APPENDIX 4

Crudine Ridge Wind Farm Route Survey and Upgrade Assessment

Downer Infrastructure

CRUDINE RIDGE WIND FARM

ROUTE SURVEY AND UPGRADE ASSESSMENT

13/11/2013

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Glossary

POI	Port of Import
WTG	Wind Turbine Generator
AHD	Australian Height Datum
NSW	New South Wales
LHS	Left Hand Side
RHS	Right Hand Side
km	Kilometre
WP/CWP	Wind Prospect/Continental Wind Partners

1 Introduction

1.1 Purpose of this report

Downer Infrastructure has been commissioned by Wind Prospect/Continental Wind Partners to prepare a heavy haulage route survey and assessment of upgrades required for the Crudine Ridge Wind Farm (CRWF).

The route survey and upgrade assessment has been carried out between Downer and Rex J Andrews Engineered Transportation Pty. Ltd. to ascertain the requirements needed to bring the Wind Turbine Generator (WTG) components from Port of Import (POI) to the Project Site.

This report was commissioned in light of feedback received regarding the heavy haulage transport route initially proposed for construction of CRWF. As well as assessing all possible heavy haulage routes to the site, and identifying and costing the most feasible route, it was requested that a route survey and upgrade assessment of the Hill End / Windeyer / Pyramul Road route (initially proposed) also be undertaken.

All routes assessed to date are detailed in this report.

1.2 Downer and Rex J Andrews

Downer is one Australasia's largest engineering companies with assets of AUD 5 billion and an annual turnover in excess of AUD 8.5 billion. Downer EDI is ranked in the top 100 ASX listed companies and employs more than 23,000 people across 400 sites globally.

Downer is unique for its diverse capabilities and comprehensive engineering services delivered across a wide range of markets and geographies, including the oil, gas and petrochemical industry sector. Downer has been one of Australia's leading service providers to the energy industry for more than 50 years.

Downer has obtained market leadership in the wind energy industry through providing quality on time projects, innovative designs and construction methods with a strong engineering base which has provided repeat business with key clients.

We have been involved in the Balance of Plant (BOP) electrical and civil contracting works for 12 Australian wind farms which are presently either operating or under construction. These projects represent a combined maximum installed capacity of over 1200MW.

Rex J Andrews P/L has been completing projects across Australia for over 24 years, we have gained significant experience in that time to ensure we can offer you the best solution to your transport, storage and erection needs. Rex J Andrews can manage the logistics of any movement both here and to or from overseas.

To date Rex J Andrews P/L has moved over 1000 Wind Turbines / Power Plants, 3000 T-Roth Concrete Girders and 50 HV Transformers over 200MVA.

1.3 Port Of Import

The Port of Newcastle has been chosen as preferred Port of Import for the WTG components in preference to Port Kembla due to its proximity to site, and its relatively few oversize/ over dimension vehicle travel restrictions.

1.4 Assumptions

For the purpose of the route survey we have based the swept paths on a scenario utilising approximately 60 metre blades and assuming a rear overhang of 12 metres. This choice was made based on the availability of component dimension data.

1.5 Site Location

The Crudine Ridge Wind Farm is situated 45 km south of Mudgee and 45 km north of Bathurst, New South Wales (NSW) and is located in the Bathurst and Mid-Western Regional Council areas. The ridgeline is of moderate-to-high elevation (890 to 1,000 m above sea level) Australian Height Datum (AHD).

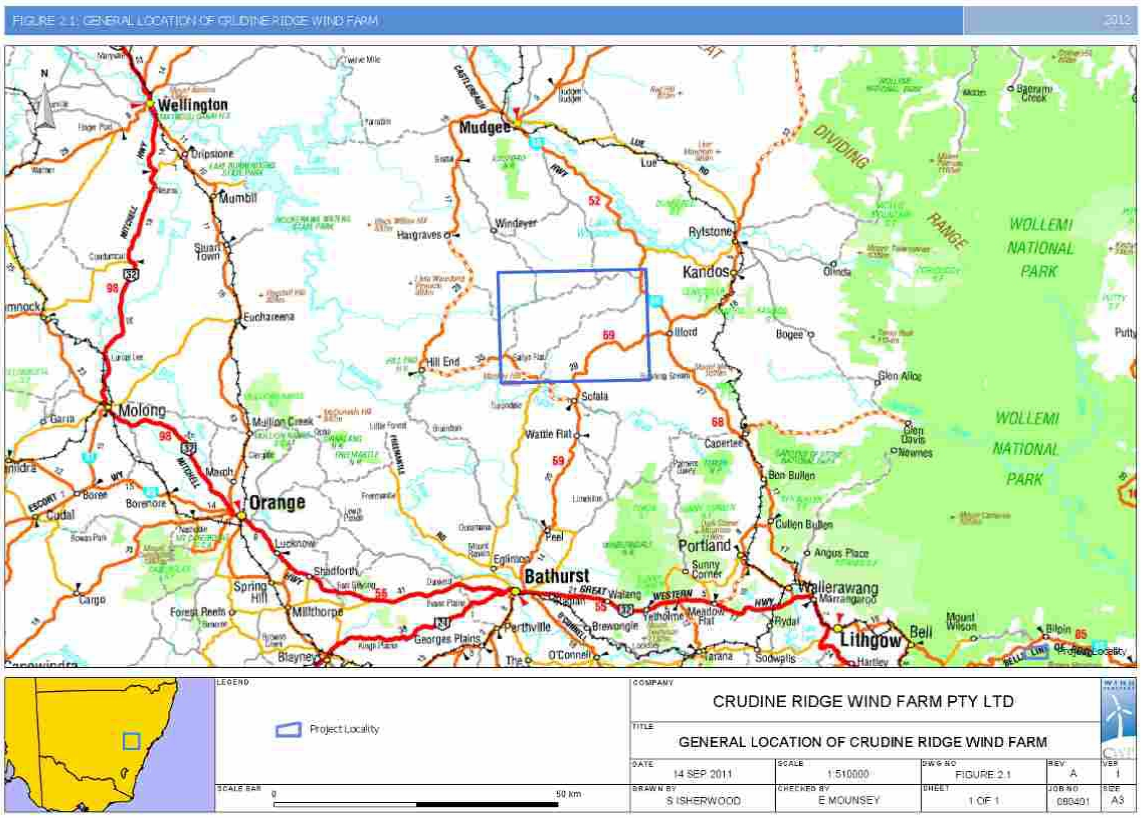
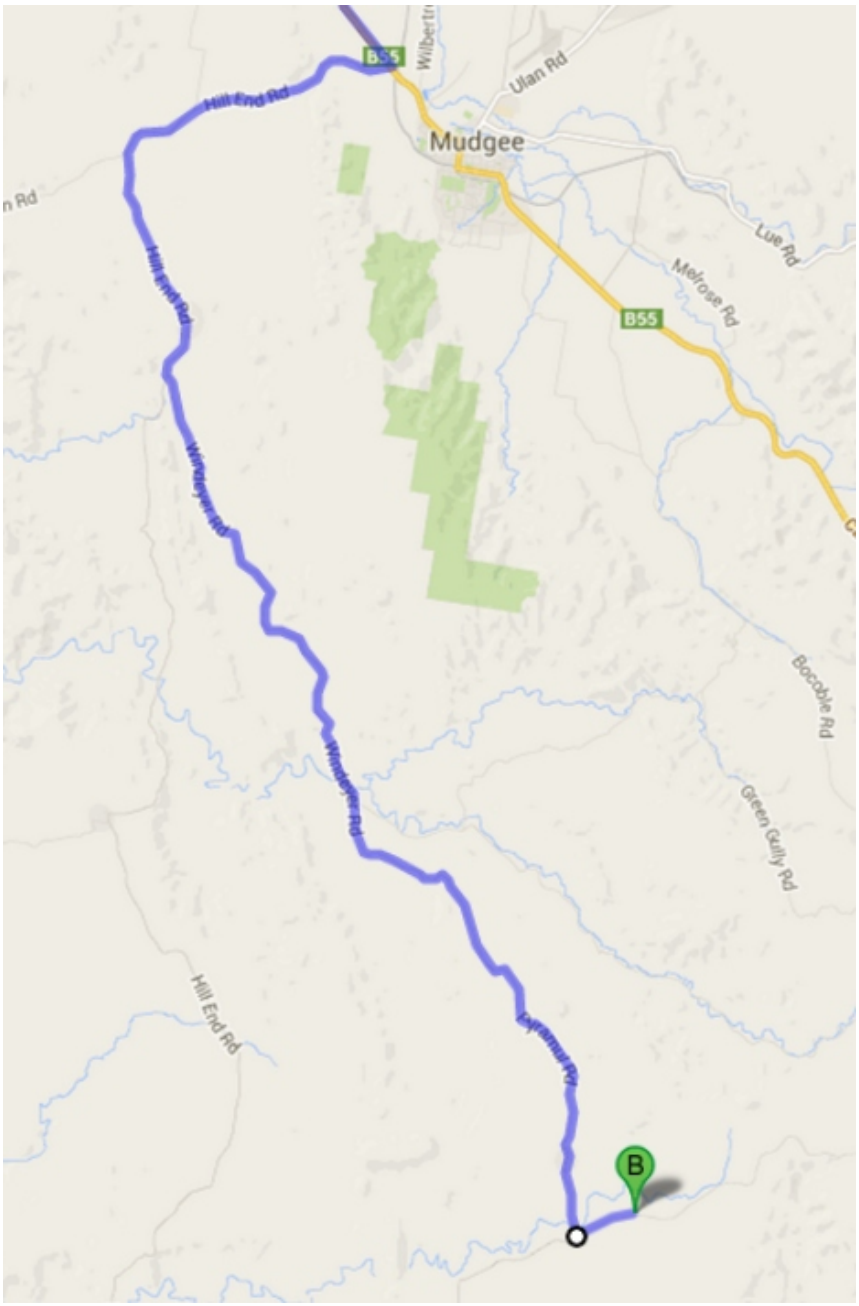


Figure 1 Site Location

1.6 Review of Original Heavy Haulage Route (via Castlereagh Highway, Hill End Road, Windeyer / Pyramul Roads)

Length of route: 406 km

Route: Selwyn Street, George Street, Industrial Drive, Maitland road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Castlereagh Highway, Medley Street, Castlereagh Highway, Hill End Road, Windeyer Road, Pyramul Road, Aarons Pass Road.

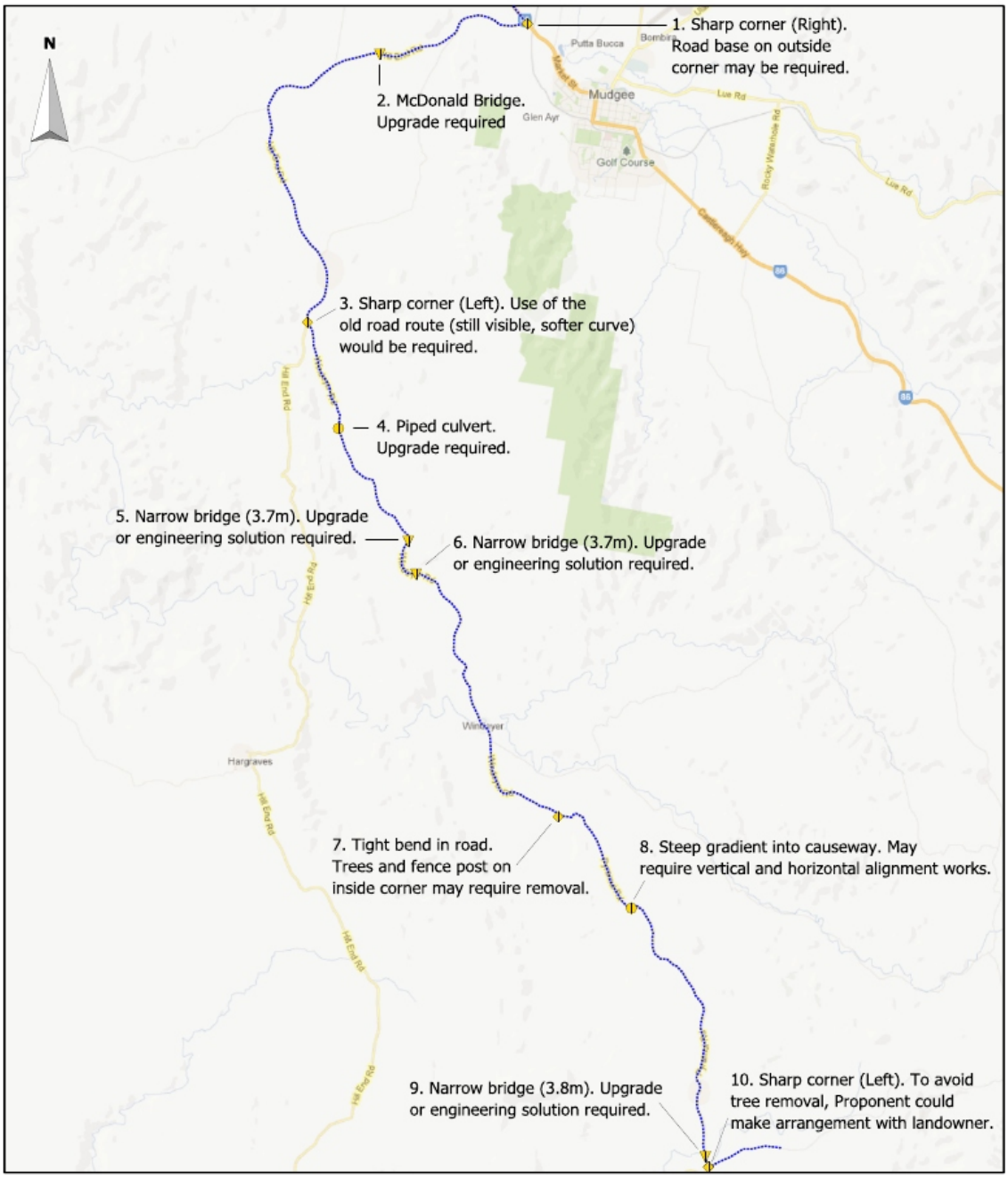


A route survey of these roads undertaken on 23 September 2013 identified three narrow bridges, a bridge and piped culvert with insufficient weight bearing capacity, and a causeway with a sharp vertical curve (see figure below). These features would require significant upgrades prior to construction, including:

- Full upgrade of four bridges
- Full upgrade of a piped culvert
- Works on the right turn off the Castlereagh Highway onto Hill End Road, and the left turn off Pyramul Road onto Aarons Pass Road to accommodate vehicle turning arcs
- Works at a number of locations to allow for the tail swing of vehicles carrying blades

Issues that were identified with using this route are twofold. Significant upgrades to Hill End and Windeyer Roads would close the roads for periods of time before vehicles starting using the route. Once upgrades have been undertaken, given the narrow carriageway of the route, significant delays are likely to be experienced by local traffic, with few opportunities to pass Project traffic. It was estimated that it could take heavy haulage vehicles up to four hours to travel from Hill End Road to the Project site.

A subsequent meeting with MWRC staff and engineers was arranged to discuss the route survey. Discussions covered potential upgrade requirements, costs and delays. A map (below) detailing the critical upgrade points was later provided, in order for MWRC to re-consider costs of upgrade.



LEGEND **Potential Upgrades Identified** Bridge Corner / Bend in road Culvert / Causeway Background Imagery: Google Earth; All other data: Google Maps, WPCWP	COMPANY CRUDINE RIDGE WIND FARM PTY LTD				WIND PROSPECT CWP
	TITLE POTENTIAL WORKS REQUIRED ON HILL END RD & WINDEYER / PYRAMUL RD				
	DATE 26 SEP 2013	SCALE 1:200000	DWG NO CRU143	REV A	VER 1
SCALE BAR 0 10 km	DRAWN BY S ISHERWOOD	CHECKED BY E MOUNSEY	SHEET 1 OF 1	JOB NO 080401	SIZE A4

2 Heavy Haulage Route Survey Newcastle Port to Aarons Pass Road / Castlereagh Highway Intersection

Length of Route: 411 km

Route: Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Castlereagh Highway, Goolma Road, Guntawang Road, Castlereagh Highway, (Mudgee bypass- Douro Street, Horatio Street), Castlereagh Highway, Aarons Pass Road.

2.1- 0.0 km Mayfield #4 Berth and Storage Area.

The ideal port for discharge would be the Mayfield berth #4. This port is situated in Newcastle harbour, and has road access via Selwyn Street Mayfield.

This berth currently handles the largest sections of items that are currently taken by road to Kooragang Island.

We see no problems with wind turbines exiting the port.

Mayfield also has suitable port storage of approx. 20,000 s/q metres adjacent to the port.

There is also another storage alternative further west on Selwyn Street, located in the old BHP administration area.

BHP old administrations building car park (secondary storage option).

2.2 – 0.2 km: Mayfield port access road onto Selwyn Street.

This is a large right hand corner that allows blades of up to 60 metres to be removed from the port.

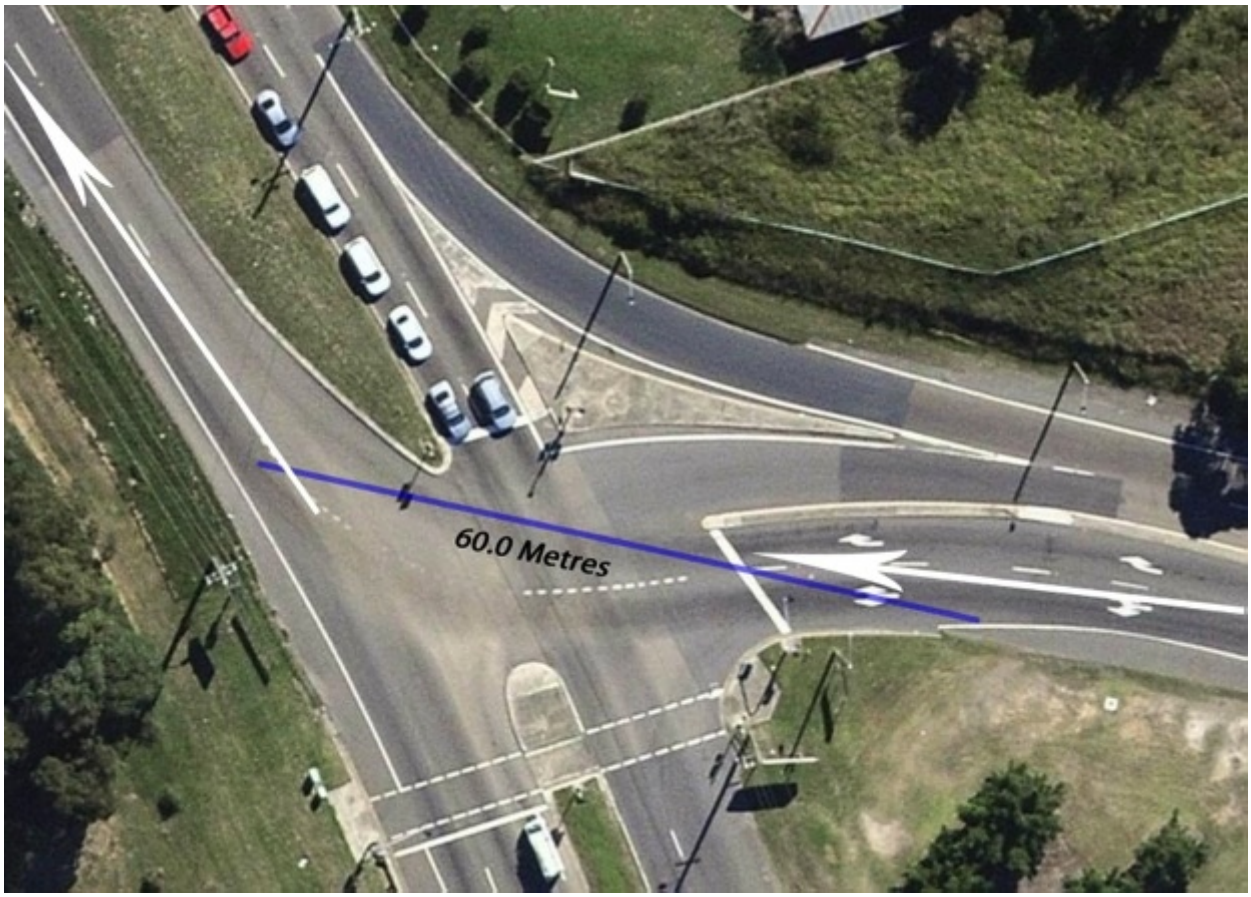
2.3 – 1.3 km: Selwyn Street onto George, than Industrial drive.

We have surveyed this corner, and believe that a maximum of 60 metre blades could stay on the correct side of the turns.

We cannot see any problems with these turns.

Once onto Industrial drive, the road maintains dual carriageway through to Maitland road.

2.4 – 5.5 km: Industrial Drive onto Maitland Road



This corner will accommodate blades at 60 metres.

We cannot see any problems with this turn.

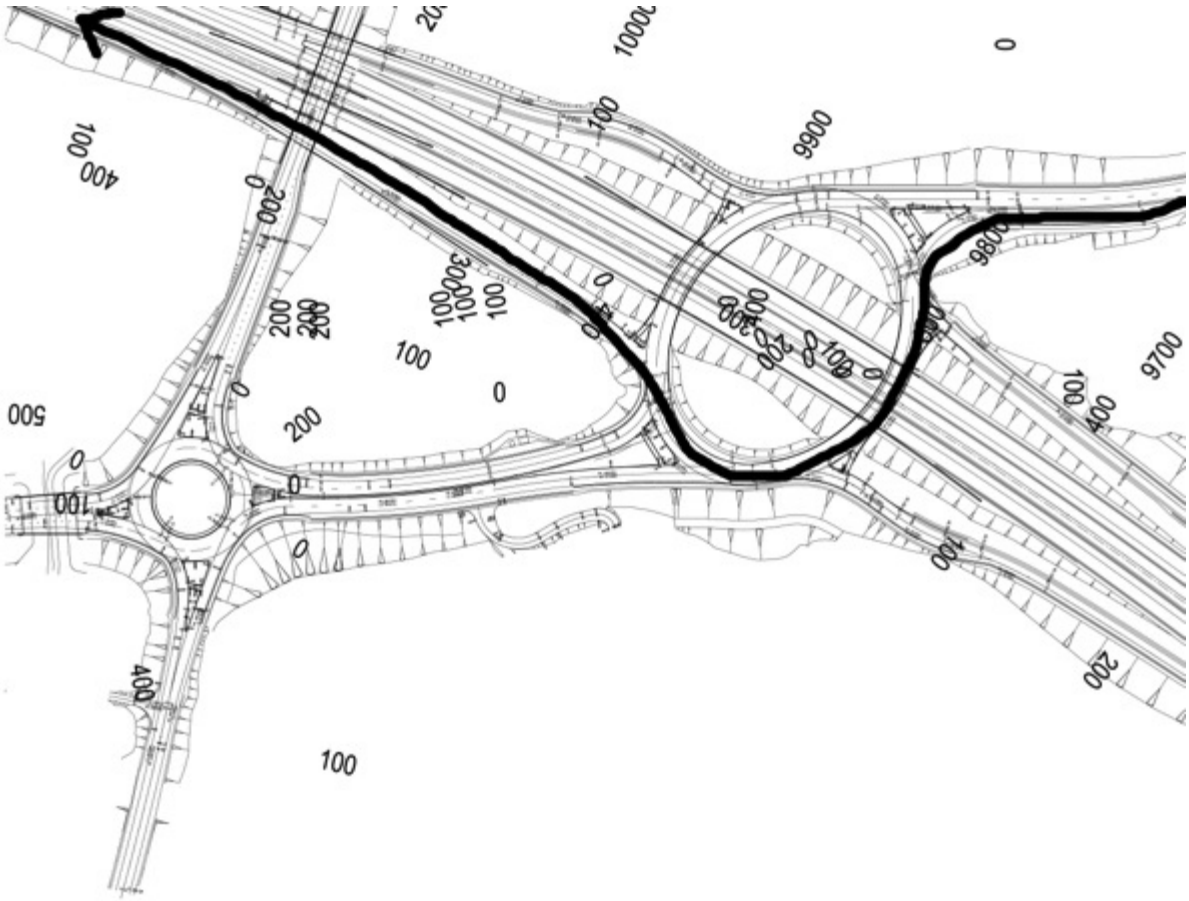
Once through the corner, the road will maintain dual carriageway through to John Renshaw drive roundabout. During this section Maitland road merges with the New England Highway, then John Renshaw Drive.

2.5 – 18.6 km John Renshaw Drive roundabout at Beresfield.

The approach and exit of this roundabout is dual carriageway, the blades at 60 metres will travel over the edge of the roundabout. There are reflective signs on the edge of the roundabout at 800mm high. Depending on the make of blade, the reflectors may need to be made removable or moved back into the roundabout.

A 55 metre blade would make this turn without any restrictions.

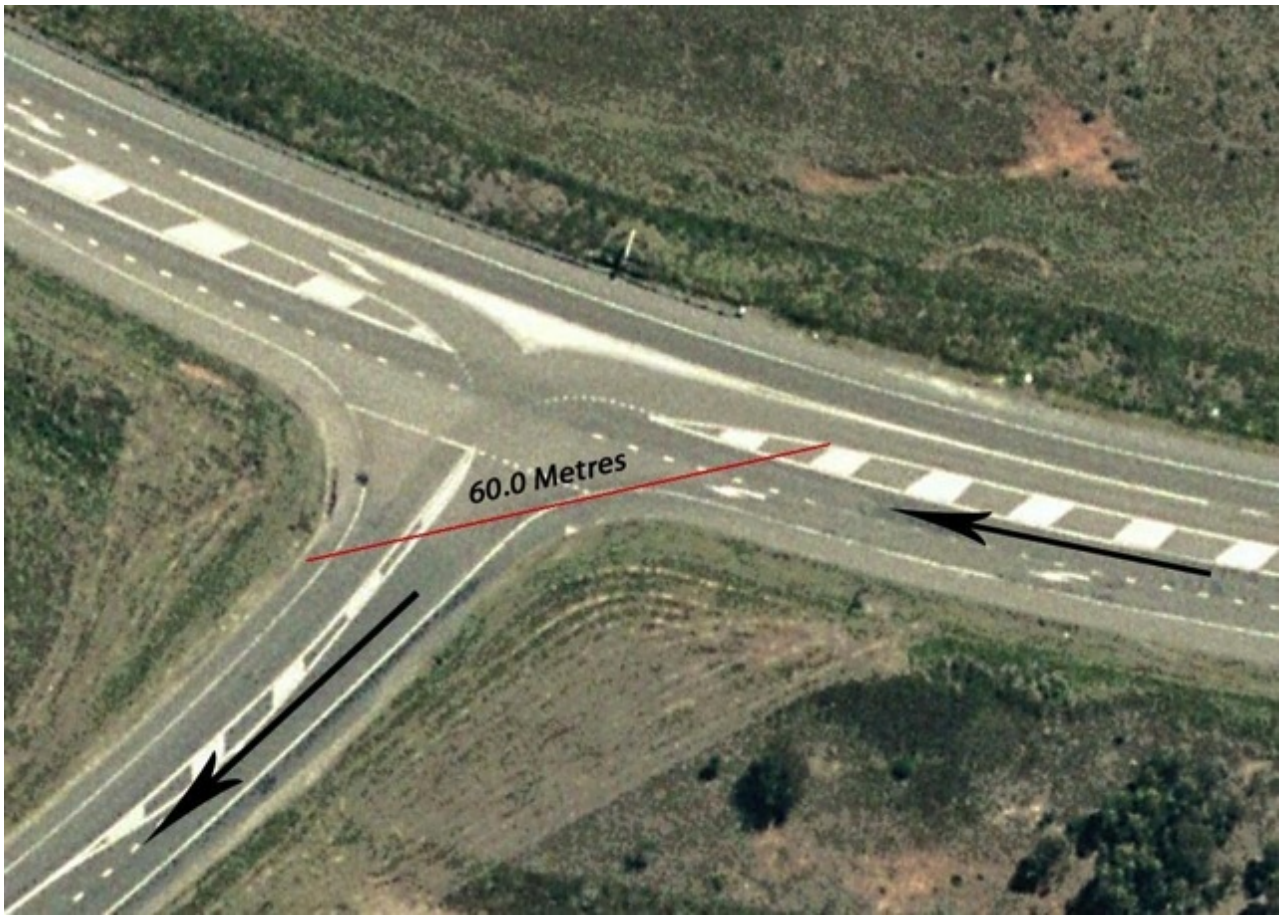
2.6 - 28.9 km: John Renshaw Drive onto the Hunter Expressway.



After reviewing the route through Maitland, and encountering large volumes of traffic, and roundabouts on that section of road that would need modifications, we have decided that utilising the near complete Hunter expressway would be preferred. We have acquired design drawings of the Buchanan interchange and can suggest that blades of up to 60 metres could use this section of road without any problems.

Once onto the Hunter expressway, the road is of dual carriageway through to the New England Highway where it merges at Branxton.

2.7 – 65.2 km: New England highway onto Golden highway.



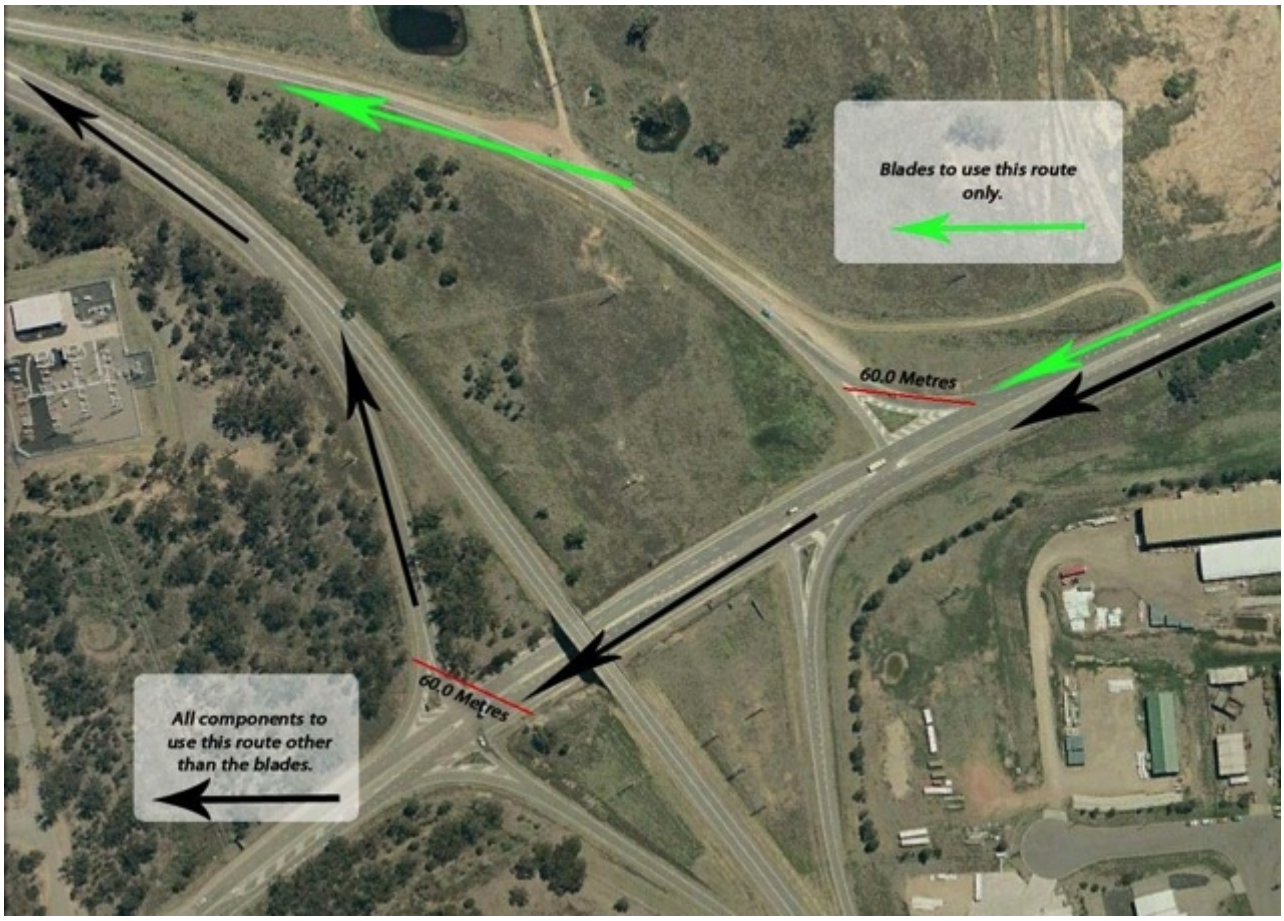
This is a large left hand corner that poses no problems.

Once onto the Golden highway, the road will predominately be single lane to the Crudine Ridge Wind Farm. However there are some overtaking lanes, and pullover bays to allow built up traffic to safely pass.

2.8 – 75.2 km: Golden Highway merge with the Putty Road.

The give way sign on this corner will need to be removed for the blade movements. Otherwise this corner poses no problems.

2.9 – 78.6 km: Golden Highway turnoff at Mt. Thorley.



There are two routes required for this section of road.

All components other than the blades, will need to go under the overpass and turn right onto the slip road. Once onto the slip road the road merges with the Golden Highway.

The blades will need to use the eastbound slip lane to merge back onto the Golden Highway. This procedure would require traffic management to cross onto the wrong side of the road. Once past the slip road vehicles would merge back onto the Golden Highway.

Once onto the Golden Highway the road is single lane to Jerrys Plains.

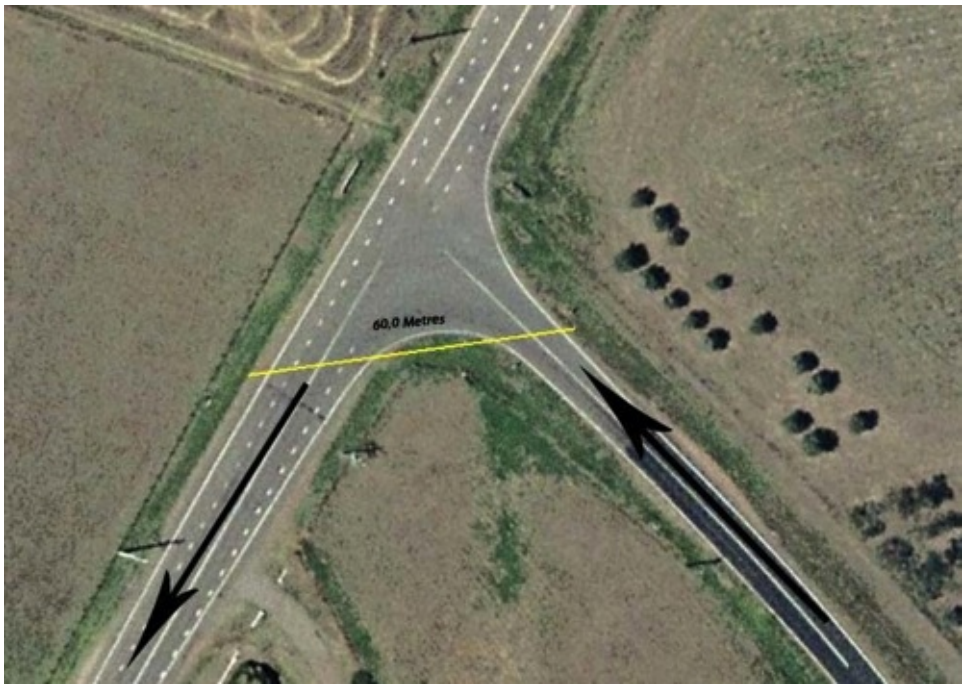
2.10 – 105 km: Jerrys Plains.

There are two corners in this town. Traffic management would be required to stop traffic on the west side of town to allow the OD/OS loads to use the majority of the road through these corners.

Vehicles carrying 60 metre blades would pass through these corners unrestricted.

Once through Jerrys Plains, the road will cross over two steep mountain ranges. These are Arrowfield Hill and Ogilvie's Hill. At each of these hills some traffic management would be required to slow or stop traffic. After these two hills there are no problems through to Denman Road.

2.11 – 130.0 km: Golden Highway left turn at the intersection of Denman Road.



This section of road may require the giveaway sign on the LHS to be made removable. This will affect the tail swing of the blades. Other than the sign, vehicles carrying the 60 metre blades would be okay on this turn.

2.12 – 133.0 km: Right hand turn at Denman.

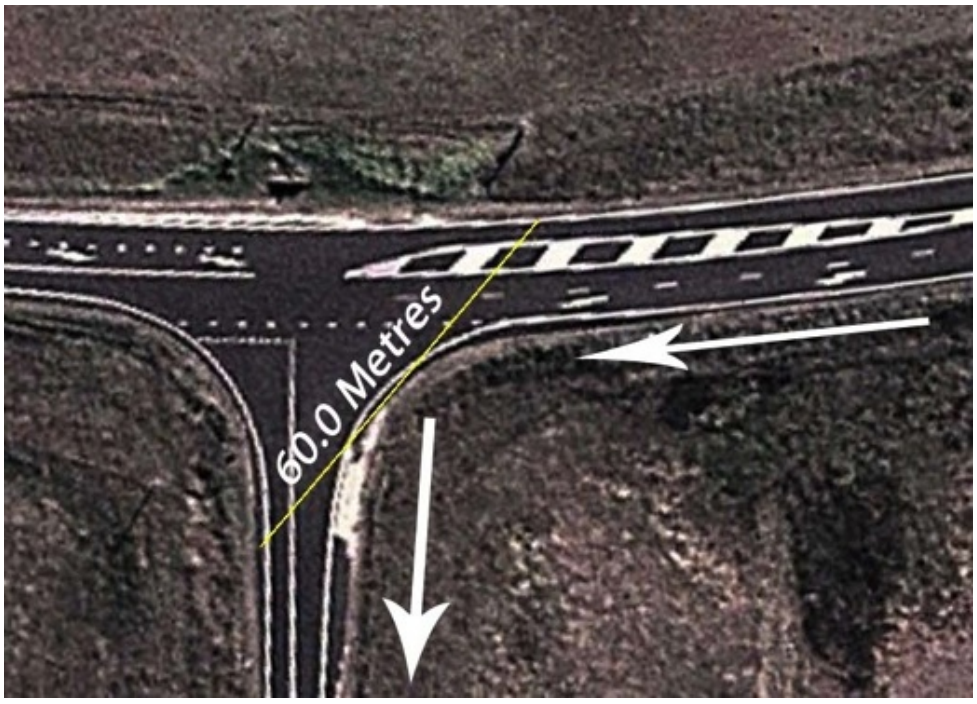
This section of road would require vehicles carrying the blades and towers to cut-off the corner, under traffic management. Vehicles with loads of up to 60 metres would then be able to use the corner without restrictions.

2.13 – 135.0 km: Denman rail crossing.

It is the transport company's requirement to produce a rail management plan, and possibly employ Rail protection officers to gain approval for us to safely traverse this rail crossing.

Once through this crossing, vehicles will pass through the townships of Sandy Hollow and Merriwa. There is parking and services in these two towns. The road is mostly single lane with no corners until the Castlereagh Highway turnoff.

2.14 – 280 km Golden Highway onto the Castlereagh Highway.



The give way sign on the inside of the corner will need to be made removable. Vehicles carrying blades up to 60 metres will then be able to use the corner. Traffic management will be required. Once vehicles are through the corner, they will travel on a single lane road through to Mudgee.

2.15 – 290 km: Birriwa rail crossing.

It is the transport company's requirement to produce a rail management plan, and possibly employ Rail protection officers to gain approval for us to safely traverse this rail crossing.

Once through this crossing, the load will travel onto Gulgong. This section of road will be single lane road.

2.16 – 323.2 km: Gulgong.

Once we arrive at Gulgong, there is a large sweeping right hand bend on the north side of town. This corner has no problems.

There are two options for OD/OS vehicles through Gulgong; the Medley Street option, and the Goolma Road option.

2.17 – 324 km: Castlereagh Highway intersection with Medley Street at Gulgong (Medley Street Option).

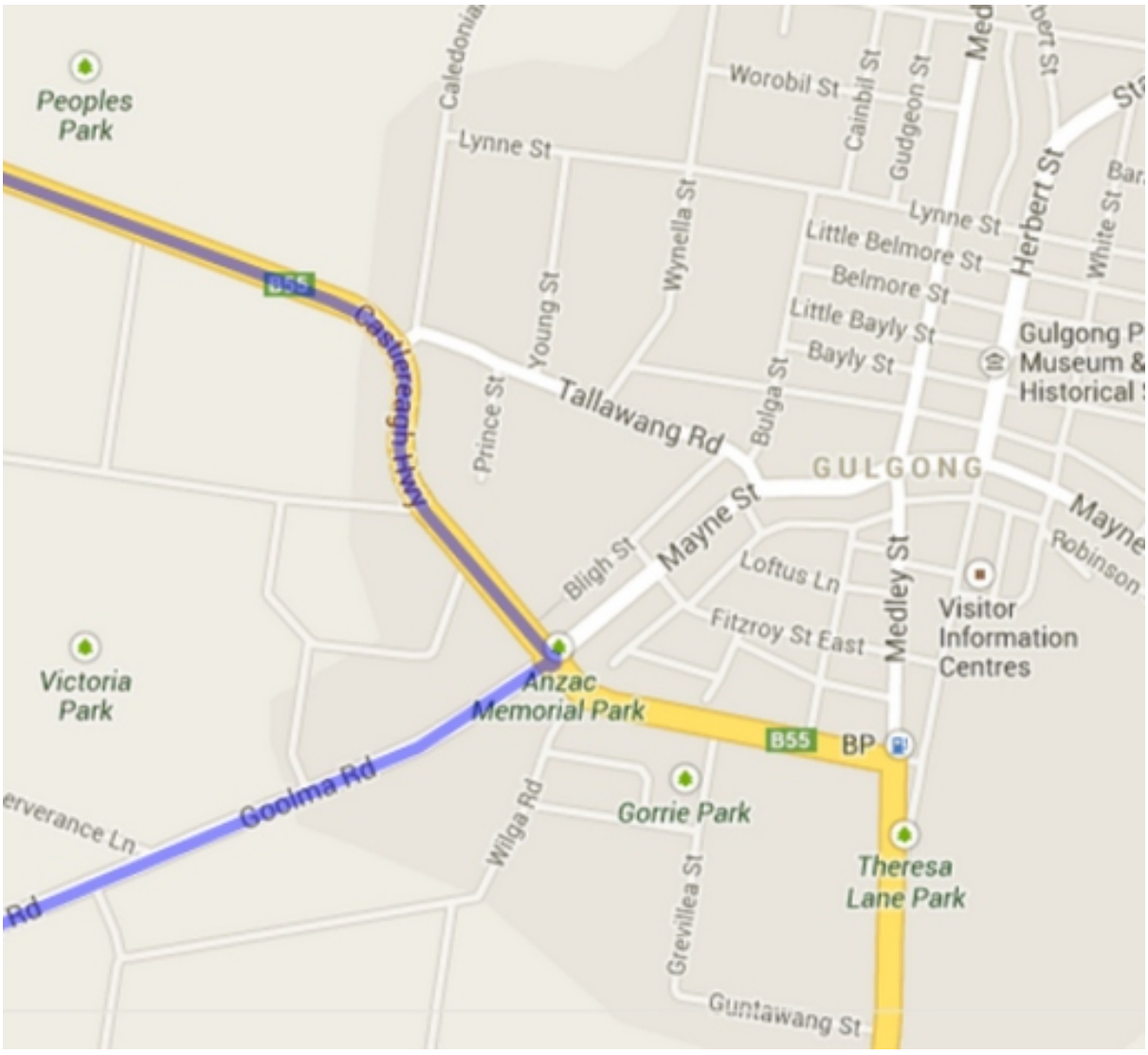
From the right bend coming into Gulgong, 200 metres further on vehicles proceed through the roundabout. There are no obstructions on this roundabout.

Once through the roundabout vehicles travel a further 200 metres to the Medley Street intersection.

Other than the corner at 324km (see below), no other road upgrades should be required with respect to the type of loads proposed for the wind farm along this route.

This corner is the tightest corner so far in the journey. The inside of the corner has two signs that would need to be made removable. There is also a guardrail that may need temporary removal while the project is being delivered. The corner has a large clear area for the tail swing, but on the exit of the corner the truck would need to stay on the pavement, as there is a sharp bank on the kerb. The inside of the corner would also need some hardstand material, as the blade trailers would track over the kerb. Otherwise all other components would be okay without much more than removable signs.

2.18 – 323 km Castlereagh highway intersection with Goolma Road at Gulgong (Goolma Road Option)



From the right bend coming into Gulgong, 200 metres further on vehicles turn right onto Goolma Road before continuing on to Guntawang Road.

Once through the roundabout vehicles travel along Goolma Road and continue onto Guntawang Road to the intersection with the Castlereagh Highway.

Other than requirements at this corner, no other road upgrades should be required for the route through Gulgong to Mudgee with respect to the type of loads proposed for the wind farm.

There are no problems with the right turn onto Goolma Road for vehicles carrying components other than blades larger than 55 metres. If blades over 55 metres are used, an unused power pole on the inside of the corner may need to be removed and the prime mover would mount the kerb on the left hand side while exiting the turn. Widening the shoulder of the road on the exit of the corner, and use of all weather material may be required.

2.19 – 348 km: Disused Rail line on the Westside of Mudgee.

Rail line is no longer in service. No requirement on this crossing.

2.20 – ROUTE 1 350.0 km: Mudgee (via Castlereagh Highway)

Via: Market Street, Douro Street, Horatio Street, Sydney Road. (This is the Highway route).

This route would be the first choice to pass through Mudgee.

However the route itself has two tight corners that would not accommodate blades over 50 metres. All other components would use this route with some minor alterations required.

2.21 – 351.0 km: Castlereagh Highway & Douro Street Intersection at Mudgee.

This corner has two sets of signs that would need to be made removable. At the base of each set of signs there is a median strip with a pedestrian cut-out. This cut-out may cause damage to the trailers if they try to mount the median strip. As a consequence, it is recommended that an alternative route for vehicles carrying blades is used. Vehicles carrying all other components could still use this corner, and would only need removable signs.

2.22- 351.5 km: Douro Street school zone in Mudgee.

This section of road travels past Mudgee High and Primary Schools. The road is generally good at 5 metres minimum width past the crossings.

We would recommend that no travel to take place between 8.00am to 9.30 am & 2.30pm till 4.00pm, Monday till Friday during school terms, on this section of road.

2.23 – 352 km: Douro Street onto Horatio Street at Mudgee.

This corner (turning from the correct side of the median) allows vehicles with loads of up to a maximum of 50 metres in length. Traffic management would be required on all corners, and a no parking section of road would be required on the exit of the corner.

2.24 - 353 km: Horatio Street roundabout at Mudgee.

The components will head east on Horatio Street through this roundabout, with clearance for vehicles carrying blades of up to 60 metres without any obstacles.

2.25 – 354 km: Horatio Street onto Sydney Road Mudgee.

There are no issues negotiating this turn, as trailers with the longest loads are steerable.

2.26 – 355 km: Disused Rail line on the Eastside of Mudgee.

Rail line is no longer in service. No management requirement on this crossing.

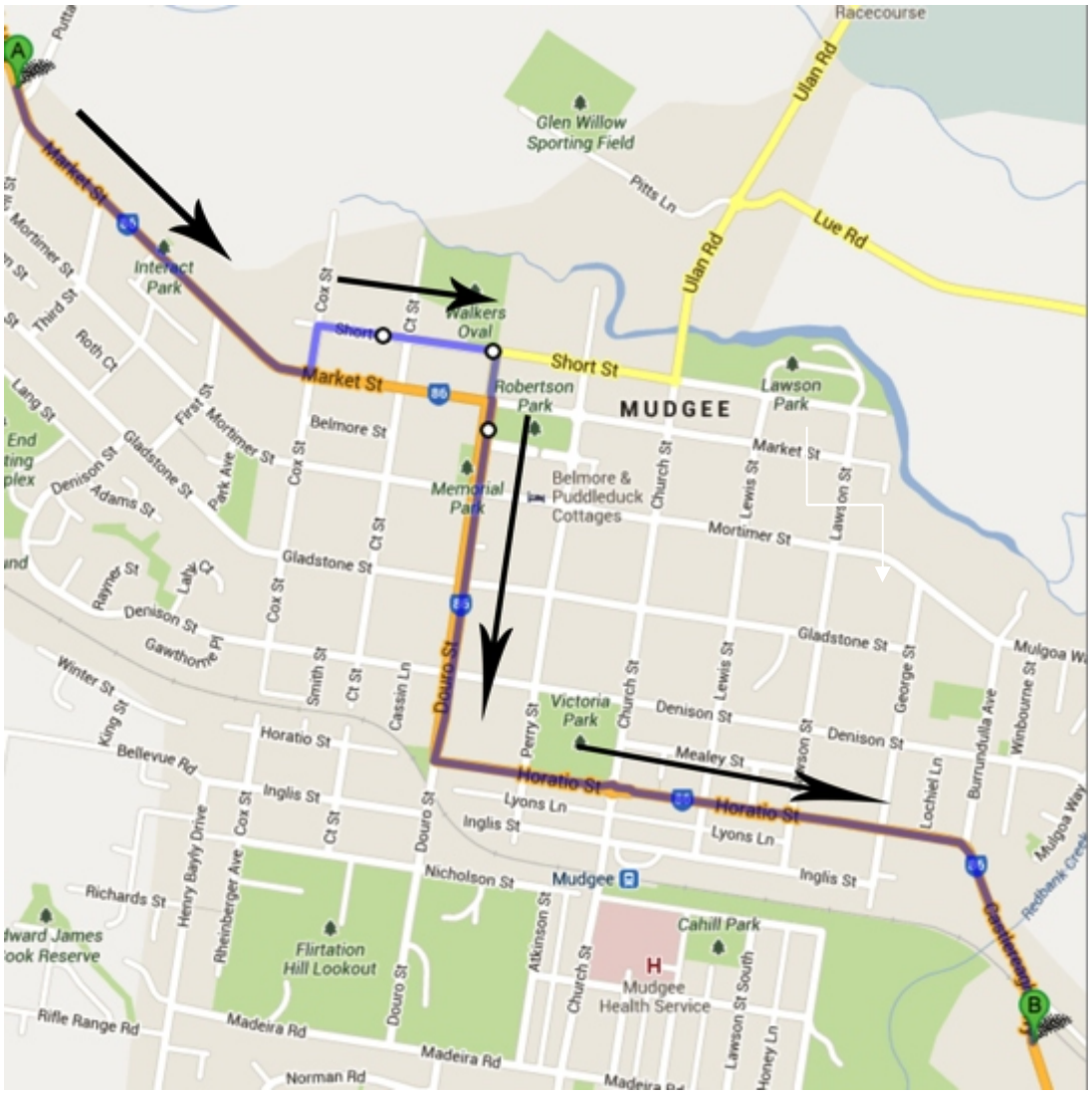
Once past the crossing, the Sydney road is renamed again to the Castlereagh Highway. This section of road is predominantly single lane, with some overtaking lanes past Windamere Dam, and again leading up to Aarons Pass Road.

2.27 – 394 km: Castlereagh highway onto Aarons Pass road.

This section of road has a large corner that can handle vehicles carrying blades up to 60 metres long. The signs on the inside of the corner would need to be repositioned approx. 2 metres back from the intersection. The corner, however, is on the top of a peak, and vision to the intersection is limited to 150 metres in either direction. We would recommend traffic management at this intersection.

2.28 – 350.0 km: ROUTE 1a through Mudgee (via Castlereagh Highway, 60 Metre Blade alternative)

Via: Market Street, Cox Street, Short Street, Douro Street, Horatio Street, Sydney Road. (This route deviates off the highway for approx 1 kilometre).



This route would be an option for vehicles carrying blades up to 60 metre in length. However this route does contain light limit roads, and would require Mid Western Regional Council approval. However, over-dimensional vehicles carrying blades are designed to minimise the impacts of loads on road infrastructure, through the use of multiple axles and wheels. These generally have gross weights of between 6.5 and 8.5 tonnes per axle. Road pavement conditions were assessed as suitable for the loads proposed. This route would also require traffic management.

2.29 – 350.5 km: Market Street onto Cox Street.

This is a large corner that poses no problems. It is proposed that vehicles carrying loads up to 60 metres would take no longer than one minute to navigate this corner.

2.30 – 351 km: Cox Street onto Short Street.

This corner may require some branches removed from a tree on the LHS, where the blades enter the corner. Some no parking signs would need to be placed on the entrance and exit of the corner. As with the preceding corner, it is proposed that vehicles carrying loads up to 60 metres would take no longer than one minute to navigate this corner.

2.31 – 351.3 km: Short Street onto Douro Street.

This corner would require no parking placed at the entrance and exit of the corner.

2.32 – 352 km: Douro Street roundabout.

Travel straight through the roundabout without any problems.

2.33 – 353 km: Duoro Street onto Horatio Street.

Using this route poses a new problem where the vehicles carrying blades up to 60 metres need to turn from the wrong side of Duoro Street onto Horatio Street. To do this the vehicles carrying blades would need to cross to the incorrect side opposite Denison Street. The blades would than travel up to the intersection with Horatio Street, where there is sufficient clearance to get the 60 metre blades around the corner.

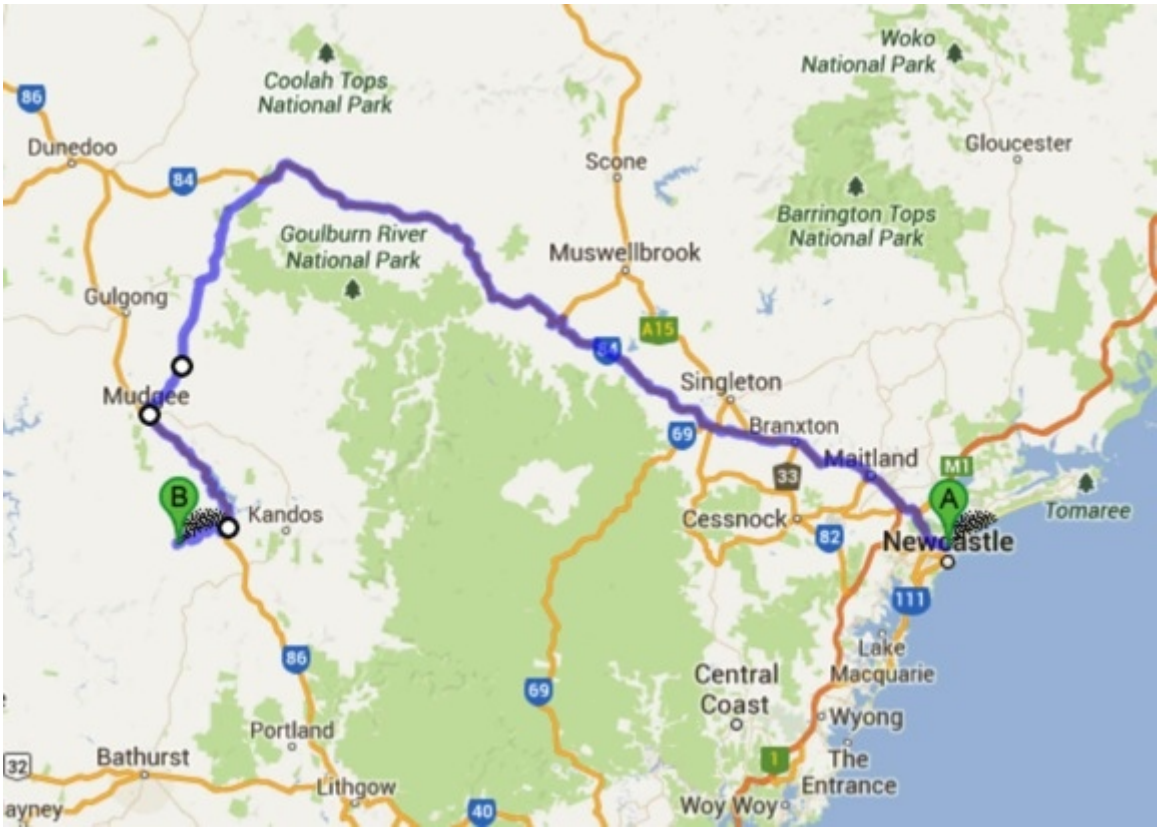
However some no parking zones may be required on the entrance and exit of the turn.

Traffic management would need to be set up in three points, and the operation would take approx five minutes.

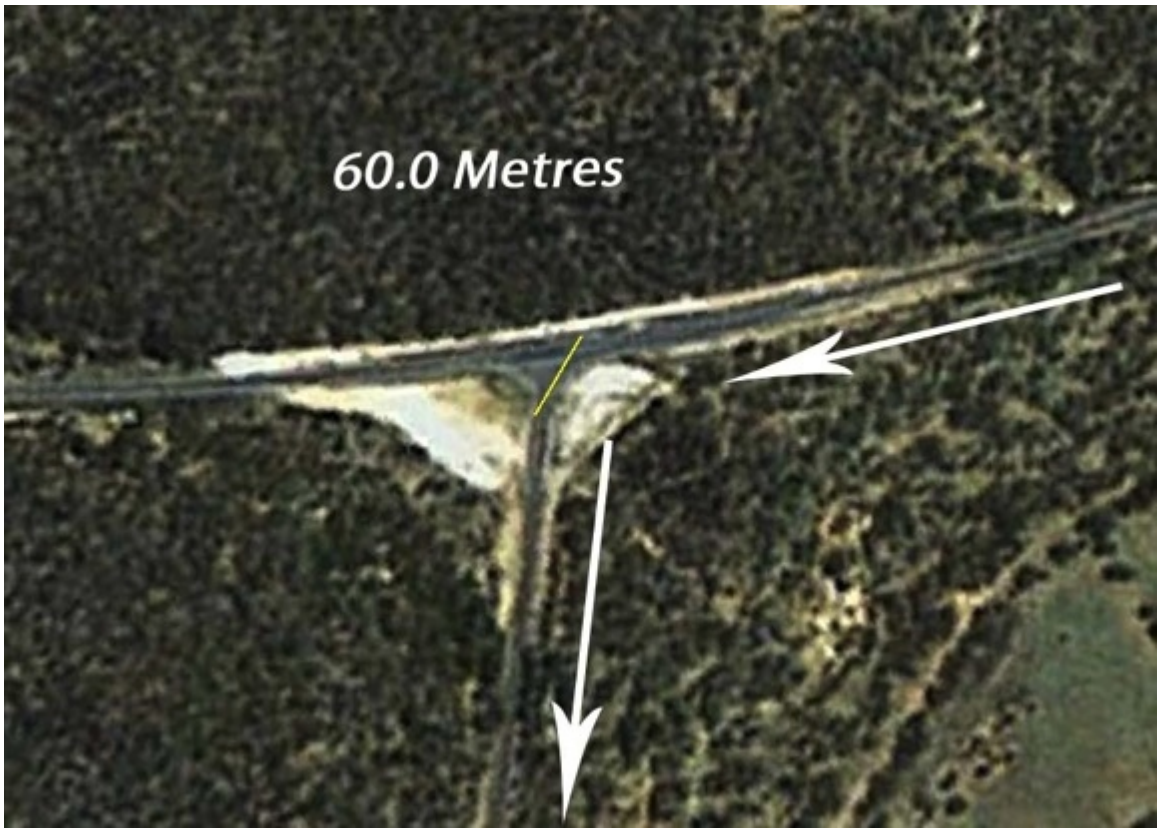
Once back onto Horatio Street, the blades would than return to the main route.

2.34 – ROUTE 1b 366 km: (via Ulan Road, 60 metre blade alternative)

Route: Selwyn Street, George St, Industrial drive, Maitland road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Ulan Road, (Mudgee bypass- Church Street, Short Street, Lawson Street, Horatio Street, Sydney Road) Castlereagh Highway, Aarons pass. This route is an alternate route to the Castlereagh Highway, and is approx 45 kilometres shorter.



2.35 – 234 km: Castlereagh Highway onto Ulan Road.



After following the same route as the main survey to 234 km mark, vehicles make a left hand turn onto the Ulan road. This is a large turn with no restrictions. Once onto this section of road vehicles will travel for 71 kilometres on the single lane road.

2.36 – 305 km: Ulan road (Church Street) onto Short Street.

Once vehicles carrying blades arrive at Mudgee, they will cross over the Cudgegong river, then immediately turn left into Short Street. This is a large corner with no restrictions. Traffic management will be required.

The Cudgegong river bridge is owned by Mid Western Regional Council, and can handle standard axle weights typical of the blades proposed.

2.37 – 306 km: Short Street onto Lawson Street.

The turn from Short onto Lawson Street has clearance to accommodate vehicles carrying blades up to 60 metres. The sign in the centre of the median will need to be made removable, and parking restrictions would need to be placed at the entrance and exit of the corner. This would allow the blades to stay clear of the telegraph pole on the inside of the corner.

2.38 – 307 km: Lawson onto Horatio Street.

The turn from Lawson Street onto Horatio Street has clearance to accommodate vehicles carrying blades up to 60 metres. Parking restrictions would need to be placed at the entrance and exit of the corner. This would allow the blades to stay clear of the telegraph pole on the inside of the corner. Traffic management would be required.

2.39 - ROUTE 2 350.0 km: through Mudgee (via Castlereagh Highway, 60 metre blade alternative)

Via: Market Street, Cox Street, Short Street, Lawson Street, Mortimer Street, Burrundulla Avenue, Sydney Road. (This route deviates off the highway for approx 2.9 kilometre).

This route would be an option for vehicles carrying blades up to 60 metres in length. This route does contain light limit roads, and would require Mid Western Regional Council approval. However, over-dimensional vehicles carrying blades are designed to minimise the impacts of loads on road infrastructure, through the use of multiple axles and wheels. These generally have gross weights of between 6.5 and 8.5 tonnes per axle and as such, should not produce undue stress on road infrastructure. Road pavement conditions were assessed as suitable for the loads proposed. It was determined during the route survey that it would take over-length vehicles approximately 15 minutes to travel through the Mudgee urban area, from the turnoff onto Cox Street to the return to the Castlereagh Highway / Sydney Road, given that each vehicle would require approximately 1 minute to navigate each intersection. Vehicles following this route would be continuously ‘rolling’ and would require traffic management.

2.40 – 350.5 km: Market Street onto Cox Street.

This is a large corner that poses no problems. It is proposed that vehicles carrying loads up to 60 metres would take no longer than one minute to navigate this corner.

2.41 – 351 km: Cox Street onto Short Street.

This corner may require some branches removed from a tree on the LHS, where the blades enter the corner. Some no parking signs would need to be placed on the entrance and exit of the corner. As with the preceding corner, it is proposed that vehicles carrying loads up to 60 metres would take no longer than one minute to navigate this corner.

2.42 – 352.4 km: Short Street onto Lawson Street.

The turn from Short onto Lawson Street has clearance to accommodate vehicles carrying blades up to 60 metres. The sign in the centre of the median will need to be made removable, and parking restrictions would need to be placed at the entrance and exit of the corner. This would allow the blades to stay clear of the telegraph pole on the inside of the corner. As with the preceding corners, it is proposed that vehicles carrying loads up to 60 metres would take no longer than one minute to navigate this corner.

2.43 - 352.8 km: Lawson Street onto Mortimer Street.

The left turn from Lawson onto Mortimer Street has sufficient clearance to accommodate vehicles carrying blades up to 60 metres in length. As with the preceding corners, it is proposed that vehicles carrying loads up to 60 metres would take no longer than one minute to navigate this corner. Some no parking signs would need to be placed on the entrance and exit of the corner.

2.44 - 353.3 km: Mortimer Street onto Burrundulla Avenue.

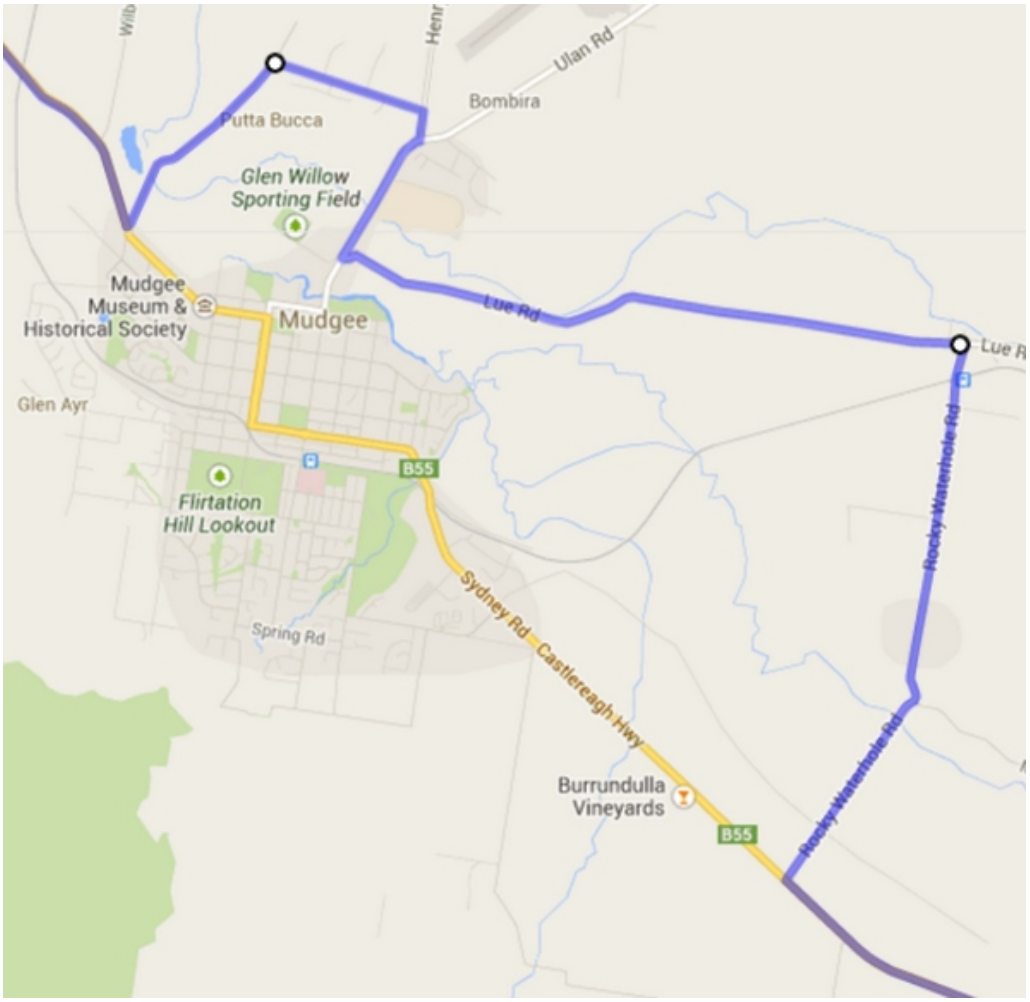
The right turn from Mortimer Street onto Burrundulla Avenue is broad and sweeping, having sufficient clearance to accommodate vehicles carrying blades up to 60 metres in length. As with the preceding corners, it is proposed that vehicles carrying loads up to 60 metres would take no longer than one minute to navigate this corner.

2.45 – 353.8 km: Burrundulla Avenue onto Sydney Road.

Veering from Burrundulla Avenue onto Sydney Road allows vehicles to access Sydney Road without a sharp left turn. There is a slight rise on Burrundulla Avenue and a sign in the median strip that may require being made removable. Traffic management would consist of escorts holding through traffic on the Castlereagh Highway if traffic is too heavy to allow safe passage.

2.46 – ROUTE 3 349 km: Mudgee (via Castlereagh Highway, potential diversion for all components)

Via Putta Bucca Road, Henry Lawson Drive, Ulan Road, Lue Road, Rocky Waterhole Road, Castlereagh Highway



The roads along this route are technically suitable for all vehicles. Three corners would require significant works; the left turn from Ulan onto Lue Road, the right turn from Lue onto Rocky Waterhole Road, and the left turn from Rocky Waterhole Road onto the Castlereagh Highway.

Each corner would require works on the adjacent land to allow for the turning arc of the vehicles. The roundabout at the left turn from Ulan Road onto Lue Road has median strips with pedestrian cut-out. This cut-out may cause damage to the trailers if they try to mount the median strip, and an alternative temporary road may be required. Further, if a temporary road were considered necessary, impacts to the pedestrian walk way and trees lining Ulan road would occur.

Given MWRC's position on traffic impacts on Ulan road, in addition to the issues identified above, we consider this route unsuitable.

3 Heavy Haulage Route Survey and Upgrade Assessment Aarons Pass Road

Route upgrades identified along Aarons Pass Road are detailed in Appendix 1, Figures 1 – 5.

3.1 - Aarons Pass Castlereagh Highway Intersection

Intersection has good turning radius for even the longest component. Line of sight is an issue as you are turning across traffic. Through traffic management this safety issue can be mitigated by escorts stopping oncoming traffic.

3.2 - 0 km

Start of Aarons Pass Road survey.

3.3 - 1.0 km

Remove two trees on RHS and level corner on both sides

3.4 - 2.5 km

Fill and cut to widen on LHS required

3.5 - 2.8 km

Fill and level on outside of corner

3.6 - 3.0 km

Remove approx. two trees on right and level corner

3.7 - 3.1 km

Remove the two trees indicated and level.

3.8 - 3.8 km

Crest of hill needs to suit vertical curve R 200.

3.9 - 3.9 km

Remove approx five trees and level inside of corner.

3.10 - 5.3 km crest

Crest to suit vertical curve R200.

3.11 - 6.6 km

Remove approx. five trees and fill in and level inside of corner. Fence post may need to be moved approx one to two metres.

3.12 - 6.9km

Incline and decline of hill to suit maximum grade 15% crest to suit vertical curve R200.

3.13 - 7.3 km

Fill in RHS of corner to edge of vegetation

3.14 - 7.7 km

Fill in RHS of corner and level camber.

3.15 - 8.1 km

Remove the two trees indicated.

3.16 - 9.1 km

Fill in and level RHS of corner

3.17 - 10.7 km

Remove trees/bushes and fill in inside of corner and extend culvert underneath to suit.

3.18 - 10.9 km

Fill in and level RHS of corner

3.19 - 11 km

Remove trees on inside corner and level, extend culvert underneath to suit.

3.20 - 12.0 km

Remove trees and level RHS of corner

3.21 - 12.5 km

Crest to suit R200.

3.22 - 12.9 km

Level out on RHS. Fill in to level up camber on LHS

3.23 - 13 km

Remove RHS embankment and approx. ten trees. Move fence post. Widen road on LHS as far as possible without tree removal.

3.24 - 13.2 km

Remove approx. fifteen trees and level.

3.25 - 15.3 km

Remove approx. six trees and level corner.

3.26 - 15.4 km

Fill and level corner.

3.27 - 15.7 km

Remove approx. four trees and level inside of corner.

3.28 - 16.0 km culvert

Road and drainage needs widening to at least 6 metres (this is generally the case from this point on to the proposed site entry).

3.29 - 17.3 km

Causeway appears suitable, however maximum axle loading to be determined.

3.30 - 17.9 km causeway

Causeway is founded on poor sub layer will crack under load. Recommend full replacement.

3.31 - 19.2 km causeway

Causeway paving is cracked suggesting poor sub grade. Suggest replacing sub grade and repaving

3.32 - 19.6 km Site Entrance

Site entrance. End of survey.

4 Conclusions

4.1 Heavy Haulage Route Newcastle Port To Aarons Pass Road/ Castlereagh Highway Intersection

As Hill End / Windeyer / Pyramul Roads are considered unsuitable for a heavy haulage route, a number of alternative routes were assessed.

Route 1: via Castlereagh Highway (Market Street, Douro Street, Horatio Street, Sydney Road)

We have based the survey transporting via the new Hunter Expressway, which is due to open in December 2013. This expressway will allow the turbines to avoid travel restrictions & bypass the tight sections of old Highway through Maitland.

This route can accommodate turbines up to approx, 3.0 MW with blades up to approx 50 metres, without any major works taking place.

Generally the route is suitable, and would need removable signs put in place of some existing signs as mentioned in the survey. Within this option, two alternative routes through and around Gulgong have been assessed as appropriate.

Route 1a: via Castlereagh Highway, 60m Blade Alternative (Market Street, Cox Street, Short Street, Douro Street, Horatio Street, Sydney Road)

If the 60 metre blade option is required, we also believe the general turbine equipment and towers could occupy the main route, however the blades in our opinion will cause disruptions through Mudgee on Route 1. We have provided a small detour off Route 1 (Route 1a), that could potentially take the 60 metre blades, however this is the least preferred option, as it requires a five minute procedure in the busiest part of Mudgee.

Route 1b: via Ulan Road, 60m Blade Alternative (Church Street, Short Street, Lawson Street, Horatio Street, Sydney Road)

We have provided another option, as Route 1b using the Ulan Road for the blades. Route 1b is 45 kilometres shorter, and in our opinion would get the blades through town without causing major traffic delays. A preliminary enquiry was placed with Andrew Kearins (Manager Technical Support) of Mid Western Regional Council to ascertain load limits on the Cudgegong River Bridge. He advised that the weight of the blade transport should not pose a problem. As some streets will have load restrictions on them Council consideration of the route will be required. This option would also not require the five minute road shutdown outside the schools on Duoro Street.

Route 2: via Castlereagh Highway, 60m Blade Alternative (Market Street, Cox Street, Short Street, Lawson Street, Mortimer Street, Burrundulla Avenue, Sydney Road)

We have provided an alternative detour off Route 1 (Route 2), that could accommodate the 60 metre blades and in our opinion would get the blades through town without causing major traffic delays nor the need for significant upgrades to the road network. As some streets will have load restrictions on them Council approval of the route will be required. This option would also not require the five minute road shutdown outside the schools on Duoro Street, and it is in our opinion the best alternative.

Route 3: via Putta Bucca Road, Henry Lawson Drive, Ulan Road, Lue Road, Rocky Waterhole Road, Castlereagh Highway.

We have investigated an alternative route, skirting Mudgee that could be suitable for all heavy haulage (Route 3).The roads along this route are technically suitable for all vehicles; however three corners would require significant works on the adjacent land to allow for the turning arc of the vehicles. The left turn off Ulan Road could require a temporary road, which would create impacts to the pedestrian walk way and trees lining Ulan road. Given MWRC's position on traffic impacts on Ulan road, in addition to the works required, we consider this route unsuitable.

4.2 Heavy Haulage Route Aarons Pass Road to Wind Farm Site Entry

In its current formation, Aarons Pass Road does not meet specifications for the heavy haulage of WTG components required for the Crudine Ridge Wind Farm.

We therefore recommend it to be upgraded to a 6 metre unsealed gravel paving. We do not consider it is necessary to seal the road to accommodate this traffic. Gravel roads have successfully been used for this purpose in previous projects we have constructed i.e. Collgar Wind Farm (Springwell Valley Road and Scott Road) Lake Bonney Wind Farm Stage 2 and 3 (Poonada Road). Corner widening should be as listed in Section 3, with passing bays situated on the shoulder every 1 km were possible without substantial tree clearing. Maps detailing upgrades listed in Section 3 and potential passing bay options identified by WP/CWP can be found in Appendix 1. However some general pruning of overhanging trees will be required to create a vertical clearance plane of six by six metres. With traffic management in place i.e. pilot vehicles holding oncoming traffic at nearest passing bay and industry standard radio protocol between Pilots/Escorts and OM/OS vehicles. This route would be a safe and viable option for the transportation of the WTG components.

4.3 Balance of Vehicle Movements

As Aarons Pass Road even with the above recommended upgrades will not facilitate all the truck movements required to bring in the balance of components, material and equipment needed for the site without further major works. Due to the fact that heavy vehicles will not be able to pass each other freely and the heavy haulage on the same road would cause delays and interruptions to the delivery of aggregate and sand for concrete production. We therefore make the following observations.

- **Site Access Northern End via Hill End Road Sally's Flat Road and Pyramul Road to Entry**
    - Subject to the type of vehicles using this route, some widening of the above roads and causeways to facilitate passing may be required. To this end, we recommend using crushed gravel without modification to the existing formation of the road. However, we also recommend these roads are to be maintained throughout the construction phase and repaired in full upon completion of the project. This option is well suited for a staged development if the wind farm was to be staged from the north.
- **Site Access from Southern End of Hill End Road.**
    - This option appears to require limited if any upgrades to facilitate the Balance of Vehicles. A preliminary enquiry was placed with Paul Kendrick of Bathurst Regional Council, as to whether or not there are any restrictions on standard heavy vehicle (<19m and <50T) access to site from Bathurst via Peel Road, Turondale Road and Hill End Road. He confirmed that there currently are no access restrictions in this respect, on either of these roads, but suggested that Peel Road is of a higher standard and as such the Peel / Hill End Road route is the best option. Subject to Council approval and conditions. Therefore this option is well suited for a full development of the wind farm and in our opinion worthy of pursuit. However if the wind Farm development is staged from the north this option still requires internal roads built from the southern entry to the northern entry on Aarons Pass Road to enable the vehicles to access the site. This scenario may not be a viable option but should still be considered and subjected to a further feasibility study.

4.4 Preliminary Costing Estimate

Resurfacing and widening of Aarons Pass Road assuming 50mm capping layer.
$1,950,000
Replacing causeway at 17.9 km in its entirety with box culvert
$450,000
Replace sub grade and resurface causeway at 19.2 km
$40,000
Total
$2,440,000

Basis of Estimate

- The above preliminary estimate is based on library prices and subject to a detailed survey of vertical curves.

5 References

Transportation Manual V112-3.3MW

V0008-1740 Weights, Dimensions and Centre of Gravity V112 55m blade

RMS 2008 Version 2:Operating Conditions: Specific permits for oversize and overmass vehicles and loads.

Rex J Andrews Engineered Transportation Pty. Ltd.
Route Survey

6 Appendix 1:

Aarons Pass Road Passing Bay Assessment