

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

Crudine Ridge Wind Farm

Aarons Pass Road - Passing Bay Assessment



June 2013

Prepared for Crudine Ridge Wind Farm Pty Ltd by Wind Prospect CWP Pty Ltd

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1. Introduction

The Crudine Ridge Wind Farm (the Project) is situated 45 km south of Mudgee and 45 km north of Bathurst, NSW. The ridgeline is of moderate-to-high elevation (890 to 1,000 m Australian Height Datum (AHD)). The nearest locality is Pyramul, which is located approximately 5 km to the North west along Aarons Pass and Pyramul Roads. The Project comprises two potential layouts; one consisting of up to 106 wind turbine generators (WTGs), and the other up to 77 WTGs together with ancillary structures including compounds and overhead transmission lines.

Downer Infrastructure have prepared a heavy haulage route survey to ascertain the route requirements to transport WTG components (over-dimensional vehicles) from Port of Import to the Project Site.

Aarons Pass Road was identified as a viable over-dimensional vehicle route option with recommended upgrades to a 6 m unsealed gravel road. This road is approximately 20 km from the turnoff at the Castlereagh Highway driving west to the northern site access point. Downer Infrastructure have identified the recommended upgrades along the road in order for it to accommodate over-dimensional vehicles.

In addition to this survey and assessment, Wind Prospect CWP (WPCWP), on behalf of Crudine Ridge Wind Farm Pty Ltd, have assessed the potential for location of passing bays along the Aarons Pass Road route, in order to address one aspect of the traffic management that will be implemented during construction.

2. Aarons Pass Road - Passing Bay Assessment

An assessment of Aarons Pass Road was undertaken with respect to the proposed route, approximately 20 km long, from the turnoff at the Castlereagh Highway to the northern site access point (Figure 1).

2.1 Local Access

To identify local road use, gateways located along Aarons Pass Road were considered. Approximately 38 gateways / driveways off Aarons Pass Road were identified, approximately 15 of which appeared to be driveways to residences (where a residence could not be seen from the roadside, a conservative approach was taken to classification of driveways).

2.2 Assessment Methodology

WPCWP have identified 42 potential passing bays along the Aarons Pass Road route, with minimum approximate dimensions of 15 x 3 m (Figure 1). These were assessed with respect to the location of existing driveways and gateways, and also with regard to minimising vegetation clearance and levelling and utilising straight sections of road where possible. To this end, the locations identified were graded from one to three, with one being a preferred passing bay and three being a lower quality passing bay.

Of the 42 passing bays identified, based on preliminary grading, 16 locations were considered very good, 13 were considered good, and a further 13 were rated as average.

2.3 Conclusion

Downer have reviewed these passing bay locations and confirm that they are all generally suitable, with only minor works required for use.

Not all passing bays are proposed to be used, and the final number and selection of passing bays will be agreed upon with Mid-Western Regional Council.

3. Potential Passing Bay Locations

Passing Bays were labelled from PB01 to PB42 heading from the east, at the turnoff at the Castlereagh Highway, to the west to the northern site access point. The terms 'Left Hand Side (LHS)' and 'Right Hand Side (RHS)' are also based on this direction of travel.

The passing bays are described below, graded 1 (very good), 2 (good) and 3 (average). Figures 2 - 5 detail the grading of the passing bay locations.

PB01



Grade 3: Left hand side (LHS) - Located at a driveway. Minor clearing required, located on a right bend.

PB02



Grade 1: Right hand side (RHS) - Located at a driveway. Minor clearing required, straight section of road.

PB03



Grade 2: LHS - Straight section of road. Not as wide as other locations.

PB04



Grade 1: LHS - Minor clearing required, large area and straight section of road.

PB05



Grade 1: LHS - Located at a driveway. Straight section of road.

PB06



Grade 1: LHS - Large existing clearing, some levelling required.

PB07



Grade 3: RHS - Located at a driveway. Minor clearing required, on a left bend.

PB08



Grade 1: LHS - Some clearing may be required, straight section of road.

PB09



Grade 3: LHS - Some clearing required, located on a straight section of road, however the road is sloped at this location.

PB10



Grade 2: LHS - Would require some clearing and levelling, straight section of road.

PB11



Grade 2. RHS - Low level of clearing and levelling (fill) required, on a slight right bend

PB12



Grade 1: RHS - Located at a driveway. Some clearing may be required.

PB13



Grade 1: LHS - Large existing clearing, some levelling and minor clearing required.

PB14



Grade 1: LHS - Straight section of road. Some levelling and clearing required.

PB15



Grade 3: LHS - Minor clearing required. Some levelling required. Not as wide as other locations.

PB16



Grade 2: LHS - Some levelling required, minor clearing required. On a slight right bend.

PB17



Grade 3: RHS - Levelling required, not a wide roadside area. On a slight bend.

PB18



Grade 1: LHS - Large existing cleared area. Some levelling required.

PB19



Grade 3: RHS - Some clearance and levelling required. On slight right bend

PB20



Grade 2: RHS - Clearance and levelling required, on straight section of road.

PB21



Grade 1: LHS - Located at a driveway. Large existing cleared area.

PB22



Grade 3: RHS - Clearance and levelling required, on straight section of road.

PB23



Grade 1: LHS - Located at a driveway. Cleared section exists, some clearance may be required.



RHS Opposite PB23 above.

PB24



Grade 3: LHS - Located opposite a driveway. Clearance and levelling required, straight section of road.

PB25



Grade 3: LHS - Clearance and levelling required, straight section of road.

PB26



Grade 1: RHS - Located at a driveway, large existing cleared area, straight section of road.

PB27



Grade 2: LHS - Large cleared area. Minor additional clearing and some levelling may be required.

PB28



Grade 1: LHS - Clearance and levelling required, on straight section of road.

PB29



Grade 1: RHS - Located at a driveway. Large cleared area.

PB30



Grade 1: RHS - Located at a driveway. Large cleared area.

PB31 Perke Road Intersection



LHS of intersection



RHS of intersection

Grade 2: Some clearance and levelling of either side would be sufficient to create a passing bay at this intersection.

PB32



Grade 2: LHS - Large cleared area, some levelling required, on a slight left bend.

PB33



Grade 3 RHS - Would require clearing and levelling, straight section of road.

PB34



Grade 2: LHS - Would require minor clearing and levelling, straight section of road.

PB35



Grade 3: LHS - Would require some clearing and levelling.

PB36



Grade 3: LHS - On slope. Some clearing and levelling possibly required.

PB37



Grade 3: LHS – Located at a driveway, smaller cleared area.

PB38



Grade 1: LHS - Long cleared section, levelling required.

PB39



Grade 2: LHS - Located at a driveway. Existing cleared area, some levelling may be required.



RHS of PB39 above (also could be used as an alternative passing bay).

PB40



Grade 2: Both sides of road would be suitable. Some levelling required.

PB41



Grade 2: LHS – Located at a driveway. Small cleared area available.



RHS of PB41 above.

PB42 – No photo

Grade 2: Existing cleared area, some levelling may be required.