

Appendix 2C

Turbine Delivery Route Assessment

MWP

TURBINE DELIVERY ROUTE ASSESSMENT
Ballycar Wind Farm, County Clare

Ballycar Green Energy

January 2024

Contents

1	Introduction	1
2	Delivery Vehicle Types.....	1
3	Proposed Turbine Delivery Route.....	7
3.1	Proposed Wind Turbine Component Delivery Routes.....	7
3.2	Component Delivery Route From Port at Foynes to N69/N18 Interchange (Dock Road Roundabouts) 10	
3.2.1	Foynes Port Road To N69	10
3.2.2	Ferry Bridge on the River Maigue.....	12
3.2.3	N69 Roundabout at Clarina	13
3.3	WTG Blade Delivery Route From N69/N18 Interchange to Clonmacken Roundabout	15
3.3.1	N69 Dock Road Roundabout at Junction 2 on N18	15
3.3.2	Junction 3 on N18 and Toll Plaza.....	17
3.4	WTG Tower and Oversize Component Delivery Route From N69/N18 Interchange to Clonmacken Roundabout.....	20
3.4.1	N69 Dock Road Roundabouts to Dock Road.....	20
3.4.2	Greenpark Roundabout on R510 Dock Road.....	22
3.4.3	Shannon Bridge Roundabout and Condell Road R527	22
3.5	Route Option 1 - Clonmacken Roundabout to Kileely Road via Knockalisheen Distributor Road.....	24
3.5.1	Clonmacken Roundabout and Condell Road R527	24
3.5.2	Coonagh Roundabout to Knockalisheen Distributor Road	25
3.5.3	Coonagh Cross Roundabout	28
3.5.4	Cratloe Road Roundabout	29
3.5.5	Knocknalisheen Road Roundabout	30
3.5.6	Knocknalisheen Road and Kileely Road Junction	30
3.6	Route Option 2 - Clonmacken Roundabout to Kileely Road via the Northern Ring Road	32
3.6.1	Clonmacken Roundabout	32
3.6.2	Northern Ring Road – Moylish Roundabout.....	36
3.6.3	Northern Ring Road – Cratloe Road/Kileely Road Junction (Hassett’s Cross).....	37
4	R464 Kileely Road to Ballycar Wind Farm Site	39
4.1	Junction of L-3056 / R464 at Parteen	39
4.2	Local Road to the Wind Farm Site.....	42
5	Conclusions	82
6	Recommendations.....	83
	84	

Figures

Figure 1:	Extendable trailer delivery vehicle with 68m long blade	2
Figure 2:	Blade lifter trailer with blade tilted to 60° to the horizontal.....	3
Figure 3:	Blade lifter trailers in convoy transitioning from tilted to lowered to avoid overhead line	3
Figure 4:	Blade lifter trailer with 68m long blade lifted to 60°	4
Figure 5:	Blade Lifter Trailer with 68m long blade in Horizontal Configuration	5
Figure 6:	Bogie type tower transporter	5
Figure 7:	Semi low-loader	6
Figure 8:	Tower Delivery Vehicle Assessed for Ballycar WF TDR.....	6
Figure 9:	Proposed WTG Component Delivery Routes from Foynes Port to Site.....	9
Figure 10:	Junction of Foynes Port Road with N69	10
Figure 11:	Junction of Foynes Port Road with the N69 - swept path.....	11
Figure 12:	Ferry Bridge on the River Maigue - facing east.....	12
Figure 13:	Ferry Bridge on the River Maigue - swept path	12

Figure 14: Clarina Roundabout - facing east.....	13
Figure 15: Clarina Roundabout swept path through central island	13
Figure 16: Example of a temporary stone road on central island of roundabout	14
Figure 17: N69 Dock Road Roundabout to N18 on-ramp - facing north	15
Figure 18: N69 Dock Road Roundabout to N18 on-ramp – swept path	16
Figure 19: Vestas V136 68m blades being delivered through N69 Dock Road Roundabout.....	16
Figure 20: Off-ramp at Junction 3 on N18	17
Figure 21: Junction 3 on N18 – swept path	18
Figure 22: Example of temporary road widening along an off-ramp.....	18
Figure 23: Toll Plaza after Junction 3	19
Figure 24: N69 to Southern Dock Road Roundabout – Tower section swept path	20
Figure 25: N69 to Northern Dock Road Roundabout – Tower section swept path	21
Figure 26: N69 to Northern Dock Road Roundabout – Tower section swept path	22
Figure 27: Shannon Bridge Roundabout and Condell Road R527 – Tower section swept path.....	23
Figure 28: Clonmacken Roundabout - facing north	24
Figure 29: Clonmacken Roundabout – swept path	25
Figure 30: Plan of Coonagh to Knockalisheen Distributor Road.....	26
Figure 31: Coonagh Roundabout - looking north.....	26
Figure 32: Coonagh Roundabout – swept path.....	27
Figure 33: Coonagh Cross Roundabout - facing north.....	28
Figure 34: Coonagh Cross Roundabout – swept path.....	28
Figure 35: Cratloe Road Roundabout – swept path	29
Figure 36: Moyross Roundabout – swept path	30
Figure 37: Knockalisheen Road Roundabout – swept path	30
Figure 38: Junction of R464 and Knockalisheen Road –Blade Lifter trailer with blade inclined at 60° - swept path	31
Figure 39: Junction of R464 and Knockalisheen Road – Oversized tower section – swept path	31
Figure 40: Clonmacken Roundabout - looking east	32
Figure 41: Clonmacken Roundabout – WTG blade deliveries arriving from the west – swept path.....	33
Figure 42: Clonmacken Roundabout – Oversize deliveries arriving from the south – swept path	33
Figure 43: Roundabout on Clonmacken Road - facing north	34
Figure 44: Roundabout on Clonmacken Road – swept path	34
Figure 45: Example of flat central island at nearby roundabout serving the Jetland Shopping Centre.....	35
Figure 46: Moylish Roundabout - facing east.....	36
Figure 47: Moylish Roundabout – swept path	36
Figure 48: Cratloe / Kileely Road junction – Blade lifter with blade raised to 60° - swept path.....	37
Figure 49: Cratloe / Kileely Road junction - facing north	38
Figure 50: Junction of L-3056 / R464 - facing north.....	39
Figure 51: Junction of L-3056 / R464 – Blade Lifter with blade raised to 60° – swept path.....	40
Figure 52: Junction of L-3056 / R464 –Tower Deliveries– swept path	41
Figure 53: Route along local road to wind farm site	43
Figure 54: Area No. 2 – facing north	44
Figure 55: Area No. 2 – Blade lifter trailer with blade raised to 60°– swept path.....	45
Figure 56: Area No. 3 - facing north.....	46
Figure 57: Area No. 3 – Blade Lifter trailer with blade raised to 60° - swept path.....	47
Figure 58: Area No. 4 – facing north	48
Figure 59: Area No. 4 – Blade Lifter trailer with blade raised to 60° - swept path	49
Figure 60: Area No. 4 - facing north.....	50
Figure 61: Area No. 5 – Blade Lifter with blade raised to 60° - swept path.....	51
Figure 62: Area No. 5 - facing north.....	52
Figure 63: Area No. 6 – Blade Lifter with blade raised to 60° - swept path.....	53
Figure 64: Area No. 7 – facing north	54
Figure 65: Area No. 7.1 – Blade Lifter with blade raised to 60° - swept path.....	55
Figure 66: Area No. 7.1 – Tower section delivery – swept path.....	56
Figure 67: Area No. 7.2 – facing north	57

Figure 68: Area No. 7.2 – Blade Lifter with blade raised to 60° - swept path.....	58
Figure 69: Area No. 7.3 – Blade Lifter with blade raised to 60° - swept path.....	59
Figure 70: Area No. 7.2 – Tower section delivery – swept path.....	60
Figure 71: Area No. 7.3 – Tower section delivery – swept path.....	61
Figure 72: Area No. 8 - facing north	62
Figure 73: Area No. 8 – Blade Lifter with blade raised to 60° – swept path.....	63
Figure 74: Area No. 8 –Tower section delivery – swept path.....	64
Figure 75: Area No. 9 – facing north	65
Figure 76: Area No. 9 - Blade Lifter with blade raised to 60°– swept path.....	66
Figure 77: Area No. 9 - Tower section delivery– swept path.....	67
Figure 78: Area No. 10 – facing north	68
Figure 79: Area No. 10 – Blade Lifter with blade raised to 60° - swept path.....	69
Figure 80: Area No. 10 – Tower section delivery – swept path.....	70
Figure 81: Area No. 11 – facing north	71
Figure 82: Area No. 11.1 – Blade Lifter with blade raised to 60°– swept path.....	72
Figure 83: Area No. 11.2 – Blade Lifter with blade raised to 60° – swept path.....	73
Figure 84: Area No. 11.1 – Tower section delivery – swept path.....	74
Figure 85: Area No. 11.2 – Tower section delivery – swept path.....	75
Figure 86: Area No. 12 – facing north	76
Figure 87: Area No. 12 – Blade Lifter with blade raised to 60°– swept path.....	77
Figure 88: Area No. 12 – Tower section delivery– swept path.....	78
Figure 89: Area No. 13 – facing north	79
Figure 90: Area No. 13 – Blade Lifter with blade raised to 60° – swept path.....	80
Figure 91: Area No. 13 – Tower section delivery – swept path.....	81

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1 Introduction

The purpose of this report is to assess the feasibility of delivering wind turbine components to the proposed development at Ballycar, County Clare. This report assesses components being delivered to the proposed development site from Foynes Port in County Limerick. Detailed survey information of most junctions was not available and therefore the analysis was carried out using Bing and Google aerial photography which is orthorectified to ITM coordinates. While this is adequate for the current assessment, a detailed topographical survey prior to the construction of the proposed development will be required for further verification and identification of any changes over the intervening period. Autodesk Vehicle Tracking (or Autotracking) swept path analysis software was used to determine the wheel track and oversail extent for each critical location along the potential delivery route.

The proposed wind farm is expected to consist of 12 wind turbines generators (WTGs). The turbine type is to be a Vestas V136. The turbines shall be 4.5MW with a maximum rotor diameter of 136m.

It should be noted that this report is not a construction stage transport assessment.

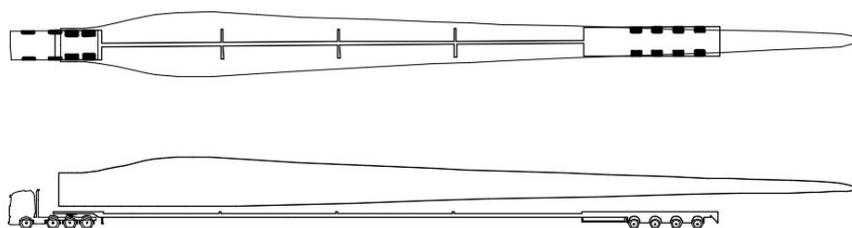
2 Delivery Vehicle Types

The longest and usually most onerous components to be delivered to the proposed site are the wind turbine blades. Analysis of the proposed delivery route has been carried out for a Vestas V136 68m long turbine blade. There are generally two truck-and-trailer configurations employed to transport wind turbine blades from port to site; extendable trailer or blade lifting trailer.

On an extendable trailer each turbine blade is transported in a horizontal position. The axles on the trailer can be steered allowing the trailer to navigate bends and reducing the swept path of the delivery vehicle. The profile of the extendable trailer configuration assessed for this proposed turbine delivery route is presented in **Figure 1**.

There are several manufacturers of these types of extendable trailer including:

- Nootboom Teletrailers <https://www.nootboom.com/cat/teletrailers/>
- Broshius Platform Trailers <https://www.broshuis.com/home/producten/vlakke-oplegger.html>



Generic 68m Blade (56.5m 4axle Trailer) (Scania R-500 4 Axle Tractor)	
Overall Length	60.260m
Overall Width	2.500m
Overall Body Height	6.159m
Min Body Ground Clearance	0.357m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	7.850m

Figure 1: Extendable trailer delivery vehicle with 68m long blade

Blade lifting trailers have the capacity to transport wind turbine blades in a horizontal position or inclined at angles of up to 60° from the horizontal. A blade lifter trailer with a blade tilted to 60 degrees is shown in **Figure 2** below. The ability to transport the blades in an inclined position allows for increased capacity to negotiate tight bends and junctions without modification to the public road network which would otherwise be required when employing an extendable blade transport trailer. An important consideration of transporting lifted blades are overhead obstructions such as overhead utilities and bridges. Where these overhead obstructions are encountered, it is necessary to lower the blade to a horizontal position until the delivery vehicle has passed under the obstruction or temporarily relocate/bury overhead utilities. An illustration of three blade lifter trailers travelling in convoy while the blades are being transitioned from inclined to almost horizontal positions to safely pass under an overhead line is shown in **Figure 3**. The profiles of the blade lifter delivery vehicle assessed in this turbine delivery route assessment are presented in **Figure 4** and **Figure 5** for the horizontal blade and inclined blade positions respectively.

There are several manufacturers of blade lifter trailers including:

- Scheurele G4 Blade Lifter <https://www.tii-group.com/tii-scheuerle/our-solutions/spmt/scheuerle-bladelifter>; and
- Goldhofer Blade Lifter Trailer <https://www.goldhofer.com/en/special-applications/ftv-850>.



Figure 2: Blade lifter trailer with blade tilted to 60° to the horizontal



Figure 3: Blade lifter trailers in convoy transitioning from tilted to lowered to avoid overhead line

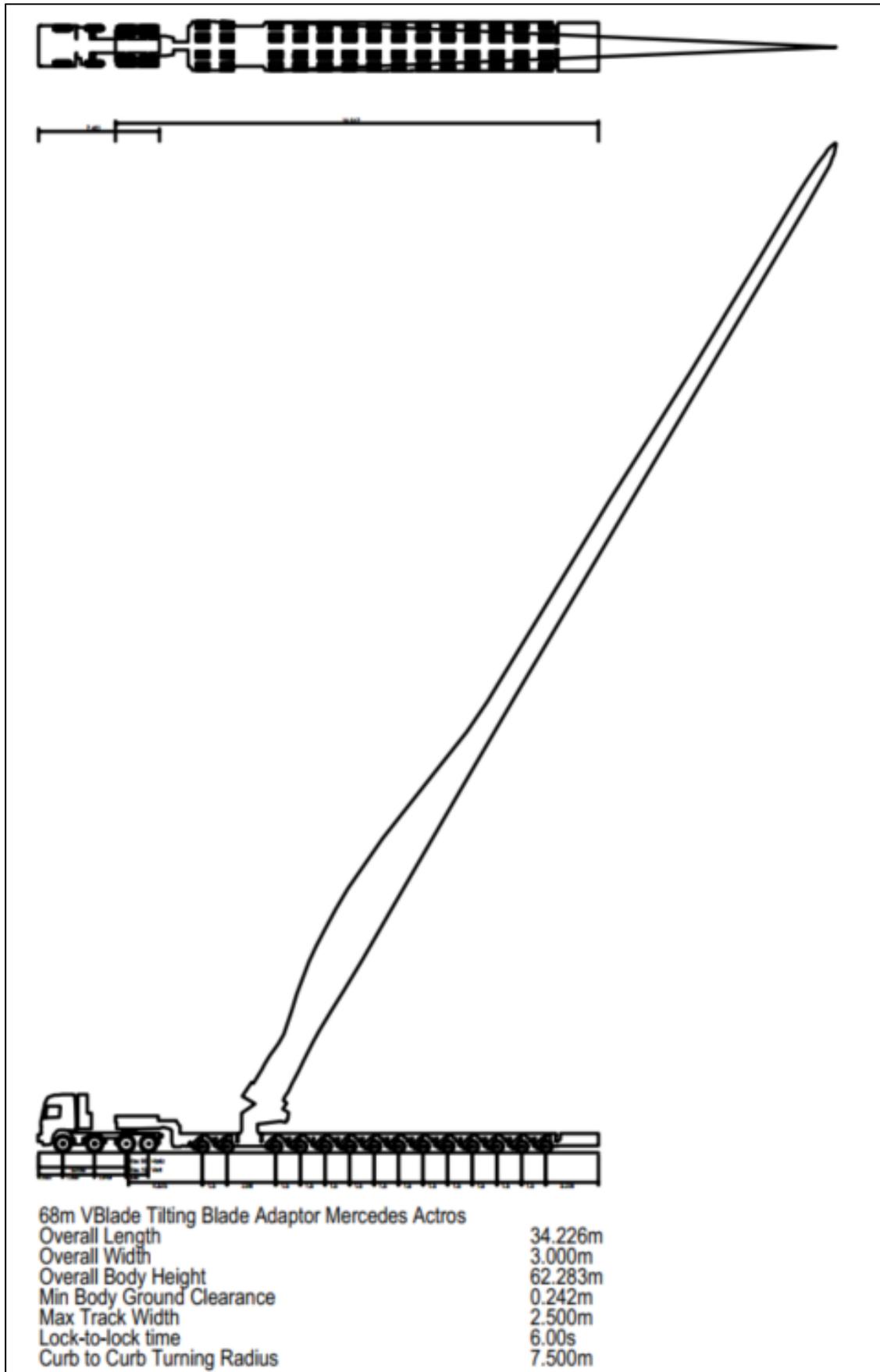


Figure 4: Blade lifter trailer with 68m long blade lifted to 60°

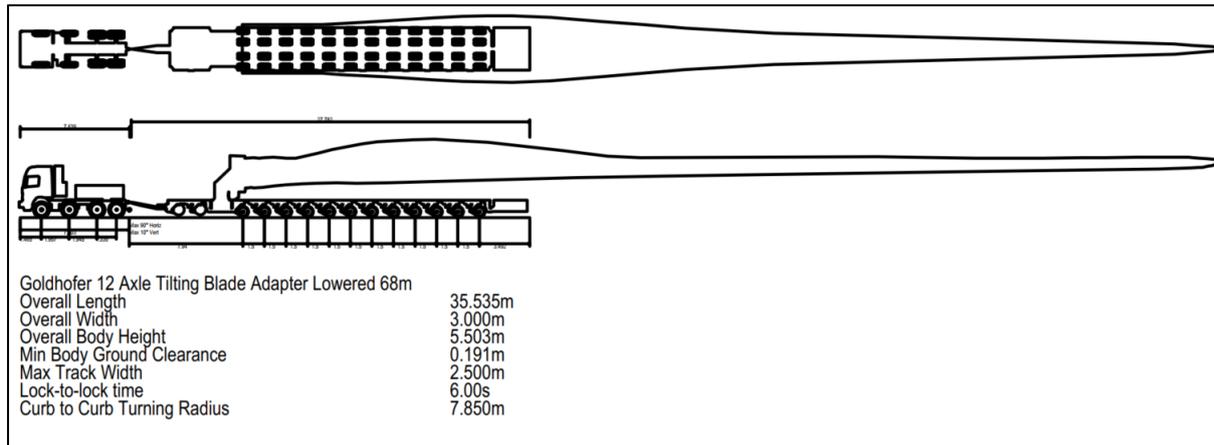


Figure 5: Blade Lifter Trailer with 68m long blade in Horizontal Configuration

Another important consideration for the route assessment is the standard delivery clearance area for manufacturers of this class of turbine which would typically be 6m wide. When road alignments are straight the blade delivery truck is not the most onerous in terms of width and height. For turbines such as the Vestas V136, the height or width of the tower sections and the nacelle can be limiting. The bottom tower section is likely to have a bottom flange diameter of up to 4.5m. A maximum load height of 5m has been assumed for the tower sections to allow for ground and overhead clearance.

There are generally two methods of transporting wind turbine tower sections:

- The clamp method using self-tracking bogies such as manufactured by Goldhofer shown in **Figure 6**;
- The stepped Semi Low-loader manufactured by Nootboom and Broshuis among others and shown in **Figure 7**.



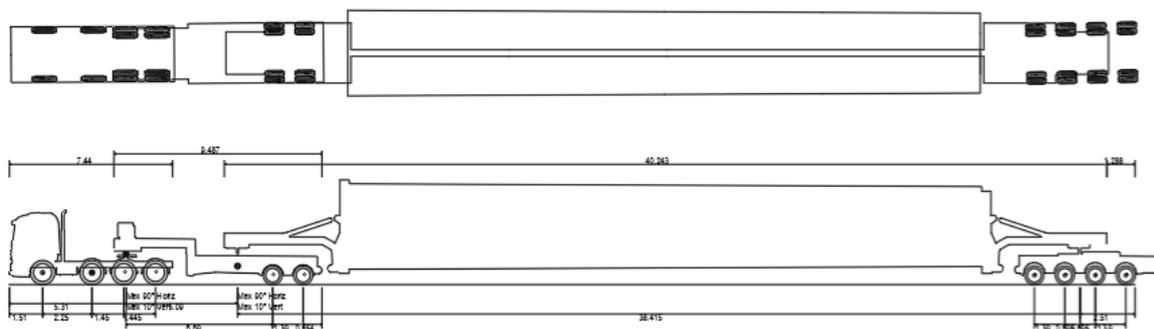
Figure 6: Bogie type tower transporter



Figure 7: Semi low-loader

The delivery vehicle assessed for the turbine delivery route for the proposed Ballycar Wind Farm is presented in Figure 8 below.

Scania R-500 with Vestas HH90 28.84m Mid Tower Clamp



Scania R-500 with Vestas HH90 28.84m Mid Tower Clamp	
Overall Length	51.325m
Overall Width	2.751m
Overall Body Height	4.798m
Min Body Ground Clearance	0.357m
Max Track Width	2.750m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	8.000m

Figure 8: Tower Delivery Vehicle Assessed for Ballycar WF TDR

3 Proposed Turbine Delivery Route

It is proposed that wind turbine components will arrive in Ireland to the port at Foynes in County Limerick. From here the components will be transported by road to the site at Ballycar via Limerick City. Each junction and bend where modifications could be required to the existing and proposed road network were assessed using Vehicle Tracking software. Illustrations of the most onerous swept and driven paths predicted to be taken by the different delivery vehicles are presented in the following section of this report. Descriptions of road modifications required for the WTG components to reach the Ballycar wind farm site are also summarised below.

At the time of writing this report, works on the new Coonagh to Knockalisheen Distributor Road around Limerick City have temporarily ceased. However, works are expected to recommence in Spring 2024. The link road will consist of a new 2km dual carriageway from Coonagh Roundabout. It is expected that this route will be used for the delivery of WTG components when it is open for use. However, should the route not be available at the time of delivery, alternative routes through Limerick City have been assessed as feasible options.

Note: The extendable turbine blade trailer vehicle typically provides the most onerous turning maneuvers in terms of swept path and driven paths. Where only the swept and driven path of the extendable blade trailer is shown below, it is expected that the other component delivery vehicles will be able to travel within the extents of the existing road or the widened extents which are required for the extendable blade trailer.

3.1 Proposed Wind Turbine Component Delivery Routes

The proposed route to deliver wind turbine component from the port at Foynes Co. Limerick to the proposed Ballycar wind farm site entrance in Co. Clare are shown on drawing **22156-MWP-00-00-DR-C-5009** and also in **Figure 9**.

Blade deliveries will use the Limerick tunnel to avoid entering the centre of Limerick city. Oversized loads such as tower components which have a loaded height greater than 4.65m will travel along the Dock Road crossing the River Shannon at Shannon Bridge. These components will then travel along Condell Road to Clonmacken Roundabout where they will rejoin the blade delivery route to the Ballycar site.

Proposed Wind Turbine Component Delivery Route:

- Depart Foynes Port and travel along the N69 as far as the N18 interchange.
- From here, the WTG blades and components with loaded heights of less than 4.65m will travel North along the N18 via Limerick Tunnel and exit at Junction 3 through the toll arriving at Clonmacken Roundabout from the west.
- Where the component loaded height is greater than 4.65m the components will continue on the N69 through the Dock Road Roundabouts and along the Dock Road R510 to Shannon Bridge Roundabout. Here the components will turn northwards over Shannon Bridge and travel along the R527 Condell road arriving at Clonmacken Roundabout from the south.
- Upon reaching the Clonmacken Roundabout, two route options to reach the R464 Kileely Road are considered.
 - Option 1 – Northwest on Condell Road towards the Coonagh Roundabout and then via the Coonagh to Knockalisheen Distributor Road. Through the Coonagh Cross, Cratloe Road and Moyross Road roundabouts to the Knockalisheen Distributor Road Roundabout. Then turning southeast on Knockalisheen distributor road to the existing junction with the R464 Kileely Road.
 - Option 2 – Northeast on the L8570 Clonmacken Road passing the Jetland Shopping Centre and through the Ennis Road junction and Moylish Roundabout towards Thomond Park. Turning left at the Cratloe Road/R464 Kileely Road junction (Hassett's Cross).

- Taking the R464 Kileely Road to Parteen before turning left onto the L-3056 Local Road to the proposed wind farm site entrance.

The route from Foynes Port to the Limerick Tunnel and through the Dock Road in Limerick to Clonmacken Roundabout is already proven for this type of turbine as it was successfully used to deliver Vestas V136 turbine blades to Cloncreen Wind Farm in County Offaly.

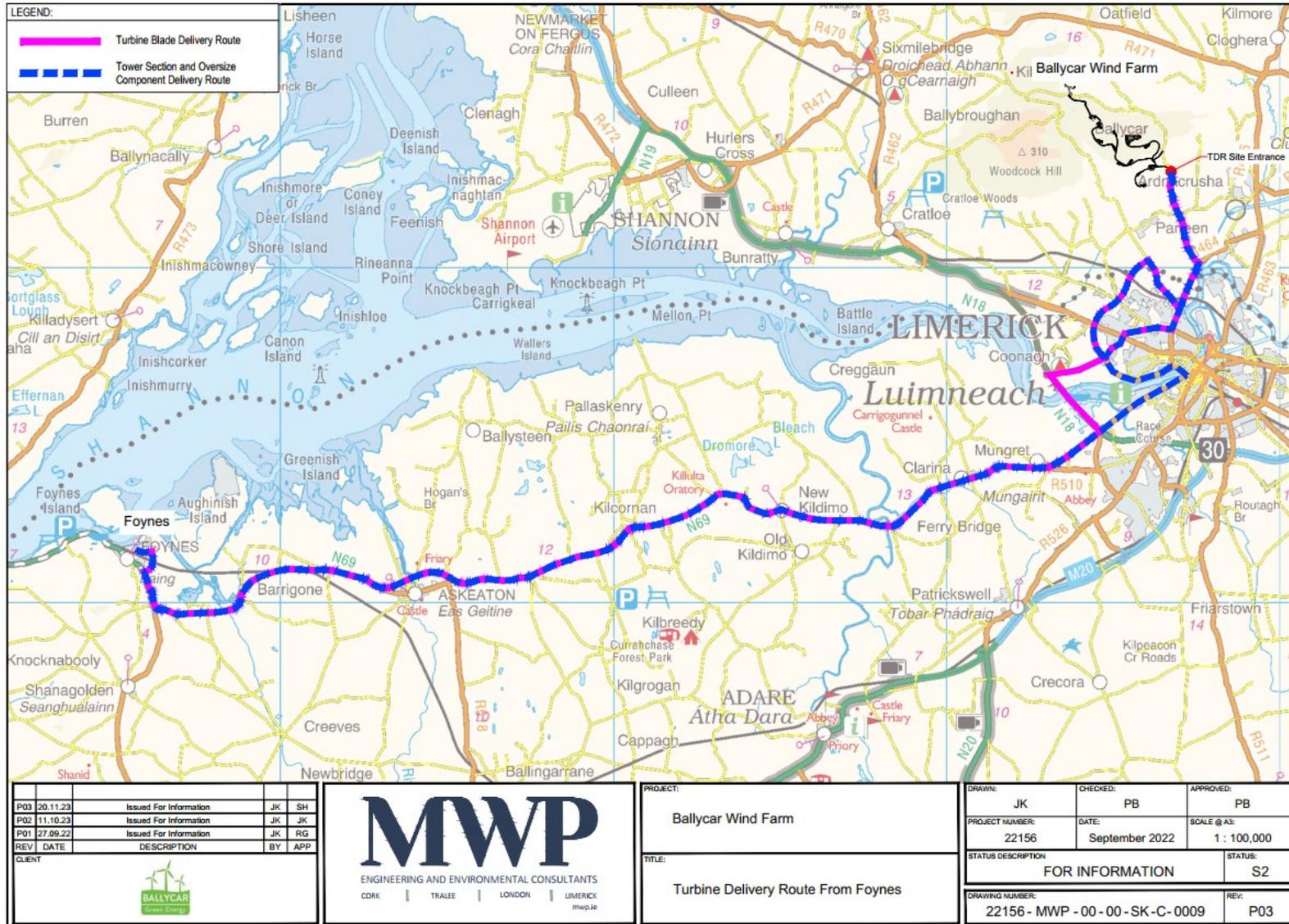


Figure 9: Proposed WTG Component Delivery Routes from Foynes Port to Site

3.2 Component Delivery Route From Port at Foynes to N69/N18 Interchange (Dock Road Roundabouts)

3.2.1 Foynes Port Road To N69

WTG components are proposed to exit the port laydown facilities at Foynes Co. Limerick in a southerly direction on the Foynes Port Road towards the junction with the N69.

The manoeuvre through the junction of the Foynes Port Road and the N69 would require temporary removal of the following:

- One lighting pole on the southeast corner of the junction;
- Stone wall on the southeast corner of the junction;
- Two direction arrows on the junction islands;
- One Stop sign on the junction splitter island;
- One direction sign on the splitter island.

Some vegetation may also have to be cleared on the northern side of the Port Road while temporary road widening may be needed on the southeast corner of the junction for the wheel track of the trailer. As noted, the route from Foynes Port to the N69 is already proven for this type of turbine as it was successfully used to deliver Vestas V136 WTG components to Cloncreen Wind Farm in County Offaly.



Figure 10: Junction of Foynes Port Road with N69

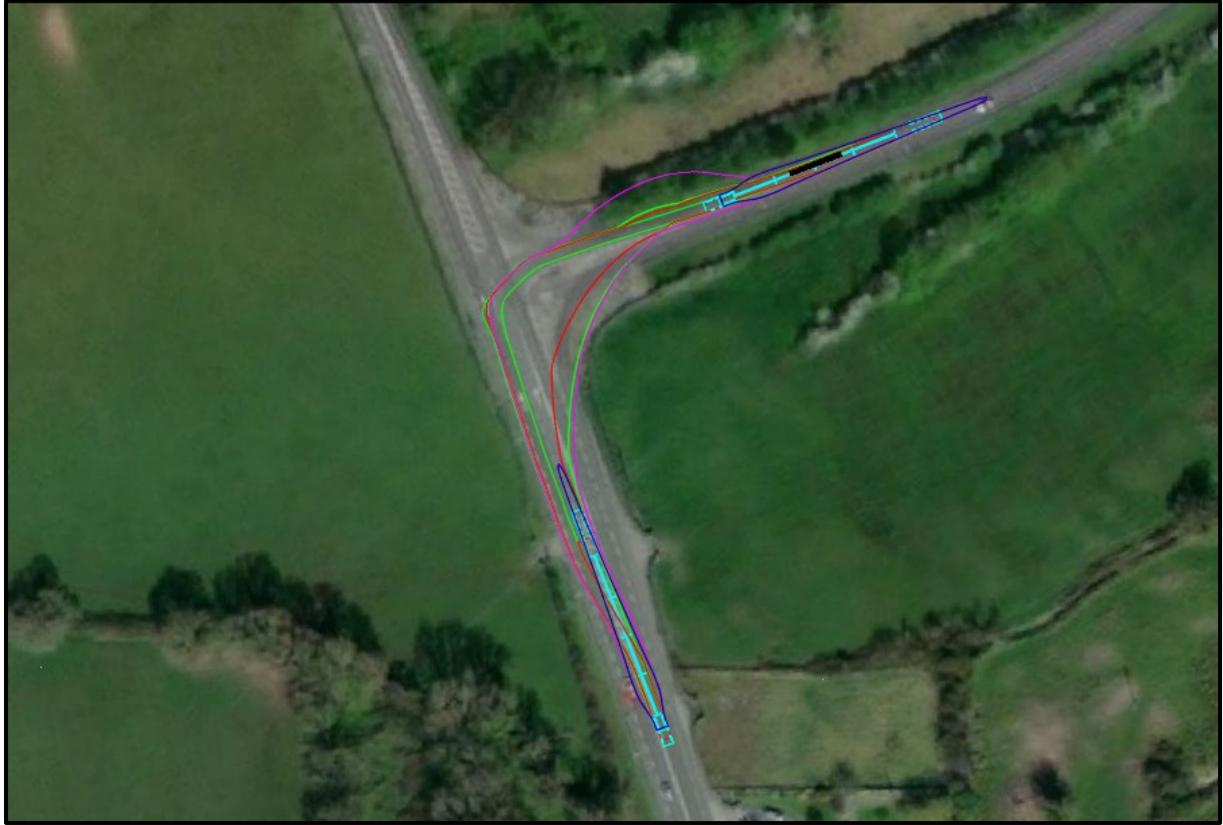


Figure 11: Junction of Foynes Port Road with the N69 - swept path

3.2.2 Ferry Bridge on the River Maigue

The bridge on the N69 over the River Maigue has sufficient width for all likely loads but has a relatively sharp crest curve at its centre. This could cause grounding of long loads, particularly those for turbine blade delivery. Therefore, the shape of the vertical profile should be determined by topographical survey. However, it should be noted that the route has been previously used before for the delivery of Vestas V136 turbines.



Figure 12: Ferry Bridge on the River Maigue - facing east



Figure 13: Ferry Bridge on the River Maigue - swept path

3.2.3 N69 Roundabout at Clarina

The central island of the Clarina roundabout has been planted with trees, however a number of these have been removed to facilitate delivery of turbine components to other wind farm developments.



Figure 14: Clarina Roundabout - facing east

The vehicle path through the central island, as shown in **Figure 15**, would require temporary removal of the following:

- Direction sign and yield sign on the approach splitter island;
- Direction sign and yield sign on the exit splitter island;
- Chevron sign and direction sign on the central island.



Figure 15: Clarina Roundabout swept path through central island



Figure 16: Example of a temporary stone road on central island of roundabout

3.3 WTG Blade Delivery Route From N69/N18 Interchange to Clonmacken Roundabout

3.3.1 N69 Dock Road Roundabout at Junction 2 on N18

The manoeuvre through the Dock Road Roundabout could be undertaken to the roundabout alignment using rear wheel steering. The wheel track is within the existing carriageway, but the overhang of the trailer and blade would require temporary removal of the following:

- Chevron sign on the central island;
- Lamp pole along on-ramp to N18.

It should be noted that this roundabout has already facilitated the delivery of Vestas V136 turbines as shown in Figure 19.



Figure 17: N69 Dock Road Roundabout to N18 on-ramp - facing north



Figure 18: N69 Dock Road Roundabout to N18 on-ramp – swept path

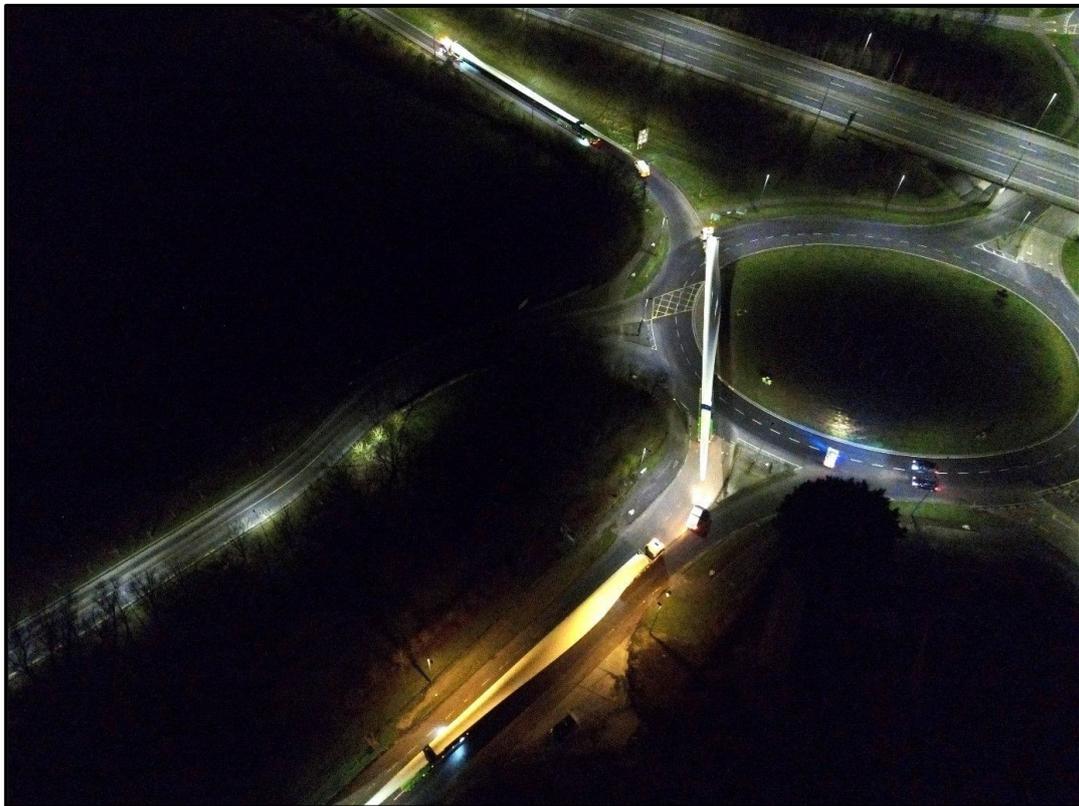


Figure 19: Vestas V136 68m blades being delivered through N69 Dock Road Roundabout

3.3.2 Junction 3 on N18 and Toll Plaza

The Junction 3 north bound exit is a grade-separated dual carriageway off-ramp leading towards a toll plaza on the eastern side of the N18. This route would require temporary road widening along the inside of the off-ramp (LHS) to mitigate against the removal of several lamp posts for blade deliveries. Alternatively, the manoeuvre could be completed with the wheel track of blade delivery vehicles within the existing off-ramp carriageway, but this would require the temporary removal of approximately six lamp poles. Utilising the blade lifter trailer with the blade in the inclined position may negate the requirement for the temporary removal of the lamp poles.

However, temporary removal of the following items would still be required for the manoeuvre with the temporary road widening option:

- One lamp pole at the exit from the N18;
- Exit sign at the exit from the N18.

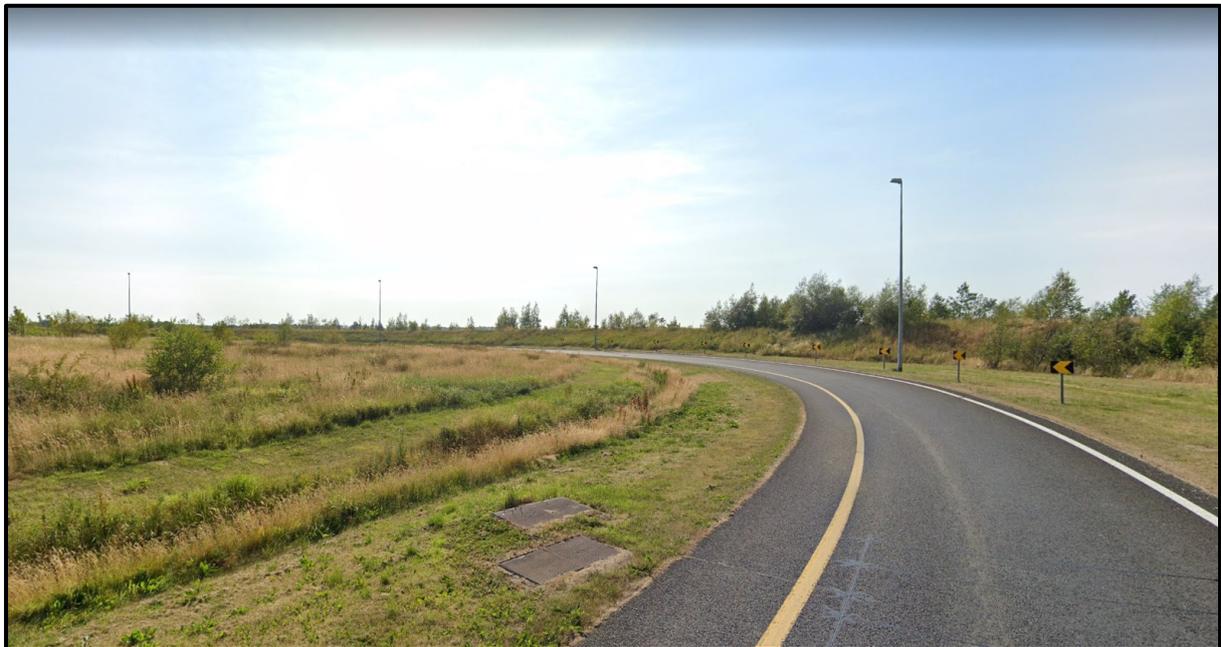


Figure 20: Off-ramp at Junction 3 on N18

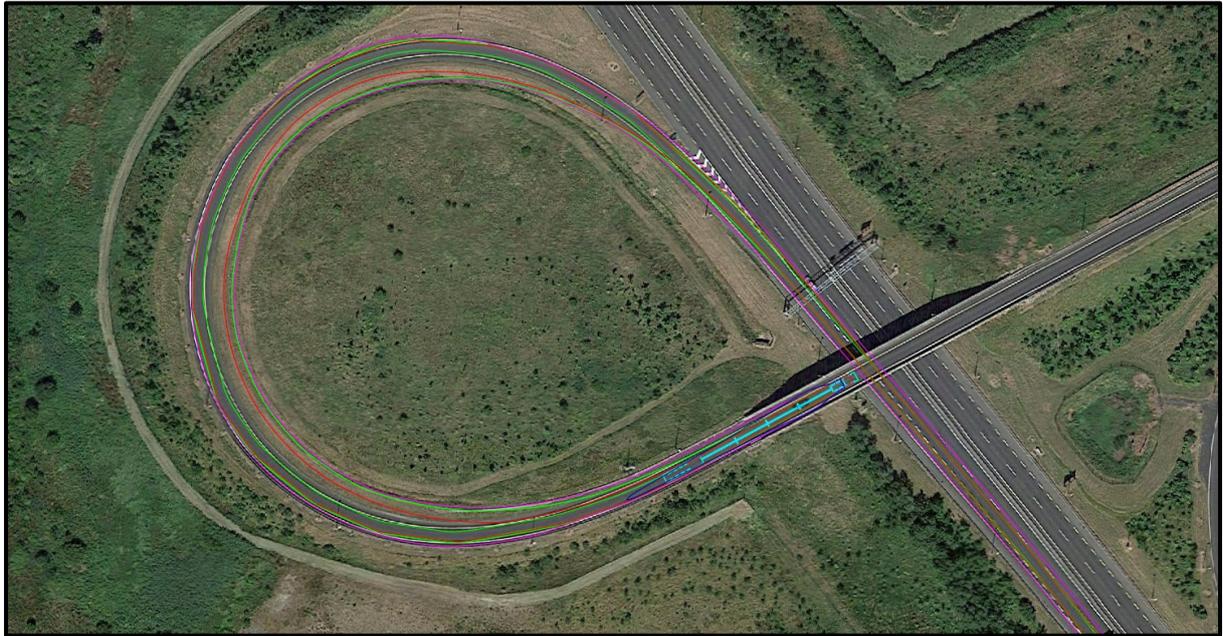


Figure 21: Junction 3 on N18 – swept path



Figure 22: Example of temporary road widening along an off-ramp.

The route at the toll plaza is through the left lane and appears adequate for all loads in terms of width and height. The delivery of Vestas V136 WTG components to Cloncreen Wind Farm in County Offaly has previously utilised the route at the toll plaza.



Figure 23: Toll Plaza after Junction 3

3.4 WTG Tower and Oversize Component Delivery Route From N69/N18 Interchange to Clonmacken Roundabout

3.4.1 N69 Dock Road Roundabouts to Dock Road

To negotiate the Dock Road Roundabouts and N18 underpass, oversized components would require the following temporary modifications to the Southern Dock Road Roundabout:

- Temporary removal of yield signs on left-hand side on approach to the roundabout and also on the N69 splitter island;
- Removal of keep left sign on the N69 splitter island.

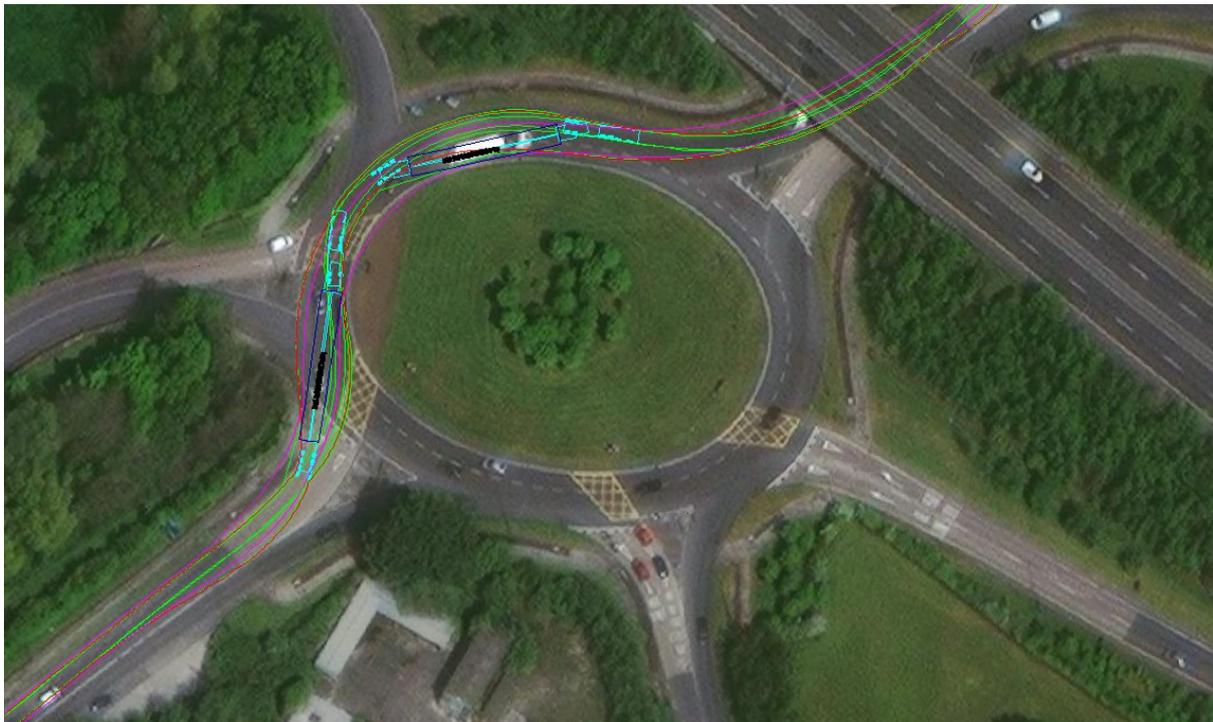


Figure 24: N69 to Southern Dock Road Roundabout – Tower section swept path

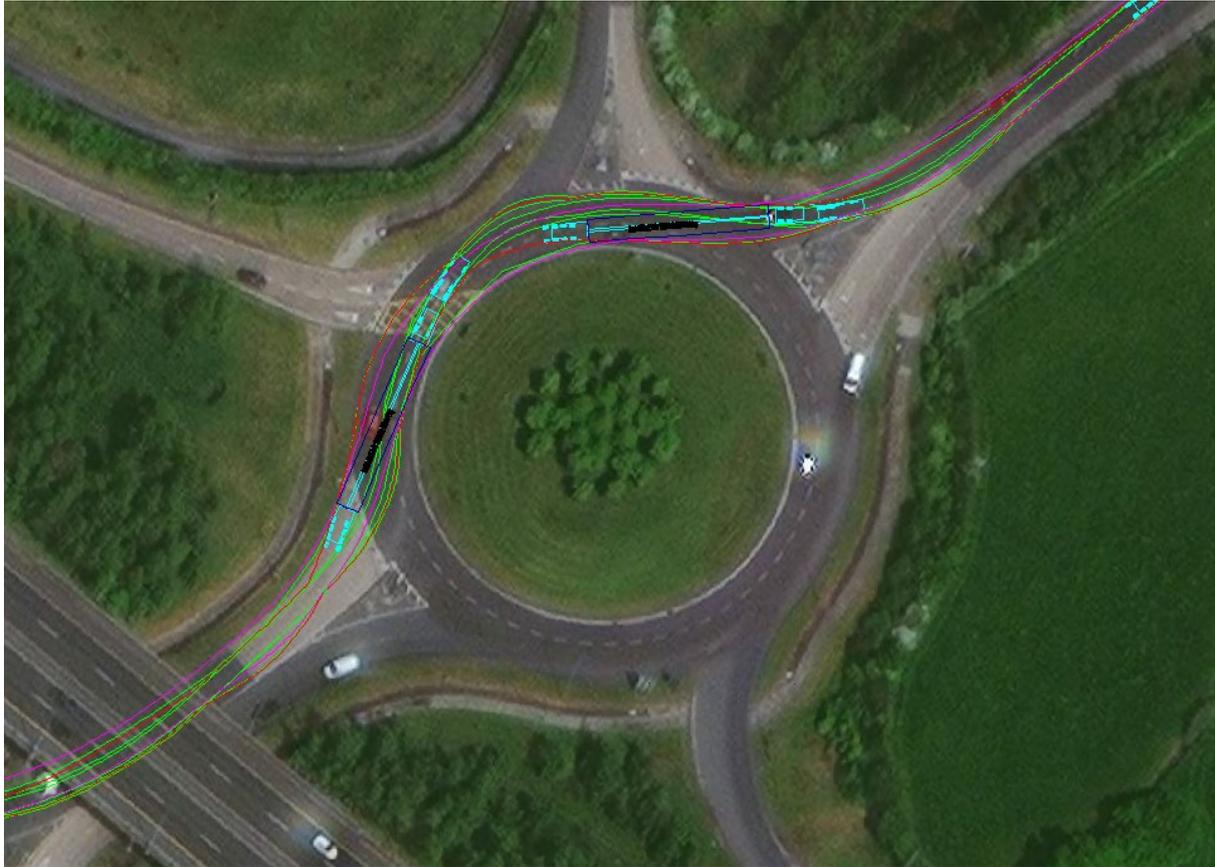


Figure 25: N69 to Northern Dock Road Roundabout – Tower section swept path

3.4.2 Greenpark Roundabout on R510 Dock Road

The temporary removal of yield and chevron signs would be required at the Greenpark roundabout on the Dock Road to allow for oversail of the oversized WTG components.

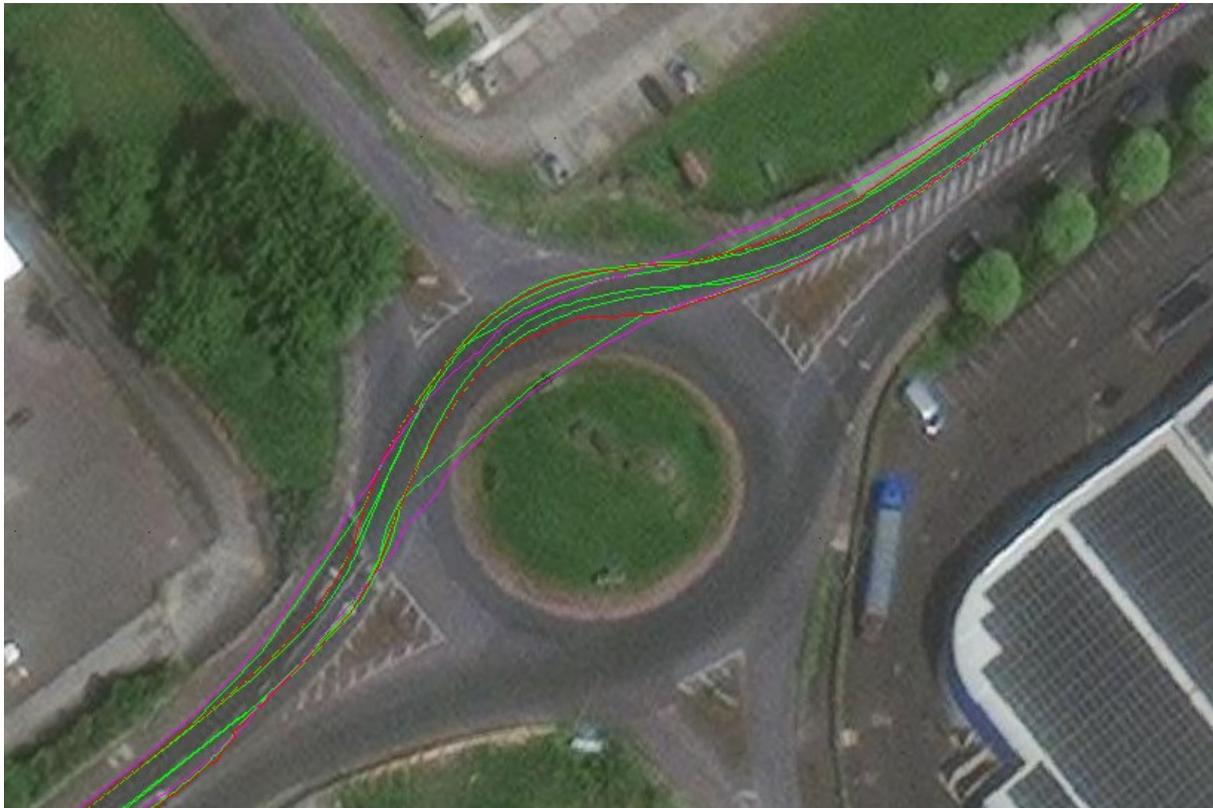


Figure 26: N69 to Northern Dock Road Roundabout – Tower section swept path

3.4.3 Shannon Bridge Roundabout and Condell Road R527

At the Shannon Bridge Roundabout in Limerick the oversized WTG components will take the first exit towards the R527 Condell Road. To facilitate this manoeuvre the temporary removal of directional, keep left, speed limit and pedestrian crossing ahead signs on the splitter island approaching the roundabout would be required. A section of the pedestrian railing and a yield sign on the inside of the left hand bend would need to also be temporarily removed during deliveries.



Figure 27: Shannon Bridge Roundabout and Condell Road R527 – Tower section swept path

3.5 Route Option 1 - Clonmacken Roundabout to Kileely Road via Knockalisheen Distributor Road

3.5.1 Clonmacken Roundabout and Condell Road R527

For Option 1, WTG blade deliveries arriving at the Clonmacken Roundabout from the west (M18) will take the first exit to the Condell Road and travel north. Oversized WTG component deliveries coming from Shannon Bridge on Condell Road R527 will continue through Clonmacken Roundabout taking the second exit.

A temporary stone road should be constructed along the edge of the central island to avoid the removal of mature trees on Clonmacken Roundabout and removal of lamp posts along the northwest quadrant of the roundabout. The central island has sufficient space to enable this option, but care should be undertaken regarding traffic management as the overhang of the blade will cross the median barrier towards any oncoming traffic on approach to the roundabout.

Temporary removal of the following items would be required for the manoeuvre:

- Lamp pole and road signs on the approach splitter island;
- Two Chevron signs on the central island;
- Lamp pole and road signs on the exit splitter island.



Figure 28: Clonmacken Roundabout - facing north



Figure 29: Clonmacken Roundabout – swept path

A temporary stone road would need to be constructed on the edge of the central island to avoid the removal of lamp poles, traffic lights and trees if deliveries followed the roundabout alignment. The central island has sufficient space to undertake this option with access unhindered for deliveries.

Temporary removal of the two Chevron signs on the central island would be required for the manoeuvre.

3.5.2 Coonagh Roundabout to Knockalisheen Distributor Road

At the time of this report, works on the new Coonagh to Knockalisheen Distributor Road around Limerick City have temporarily ceased, however works are due to recommence in Spring 2024. The road will consist of a new 2km dual carriageway from Coonagh Roundabout. The route would pass through the Coonagh Cross, Cratloe Road, Moyross and Knockalisheen Roundabouts before connecting onto the Knockalisheen Road. This option would avoid the built-up areas of the city and provide a less intrusive delivery route to the wind farm when it is completed.

Component deliveries arriving at the Coonagh Roundabout from the south (Condell Road R527) will take the third exit and join the newly constructed Coonagh to Knockalisheen Distributor Road.

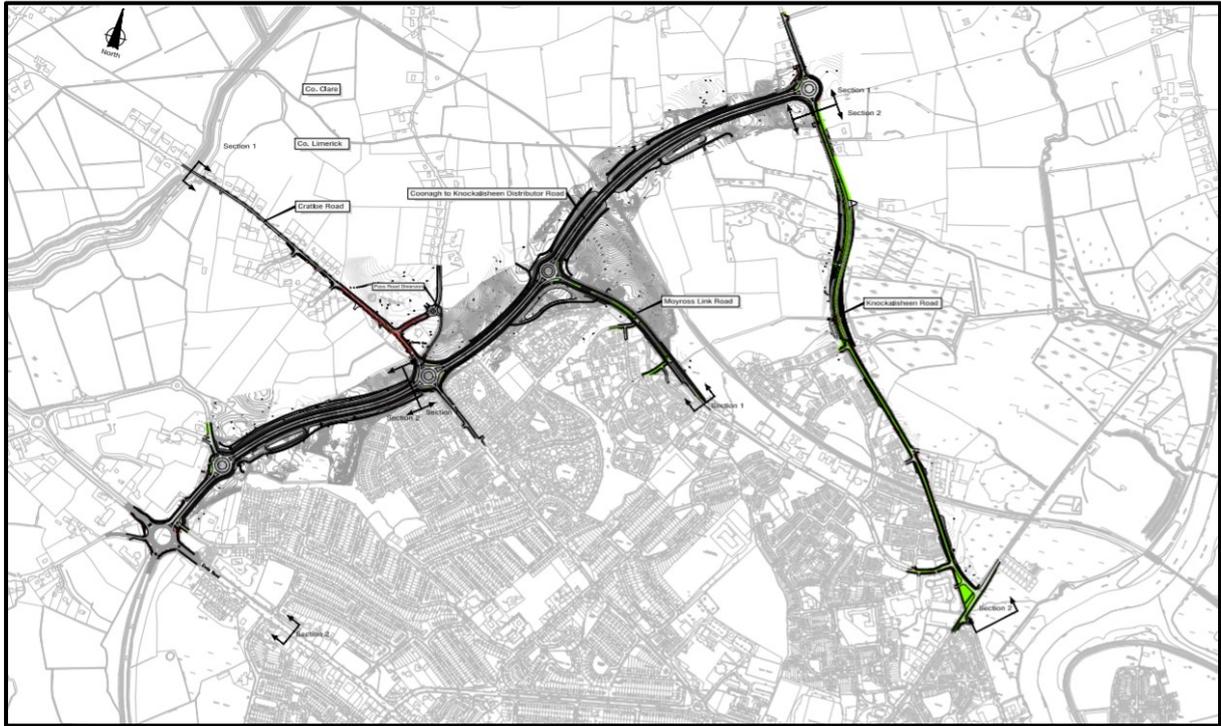


Figure 30: Plan of Coonagh to Knockalisheen Distributor Road



Figure 31: Coonagh Roundabout - looking north

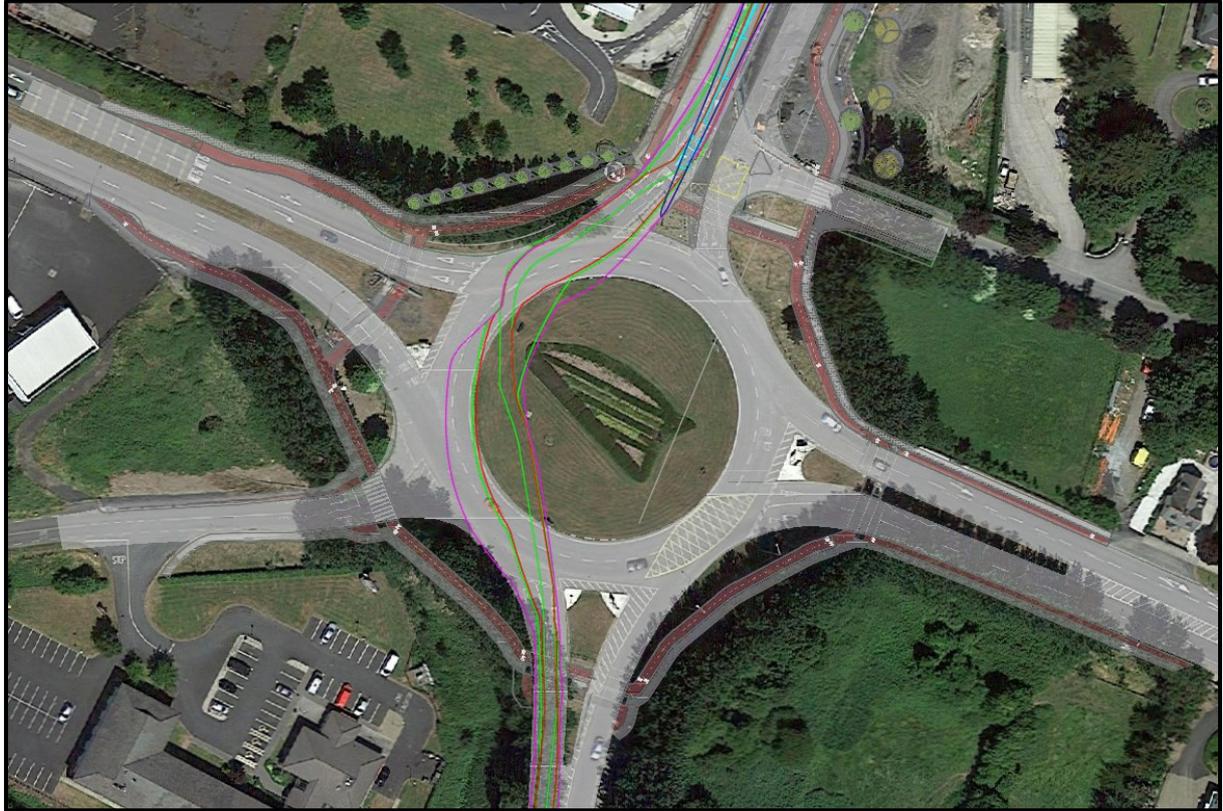


Figure 32: Coonagh Roundabout – swept path

3.5.3 Coonagh Cross Roundabout

The manoeuvre through Coonagh Cross Roundabout could be undertaken to the roundabout alignment using rear wheel steering. The central island has sufficient space to undertake this option but will require regrading due to the earth mound formed on the roundabout. The wheel track is within the existing carriageway, but the overhang of the trailer and blade would require temporary removal of the following:

- Yield sign on inside approach to roundabout;
- Pedestrian traffic lights on inside approach to roundabout;
- Light pole on inside approach to roundabout.



Figure 33: Coonagh Cross Roundabout - facing north

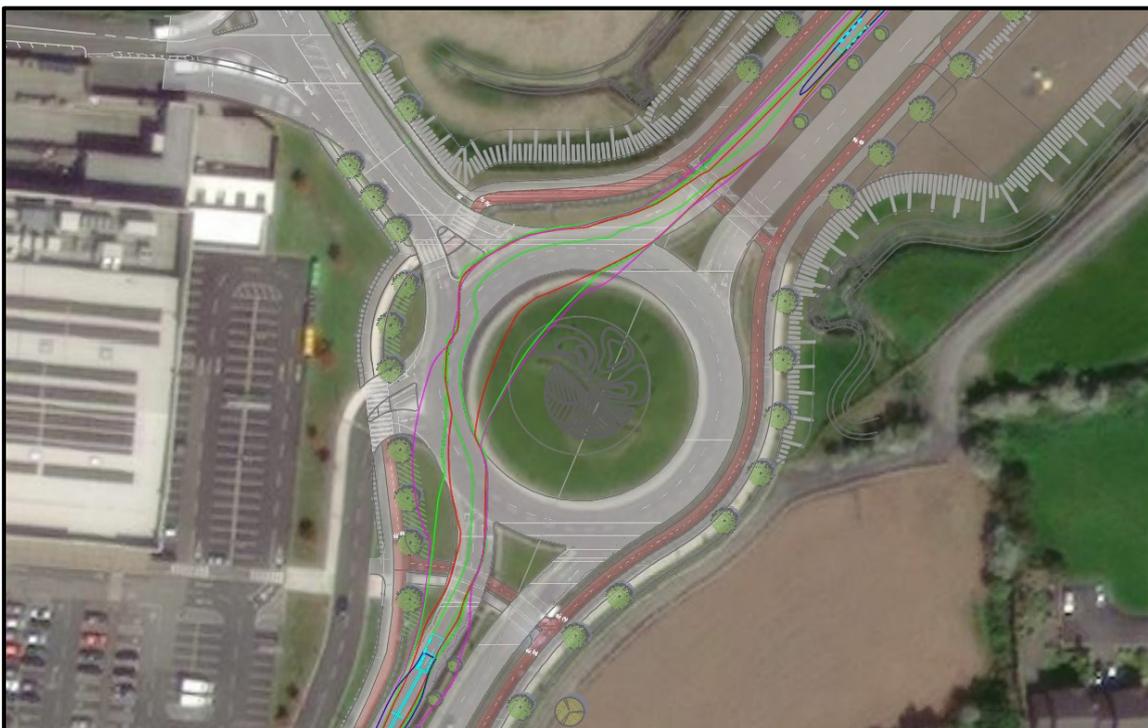


Figure 34: Coonagh Cross Roundabout – swept path

3.5.4 Cratloe Road Roundabout

The delivery route through the Cratloe Road and Moyross Roundabouts is feasible and could be undertaken to the roundabout alignment using rear wheel steering. Temporary road widening may be required along the edge of the central island for the Cratloe Road Roundabout. A further analysis should be undertaken when the roundabouts are constructed to determine if any items of street furniture require temporary removal.



Figure 35: Cratloe Road Roundabout – swept path



Figure 36: Moyross Roundabout – swept path

3.5.5 Knocknalisheen Road Roundabout

It would be expected that blade deliveries travelling through the Knocknalisheen Roundabout would need to travel in a contra-flow direction so that they can turn south onto the Knocknalisheen Road. Delivery appears feasible and could be undertaken to the roundabout alignment using rear wheel steering. A further analysis should be undertaken when the roundabout is constructed to determine if any items of street furniture require temporary removal.



Figure 37: Knocknalisheen Road Roundabout – swept path

3.5.6 Knocknalisheen Road and Kileely Road Junction

The existing railway bridge is to be replaced as part of the upgrading works to the Knocknalisheen Road. The shape of the vertical profile for the new bridge should be analysed when complete to ensure grounding of long delivery loads will not occur.

Deliveries will turn north onto the R464 Kileely Road at the end of the Knocknalisheen Road. The junction between the R464 and the Knocknalisheen Road has been realigned as part of the upgrading works to the Knocknalisheen Road. It is envisaged blades will be transported on a blade lifter trailer with the blade inclined to 60° at this junction. In this delivery configuration widening works are avoided. The temporary removal of traffic signals would be required while deliveries are taking place. The expected swept paths of the blade lifter and tower section delivery vehicles are presented in **Figure 38** and **Figure 39** below.

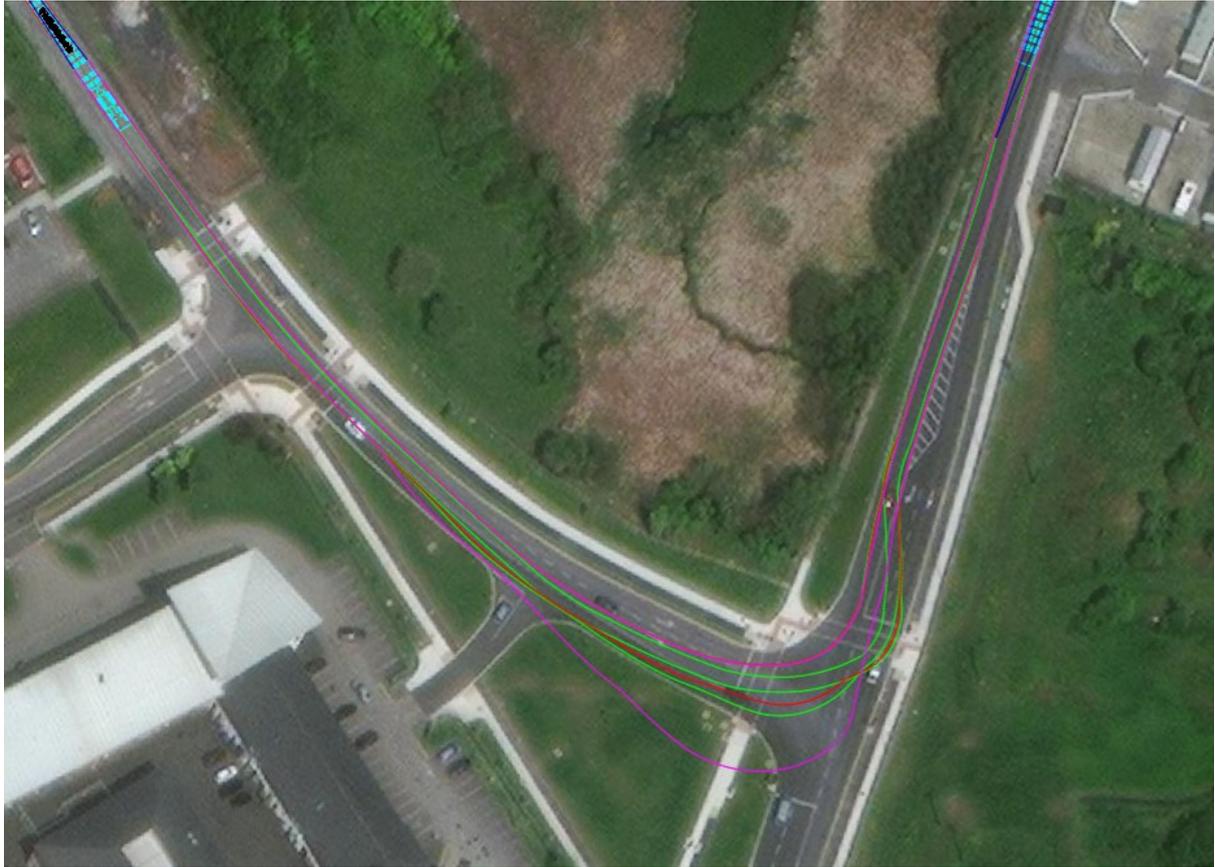


Figure 38: Junction of R464 and Knockalisheen Road – Blade Lifter trailer with blade inclined at 60° - swept path

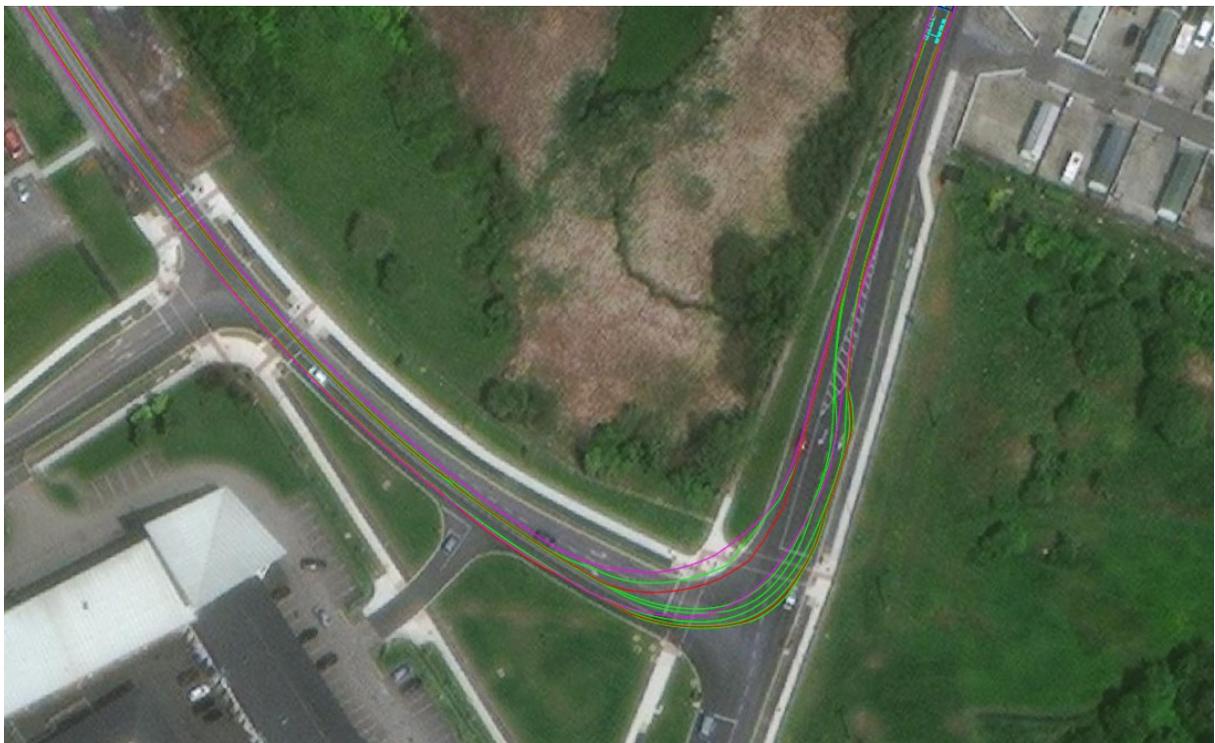


Figure 39: Junction of R464 and Knockalisheen Road – Oversized tower section – swept path

3.6 Route Option 2 - Clonmacken Roundabout to Kileely Road via the Northern Ring Road

3.6.1 Clonmacken Roundabout

For delivery route Option 2, a temporary stone road should be constructed along the edge of the central island of Clonmacken roundabout to allow for component deliveries and avoiding the removal of trees. The central island has sufficient space to enable this option, but care should be undertaken regarding traffic management as the overhang of the blade will cross the median barrier towards any oncoming traffic on approach to the roundabout.

Temporary removal of the following items would be required for the manoeuvre:

- Yield sign on the approach to roundabout;
- Two Chevron signs on the central island;
- Two lamp poles on northwest quadrant of roundabout;
- Exit sign on the exit splitter island.



Figure 40: Clonmacken Roundabout - looking east

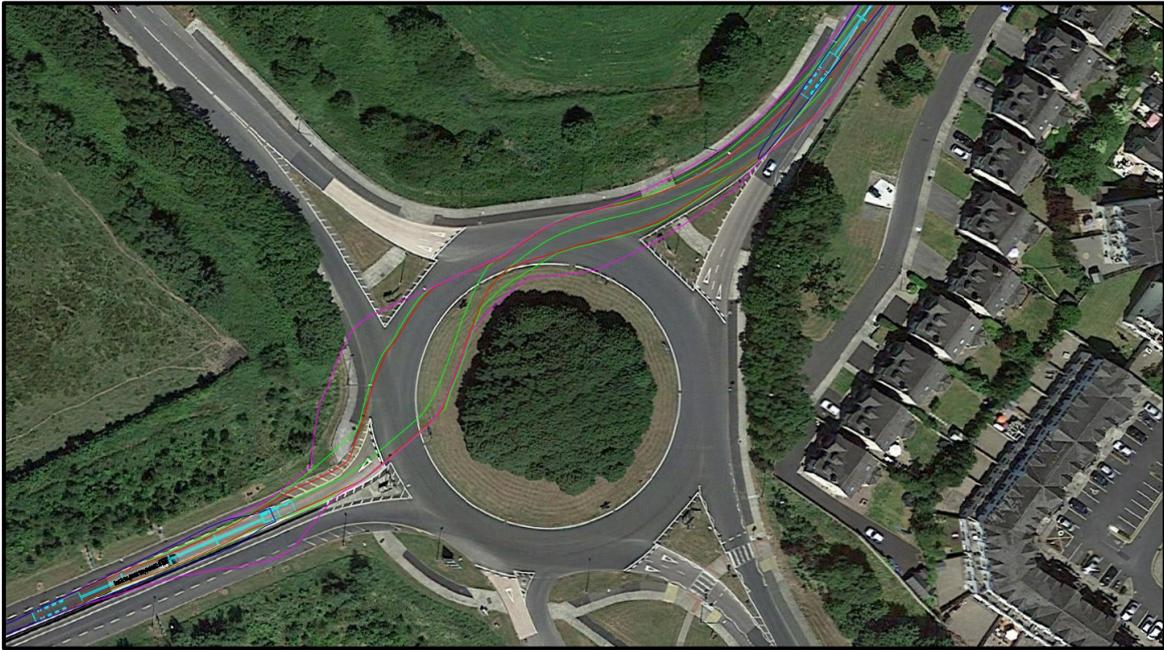


Figure 41: Clonmacken Roundabout – WTG blade deliveries arriving from the west – swept path

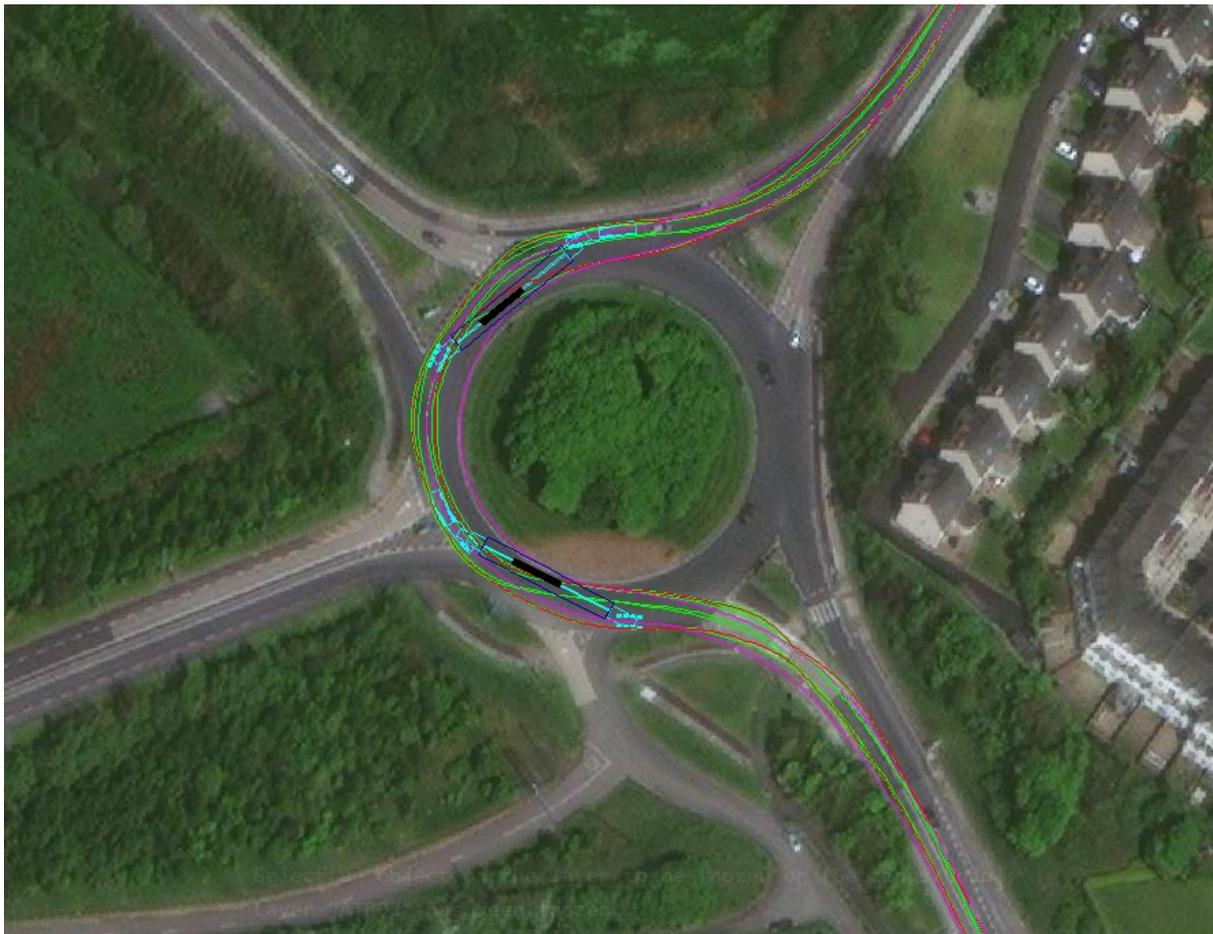


Figure 42: Clonmacken Roundabout – Oversize deliveries arriving from the south – swept path

The central island of the roundabout on the Clonmacken Road should be temporarily removed to mitigate against the removal of lamp poles, trees, and a Victorian gas lamp pole for blade deliveries. The central island appears to be constructed from blockwork which should be relatively straightforward to modify temporarily and reinstate afterwards. The central island of this roundabout could be replaced with a trafficable flat central island identical to the roundabout serving the nearby Jetland Shopping Centre for future deliveries (see **Figure 45**). Yield and directional signage will require removal on the two splitter islands.



Figure 43: Roundabout on Clonmacken Road - facing north



Figure 44: Roundabout on Clonmacken Road – swept path



Figure 45: Example of flat central island at nearby roundabout serving the Jetland Shopping Centre

3.6.2 Northern Ring Road – Moylish Roundabout

Deliveries will journey eastwards along the Northern Ring Road and travel through the Moylish Roundabout towards the Cratloe Road. Blade deliveries should pass through the roundabout in a contra-flow direction which allows for a straighter alignment onto the Cratloe Road as seen in **Figure 46**. Delivery vehicles would also need to drive over the exit splitter island to pass back onto the correct side of the road.

Temporary removal of the following items would be required for the manoeuvre:

- Three lamp poles may require removal depending on the position of the blade on the trailer. These include one lamp pole at the southwest quadrant of the roundabout and two lamp poles at the southeast quadrant of the roundabout;
- Directional arrow sign on the exit splitter island.



Figure 46: Moylish Roundabout - facing east



Figure 47: Moylish Roundabout – swept path

3.6.3 Northern Ring Road – Cratloe Road/Kileely Road Junction (Hassett’s Cross)

Deliveries would need to turn left onto the Kileely Road from the Cratloe Road at Hassett’s Cross adjacent to Thomond Park. Third party lands and temporary road widening would be required at the northwest quadrant of the junction to facilitate blade deliveries using an extendable trailer.

Temporary removal of the following items may be required for the manoeuvre using the extendable blade trailer:

- Two light poles on northwest quadrant;
- Three trees on northwest quadrant;
- Wall along northwest quadrant of junction;
- CCTV pole on northwest quadrant of junction;
- Traffic lights on northwest quadrant of junction;
- Road sign on northwest quadrant of junction;
- ESB pillar boxes and bollards along northwest quadrant of junction.

Where a blade lifter trailer is used to deliver the blades, the third party lands and temporary road widening would not be required. No temporary road modifications are required for deliveries using blade lifter trailers with the blade inclined at 60°.

The expected swept path for the blade lifter trailer is presented in **Figure 48** below.



Figure 48: Cratloe / Kileely Road junction – Blade lifter with blade raised to 60° - swept path



Figure 49: Cratloe / Kileely Road junction - facing north

4 R464 Kileely Road to Ballycar Wind Farm Site

The component delivery route travels northwards along the R464 to Parteen before turning left onto the L-3056 Local Road to the Ballycar wind farm site. It is proposed the blade lifter trailer will incline the WTG blades to an angle of 60° from this junction all the way along the L-3056 to the windfarm site.

4.1 Junction of L-3056 / R464 at Parteen

The existing junction of the L-3056 / R464 at Parteen is bound by private houses along the inside corner where deliveries are required to turn left. Third party land is therefore temporarily required within the field to the southeast of the junction to facilitate tower and other oversize component deliveries.

One light pole along the R464 would require temporary removal for the left turning manoeuvre.



Figure 50: Junction of L-3056 / R464 - facing north

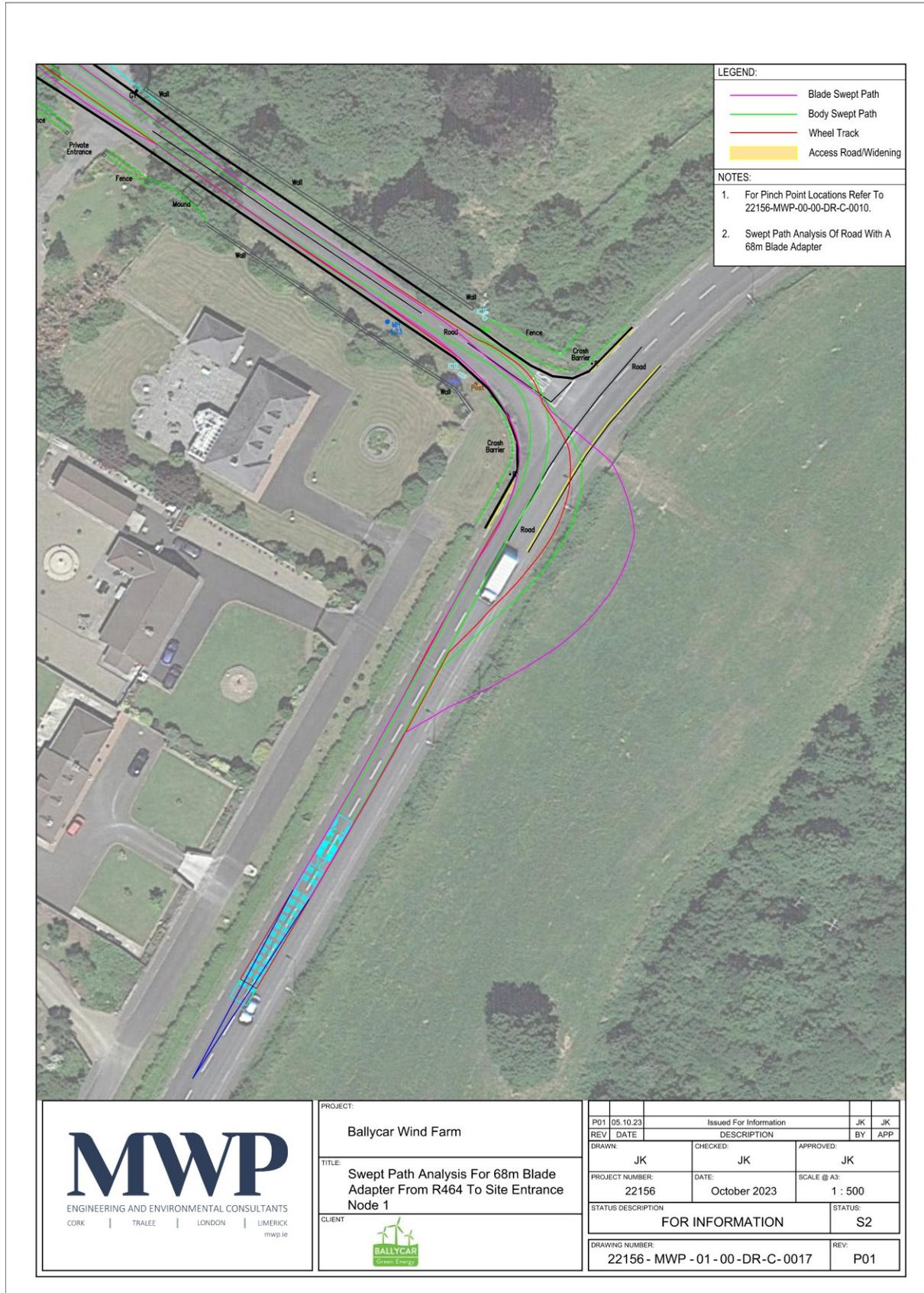


Figure 51: Junction of L-3056 / R464 – Blade Lifter with blade raised to 60° – swept path

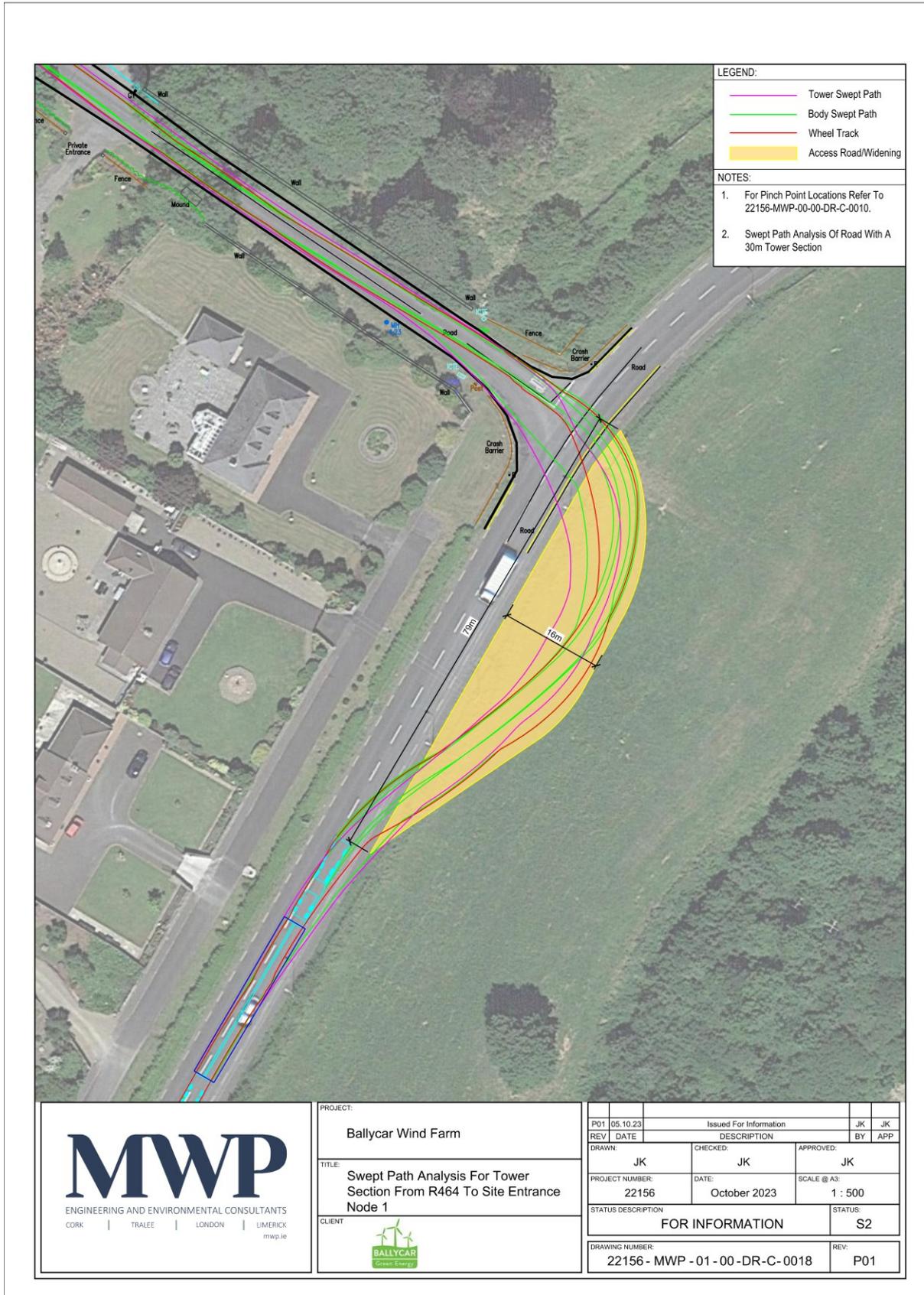


Figure 52: Junction of L-3056 / R464 –Tower Deliveries– swept path

4.2 Local Road to the Wind Farm Site

The L-3056 local road is relatively straight and appears to have sufficient road width (min 5m). The road already caters for HGV traffic due to the presence of a quarry on the road. However, 13 pinch points have been identified along the route where bends and narrow sections of the road have been assessed for component deliveries as shown in **Figure 53**.

It is proposed that the blade lifter trailer will incline the WTG blades to an angle of 60° along this section of road. This will avoid the requirement for temporary road widenings. Streetview imagery and swept paths of the blade lifter vehicle and the tower sections delivery vehicle for the 13No. pinch points along the L-3056 are presented as **Figure 54 to Figure 91**. Blade tip oversail for a WTG blade inclined at 60° would be greater than 62m above road level as shown in **Figure 4**.

No temporary widening of the road surface are expected to be required along this section of road between the junction of L-3056 / R464 and the Ballycar site entrance for both the blade lifter and tower section delivery vehicles.

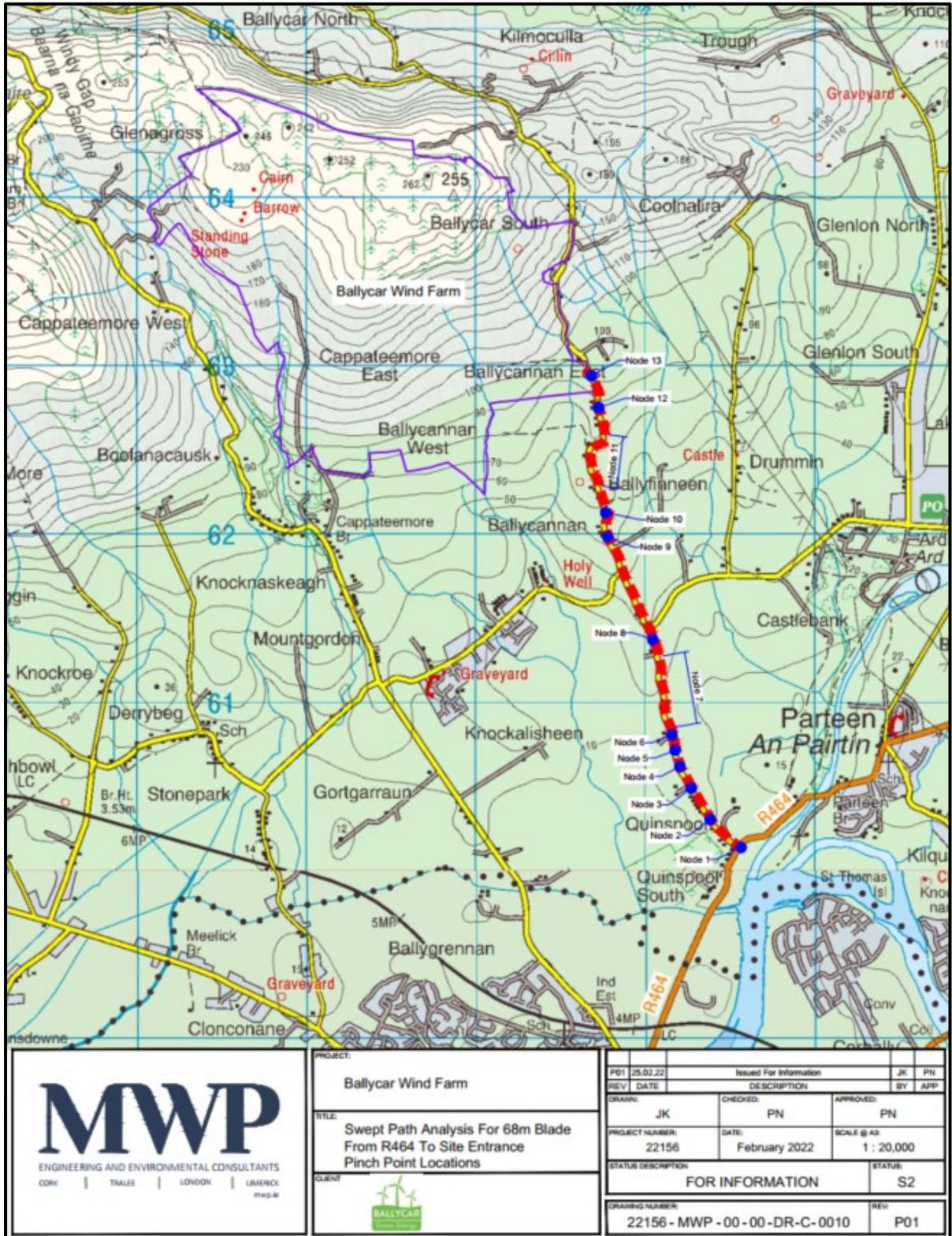


Figure 53: Route along local road to wind farm site



Figure 54: Area No. 2 – facing north



Figure 55: Area No. 2 – Blade lifter trailer with blade raised to 60°– swept path



Figure 56: Area No. 3 - facing north



Figure 57: Area No. 3 – Blade Lifter trailer with blade raised to 60° - swept path



Figure 58: Area No. 4 – facing north



Figure 59: Area No. 4 – Blade Lifter trailer with blade raised to 60° - swept path

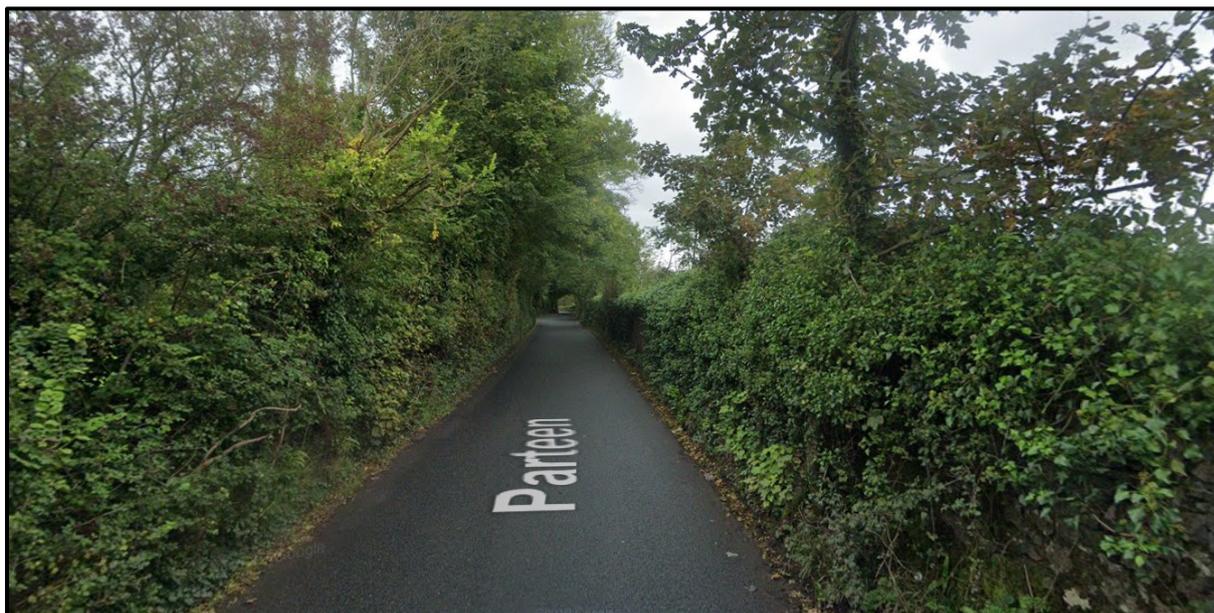


Figure 60: Area No. 4 - facing north



Figure 61: Area No. 5 – Blade Lifter with blade raised to 60° - swept path



Figure 62: Area No. 5 - facing north

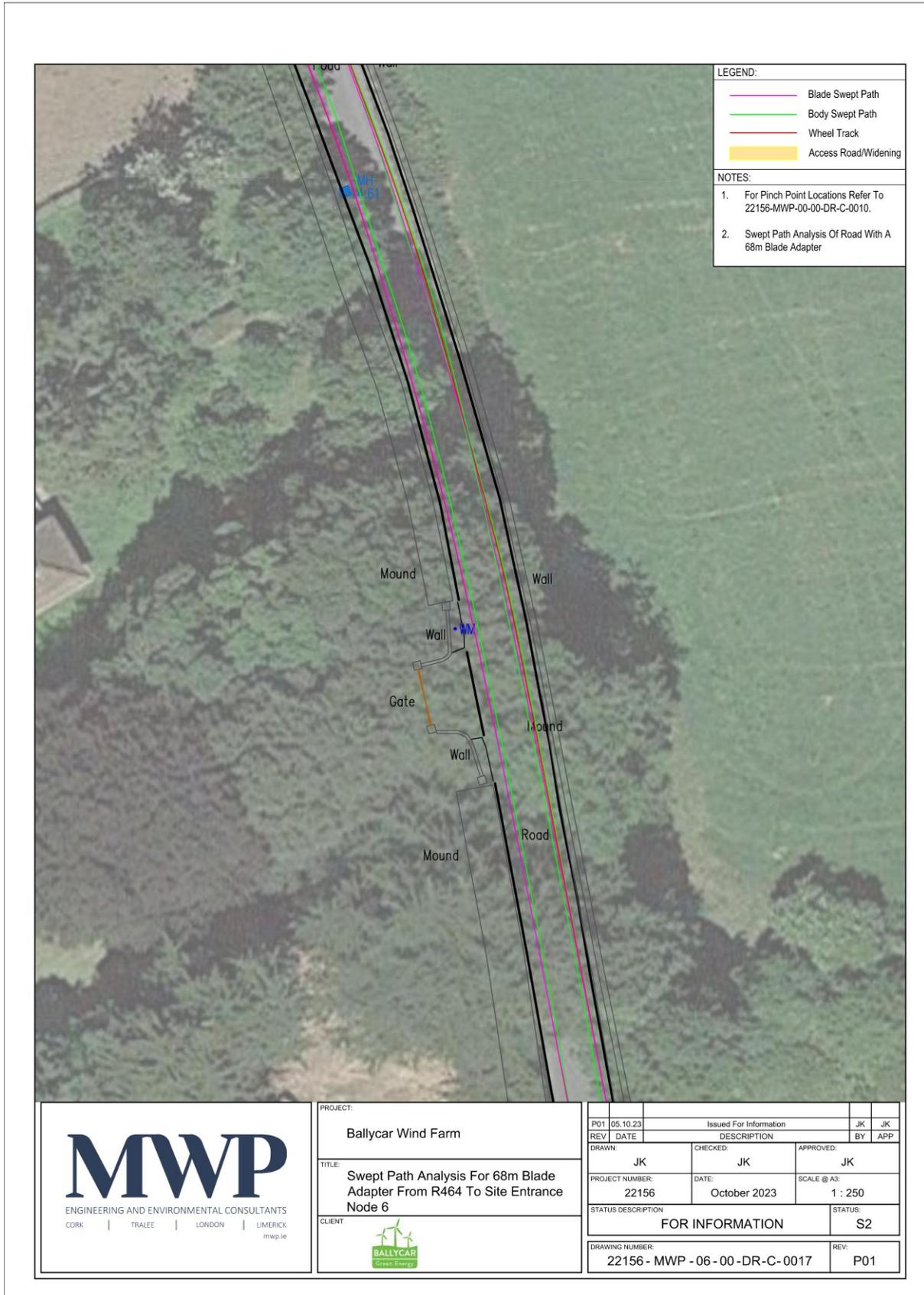


Figure 63: Area No. 6 – Blade Lifter with blade raised to 60° - swept path



Figure 64: Area No. 7 – facing north

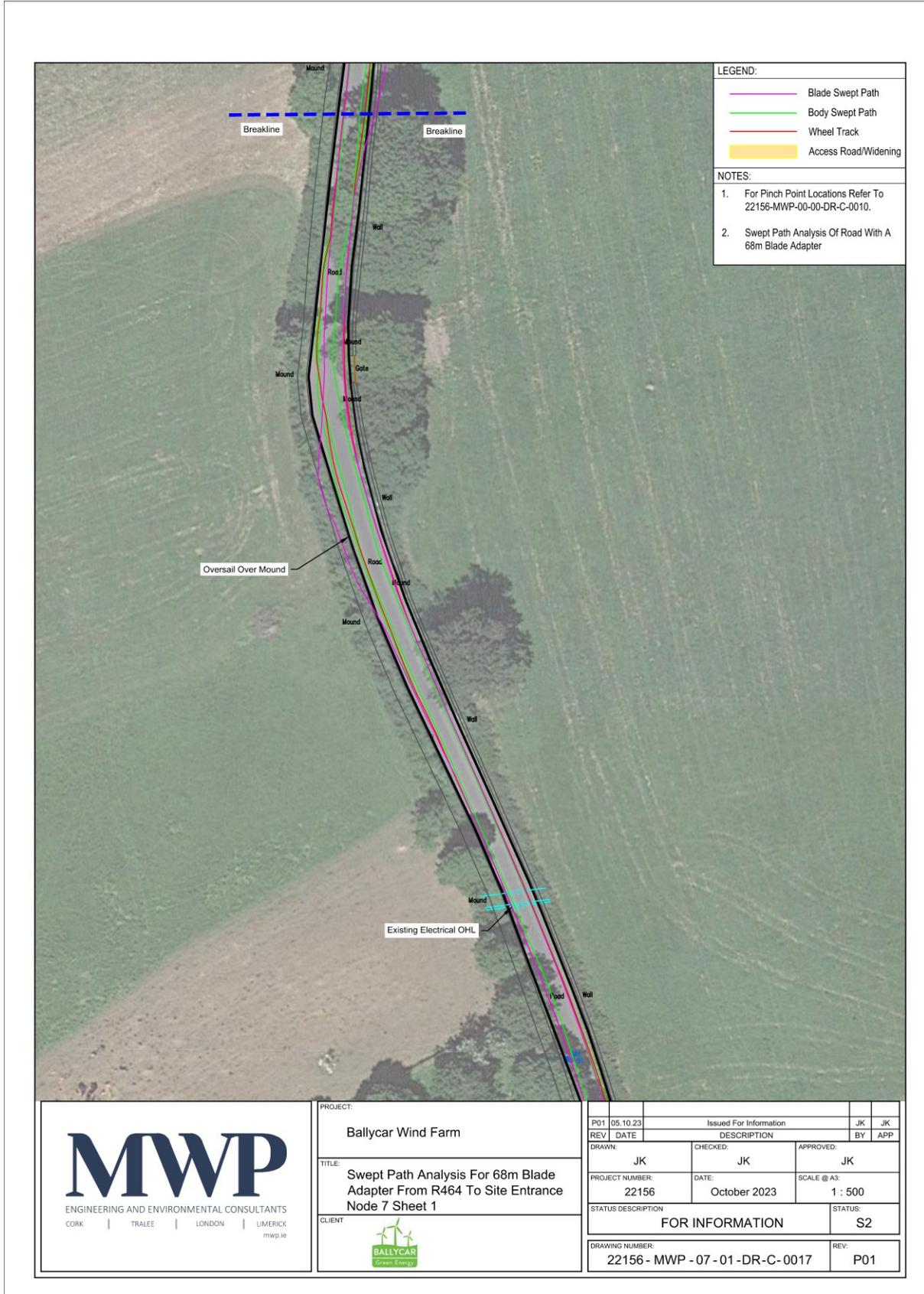


Figure 65: Area No. 7.1 – Blade Lifter with blade raised to 60° - swept path

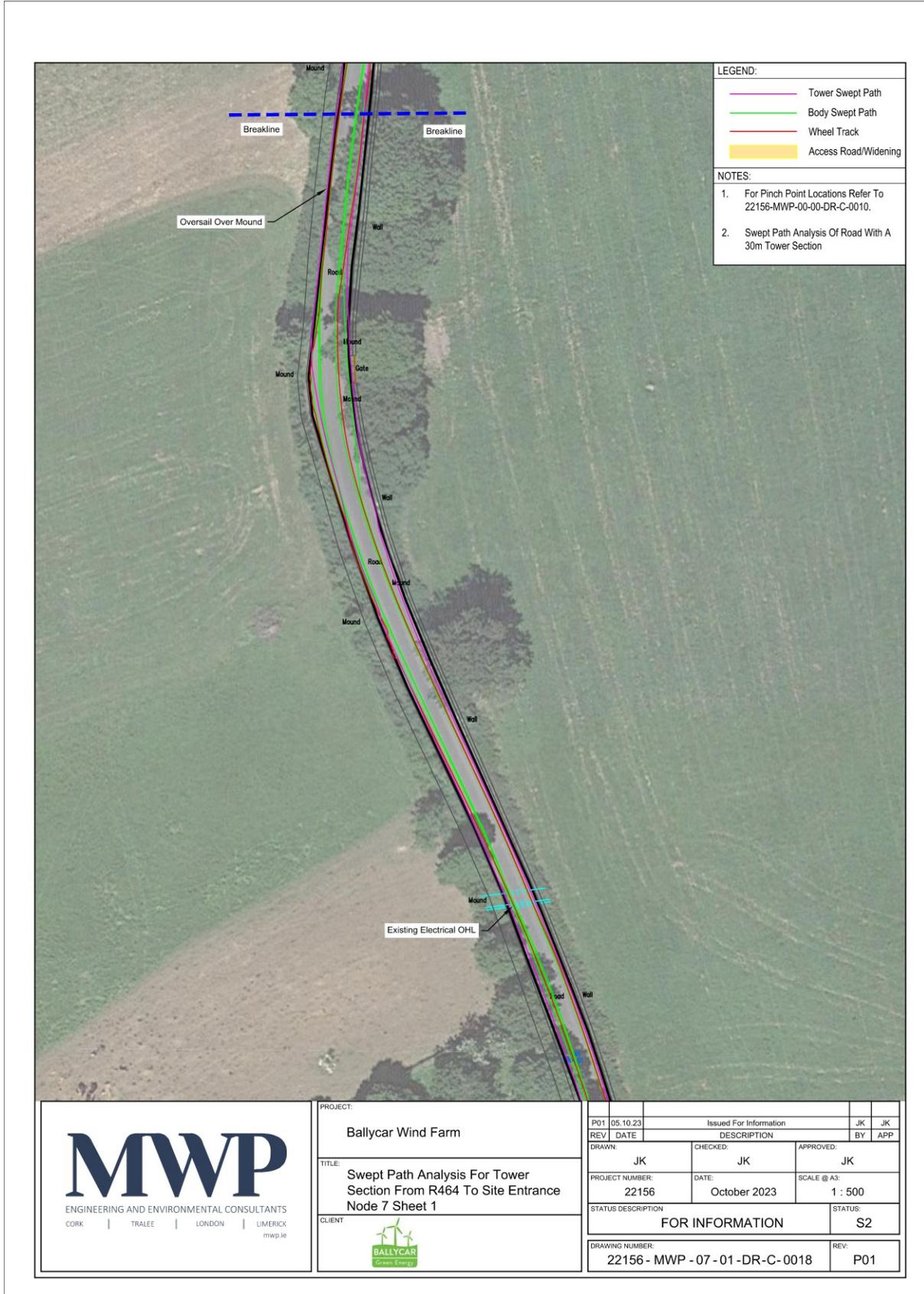


Figure 66: Area No. 7.1 – Tower section delivery – swept path



Figure 67: Area No. 7.2 – facing north



Figure 68: Area No. 7.2 – Blade Lifter with blade raised to 60° - swept path

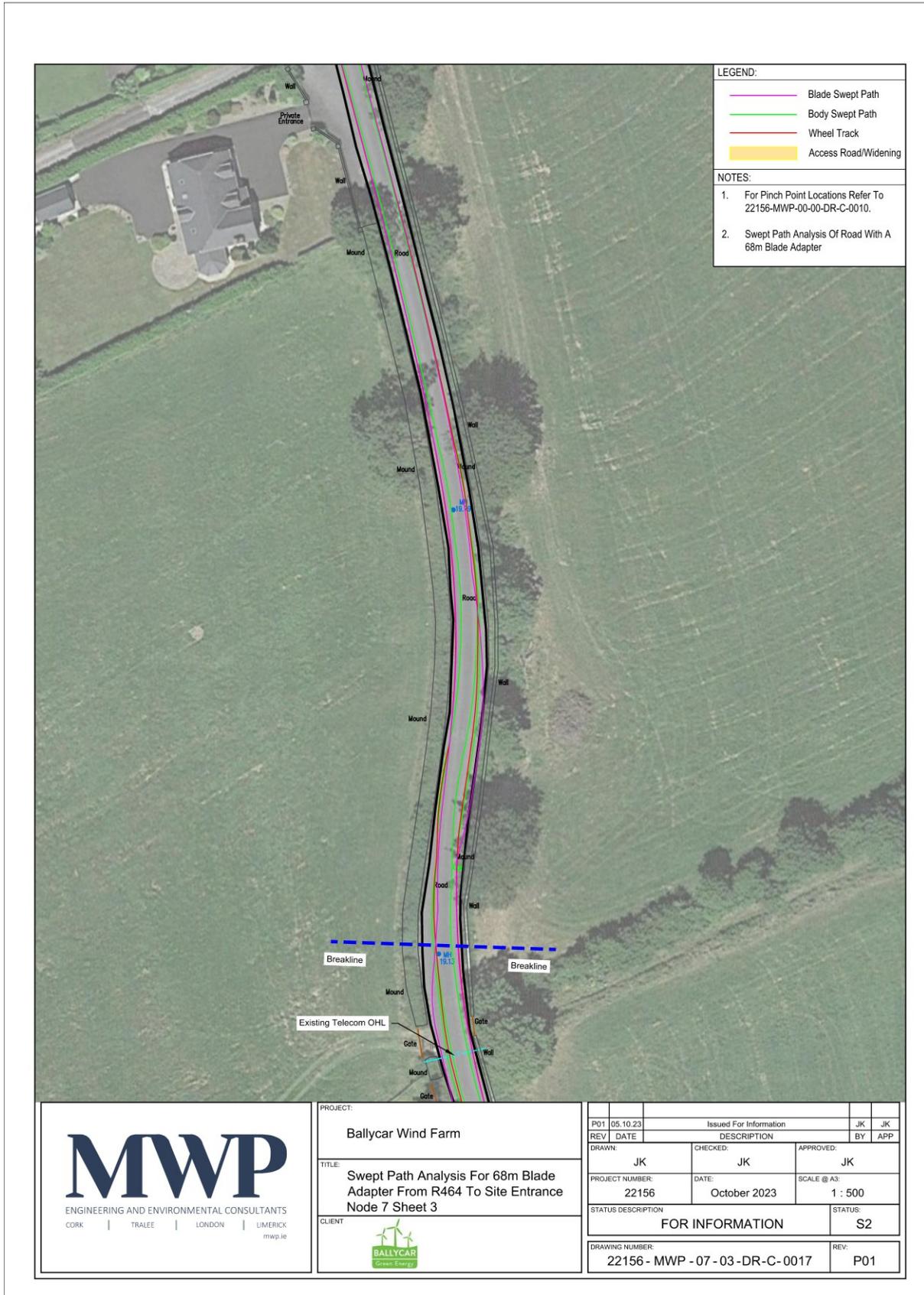


Figure 69: Area No. 7.3 – Blade Lifter with blade raised to 60° - swept path



Figure 70: Area No. 7.2 – Tower section delivery – swept path

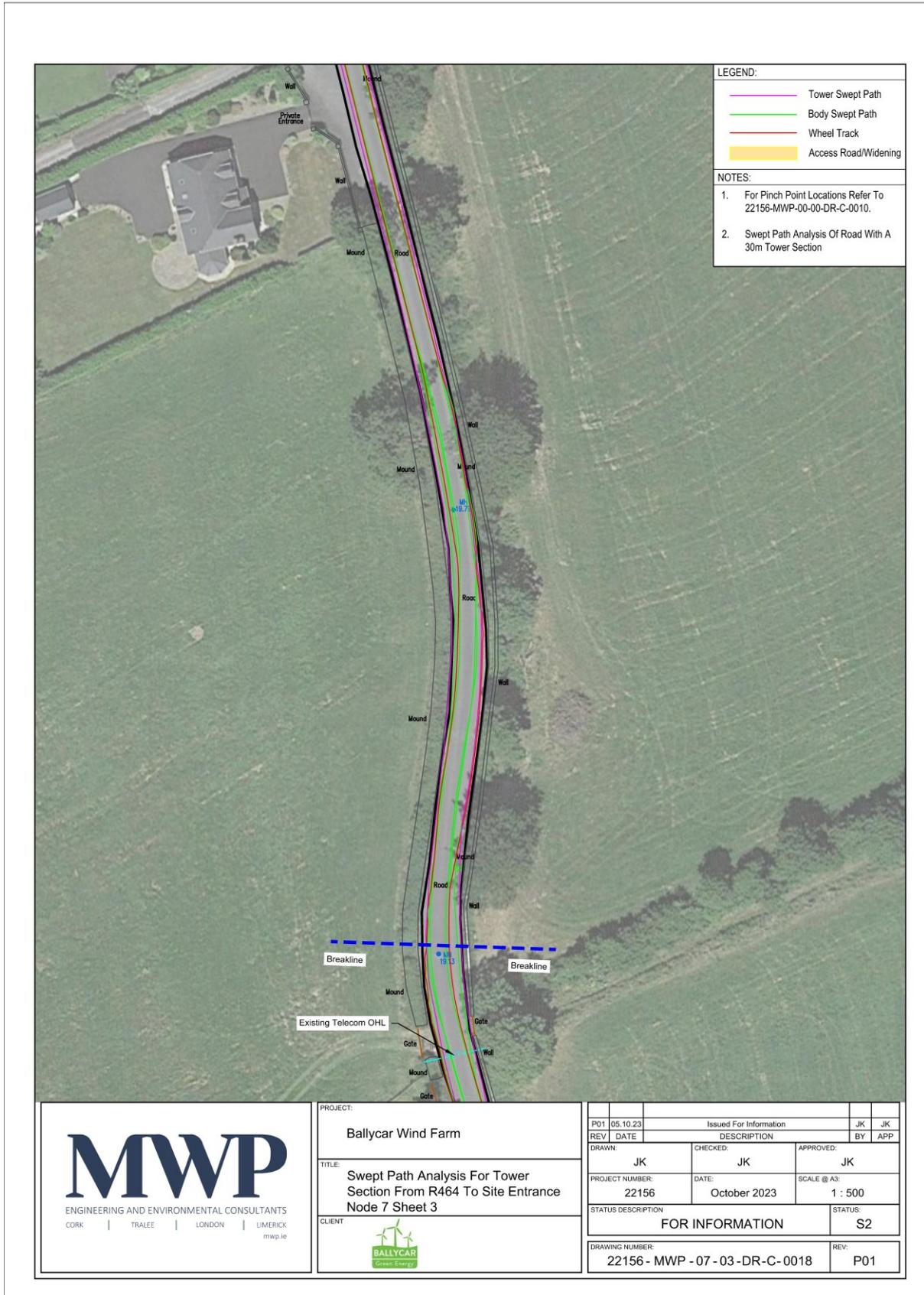


Figure 71: Area No. 7.3 – Tower section delivery – swept path



Figure 72: Area No. 8 - facing north



<p>ENGINEERING AND ENVIRONMENTAL CONSULTANTS CORK TRALEE LONDON LIMERICK mwp.ie</p>	PROJECT: Ballycar Wind Farm	P01 05.10.23 Issued For Information JK JK
	TITLE: Swept Path Analysis For 68m Blade Adapter From R464 To Site Entrance Node 8	REV DATE DESCRIPTION BY APP DRAWN: JK CHECKED: JK APPROVED: JK
	CLIENT: 	PROJECT NUMBER: 22156 DATE: October 2023 SCALE @ A3: 1 : 500
		STATUS DESCRIPTION: FOR INFORMATION STATUS: S2
	DRAWING NUMBER: 22156 - MWP - 08 - 00 - DR - C - 0017	REV: P01

Figure 73: Area No. 8 – Blade Lifter with blade raised to 60° – swept path



Figure 74: Area No. 8 –Tower section delivery – swept path



Figure 75: Area No. 9 – facing north

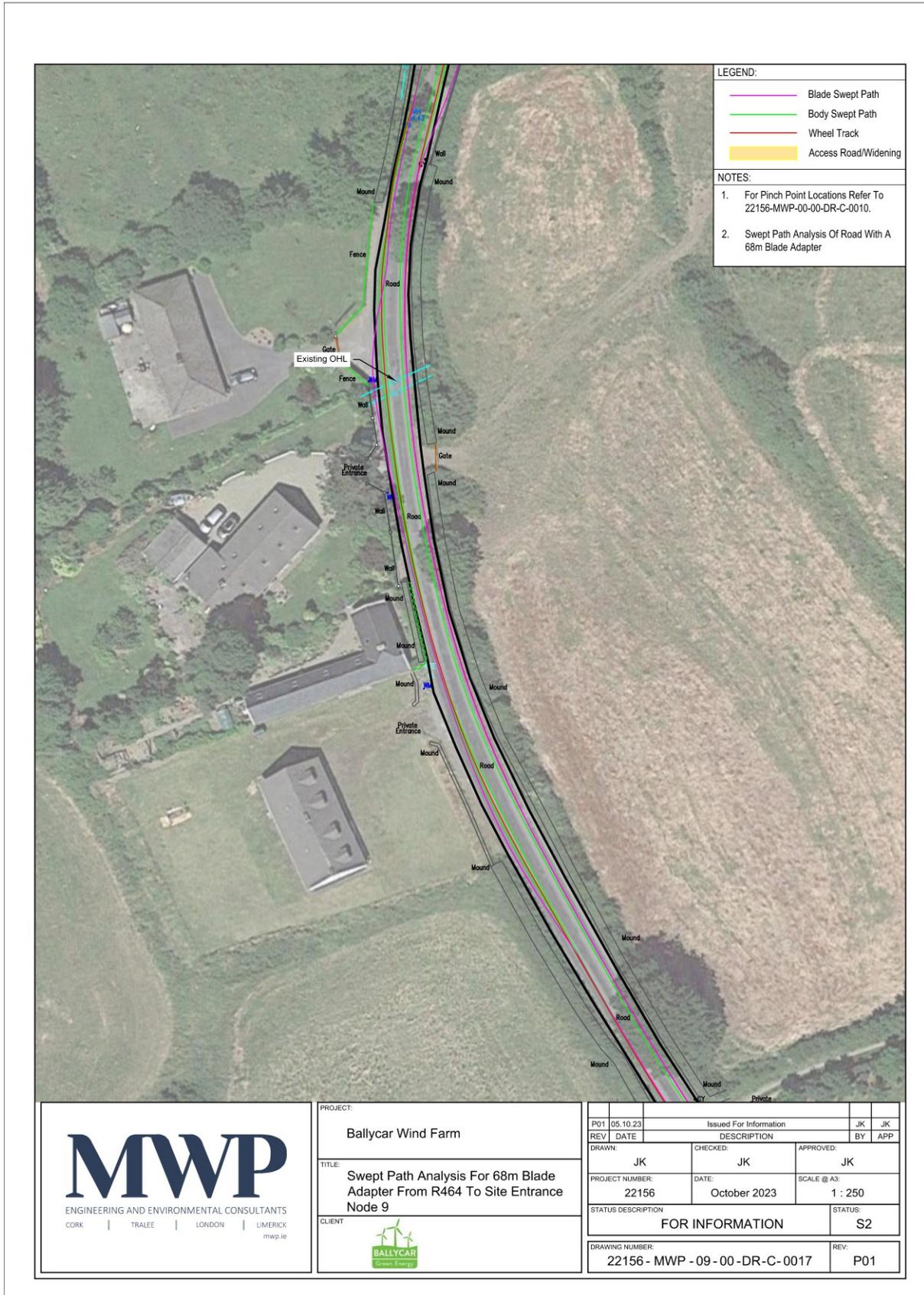


Figure 76: Area No. 9 - Blade Lifter with blade raised to 60°– swept path

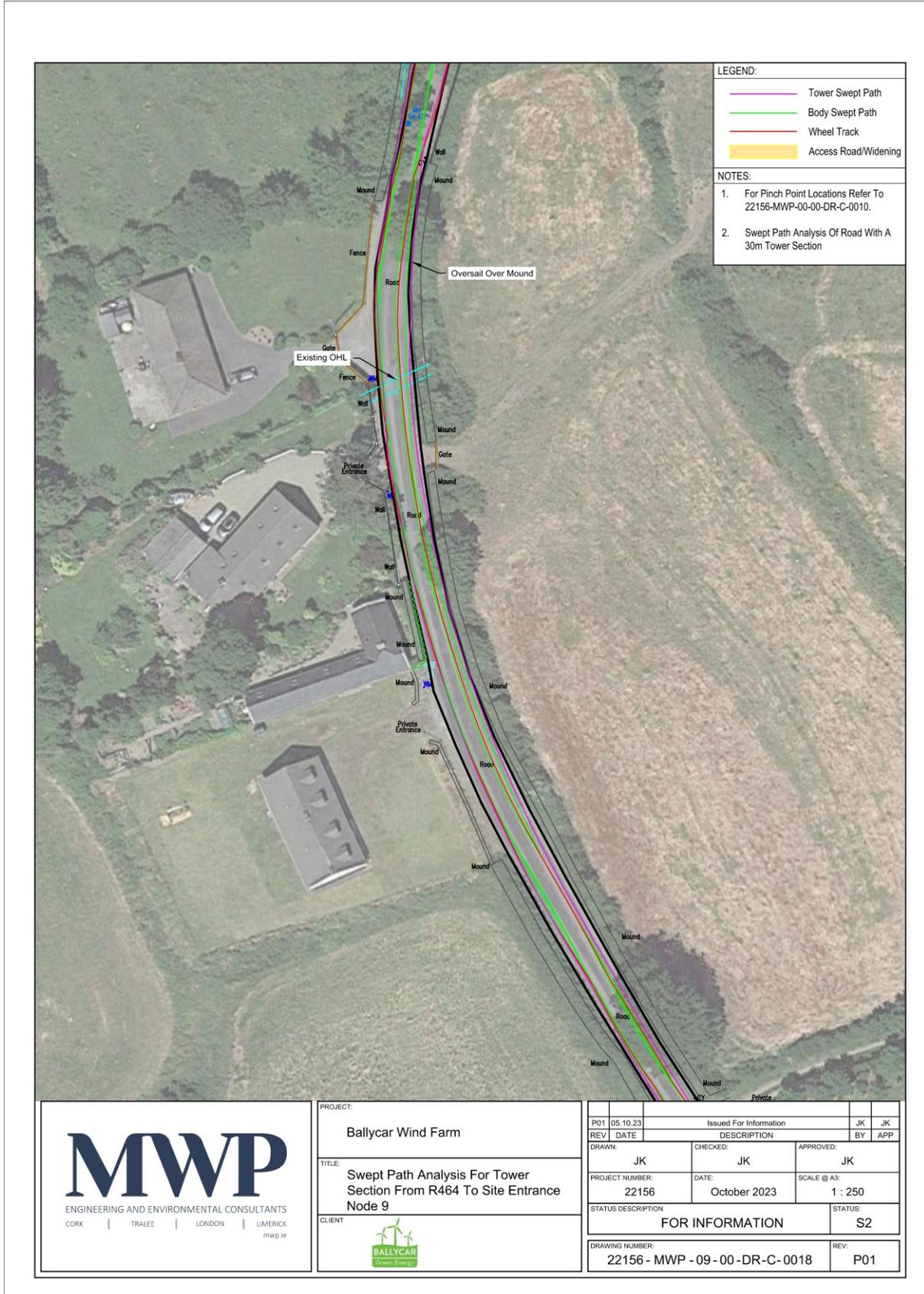


Figure 77: Area No. 9 - Tower section delivery– swept path



Figure 78: Area No. 10 – facing north

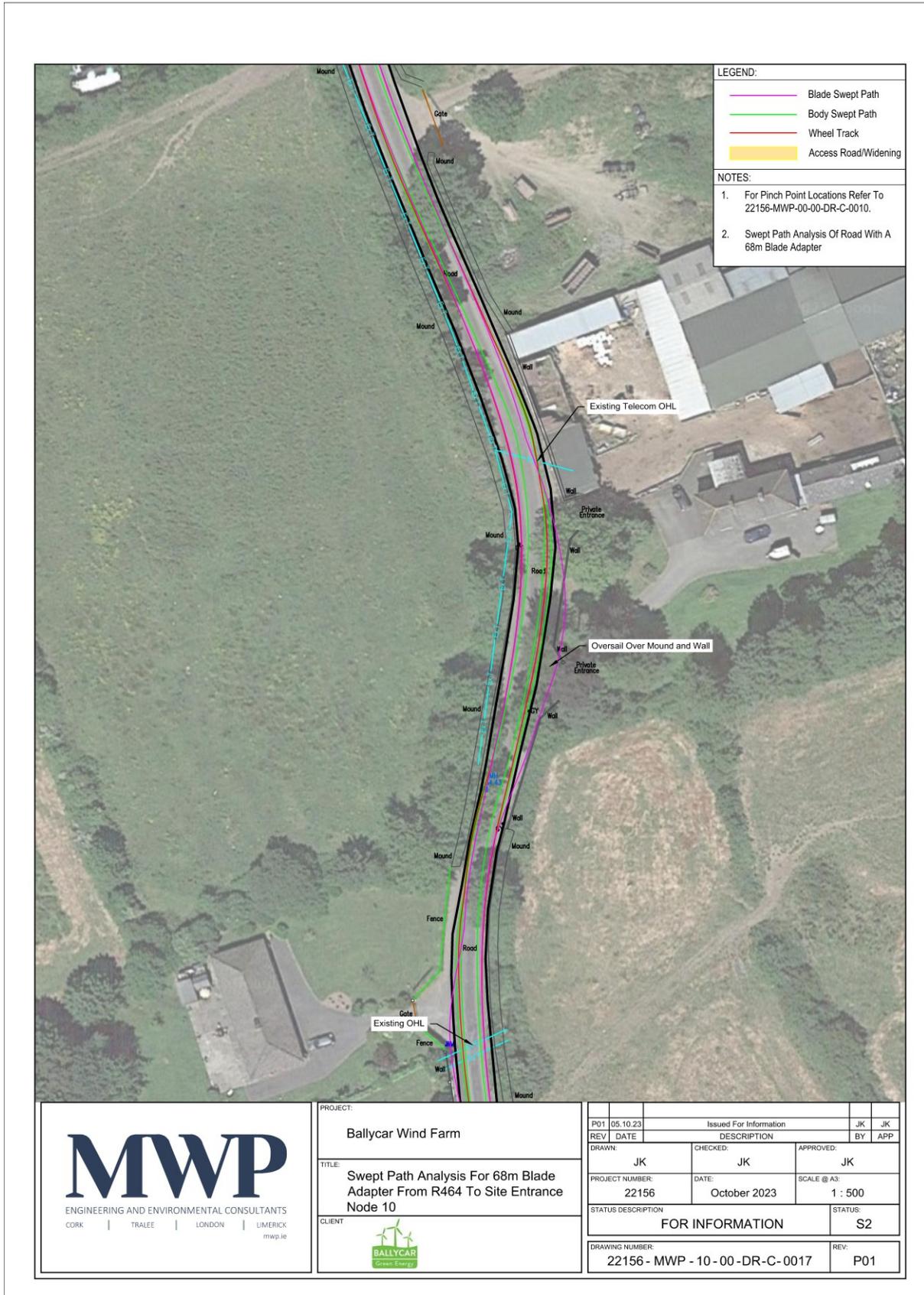


Figure 79: Area No. 10 – Blade Lifter with blade raised to 60° - swept path



LEGEND:

- Tower Swept Path
- Body Swept Path
- Wheel Track
- Access Road/Widening

NOTES:

1. For Pinch Point Locations Refer To 22156-MWP-00-00-DR-C-0010.
2. Swept Path Analysis Of Road With A 30m Tower Section

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PROJECT:
Ballycar Wind Farm

TITLE:
Swept Path Analysis For Tower Section From R464 To Site Entrance Node 10

CLIENT:

P01	05.10.23	Issued For Information		JK	JK
REV	DATE	DESCRIPTION		BY	APP
DRAWN:	JK	CHECKED:	JK	APPROVED:	JK
PROJECT NUMBER:	22156	DATE:	October 2023	SCALE @ A3:	1 : 500
STATUS DESCRIPTION				STATUS:	
FOR INFORMATION				S2	
DRAWING NUMBER:				REV:	
22156 - MWP - 10 - 00 - DR - C - 0018				P01	

Figure 80: Area No. 10 – Tower section delivery – swept path



Figure 81: Area No. 11 – facing north

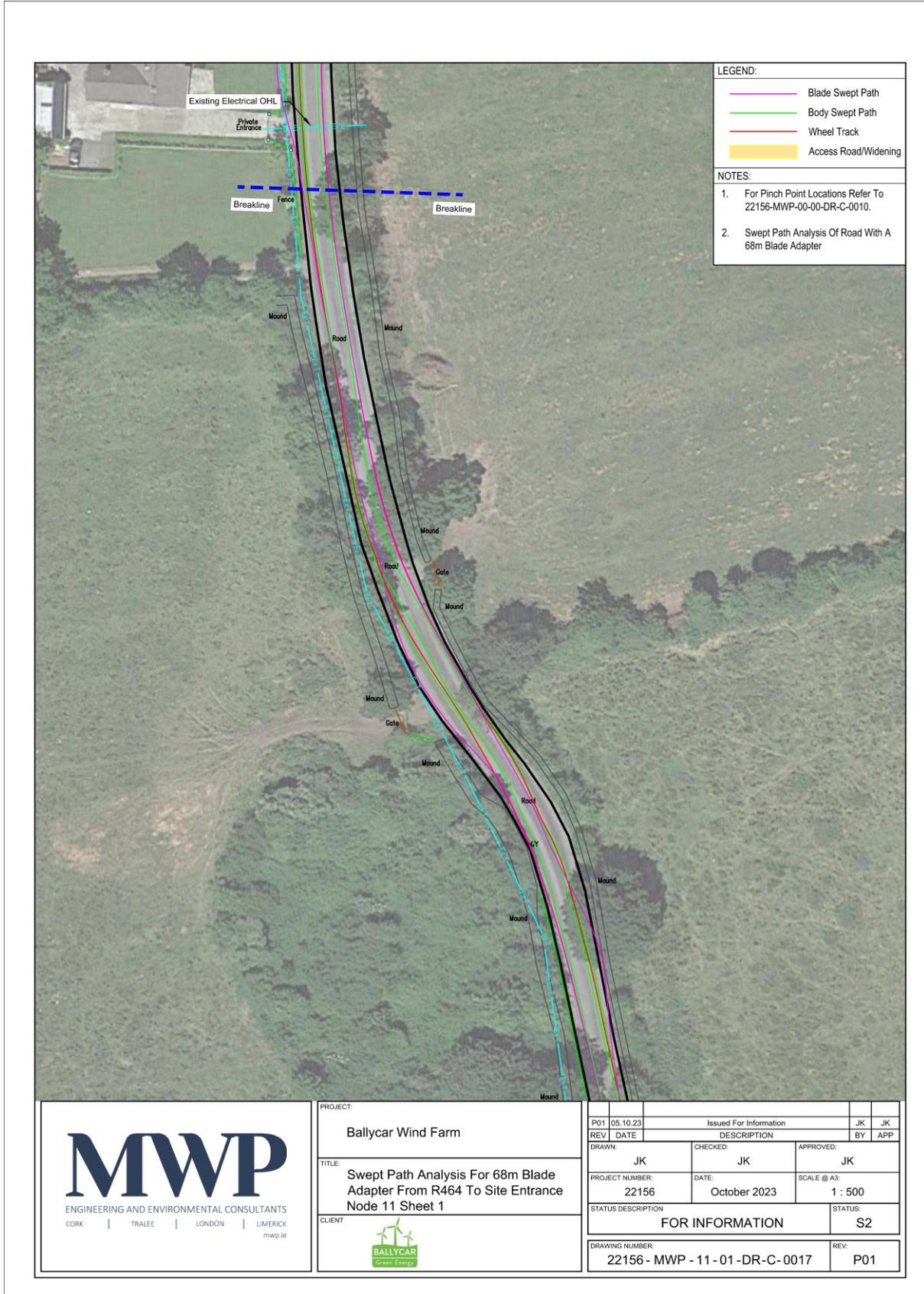


Figure 82: Area No. 11.1 – Blade Lifter with blade raised to 60°– swept path

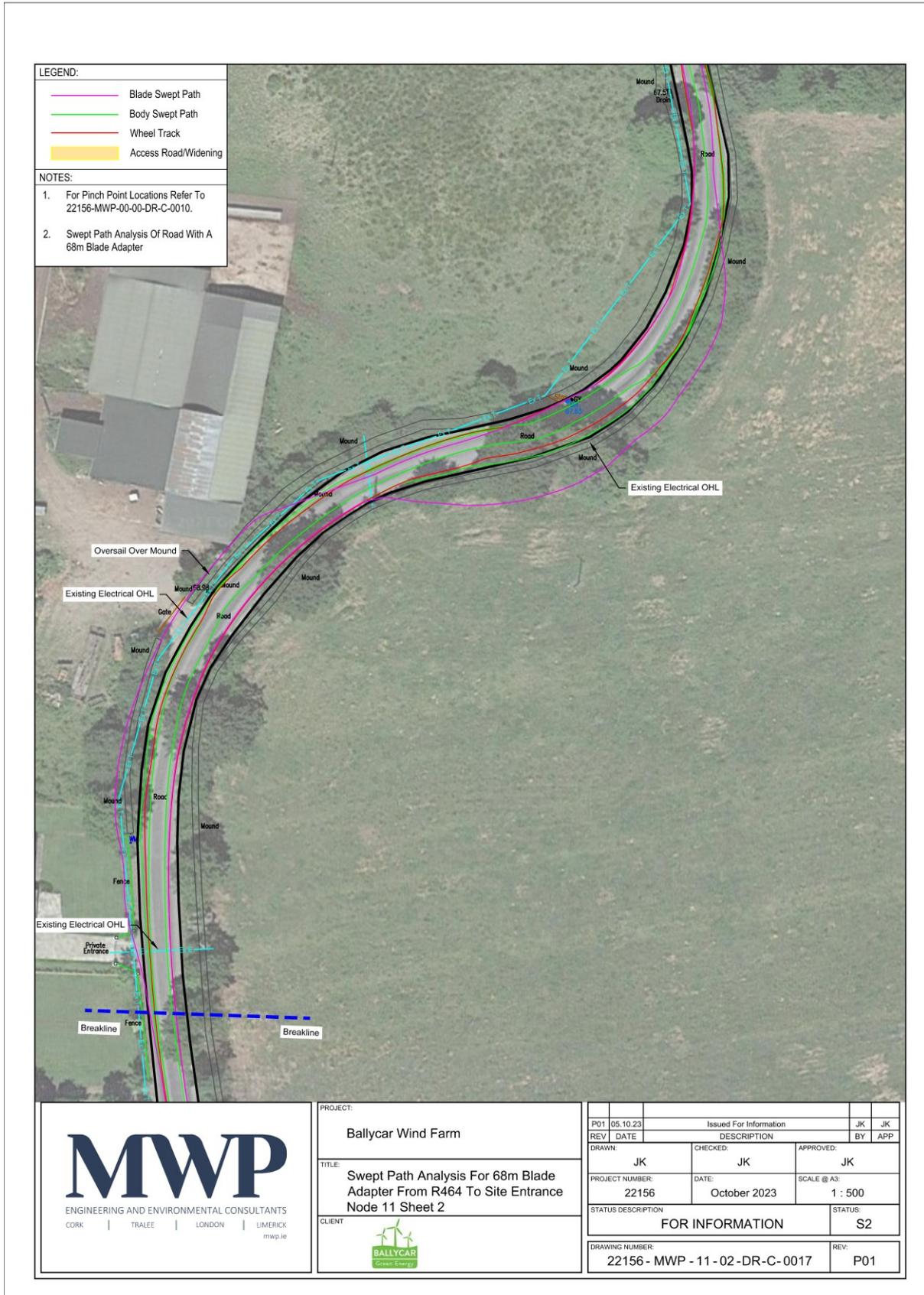


Figure 83: Area No. 11.2 – Blade Lifter with blade raised to 60° – swept path

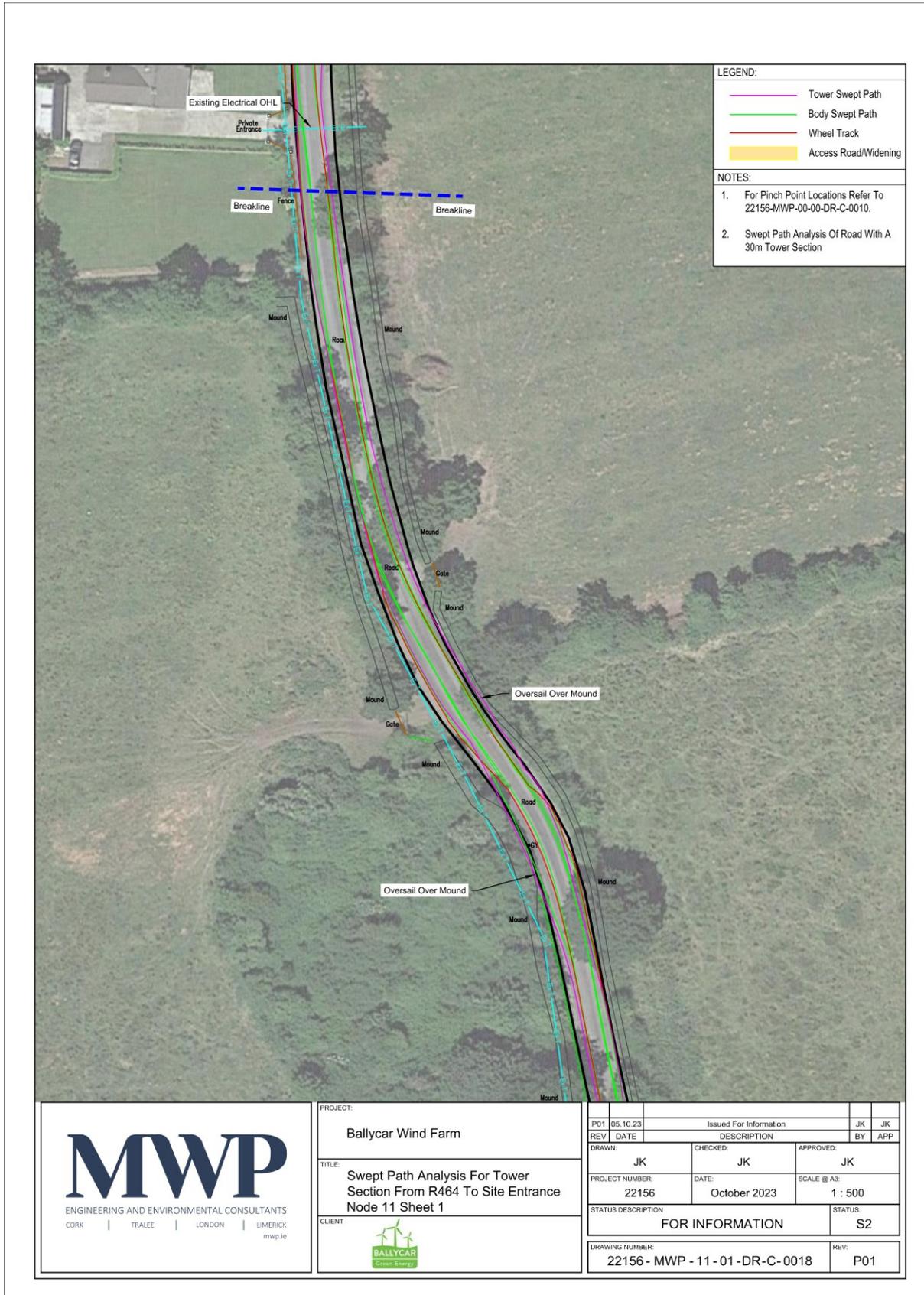


Figure 84: Area No. 11.1 – Tower section delivery – swept path

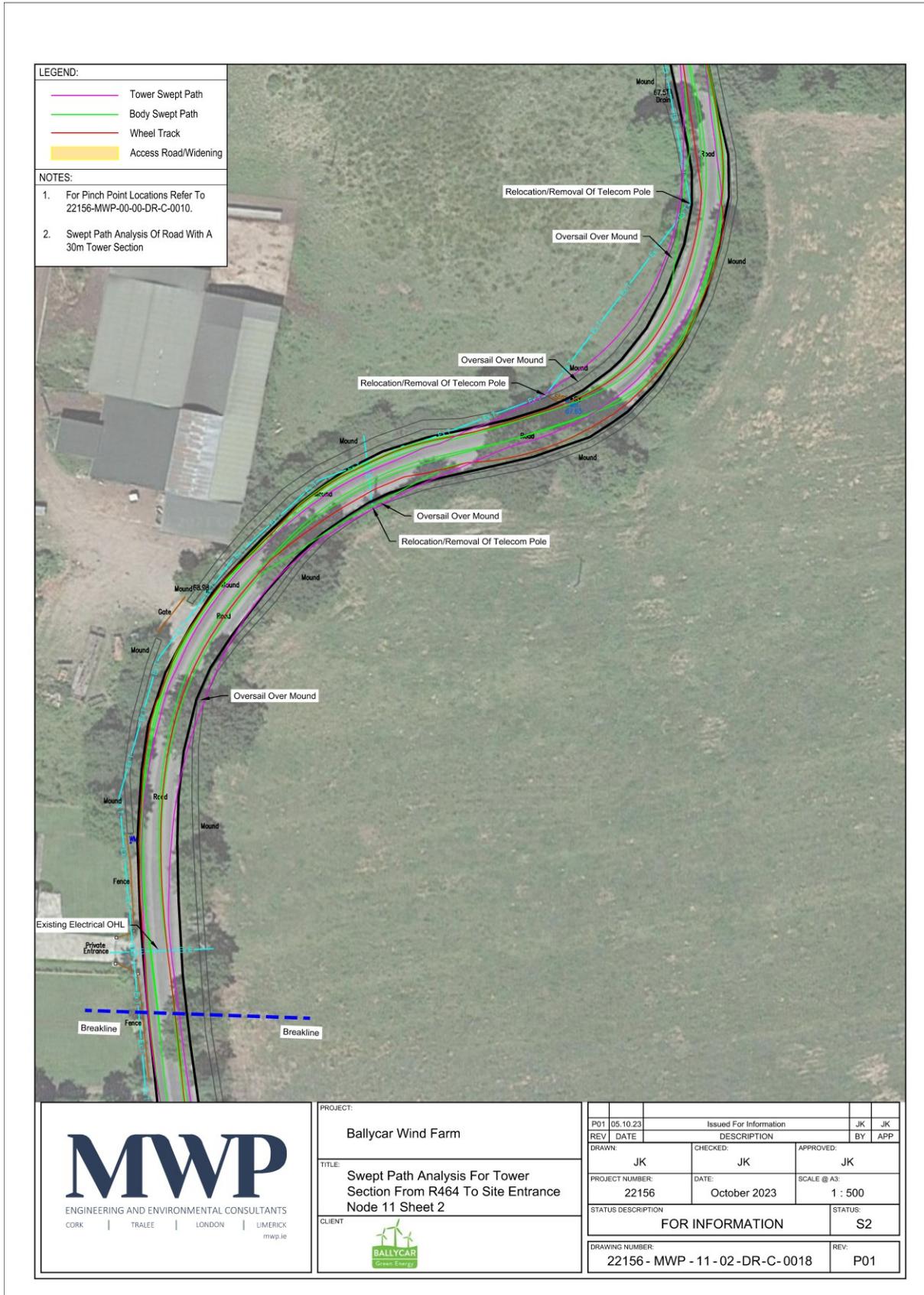


Figure 85: Area No. 11.2 – Tower section delivery – swept path



Figure 86: Area No. 12 – facing north

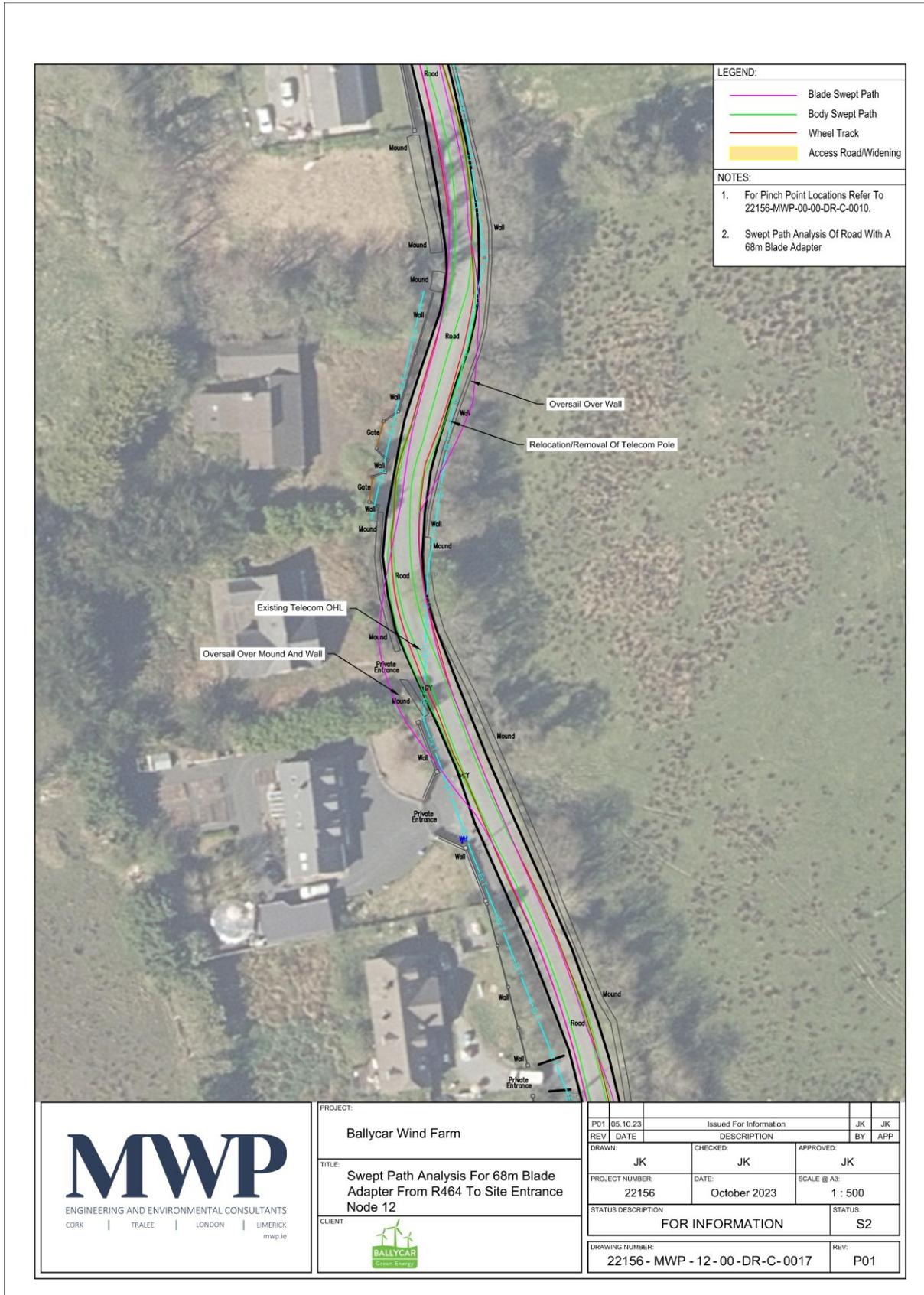


Figure 87: Area No. 12 – Blade Lifter with blade raised to 60° – swept path

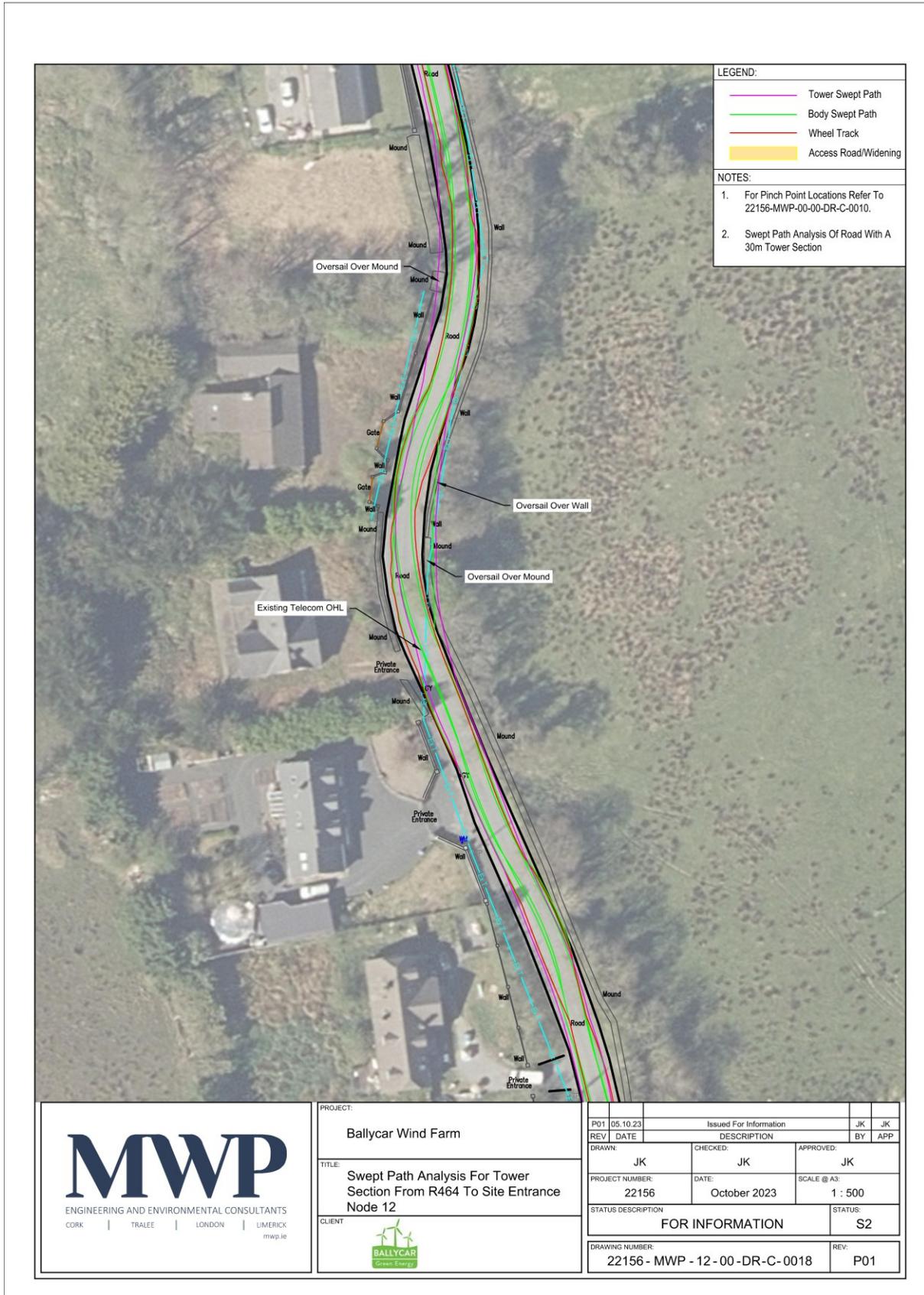


Figure 88: Area No. 12 – Tower section delivery– swept path



Figure 89: Area No. 13 – facing north

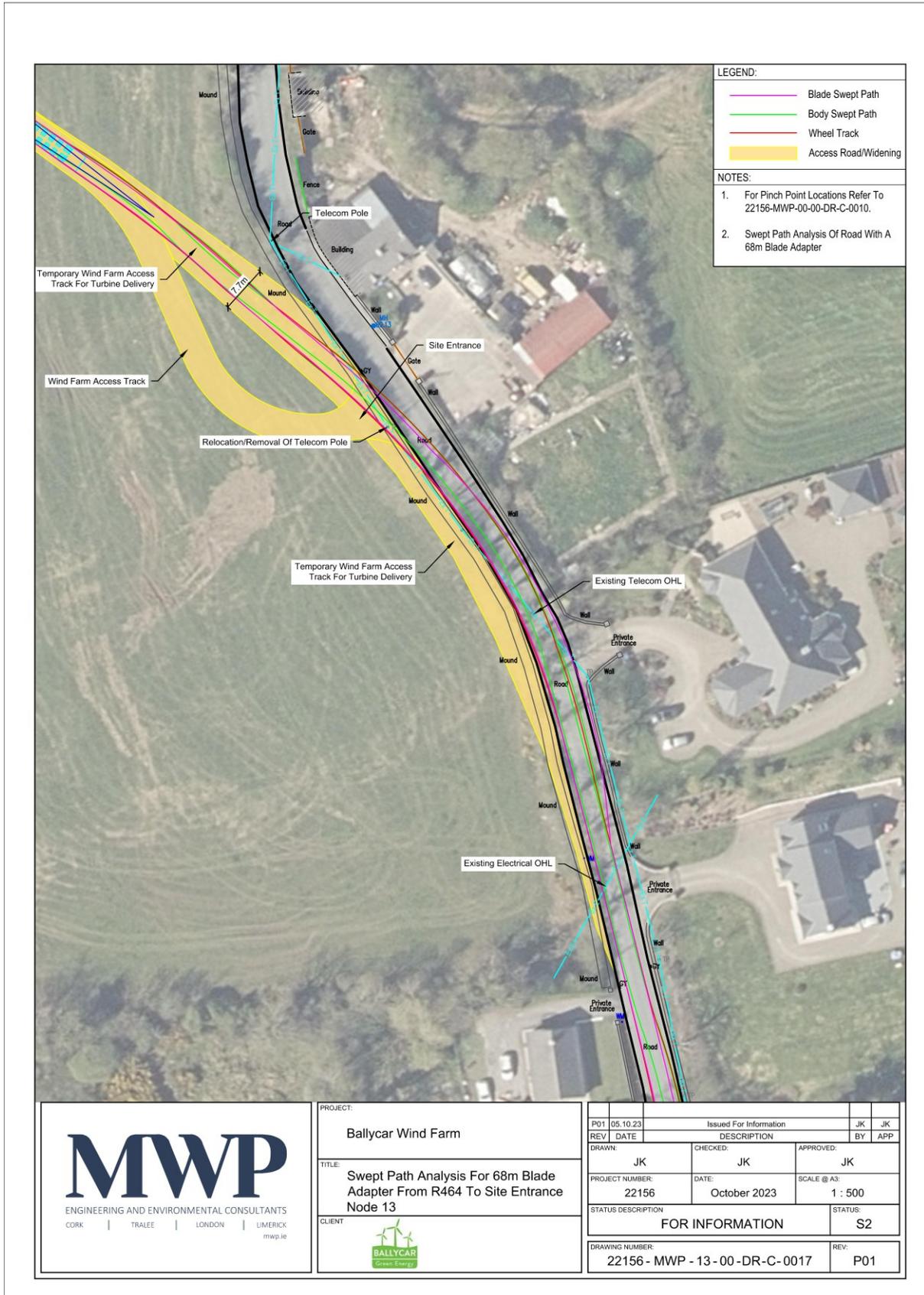


Figure 90: Area No. 13 – Blade Lifter with blade raised to 60° – swept path

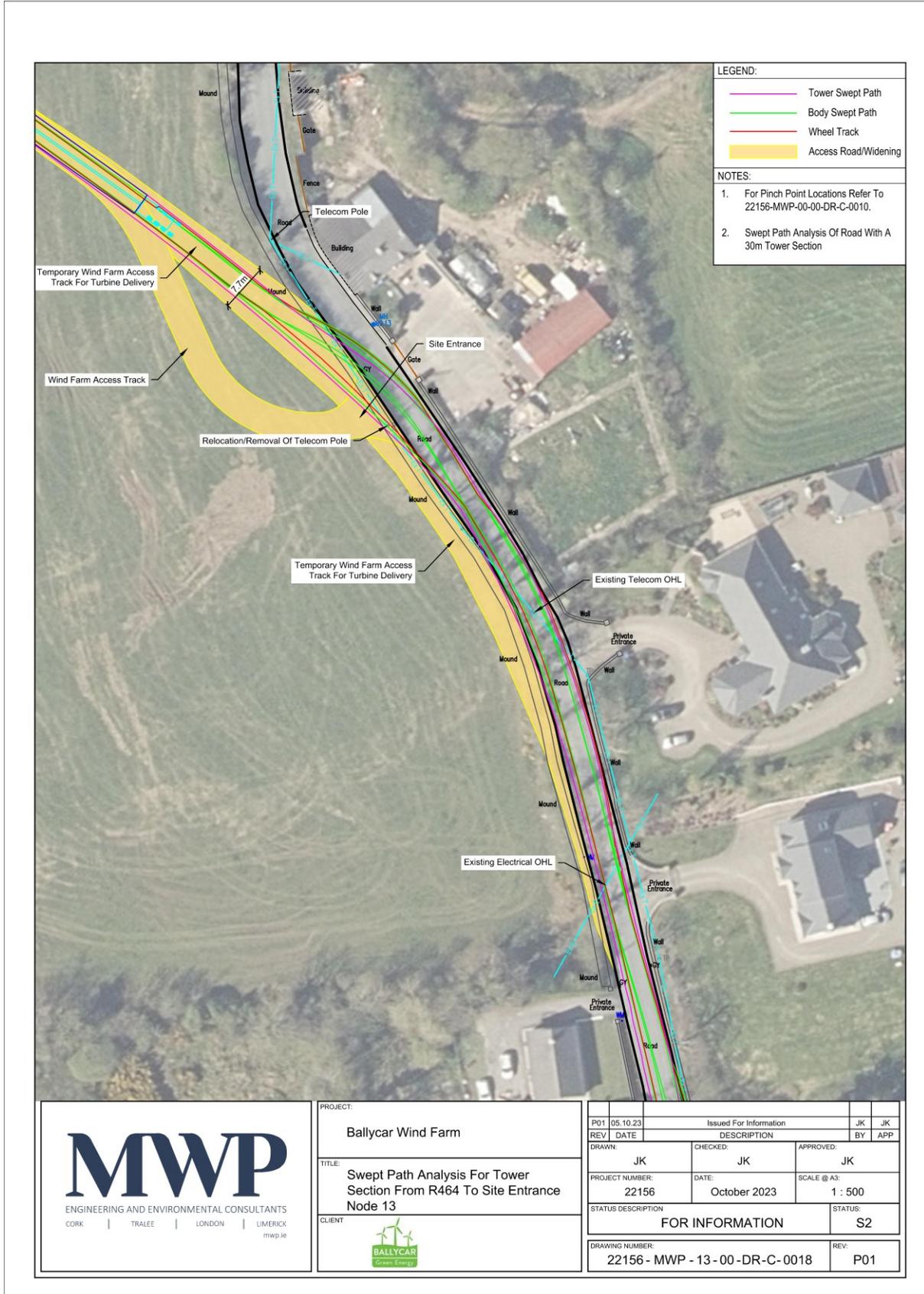


Figure 91: Area No. 13 – Tower section delivery – swept path

5 Conclusions

The proposed Wind Turbine Generator (WTG) component delivery route from the port at Foynes County Limerick to the Ballycar Wind Farm site is feasible for all turbine components for the type of turbine envisaged.

The route from Foynes Port to the N18 has already been proven by the successful delivery of Vestas V136 turbines to Cloncreen Wind Farm in County Offaly. However, the bottom tower sections and the nacelles may be too high to go through the Limerick Tunnel and would require delivery via the Shannon Bridge in Limerick City. This route has also been assessed and found to be feasible.

Two options were assessed in terms of transporting turbine blades through Limerick City. Option 1 assessed the route starting from Clonmacken Roundabout via the new Coonagh to Knockalisheen Distributor Road, where works have temporarily ceased, however are due to recommence in Spring 2024. This route is considered suitable for deliveries.

Option 2 assessed the route from Clonmacken Roundabout and travelling through the Clonmacken Road, Northern Ring Road, Cratloe Road and Kileely Road. This route is considered suitable for deliveries. Using the blade lifter trailer, temporary road widening will not be required at the Cratloe / Kileely Road junction. Temporary removal of street furniture and light poles will be required at several junctions.

The junction of the L-3056 / R464 at Parteen requires temporary road widening through third party land to the southeast of the junction. A blade lifter trailer will be utilised at this junction to minimise the scale of widening required.

The local road from the R464 at Parteen to Ballycar is considered feasible for delivery and appears to meet minimum road width requirements for turbine delivery due to the road being used as a haul route for a nearby quarry. No temporary road widenings will be required along the local road to facilitate delivery of blades as a blade lifter trailer will be utilised.

6 Recommendations

It is recommended that the following be carried out post-consent:

- A schedule of street furniture alterations should be compiled and formally agreed with the relevant local authorities and Transport Infrastructure Ireland (TII) for the chosen delivery route.
- Consultation with all relevant local authorities and An Garda Síochána regarding possible traffic restrictions when transporting components.
- A utility survey should be completed along the selected delivery route to confirm the clearance requirements for turbine components which should include public streetlights, telephone poles and overhead lines. Consultation should be made with Eir and ESB Networks regarding temporary removal of their services during delivery where required.
- Further analysis should be undertaken of the Coonagh to Knockalisheen Distributor Road when this road and its roundabouts are fully constructed. This analysis should determine if street furniture or lamp posts require removal and assess the vertical profile for the new railway bridge along the Knockalisheen Road to ensure grounding of long delivery loads will not occur.



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