

Peer Review

Bylong Coal Project Planning and Traffic Review

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Prepared for
Muswellbrook Shire Council

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1 Introduction

Cardno (NSW/ACT) Pty Ltd has been engaged by Muswellbrook Shire Council to support the preparation of a submission to the Planning Assessment Commission (PAC) on the proposed KEPCO Bylong Coal Project. This report reviews and researches:

- > Road network impacts based on traffic modelling, assumptions, information gaps and considers potential impacts on the physical infrastructure and road user safety focussing on the Bylong Valley Way ; and
- > Likely travel patterns of the workforce to and from the mine, with analysis of where they are likely to live and the reasons that inform their decisions to do so (such as education and community needs of the worker's family).

2 Road Network Impacts

2.1 Strategic Context – Mining Affect Communities

The NSW Government acknowledges that “mining activity can place additional stress on local infrastructure, particularly roads, bridges and other local government funded infrastructure (NSWT&I 2011, p1)”. This analysis concluded that most mining affected communities (including Mid Western Regional Council) were found to have received more capital and recurrent funding per capita than non-mining LGA’s, with the exception of Tier 1 areas including Muswellbrook. Further consideration should be given to the extent to which mining and mining-related activity has accelerated the deterioration of roads and other infrastructure in these communities (NSWT&I 2011 p5).

2.2 Bylong Mine Location

The travel distances and approximate journey times from the proposed mine and key centres is presented in Table 2-1 below.

Table 2-1 Travel Distance & Travel Time to/ from Bylong Mine – Shortest Travel Time

Shortest route to Bylong Coal Project	Kilometres (km)KM	Approximate Travel Minutes Time (minutes)
Rylstone	53	40
Kandos	61	47
Sandy Hollow*	64	48
Denman**	74	58
Merriwa	62	63
Mudgee	80	69
Muswellbrook*	103	78
Jerrys Plains*	106	82
Scone	123	94
Mount Thorley*	137	100
Singleton*	144	107
Lithgow***	152	113
Rutherford *	176	130
Cessnock*	175	133
Port of Newcastle*	217	161

Indicative travel time only, subject to prevailing road conditions, road works, road congestion and traffic incidents.

* Via Bylong Valley Way

** The most direct trafficable route from the lower Hunter Valley is through Denman via Yarrawa Road connecting to the Bylong Valley Way. Yarrawa Road is unsealed in sections.

*** Via Castlereagh Highway and then using Bylong Valley Way situated in Mid Western LGA

Additional distance and travel times via Ulan-Wollar Road from nearby towns in the Muswellbrook LGA, mining support clusters and the Port of Newcastle are presented in Table 2-2 below:

Table 2-2 Alternate route via designated heavy vehicle route Ulan-Wollar Road from nearby towns and mining support areas– Approximate travel time

Designated Freight Route to Bylong Coal Project	Kilometres (km)	Approximate Travel Time (minutes)
Merriwa	133	101
Sandy Hollow	169	124
Denman	183	135
Muswellbrook*	207	154
Mt Thorley*	238	173
Rutherford*	282	207
Port of Newcastle*	322	237

* Mining support clusters based in Hunter Valley

Travelling via Ulan Road, the designated heavy vehicle freight route, typically incurs an additional 70+ minute's travel time for trips originating from the east. The most direct route from the east is through Denman via Yarrawa Road connecting to the Bylong Valley Way. Yarrawa Road is unsealed in sections and not suitable for heavy vehicle traffic.

2.3 Key Connections between the Hunter Valley and Ulan/ Bylong Area

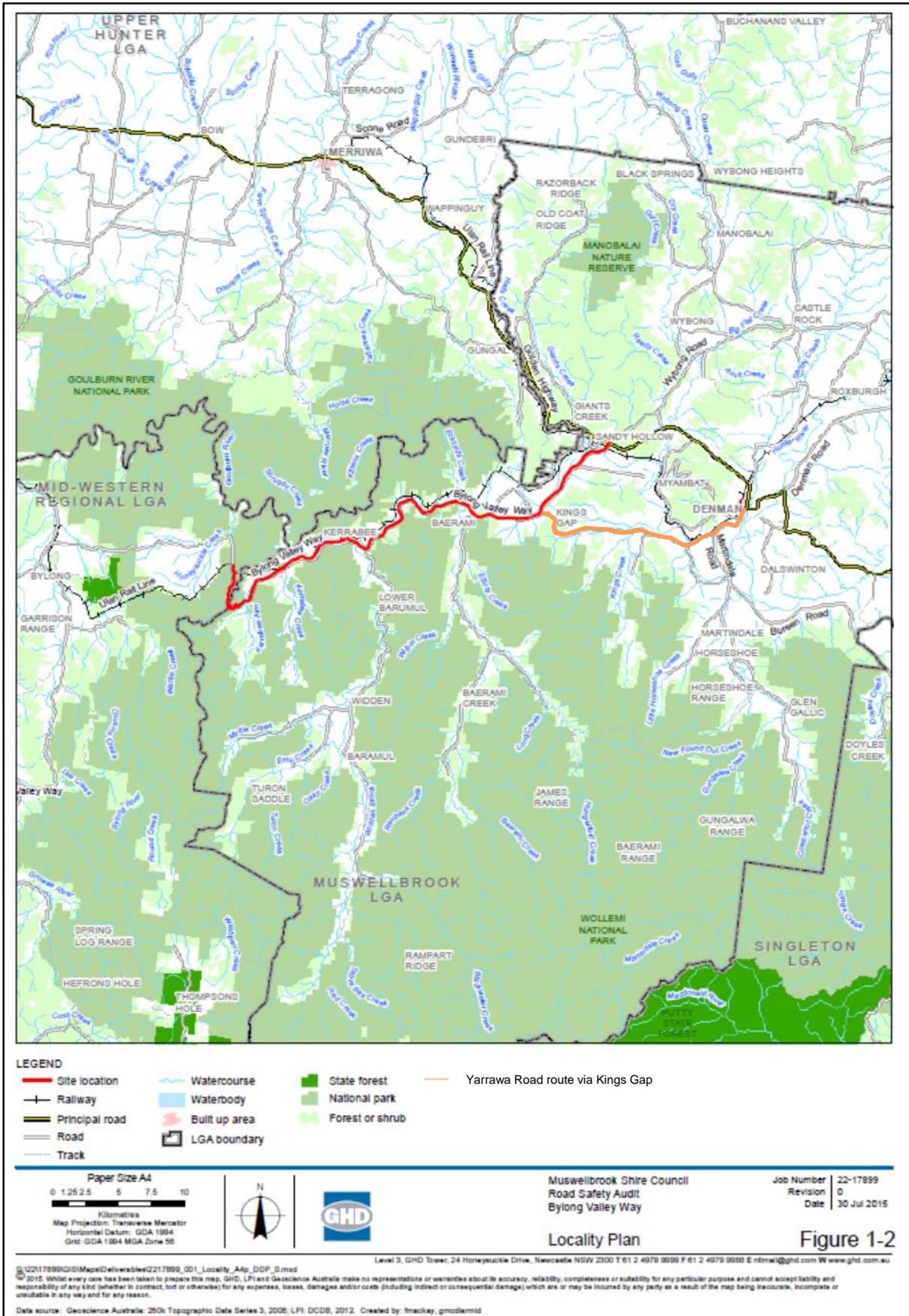
The key interactions and linkages between the Western and Hunter Valley Coalfields are identified, and documented in the *Hunter Economic Infrastructure Plan (Infrastructure NSW & RDA Hunter 2013)* and the Upper Hunter Strategic Regional Land Use Plan (Department of Planning 2012). The UHSRLUP recognises the need for transport upgrades associated with mining and mining activity, identifying intersection and pavement upgrades, maintenance and road quality as issues. These issues are key factors influencing the road environment and overall road safety. The UHSRLUP includes the Ulan-Bylong area which includes the BCP proposal.

The Golden Highway corridor provides the key connection for freight and labour supporting coal mining in the Upper Hunter and Mid Western Ulan/Bylong area. The Hunter Economic Infrastructure Plan (HEIP) recognises the importance of this corridor noting that the forecast growth in mine related freight over the next 20 years on the Golden Highway will match current flows experienced on the New England Highway. The heavy vehicle route connecting the Golden Highway to the Western Coalfields is Ulan-Wollar road. The most direct route to the Bylong mine from the Golden Highway is via the Bylong Valley Way situated within the Muswellbrook Shire Council area.

2.4 Bylong Valley Way

The Bylong Valley Way directly connects the Muswellbrook and Mid Western LGA's (Refer Figure 2-1). Main Road 208 (MR208) extends between Castlereagh Highway (B55) at Mudgee and Golden Highway (B84) at Sandy Hollow. MR208 is a two lane rural road with bitumen seal and unsealed shoulders. Between Mudgee and Budgee Budgee, the sealed carriageway is 7.0m to 7.5m wide and the unsealed shoulders are 2.0m to 3.0m wide. Between Budgee Budgee and Sandy Hollow, the sealed carriageway varies in width between 6.0m and 7.5m, and the unsealed shoulders have an average width about 2.0m. The posted speed limit is generally 100 km/h, 80 km/h outside of villages/towns and 50 km/h within Bylong, Rylstone and Kandos. A level railway crossing is located on Bylong Valley Way just to the east of the Wollar Road intersection. At present this level crossing is passively controlled with signs and flashing lights similar to other level crossings within rural settings. An additional level railway crossing is located further north in close proximity to the Golden Highway. The Annual Average Daily Traffic (AADT) on Bylong Valley Way based on October 2011 counts was 398 vehicles in Bylong, and 418 vehicles with 13% heavy vehicles between Bylong and Sandy Hollow. (PB 2015, p13 & GTA 2015, p10)".

Figure 2-1 Bylong Valley Way



Source: Bylong Valley Way Road safety Audit Muswellbrook Shire Council 2015

3 Review of KEPCO Traffic and Transport Impact Assessment

The findings of Cardno's review identify a number of information gaps and issues for further investigation and review to validate the assumptions and conclusions presented by the proponent in support of this proposal. The key issues are presented below:

- > The construction and operations workforce – origin/destination analysis is not detailed enough to assess impacts effectively. A greater proportion of traffic than assessed will originate from the east given the mining and mining support workforce based in the Lower and upper Hunter. This situation will be amplified during the construction phase of the project.
- > Similarly, information on construction materials quantities, heavy vehicle haulage capacities and haulage routes are required to accurately assess whether the estimated heavy vehicle trips are reasonable.
- > In terms of intersection analysis, while the capacity is not an issue at intersections, the proportionate impact is significant. In relation to link analysis, again while capacity is not an issue, the proportionate impact is considered significant up to 461% increase.
- > Safety at the intersections, particularly with respect to turning movements will be a critical factor. Turn warrant assessment and swept path analysis requires consideration.
- > Pavement impact assessment also requires consideration.
- > It is noted that the Roads and Maritime Services (RMS) has raised similar concerns relating to road safety and commitments to manage driver fatigue and mine commuter safety. In particular, RMS considered there was a lack of certainty for implementing and achieving measurable and successful management strategies. For example, commitments to car-pooling and bussing of employees and avoiding shift changes to school bus pick and drop off times are not firmly locked in (Department of Planning & Environment 2017 p30).
- > Transport for NSW (TfNSW) has requested similar clarifications sought by the RMS but did not provide any further comment on this project (Department of Planning & Environment 2017, p30). Further investigations and clarification of road improvement contribution for these upgrades are required.
- > The Department of Planning and Environment (DPE) conclusions concerning the predicted low number and percentage of workforce using this route does not appear to consider the removal or reduction of the WAF and the proximity of accommodation in nearby Sandy Holly, Denman and Muswellbrook.

The following areas are identified for further investigation, ordered by priority

Table 3-1 Review of KEPCO Traffic and Transport Impact Assessment and Response to Submissions

Item	Issue Identified
High Priority	
Construction and operations workforce – origin/destination	<p>Some details (below) regarding origin/destination of construction and operations workers but not detailed enough to assess impact effectively</p> <p>10-15% from local area (not specified which areas)</p> <p>20 staff housed in KEPCO accommodation near site</p> <p>Remaining workers: 80% from Mudgee, 20% from Denman/Sandy Hollow, Kandos/Rylstone and with MRC LGA (details of routes not specified)</p> <p>It is reasoned that a greater proportion of traffic than assessed will originate from the east (Muswellbrook/Sandy Hollow) given the mining specialists in this area. Further clarification is required.</p>
Construction materials quantities and haulage routes	<p>Details for materials (quantities for road construction materials, pipes, fuel, etc.) not provided. These details are required to accurately assess whether the estimated heavy vehicle trips are reasonable. Example of relevant materials included at Appendix A.</p> <p>Breakdown of origin/destinations for the construction trips (by materials supplied, vehicle types, route proposed) not provided. Further information required.</p>
Delivery quantities and routes	<p>Heavy vehicle trips have been included in the assessment, however details for their purpose have not been provided. Further explanation required, refer to Appendix A for an example.</p>
Intersection analysis	<p>While the capacity is not an issue at the intersections, the proportionate impact is significant and should be investigated further.</p>
Link analysis	<p>While the capacity is not an issue, the proportionate impact is significant (up to 461% increase) and should be investigated further.</p>
Turn warrant assessment	<p>Only Bylong Valley Way/Wollar Road and Bylong Valley Way/Upper Bylong Road have been assessed. Other intersections have not been assessed.</p> <p>Demonstration of the turn warrant assessments (plotted graphs) have not been provided. Further information required.</p>
Swept Path Analysis of development affected intersections	<p>No swept path analysis of development vehicles at subject intersections has been undertaken. It is not clear whether the existing intersection geometry can accommodate all development vehicles. Further investigation required and details of localised upgrades if required.</p>
Pavement impact assessment	<p>Report recommends inspections to be undertaken to monitor pavement impacts. Usually a pavement scoping assessment will be undertaken to determine whether a detailed pavement impact assessment will be warranted prior to approval of the project. Further investigation required.</p>

Item	Issue Identified
Road safety audit	No road safety audit has been undertaken. Preliminary assessment of Bylong Valley Way highlights the following areas of concern: Existing physical constraints including narrow carriageway widths, narrow or non-existent shoulders, sheer drop off without adequate guard rails, sharp horizontal curves, steep grades, etc. Lack of signage and line marking Increase in traffic volumes due to the development warrants the need for a road safety audit. Contributions towards road safety upgrades should be based on the proportionate impact of the development traffic to the baseline traffic. Further details outlining how the contribution was calculated should be provided.
Moderate Priority	
Crash data review	Crash analysis undertaken, no conclusions regarding the crash risk were formulated, safety upgrades to be implemented by MSC and MRC were mentioned.
Peak hour assessed	Assumed 6:00-7:00am and 6:00-7:00pm for AM and PM peaks respectively, coinciding with the development peak. Assessment should provide a sensitivity assessment for the road network peaks and development traffic during those periods.
Heavy vehicle permitted routes	Sufficient detail is not provided, only summarised the B-double routes
Low Priority	
Traffic surveys	Traffic surveys from multiple sources across different assessment years, it is not clear how the data has been factored to the 2015 baseline year. Further information required.
Vehicle occupancy	A car share rate of 30% has been utilised. A 30% rate is considered to be reasonably high and will be difficult to achieve. Further justification required. Bus trips have assumed close to 100% (93%) occupancy which may not be achievable.
Construction Management Plan	Not prepared, recommendation made for a CMP to be prepared prior to construction commencing.

Case Study 1 - Car pooling in practice - Wilpinjong Extension Project

A car share rate of 30% has been utilised for the Bylong Coal Project. A rate of 30% is considered to be reasonably high and will be difficult to achieve. Analysis of ABS Journey to Work data (ABS 2011) for Mudgee and Muswellbrook LGA's indicates that passenger in motor vehicles is 4.04% and 3.17% respectively. 2012 analysis for the Wilpinjong Extension Project suggested that employees and contractors travelled with an average of 1.1 persons per vehicle (GTA 2015, p6).

4 Mine Worker Location and Travel Patterns

4.1 Mine Worker Locational Preferences

There are a range of spatial, socio-economic and demographic factors that influence individual and household decisions concerning locational preferences for mine workers. Decisions are now often made by households rather than individuals with issues such as social networks, lifestyle, amenity and sense of place all important determinants in the migration versus commute decision (Sandow & Westin, 2010, p. 435). A key characteristic or feature of this highly skilled and mobile workforce is the willingness to engage in long distance commuting (LDC).

The findings of the Federal Parliamentary Inquiry (Commonwealth of Australia 2013) focussing on fly in-fly out (FIFO) and drive in-drive out (DIDO) arrangements for the mining sector and impacts on local communities, recognises that more quantitative and qualitative research is required to fill key information gaps to improve the understanding of issues facing the sector and mining affected communities. This situation is reflected in the limited evidence base underpinning the proponents assumptions and conclusions involving workforce locations and resulting travel routes, subject to proposed industrial policies, workforce education, "local" supplier contracts which appear difficult to achieve in practice conflicting with established industry trends and locational decisions discussed below.

Research on workforce geographical mobility (Green & Canny 2003, p38) suggests that there is general agreement, that when faced with the option of relocation, workers choose to commute long distances rather than relocate, in order to internalise the cost of geographical mobility rather than externalising them to other family members. In this context long distance commuting is a strategic mobility choice of households, rather than a short term solution (Sandow & Westin 2010). Qualitative research involving mining workers and their families in Western Australia reported coastal lifestyle as the key location decision driver at 70%, with rural lifestyle the next ranked factor at 50% based on respondents able to select multiple factors (Heath & Haslam McKenzie 2013, p51).

Extrapolating this experience to the Hunter Valley Coalfields suggests that mine workers will choose to locate in existing centres in the Mid-Western LGA including Mudgee, Rylstone and Kandos as well as the Upper Hunter including Merriwa, Denman and Muswellbrook. The Hunter Expressway has also extended the travel catchment east towards the Lower Hunter for mine workers located in Cessnock and Maitland LGA's. These observations are supported in the analysis undertaken as part of the Hunter Economic Infrastructure Plan which notes that mining-related work trips within Muswellbrook and Singleton dominate local trips for the workforce. A proportion of these trips are likely to be redirected over time to newer growing mining areas, leading to longer trips. These trips have associated negative effects including increased journey times and potential worker fatigue (INSW & RDA Hunter 2013, p30). Under reporting of actual residence location is also a potential factor due to industry fatigue management policy requiring mine workers to reside within approximately one (1) hour of the mine site.

4.2 Expected Travel Patterns

"Increased working hours and the move in the mining industry towards continuous operation and 12 hour shifts (Brereton et al 2008, p76) reflects contemporary mining practices. Research by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) has also identified a strong gender bias towards males involved in long distance commuting (De Silva et al 2011). Long distance commuting is a key feature of the mine workforce and has driven industry fatigue management policies and education practices. These policies typically require the workforce to be accommodated within 1 hour of the worksite and this approach is reflected in the proponents' application.

An examination of Environmental Impact Statements (EIS) and operational observations and experience of other mines provide a relevant point of reference. The nearby Wilpinjong Extension Project (WEP) EIS reveals that the morning travel peaks hours occurred between 5.00am and 7.00am at all locations, while the busiest hours in the evening occurred between 2.00pm and 7.00pm. The busiest hours for traffic generated by the Wilpinjong coal mine were 6.00am to 7.00am, and 6.00pm to 7.00pm (GTA 2015, p12). This contrasts with the BCP proposal which assumes 6:00-7:00am and 6:00-7:00pm for AM and PM peaks respectively. Common sense suggests that driver behaviour will seek to use the shortest trafficable route between their residence and the work place. Mine workers travelling to and from the east (Hunter Valley) will elect to take

the most direct route using Bylong Valley Way. The peak hours coincide with the dawn and dusk periods and are associated with increased crash risk.

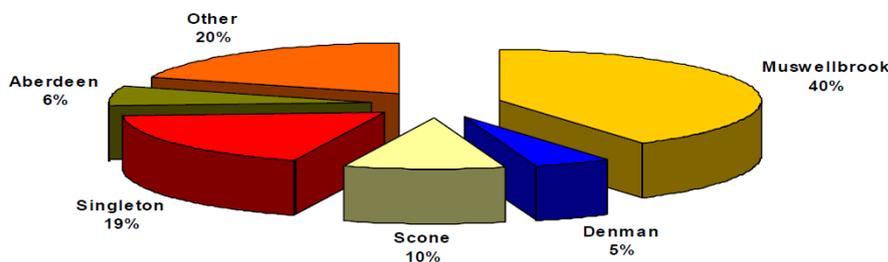
Case Study 2– Ashton Coal Mine (Open Cut and Underground Operations)

An analysis of publicly available data shows that the mining workforce catchment for each mine varies based on location, accessibility and importantly mine type (open cut, underground or mixed). As an example Ashton coal mine operated by Yancoal is situated approximately 14km north west of Singleton. This mine complex comprises both open cut (now closed) and underground operations. This mine draws its workforce from a wide catchment and comprises 23% from Upper Hunter (17% Singleton), 58.5% Mid Hunter (Cessnock 36.4%) and 13.4% from the Lower Hunter (Lake Macquarie and Newcastle 6.7% respectively) involving long distance commuting up to or exceeding 1 hour drive time. It is noteworthy that 17% of the workforce was drawn from the immediate Singleton area.

Source: Yancoal 2016

Case Study 3 - Mine Worker Location

A mining industry and employee survey conducted by Coakes Consulting (1999), as part of the Environmental Impact Assessment for the Mt Arthur Coal Project, reported that 56% of employees of Bayswater, Bengalla, Drayton and Muswellbrook Coal lived in Muswellbrook Shire (47.8% in Muswellbrook and 8.6% in Denman). It is concluded that the 20% “Other” would primarily be located in the Lower Hunter, most likely within the Maitland and Cessnock LGA’s



5 Mine Workforce and Mining Support Services

The mining workforce and mining support business has consciously located to optimise access and service the Hunter Valley, Western and Gunnedah Basin coalfields. Businesses synonymous with black coal mining industry, including but not limited to; Bradken , Daracon, Downer EDI Mining, Gough & Gilmour, Hatch Engineering, Liebheer Australia, Monadelphous, Orica Limited , Sandvick, Westrac, Westrac Underground Mining and Valley Long Wall have made significant investments in establishing national headquarters and regional bases in the Lower and Upper Hunter, clustered in areas including the Port of Newcastle, Mt Thorley, Rutherford, Singleton and Muswellbrook localities. The physical location of Mines Rescue centres reinforces this observation. Mines Rescue has the primary role to provide underground incident response. Mines Rescue has four rescue stations within NSW. Refer Table 5-1 below:

Table 5-1 Mine rescue stations supporting underground incident response in NSW

Mine Rescue Station	Approximate distance Bylong Coal Projects	Approximate travel time by road to Bylong Coal Project
Singleton (Hunter Valley)*	145km	1hr 45min
Lithgow (Western)	152km	1hr 52min
Newcastle (Newcastle)*	201km	2hr 20min
Wollongong (Southern)	334km	4hrs 27min

* Shortest route is via Bylong Valley Way

Source: Mine Rescue NSW and Google Maps road distance and travel time calculator

The Hunter coal industry has witnessed a progressive shift of mining and associated employment inland, particularly in the Upper Hunter (Maitland City Council & Hunter Development Corporation 2013, p27). In 2013 Deloitte Access Economics reported that the mining workforce situated in the Hunter totalled 17,700 people or 7.2% of the total workforce (Deloitte Access Economics 2013).

It also noted that many underground mines situated in the Lower Hunter are progressively transitioning to care, maintenance and closure over the next decade as the winnable resource is exhausted. This observed transition and time horizon closely coincides with the proposed commencement of underground operations for the proposed Bylong Coal Project. Accordingly, it is highly likely, if not certain, that a high proportion of the existing underground workforce situated in the Hunter Valley will follow this transition and adopt long distance commuting to access employment in new underground mines including the Bylong Coal Project.

6 Key issues and Consequences

In relation to the proponents assumptions and conclusions the following issues are raised.

6.1 Key Information Gaps

Based on KEPCO's traffic assessment, commitments proposed by KEPCO in response to RMS recommendations and the Department's recommended conditions, the increase in traffic as a result of the project could be safely accommodated on the local and regional road network. (Department of Planning & Environment 2017 p111). Having regard to the information gaps identified in Table 1 this conclusion is considered premature and requires further independent analysis and/or justification by the proponent. In essence road safety issues on Bylong Valley Way attributed to this proposal remain unresolved and will negatively impact on Muswellbrook LGA.

The assumption that the workforce will primarily be drawn from the Mudgee/Mid Western LGA requires further analysis and justification. As outlined above, the mining support resources required, particularly during construction phase, will most likely be drawn from the Lower and Upper Hunter from mining industry clusters situated in locations such as, Muswellbrook, Mount Thorley and the Port of Newcastle. It is also likely that the required underground workforce will be bolstered from the Lower Hunter as underground mines in this area are progressively retired from production.

The proponent's assertion that the operational workforce will be mainly reside in communities local to the Project and as such minimal impacts are to be expected on road linkages such as the Bylong Valley Way. This approach underplays the likely traffic flows to/from the east linking the Hunter Valley. As foreshadowed in the HEIP the importance of linkages and the movement of freight and labour between the coal fields will grow over time.

The most direct route from and to the Hunter Valley is via Bylong Valley Way. Travelling via Ulan-Wollar Road, incurs an additional 70+ minutes travel time. Journey Management Plans (JMP) are therefore unlikely to use this longer, albeit safer, route for mine workers travelling to/from the Hunter Valley with the exception of mine workers located in Merriwa.

In the absence of an independent road safety audit, the proponent's offer of \$40,000 contribution to Muswellbrook Shire Council towards road safety upgrades on Bylong Valley Way requires further explanation how this figure was calculated. It is reasonable to expect that an increase in mine worker traffic travelling to the mine using Bylong Valley Way will result in an increase in crash rates on this rural road. This heightened safety risk to road users will be most evident during the construction phase of this project. The key issues in respect to road user safety are increased employee exposure to risk and exposure to other road users. Given the relative isolation of this proposed mine from nearby centres, longer travel distances along with 12 hour working shifts, managing worker fatigue is a critical issue for the project during construction and operations. Carpooling will assist but is unlikely to achieve the levels identified and relied upon in this proposal.

The existing road environment comprises challenging road geometry and grades, narrow sections, drop offs and blind bends. In the absence of an independent road safety audit provided by the proponent, this review relies on the road safety audit prepared by GHD for Muswellbrook Shire Council. This initial assessment of Bylong Valley Way highlights the following areas of concern:

- > Existing physical constraints including narrow carriageway widths, narrow or non-existent shoulders, sheer drop off without adequate guard rails, sharp horizontal curves, steep grades, etc.
- > Lack of signage and line marking

Operational observations for the nearby Wilpinjong coal mine identifies 141 heavy vehicles per day (vpd) or 12.9% heavy vehicle proportion confirms that heavy vehicles use Bylong Valley Way (GTA 2015, p14). The survey identified that heavy vehicles up to Class 11 vehicles use Bylong Valley Way. This exceeds the 10 tonne limit which has been conditioned for the road. The introduction of additional mine worker traffic (light vehicle traffic under 10 tonne) is a concern. Austroads (2015 in GTA 2015, pp21-22) found that in rural road environments in Australia, off-path crashes were the most likely, and were associated with the greatest number of fatalities, typically involving single vehicles leaving the carriageway, known as run-off-road (ROR) crashes, with speed and fatigue contributing factors. Crash exposure increases as the length of the trip increases and as traffic volumes increase. Increase in proponent based traffic warrants the need for a road

safety audit. Contributions towards road safety upgrades should be based on the proportionate impact of the development traffic to the baseline traffic. Council's road safety audit identifies a series of "intolerable" risks ratings requiring attention. The installation of 140 metres of new safety barriers will cost \$103,600. This figure excludes upgrades and/or repairs to existing safety barriers. The total cost of road safety works is \$1.18m. These works should form part of the initial road safety response prior to and during the construction period.

**Case Study 4 - Road safety conditions of consent in practice
Mine related traffic using restricted public roads**

The Mangoola mine situated in the Muswellbrook LGA has conditions of consent restricting heavy vehicle and employee access to specified public roads to manage identified negative impacts on the local road network. A recent fatal accident the subject of a Coronial inquiry documents the tragic consequences when two mine vehicles collided on a restricted local road. This is an example of driver behaviour circumventing a condition of consent resulting in tragic consequences. Recent traffic counts by Muswellbrook Shire Council demonstrate that mine related light vehicles and heavy vehicles are using restricted public roads contrary to conditions of consent, similar to those recommended for the BCP (Refer Appendix B)

6.2 No Workforce Accommodation Facility (WAF)

The Department's conclusion and recommendation that the WAF is either not required or significantly reduced in scale does not appear to consider the likely traffic flows of mine workers travelling to and from nearby towns in the Muswellbrook LGA including Denman, Sandy Hollow, Muswellbrook and potentially further distances to the Lower Hunter.

6.3 Heavy Vehicles

If heavy vehicles are restricted to the designated heavy vehicle route via Ulan-Wollar Road and this proposed development condition is enforced there will be no impact on Bylong Valley Way. To provide a sense of the scale of the proposed operation the HEIP identifies the fundamental relationship between coal production and mine inputs as 2.5 percent of overall coal production. Applying this factor to this project, 6.5Mtpa production equates to an inbound road based freight forecast of 0.16Mtpa solely for mine inputs or 4Mt inputs over the projected life of the mine.

Given the temptation to avoid a 70 minute time penalty and short cut travel via the Bylong Valley Way, it is considered prudent to require regular independent traffic counts to reinforce compliance, particularly during the construction phase. This would involve counts over a 7 day period targeting AADT exceeding background traffic growth of 1% and independent auditing of Journey Management Plans (JMP) to inform the Traffic Management Plan (TMP) are also recommended.

The proposed condition of consent applying heavy vehicle limits on Bylong Valley Way from the east below 10 tonne is supported, however experience suggests that such conditions are rarely, if ever enforced, sometimes with tragic consequences. Examples include fatal and non-fatal road crashes in the Muswellbrook area involving mine vehicle traffic travelling on "restricted" non-mining traffic roads (Refer Case Study 4).

6.4 Traffic Management Plan

Importantly, Muswellbrook Shire Council must be included as a key stakeholder involved in the Traffic Management Plan (TMP) annual reviews and planning for proposed road safety upgrades. Muswellbrook Council was previously identified in the draft conditions of consent issued to the proponent in 2016 and should be reinstated in this role as part of the conditions of consent

6.5 Road Maintenance 'Payment for Damage' Contribution

Conditions of consent must include KEPCO previous commitment to Muswellbrook Shire Council dated 13 April 2017 for an appropriate road maintenance 'payment for damage' contribution to be made for the peak construction activities which will be negotiated with Council based on the results of the proposed 'before' and 'after' dilapidation inspections.

7 Conclusion

Cardno's traffic peer review and analysis, highlights that the existing road network cannot be considered safe for the increase in vehicular movements until numerous information gaps are addressed and additional independent analysis and assessment of Bylong Valley Way is addressed, particularly for the construction phase of this project. The BCP has a role and an ongoing financial contribution to make in collaboration with Mid Western and Muswellbrook local government areas to facilitate a safe road network for mine workers and all road users. The Department has a key role in enforcing conditions of consent with proposed monitoring and the involvement of Muswellbrook Shire Council in the Traffic Management Plan (TMP) supporting this.

8 References

- Australian Bureau of Statistics 2011 Census of Population and Housing REPLAN Community
- Brereton D, Moran C, McIlwain, McIntosh J & Parkinson K 2008 Assessing the cumulative impacts of mining on regional communities: An exploratory study of coal mining in the Muswellbrook area of NSW . Centre for social responsibility in mining, Centre for water in the Minerals Industry, University of Queensland
- Commonwealth of Australia 2013 *The Standing Committee on Regional Australia – Inquiry into and report on the use of 'fly-in, fly-out(FIFO) and 'drive-in, drive-out' (DIDO) workforce practices* http://www.aph.gov.au/Parliamentary_Business/Committees/House_of_representatives_Committees?url=ra/fifodido/tor.htm
- Coakes Consulting. 1999. Mining industry and employee survey. In Report prepared for Coal Operations Australia Limited, edited by C. Consulting. Sydney NSW.
- Deloitte Access Economics 2013 *Prospects and Challenges for the Hunter Region*
- Department of Planning 2012 *Upper Hunter Strategic Regional Land Use Plan*
- Department of Planning and Environment 2017 *Bylong Coal Project Preliminary Assessment Report*
- DeSilva H, Johnson L & Wade K 2011 *Long distance commuters in Australia: A socio-economic and demographic profile* Australasian Transport Research Forum 2011 Proceedings <http://www.patrec.org/atrf.aspx>
- Green and Canny 2003 *Geographic Mobility Family Impacts*. Google Books
Google Maps www.google.com.au/maps
- GTA 2015 *Wilpinjong Extension Project Wilpinjong, NSW - Road Transport Assessment*
- GHD 2015 *Bylong Valley Way Road Safety Audit*
- Hoath, A. & Haslam McKenzie F (2013) *the socio-economic impacts of long distance commuting on source communities*. Perth, Co-operative Research Centre for Remote Economic Participation and Curtin Graduate School of Business
- INSW & RDA Hunter 2013 *Hunter Economic Infrastructure Plan*
- Maitland City Council & Hunter Development Corporation 2013 *Hunter Strategic Infrastructure Plan*
- Mine Rescue NSW <https://www.minesrescueservices.com/>
- NSW Trade and Investment 2011 *Economic Assessment Mining Affected Communities*
- Parsons Brinkerhoff 2015 *Bylong Coal Project Traffic and Transport Impact Assessment*
- Parsons Brinkerhoff 2016 *Bylong Coal Project Response to Submissions Revised Traffic and Transport Impact Assessment*
- Sandow E & Westin K 2010 The persevering commuter – Duration of long-distance commuting. Transportation Research Part A: Policy and Practice. Volume 44, Issue 6, July 2010, Pages 433–445
- Yancoal 2016 *Ashton coal mine workforce data provided to Muswellbrook Shire Council*

Bylong Coal Project Planning and
Traffic Review

APPENDIX

A

CARDNO TECHNICAL MEMORANDUM

Technical Memorandum

Title	Bylong Coal Mine – Traffic and Transport Impact Assessment Peer Review Review Findings		
Client	Muswellbrook Shire Council	Project No	81017146
Date	4 May 2017	Status	Final
Author	Alice Shi	Discipline	Traffic and Transport
Reviewer	John Peace	Office	Brisbane

Introduction

Cardno has been commissioned by Muswellbrook Shire Council (MSC) to review the Traffic and Transport Impact Assessment (TTIA) prepared for the Environmental Impact Statement (EIS) for the Bylong Coal Project. The TTIA was prepared by Parsons Brinckerhoff (now WSP Parsons Brinckerhoff) with a revised version, Appendix D: Revised Traffic and Transport Impact Assessment, responding to submissions from government authorities including Transport for NSW, Mid-Western Regional Council and Muswellbrook Shire Council. This version of the report (issued 21 March 2016) has been reviewed by Cardno with findings outlined in the following section.

Muswellbrook Shire Council has expressed concerns regarding the TTIA particularly with respect to the impacts on the road network and the road safety aspects.

Review Findings

Table 1 outlines the peer review findings undertaken by Cardno.

Table 1 Bylong Coal Project Traffic and Transport Impact Assessment – Peer Review

Items for Traffic Assessment	Included in Assessment?	Reasonable Approach?	Comments
Assumptions			
Scope of assessment – spatial scope	✓	✓	No issues
Project staging and timing	✓	✓	No issues
Hours of operation	✓	✓	24 hours 7 days, consistent with other mining projects
Traffic surveys	✓	✗	Traffic surveys from multiple sources across different assessment years, it is not clear how the data has been factored to establish the 2015 baseline year. Further information required.
Cumulative background traffic – other mines	✓	✓	Included Bylong quarry, Wilpinjong mine, Moolarben mine, Ulan mine
Site inspection	✓	✓	Two site inspections, including Bylong Valley Way on both occasions (10 April 2014 and 20 January 2016)
Crash data review	✓	✗	Crash analysis undertaken, no conclusions regarding the crash risk were formulated, safety upgrades to be implemented by MSC and MRC were mentioned but not detailed.
Construction workforce	✓	✓	Up to 665 workers, considered to be appropriate for scale of proposed development
Operations workforce	✓	✓	Up to 470 workers, considered to be appropriate for scale of proposed development
Construction workforce – origin/destination	✓	✗	Some details (below) regarding origin/destination of construction and operations workers but not detailed enough to assess properly <ul style="list-style-type: none"> ▪ 10-15% from local area (not specified which areas) ▪ 20 staff housed in KEPCO accommodation near site ▪ Remaining workers: 80% from Mudgee, 20% from Denman/Sandy Hollow, Kandos/Rylstone and with MRC LGA (details of routes not specified)
Operations workforce – origin/destination	✓	✗	It is reasoned that a greater proportion of traffic than assessed will originate from the east (Muswellbrook/Sandy Hollow) given the mining specialists in this area.
Shift split / changeover times	✓	✓	Two 12 hour shifts (7:00am-7:00pm, 7:00pm-7:00am) 7 days a week Daytime office staff 8:00am-4:00pm. Consistent with other mining projects

Items for Traffic Assessment	Included in Assessment?	Reasonable Approach?	Comments
Peak hour assessed	✓	✘	Assumed 6:00-7:00am and 6:00-7:00pm for AM and PM peaks respectively, coinciding with the development peak. Assessment should provide a sensitivity assessment for the road network peaks and development traffic during those periods.
Background traffic growth rate	✓	✓	2% p.a. assumed, considered to be acceptable for the TTIA and is in line with other traffic studies for adjacent mine developments (1.8% assumed by GTA Consultants for the Wilpinjong Mine Extension).
Vehicle passenger capacity – buses	✓	✓	50 passengers, indicating a coach or similar, large but not unreasonable
Vehicle occupancy	✓	✘	A car share rate of 30% has been utilised. A 30% rate is considered to be reasonably high and will be difficult to achieve. Further justification required. Bus trips have assumed close to 100% (93%) occupancy which may not be achievable.
Construction material quantities	✓	✘	Details for materials (quantities for road construction materials, rail loop, pipes, water infrastructure, etc.) not provided. Required to accurately assess whether the estimated heavy vehicle trips are reasonable. Example of relevant materials included at Appendix A.
Construction haulage routes	✓	✘	Breakdown of origin/destinations for the construction trips (by materials supplied, vehicle types, route proposed) not provided. Further information required.
Construction material vehicle capacity	✓	✓	Heavy vehicle classifications have been specified at a high level. Vehicle types are considered reasonable and within permitted haulage route capacities, however the quantity of haulage proposed is required to accurately assess whether the trips are reasonable.
Delivery quantities	✓	✘	Heavy vehicle trips have been included in the assessment however details for their purpose have not been provided. Further explanation required for construction and operations.
Delivery routes	✘	✘	
Delivery vehicle capacity	✓	✓	Heavy vehicle classifications have been specified. B-double is assumed to be used, assumed routes for this vehicle type have not been outlined.
Mine Operations Equipment	✘	✘	Details of mine operations equipment has not been provided. Further information required volume, type, haulage route and origin and destination of equipment
Performance thresholds	✓	✓	DOS, LOS and queue thresholds are reasonable
Heavy vehicle permitted routes	✓	✘	Sufficient detail is not provided, only summarised the B-double routes. Further information required.
Intersection Analysis			

Items for Traffic Assessment	Included in Assessment?	Reasonable Approach?	Comments
Key criteria assessed	✓	x	The intersection assessment summaries provide DOS, delay, LOS and queues. While the capacity is not an issue at the intersections, the proportionate impact is significant and should be investigated further.
Operational assessment	✓	✓	SIDRA analysis appears to have been undertaken for the intersections. Details for these analyses are not included with the version of the report provided. However, capacity is shown to not be a major constraint but the proportionate impact at the subject intersections is significant and should be investigated further.
Link Assessment			
Key criteria assessed	✓	x	While the capacity is not an issue, the proportionate impact is significant (up to 461% increase) and should be investigated further.
Turn Warrant Assessment			
Intersections assessed	✓	x	Only Bylong Valley Way/Wollar Road and Bylong Valley Way/Upper Bylong Road have been assessed. Other intersections have not been assessed. Demonstration of the turn warrant assessments (plotted graphs) have not been provided. Further information required.
Swept Path Analysis of development affected intersections	x	x	No swept path analysis of development vehicles at subject intersections has been undertaken. It is not clear whether the existing intersection geometry can accommodate all development vehicles. Further investigation required and details of localised upgrades if required.
Pavement Impact Assessment			
Pavement impacts assessed	x	x	Report recommends inspections to be undertaken to monitor pavement impacts. Usually a pavement scoping assessment will be undertaken to determine whether a detailed pavement impact assessment will be warranted prior to approval of the project. Further investigation required.
Road Safety Audit			
Road safety assessed	x	x	No road safety audit has been undertaken. Reference is made to the MSC road safety audit however this has not been made available at the time of review. Preliminary assessment of Bylong Valley Way highlights the following areas of concern: <ul style="list-style-type: none"> ▪ Existing physical constraints including narrow carriageway widths, narrow or non-existent shoulders, sheer drop off without adequate guard rails, sharp horizontal curves, steep grades, etc. ▪ Lack of signage and line marking Increase in traffic volumes due to the development warrants the need for a road safety audit of the affected roads, particularly along Bylong Valley Way east of Wollar Road.

Items for Traffic Assessment	Included in Assessment?	Reasonable Approach?	Comments
			Contributions towards road safety upgrades should be based on the proportionate impact of the development traffic to the baseline traffic. Further details outlining how the contribution was calculated should be provided. Mitigating road safety risks, particularly with the additional traffic associated with the mine, is a primary concern.
Construction Management Plan			
Construction Management Plan prepared	x	x	Not prepared, recommendation made for a Construction Management Plan to be prepared prior to construction commencing.

Summary

Cardno has reviewed the Traffic and Transport Impact Assessment and ascertained the following areas for further investigation, ordered by priority.

Table 2 Summary of Peer Review

Item	Issue Identified
High Priority	
Construction and operations workforce – origin/destination	<p>Some details (below) regarding origin/destination of construction and operations workers but not detailed enough to assess impact affectively</p> <ul style="list-style-type: none"> ▪ 10-15% from local area (not specified which areas) ▪ 20 staff housed in KEPCO accommodation near site ▪ Remaining workers: 80% from Mudgee, 20% from Denman/Sandy Hollow, Kandos/Rylstone and with MRC LGA (details of routes not specified) <p>It is reasoned that a greater proportion of traffic than assessed will originate from the east (Muswellbrook/Sandy Hollow) given the mining specialists in this area. Further clarification is required.</p>
Construction materials quantities and haulage routes	<p>Details for materials (quantities for road construction materials, pipes, fuel, etc.) not provided. Required to accurately assess whether the estimated heavy vehicle trips are reasonable. Example of relevant materials included at Appendix A.</p> <p>Breakdown of origin/destinations for the construction trips (by materials supplied, vehicle types, route proposed) not provided. Further information required.</p>
Delivery quantities and routes	<p>Heavy vehicle trips have been included in the assessment however details for their purpose have not been provided. Further explanation required, refer to Appendix A for an example.</p>
Intersection analysis	<p>While the capacity is not an issue at the intersections, the proportionate impact is significant and should be investigated further.</p>
Link analysis	<p>While the capacity is not an issue, the proportionate impact is significant (up to 461% increase) and should be investigated further.</p>
Turn warrant assessment	<p>Only Bylong Valley Way/Wollar Road and Bylong Valley Way/Upper Bylong Road have been assessed. Other intersections have not been assessed.</p> <p>Demonstration of the turn warrant assessments (plotted graphs) have not been provided. Further information required.</p>
Swept Path Analysis of development affected intersections	<p>No swept path analysis of development vehicles at subject intersections has been undertaken. It is not clear whether the existing intersection geometry can accommodate all development vehicles. Further investigation required and details of localised upgrades if required.</p>
Pavement impact assessment	<p>Report recommends inspections to be undertaken to monitor pavement impacts. Usually a pavement scoping assessment will be undertaken to determine whether a detailed pavement impact assessment will be warranted prior to approval of the project. Further investigation required.</p>
Road safety audit	<p>No road safety audit has been undertaken. Preliminary assessment of Bylong Valley Way highlights the following areas of concern:</p> <ul style="list-style-type: none"> ▪ Existing physical constraints including narrow carriageway widths, narrow or non-existent shoulders, sheer drop off without adequate guard rails, sharp horizontal curves, steep grades, etc. ▪ Lack of signage and line marking <p>Increase in traffic volumes due to the development warrants the need for a road safety audit, particularly along Bylong Valley Way east of Wollar Road.</p> <p>Contributions towards road safety upgrades should be based on the proportionate impact of the development traffic to the baseline traffic. Further details outlining how the contribution was calculated should be</p>

Item	Issue Identified
	provided. Mitigating road safety risks, particularly with the additional traffic associated with the mine, is a primary concern.
Moderate Priority	
Crash data review	Crash analysis undertaken, no conclusions regarding the crash risk were formulated, safety upgrades to be implemented by MSC and MRC were mentioned.
Peak hour assessed	Assumed 6:00-7:00am and 6:00-7:00pm for AM and PM peaks respectively, coinciding with the development peak. Assessment should provide a sensitivity assessment for the road network peaks and development traffic during those periods.
Heavy vehicle permitted routes	Sufficient detail is not provided, only summarised the B-double routes
Low Priority	
Traffic surveys	Traffic surveys from multiple sources across different assessment years, it is not clear how the data has been factored to the 2015 baseline year. Further information required.
Vehicle occupancy	A car share rate of 30% has been utilised. A 30% rate is considered to be reasonably high and will be difficult to achieve. Further justification required. Bus trips have assumed close to 100% (93%) occupancy which may not be achievable.
Construction Management Plan	Not prepared, recommendation made for a CMP to be prepared prior to construction commencing.

Bylong Coal Mine – Traffic and Transport
Impact Assessment Peer Review

APPENDIX A
EXAMPLE MINE CONSTRUCTION AND
OPERATIONS MATERIALS

Loads/Round Trips Per Annum

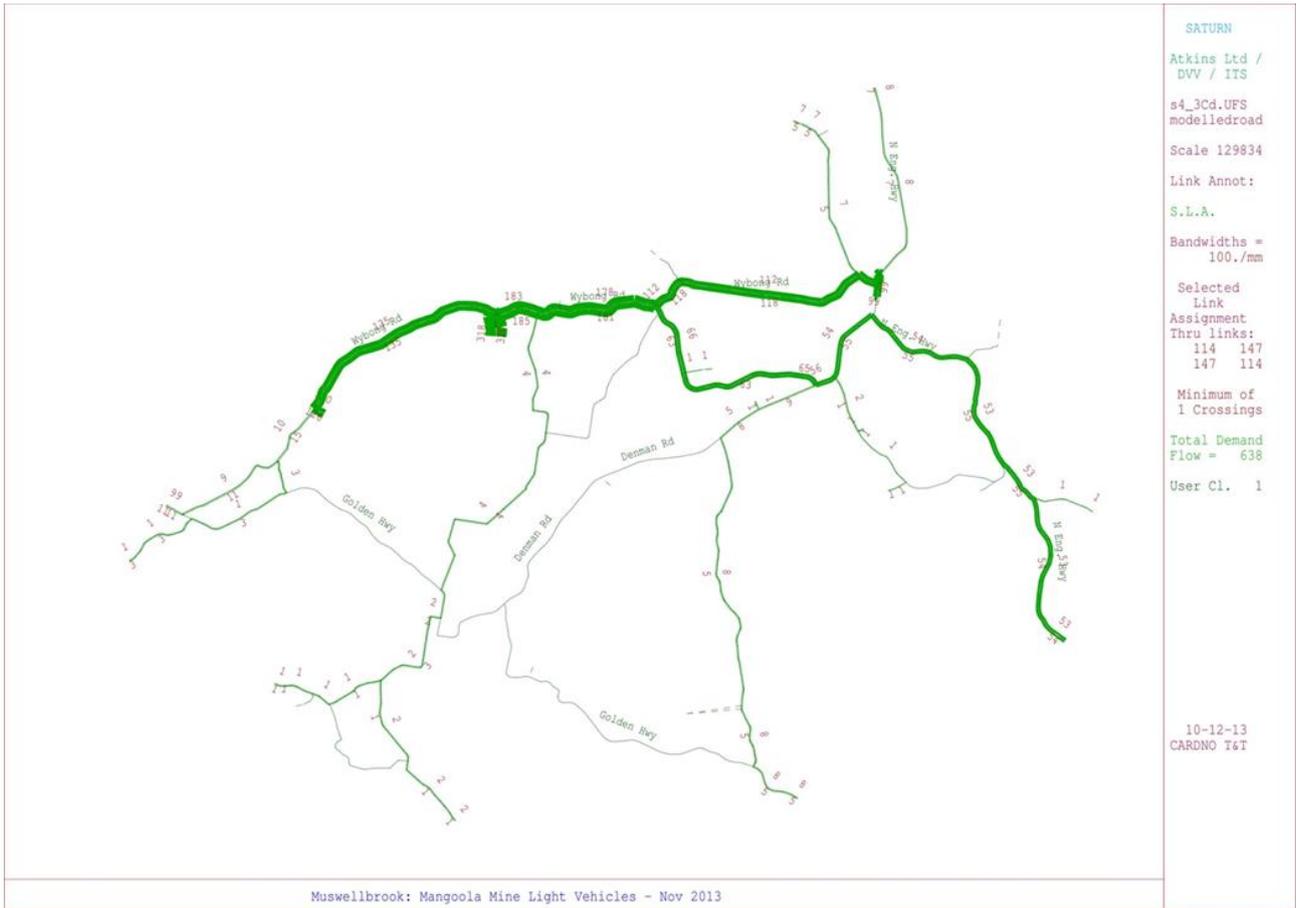
Item	Component	Description of Frequency	Typical vehicle	Origin
Overburden Removed (Bt)				
Coal Output (t)				
Additional Workforce				
	Operations			
	Local		Bus	Location A
			LV	Location B
	FIFO		LV	Location C
	DIDO		LV	Location D
	Construction			
	Local		LV	Location A
			LV	Location B
	FIFO		LV	Location C
	DIDO		LV	Location D
Mine Operation Inputs				
	Toll North Stock Shipment	Daily- Tuesday-Saturday.	B-Double	Location C
	Toll North Stock Shipment	Average approx. 1 per month	B-Double	Location D
	Tytec Michelin HV Tyres	1-2 per week	Semi Trailer	Location E
	Toll North or Tytec Tyre & Rim Repairs	1 per month	Semi Trailer	Location B
	iOR Diesel	3 per day	B-Double	Location E
	Toll Liquids Oils	2-3 per month	B-Double	Location E
	Toll Liquids Truckwash	1 per month	Rigid Truck	Location A
Camp Operation				
	Food Deliveries	2 per week	Semi Trailer	Location A
	Linen Deliveries	2 per week	Semi Trailer	Location A
Waste (mine and camp)				
	General, Recyclable, Special Waste		Semi Trailer	Location C
	Steel		Semi Trailer	Location A
Construction Inputs				
Road Realignment				
	Bitumen		Rigid Truck	Location A
	Bridge Barriers		Semi Trailer	Location A
	Concrete		Ag Truck	Location C
	Culvert/Pipe		Semi Trailer	Location A
	Misc		Semi Trailer	Location E
	Misc		Semi Trailer	Location A
	Piles		Semi Trailer	Location A
	Precast Concrete		Semi Trailer	Location A
	Reinforcing Steel		Semi Trailer	Location A
	Site Office		Semi Trailer	Location A
	High Strength Road Base		B-Double	Location C
	Plant/equipment		Semi Trailer	Location E
Water Infrastructure				
	Concrete Pipe		Semi Trailer	Location A
	Culvert		Semi Trailer	Location A
	Flood Gate		Semi Trailer	Location A
	Gabions		Semi Trailer	Location A
	Geotextile		Semi Trailer	Location E
	Road Base		B-Double	Location C
	Valves		Semi Trailer	Location E
	Walkway		Semi Trailer	Location E
	Plant/equipment		Semi Trailer	Location E
Coal Mine Plant				
	Shovel		Semi Trailer	Location D
	Haul Truck		Semi Trailer	Location D
	Haul Truck		Semi Trailer	Location E
	Bulldozer		Semi Trailer	Location E
	Water Cart		Semi Trailer	Location E
	Grader		Semi Trailer	Location E
	Drill		Semi Trailer	Location E
Camp Extension				
	Camp Modules		Semi Trailer	Location D

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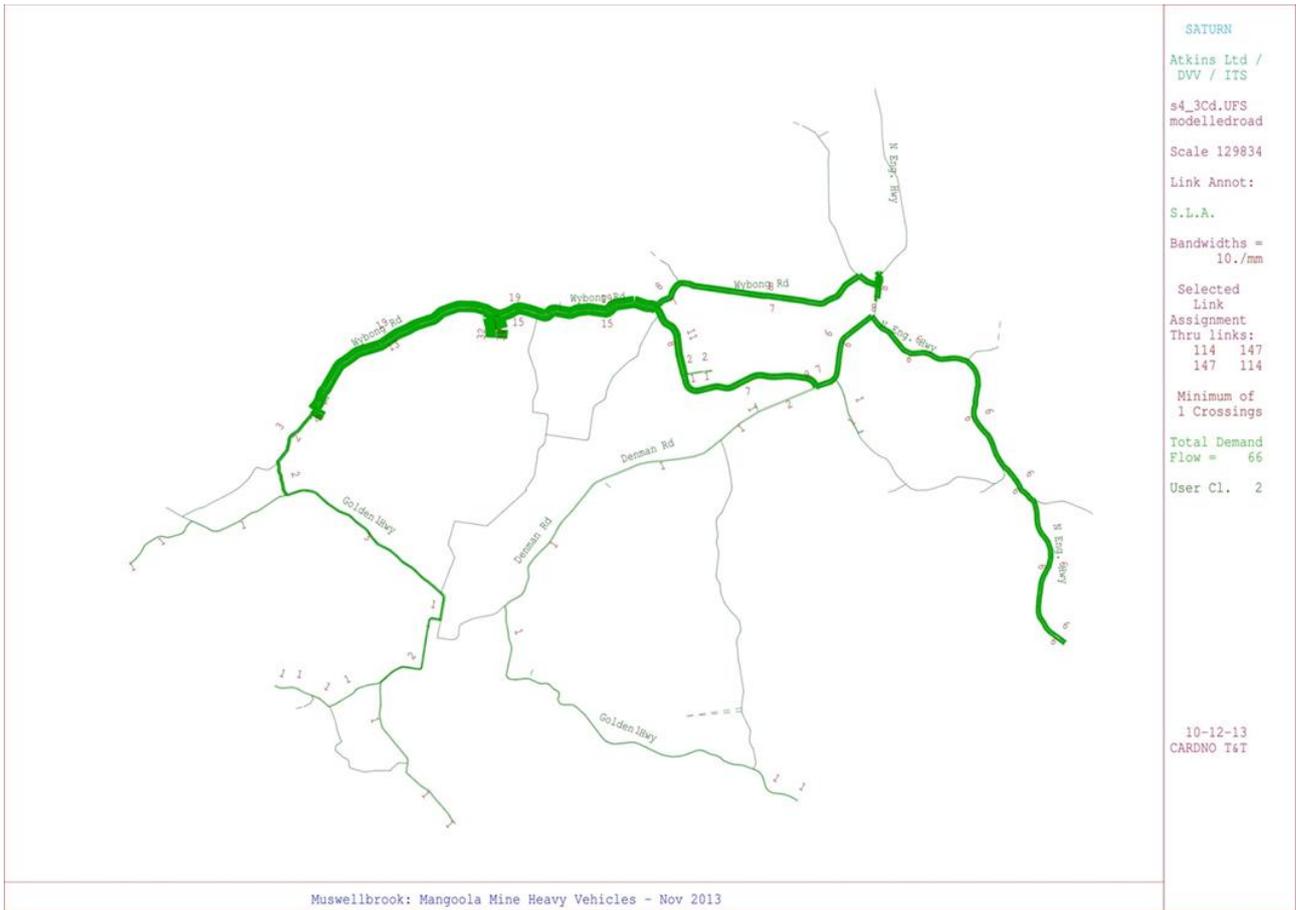
APPENDIX

B

MINE RELATED VEHICLES TRAFFIC MONITORING



Traffic monitoring Muswellbrook LGA 2013 – Mangoola Mine Heavy Vehicles (Case Study)



About Cardno

Cardno is an ASX200 professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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