



# Appendix 12.1

## **Turbine Delivery Report**

**Coolglass Wind Farm EIAR Volume 3**

**Coolglass Wind Farm Limited**

SLR Project No.: 501.V00727.00006

25 May 2023

# TURBINE DELIVERY ROUTE REVIEW

## COOLGLASS WIND FARM

**Coolglass Wind Farm**

Prepared for: **Coolglass Wind Farm Limited**

Client Ref: 428.02036.00787

SLR Ref: 428.02036.00787  
Version No: V0b  
January 2023



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## 1.0 Introduction and Scope

### 1.1 Introduction

SLR Consulting has been instructed by Coolglass Wind Farm Ltd to prepare a detailed access report for the delivery of wind turbine components to the proposed Coolglass Wind Farm (the Site), located to the southeast of Portlaoise, Ireland. The purpose of this report is to identify the maximum blade length that could be delivered to the site.

### 1.2 Background

This Turbine Delivery Route (TDR) Assessment report has been prepared on behalf of Coolglass Wind Farm Limited (the "Applicant") in respect of a 13 no turbine wind farm development, grid connection and associated works on land within the townlands of Fallowbeg Middle, Coolglass, Orchard Upper, Crissard, Fossy Lower, Aghadreen, Fossy Upper, Gorreelagh, Scotland, Aghoney, Brennanshill, Moyadd, Luggacurren, Kylenebehy, Fallowbeg Upper and Knocklead, County Laois. The site is approximately 731 ha in size. The development will consist of:

- 13 no. turbines, each with a height of 180m, rotor diameter between 155m and 126m, hub height of between 99m and 107.5m and all associated site infrastructure including:
- Works along
  - 110 kV electricity substation and 2 no. switch rooms;
  - equipment compound,
  - turbine foundations;
  - 33kV collector cable circuit connecting the wind farm two clusters;
  - 2 no. temporary construction compounds,
  - c. 15.5 kilometres of site access tracks;
  - underground electricity and communications cabling;
  - site drainage works;
  - 2 no. site entrances; and
  - 1 no. borrow pit.

### 1.3 Scope of Work

This TDR Assessment has been prepared to assess the maximum blade length which could be delivered to the proposed wind farm and to confirm that the nacelle and tower components can also be transported to Site.

The review focuses on the suitability of potential route options, with identification of specific areas likely to present significant constraints. Swept path analysis has been undertaken for those problem areas as part of our assessment.

Identification of road signage, etc. to be temporarily removed and clearance of trees and hedges has not been specifically identified in this report. These elements have been considered as part of a more detailed analysis completed within a Turbine Delivery Route Works report.

SLR devised the following scope of works:

- Desk based study to identify potential routes and pinch points;



- Site visit undertaken on the 9<sup>th</sup> and 10<sup>th</sup> November 2021;
- Site visit undertaken 17<sup>th</sup> February 2023;
- Swept Path Analysis of identified potential pinch points; and
- Production of this Turbine Delivery Route Review report.

## 2.0 Proposed Development

### 2.1 Description of Proposed Development

The proposed development would consist of approximately 13 turbines over two turbine field areas with a cumulative total output of approximately 85.5 MW.

- There are 7 turbines in the northern development area.
- There are 6 turbines in the southern development area.

The duration of the construction works is expected to be in the order of 18 months.

### 2.2 Turbine Details

A candidate turbine has been selected for the proposed wind farm development. The exact dimensions are shown in **Table 1**.

**Table 1 Turbine Details**

Parameter	Details
Blade Tip Height	180m
Rotor Diameter	Up to 162m (blade length 81m)
Hub Height	Up to 110m

### 2.3 Proposed Access Route

There are a number of ports around Ireland that could handle wind turbine components and would therefore be suitable for the delivery of the turbine components. A large port is not normally the deciding factor as often local authorities will insist on the nearest suitable port to minimise disruption to general traffic during the transportation of the turbine components.

Ports that are primarily for Roll On- Roll Off ferries generally are unsuitable due to the frequent use of the berths by ferries and the lack of general berthing facilities. Fishing Ports are generally quays in town centres, so will depend upon road access to the quayside. Container ports are generally too specialist with their equipment for handling the longest of loads, but could still be used.

Coolglass Wind Farm is located near to the M7 Motorway south of Portlaoise, with good road links to both the major Port at Dublin (M50/M7) and the major Port at Cork (M8,M7). Both ports should therefore be considered suitable for the delivery of the turbine components.

Other ports within a reasonable distance, include:

- Dun Laoghaire
  - Ferry terminal, but there appears to be a number of general berths as well, road access would be difficult for long loads, port discounted.
- Wicklow
  - Town centre quayside, road access would be difficult for long loads, port discounted.
- Arklow

- 
- Fishing port with access through the town centre, road access would be difficult for long loads, port discounted.
  - Wexford
    - Town centre quay separated by a railway from the main road, road access would be difficult for long loads due to tight turns to cross railway, port discounted.
  - Rosslare
    - Ferry terminal with no general berths, port discounted.
  - Waterford (Bellview)
    - Route to the development site would require use of a significant length of single carriageway road, so would be less desirable than routes that use motorways and dual carriageways.
    - The port is also a greater distance than either Cork or Dublin and is therefore discounted.

These ports have not been considered further due to poor road links leaving the port to gain access to the main road network.

This desk-based study has been undertaken for both the port at Dublin and the port at Cork / Cobh and the access route from each port to the site is included. Where a route was considered suitable from the desk study, it was reviewed during the site visit to determine its suitability.

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## 3.0 Transport Requirements

Wind farm developments can generate traffic impacts associated with the vehicles removing and delivering materials during site preparation and construction of the wind farm.

In addition to general construction traffic the wind turbine components need to be delivered to site and these bring about impacts beyond that the general construction traffic create as these vehicles tend to be longer, wider and heavier. The movement of vehicle and load combinations over certain sizes is therefore regulated and permits need to be obtained.

Paramount during the planning and consultation period for a wind farm is the need to consider the capacity of the highway network both locally and from the port of delivery to accommodate the transport configurations necessary to deliver the various wind turbine components.

There are two permit systems to authorise for the movement of abnormal load transport configurations, The Garda permit and a Local Authority Permit.

### 3.1.1 Garda Permit

The Garda Permit applies only to designated major inter-urban routes and routes to the main ports at Dublin, Cork, Rosslare and Ringaskiddy. The Garda permit is set out by the following legislation:

- Road Traffic (Permits for Specialised Vehicles) Regulations 2009, S.I. No. 147 of 2009; and
- Road Traffic (Specialised Vehicle Permits) (Amendment) Regulations 2010, S.I. 461 of 2010.

The Garda Permit applies to transport configurations not exceeding 27.4 metres in length and 4.3 metres in width and 4.65m in height.

The combined weight of the vehicle and load must not exceed the maximum limits set out in the Road Traffic (Construction and Use of Vehicles) Regulations 2003, S.I. 5 of 2003 and the maximum height limit set down in Road Traffic (Construction and Use of Vehicles) (Amendment) Regulations 2008, S.I.366 of 2008.

### 3.1.2 Local Authority Permit

A Local Authority Permit is required for all roads, (including roads designated under the Road Traffic (Specialised Vehicle Permits) (Amendment) Regulations 2010 for Garda Permits, for vehicles and loads which do not qualify under the Garda Permit Scheme, and in either or all of the following cases:

- The weight and dimensions of the vehicle exceed the maximum permissible limits set out in the Road Traffic (Construction & use of Vehicles) Regulations 2003, as amended; and/or
- The vehicle/load exceeds 4.65m in height.

The access study has identified the transport configurations for the most onerous wind turbine components, transported by a specialist vehicle fleet.

The maximum height relates to the design standards for bridges and structures over roads in Ireland.

## 3.2 Time Restrictions

The movement of abnormal load transport configurations will need to be timed to avoid periods of heavy traffic flow to minimise disruption to the public. These include the normal daily rush hour periods, Saturdays and major public events. Specific timing restrictions imposed by the police or local authority have not been determined at this stage.

### 3.3 Escorts

Through urban areas temporary parking restrictions are likely to be necessary to guarantee a clear route for the abnormal loads, and these need to be arranged in advance through the appropriate local authority. The parking restrictions will need to be locally enforced.

Due to the size of vehicles required to transport these loads, escorts will be required for the entire route to control oncoming and conflicting traffic.

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## 4.0 Swept Path Analysis Vehicle Configuration

Swept path analysis has been undertaken for the development on aerial Photography base mapping using bespoke vehicle and load combinations appropriate for the size of turbines that are proposed. All vehicles are modelled by SLR from the generic standard vehicles contained in the AutoTRACK software library. The vehicles have only been modified in length and number of axles on the trailer, with the turning properties of the vehicles not being modified.

SLR has used two blade carrier trailer lengths in the analysis, to give a comparison as the swept paths generated do vary with trailer length. But it should be noted that advances in trailer design along with differences between trailer manufacturers will result in other trailer lengths being available.

Trailers are available such as the Noteboom Super Wing Carrier which are capable of both changing the wheelbase distance during transportation and lifting the trailer bed to increase ground clearance.

Data used for determining the length of trailers has been obtained from various trailer manufacturers websites including Noteboom. SLR is aware that the lengths of trailers used in the assessment would be available, but is not aware of which haulage companies would have these trailers available for use.

Unless otherwise stated on the swept path drawings, manual override of rear axle steering has not been used in the analysis. The reason for this is that the trailers are not usually powered and therefore they can only follow the tractor unit. There is a risk with using manual override of the rear axle steering, of creating a swept path that is unachievable as it requires the trailer to move sideways, which it cannot do without power.

In addition to undertaking swept path analysis for the blade transport configurations, swept paths have also been undertaken for a 30m tower section loaded onto a windmill transporter; this would be one of the largest sections of the tower. The nacelle has been considered separately from this assessment.

The swept path drawings do not identify specific items of street furniture that will need to be temporarily removed to allow the passage of the long vehicles, these will be identified prior to the movement of loads by the haulage contractor. This is because street scenes change with time, items appear and disappear, and trees and shrubs grow.

A review of aerial photography and an internet search does not identify any wind farms in the immediate area, however the consented Pinewoods Wind Farm is located approximately 7km southwest of the Coolglass Wind Farm; the turbine tip heights are 136.5m with blades approximately 50m in length. It needs to be assumed that away from the motorways, the road network has not previously been used for the transport of long abnormal loads associated with wind turbines of the size proposed for Coolglass Wind Farm.

The standards used for motorway design are generous due to the high speeds involved, therefore motorways and their interchanges would generally be geometrically suitable for the abnormal loads associated with wind farm developments. However a blade length of 81m as required by the project may be greater than what the geometry allows, and the route needs to be reviewed to identify locations where swept path may be required.

Multiple trailer lengths have been used for the assessment, as the location of the rear axles can greatly alter the swept path with either a greater swing out of the blade tip on the outside of bend or more cutting in of the long blade on the inside of bend. It should be noted that other trailer lengths to those used in the assessment are available, including longer trailers, and there are also trailers that can be modified in length during transport which are difficult to create swept paths for.

- Volvo FH16 8x4 tractor towing a 42m long trailer with rear axle steering; and
- Volvo FH16 8x4 tractor towing a 55m long trailer with rear axle steering.

The typical bed height for the trailers is around 1.15m, however when loaded the blade may be around 1.5m to 2.5m above the ground, depending how it is loaded, therefore any item of street furniture that is taller than the

height of the blade within the swept area of the load will need to be temporarily removed; this will include all streetlights, traffic signals and traffic signs however bollards and street nameplates will typically be low enough to be over sailed. Hedges simply need to be trimmed to lower their height to the appropriate level.

With tower sections having a diameter of around 4m, the loading onto vehicles is an important consideration where there are height restrictions along the route. The maintained headroom at bridges in Ireland is 5.03m, however some existing structures including the Dublin Port Tunnel and the Jack Lynch Tunnel only have a headroom of 4.6m. Therefore the choice of vehicle is important to ensure that the tower sections can pass under structures with restricted headroom, and are able to leave the port.

Where verges and footways are overrun by the wheels of tractors or trailers, the surface will need to be strengthened and protected. Depending on ground conditions and the vehicles movement, it may be possible to simply provide protective plating to these areas rather than providing a pavement construction.

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## 5.0 Access Route Review

It should be noted that within this report the routes have only been assessed at high level. Modifications that will be required along the route, which include construction of overrun areas, removal of street furniture, etc. are not specifically identified in this report. A separate review has been completed which identifies the likely scale of the works each node requires to accommodate the transport of the components.

A desk study has been undertaken using available internet mapping, aerial images and street view imagery. This has identified the nearest viable ports and routes from them to the proposed wind farm location.

The routes from the nearest ports to the site have been identified in the desk study and those considered to be viable were reviewed during a site visit on the 9<sup>th</sup> and 10<sup>th</sup> November 2021. The weather during the site visit was dry.

The purpose of the site visit was to drive the identified routes to determine if they are viable and all constraints have been identified between the potential ports of delivery and the proposed wind farm location. A drive through of the routes has been video recorded.

### 5.1 Dublin - Approx. 106Km

The port of Dublin has quays and facilities on both sides of the River Liffey with the R131 Tom Clarke Bridge (formally known as the east link toll bridge) linking the two. The M50 orbital motorway commences in the north side of the port and heads north towards the airport before heading west and south around the city.

If the turbine components come into the south of the river, they will need to cross the R131 Tom Clarke Bridge, there is a sharp turn onto this bridge, which is likely to limit blade lengths to around 60m.

The M50 leaves the port area through the Dublin Port Tunnel, which is a twin bore tunnel, 4.5km in length. Each tunnel bore is circular and contains two lanes with no hard shoulder. The tunnel website defines a maximum vehicle height of 4.65m. Vehicle widths greater than 2.9m and over 25m length require permission to pass through the tunnel and need to be booked in advance.

The height restriction could be an issue for some of the turbine components, such as tower sections and blades, as when loaded onto transport vehicles they could exceed the height restriction. As both bores of the tunnel were built at the same time it is unlikely that one of the tunnel bores would be able to accommodate taller vehicles.

The video taken during the site visit shows that the tunnel contains several bends, these will need to be checked to ensure that the long blade sections can pass through, especially as there is no verge to oversail. Lights, electronic signage and ventilation equipment are also visible in the video, suspended from the tunnel roof. The video does not show any crests or dips in the tunnel alignment that would raise concern for long loads.

There is a route through the city for taller vehicles, that would avoid the tunnel, however this route is likely to have timing restrictions placed upon it. This route would join the M50 near the airport.

Leaving the tunnel the M50 heads north for a short distance before turning west at the junction with the start of the M1 near the Airport. The M50 heads west and south around the city to reach the N7 (M7). The slip road leaving the M50 passes under the N7 through a narrow bridge, two lanes width, the bridge is both in a dip and on a bend and may be a restriction for long loads. However rough measurements using Google earth images would suggest a load in the region of 90m should be able to pass through this structure.

The N7 heads west and becomes the M7 at the town of Naas. The route leaves the M7 at junction 16 Portlaoise. The junction is a dumbbell junction with a small roundabout on each side of the motorway. The route requires a right turn at the first roundabout to cross the motorway, and then a left turn at the second roundabout to join the R445 south.



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## 5.2 Cork / Cobh / Ringaskiddy – Approx. 180km

There are numerous ports and quays around the city of Cork and Cobh. However not all the ports / quays have access to the major road network required to provide access for the long loads associated with wind turbine developments. Due to the high number of ports / quays available in the area, the access to the major road network has not been checked from these locations as part of this report, but would need to be checked if any of these port locations are chosen for port of turbine delivery.

Some of the ports and quays require the transport to pass through the Jack Lynch Tunnel with a headroom restriction of 4.6m.

This report therefore commences at the start of the M8 Motorway, located to the east of Cork. The motorway heads north and joins the M7 south of Portlaoise.

Approaching from the south the route leaves the M7 at Junction 16 to join the R445. The junction is a dumbbell junction with a small roundabout on each side of the motorway. The route requires a left U-Turn at the roundabout to join the R445 south.

## 5.3 Portlaoise R445

The R445 is a typical rural road with hard shoulders and a near straight alignment.

The route follows the R445 for a short distance before turning left onto the R425. The turn onto the R425 would be an easy turn for long loads due to its angle.

## 5.4 Portlaoise R425 – R426

The R425 is a lower standard road without hard shoulders and the initial section has a near straight alignment.

The R425 crosses a roundabout junction with the N80, before crossing over the M7 Motorway. and passes through a sweeping bend at the village of Sheffield Cross. At the junction in Sheffield Cross the road number changes to the R426.

The route continues south and the road alignment contains more bends. Verge provision is variable with many hedges being immediately on the edge of the road. The route crosses the R427 at a slightly staggered crossroads, the stager is minimal and would not cause any issues for the long vehicles. Verge provision south of the crossroads is better.

The R426 enters the village of Timahoe and bends slightly. Timahoe contains a large well-kept village green and two pubs alongside the road with parking areas across their frontage. The road kinks as it leaves the village, with buildings close by, which could possibly be restrictive for large vehicles passing through the village.

The R426 continues south of the village, passing through a number of sweeping bends before reaching a crossroads with the L3851. At this location the route turns left to continue to the wind farm site.

## 5.5 L3851

The L3851 is a narrow two-lane road without centre line markings. The road would appear to be around 5m in width. The road passes through a pair of tight bends before reaching the northern cluster access to the proposed wind farm. The southern cluster access is located further along the road.

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## 6.0 Summary of the Route Review

It should be noted that the routes have only been assessed at high level for the transport of the long turbine blades and tower section; the transport of the nacelle has been considered separately. Modifications that will be required along the route, which include construction of overrun areas, removal of street furniture, etc. are not specifically identified in this report. The routes are shown in Figure 01.

### 6.1.1 Port of Dublin to Portlaoise

This is the most likely port to be used as it is around half the distance than the route from the Port at Cork.

The major restriction along this route is the Dublin Port Tunnel which has a height restriction of 4.65m and a width restriction of 2.9m. However the width restriction only requires permission to be granted to pass through the tunnel. The geometry of the tunnel will need checking due to the limited distance from the verge to the tunnel walls.

SLR has not consulted with the tunnel operator, as at this early stage of the assessment SLR do not know the exact vehicle configurations and dimensions. As such it would not be possible to obtain meaningful information related to the transport of the components through the tunnel.

The route follows the motorway network (M50, M7) from the port all the way to Portlaoise where it leaves the motorway network to join the R445 southbound.

There is an overground route out of the port utilising the R131, R105 Annesley Bridge Road, R107 and R139. Although not assessed, this route would be acceptable for the tower sections, but may not be acceptable for the blades due to the turns that need to be made.

### 6.1.2 Port of Cork (Cobh) to Portlaoise

The port of Cork (Cobh) is the next nearest port after Dublin with a direct motorway link to the proposed wind farm development at Portlaoise.

Although there are a number of ports and quays around the Cork / Cobh area, it is clear from a quick review of internet aerial photography and street view imagery that some of them do not have suitable access for long vehicles to the major road network due to road geometry. As a result the assessment commences at the start of the M8 motorway. The M8 joins with the M7 to the south of Portlaoise.

The junction that would be used to leave the motorway network to join the local roads is the same as the route from Dublin. A U-Turn is required when leaving the M7 northbound to join the R445 southbound; this is likely to be unachievable for the long loads.

### 6.1.3 Portlaoise to site

The route from each port follows the same route from Portlaoise to reach the wind farm development site with issues potentially at the N80 roundabout, in the village of Timahoe, where the route turns onto the minor road leading to the wind farm site, and along the minor road.

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## 7.0 Swept Path Assessment

Locations have been determined for swept path analysis from the desk study and the subsequent site visit, most of the locations that have been identified require the blade delivery vehicle to make a turn.

The swept path analysis undertaken for this report is concerned with the delivery of the turbine blades, to identify the required improvements. Swept paths for the delivery of other components, including a 30m tower section have also been completed to identify if any additional improvements are required. The swept paths for other tower sections and nacelles, has not been included within this assessment.

Swept path analysis has been undertaken using AutoTrack Software with multiple vehicle configurations carrying an 81m length turbine blade. The vehicles have been modelled from standard vehicles within the software vehicle library which have simply had their wheelbase extended to match the length of known trailers and a load added, to account for the length of the wind turbine blade.

- Vehicle 1 – Blade Carrier - 41m length trailer,
- Vehicle 2 – Blade Carrier - 55m length trailer; and
- Vehicle 3 – Tower Carrier.

It should be noted that there are trailers available, which allow the assembly holding the blade to slide on the trailer bed, this allows for the wheelbase to be amended during transport. Using this type of trailer would allow a change of up to 15m to be achieved to the wheelbase. It is not possible to model a change like this using AutoTrack therefore the two sets of tracking need to be looked at together.

Longer trailers are available, as of November 2022 extendible trailers up to 69m in length are available from Broshuis. These longer trailers have not been used in this assessment as it is not known if the haulage companies have access to these vehicles.

There may be a requirement to undertake trimming of vegetation throughout the transport route to ensure that the delivery vehicles can pass; the details will be determined prior to deliveries, and will in the majority of locations be limited to trimming growth back to the road boundaries.

The sites identified for assessment are described below. Where works are anticipated to accommodate the transport of the components, the TDR Works report should be reviewed to confirm the details.

### 7.1.1 Port of Dublin – M50

The port has a direct and reasonably straight access to the M50 Motorway, it is therefore considered suitable for long loads, without the need for swept path analysis to be undertaken.

As identified previously, there is a question over the headroom of the Dublin Port Tunnel, which will require blades and tower sections to be mounted low enough. There may also be an issue over the length of the blades.

If the loads cannot be mounted low enough to pass through the tunnel, then a surface route would appear to be available through the city, which reaches the M50 near the airport. This route has not been assessed using swept path analysis, but a review of aerial imagery would suggest that this route would be suitable for the tower sections but not the blades.

Due to the identified restrictions it is likely that the tower sections would be transported via the surface route, with the blades transported via the tunnel. At this stage it has not been possible to confirm the suitability of the tunnel as the dimensions have not been obtained. It is therefore best to determine the suitability of the tunnel when the haulage company has been appointed and the exact delivery vehicle combination is known.

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### 7.1.2 M7 Portlaoise Junction – (Node 1 and Node 2)

From the North (Dublin), the turn off the M7 Motorway at Portlaoise has been checked using swept path analysis as the route traverses two roundabouts with a bridge between them. The swept paths are shown on the drawings, the first roundabout is Node 1 and the second roundabout is Node 2.

Two swept path routes have been taken to pass through the junction.

The first path through the roundabout at Node 1 correctly follows the circulatory carriageway, on this path the rear blade overhang requires large areas of clearance to be undertaken on the approach too, and around the roundabout. As the roundabout is in cutting this may require an extensive amount of earthworks, depending on levels and ground clearance of the blade tip.

The second path through the roundabout at Node 1 travels the wrong way around the circulatory carriageway. This path requires a substantially smaller amount of clearance and earthworks to be undertaken, but will require some temporary road construction to be provided.

The recommendation for the first roundabout (Node 1) would be to use the second path and pass the wrong way around the roundabout, as this is achievable without excessive earthworks that would change the junction.

At the second roundabout (Node 2) the route through is easier as it is only a slight left turn with no deformation due to the roundabout geometry. The only issue with this turn is that the blade tip will swing out over the M8 and into a planted area requiring some trees to be cleared and potentially some earthworks to be undertaken. The blade tip will also oversail the roundabout island, but as this is flat it will only require the temporary removal of traffic signs.

## 7.2 Port of Cork / Cobh

Subject to headroom clearances at structures, the route is considered suitable for the delivery of turbine blades, as such swept path analysis has not been undertaken.

The Jack Lynch Tunnel is on a long horizontal curve and vertical sag curve and although there may be headroom issues with the Jack Lynch Tunnel, it is not possible to check the tunnel as mapping would only show the approximate line of the tunnel, not exact dimensions. It is therefore best to determine the suitability of the tunnel when the haulage company has been appointed and the exact delivery vehicle combination is known.

### 7.2.1 M7 Portlaoise Junction – (Node 2)

The U-Turn off the M8 to the R445 has been checked with swept path analysis and is shown on the Drawings .

A simple U-turn may be achievable by the vehicle turning from the slip road direct onto the R445 south; however the rear axles of the trailer will swing out requiring a large overrun area to be constructed in cutting. This would require a large amount of the tree planting to be removed. This path is shown on the drawings.

To try and reduce the amount of clearance and cutting to be undertaken, swept path has been checked for the vehicle to use the circulatory carriageway the wrong way. This is achievable for the vehicle; however it still requires a large area of clearance and excavation to lower the areas to road level, all around the junction.

Swept path has also been undertaken which includes a reversing manoeuvre. The vehicle would cross the roundabout island towards the R445 north road opposite. The vehicle would then reverse over the central island and onto the road over the motorway. Once completed the vehicle would then move forward and onto the R445 south towards the wind farm. This manoeuvre would be achievable with considerably less clearance and excavation being required, however, to achieve this manoeuvre the central island of the roundabout would need temporary construction to allow it to be overrun by vehicles.

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## 7.3 Portlaoise to Site

### 7.3.1 R445, R425 (Node 3)

Swept path Analysis has not been undertaken along the R445 as the road is straight.

The turn from the R445 onto R425 (Node 3) is a gentle turn aligned more like a slip road than a junction. The R445 is a wide road with hard shoulder provision at the junction, giving plenty of space for the transport configuration to correctly position itself, although some trimming of vegetation will be necessary.

The R425 is straight as it heads towards Node 4, however the route has lost its hard shoulder provision reducing the available width along this section..

### 7.3.2 Portlaoise R425, N80 Roundabout (Node 4)

The roundabout junction between the R425 and the N80 is flat with central landscape planting. Swept path analysis has been undertaken and is shown on the Drawings .

The initial swept path, with vehicles using the circulatory carriageway, confirms that this manoeuvre would create too much swing out for the blade tip, which would be in conflict with trees and a residential property to the north of the roundabout. This was considered to be unacceptable, and the swept path is not included on the drawings.

Due to the difficulties in circulating the roundabout, routes across the island have been checked, which are capable of keeping the vehicle within the highway boundaries. This will require a roadway to be built across the roundabout central island.

The roundabout central island is landscaped and planted with a star pattern. This will need to be reinstated or amended if the roadway is to remain; however the planting includes an ornamental tree and hedge, which the swept path has tried to avoid as this could be hard to replace.

Passing to the left of the tree, the blade tip swings out and requires trees around the roundabout to be removed. Passing to the right of the tree, there are no issues with the blade tip, however this route requires approaching and leaving the roundabout on the wrong side of the road.

If the roadway is to remain, our recommendation would be to go over the centre of the island, as the Chevron signs would be used to visually block the route, however this would require the landscape planting to be redesigned and reinstated.

### 7.3.3 R425 - R426 (Nodes 5, 6, 7 and 8)

The R425 heads south from the roundabout, with a near straight alignment, the road crosses over the M8 Motorway and passes through a long sweeping bend at Sheffield Cross (Node 5), where the road becomes the R426. Around this bend there might be a requirement for a small amount of vegetation to be trimmed, if there is a conflict with the blade tip. It might also be prudent to temporarily remove traffic signs on the inside of the bend to allow long vehicles to cut in. both of these will need to be assessed immediately prior to delivery.

Leaving the village of Sheffield Cross, the R426 route narrows considerably with intermittent or no verge provision and vegetation often growing up against the road edge. The road passes through a number of bends before reaching Node 6. Along this section there may be a requirement to trim vegetation or move overhead cables. These works will need to be determined immediately prior to undertaking the deliveries.

At Node 6 there are a pair of sweeping S Bends; the potential issue here is the radius of the second bend that causes the blade tip to swing out. The blade tip does not go outside the road boundary but will pass close to trees which may require trimming.

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Node 7 is located at a crossroads with the R427. There is a slight stagger in the crossroads for the R426, and a farmhouse is relatively close to the road with a mature tree in its garden.

The swept path shows that for the long vehicles to negotiate the junction without the blade tip going outside the road boundary, the vehicle would need to pass the wrong side of the splitter island as it approaches the crossroads. There may be a requirement for a small amount of protection to the verge along with the temporary removal of the bollards and traffic signs from the splitter islands.

Node 8 is where the R426 passes through a bend with buildings on both sides of the road with boundary walls along the road edges. Swept path analysis shows that the delivery vehicles are not impeded by the close proximity of these boundary walls.

The R426 continues south, passing through more bends before reaching the village of Timahoe.

There may be a requirement to undertake some trimming of vegetation throughout the transport route to ensure that the vehicles can pass, this will be determined prior to deliveries, and is anticipated to be limited to trimming growth back to the road boundaries.

### 7.3.4 Timahoe (Node 9)

The R426 approaching Timahoe is a straight tree lined avenue with a tree canopy that covers the road. The tree canopy was inspected during February 2023 and was considered to have around 4m to 5m clearance above the road, with a slightly greater clearance above the road centre. The clearance would be sufficient to allow for agricultural vehicles to pass under without issue. Regular use of the route by agricultural vehicles throughout the year will maintain the available headroom.

The abnormal load vehicles will be similar in height to agricultural vehicles and will be no greater than 4.65m being the height restriction along the route from the port of Dublin. As the clearance in the centre of the road is greatest, the vehicles will be required to travel along the centre of the road through this area.

If the loads are transported during the summer months when the trees are in full leaf, then there may be a requirement to undertake limited trimming of branches to ensure the loads can pass through unhindered. This will need to be determined at the time of transportation as it will depend upon time of year and weather conditions. Any trimming would be done sympathetically so as not to affect the appearance of the route.

The R426 crosses a side road and bends slightly to the right and passes a well-kept village green containing a number of ornamental trees and picnic benches. The road then bends to the left, passing between buildings to leave the village.

There are two pubs alongside the village green adjacent to the road in the village of Timahoe, both with parking across their frontages due to widening of the road. The first pub is the Tower Inn and the next pub is the Ramsbottoms Bar. The Ramsbottom Bar is on the inside of the bend as the road leaves the village green area and the building creates an obstruction which has been checked with swept path analysis.

Entering the village the transport configuration will need to continue straight and head towards the houses next to the Ramsbottom Bar before slowly turning to the right. The slow turn is to avoid the blade tip from swinging excessively over the property next to the crossroads and conflicting with the building.

Once the tractor unit has reached the buildings it will need to turn slightly to the right and run parallel to the building; this will result in it crossing over the road at the end of the Ramsbottom Bar and head towards the back of the village shop.

The tractor will turn gently to the left, mounting the footway and running along it for a short distance, before going back onto the road.

The gentle turns will result in the blade tip avoiding the ornamental trees and other features on the village green, however some overhead cables will need to be repositioned.

### 7.3.5 R426 South of Timahoe (Node 10)

South of Timahoe the R426 continues as a two lane road with verge provision, the road passes through a number of bends. At Node 10 the route reaches a crossroads with the L3851 where it turns left to reach the wind farm accesses. Swept path analysis at the crossroads has been undertaken.

Due to the narrow widths of the two roads, a turn at the crossroads will require a significant amount of land from around the junction being required for oversail or road widening / hardstanding or slip road will need to be constructed, resulting in the loss of hedgerow and possibly some trees. Due to this a number of options have been investigated; the hedge to be affected appears to be patchy with gaps, and consists mainly of shrubs rather than trees. Overhead cables are present and may need to be moved.

Option 1, turn at the crossroads. The tight turn will require an overrun area to be constructed on the inside of the turn, along with a length of hedge removal along the L3851 to allow the trailer to straighten up behind the tractor unit. A length of hedgerow on the opposite side of the R426 will also need to be removed, along with trees at the crossroads to allow the blade tip to oversail the field.

Option 2, slip road. To reduce the amount of hedgerow to be lost, it is possible to build a slip road across the field corner to take the vehicle off the R426 early, before joining the B3851, thus allowing the vehicle to pass between the roadside hedge and the plantation. Designed correctly, the only sections of hedge that would be affected are the entry and exit locations for the slip road.

Option 3, the land to the right of the R426 has been optioned, however to use this land would require a turn to the right before turning left into the L3851. This option will require an extensive amount of hardstanding to be constructed along with removal of hedges from around the junction.

There may be a requirement to undertake some trimming of vegetation throughout the transport route to ensure that the vehicles can pass, this will be determined prior to deliveries, and will in the majority of locations be limited to trimming excessive growth back to the road boundaries.

### 7.3.6 L3851 (Node 11)

The L3851 is a narrow lane, approximately 5m in width with verge provision and hedges along both sides.

At Node 11 the road passes through an S Bend (where swept path analysis has been undertaken).

The blade tip will oversail the road boundary around the bend, however clearance would be restricted to repositioning an overhead cable and trimming the height of vegetation to allow the blade tip to oversail.

To avoid the blade tip oversailing the road boundary to the south of the road, a new haul road would need to be constructed between the back of the hedge and the tree plantation to the north. This will require some roadside vegetation to be cleared and some to be trimmed to reduce its height. Detailed analysis will determine if the overhead cable can remain or if it needs to be repositioned.

### 7.3.7 Access to North Turbine Field (Node 12).

Access to the north turbine field is taken from the L3851 with two locations identified as being suitable.

The first location at Node 12 is where there is an existing forestry access to a plantation. At this location a gentle turn can be made that prevents the blade tip from swinging out over the road boundary on the southern side. A narrow strip of trees would need to be removed from the plantation.

The second location is at the end of the forestry plantation where an existing track provides a link to the development site. At this location a gentle turn can be made that prevents the blade tip from swinging out over

the road boundary on the southern side. However the difference with this layout is that once clear of the road a tighter bend is required to connect to the existing farm track, as this turn will need to be sharper a larger area of trees would need cleared from the plantation for the oversail of the blade, making the access more obvious.

At both locations the slip road is not suitable for the general construction traffic to re-join the public road. Therefore the existing track will need to be improved and a standard junction layout provided at the end of it where it joins the public road. This standard layout would then be used by all general construction traffic, with the slip lane reserved for the abnormal load deliveries that require it.

### Access to South Turbine Field (Node 13).

Access to the south turbine field is taken from the L3851 following a sweeping bend. The access was that used by a former quarry and is adjacent to a forestry access. The land opposite the access cannot be oversailed.

The access is to be designed as a gentle slip road to prevent the blade tip oversailing the road boundary. The radius of the slip road will gently increase as it turns towards the existing track to the turbine area. There are no trees to be cleared for this layout as the slip road is across open fields, with only roadside hedging requiring removal and replacement.

The slip road will not be suitable for the general construction traffic to re-join the public road. Therefore the existing track will need to be improved and a standard junction layout provided at the end of it where it joins the public road. This standard layout would then be used by all general construction traffic, with the slip lane reserved for the abnormal load deliveries that require it.

Table 2 below provides a summary of each Node location that has been the subject of swept path analysis. The drawing numbers are confirmed and the anticipated works are summarised. The definition of these works are described below:

- Trimming of vegetation - The growth on shrubs and trees will be trimmed/cut back to allow the abnormal load to pass. The plant will remain and will in most cases regrow.
- Clearance of vegetation - Shrubs and trees will be removed completely.
- Utility diversions - Overhead cables will be diverted to alternative route (possibly underground)
- Roadway Construction - A surface suitable for a vehicle to drive over will be provided, this may be an unbound stone surface, a concrete surface, a tarmac surface, or plating to protect the existing surface.

**Table 2 Summary of Swept Path Analysis**

Location		Swept Path Drawing Reference.	Details
Node 1 Dublin approach	M7 Junction 16 (East Roundabout)	H004, H044, H045	<ul style="list-style-type: none"> <li>• Excavation required around roundabout</li> <li>• Clearance of vegetation</li> <li>• Provision of hardstanding's</li> <li>• Utility diversions</li> <li>• Temporary removal and reinstatement of traffic signs</li> </ul>
Node 2 Dublin approach	M7 Junction 16 (West Roundabout)	H004, H044, H045	<ul style="list-style-type: none"> <li>• Excavation required around roundabout</li> <li>• Trimming of vegetation</li> <li>• Utility diversions</li> <li>• Temporary removal and reinstatement of traffic signs</li> </ul>



Location		Swept Path Drawing Reference.	Details
Node 2 Cobh approach	M7 Junction 16 (West Roundabout)	H025, H047, H048	<ul style="list-style-type: none"> <li>Excavation required around roundabout</li> <li>Roadway Construction</li> <li>Clearance of vegetation</li> <li>Utility diversions</li> <li>Temporary removal and reinstatement of traffic signs</li> </ul>
Node 3	R445 / R425 Junction	H034, H050, H051	<ul style="list-style-type: none"> <li>Trimming of vegetation</li> <li>Utility diversions</li> <li>Temporary removal and reinstatement of traffic signs</li> </ul>
Node 4	R425 / N80 Roundabout	H007, H053, H054	<ul style="list-style-type: none"> <li>Roadway construction</li> <li>Clearance/Reinstatement of Landscaping</li> <li>Trimming of vegetation</li> <li>Utility diversions</li> <li>Temporary removal and reinstatement of traffic signs</li> </ul>
Node 5	R425 / R426 Bend - Sheffield Cross	H037, H056, H057	<ul style="list-style-type: none"> <li>Trimming of vegetation</li> <li>Temporary removal and reinstatement of traffic signs</li> <li>Utility diversions</li> </ul>
Node 6	R426 Bends	H040, H062, H063	<ul style="list-style-type: none"> <li>Trimming of vegetation</li> <li>Utility diversions</li> </ul>
Node 7	R426 / R427 Staggered Crossroads	H043, H065, H066	<ul style="list-style-type: none"> <li>Trimming of vegetation</li> <li>Temporary removal and reinstatement of traffic signs</li> <li>Utility diversions</li> </ul>
Node 8	R426 Bends	H031, H068, H069	<ul style="list-style-type: none"> <li>Trimming of vegetation</li> <li>Utility diversions</li> </ul>
Node 9	R426 Timahoe	H010, H071, H072	<ul style="list-style-type: none"> <li>Trimming of vegetation</li> <li>Footway strengthening/protection</li> <li>Temporary removal and reinstatement of traffic signs</li> <li>Parking restrictions</li> <li>Utility diversions</li> </ul>
Node 10	R426 / L3851 Crossroads	H013, H074, H075	<ul style="list-style-type: none"> <li>Clearance of vegetation</li> <li>Trimming of vegetation</li> <li>Roadway construction</li> <li>Utility diversions</li> </ul>

Location		Swept Path Drawing Reference.	Details
			<ul style="list-style-type: none"> <li>• Temporary removal and reinstatement of traffic signs</li> </ul>
Node 11	L3851 Bends	H016, H077, H078	<ul style="list-style-type: none"> <li>• Clearance of vegetation</li> <li>• Trimming of vegetation</li> <li>• Roadway construction</li> <li>• Utility diversions</li> </ul>
Node 12	L3851 – Site Access 1	H019, H080, H081	<ul style="list-style-type: none"> <li>• Clearance of vegetation</li> <li>• Trimming of vegetation</li> <li>• Roadway construction</li> <li>• Utility diversions</li> </ul>
Node 13	L3851 – Site Access 2	H022, H083, H084	<ul style="list-style-type: none"> <li>• Clearance of vegetation</li> <li>• Trimming of vegetation</li> <li>• Roadway construction</li> <li>• Utility diversions</li> </ul>

## 8.0 Consultations

Consultations have not been made with interested parties for the preparation of this report. Transport Infrastructure Ireland (TII) and Laois County will be consulted on the proposed route as part of the EIA Scoping.

## 9.0 Summary

Swept path analysis has shown that it is possible to deliver 81m long blades to site, so long as they fit through the tunnel leaving the port of Dublin.

Clearance works will be needed at a number of junctions along the route, where turns need to be made. Careful route planning through these locations, including passing across roundabouts, creating slip lanes or passing the wrong way through junctions will reduce the amount of work necessary to allow the blades and tower sections to pass.

## 10.0 Recommendations

Although the majority of the route does not cause issues for the transport configuration, there are some geometric restrictions.

**Table 3 Summary Description of Works**

Location	Description	Rating (Red, Amber, Green)
Node 1 M7 Junction 16, Southbound exit Eastern Roundabout	<p>Transport configuration to pass wrong way around roundabout to limit works required.</p> <p>Large area of excavation will be required to allow the long vehicles to navigate the turn, which will permanently change the appearance of the junction.</p> <p>New road surfaces will be required.</p> <p>Vegetation trimming or clearance will be necessary.</p>	Land required, assumed to be highway within ownership of County Laois or TII.
Node 2 M7 Junction 16, Western Roundabout	<p>Transport configuration passes correct way around roundabout to reach exit.</p> <p>Small area of excavation will be required to allow the long vehicles to navigate the turn, which will permanently change the appearance of the junction.</p> <p>Vegetation trimming or clearance will be necessary.</p>	Land required, assumed to be highway within ownership of County Laois or TII
Node 2 M7 Junction 16, Northbound exit Western Roundabout	<p>Transport configuration to pass across central island, before reversing back over island and onto bridge. The configuration can then move forward to continue the route.</p> <p>Small area of excavation will be required to allow the long vehicles to navigate the turn, which will permanently change the appearance of the junction.</p> <p>New road surfaces will be required.</p>	Land required, assumed to be highway within ownership of County Laois or TII.

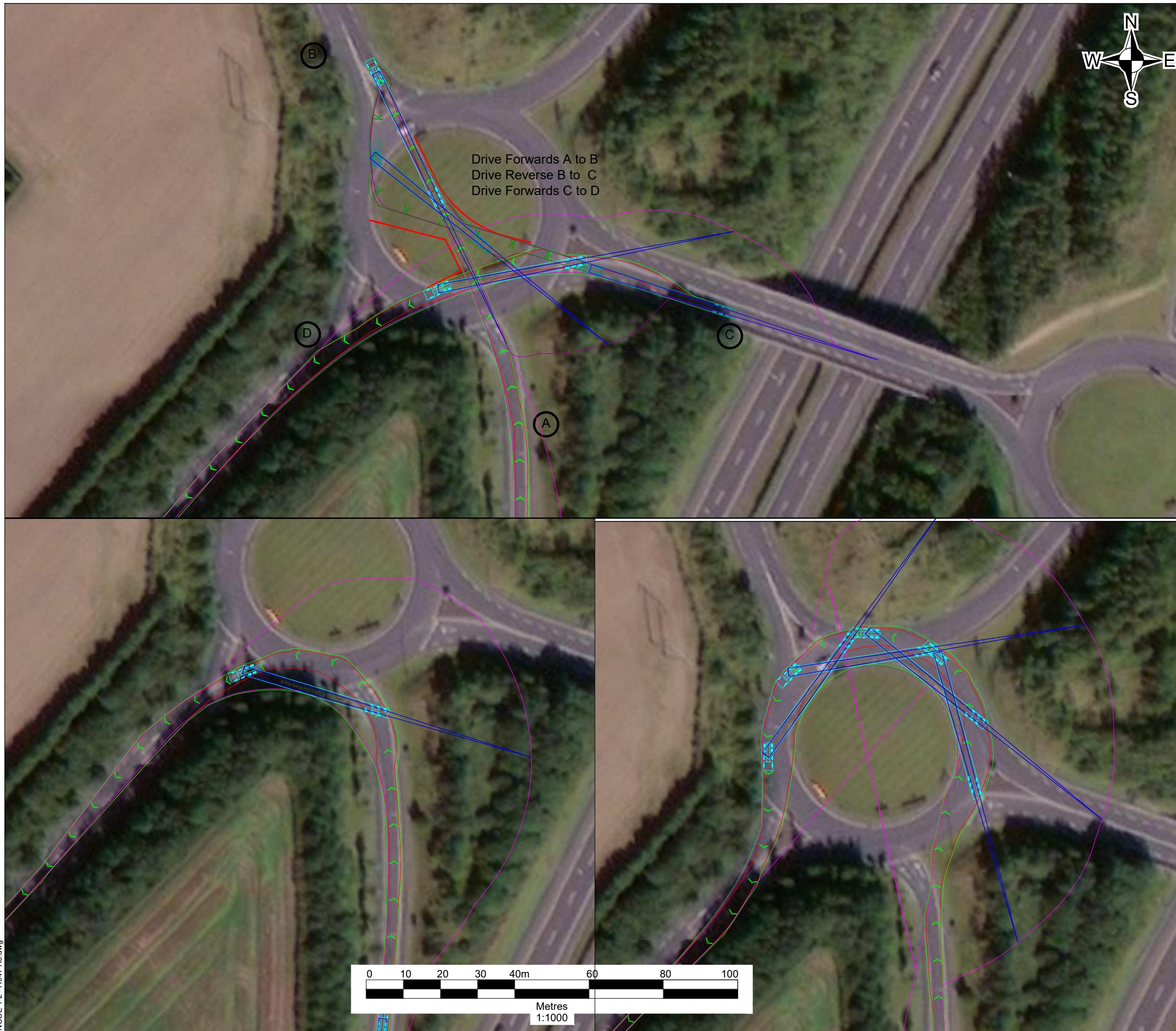
Location	Description	Rating (Red, Amber, Green)
	Vegetation trimming or clearance will be necessary.	
Node 3	Vegetation trimming will be necessary	No land required
Node 4 R425 / N80 Roundabout	Transport configuration to pass across the central island to the right of the centre (i.e. on wrong side of road) to minimise unnecessary clearance of roadside trees.  New road surfaces will be required.  Vegetation trimming or clearance will be necessary.	No Land required, assumed to be highway within ownership of County Laois.
Node 5	Vegetation trimming will be necessary	No land required
Node 6	Vegetation trimming will be necessary	No land required
Node 7	Vegetation trimming will be necessary	No land required
Node 8	Vegetation trimming will be necessary	No land required
Node 9 Timahoe	Transport configuration to make use of additional road width outside of pubs, and footway opposite to slacken the turn, preventing clearance of ornamental trees on village green.  Parking restrictions necessary.  Vegetation trimming or clearance will be necessary.	No Land required; Land assumed to be highway within ownership of County Laois.
Node 10 R426 / L3851 Junction	Haul road to be provided in field to avoid blade over sail of land outside the control of the developer.  Access designed to avoid blade over sail of land outside the control of the developer.  Vegetation trimming or clearance will be necessary.	Land required. Land under option.
Node 11	Haul road to be provided in field to avoid blade over sail of land outside the control of the developer.  Vegetation trimming or clearance will be necessary.	Land required. Land under option.
Node 12	Access designed to avoid blade over sail of land outside the control of the developer.	Land required. Land under option.

Location	Description	Rating (Red, Amber, Green)
	Vegetation trimming or clearance will be necessary.	
Node13	Access designed to avoid blade over sail of land outside the control of the developer.  Vegetation trimming or clearance will be necessary.	Land required. Land under option.

### Colour definitions

- Red** Third party land outside the control of the developer or Highway authority is required to complete the works. The works are likely to permanently change the appearance of the road.
- Amber** All works are within the highway boundary or on land under the control of the developer. The works are likely to permanently change the appearance of the road.
- Green** All works are within the highway boundary or on land under the control of the developer. The works required will not permanently change the appearance of the road.

# DRAWINGS



**NOTES**  
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The software used for the swept path analysis produces a swept path with the trailer following the tractor unit and automatically applying rear axle steering as necessary.

Revision	By	Chk'd By	Date	Comments

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PORTLAOISE, IRELAND

Project  
TURBINE DELIVERY ROUTE ASSESSMENT  
SWEPT PATH ANALYSIS

Drawing Title  
**NODE 2**  
**M7 JUNCTION 16 NORTHBOUND**  
**81m BLADE - 42m TRAILER**

Scale 1:1,000 @ A3	Date MARCH 2022
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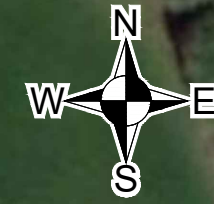
Drawing Number <b>428-02036-00787-H047</b>	Revision <b>R0</b>
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NODE 1-2 - H047 R0.dwg



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Use of manual override of rear axle steering will make minimal difference to swept path

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The software used for the swept path analysis produces a swept path with the trailer following the tractor unit and automatically applying rear axle steering as necessary. it is possible to manually override the rear axle steering, and this has been used to give a comparison. The main aim of manually overriding the rear axle steering is to keep wheels of trailers on tarmac surfaces, thus limiting the amount of overrun surfacing construction being required. Caution is required, as where turns are extreme, manual override of rear axle steering may produce an undeliverable swept path, without the trailer being powered.

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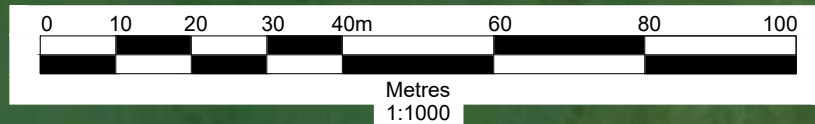
Project  
 TURBINE DELIVERY ROUTE ASSESSMENT  
 SWEEP PATH ANALYSIS

Drawing Title  
**NODE 3**  
**R445 / R425 JUNCTION**  
**81m BLADE - 55m TRAILER**

Scale 1:1,000 @ A3	Date OCTOBER 2022
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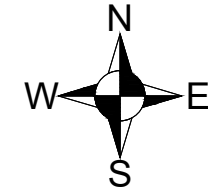
Drawing Number <b>428-02036-00787-H051</b>	Revision <b>R0</b>
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NODE 3 - H051\_R0.dwg

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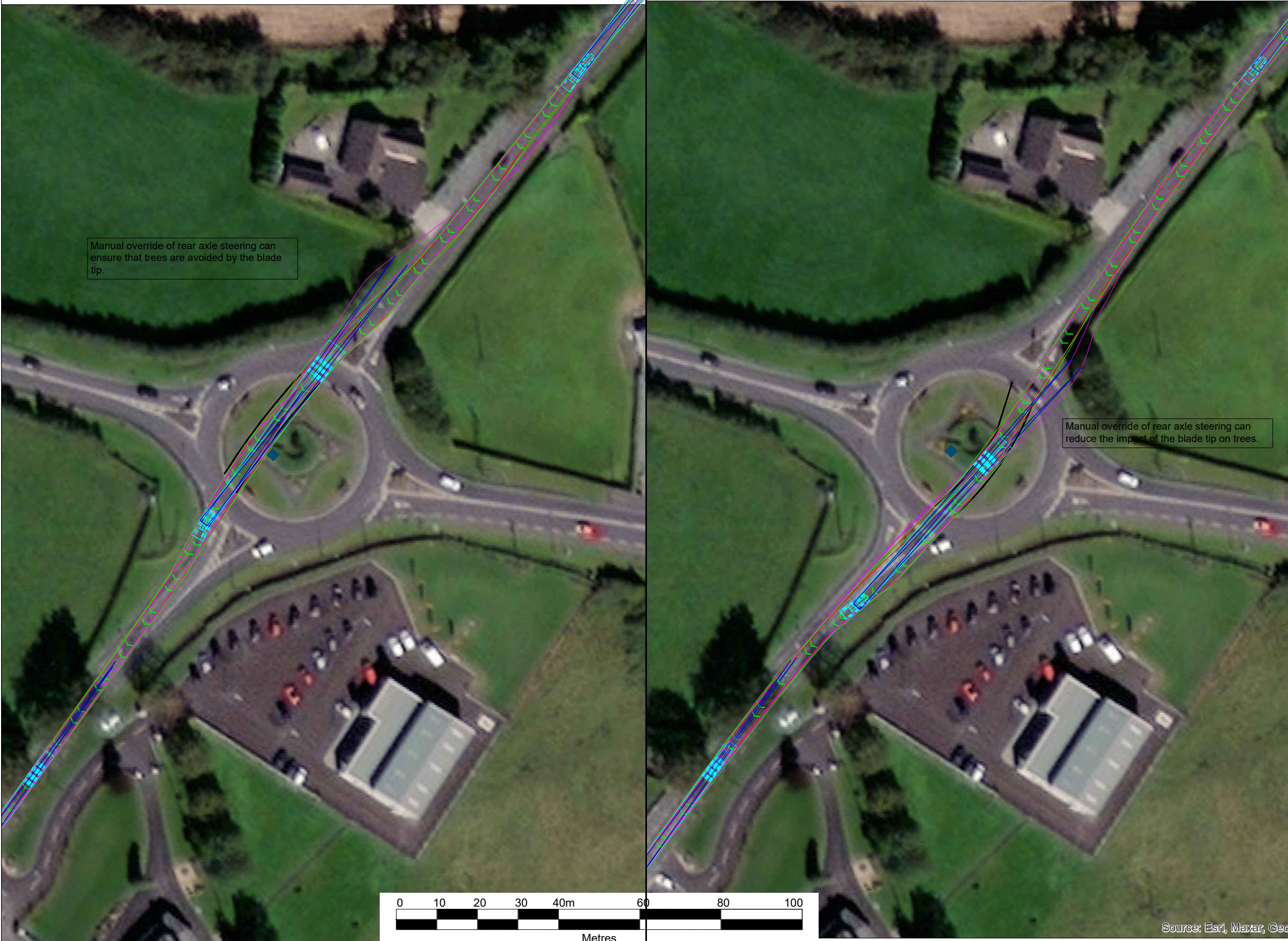
**NOTES**

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It is possible to manually override the rear axle steering, and this has been used to give a comparison. The main aim of manually overriding the rear axle steering is to keep wheels of trailers on tarmac surfaces, thus limiting the amount of overrun surfacing construction being required.

Caution is required, as where turns are extreme, manual override of rear axle steering may produce an undeliverable swept path, without the trailer being powered.



Manual override of rear axle steering can ensure that trees are avoided by the blade tip.

Manual override of rear axle steering can reduce the impact of the blade tip on trees.

Revision	By	Chk'd By	Date	Comments



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 SWEEP PATH ANALYSIS

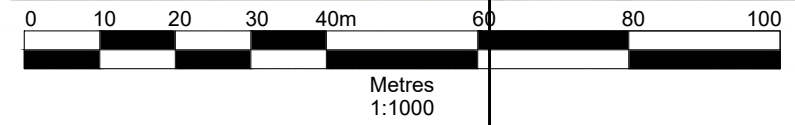
Drawing Title  
**NODE 4**  
**R425 / R426 ROUNDABOUT**  
**81m BLADE - 55m TRAILER**

Scale  
 1:1,000 @ A3

Date  
 OCTOBER 2022

Drawing Number  
**428-02036-00787-H054**

Revision  
**R0**

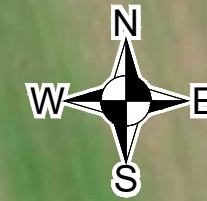


Source: Esri, Maxar, Geo

NODE 4 - H054 R0.dwg

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The software used for the swept path analysis produces a swept path with the trailer following the tractor unit and automatically applying rear axle steering as necessary. it is possible to manually override the rear axle steering, and this has been used to give a comparison. The main aim of manually overriding the rear axle steering is to keep wheels of trailers on tarmac surfaces, thus limiting the amount of overrun surfacing construction being required. Caution is required, as where turns are extreme, manual override of rear axle steering may produce an undeliverable swept path, without the trailer being powered.

Revision	By	Chk'd By	Date	Comments



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Project  
 TURBINE DELIVERY ROUTE ASSESSMENT  
 SWEEP PATH ANALYSIS

Drawing Title  
**NODE 6**  
**R426 BENDS**  
**30m TOWER TRAILER**

Scale  
 1:1,000 @ A3

Date  
 MARCH 2022

Drawing Number  
**428-02036-00787-H040**

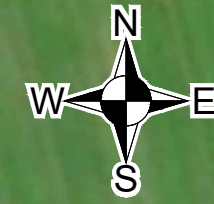
Revision  
**R2**

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NODE 7 - H040 R2.dwg

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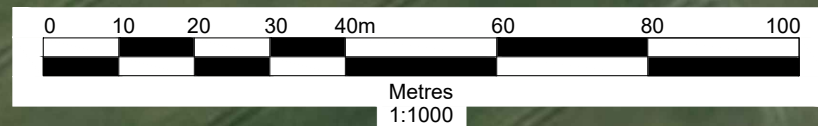
Project  
 TURBINE DELIVERY ROUTE ASSESSMENT  
 SWEEP PATH ANALYSIS

Drawing Title  
**NODE 7**  
**R426 / R427 CROSSROADS**  
**81m BLADE - 55m TRAILER**

Scale 1:1,000 @ A3	Date OCTOBER 2022
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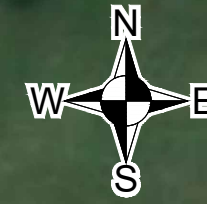
Drawing Number <b>428-02036-00787-H066</b>	Revision <b>R1</b>
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Manual override of rear axle steering can ensure that trees are avoided by the blade




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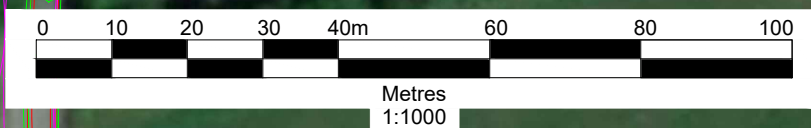
Project  
 TURBINE DELIVERY ROUTE ASSESSMENT  
 SWEEP PATH ANALYSIS

Drawing Title  
**NODE 8**  
**R426 FARM WALLS**  
**81m BLADE - 55m TRAILER**

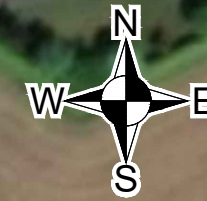
Scale 1:1,000 @ A3	Date OCTOBER 2022
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Drawing Number <b>428-02036-00787-H069</b>	Revision <b>R1</b>
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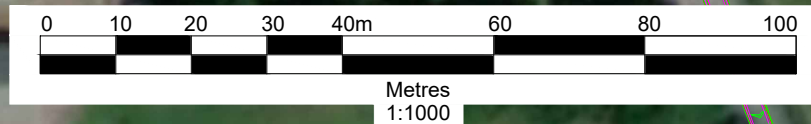
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Manual override rear axle steering will ensure that ornamental trees and buildings can be avoided by the blade tip.



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Revision	By	Chk'd By	Date	Comments



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 SWEEP PATH ANALYSIS

Drawing Title  
**NODE 9**  
**R426 TIMAHOE**  
**81m BLADE - 42m TRAILER**

Scale  
 1:1,000 @ A3

Date  
 OCTOBER 2022

Drawing Number  
**428-02036-00787-H071**

Revision  
**R1**

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