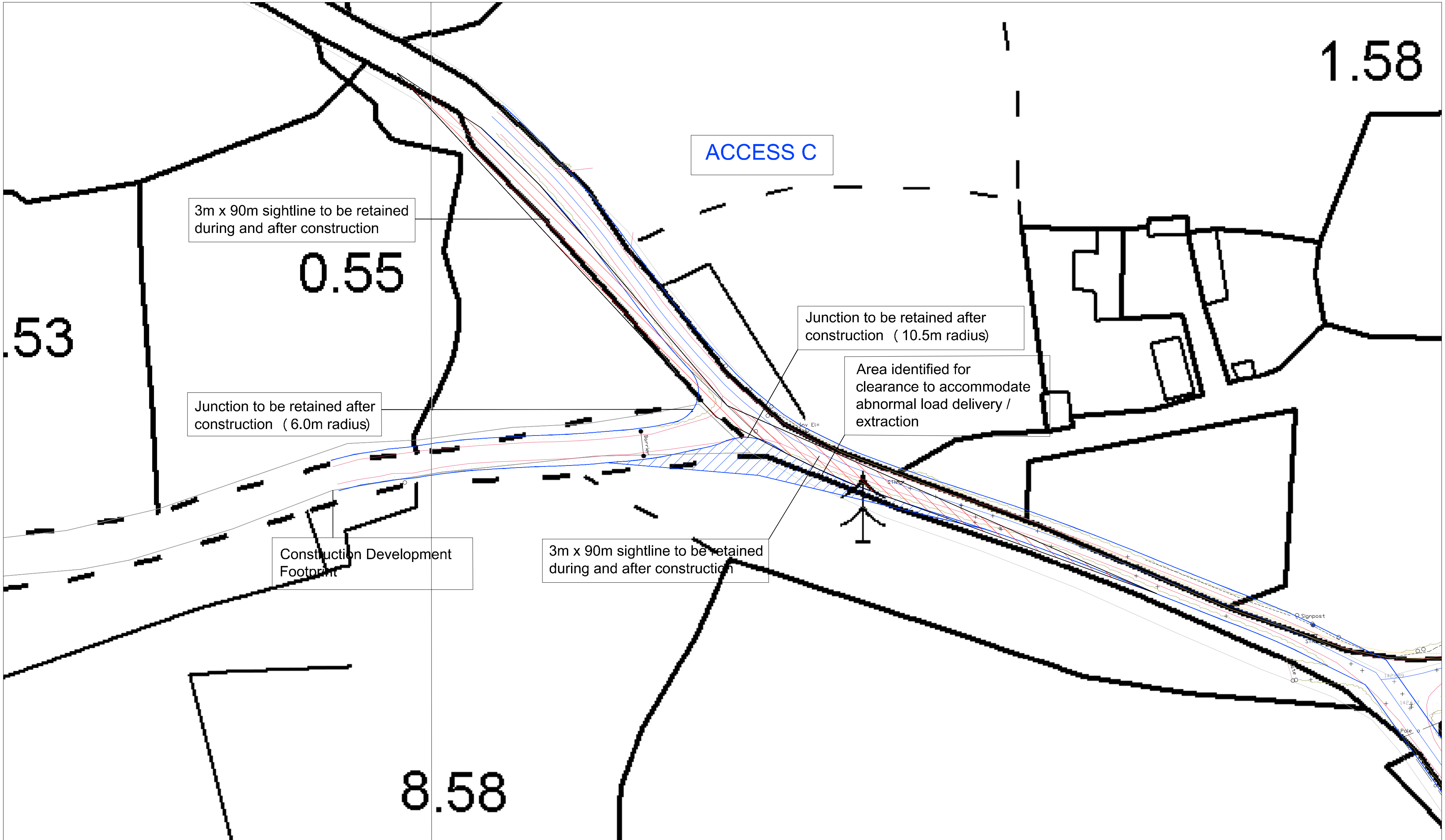
SCALE: 1:1000

PROJECT NO: 2681

DATE: 06.08.20

DRAWN BY: AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-16 Location 5 - Access junction C, layout and sightlines

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 05.08.20	DRAWN BY:	AL

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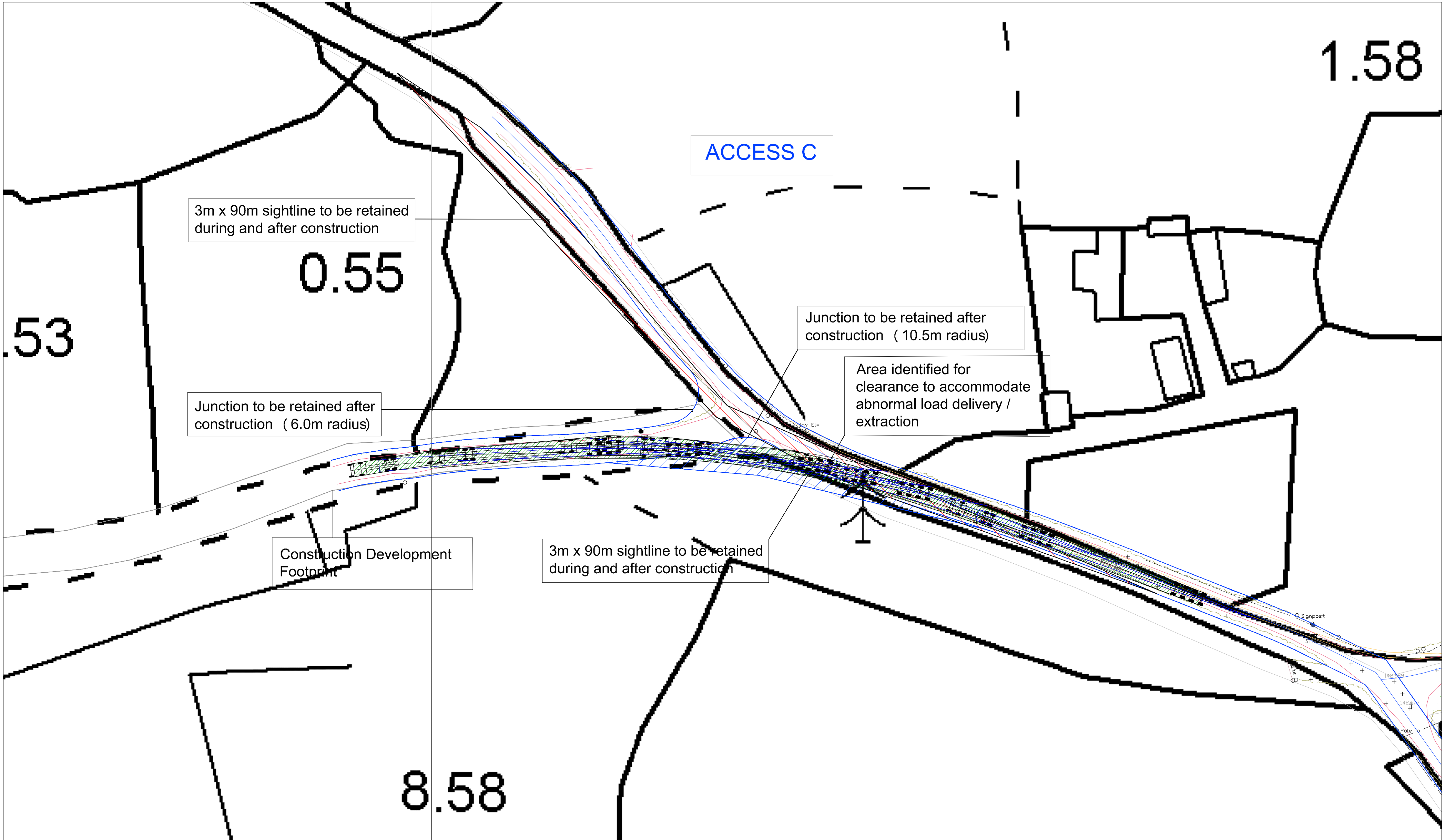
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-17 Location 5 - Access junction C, blade extended artic

PROJECT: Cleanrath Wind Farm

CLIENT: Cleanrath Wind Farm Ltd

SCALE: 1:1000

PROJECT NO: 2681

DATE: 06.08.20

DRAWN BY: AL

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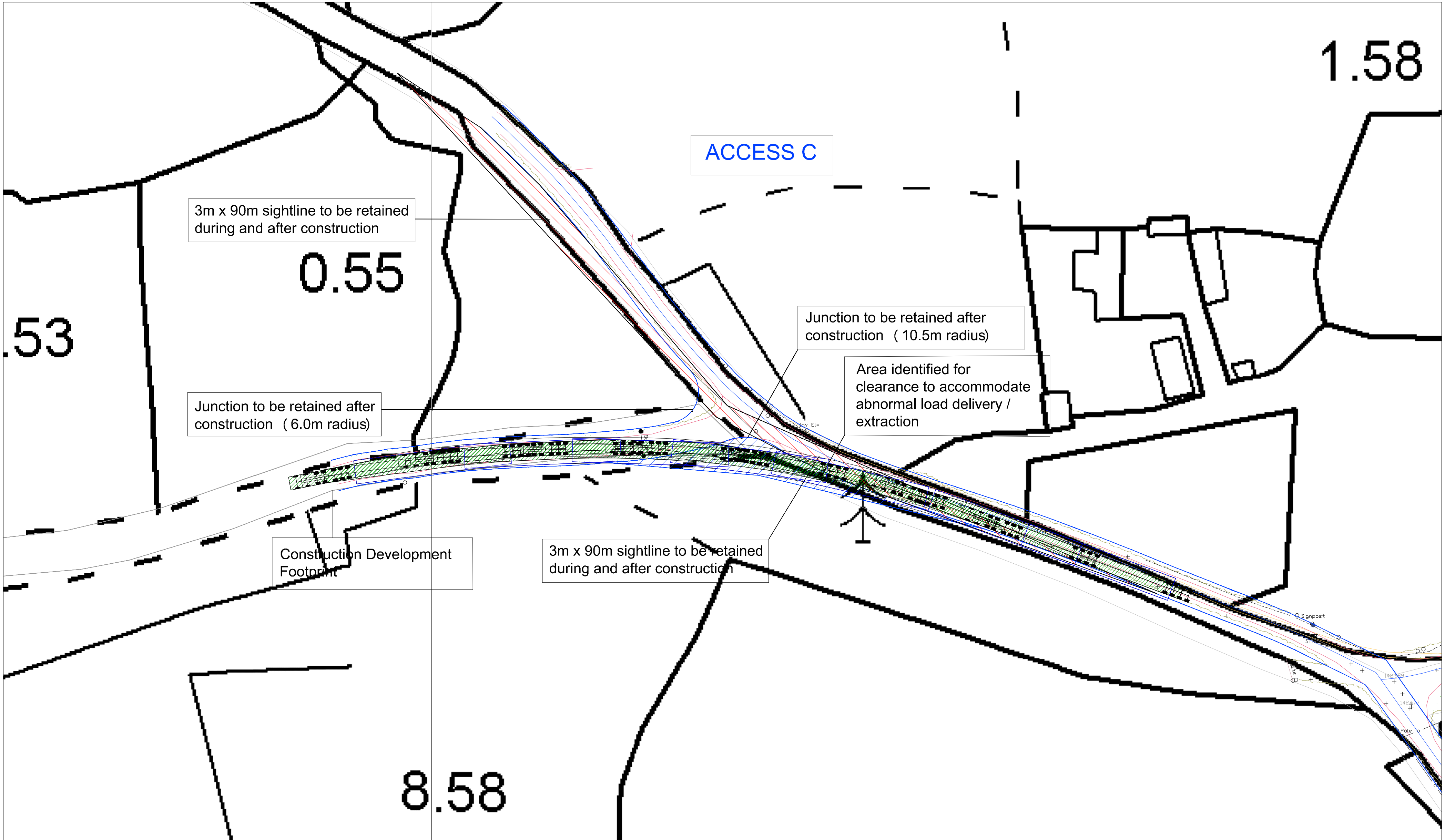
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-18 Location 5 - Access junction C, tower extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 06.08.20	DRAWN BY:	AL

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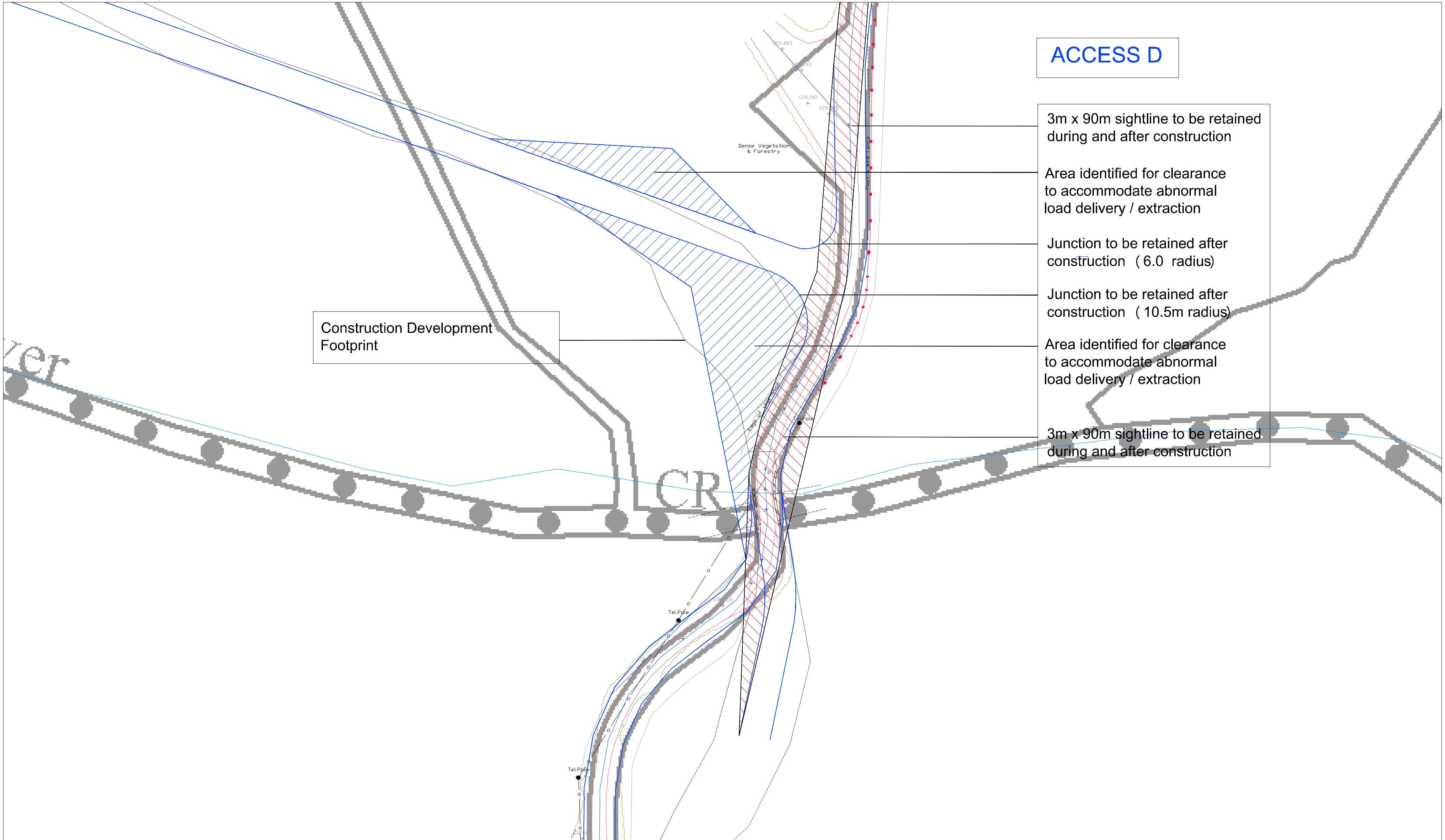


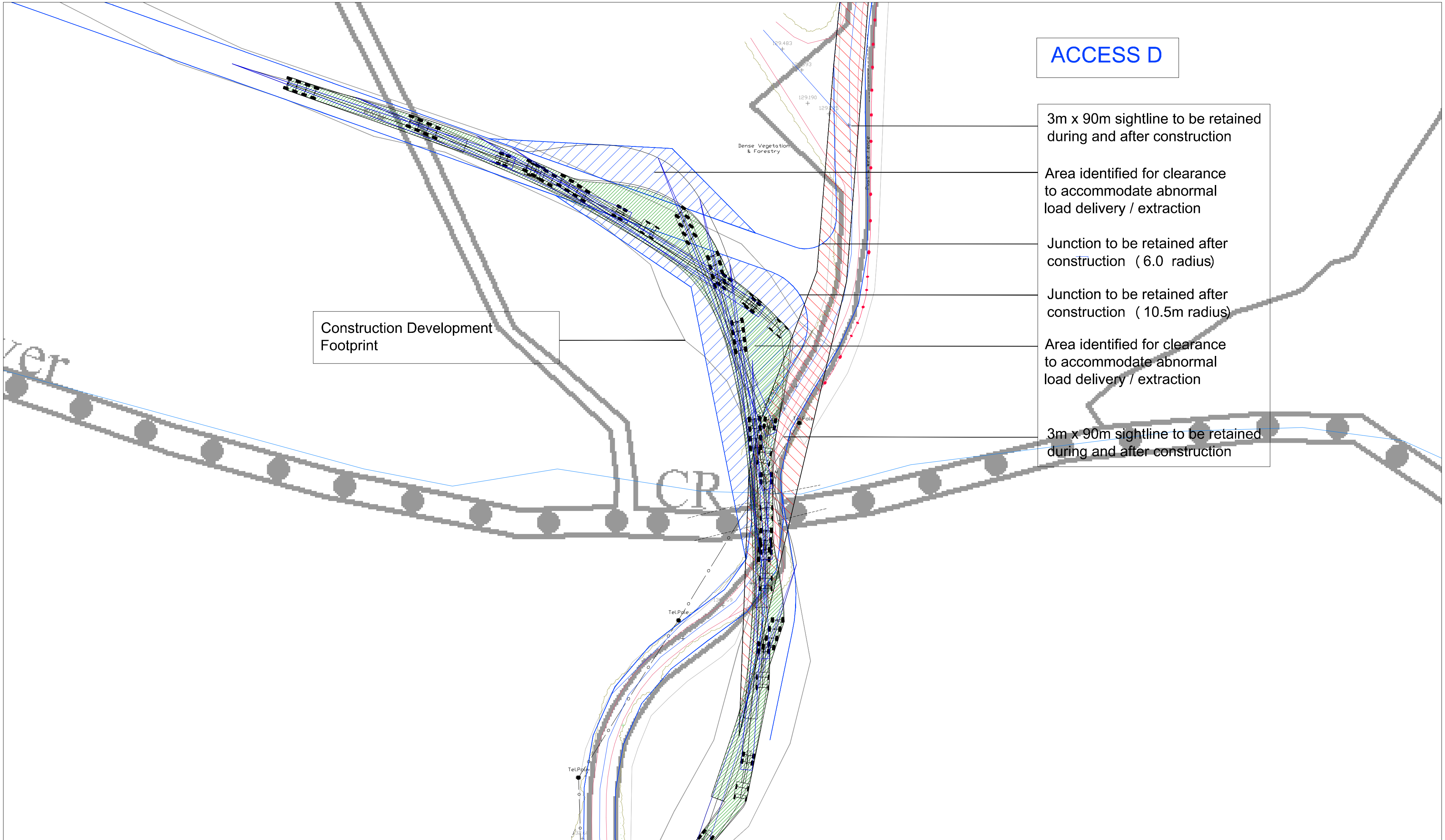
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-19 Location 6 - Access junction D, layout and sightlines

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 05.08.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



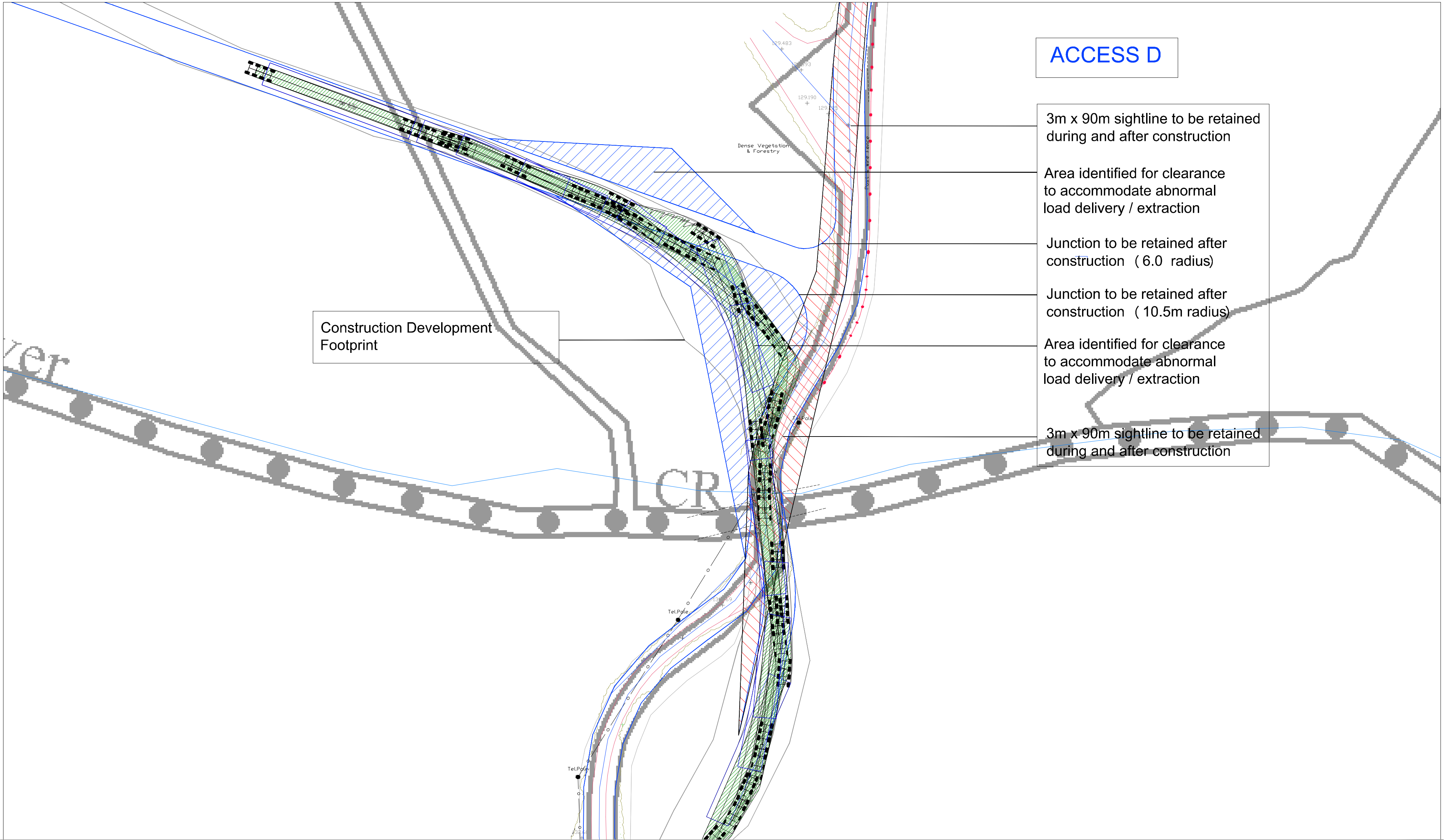
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-20 Location 6 - Access junction D, blade extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 06.08.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-21 Location 6 - Access junction D, tower extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 06.08.20	DRAWN BY:	AL

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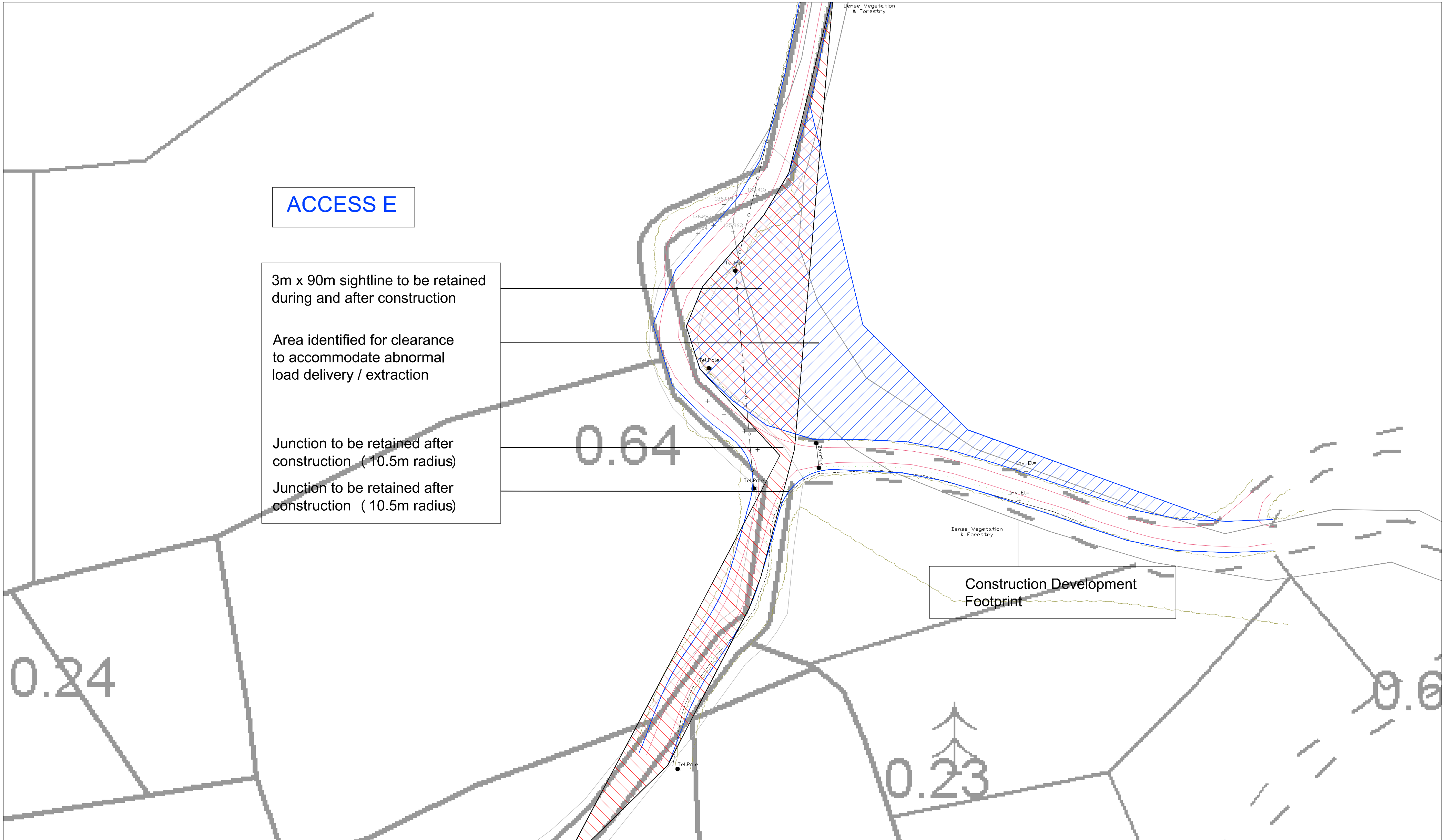
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-22 Location 7 - Access junction E, layout and sightlines

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 05.08.20	DRAWN BY:	AL

ALAN LIPSCOMBE
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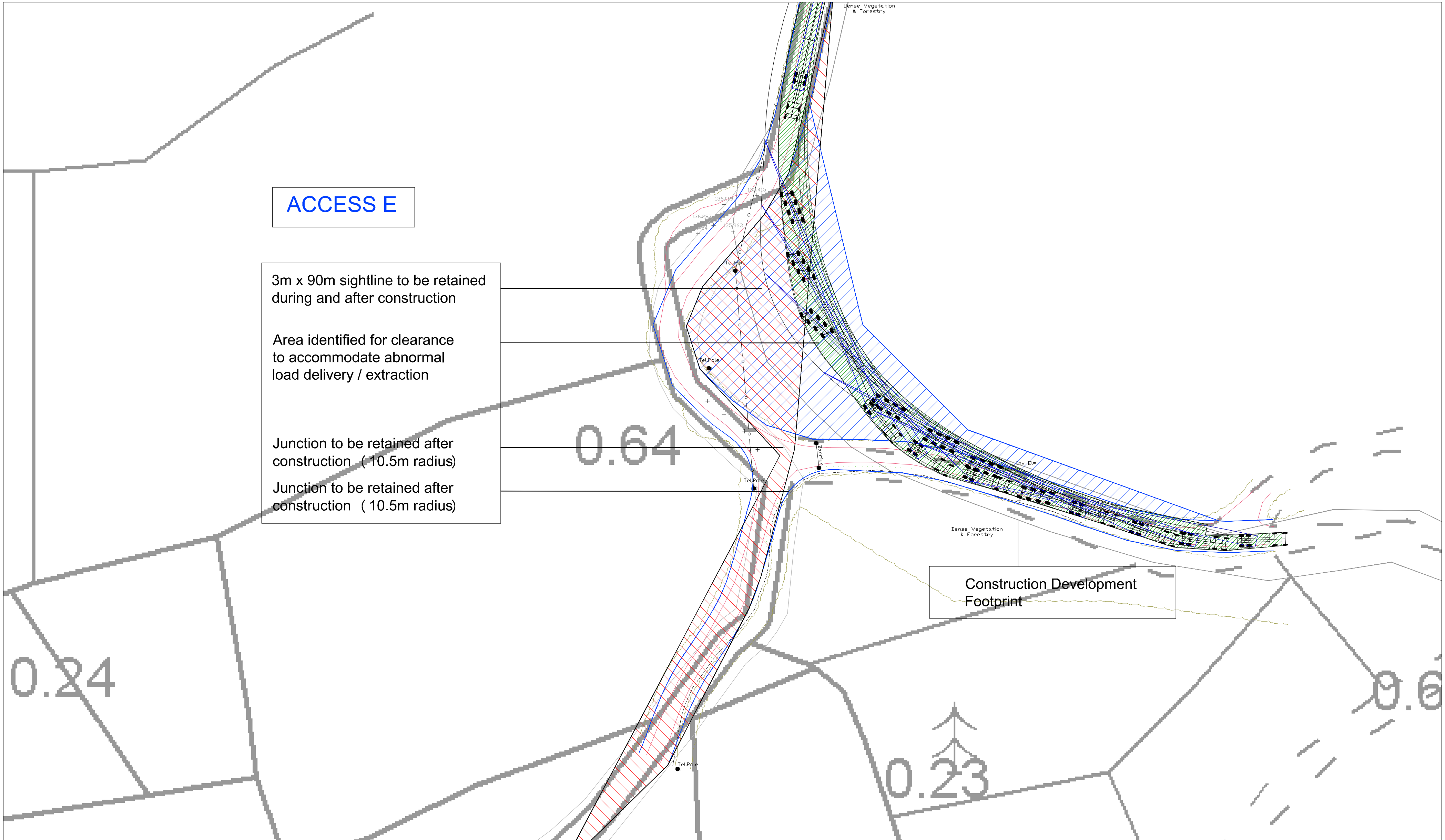

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-23 Location 7 - Access junction E, blade extended artic

PROJECT:	Cleanrath Wind Farm
CLIENT:	Cleanrath Wind Farm Ltd
PROJECT NO: 2681	DATE: 06.08.20

ALAN LIPSCOMBE
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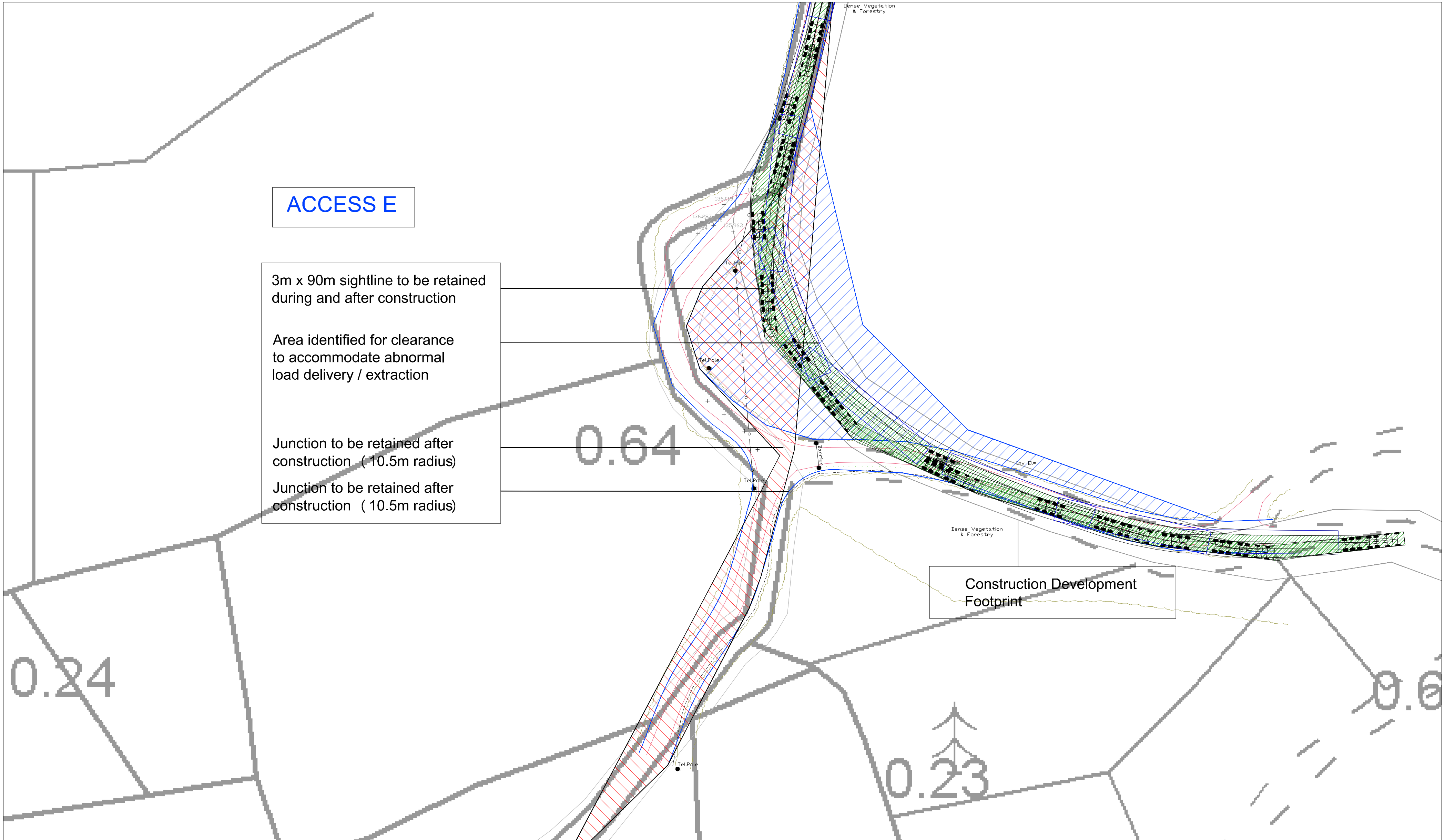

NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

Figure 14-24 Location 7 - Access junction E, tower extended artic

PROJECT:	Cleanrath Wind Farm		
CLIENT:	Cleanrath Wind Farm Ltd	SCALE:	1:1000
PROJECT NO: 2681	DATE: 06.08.20	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

Plate 14-7 Location 5 - Junction off Local Road at Cloontycarthy Pre-Construction

Plate 14-8 Location 5 - Junction off Local Road at Cloontycarthy Post Construction

Route assessment from port of entry to junction on N22

An assessment of the swept path requirements of the turbine delivery vehicles was undertaken from the port of entry at Ringaskiddy in Cork, to the turn-off on the N22 at Lunches Cross, which is included as Appendix 14-1. The route was driven in order to establish any potential pinch points, which were identified as follows;

- The Pfizer Roundabout on the N28,
- The roundabout on the N28 through Shanbally, and,
- The N28 Shannonpark Roundabout,
- The N25 through Macroom.

The assessment showed that the envelope of the roundabouts would accommodate the turbine vehicles, however, a dry delivery run was undertaken prior to the delivery stage to identify any temporary local measures that were required, including temporary local over-runs of central islands and the temporary relocation of signing. This dry run did not identify any significant works other than some vegetation trimming in some areas.

The same applies to the N22 through Macroom, particularly at the western end, including the crossing of the River Sullane, where the geometry becomes relatively restricted. A dry run on the N22 through the town was undertaken prior to the construction of the development but again no accommodation works were required to accommodate turbine transport during the construction phase and therefore will not be required during the operational phase, in the unlikely event that a turbine component needed to be replaced or during the decommissioning phase.

Plate 14-9 Port access on the N28 at Ringaskiddy, Cork

Plate 14-10 Roundabout on the N28 through Shanbally on route to port

Plate 14-11 N22 through Macroom

The Cleanrath wind farm development has been constructed and the delivery of turbines has been successfully completed. Plate 14-12 and 14-13 show a turbine blade being transported through Macroom during turbine delivery.

Plate 14-12 N22 through Macroom

14.1.8 Provision for Sustainable Modes of Travel

14.1.8.1 Walking, Cycling and Public Transport

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

There were no public transport services that pass the site.

14.1.9 Likely and Significant Effects and Associated Mitigation Measures

14.1.9.1 *"Do Nothing" Scenario*

An alternative land-use option to developing the Cleanrath wind farm development would have been to leave the site as it was prior to construction, with no changes made to the land-use practices of low-intensity agriculture, turf cutting and commercial forestry. This option would have no positive impact with regards to the production of renewable energy or the offsetting of greenhouse gas emissions. On the basis of the positive environmental effects arising from the Cleanrath wind farm development , the do–nothing scenario was not the chosen option. Instead, an application for planning permission was made and granted ultimately by An Bord Pleanála.

The Cleanrath wind farm development has been constructed, has been operational and is now operating in Sleep Mode with the site essentially in a shut-down mode with no export of electricity pending the outcome of the Substitute Consent process. In the event that Substitute Consent is obtained, the intention is to recommence and continue the full operation of the Cleanrath wind farm development until the end of 25 years from the formal commissioning of the turbines in July 2020 and implement the decommissioning plan for the Cleanrath wind farm development at the end of the operational period.

In the event that Substitute Consent is not granted and full operation of the development is not recommenced, it will remain in Sleep Mode which is, in effect, the "do nothing" option insofar as it represents the current situation as at the date of the application for Substitute Consent. There is the possibility that the decommissioning plan may need to be implemented early, should Substitute Consent not be granted. These scenarios are assessed in this chapter.

14.1.9.2 Construction Phase

During the 9 days when the concrete foundations were poured the effects on the surrounding road network were moderate but were temporary.

During the 191 days when the concrete was delivered to the cable route the effects on the surrounding road network were imperceptible and were temporary.

During the remaining 103 days for the site preparation and ground works stage, the delivery of construction materials had a slight impact and was temporary.

During the 9 days of the turbine construction stage when general materials are delivered to the site, the delivery of construction materials had a slight impact and was temporary.

During the 28 nights when the various components of wind turbine plant were delivered to the site by extended articulated vehicles, the impact of the delivery vehicles on these days was slight to moderate and occurred on 28 nights only.

14.1.9.3 Operational Phase

The effects set out in this section relate to the operational phase of the Cleanrath wind farm development should Substitute Consent be granted. This includes the previous period of short-term operation and the current period of Sleep Mode and also assesses future operation.

During the initial first 3 month period of operation from January to March 2020 there were up to 10 cars / vans visiting the site per day. Following that initial period during the operation of the Cleanrath wind farm development, there has been and it is estimated that there will continue to be a maximum of three maintenance staff members employed on site with a similar number of vehicle trips to and from the site. During the operation phase also, there will be 2 days when plant required for the restoration of peatland habitat will be delivered to and from the site. For the remaining days during the operational stage a maximum of 3 car trips for maintenance staff will occur during any one day. As highlighted above, there is the potential requirement for a blade swap on a turbine as part of turbine maintenance should a blade be found to be defective. In the unlikely event this occurs it is not anticipated that a significant number of blade swaps will be required. It is therefore considered that the impact on the surrounding local highway network will be imperceptible during the operational phase of the development.

14.1.9.4 Decommissioning Phase

For both the potential early decommissioning or the intended decommissioning phase after the operational life time of the project, the potential traffic effects will be similar. During the 5 days when the foundations will be backfilled the effects will be slight to moderate and will be temporary.

During the 15 days when the cables will be removed from ducts on the cable route the effects on the surrounding road network will be imperceptible and temporary.

During the 9 days of the turbine removal when smaller component parts will be removed using standard HGVs the impact will be slight and temporary.

During the 28 nights when the large components of wind turbine plant are removed from the site using extended articulated vehicles, the impact of the delivery vehicles on these days will be slight to moderate and will be temporary occurring on 28 nights only.

14.1.10 Cumulative Impact

Cumulative Impact During Construction Operation and Decommissioning

Other existing wind farm developments (existing, under construction and proposed), located within the vicinity of the Cleanrath wind farm development site, shared and will share sections of abnormal load delivery routes that are common to each other. Construction staff on each of the projects would have also used similar routes to access the various wind farm sites.

The implementation of the traffic management measures, included in Appendix 4-4 of this rEIAR, during the construction phase of the Cleanrath wind farm development ensured that the potential for significant, negative cumulative impacts on roads and traffic due to the construction of the other wind farms occurring simultaneously was minimised.

As the likelihood of abnormal load deliveries to the Cleanrath wind farm development during the operational phase is minimal, it is considered that the potential for cumulative impacts on roads and traffic during the operational phases of the wind farms is imperceptible.

There is potential for significant, negative, cumulative impacts on roads and traffic to occur between other wind farm developments during their respective decommissioning phases, should they overlap. In the event that this is the case the traffic management plan for the decommissioning phase of the Cleanrath wind farm development will schedule abnormal load vehicle movements so as not to occur concurrent to abnormal load vehicle movements associated with the other wind farms. A Traffic Management Plan for the decommissioning phase for the grid connection cabling is included in the Decommissioning Plan Appendix 4-9.

14.1.11 Residual Impacts

Construction Stage

During the 16 month construction stage of the wind farm development, the additional traffic that travelled on the delivery route indicated in Figure 14-1 had a negative, temporary impact on existing road users, ranging from imperceptible to moderate, which were minimised with the implementation of the mitigation measures included in the traffic management plan.

Works required to lay the grid connection cable were generally installed in the corridor of the road and resulted in local short term delays and diversions to traffic and road closures. While traffic delays were incurred resulting in a slight, temporary impact on local traffic. However, it is noted that only a short section of the cable route and a limited number of road users passing through it were affected each day.

Operational Stage

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

Decommissioning Stage

In the event that the wind farm is decommissioned, the decommissioning plan which is included as Appendix 4-9 will be implemented in order to minimise the residual impacts during this stage. It is considered that the potential impacts will be similar but less than the construction phase with the traffic movement being a mirror of the construction phase. The concrete and steel used in the turbine foundations will remain in situ and so there will be no traffic impact associated with this element.

14.2 Telecommunications and Aviation

14.2.1 Introduction

This section of the rEIAR addresses the potential impact of the Cleanrath wind farm 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 have been avoided, with the likely significant effects assessed (and mitigation measures) in Section 14.2.4.

14.2.1.1 Methodology and Guidance

This section of the rEIAR 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 2.4 of this rEIAR.

The assessment of likely significant effects on material assets uses the standard methodology and classification of effects, as presented in Section 1.9.2 of this rEIAR. The full project description, including turbine locations and elevations, is provided in Chapter 4.

14.2.1.2 Statement of Authority

This section of the rEIAR has been prepared by Owen Cahill, an Environmental Engineer with MKO. Owen has over 8 years' experience in the environmental sector where he 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. He has coordinated the scoping and consultation exercise with telecommunications operators and aviation authorities for numerous renewable energy developments and prepared the relevant sections of this rEIAR.

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 Cleanrath wind farm development as summarised below; full details are provided in Section 2.4 of this rEIAR.

The layout and design of the Cleanrath wind farm 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. Scoping was undertaken in 2015 as part of the assessment carried out for the 2017 Permission. The scoping exercise was repeated again in 2020 as part of this rEIAR. Telecommunications and aviation consultees for both 2015 scoping and 2020 scoping are presented below in Tables 14-25 and 14-26 respectively.

Table 14-29 Telecommunications and Aviation Scoping Responses (2015)

Consultee	Response	Potential for Interference Following Consultation Exercise	Action Required
Airspeed Communications	None received	No response	N/A
RTE Transmission Network Ltd	None received	No response	N/A
Tetra Ireland Communications Ltd.	None received	No response	N/A
Meteor Mobile Communications Ltd.	3rd December 2015	No links in the area therefore no potential for impacts to arise.	N/A
TG4	None received	No response	N/A
Three Ireland	None received	No response	N/A
Towercom	None received	No response	N/A
UPC (now Virgin Ireland Ltd)	None received	No response	N/A

Table 14-30 Telecommunications and Aviation Scoping Responses

Consultee	Response	Potential for Interference Following Consultation Exercise	Action Required
Airspeed Communications	None received	No response	N/A

Consultee	Response	Potential for Interference Following Consultation Exercise	Action Required
BT Communications Ireland	None received	No response	N/A
Cork Airport	None received	No response	N/A
Department of Defence	3rd June 2020	DoD noted no issues with the Cleanrath wind farm development and issued observations as discussed below in Section 14.2.3.3	N/A
Eir	15th May 2020	No links in the area therefore no potential for impacts to arise.	N/A
ESB Telecoms	None received	No response	N/A
Imagine Group	None received	No response	N/A
Irish Aviation Authority (IAA)	18th June 2020	IAA noted no issues with the Cleanrath wind farm development. Upon sending through turbine locations, observations were provided as discussed below in Section 14.2.3.3	N/A
Ripplecom	None received	No response	N/A
RTE Transmission Network Ltd	11th May 2020	RTE 2rn initially noted no issues with the Cleanrath wind farm development. They note that the protocol agreement that is already in place still stands	N/A
Tetra Ireland Communications Ltd.	None received	No response	N/A
TG4	None received	No response	N/A
Three Ireland	25th May 2020	No links in the area therefore no potential for impacts to arise.	N/A
Towercom	None received	No response	N/A
Viatel Ireland Ltd	None received	No response	N/A
Virgin Ireland Ltd	None received	No response	N/A
Vodafone Ireland Ltd	None received	No response	N/A

The scoping responses from the telecommunications and aviation consultees are summarised below. Copies of formal scoping responses are provided in Appendix 2-3.

14.2.3.2.1 Broadcasters

RTE Television Network Radio Telefís Éireann Transmission Network Ltd., now 2RN, responded by email on the 11th May 2020. Having previously reviewed the location of the Cleanrath wind farm development, 2rn noted the protocol agreement previously has not changed considering there has been a reduction of turbines and that the signed agreement still stands and can be found in Appendix 14-2.

14.2.3.2.2 Telephone and Broadband Operators

There were no responses received from any telephone or broadband operators.

14.2.3.3 Aviation

Irish Aviation Authority (IAA)

The Irish Aviation Authority (IAA) issued a response during the consultation exercise on the 18th June 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

As the Cleanrath wind farm development has be constructed, and the turbine are constructed, all of the above has been agreed with IAA previously. The details are included in Appendix 14-3

Department of Defence

The Department of Defence also issued a response during the consultation exercise on the 3rd June 2020, 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."*

The constructed turbines have lighting installed as per the requirements of the IAA as outlined above. The developer has responded to the Department of Defence to get clarity on their requirements.

14.2.4 Likely Significant Effects and Associated Mitigation Measures

14.2.4.1 'Do-Nothing' Scenario

An alternative land-use option to developing the Cleanrath wind farm development would have been to leave the site as it was prior to construction, with no changes made to the land-use practices of low-intensity agriculture, turf cutting and commercial forestry. This option would have no positive impact with regards to the production of renewable energy or the offsetting of greenhouse gas emissions. On the basis of the positive environmental effects arising from the Cleanrath wind farm development, the do–nothing scenario was not the chosen option. Instead, an application for planning permission was made and granted ultimately by An Bord Pleanála.

The Cleanrath wind farm development has been constructed, has been operational and is now operating in Sleep Mode with the site essentially in a shut-down mode with no export of electricity pending the outcome of the Substitute Consent process. In the event that Substitute Consent is obtained, the intention is to recommence and continue the full operation of the Cleanrath wind farm development until the end of 25 years from the formal commissioning of the turbines in July 2020 and implement the decommissioning plan for the Cleanrath wind farm development at the end of the operational period.

In the event that Substitute Consent is not granted and full operation of the development is not recommenced, it will remain in Sleep Mode which is, in effect, the "do nothing" option insofar as it represents the current situation as at the date of the application for Substitute Consent. There is the possibility that the decommissioning plan may need to be implemented early, should Substitute Consent not be granted. These scenarios are assessed in this section.

As the Cleanrath wind farm development has been constructed and operated, there has been no direct or indirect effects on telecommunications or aviation reported to date.

14.2.4.2 Construction Phase

The potential for telecommunication and aviation interference from wind turbines occurs only during the operational phase of the development. Prior to the commencement of turbine construction, the IAA were notified by the developer 30 days prior to any construction as required by SI 215 of 2005 (Obstacles to Aircraft in Flight) Order. This consultation included providing details on the lighting on all cranes that were used during construction. There were no interference impacts associated with the construction phase of the Cleanrath wind farm development, and therefore no mitigation required. There was no direct or indirect effects on telecommunications or aviation.

14.2.4.3 Operational Phase

The effects set out below relate to the operational phase of the Cleanrath wind farm development should Substitute Consent be granted. This includes the previous period of short-term operation and the current period of Sleep Mode operation.

14.2.4.3.1 *Telecommunications*

Pre-Mitigation Impact

Consultation regarding the potential for electromagnetic interference from the Cleanrath wind farm 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 Cleanrath wind farm development on RTE infrastructure within the rEIAR site boundary.

Mitigation Measures

It is standard practice of 2RN to produce a Protocol Document for wind farm developments, which was 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 Cleanrath wind farm 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.

In the event of further scoping responses being received from the EIA consultees, the comments of the consultees and any mitigation measures were considered in the construction and will continue to be considered during operation of the Cleanrath wind farm development, subject to the outcome of the Substitute Consent process.

The Cleanrath wind farm development has been constructed and operated, there has been no direct or indirect effects on telecommunications reported to date.

Residual Impact

The Cleanrath wind farm development will have no residual impact on any identified telecommunication links or infrastructure.

Significance of Effects

There will be no significant effect on telecommunications from the Cleanrath wind farm 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 Cleanrath wind farm development, in line with policy on tall structures. This lighting has been installed.

Mitigation Measures

No further mitigation is proposed. Details of the installed lighting has been issued to the Department of Defence as part of the consultation process.

Residual Impact

The Cleanrath wind farm development will have no residual impact on aviation as all lighting requirements are in place and all requirements agreed with IAA.

Significance of Effects

There will be no significant direct or indirect effects on aviation operations due to the Cleanrath wind farm development.

14.2.4.4 Decommissioning Phase

The potential for electromagnetic interference from wind turbines occurs only during the operational phase of the development. As with the construction phase, there will be no electromagnetic interference impacts associated with the decommissioning phase of the Cleanrath wind farm development. Prior to decommissioning of turbines, IAA will be notified 30 days prior to commencement. Following the same procedure during construction phase, details on all cranes and associated lighting will be provided to and agreed with IAA. There will be no direct or indirect effects on telecommunications or aviation during decommissioning.

14.2.5 Cumulative Impact Assessment

Section 2.5 of this rEIAR 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 Cleanrath wind farm development, there will be no cumulative impacts relating to the Cleanrath wind farm 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. It has been demonstrated during construction and operation of the Cleanrath wind farm development to date that there is no impact on telecommunications and aviation therefore, 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 Cleanrath wind farm 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 has been installed, as detailed in Appendix 14-3 as is standard for permitted wind farms.

As a result, there will no impact from the Cleanrath wind farm development in respect to aviation or telecommunication. The Cleanrath wind farm development will have no significant effects.